

# **Rita-1X (4649.72 - 4675.02 m), Heno Formation (Gert Member), Danish Central Graben**

Sedimentological and ichnological  
core description report

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Confidential report

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## 1. ABSTRACT

Sedimentological and ichnological properties of the Rita-1X core covering the Gert Member (Heno Formation) interval of Kimmeridgian age at the margin of the Feda Graben, Danish Central Graben, were described in order to interpret the depositional setting. The cored interval consists of alternating massive mudstone, bedded mudstone, mud-draped cross-stratified sandstone and conglomeratic intervals. In the lower part of the core, recurring sedimentary successions form of 1-3 m-thick units, which consist of *Chondrites*-bearing, massive organic-rich mudstone that grade upward into mud-crack-bearing heterolithic lamination/bedding, and locally further into root-bearing mudstone. These successions are interpreted to reflect a gradation from an oxygen-deficient lagoonal environment to an intertidal and supratidal marsh setting. In the upper part of the core, the deposits form a few m-thick, upward coarsening or fining successions. The base of the upward coarsening successions typically consists of biodeformation structures bearing massive mud, which grade upward into graded sand-mud beds interpreted as bay-head delta deposits. These deposits are further gradationally or erosionally overlain by 1-2 m-thick rhythmically cross-stratified heterolithic sandstone successions interpreted as tidal channel and bar deposits. The base of the channel units typically contain interbedded or mixed conglomerates and highly deformed, carbonaceous mudstone beds pointing to high-energy conditions and formation of abundant fluid mud in the depositional system. The channel units are mainly unburrowed, but toward the top of the cored interval, local occurrences of *Asterosoma*, *Cylindrichnus* and *Ophiomorpha* were observed, suggesting increasing marine influence, and thus transgressive setting for the upper most part of the core. In concert, the observed lagoonal, bay-head delta, tidal and marsh sub-environments are consistent with an estuarine/deltaic embayment setting for the Gert Member.

## 2. STUDY AREA AND METHODS

The purpose of the study is to describe sedimentological and ichnological properties of the Kimmeridgian Gert Member (Heno Formation) interval of the Rita-1X (4649.72–4675.02 m) well in order to interpret its depositional setting. The well is located at the margin of the Feda Graben, Danish Central Graben (Fig. 1). The sedimentological description included descriptions of lithology, grain size, primary and secondary sedimentary structures, bedding contacts and character of bedding, soft-sediment deformation structures, mineralogical accessories and the identification of important stratigraphic surfaces. Ichnological data comprises description of ichnogenera and/or

ichnospecies, trace-fossil assemblage, and bioturbation index (BI of Taylor and Goldring, 1993). BI provides a description of the degree to which original sedimentary fabric has been destroyed as a result of biogenic processes. This classification scheme allocates a numerical value ranging from 0 to 6 – the values corresponding to a percentage of bioturbation (cf. Taylor and Goldring, 1993) – along with a descriptive term to biogenically disturbed media. Undisturbed or non-bioturbated sedimentary fabrics are classified as BI 0 (0 percent reworked), while pervasively bioturbated media (100 percent reworked) are classified as BI 6. Intermediate levels of bioturbation are characterized using BI 1–5 and are defined as follows: BI 1, 1–4 percent reworked; BI 2, 5–30 percent reworked; BI 3, 31–60 percent reworked; BI 4, 61–90 percent reworked; and, BI 5, 91–99 percent reworked (Taylor and Goldring, 1993).

### **3. Description and Interpretation**

The deposits are divided into 6 recurring facies types (F1-F6), which are further grouped into 4 facies associations (FA1-FA4). Below each facies is briefly described and interpreted. Figure 2 illustrates the location of the cored section in the Gert Member reservoir interval. A summary sedimentological core profile is presented in Figure 3.

#### **F1: Description – Bioturbated mudstone**

Facies 1 (F1) is a common facies type occurring throughout the core (Fig. 3). Its lower contact is gradational and it typically overlies Facies 4, 5 or 7 (F4, F5 and F7, respectively). Upward, it grades into F7, Facies 2 (F2) or Facies 3 (F3). F1 consists of massive appearing mudstone that forms 0.5 – 1 m-thick aggrading successions. Lithological accessories include abundant coal fragments and floating, fine-grained sand grains. F1 is commonly bioturbated (BI 2-6) by a low diversity assemblage that consists of diminutive burrow mottling. Recognized genera include pyritized *Chondrites* (0.5 – 1 mm), *Planolites* and *Taenidium*. Lack of lithological contrast hinders exact delineation of bioturbation intensity and present genera in places.

#### **F1: Interpretation – Lagoon - central embayment**

Lack of sedimentary structures, locally high bioturbation intensity coupled with fine grain-size suggests dominantly a sheltered low-energy setting. The ichnological content of F1 points to a stressed, probably brackish (low diversity, diminutive trace fossils) and locally possibly dysoxic

setting (monospecific intervals of pyritized *Chondrites*). Hypothetically, locally occurring red iron staining may point to oxidation of iron and further to fluctuating oxygen levels.

