APPENDIX I. The samples studied.

The samples studied are listed below in three sections.
1. Ordovician field samples.
2. Silurian-Lower Devonian field samples.
3. Oum Doul-1 well core samples.

Within each section, samples are listed alpha-numerically.

The topographic maps cited are those from the 1:100 000 Cartes du Maroc series (Appendix II) and the geological map sheets have been produced at a scale of 1:200 000 (Appendix III). The grid references given are referable to both sets of maps.

The rock colours given in the lithology sections are determined by comparison with the 'Rock-colour chart' (1980) which is distributed by the Geological Society of America.

The macrofaunal identification and the interpretation of the age of the assemblages was carried out by Dr M. Romano and Dr. T.P. Young for the Ordovician field samples and by Dr. R.B. Rickards for the Silurian to Lower Devonian field samples.

For each sample, the lithostratigraphic position according to the relevant published geological map is given. Under the inferred lithostratigraphic subheading, the nomenclature used is that proposed by the Simon Robertson Group. This is the scheme that is adopted in the present study. A direct comparison between the two schemes is given in the figures in the introductory chapter.

1. THE ORDOVICIAN FIELD SAMPLES.

Sample: DJ 10
Lithology: Siltstone. Medium dark grey, angular break, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: or5c, Upper Tiouririne Formation.
Inferred lithostratigraphic position: Ktaoua (sandstone and shale) Formation.
Sample: DJ 106
Lithology: Shale-silty shale. Medium grey to medium dark grey, weathered to olive grey, angular breaking, nodular in part, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: The grid reference for this sample is located on drift deposits with orl-2, the Fezouata Shale, forming the adjacent outcrops.
Inferred lithostratigraphic position: Fezouata (shale) Formation.

Sample: DJ 107
Lithology: Shale-silty shale. Medium grey to medium dark grey, weathered to olive grey, angular breaking, nodular in part, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: The grid reference for this sample is located on drift deposits with orl-2, the Fezouata Shale, forming the adjacent outcrops.
Inferred lithostratigraphic position: Fezouata (shale) Formation.

Sample: DW 105
Lithology: Siltstone. Greenish grey to olive grey, angular breaking, faintly laminated, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: ks2 (Upper Cambrian shales).
Inferred lithostratigraphic position: ?
Sample: DW 115
Lithology: Siltstone. Greenish grey to olive grey, angular break, faintly laminated, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: ki3-4 (Lower Cambrian arenites).
Inferred lithostratigraphic position: ?

Sample: DW 261
Lithology: Shale. Light olive grey weathered to dark yellowish orange, angular break, slightly micaceous.
Age derived from the macrofauna: Upper Tremadoc to lower Arenig, probably lower Arenig.
Lithostratigraphy according to the geological map: The grid reference for this sample is located on drift deposits within the valley of Oued Bou Tious. Near-by, outcrops of or2, Fezouata Shales of Arenig age, are present on the valley floor.
Inferred lithostratigraphic position: Fezouata (shale) Formation.

Sample: DW 262
Lithology: Shale. Light olive grey weathered to dark yellowish orange, subfissile, slightly micaceous.
Age derived from the macrofauna: Arenig, probably lower Arenig.
Lithostratigraphy according to the geological map: The grid reference for this sample is located on drift deposits within the valley of Oued Bou Tious. Near-by, outcrops of or2, Fezouata Shales of Arenig age, are present on the valley floor.
Inferred lithostratigraphic position: Fezouata (shale) Formation.
Sample: DW 263
Lithology: Shale. Light olive grey weathered to dark yellowish orange, subfissile, slightly micaceous.
Age derived from the macrofauna: Arenig, probably lower Arenig.
Lithostratigraphy according to the geological map: The grid reference for this sample is located on drift deposits within the valley of Oued Bou Tious. Near-by, outcrops of or2, Fezouata Shales of Arenig age, are present on the valley floor.
Inferred lithostratigraphic position: Fezouata (shale) Formation.

Sample: DW 269
Lithology: Shale. Light olive grey weathered to dark yellowish orange, angular break, slightly micaceous.
Age derived from the macrofauna: Probably Arenig.
Lithostratigraphy according to the geological map: The grid reference for this sample is located on drift deposits within the valley of Oued Bou Tious. Near-by, outcrops of or2, Fezouata Shales of Arenig age, are present on the valley floor.
Inferred lithostratigraphic position: Fezouata (shale) Formation.

Sample: DW 272
Lithology: Shale. Light olive grey weathered to dark yellowish orange, angular break, micaceous, graptolites are common.
Age derived from the macrofauna: Lower Arenig, just possibly Upper Tremadoc.
Lithostratigraphy according to the geological map: The grid reference for this sample is located on drift deposits within the valley of Oued Bou Tious. Near-by, outcrops of or2, Fezouata Shales of Arenig age, are present on the valley floor.
Inferred lithostratigraphic position: Fezouata (shale) Formation.
Sample: DW 291
Lithology: Shale. Medium dark grey weathered to light olive grey, fissile, slightly micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: orl-2, Fezouata Shales.
Inferred lithostratigraphic position: Fezouata (shale) Formation.

Sample: DW 294
Lithology: Silty shale. Medium dark grey weathered to light olive grey, angular break, slightly micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: orl-2, Fezouata Shales.
Inferred lithostratigraphic position: Fezouata (shale) Formation.

