

High-resolution ammonite-based biostratigraphy of the Janusfjellet Subgroup (Middle Jurassic – Lower Cretaceous) of Spitsbergen

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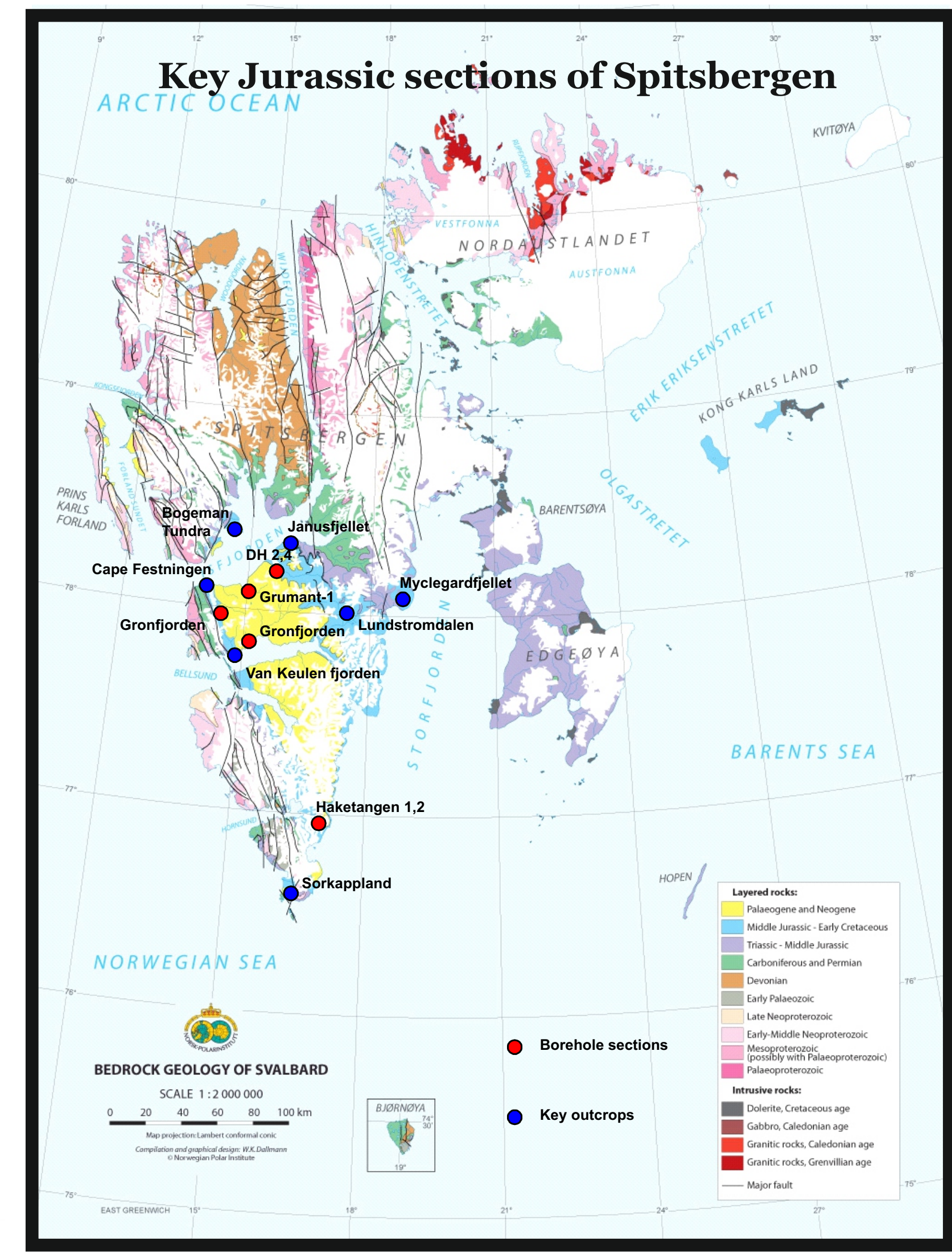
of Spitsbergen



Ammonite zonal succession of the Middle Jurassic - Lower Cretaceous of Spitsbergen

Spitsbergen is a key region for reconstructing Middle Jurassic – Early Cretaceous geological history of the Barents Sea region, an important pathway of faunal immigration and thus crucial area for high-resolution biostratigraphic correlation within the Panboreal Superrealm. However, precise age of members and formations of the Adventdalen Group remains controversial, as well as age of the regionally traced gaps or unconformities, which correlatives are traced across the Barents Sea shelf.