F1 is commonly overprinted with rootlets (F7), which indicate a shallow subaqueous environment. Furthermore, its close association with bay-head delta (F2), intertidal (F3) and locally tidal channel/bar facies (F5) (see interpretations below), suggests a close genetic relationship with these paralic environments. Considering the stratigraphic occurrence of F1 and the above described sedimentological and ichnological characteristics, F1 is interpreted to represent lagoon or central embayment environment within a deltaic-estuarine setting.

### **F2: Description – Massive to bedded mudstone**

F2 is a common facies type associated particularly in the top of the core (Fig. 3). It forms the lower part of the 1-2 m-thick upward-coarsening successions. Its lower contact is most commonly gradational and it overlies either F1 or F5. It is commonly overlain by F4 or F6B (Extraformational conglomerates; Fig. 4) both in erosion and gradation. F2 consists characteristically of massive, dark mudstone (subfacies F2A) or beds up to 3 cm-thick (subfacies F2B). In contrast to F1, F2A bears increasing proportion of coal fragments, outsized clasts (coarse sand to gravel) and soft sedimentary deformation features (loading, water escape). Moreover, bioturbation intensity is typically lower (BI 0-3) and rapidly fluctuating. The ichnofabric is characterized by sporadic occurrences of deformed, mantle-and-swirl trace fossils (Lobza and Schieber, 1999; Schieber et al., 2003) and *Planolites* (Figs. 4AB). Upward, F2A coarsens and grades into interlaminated dark mudstone and sandstone (F2B). Commonly, the top of mud-sand couplet bears subaqueous shrinkage cracks. Bioturbation remains sporadic and consists of local occurrences of mantle-and-swirl trace fossils and small *Planolites*. In the topmost part of the facies, extraformational gravel clasts become abundant in the matrix.

### **F2: Interpretation – Bayhead delta**

Cm-scale, structureless, dark mudstone beds, soft sedimentary deformation features, outsized clasts and sporadic bioturbation are all consistent with fluid mud (i.e., a fine-grained sediment suspension where suspended sediment concentrations are greater than  $10 \text{ g L}^{-1}$ ) sediment accumulation (e.g., Ichaso and Dalrymple, 2009). Particularly, abundant deformation structures and mantle-and-swirl trace fossils support this interpretation as they indicate high initial water content of the sediment. Subaqueous shrinkage cracks are interpreted to represent synaeresis cracks being consistent with

tidally-modulated river flood origin for the lamina couplets. Further considering the upward coarsening nature of the succession and the stratigraphic position of the facies gradationally above lagoonal facies (F1) and below tidal channel/bar facies (F4), F2 is interpreted to represent bay head delta environment.

### **F3: Description – Mud-crack bearing, wispy heterolithic interlamination**

Facies 3 is a relatively rare facies type occurring sporadically in the lower part of the core. It grades upward into root-bearing mud or burrow mottled mudstone (F1/F7). It consists of mm-scale, wispy interlamination of brown mudstone and white sandstone. White sandy matrix macroscopically appears to be Ca-rich, but it does not react visibly with HCL. Mud-laminae are typically enriched in pyrite forming irregular pyrite laminations and patches. The deposits are typically fragmented by vertical to subvertical, mud-filled cracks, between which the mud-sand-pyrite interlamination are arranged in to upward widening, concave-shaped lamina sets (Fig. 5A). Indistinct burrow mottling (cf. *Planolites*) and diminutive backfilled trace fossils (*Taenidium*) are locally common.

### **F3: Interpretation – Intertidal flat**

Mud-cracks are interpreted to represent desiccation cracks. Their occurrence throughout the facies point to repeated, periodic subaerial exposure. Organic-rich, brown, wispy mud-lamina and white sand lamina that are associated with pyrite enrichment and form incipient domal buildups may point to microbial activity (microbial mats) (Schieber, 1989; Eriksson et al., 2003). In general, microbial mats form typically domal-build-ups between desiccation cracks due to improved drainage along the cracks. Pyrite inter-laminae are also characteristics for microbial mats as organic matter tends to be enriched in to sediments as thin layers. Whether the white sandstone lamina contain dolomite remains to be tested. Considering the above mentioned characteristics, stratigraphic position between lagoonal mudstone (F1) and paleosol horizons (F6), and the overall tidally-dominated depositional environment (see below), F3 is interpreted to represent intertidal flat environment.

### **F4: Description – Mud-draped cross-stratified sandstone**

F4 is a common facies type throughout the core and is commonly associated with F6 and F5. Its lower contact is either gradational or erosional, and it overlies F2, F5 or F6. Upward it may grade into F2 or more rarely to F1 or F3. F4 consist of heterolithic cross-stratification and can be divided into to two sub-facies: F4A consists of undefined heterolithic cross-stratification, whereas F4B

contain heterolithic sigmoidal cross-stratification. F4A compose of deformed and discontinuous heterolithic strata due to which the nature of bed forms was not possible to delineate in detail. Note is made that there are local probable current ripples. F4B is better preserved and form alternating mud-dominated sub-horizontal intervals (bottomset) and sand-dominated cross-stratified intervals (foreset) in vertical section. Set thickness is commonly around 15 cm. As co-sets, F4B may form upward coarsening or fining, complex heterolithic bedding units up to 60 cm-thick. These successions are characterized by varying bed dip orientation, rapidly fluctuating grain size together with abundant soft sedimentary deformation. Set boundaries are locally marked by cm-scale, massive dark mudstone. Locally, the lower boundary bears mudstone-clasts. Bioturbation intensity of F4 varies from unbioturbated to moderately bioturbated (BI 0-3). Common trace fossils include *Cylindrichnus*, *Asterosoma*, *Planolites* and fugichnia (Figs. 4EF).