Sample: DW 303
Lithology: Silty shale. Medium grey, angular break, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: or1-2, Fezouata Shales. or1, the Lower Fezouata Shales and or2, the Upper Fezouata Shales are differentiated in the vicinity of sample DW 304 but the outcrops are poorly labelled.
Inferred lithostratigraphic position: Fezouata (shale) Formation.
Sample: DW 304
Lithology: Siltstone-silty shale. Medium light grey weathered to light olive grey, angular break, calcareous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: orl-2, Fezouata Shales. or1, the Lower Fezouata Shales and or2, the Upper Fezouata Shales are differentiated in the vicinity of sample DW 304 but the outcrops are poorly labelled.
Inferred lithostratigraphic position: Fezouata (shale) Formation.

Sample: DW 305
Lithology: Siltstone-silty shale. Medium light grey weathered to light olive grey, angular break, calcareous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: orl-2, Fezouata Shales.
Inferred lithostratigraphic position: Fezouata (shale) Formation.

Sample: DW 307
Lithology: Silty shale. Medium grey weathered to light olive grey, subfissile, nodular in part, slightly micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: orl-2, Fezouata Shales.
Inferred lithostratigraphic position: Fezouata (shale) Formation.

Sample: DW 309
Lithology: Shale. Greyish black, angular break, micaceous.
Macrofauna observed: cf. Placoparia (P.) cambriensis Hicks, kerfornellid indet., Ormathops clariondi Destombes, Calymenid indet., bivalve indet., hyolithid indet., ostracods indet., bellerophontid indet.
Age derived from the macrofauna: Arenig to Llanvirn, probably Llanvirn.

Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift which occurs between outcrops of or1-2, Fezouata Shales, and or3, Tachilla shales.

Inferred lithostratigraphic position: Tachilla (shale) Formation, based on the presence of the Llanvirn aged macrofauna.

Sample: DW 310
Lithology: Shale. Greyish black, angular break, micaceous.

Age derived from the macrofauna: Probably Llanvirn.

Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift which occurs between outcrops of or1-2, Fezouata Shales, and or3, Tachilla shales.

Inferred lithostratigraphic position: Tachilla (shale) Formation, based on the presence of the Llanvirn aged macrofauna.

Sample: DW 323
Lithology: Siltstone-silty shale. Medium dark grey, angular break, micaceous.
Macrofauna observed: Colpocoryphe grandis (Snajdr), ostracod indet. Colpocoryphe grandis is generally lower Caradoc in Western Europe, its only supposed Llandeilo occurrence being in Bohemia
Age derived from the macrofauna: Upper Llandeilo to lower Caradoc, probably Lower Caradoc.

Lithostratigraphy according to the geological map: The grid reference indicates the position of DW 323 on drift deposits which lie adjacent to outcrops of or4, the First Bani Sandstone and or5, the Ktaoua Clay & Sandstone.

Inferred lithostratigraphic position: The lithology and probable Lower Caradoc fauna suggests that this sample is assignable to the Ktaoua (Sandstone and Shale) Formation.

Sample: DW 332
Lithology: Silty shale-siltstone. Medium dark grey weathered to light olive brown, angular break, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift which occurs adjacent to outcrops of or1-2, the Fezouata Shales.
Inferred lithostratigraphic position: Fezouata (shale) Formation.

Sample: DW 335
Lithology: Shale. Dark grey, angular break, slightly micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: Or4, First Bani sandstone.
Inferred lithostratigraphic position: Probably the First Bani (sandstone) Formation. The lithology of dark grey shales makes this assignment questionable. The position of samples DW 335, DW 336 and DW 337 on the geological map indicates that DW 335 is older than DW 336, which is, in turn, older than DW 337.

Sample: DW 336
Lithology: Shale. Dark grey, angular break, micaceous, occasional shelly fragments present.
Age derived from the macrofauna: Caradoc, probably lower Caradoc.
Lithostratigraphy according to the geological map: The grid reference for the sample is located on drift deposits which lie between outcrops of or4, the First Bani Sandstone and or6a, the Upper Ktaoua.
Inferred lithostratigraphic position: The lithology, the position on the geological map and the fauna present indicate that this sample is from the Ktaoua (sandstone and shale) Formation. The position of samples DW 335, DW 336 and DW 337 on the geological map indicates that DW 335 is older than DW 336, which is, in turn, older than DW 337.
Sample: DW 337
Lithology: Shale. Dark grey, angular break, micaceous, shelly fragments are common.
Age derived from the macrofauna: Probably Caradoc.
Lithostratigraphy according to the geological map: The grid reference for the sample is located on drift deposits which lie between outcrops of or4, the First Bani Sandstone and or6a, the Upper Ktaoua.
Inferred lithostratigraphic position: The lithology, the position on the geological map and the fauna present indicate that this sample is from the Ktaoua (sandstone and shale) Formation. The position of samples DW 335, DW 336 and DW 337 on the geological map indicates that DW 335 is older than DW 336, which is, in turn, older than DW 337.

Sample: DW 348
Lithology: Ironstone. Brownish grey mottled with greyish red purple, weathered to light brownish grey, silt-fine sand grade grain size, angular break, common black specs of iron mineral, micaceous, redened bioclastic fragments present.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: or1-2, Fezouata Shales.
Inferred lithostratigraphic position: Fezouata (shale) Formation. However, there is no indication on the map of ironstone lithologies at the outcrop from which the sample was taken.