Adventdalen Group in Spitsbergen is overlying the Brentskardhaugen Bed, which is containing reworked fossils of the Toarcian and Aalenian age (Ershova, Repin, 1983; Backström, Nagy, 1985).



AGE (Ma)	Stage	Ammonite Zones Tethyan	Ammonite Zones Northwest Europe	Ammonite Zones Spitsbergen	Simplified rock succession, Spitsbergen
125.0 ± 1.0	Barremian	P. waagenoides C. sarasini I. giraudi Hemi. feraudianus Hemi. sartouisi A. vandenheckii	P. bidentalatum Sim. stolleyi Ancy. innexum / pingue Paracrioceras denckmanni Para. elegans	Non-marine deposits	Grain size increasing Glendonites
130.0 ± 1.5	Hauterivian	Coron. darsi K. compressissima Nick. pulchella Kotesh. nicklesi Tavera. hugii auct.	H. fissicostatum Hopl. crioceras Hopl. rorocinctum S. variabilis S. marginatus	M. speetonensis S. versicolor	possible gap
136.4 ± 2.0	Valanginian	B. balearis Pleisiospidiscus ligatus Subsarynella sayni Lyticoceras odosaglicatum Crioceratites loryi Acanthodiscus radiatus	M. speetonensis S. inversum E. regale E. noricum E. ambygonium	Pr. bojarkensis Dichotomites bidichotomus	possible gap
140.2 ± 3.0	Berriasian	Crisarasiniella furcillata Neocomites peregrinus Saynoceras verrucosum Busnardoites campylotoxus Th. pertransiens Th. otopena Th. alpillensis Berr. picteti Malbo. paramimounum Dai. dalmasi S. subalpina Berriassella grandis Berr. jacobi	paucinodum tuberculata Dicho. ivanovi through Para. robustum (13 zones) Peregr. albidum Sur. stenophalus Surites iceni Hectoro. kochi Runctonia runctoni Subcraspedites lamplughi Subcraspedites preplicomphalus Sub. primitivus Para. oppressus T. anguliformis Ga. kerberus Ga. okusensis Gl. glaucolithus Pro. alban Virgatopav. fittoni Pav. rotunda P. pallasioides P. pectinatus P. hudlestoni P. wheatlevisensis P. scitulus P. elegans	Pr. bojarkensis Dichotomites bidichotomus P. michalskii A. astierptychus P. quadrifidus Tollia tolli B. meszhnikovii S. analogus H. kochi Chetaites sibiricus V. lamplughi / Chetaites chetae C. (T.) taimyrensis C. (C.) okensis Praec. exoticus Laug. groenlandicus Crend. anguinus Dors. maximus Dors. ilovaiskii Pavlovia rugosa Paravirgatites sp. Sub. taimyrensis Hopl. decipiens Euprion. sokolovi Amoebites kitchini Plasm. bauhini A. rosenkrantzi A. regulare A. serratum A. ilovaiskii M. tenuiserratum Subvertebriceras denseplicatum Cardioceras cordatum S. obliteratum? Longaeviceras keyserlingi D. pomeroyense?	possible gap
150.8 ± 4.0	Volgian/Tithonian	Micracanthoceras microcanthum M. ponti / Burck Simoceras admirandum / bipinnatum Richterella richteri S. semiforme S. darwini Hyboniticeras hyboniticum	Virgatopav. fittoni Pav. rotunda P. pallasioides P. pectinatus P. hudlestoni P. wheatlevisensis P. scitulus P. elegans	Pr. bojarkensis Dichotomites bidichotomus P. michalskii A. astierptychus P. quadrifidus Tollia tolli B. meszhnikovii S. analogus H. kochi Chetaites sibiricus V. lamplughi / Chetaites chetae C. (T.) taimyrensis C. (C.) okensis Praec. exoticus Laug. groenlandicus Crend. anguinus Dors. maximus Dors. ilovaiskii Pavlovia rugosa Paravirgatites sp. Sub. taimyrensis Hopl. decipiens Euprion. sokolovi Amoebites kitchini Plasm. bauhini A. rosenkrantzi A. regulare A. serratum A. ilovaiskii M. tenuiserratum Subvertebriceras denseplicatum Cardioceras cordatum S. obliteratum? Longaeviceras keyserlingi D. pomeroyense?	possible gap