#### **F4: Interpretation – Tidal bar**

Double mud drapes, sigmoidal cross-stratification and overall rhythmic nature of heterolithic cross-stratification point to strong tidal influence. F4 occurs in the middle part of sharp-based upward fining successions (tidal channel) or gradationally above fluid mud prone bayhead delta sediments (Bay head delta – mouth bar). Desiccation crack-bearing examples indicate that the occurrence of F4B extends in to intertidal zone.

#### **F5: Description – Inclined Heterolithic Stratification**

F5 is a recurring facies type especially in the top part of the core. Its lower contact is typically gradational and it overlies F4 or F6B. Upward it grades to F2. F5 consists of poorly developed, Inclined Heterolithic Stratification (IHS; Thomas et al., 1987) and forms brief (<60 cm-thick), slightly upward fining or aggrading successions. The deposits consist of inclined beds of massive mud and sandstone/conglomerates that display relatively uniform dipping orientation (Fig. 4D). Locally, mudstone interbeds get thinner toward the top of the facies despite of the overall degreasing coarsest grain size fraction (4650.64–4649.72 m). Grain size alternation between successive beds is either sharp or gradational. Soft sedimentary deformation (loading, contorted bedding) is pervasive. Bioturbation intensity is fluctuating ranging from unbioturbated to moderately bioturbated (BI 0-3). Observed trace fossils include common *Cylindrichnus*, *Skolithos linearis*, *Asterosoma*, rare mud-lined *Ophiomorpha* (no clear pellets), *Planolites* and ?*Rosselia*. *Cylindrichnus* form locally monospecific occurrences. In general, IHS is not well developed in the

studied sediments and is closely associated with F4, which demonstrates changes in bedding angle and orientation in successive sets.

#### **F5: Interpretation – Top of a tidal mouth bar – Distributary channel mouth**

IHS is a common feature in laterally-accreting tidal channel and bar environments. In the present case, it is thought to be poorly developed because of the overall high-energy setting (seaward from energy minima of the estuary/delta), which does not favour the development of well-developed meandering channels. Up to 3 cm-thick massive mud-drapes, overall evidence for high-energy environment (e.g., pervasive conglomerates, brief colonization window), and upward decreasing mud-drape thickness despite of the upward fining nature of the facies are all consistent with bottom hugging fluid-mud accumulation (Dalrymple et al., 2003; Dalrymple and Choi, 2007). Low diversity *Cylindrichnus* dominated ichnofabric (Fig. 4F) is reportedly a common feature in tidal estuarine/deltaic channel and bar deposits (e.g., Cretaceous McMurray Fm, Alberta, Canada). Since F5 occur only as brief intervals and is closely associated with F4 that displays abrupt changes in bedding angle, it is possible that it represents a part of a tidal bar (heterolithic dune) rather than a bank attached point bar. Moreover, as its underlying facies F6 is not always erosionally based, it likely has a close genetic relationship with the bay head delta mudstone. Considering the above mentioned sedimentological and ichnological characteristics and the stratigraphic occurrence just above the bay-head delta facies, F5 is interpreted to represent laterally accreting tidal mouth bar-distributary channel mouth complex.

#### **F6: Description – coarse-grained sand to conglomerates**

F6 is a common facies type especially in the top of the core. It can be divided into two subfacies: F6A consists of intraformational clay-clast conglomerate, whereas F6B consists of extraformational conglomerates and/or coarse-grained sand (Fig. 4C). F6A overlies Facies 7 or Facies 1 in erosion, while F6B sharply overlies F2. Determining whether the lower contact of F6B is erosional or not was not always possible, but at least at 4657 meters the contact appears as loaded and non-erosional. Both sub-facies grade upward into F4 or F5.

F6A consist of 10-15 cm-thick, upward fining intervals of matrix supported, mud-clast conglomerate, where the clasts are typically derived from the underlying facies. Coal fragments and dispersed organic matter (e.g. cone fragments) are common.

F6B compose of unbioturbated, cross-bedded or massive-appearing, clast-supported, extraformational conglomerates (up to 6 mm in diameter) that form 10-50 cm-thick upward fining units (Fig. 4C). Massive appearing sets contain few cm-thick, both normally and inversely graded intervals. Clasts are subrounded to subangular, and consist of quartzite and other felsic rock fragments. Cross-bedded intervals bear 1-2 cm-thick, massive-appearing, deformed mud beds or flasers. In addition, very commonly are present allochthonous coal interbeds and fragments. Coal fragments contain characteristically yellowish (sulphur?) staining.

#### **F6: Interpretation – Base of proximal tidal mouth bar or distributary channel mouth**

Erosionally-based occurrences that form the base of upward fining successions are interpreted as channel bases. Gradationally based occurrences forming upper part of upward coarsening bay head delta complex are interpreted to be associated with mouth bar facies (See Discussion and Conclusions).