Sample: DW 349
Lithology: Siltstone-silty shale. Medium dark grey, angular break, micaceous.
Macrofauna observed: Colpocoryphe grandis (Snajdr). Colpocoryphe grandis is generally lower Caradoc in Western Europe, its only supposed Llandeilo occurrence being in Bohemia.
Age derived from the macrofauna: Upper Llandeilo to lower Caradoc, probably Lower Caradoc.
Lithostratigraphy according to the geological map: or5a, Lower Ktaoua.
Inferred lithostratigraphic position: Ktaoua (sandstone and shale) Formation.
Sample: DW 350
Lithology: Siltstone-silty shale. Medium dark grey, angular break, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: or5a, Lower Ktaoua.
Inferred lithostratigraphic position: Ktaoua (sandstone and shale) Formation.

Sample: DW 351
Lithology: Shale-silty shale. Dark grey weathered to olive grey, angular greak, slightly nodular, slightly micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: or5a, Lower Ktaoua.
Inferred lithostratigraphic position: Ktaoua (sandstone and shale) Formation.

Sample: DW 352
Lithology: Siltstone-silty sandstone. Dark grey, angular break, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: or5a, Lower Ktaoua.
Inferred lithostratigraphic position: Ktaoua (sandstone and shale) Formation.

Sample: DW 353
Lithology: Siltstone-silty shale. Medium dark grey, angular break, micaceous, shelly material is common.
Macrofauna observed: Colpocoryphe grandis (Snajdr), Triplesia sp., Aegiromena aquila praecursor (Havlicek), cf. Drabovia sp., crinoid indet.
Age derived from the macrofauna: Lower Caradoc.
Lithostratigraphy according to the geological map: or4, First Bani Sandstone.
Inferrred lithostratigraphic position: The position of the sample on the geological map indicates that it is taken from the youngest margin of a First Bani (sandstone) Formation outcrop.

Sample: DW 354
Lithology: Siltstone-silty shale. Medium dark grey, angular break, micaceous, occasional shelly fragments present.
Macrofauna observed: Colpocoryphe grandis (Snajdr), Onniella sp., Aegiromena aquila praecursor (Havlicek), cystoid indet., crinoid indet., gastropod.
Age derived from the macrofauna: Lower Caradoc.
Lithostratigraphy according to the geological map: or4, First Bani Sandstone.
Inferrred lithostratigraphic position: The position of the sample on the geological map indicates that it is taken from the youngest margin of a First Bani (sandstone) Formation outcrop.

Sample: DW 359
Lithology: Shale-silty shale. Medium dark grey, angular break, nodular in part, slightly micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: or6a, Upper Ktaoua.
Inferrred lithostratigraphic position: Ktaoua (sandstone and shale) Formation.

Sample: DW 360
Lithology: Shale-silty shale. Medium dark grey, subfissile, nodular in part, slightly micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits between outcrops of or4, the First Bani Sandstone and or6a, the Upper Ktaoua.
Inferrred lithostratigraphic position: Probably the Ktaoua (sandstone and shale) Formation.

Sample: DW 361

Lithology: Shale. Dark grey, angular break, nodular in part, micaceous.


Age derived from the macrofauna: Llandeillo to Caradoc.

Lithostratigraphy according to the geological map: or6a, Upper Ktaoua. The macrofauna present in this sample indicates that the age assigned to this unit on the map is incorrect.

Inferred lithostratigraphic position: Ktaoua (sandstone and shale) Formation.

Sample: DW 362


Lithology: Silty shale. Dark grey, angular break, nodular in part, micaceous.

Macrofauna observed: Flexicalymene sp., Colpocoryphe grandis (Snajdr), cf. Drabovia sp., gastropod indet., crinoid indet.

Age derived from the macrofauna: Llandeillo to lower Caradoc, probably lower Caradoc.

Lithostratigraphy according to the geological map: or6a, Upper Ktaoua. The macrofauna present in this sample indicates that the age assigned to this unit on the map is incorrect.

Inferred lithostratigraphic position: Ktaoua (sandstone and shale) Formation.

Sample: DW 364


Lithology: Silty shale. Dark grey, angular break, nodular in part, micaceous.

Macrofauna observed: None.

Age derived from the macrofauna: None.

Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits adjacent to outcrops of or5a, Lower Ktaoua.

Inferred lithostratigraphic position: Ktaoua (sandstone and shale) Formation.

Sample: DW 415


Lithology: Silty shale. Dark grey weathered to medium light grey or light brownish grey, fissile to subfissile, nodular in part, micaceous.

Macrofauna observed: None.

Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits located some distance (ca. 2 km) from outcrops of or4, the First Bani Sandstone and or5, the Lower Ktaoua and the Upper Tiouririne Formation.
Inferred lithostratigraphic position: Ktaoua (sandstone and shale) Formation.

Sample: GAO 65
Lithology: Siltstone. Greenish grey to olive grey, angular break, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits located between outcrops of ks2 (Upper Cambrian shales) and or2, Upper Fezouata Shales.
Inferred lithostratigraphic position: Probably the Fezouata (shale) Formation.

Sample: GAO 67
Lithology: Shale. Black, friable, very carbonaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits located between outcrops of ks2 (Upper Cambrian shales) and or2, Upper Fezouata Shales.
Inferred lithostratigraphic position: Probably the Fezouata (shale) Formation.

Sample: GAO 388
Lithology: Silty sandstone. Yellowish grey, heavily weathered to light brown or greyish orange pink, fine grained and silty in part, moderately well cemented, angular break, abundant shelly bioclasts present.
Age derived from the macrofauna: Llanvirn to Llandeilo
Lithostratigraphy according to the geological map: or6b, Second Bani Sandstone
Inferred lithostratigraphic position: The Llanvirn to Llandeilo age of the macrofossils recorded from this sample suggest that it was taken from the First Bani Sandstone rather than the Second Bani Sandstone, the latter is typically upper Ashgill in age.