154.55 ± 4.0	Kimmeridgian	Hyboniticeras beckeri Aula. eudoxus Asp. acanthicum Crussol. divisum Alaxioceras hypselocyclum Sutneria platynota Subnebrodites planula	Aulacostephanus autissiodorensis Aulacostephanus eudoxus Aulacostephanoides mutabilis Rasenia cymodoce Pictonia baylei	Sub. taimyrensis Hopl. decipiens Euprion. sokolovi Amoebites kitchini Plasm. bauhini A. rosenkrantzi A. regulare A. serratum A. ilovaiskii M. tenuiserratum Subvertebriceras denseplicatum Cardioceras cordatum S. obliteratum? Longaeviceras keyserlingi D. pomeroyense?	possible gap
155.65 ± 4.0	Oxfordian	Epipeltoeras bimammatum Per. bifurcatus Gregoryceras Transversarium Perisphinctes (A.) plicatilis	Ringsteadia pseudocordata Per. caulisnigrae Perisphinctes pumilus	Sub. taimyrensis Hopl. decipiens Euprion. sokolovi Amoebites kitchini Plasm. bauhini A. rosenkrantzi A. regulare A. serratum A. ilovaiskii M. tenuiserratum Subvertebriceras denseplicatum Cardioceras cordatum S. obliteratum? Longaeviceras keyserlingi D. pomeroyense?	possible gap
161.2 ± 4.0	Callovian	Quenstedtoceras (Q.) mariae Quenstedtoceras (L.) lamberti Pelto. athleta Ery. coronatum Rein. anceps Macrocephalites (Dolikephalites) gracilis Bull. bullatus	Quenstedtoceras (Q.) mariae Quenstedtoceras (L.) lamberti Pelto. athleta Ery. coronatum Rein. anceps Macrocephalites (Dolikephalites) gracilis Bull. bullatus Macro. herveyi	Sub. taimyrensis Hopl. decipiens Euprion. sokolovi Amoebites kitchini Plasm. bauhini A. rosenkrantzi A. regulare A. serratum A. ilovaiskii M. tenuiserratum Subvertebriceras denseplicatum Cardioceras cordatum S. obliteratum? Longaeviceras keyserlingi D. pomeroyense?	possible gap
164.7 ± 4.0	Bathonian	Clyoniceras (C.) discus Hectoceras (P.) retrocristatum Cado. premeri M. morrisi / I. subcontractus Procerites (P.) progacilis Pro. aurigerus Zigzagoceras zigzag	Clyoniceras (C.) discus Oxycentes orbis Pro. hodsoni Ar. cranocephaloide Arcticoceras ischmae	Sub. taimyrensis Hopl. decipiens Euprion. sokolovi Amoebites kitchini Plasm. bauhini A. rosenkrantzi A. regulare A. serratum A. ilovaiskii M. tenuiserratum Subvertebriceras denseplicatum Cardioceras cordatum S. obliteratum? Longaeviceras keyserlingi D. pomeroyense?	possible gap
167.7 ± 3.5	Bajocian	Parkinsonia (P.) parkinsoni Garantiana garantiana Strenoceras niortense Stephan. humphriesianum propinquans (= zone E. (O.) sauzei) Witchellia laeviuscula Hyperlioceras discites	Parkinsonia (P.) parkinsoni Garantiana garantiana Strenoceras niortense Stephan. humphriesianum propinquans (= zone E. (O.) sauzei) Witchellia laeviuscula Hyperlioceras discites	Sub. taimyrensis Hopl. decipiens Euprion. sokolovi Amoebites kitchini Plasm. bauhini A. rosenkrantzi A. regulare A. serratum A. ilovaiskii M. tenuiserratum Subvertebriceras denseplicatum Cardioceras cordatum S. obliteratum? Longaeviceras keyserlingi D. pomeroyense?	possible gap
171.6 ± 3.0	Aalenian	Graphoceras concavum Ludwigia purchisonae	Graphoceras concavum Ludwigia purchisonae	Sub. taimyrensis Hopl. decipiens Euprion. sokolovi Amoebites kitchini Plasm. bauhini A. rosenkrantzi A. regulare A. serratum A. ilovaiskii M. tenuiserratum Subvertebriceras denseplicatum Cardioceras cordatum S. obliteratum? Longaeviceras keyserlingi D. pomeroyense?	possible gap
175.6 ± 2.0	Aalenian	Leioceras opalinum	Leioceras opalinum	Sub. taimyrensis Hopl. decipiens Euprion. sokolovi Amoebites kitchini Plasm. bauhini A. rosenkrantzi A. regulare A. serratum A. ilovaiskii M. tenuiserratum Subvertebriceras denseplicatum Cardioceras cordatum S. obliteratum? Longaeviceras keyserlingi D. pomeroyense?	possible gap



