

NORLEX (North Sea and Norwegian Sea) Biostratigraphy with images

Coordinated by Felix Gradstein. Compiled by Rebecca Bobick (2014,2015); Re-calibrated to 2020 age model (Gradstein, Ogg and Schmitz; Geologic TimeScale 2020; Elsevier)

North Sea Lithostratigraphy

Cenozoic Major Nordic Hiatuses & General Lithology Formations in North Sea (Cenozoic)	Reference: Cenozoic_North Sea.pdf found in Anthonissen, E.D. 2009. A new Pliocene biostratigraphy for the northeastern North Atlantic.
Cretaceous Chalk Formations (Fritsen-Riis, 2000) Lithostratigraphy for formations of North Sea central graben	Reference: Fritsen-Riis_2000 (NPD) = "Revised Chalk lithostrat nomenclature". Ages to Paleocene stages and UC zones from Figure 1. Mainly "NORTH SEA CENTRAL GRABEN CHALK LITHOSTRATIGRAPHIC NOMENCLATURE"
Cretaceous Chalk of the Eldfisk Field Biostrat Zones of North Sea Eldfisk Field Subzones of North Sea Eldfisk Field (Cretaceous) Holostratigraphy for the chalk of the North Sea Eldfisk Field	Reference: Cretaceous Hampton et al. "A holostratigraphic approach to the chalk of the North Sea Eldfisk Field, Norway"
Cretaceous Northern Province Chalk (BGS) Groups of chalks for Northern Province of UK Offshore Sector (Cretaceous)	Reference: "A stratigraphic framework for the Upper Cretaceous Chalk of England and Scotland With Statements on the Chalk of Northern Ireland and the UK Offshore Sector", Hopson, P.M., Calibration age reference from Pp. 32

North Sea Dinoflagellate Cysts

Cenozoic Dinocyst Datums and Zones (N-Sea) Dinocyst zone (Cenozoic) Offshore Norway Dinocyst Markers (Cenozoic)	Reference: based on: Smelror (pers.com.), Mudge & Bujak (1996), Millenium Atlas (2003)
Cenozoic Dinoflagellate LAD and NSR Zones Assemblages of Dinoflagellates (Cenozoic)	Reference: Gradstein, F.M. and Backstrom, S., 1996. Cenozoic biostratigraphy and paleobathymetry Haltenbanken and northern North Sea. Norsk Geologisk Tidsskrift, v. 76, p 3 - 32.
Cenozoic Dinocyst events (Anthonissen) Dinocyst events (Cenozoic)	Reference: Based on: Anthonissen, E.D. 2009. A new Pliocene biostratigraphy for the northeastern North Atlantic.
Cretaceous Dinocyst Palynology Datums and Zones Zone for palynology datums (Cretaceous) Offshore Norway palynology Dinoflagellate markers	Reference: NORLEX chart "LowerCretaceous_midNorway.pdf" and "UpperCretaceous_midNorway.pdf" generated by "TSC_NorLEX_Cret_version4_MACoet07.txt"
Cretaceous Dinocyst Datums and Zones (Boreal) Boreal Dinocyst Zone (Foucher '81, Cretaceous) Boreal Dinocyst Subzone (Cretaceous) Boreal, NW Europe major or selected dinoflagellate datums (Cretaceous) Boreal, NW Europe other dinoflagellate datums (Cretaceous)	Reference: Boreal Dinoflagellate Zones (DTS): Riding & Thomas (1992) use the following procedure for correlating their dinocyst zones to the ammonite zones -- If the FAD or LAD of an index dinocyst falls within an ammonite zone, the boundary of the dinocyst biozone is approximated to the ammonite zonal boundary. This means that the dinocyst zonal boundary is rounded down in the case of a FAD, and rounded up in the case of a LAD, to the ammonite zonal boundary.
JURASSIC Dinocyst Datums and Zones (Boreal) Dinocyst Boreal Zone Boreal, NW Europe major or selected dinocyst datums (Jurassic)	Reference: Dinocyst Zones of Poulsen and Riding (2003)
Jurassic Dinocyst Biozonation	Reference: Jurassic Statoil Hydro NORLEX Dinocyst biozonation