Sample: GAO 471
Lithology: Sandstone. Light olive grey, fine grained, well cemented, angular break, micaceous.
Macrofauna observed: Tissintia convergens Havlicek
Age derived from the macrofauna: Llandeilo.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits adjacent to outcrops of or4, the First Bani Sandstone.
Inferred lithostratigraphic position: First Bani (sandstone) Formation.

Sample: JD 29
Lithology: Shale-silty shale. Medium dark grey weathered to olive grey, subfissile, laminated, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits adjacent to outcrops of or1-2, the Fezouata Shales.
Inferred lithostratigraphic position: Fezouata (shale) Formation.

Sample: IHO 220
Lithology: Sandstone. Dark yellowish orange weathered to moderate brown, fine grained, moderately well cemented, micaceous, abundant shelly fauna.
Age derived from the macrofauna: Llandeilo.
Lithostratigraphy according to the geological map: s11, Llandeilo sandstones.
Inferred lithostratigraphic position: First Bani (sandstone) Formation.

Sample: JW 4
Lithology: Shale. Medium dark grey, irregular break, slightly micaceous, abundant poorly preserved fauna.

Age derived from the macrofauna: If the identification of Tarfaya sp. is correct then Arenig.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits adjacent to outcrops of or1-2, the Fezouata Shales.
Inferred lithostratigraphic position: Fezouata (shale) Formation. It appears from the relative positions of samples JW 4 and JW 5 on the geological map that JW 4 is probably the older of the two.

Sample: JW 5
Lithology: Shale. Medium dark grey, irregular break, slightly micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits adjacent to outcrops of or1-2, the Fezouata Shales.
Inferred lithostratigraphic position: Fezouata (shale) Formation. It appears from the relative positions of samples JW 4 and JW 5 on the geological map that JW 4 is probably the older of the two.

Sample: TD 17
Lithology: Shale. Light olive brown weathered to yellowish grey, subfissile, few graptolites present.
Macrofauna observed: Climacograptus normalis Lapworth, Climacograptus angustus Perner, Climacograptus sp., Orthograptus sp., Diplograptus modestus Lapworth, Diplograptus sp., Glyptograptus gr. persculptus (Salter), Glyptograptus sp.
Age derived from the macrofauna: Ordovician, Upper Ashgill, probably persculptus Zone (?upper part).
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits adjacent to outcrops of ss (Gothlandien, ie Silurian) and si4, the Bani Sandstone.
Inferred lithostratigraphic position: Second Bani (sandstone) Formation., based on the lithology and the macrofaunal content.

2. THE SILURIAN-LOWER DEVONIAN FIELD SAMPLES

Sample: DJ 84
Lithology: Shale. Medium light grey weathered to light brown, subfissile.
Macrofauna observed: Pristiograptus dubius (Suess), Cyrtograptus cf. ellesae Gortani, Monograptus flemingii (Salter).
Age derived from the macrofauna: Middle Wenlock, upper Sheinwoodian, probably ellesae Zone.
Lithostratigraphy according to the geological map: or5a, Lower Ktaoua.
Inferred lithostratigraphic position: Argillaceous Shale Formation. This is based on the lithology and on the age of the macrofaunal content. There are Silurian aged rocks evident in the vicinity of the grid reference for this sample which suggests that the lithostratigraphic position according to the geological map may be an error in mapping or in the grid reference taken for the sample.

Sample: DW 34
Lithology: Shale. Greyish black, irregular break, slightly micaceous, abundant graptolites present.
Macrofauna observed: Bohemograptus bohemicus (Barrande), Lobograptus squanicus Tullberg, Saetograptus chimaera (Barrande).
Age derived from the macrofauna: Lower Ludlow, Gorstian, squanicus Zone.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits adjacent to outcrops of Ordovician, Silurian and Devonian rocks.
Inferred lithostratigraphic position: Argillaceous Shale Formation. This is based on the lithology (note that the Argillaceous Shale Formation is more organically rich [darker in colour] and graptolite rich in the Tazzarine area, as stated in the 'lithostratigraphic framework' section of this study) and on the age of the faunal content.

Sample: DW 51
Lithology: Shale. Greyish black, irregular break, slightly micaceous, occasional graptolites present.
Macrofauna observed: Monograptus prognatus Koren' or M. pridoliensis Pribyl, Monograptus beatus Koren', Linograptus posthumus Richter, Pristiograptus dubius (Suess), Monograptus cf. subhercynicus Willerfert
Age derived from the macrofauna: Pridoli
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits adjacent to outcrops of di1-3 (Lower Devonian).
Inferred lithostratigraphic position: Calcareous Shale Formation, Black Shale Member. The age of this sample, derived from the macrofauna present, Pridoli, suggests that deposition of the Black Shale Member of the Calcareous Shale Formation was initiated prior to the Lochkovian. Lochkovian was the age previously assigned to this member.
Sample: DW 52
Lithology: Shale. Dark grey, subfissile, micaceous, abundant graptolites present.
Age derived from the macrofauna: Pridoli, approximating to the \textit{lochkoviensis} Zone.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits adjacent to outcrops of di1-3 (Lower Devonian).
Inferred lithostratigraphic position: Calcareous Shale Formation, Black Shale Member. The age of this sample, derived from the macrofauna present, Pridoli, suggests that deposition of the Black Shale Member of the Calcareous Shale Formation was initiated prior to the Lochkovian. Lochkovian was the age previously assigned to this member.