#### **F7: Description –root-bearing mudstone**

Facies 7 is a common facies type in the lower and middle part of the core (Fig. 5C). It typically overlies F1 in gradation and overprints it. Most commonly, it is gradationally overlain by F1 or F6A in erosion, or more rarely, F3 in gradation. F7 consists of up to 2 m-thick succession of multi-coloured (dark grey – light grey – greenish grey with white patches) mudstone successions that contain abundant slickenside and rootlets (vertically-subvertically oriented, dark brown organic filaments). Slickenside had no single orientation. Gypsum veins occur locally in intensely slickensided intervals.

At 4670 m (Core 6, box 8), there is a single occurrence of an irregularly branching burrow network developed at F7/F3 interface. The burrows are of variable diameter, show locally bulbous enlargements and locally vague meniscate backfill (Fig. 5B).

#### **F7: Interpretation – Pedogenically altered horizon**

Non-oriented slickenside and roots point to development of incipient paleosol horizons. Slickenside may form as a result of tectonic shearing or pedogenic processes, but in the first case they are typically strongly oriented. The irregularly branching burrow network, with bulbous enlargements and local meniscate backfill is interpreted to represent activity of colonial insects (Fig. 5B).

## **4. DISCUSSION AND CONCLUSIONS**

### **4.1. Facies Associations and depositional setting**

The deposits can be divided into three broad facies associations: FA1 Lagoon – Lagoon margin (F1, F3); FA2 Bay head delta complex– Distributary channel mouth (F2, F6, F4, F5); and FA3 Paleosol (F7). In concert, all facies point to an estuarine/deltaic embayment setting. In general, challenges exist in distinguishing between tidal point bars and free standing tidal bars especially in core. Dalrymple and Choi (2007) argued that both tidal point bars and elongate tidal bars are most commonly erosionally-based, demonstrate lateral accretion and thus upward fining grain size trend. Consequently, their distinction is not straightforward. The overall proximal setting, abundant fluid mud and conglomerates in the base of these successions would be easily explained by confined flow. Thin channel-like units that non-erosionally overlie bay head prodelta sediments may represent terminal distributary channels (Olariu et al., 2005).

### **4.2. Tentative Relative Sea Change**

From the base of the core 4675 meters to 4658 meters the deposits consist of alternating lagoonal (F1), tidal (F3-5) and paleosol (F7) intervals. The succession is somewhat aggradational and facies association changes could be easily explained by autocyclic factors. A candidate for minor valley base and transgressive flooding situates at 4668 meters, where fluid mud rich tidal channel/bar facies overlie a paleosol horizon.

From 4658 meters upward, however, the deposits form a succession of stacked tidal channel, bayhead delta and lagoonal facies complex that overlies a paleosol horizon in erosion. Above the basal contact, there is possible evidence for increased depositional slope (extraformational conglomerates, fluid mud) and tidal processes (heterolithic sigmoidal cross-stratification, rhythmic sand-clay couplets, double mud-drapes, abundant fluid mud layers). Palaeosol facies is no longer present and ichnofossils suggest progressively increasing marine influence. Moreover, the only marine microfossils (dinocysts; Dybkjær, 2009, personal communication) from the core were discovered from this interval. In concert, the above mentioned features suggest estuarine incised valley fill setting.

### **4.3. Future studies**

- During the course of this study it was noticed that GR curves may vary radically (e.g., GR\_NUC vs. GR\_RES), and locally did not reflect true lithological variability in the core. For instance,

Figure 3 displays a GR\_NUC curve, in which observed channel deposits are not visible at 15275-15282 ft. This may lead to an error in well-log based correlations in Landmark.

- The possible presence of an insect generated ichnofabric in the upper Jurassic Gert member paleosol is academically interesting, since it would be one the earliest reported occurrences of colonial insects. However, a more detailed description of burrow morphologies (thin sections) is needed before those trace fossils can be conclusively assigned to activities of insects or other invertebrates.

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### FIGURE CAPTIONS:

**Figure 1.** Map of the study area. The studied well Rita-1X is shown on red. Modified after Johannessen et al., 2010.

**Figure 2.** Location of the studied core interval (black bar ~25 m) in the Gert member reservoir interval. GR log suggests that the top of the reservoir interval consists of alternating bay head delta / estuarine embayment mudstone and distributary channel –mouth bar facies.

**Figure 3.** Sedimentological log of the studied Rita-1X (Gert Mb) interval.

**Figure 4.** A) Mantle-and-swirl trace fossils in structureless mudstone (F2A). Note the deformed muddy-mantle (dashed white line) lined according to movement direction of the causative organism. Bay head prodelta, 4653 m. ms–mantle-and-swirl trace fossils. B) Graded sand-mud lamina/beds (F2B). Sy–synaeresis cracks. Bay-head delta. C) Extraformational conglomerates. F6. D) Inclined heterolithic stratification consisting of structureless mud, conglomerate and sand layers (F5). Terminal distributary channel in bay head delta complex, Rita-1X, 4656 m. E) *Asterosoma* in HS (F4/F5). F) *Cylindrichnus* in IHS (F5).