Basal part of the Adventdalen Group is characterized by ammonite genus *Arcticoceras*, indicating Lower Bathonian *Arcticoceras* and Middle Bathonian *Cranocephaloide* ammonite zones (Mitta et al., 2014). A prominent assemblage with *Keplerites svalbardensis* and *cardioceratids* above *Arcticoceras*-bearing unit is typical for the Upper Bathonian *Variabile* and *Calyx* Zones. Typical Lower Callovian ammonites are unknown in Spitsbergen. Middle Callovian is mainly represented by its uppermost part (cf. Kopik, Wierzbowski, 1988), while ammonites typical for lower part of the Middle Callovian remain unfigured (Ershova, Korchinskaya, 1980). Upper Callovian here is well-characterized by numerous records of *cardioceratids*.

Although presence of Middle-Upper Oxfordian gap is widely accepted by those who studying Jurassic of Spitsbergen and adjacent areas, in fact nearly full succession of the Oxfordian ammonite zones was established for this region by Ershova (1983). In the famous Festningen section basal part of the Late Jurassic black shales (Lardyfjellet Mb) is dated by early *Amoeboceras* as *Glosense* (= *Ilovaiskii*) Zone. Kimmeridgian Stage in Spitsbergen is represented by full succession of Boreal zones (Rogov, 2014), and only two thin intervals are characterized by short-term appearance of Subboreal *aulacostephanid* ammonites (*cymodoce* and *sachsi* horizons), possibly indicating small-ranged climate oscillations. The Volgian Stage in Spitsbergen is intensively studied during the last decades. Now nearly full succession of the Middle and Upper Volgian zones is established here (Rogov, 2010; Wierzbowski et al., 2011), while completeness of the Lower Volgian still questioned, because only its uppermost part is characterized by ammonites. It is very possible, that lower part of the Lower Volgian is absent here, as in the many other Arctic sites, being removed during the Middle Volgian transgression. Ryazanian and Valanginian Stages, well-characterized by ammonites and bivalves, seems to be nearly complete in Spitsbergen (Frebold, 1929; Ershova, 1983; Wierzbowski et al., 2011). The same is true for glendonite-bearing Upper Hauterivian deposits, which are characterized by *Speetonoceras* and *Simbirskites*. However, presence of the Lower Hauterivian in Spitsbergen still not confirmed by ammonite records.

Key references

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