Sample: DW 55
Lithology: Shale. Dark grey, subfissile, slightly micaceous, abundant graptolites present.
Age derived from the macrofauna: Pridoli, \textit{lochkoviensis} Zone.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits adjacent to outcrops of di1-3 (Lower Devonian).
Inferred lithostratigraphic position: Calcareous Shale Formation, Black Shale Member. The age of this sample, derived from the macrofauna present, Pridoli, suggests that deposition of the Black Shale Member of the Calcareous Shale Formation was initiated prior to the Lochkovian. Lochkovian was the age previously assigned to this member.
Sample: DW 56
Lithology: Shale. Dark grey, subfissile, slightly micaceous, graptolites are common.
Macrofauna observed: Monograptus cf. pridoliensis Pribyl, Linograptus posthumus Richter.
Age derived from the macrofauna: Pridoli, lochkoviensis Zone.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits adjacent to outcrops of di1-3 (Lower Devonian).
Inferred lithostratigraphic position: Calcareous Shale Formation, Black Shale Member. The age of this sample, derived from the macrofauna present, Pridoli, suggests that deposition of the Black Shale Member of the Calcareous Shale Formation was initiated prior to the Lochkovian. Lochkovian was the age previously assigned to this member.

Sample: DW 57
Lithology: Shale. Dark grey, subfissile, slightly micaceous, few graptolites present.
Macrofauna observed: Monograptus cf. uniformis Pribyl.
Age derived from the macrofauna: Lochkovian, uniformis Zone.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits adjacent to outcrops of di1-3 (Lower Devonian).
Inferred lithostratigraphic position: Calcareous Shale Formation, Black Shale Member.

Sample: DW 58
Lithology: Shale. Greyish black, irregular break, slightly micaceous.
Macrofauna observed: Monograptus aff. uniformis Pribyl, Monograptus cf. pridoliensis Pribyl
Age derived from the macrofauna: Lochkovian, uniformis Zone.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits adjacent to outcrops of di1-3 (Lower Devonian).
Inferred lithostratigraphic position: Calcareous Shale Formation, Black Shale Member.

Sample: DW 94
Lithology: Shale. Greyish black, irregular break, slightly micaceous.
Macrofauna observed: Monograptus transgrediens Perner
Age derived from the macrofauna: Pridoli, transgrediens Zone
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits adjacent to an outcrop of s4 (Pridoli).
Inferred lithostratigraphic position: Calcareous Shale Formation, Black Shale Member. The age of this sample, derived from the macrofauna present, Pridoli, suggests that deposition of the Black Shale Member of the Calcareous Shale Formation was initiated prior to the Lochkovian. Lochkovian was the age previously assigned to this member.

Sample: DW 96
Lithology: Shale. Dark grey, subfissile, slightly micaceous.
Macrofauna observed: Monograptus yukonensis Jackson & Lenz.
Age derived from the macrofauna: Pragian (Siegenian), yukonensis Zone
Lithostratigraphy according to the geological map: S4 (Pridoli).
Inferred lithostratigraphic position: The macrofauna recorded here is clearly younger than the age assigned to the outcrop from which the sample was taken on the geological map. This dark grey shale of Pragian age is probably assignable to either the Lmhaifid Formation or the Assa Formation.

Sample: DW 97
Lithology: Shale. Dark grey, subfissile, slightly micaceous.
Macrofauna observed: Monograptus cf. aequabilis, Monograptus notaequabilis Jackson & Stein, Monograptus yukonensis Jackson & Lenz subsp.
Age derived from the macrofauna: Pragian (Siegenian), yukonensis Zone
Lithostratigraphy according to the geological map: S4 (Pridoli).
Inferred lithostratigraphic position: The macrofauna recorded here is clearly younger than the age assigned to the outcrop from which the sample was taken on the geological map. This dark grey shale of Pragian age is probably assignable to either the Lmhaifid Formation or the Assa Formation.

Sample: DW 162
Lithology: Shale. Black, fissile, very carbonaceous, slightly micaceous.
Macrofauna observed: Monograptus priodon (Bronn), Monograptus riccartonensis Lapworth, ?Pristiograptus dubius (Sues). Age derived from the macrofauna: Middle Wenlock, upper Sheinwoodian, riccartonensis Zone.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits adjacent to an outcrop of or6, the Second Bani Sandstone.
Inferred lithostratigraphic position: Carbonaceous Shale Formation. This is based on the lithology and on the age of the macrofauna present. In the vicinity of the sampled outcrop, s2 sediments on the
map (Llandovery to Wenlock in age) commonly outcrop in association with the or6 unit. This suggests there has been an error in the mapping or an error in the grid reference taken for the sample.

Sample: DW 164
Lithology: Shale. Greyish black, fissile, carbonaceous, slightly micaceous.
Macrofauna observed: Retiolites geinitzianus, Retiolites densireticulatus (Boucek), Monograptus priodon (Bonn) s.l., Pristiograptus nudus (Lapworth), Monoclimacis cf. crenulata sensu Elles & Wood, Monograptus sp.
Age derived from the macrofauna: Uppermost Llandovery, upper Telychian, crenulata Zone
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits adjacent to an outcrop of or6, the Second Bani Sandstone.
Inferred lithostratigraphic position: Carbonaceous Shale Formation. This is based on the lithology and on the age of the macrofauna present. In the vicinity of the sampled outcrop, s2 sediments on the map (Llandovery to Wenlock in age) commonly outcrop in association with the Second Bani Sandstone. This suggests there has been an error in the mapping or an error in the grid reference taken for the sample.