**Figure 5.** A) Heterolithic interlamination of F3. Note the common enrichment of pyrite (white arrow) and incipient domal build-ups that develop between mud-cracks. These features possibly indicate the presence of microbial mats. Stratigraphic position of the facies suggests high intertidal to supratidal setting. B) Burrow network consisting of uneven burrows of variable diameter, which

branch irregularly and contain local bulbous enlargements. Black arrows point to meniscate infill. In concert, these features could be explained by activity of colonial insects. F3 - F7 gradation. C) Mudstone containing irregular vertical organic filaments interpreted as rootlets. Facies 7.

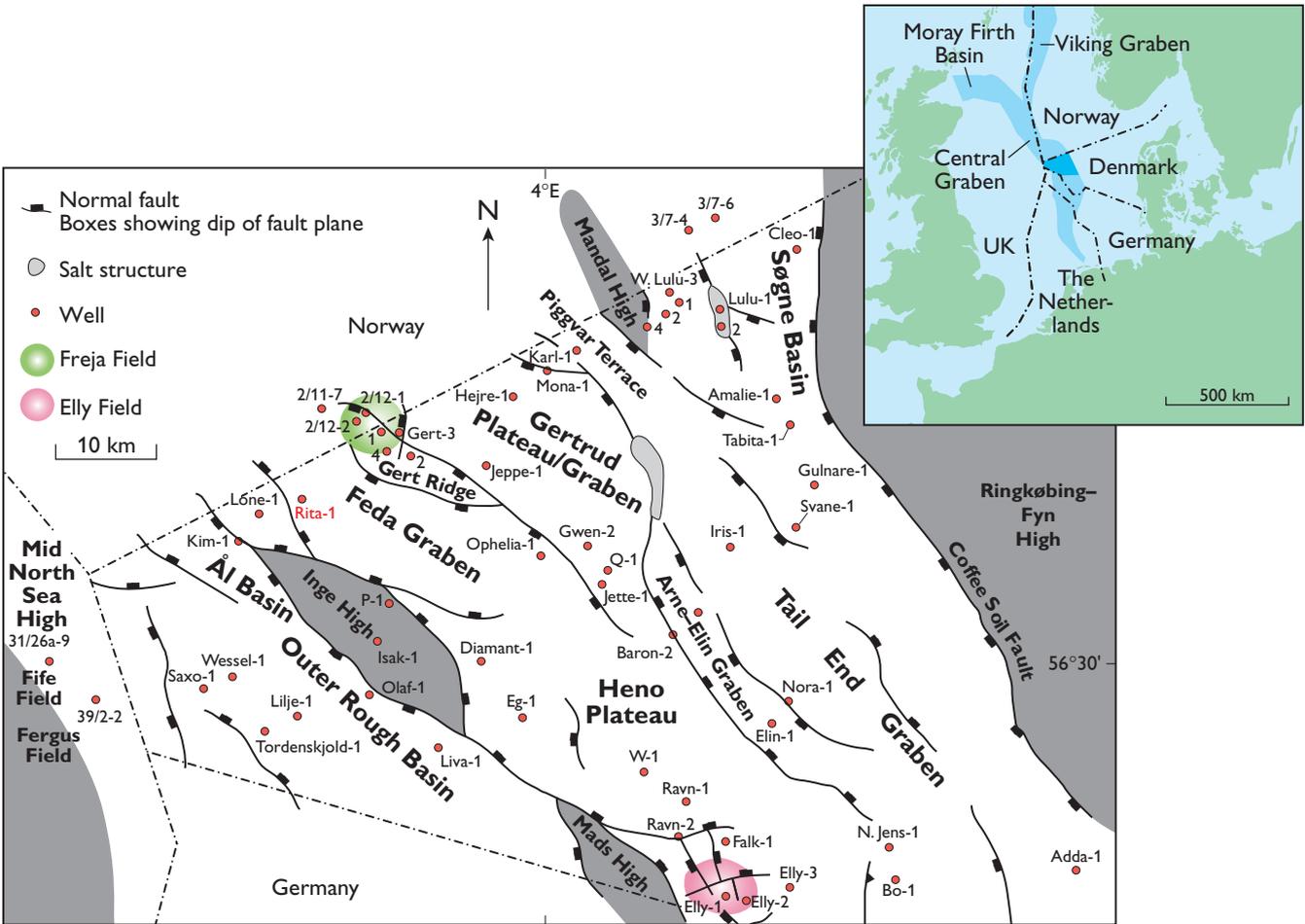