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Dinoflagellate (Jurassic)	
Jurassic NorthSea Dinocyst Ranges	Reference: Chart Jurassic DC; 07 September 2011 by TNO
Dinoflagellate range data (Jurassic)	
Triassic Dinoflagellate Cysts	Reference: Diagram "Triassic W-Europe (North Sea)" NEEDS TO BE CONFIRMED
Dinoflagellate Cyst (Triassic)	
North Sea Pollen and Megaspores	
Jurassic Spores/Pollen Ranges	Reference: Chart Jurassic DC; 07 September 2011 by TNO
Pollen range data (Jurassic)	
Triassic Spores/Pollen	Reference: Diagram "Triassic W-Europe (North Sea)"
Spore/Pollen (Triassic)	
Triassic MegaSpore/Megafossils	Reference: Diagram "Triassic W-Europe (North Sea)"
Megaspore/Megafossil (Triassic)	
North Sea Foraminifera	
Cenozoic Deep Water Foraminifera	Reference: based on: Atlas of paleogene cosmopolitan deep-water agglutinated foraminifera, M.A. Kaminski & F.M. Gradstein, Grzybowski Foundation, 2005; Gradstein, F.M. and Backstrom, S., 1996. Cenozoic biostratigraphy and paleobathymetry Haltenbanken and northern North Sea. Norsk Geologisk Tidsskrift, v. 76, p 3 - 32.
NSR Zone of foraminifera (Cenozoic)	
Assemblages of Agglutinated Benthic Foraminifera, Calcareous Foraminifera, and other microfossils	
Deep-Water Forams; Paleogene	Reference: Atlas of paleogene cosmopolitan deep-water agglutinated foraminifera, M.A. Kaminski & F.M. Gradstein, Grzybowski Foundation, 2005
Paleogene offshore Norway Agglutinated Foraminifer Markers (Cenozoic)	
Cenozoic Foram, Bolboformid and Diatom Events (Anithonissen)	Reference: Based on: Anthonissen, E.D. 2009. A new Pliocene biostratigraphy for the northeastern North Atlantic.
Zone (base) for microfossil events	
Microfossil data (Cenozoic)	
Cretaceous Microfossil Datums and Zones (Offshore Norway)	Reference: NORLEX chart "LowerCretaceous_midNorway.pdf" and "UpperCretaceous_midNorway.pdf" generated by "TSC_NorLEX_Cret_version4_MACoet07.txt"
Microfossil Marker Zones (Cretaceous)	
offshore Norway microfossil markers (Cretaceous)	
Cretaceous-Cenozoic Offshore Norway Microfossils	Reference: NEOGENE: based on Gradstein & Backstrøm (1996), Kaminiski & Gradstein (2005), Gradstein (pers.com); PALEOGENE: based on Gradstein & Backstrøm (1996); CRETACEOUS: Gradstein et al., 1999
Zone for Offshore Norway Microfossils (Cretaceous)	
Offshore Norway microfossil markers (Cretaceous)	
Lower Jurassic Foraminifer Datums and Zones (Boreal)	Reference: Copestake, P., 1989. "6.2. The Hettangian to Toarcian (Lower Jurassic)" chapter. In: Stratigraphic Atlas of Fossil Foraminifera (2nd edition) (D.G. Jenkins and J.W. Murray, editors), published by Ellis Horwood Ltd. for The British Micropalaeontological Society: pg. 129-188.
Zones of Copestake (1989)	
British Jurassic zonal foraminifer markers (Jurassic)	
Other selected foraminifer datums (Jurassic)	
Lower Jurassic Foraminifera Ranges	Reference: Fig. 6.26, 6.27, and 6.28 - Stratigraphic distribution of foraminifera in the Lower Jurassic In: Stratigraphic Atlas of Fossil Foraminifera (2nd edition) (D.G. Jenkins and J.W. Murray, editors), published by Ellis Horwood Ltd. for The British Micropalaeontological Society: pg. 129-188.
Location Unstated	

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Viking Graben
 Moray Firth Basin
 Southern North Sea Basin
 Cleveland Basin
 Midlands Basin'-East Midlands Shelf
 Mendip High-Radstock Shelf
 South Wales-North Somerset (eastern Bristol Channel Basin)
 Wessex Basin
 Fastnet-Celtic Sea-Cardigan Basins
 Ulster Basin
 Mull-Morvern
 Location unknown

Middle Jurassic (Callovian) Foraminifera Ranges

Dorset Coast
 Lyme Bay Borehole
 Winterborne Kingston Borehole
 Seabarn Farm Borehole
 Frome Borehole

Reference:

Fig. 6.35 - Range Chart for Selected Callovian Foraminifera In: Stratigraphic Atlas of Fossil Foraminifera (2nd edition) (D.G. Jenkins and J.W. Murray, editors), published by Ellis Horwood Ltd. for The British Micropalaeontological Society: pg. 189-236.

Middle-Late Jurassic Foraminifera Ranges

Middle-Late Jurassic Foraminifera

Reference:

Fig. 6.36 - Distribution of Middle-Late Jurassic Foraminifera in B.P. U.K.C.S. will 211/12-1 (Magnus Field) In: Stratigraphic Atlas of Fossil Foraminifera (2nd edition) (D.G. Jenkins and J.W. Murray, editors), published by Ellis Horwood Ltd. for The British Micropalaeontological Society: pg. 189-236.

Middle Jurassic (Bajocian) Foraminifera Ranges

Dorset Coast
 Lyme Bay Borehole
 Winterborne Kingston Borehole
 Seabarn Farm Borehole
 Seabarn Farm Borehole subset A.
 Frome Borehole
 mid-Cotswolds
 Naggridge No. 1 Borehole
 Horsecombe Vale 15 Borehole
 Atworth
 Chickerell

Reference:

Fig. 6.34 - Range Chart of selected Aalenian, Bajocian and Bathonian Foraminifera In: Stratigraphic Atlas of Fossil Foraminifera (2nd edition) (D.G. Jenkins and J.W. Murray, editors), published by Ellis Horwood Ltd. for The British Micropalaeontological Society: pg. 189-236.

Oxfordian-Portlandian Jurassic Foraminifera Ranges

Dorset Coast
 Winterborne Kingston
 Purton
 Woodham
 Milton Keyes
 Warboys
 Yorkshire Coast

Reference:

Fig. 6.46 - Range Chart of Oxfordian-Portlandian Foraminifera. (Legend as for Fig. 6.2.7) In: Stratigraphic Atlas of Fossil Foraminifera (2nd edition) (D.G. Jenkins and J.W. Murray, editors), published by Ellis Horwood Ltd. for The British Micropalaeontological Society: pg. 237-271.

Combined Jurassic foram ranges

Reference:

Stratigraphic Atlas of Fossil Foraminifera (2nd edition) (D.G. Jenkins and J.W. Murray, editors), published by Ellis Horwood Ltd. for The British Micropalaeontological Society: pg. 129-326.