Sample: DW 215
Macrofauna observed: Saetograptus cf. incipiens (Wood), Saetograptus chimaera (Barrande).
Age derived from the macrofauna: 'Middle' Ludlow.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits located between outcrops of di, Lower Devonian, and dm, Middle Devonian, sediments. The lithology clearly indicates that this sample is from the Orthoceras limestone Formation which is shown on the map to outcrop in the vicinity of the position of the grid reference for this sample.
Inferred lithostratigraphic position: Orthoceras Limestone-Shale Formation.

Sample: DW 230
Lithology: Shale. Light grey with pale red purple laminae, fissile, soapy texture.
Macrofauna observed: Monograptus ludensis (Murchison), ?Pristiograptus dubius (Suess)
Age derived from the macrofauna: Upper Wenlock, Homerian, ludensis Zone.

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Lithostratigraphy according to the geological map: s2, lower Ludlow argillaceous shales.

Inferred lithostratigraphic position: Argillaceous Shale Formation.

Sample: DW 231
Lithology: Shale. Light grey weathered to light brownish grey, fissile, soapy texture.
Macrofauna observed: *Monograptus ludensis* (Murchison), *Pristiograptus dubius* (Suess), *Pristiograptus jaegeri* Holland *et al.*
Age derived from the macrofauna: Upper Wenlock, Homerian, *ludensis* Zone.

Lithostratigraphy according to the geological map: s2, lower Ludlow argillaceous shales.
Inferred lithostratigraphic position: Argillaceous Shale Formation.

Sample: DW 232
Lithology: Shale. Medium dark grey, fissile, slightly micaceous.
Macrofauna observed: *Colonograptus* sp.
Age derived from the macrofauna: Ludlow.

Lithostratigraphy according to the geological map: s2, lower Ludlow argillaceous shales.
Inferred lithostratigraphic position: Argillaceous Shale Formation. From the relative positions of samples DW 232, DW 234 and DW 235 on the geological map, it appears that DW 232 is older than DW 234 and DW 235.
Sample: DW 234
Lithology: Shale. Light grey weathered to light brownish grey, fissile, soapy texture.
Macrofauna observed: Saetograptus friischi cf. linearis (Boucek) Saetograptus varians, Pristiograptus dubius (Suess).
Age derived from the macrofauna: Ludlow.
Lithostratigraphy according to the geological map: s2, lower Ludlow argillaceous shales.
Inferred lithostratigraphic position: Argillaceous Shale Formation. From the relative positions of samples DW 232, DW 234 and DW 235 on the geological map, it appears that DW 232 is older than DW 234 and DW 235.

Sample: DW 235
Lithology: Shale. Medium dark grey weathered to light brown, subfissile, slightly micaceous.
Macrofauna observed: cf. Saetograptus friischi cf. linearis (Boucek).
Age derived from the macrofauna: Ludlow.
Lithostratigraphy according to the geological map: s2, lower Ludlow argillaceous shales.
Inferred lithostratigraphic position: Argillaceous Shale Formation. From the relative positions of samples DW 232, DW 234 and DW 235 on the geological map, it appears that DW 232 is older than DW 234 and DW 235.

Sample: DW 246
Lithology: Shale. Dark grey with pale olive weathered surface, fissile, micaceous.
Age derived from the macrofauna: Llandovery, lower Telychian, ?turriculatus-?crispus Zones.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits which lie adjacent to outcrops of s1, the Ain Chebi Formation.
Inferred lithostratigraphic position: Carbonaceous Shale Formation.

Sample: DW 248

Lithology: Shale. Black, fissile, carbonaceous and micaceous, graptolites are common.


Age derived from the macrofauna: Llandovery, Telychian, *griestoniensis* Zone.

Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits which lie adjacent to outcrops of s1, the Ain Chebi Formation.

Inferred lithostratigraphic position: Carbonaceous Shale Formation.

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Sample: DW 249


Lithology: Shale. Black, subfissile, carbonaceous and slightly micaceous.


Age derived from the macrofauna: Llandovery, upper Telychian, *crenulata* Zone.

Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits which lie adjacent to outcrops of s1, the Ain Chebi Formation.

Inferred lithostratigraphic position: Carbonaceous Shale Formation.

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Sample: DW 250


Lithology: Shale. Greyish black, subfissile, micaceous.


Age derived from the macrofauna: Llandovery, upper Telychian, *crenulata* Zone.

Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits which lie adjacent to outcrops of s1, the Ain Chebi Formation.

Inferred lithostratigraphic position: Carbonaceous Shale Formation.
Sample: DW 251
Lithology: Greyish black and dark grey laminated shale with intercalated dark grey silty shale. The laminated shale is subfissile, carbonaceous and micaceous with abundant graptolites. The dark grey silty shale more massive and micaceous.
Macrofauna observed: Retiolites geinitzianus cf. densireticulatus Boucek, Monograptus rickardsi Hutt s.l., Monograptus priodon (Bronn), Monograptus spiralis Geinitz.
Age derived from the macrofauna: Llandovery, upper Telychian, probably crenulata Zone.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits which lie adjacent to outcrops of s1, the Ain Chebi Formation.
Inferred lithostratigraphic position: Carbonaceous Shale Formation.

Sample: DW 355
Lithology: Black, subfissile, slightly micaceous, carbonaceous, abundant graptolites present.
Macrofauna observed: Monograptus ex. gr. flemingii (Salter), Pristiograptus dubius (Suess), Pristiograptus sp., Cyrtograptus sp., Pristiograptus meneghinii/Pristiograptus pseudodubius (probably a transitional form between the two species).
Age derived from the macrofauna: 'Middle' Wenlock, upper Sheinwoodian, flexilis Zone.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits positioned between outcrops of or6, the Second Bani Sandstone and s1-3 (Silurian).
Inferred lithostratigraphic position: Carbonaceous Shale Formation or Argillaceous Shale Formation.