Figure 1

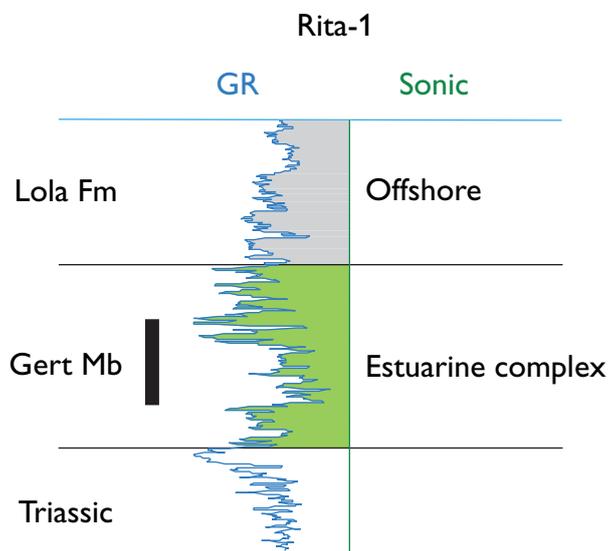


Figure 2

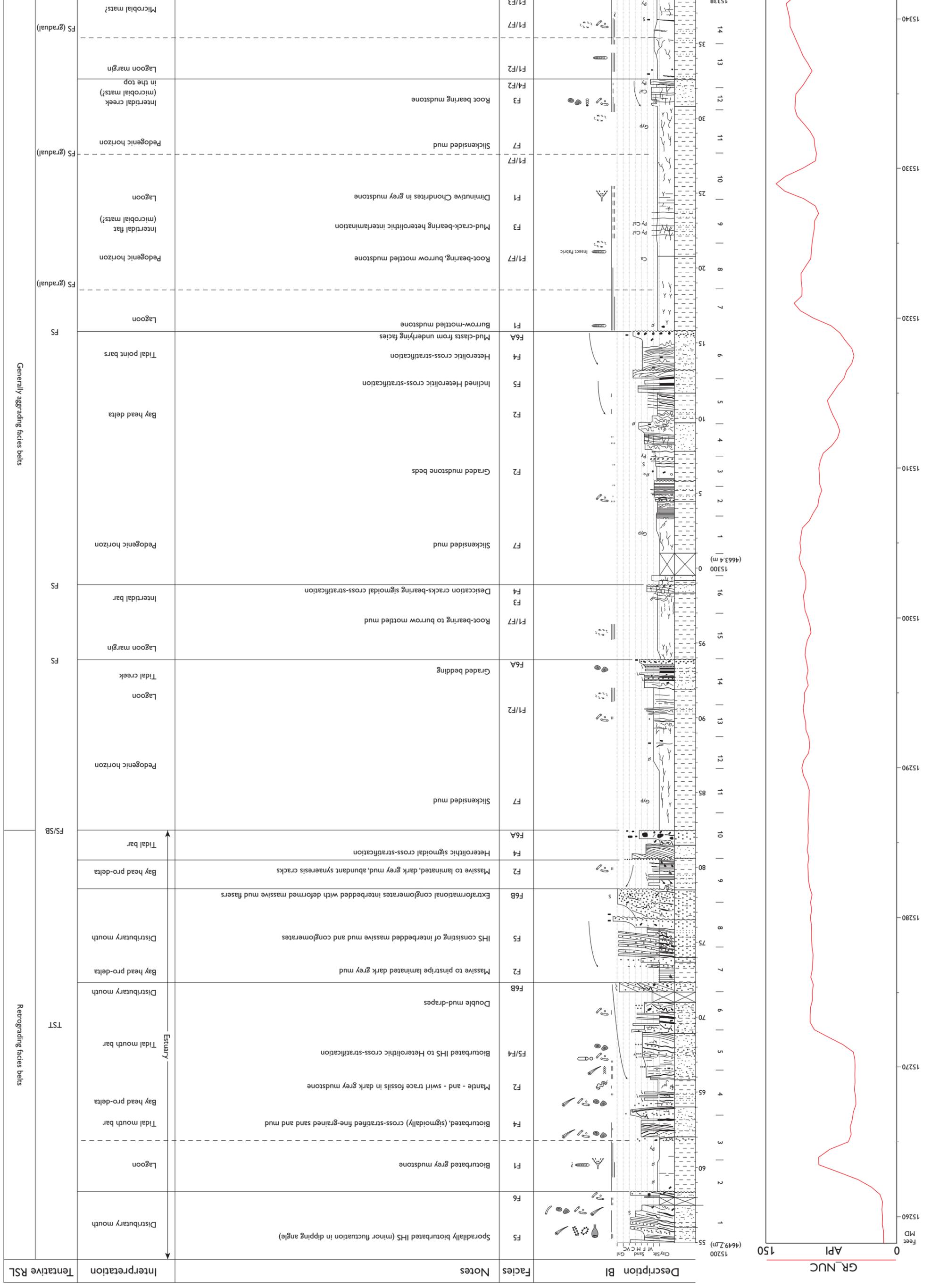


Figure 3

Generally aggrading facies belts

Retrograding facies belts

Tentative RSL

Interpretation

Estuary

Tidal bar

Lagoon

Tidal creek

Lagoon margin

Intertidal bar

Pedogenic horizon

Graded mudstone beds

Inclined Heterolithic cross-stratification

Heterolithic cross-stratification

Mud-clasts from underlying facies

Burrow-mottled mudstone

Root-bearing, burrow mottled mudstone

Diminutive Chondrites in grey mudstone

Mud-crack-bearing heterolithic interamination

Intertidal flat (microbial mats?)

Lagoon

Pedogenic horizon

Intertidal creek (microbial mats?)

Lagoon margin

Microbial mats?