Sample: DW 356
Lithology: Shale. Black, subfissile, slightly micaceous, carbonaceous, abundant graptolites present.
Macrofauna observed: Cyrtograptus rigidus cautleyensis Rickards, Monograptus flemingii (Salter), Monoclimacis cf. kingii Rickards, Monoclimacis flumendosae (Gortani), Pristiograptus dubius (Suess), Pristiograptus sp., Monograptus flemingii (Salter) s.l.
Age derived from the macrofauna: 'Middle' Wenlock, upper Sheinwoodian, probably flexilis Zone.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits positioned between outcrops of or6, the Second Bani Sandstone and s1-3 (Silurian).
Inferred lithostratigraphic position: Carbonaceous Shale Formation or Argillaceous Shale Formation.
Sample: DW 357
Lithology: Shale. Black, irregular break, slightly micaceous, carbonaceous.
Macrofauna observed: Monograptus cf. riccartonensis.
Age derived from the macrofauna: 'Middle' Wenlock, upper Sheinwoodian, riccartonensis Zone.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits positioned between outcrops of or6, the Second Bani Sandstone and s1-3 (Silurian).
Inferred lithostratigraphic position: Carbonaceous Shale Formation or Argillaceous Shale Formation.

Sample: DW 358
Lithology: Shale. Black, irregular break, slightly micaceous, abundant graptolites present.
Macrofauna observed: Pristiograptus dubius (Suess), Pristiograptus sp., Monoclimacis flumendosae (Gortani), Pristiograptus? meneghini (Gortani).
Age derived from the macrofauna: 'Middle' Wenlock, ?Sheinwoodian.
Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits positioned between outcrops of or6, the Second Bani Sandstone and s1-3 (Silurian).
Inferred lithostratigraphic position: Carbonaceous Shale Formation or Argillaceous Shale Formation.

Sample: DW 367
Lithology: Black, subfissile, slightly micaceous, carbonaceous, graptolites are common.
Macrofauna observed: Pristiograptus dubius (Suess), Monoclimacis flemingii/flumendosae (Gortani), Monograptus flemingii/priodon, Climacograptus cantheyensis, Pristiograptus meneghini (Gortani).
Age derived from the macrofauna: Wenlock, upper Sheinwoodian, riccartonensis/rigidus zonal boundary..
Lithostratigraphy according to the geological map: s1-3 (Silurian).
Inferred lithostratigraphic position: Carbonaceous Shale Formation.

Sample: JW 9

Lithology: Shale. Light grey weathered to light brownish grey, fissile, soapy texture.

Macrofauna observed: *Monograptus flemingii* (Salter), *Pristograptus pseudodubius* (Boucek), *Cytograptus cf. ellesae* Gortani, *Monoclimacis flumendosae* (Gortani), *Pristograptus jaegeri*.

Age derived from the macrofauna: Wenlock, upper Sheinwoodian, probably *ellesae* Zone.

Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits positioned adjacent to outcrops of s1-3 (Silurian).

Inferred lithostratigraphic position: Argillaceous Shale Formation.

Sample: JW 10


Lithology: Shale. Dark grey, subfissile, slightly micaceous.

Macrofauna observed: *Lobograptus scanicus* Tullberg s.l., *Saetograptus chimaera* (Barrande) s.l., *Saetograptus* sp.

Age derived from the macrofauna: Ludlow, Ludfordian, approximately *tumescens* (incipiens) Zone or higher.

Lithostratigraphy according to the geological map: s2 (Telychian-Sheinwoodian-Homerian aged shales).

Inferred lithostratigraphic position: Argillaceous Shale Formation. The date given for the outcrop from which this sample was taken on the geological map appears to be incorrect from the macrofaunal evidence here.

Sample: JW 46


Lithology: Shale. Medium dark grey, fissile, slightly micaceous.

Macrofauna observed: *Monograptus discus* Barrande, *Retiolites geinitzianus* (Barrande) s.l., *Monograptus planus* (Barrande).

Age derived from the macrofauna: Upper Llandovery, Telychian, could be either *crispus* or *griestoniensis* Zone on this association.

Lithostratigraphy according to the geological map: s1 (Llandovery-Wenlock aged shales).

Inferred lithostratigraphic position: Carbonaceous Shale Formation.

Sample: JW 224

Lithology: Shale. Dark grey, subfissile, slightly micaceous.

Macrofauna observed: Bohemagraptus bohemicus (Barrande), Colonograptus colonus (Barrande), Monograptus unciniatus Tullberg.

Age derived from the macrofauna: Ludlow, Gotstian, upper nilsoni zone.

Lithostratigraphy according to the geological map: The grid reference for this sample is positioned on drift deposits. The outcrops indicated on the map in the close vicinity of the grid reference are of Devonian and Carboniferous age. However, there are Ludlow aged outcrops approximately 6km to the south-east along strike.

Inferred lithostratigraphic position: Carbonaceous Shale Formation, based on the lithology and the macrofauna present.

Sample: JW 249

Lithology: Shale. Medium dark grey, fissile, micaceous.

Macrofauna observed: Monograptus turriculatus (Barrande), Monograptus runcinatus Lapworth, Pseudoplegmatograptus obesus (Lapworth), Monograptus marri (Perner), Monograptus proteus (Barrande), Monograptus gemmatus sensu Elles & Wood.