Pedogenic horizon

Biocurbed grey mudstone

Biocurbed, (sigmoidally) cross-stratified fine-grained sand and mud

Mantle - and - swirl trace fossils in dark grey mudstone

Biocurbed IHS to Heterolithic cross-stratification

Double mud-drapes

Massive to pinstripe laminated dark grey mud

IHS consisting of interbedded massive mud and conglomerates

Extrastromatal conglomerates interbedded with deformed massive mud flasers

Massive to laminated, dark grey mud, abundant syneresis cracks

Heterolithic sigmoidal cross-stratification

Graded bedding

Root-bearing to burrow mottled mud

Desiccation cracks-bearing sigmoidal cross-stratification

Slickensided mud

Slickensided mud

Graded mudstone beds

Inclined Heterolithic cross-stratification

Heterolithic cross-stratification

Mud-clasts from underlying facies

Burrow-mottled mudstone

Root-bearing, burrow mottled mudstone

Diminutive Chondrites in grey mudstone

Mud-crack-bearing heterolithic interamination

Intertidal flat (microbial mats?)

Lagoon

Pedogenic horizon

Intertidal creek (microbial mats?)

Lagoon margin

Microbial mats?

Pedogenic horizon

Intertidal flat (microbial mats?)

Lagoon

Pedogenic horizon

Intertidal creek (microbial mats?)

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Lagoon margin

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GR\_NUC

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## Lithology

	Sandstone
	Mudstone
	Muddy sandstone
	Sandy mud
	Conglomerate
	Extraformational clast
	Mud clast
	Coal clast
	Ca-cement

## Sedimentary structures

	Low angle cross-stratification
	Trough cross-stratification
	Tangential cross-stratification
	Planar lamination
	Asymmetric ripple cross-stratification
	Symmetric ripple cross-stratification
	Combined flow ripple cross-stratification
	Climbing ripple cross-stratification
	Heterolithic bedding (mud dominated)
	Heterolithic bedding (sand dominated)
	Graded bedding
	Erosive contact
	Contorted bedding
	Loading
	Water escape structure
	Synaeresis crack

## Other

	Moullusc (Bivalve shell)	
	Bellemnite	
	Organic matter	
<b>Py</b>	Pyrite	
	Fracture	
	Fault	
<b>Gl</b>	Glauconite	
	Trend of the coarsest grain size fraction	
<b>III</b>	Intense	} Bioturbation
<b>II</b>	Moderate	
<b>I</b>	Weak	
<b>FS</b>	Flooding surface	
<b>TSE</b>	Transgressive surface of erosion	

## Biogenic structures

1		<i>Arenicolites</i>
2		<i>Ancornichnus</i>
3		<i>Asterosoma</i>
4		<i>Burrow motling</i>
5		<i>Chondrites</i>
6		<i>Curvolithus</i>
7		<i>Conichnus</i>
8		<i>Cylindrichnus</i>
9		<i>Diplocraterion habichi</i>
10		<i>Diplocraterion isp.</i>
11		<i>Diplocraterion parallelum</i>
12		<i>fugichnia</i>
13		<i>Gyrolithes</i>
14		<i>Helminthopsis</i>
15		"Laminites"
16		<i>Lockeia</i>
17		<i>Macaronichnus isp.</i>
18		Mantle and swirl
19		<i>Nereites</i>
20		<i>Ophiomorpha irregulaire</i>
21		<i>Ophiomorpha isp.</i>
22		<i>Palaeophycus herberti</i>
23		<i>Palaeophycus tubularis</i>
24		<i>Phoebichnus</i>
25		<i>Phycosiphon incertum</i>
26		<i>Planolites</i>
27		<i>Rhizocorallium irregulare</i>
28		<i>Rhizocorallium isp.</i>
29		<i>Rhizocorallium jenense</i>
30		Roots
31		<i>Rosselia</i>
32		<i>Schaubcylindrichnus frey</i> ("Terebellina")
33		<i>Scolicia</i>
34		<i>Skolithos isp.</i>
35		<i>Spirophyton</i>
36		Spreite structures
37		<i>Taenidium</i>
38		<i>Teichichnus isp.</i>
39		<i>Teichichnus rectus</i>
40		<i>Teichichnus zigzag</i>
41		<i>Thalassinoides isp.</i>
42		<i>Zoophycos</i>

Figure 3 Cont.

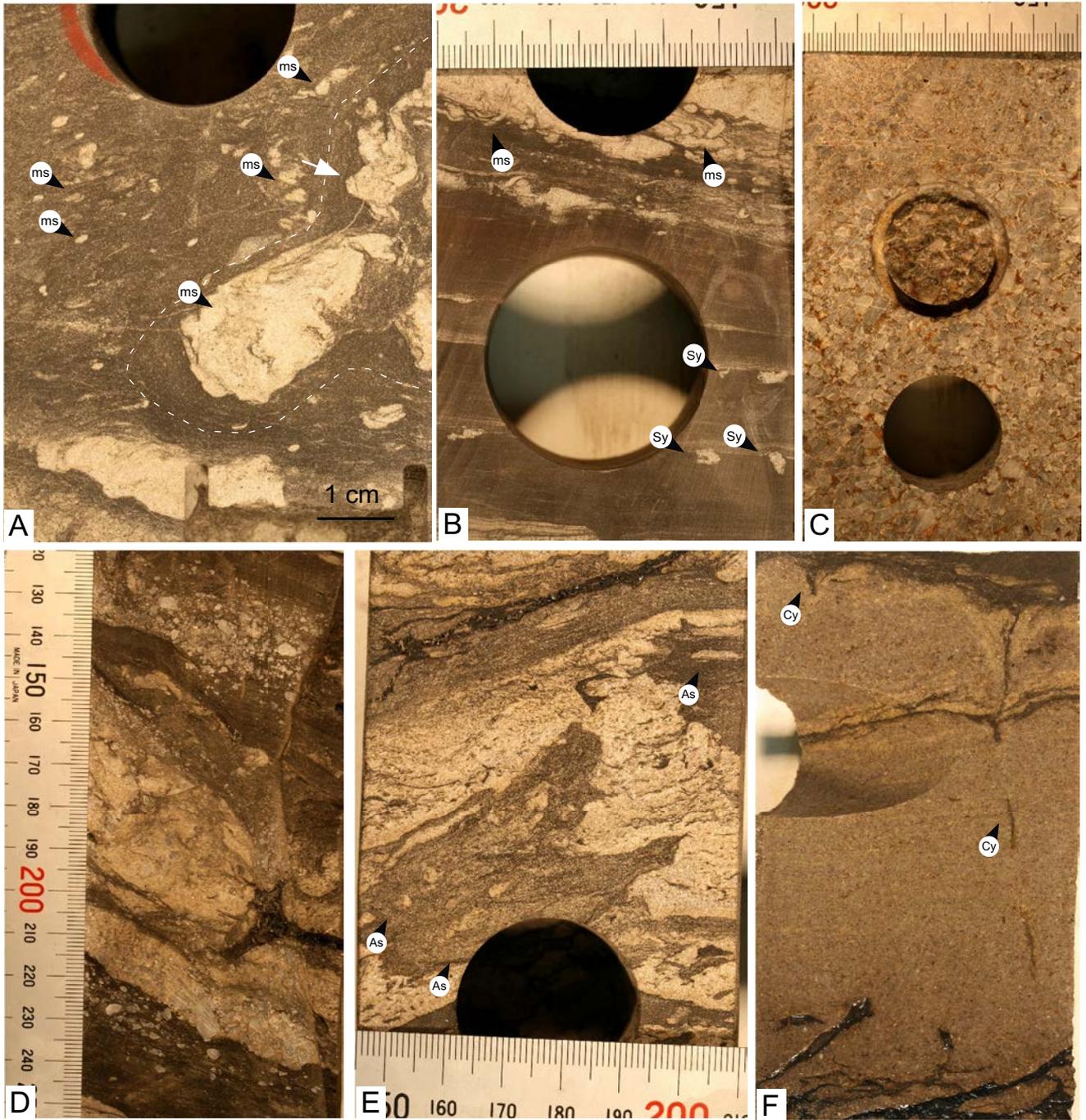


Figure 4

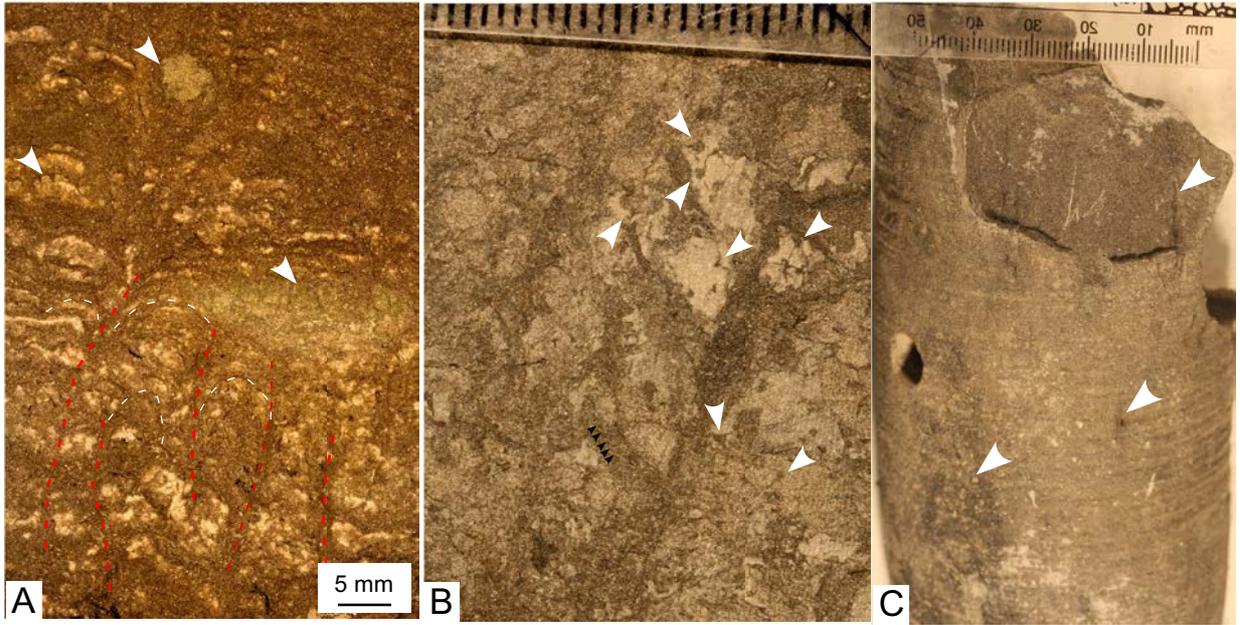


Figure 5