Age derived from the macrofauna: Llandovery, lower Telychian, turriculatus Zone.

Lithostratigraphy according to the geological map: ss, Gothlandien (ie. Silurian) graptolitic shales and Orthoceras Limestones.

Inferred lithostratigraphic position: Carbonaceous Shale Formation, based on the lithology and the macrofauna present.

3. OUM DOUL-1 CORE SAMPLES

Sample: OD 1496.
Location: Oum Doul-1; latitude 28 05' 38"N, longitude 9 52' 05"W; core 21, depth 1496m.

Lithology: Shale. Dark grey with medium grey laminae, sub-fissile, micaceous.

Macrofauna observed: None

Age derived from the macrofauna: None

Formation: Lefdar.
Sample: OD 1612.
Location: Oum Doul-1; latitude 28°05'38"N, longitude 9°52'05"W; core 22, depth 1612m.
Lithology: Shale. Dark grey with medium grey lamminae, irregular break, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: Draa.

Sample: OD 1612.1.
Location: Oum Doul-1; latitude 28°05'38"N, longitude 9°52'05"W; core 22, depth 1612.1m.
Lithology: Shale. Dark grey with medium grey lamminae, irregular break, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: Draa.

Sample: OD 1809.
Location: Oum Doul-1; latitude 28°05'38"N, longitude 9°52'05"W; core 24, depth 1809m.
Lithology: Shale. Medium dark grey, lamminated, sub-fissile, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: Draa.

Sample: OD 1809.3.
Location: Oum Doul-1; latitude 28°05'38"N, longitude 9°52'05"W; core 24, depth 1809.3m.
Lithology: Shale. Medium dark grey, lamminated, sub-fissile, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: Draa.

Sample: OD 2409.65.
Location: Oum Doul-1; latitude 28°05'38"N, longitude 9°52'05"W; core 31, depth 2409.65m.
Lithology: Shale. Medium dark grey, lamminated, sub-fissile, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: Anou Smaira.

Sample: OD 3130.65.
Location: Oum Doul-1; latitude 28 05' 38"N, longitude 9 52' 05"W; core 42, depth 3130.65m.
Lithology: Shale. Medium dark grey, irregular break, slightly micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: N'Kheila.

Sample: OD 3131.
Location: Oum Doul-1; latitude 28 05' 38"N, longitude 9 52' 05"W; core 42, depth 3131m.
Lithology: Shale. Medium dark grey, lamminated, fissile, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: N'Kheila.

Sample: OD 3186.2.
Location: Oum Doul-1; latitude 28 05' 38"N, longitude 9 52' 05"W; core 43, depth 3186.2m.
Lithology: Shale. Medium dark grey, irregular break, slightly micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: N'Kheila.

Sample: OD 3186.5.
Location: Oum Doul-1; latitude 28 05' 38"N, longitude 9 52' 05"W; core 43, depth 3186.5m.
Lithology: Shale. Medium dark grey, irregular break, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: N'Kheila.

Sample: OD 3239.
Location: Oum Doul-1; latitude 28 05' 38"N, longitude 9 52' 05"W; core 44, depth 3239m.
Lithology: Shale. Medium dark grey, irregular break, slightly micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: N'Kheila.

Sample: OD 3239.5.
Location: Oum Doul-1; latitude 28°05'38"N, longitude 9°52'05"W; core 44, depth 3239.5m.
Lithology: Shale. Dark grey, irregular break, slightly micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: N'Kheila.

Sample: OD 3274.
Location: Oum Doul-1; latitude 28°05'38"N, longitude 9°52'05"W; core 45, depth 3274m.
Lithology: Shale. Dark grey, irregular break, slightly micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: N'Kheila.

Sample: OD 3274.5.
Location: Oum Doul-1; latitude 28°05'38"N, longitude 9°52'05"W; core 45, depth 3274.5m.
Lithology: Shale. Dark grey, irregular break, slightly micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: N'Kheila.

Sample: OD 3333.2.
Location: Oum Doul-1; latitude 28°05'38"N, longitude 9°52'05"W; core 46, depth 3333.2m.
Lithology: Shale. Medium dark grey, irregular break, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: N'Kheila.

Sample: OD 3504.
Location: Oum Doul-1; latitude 28°05'38"N, longitude 9°52'05"W; core 50, depth 3504m.
Lithology: Shale. Medium dark grey, irregular break, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: Mdaour el Kbir-El Ansar.

Sample: OD 3504.2.
Location: Oum Doul-1; latitude 28°05'38"N, longitude 9°52'05"W; core 50, depth 3504.2m.
Lithology: Shale. Medium dark grey, irregular break, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: Mdaour el Kbir-El Ansar.

Sample: OD 3675.75.
Location: Oum Doul-1; latitude 28°05'38"N, longitude 9°52'05"W; core 55, depth 3675.75m.
Lithology: Shale. Greyish black, irregular break, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: Assa.

Sample: OD 3675-3677.5.
Location: Oum Doul-1; latitude 28°05'38"N, longitude 9°52'05"W; core 55, depth 3675-3677.5m.
Lithology: Shale. Greyish black, irregular break, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: Assa.

Sample: OD 4069.8-4071.5.
Location: Oum Doul-1; latitude 28°05'38"N, longitude 9°52'05"W; core 60, depth 4069.8-4071.5m.
Lithology: Shale. Dark grey, irregular break, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: Lmhaifid.

Sample: OD 4070.
Location: Oum Doul-1; latitude 28° 05' 38"N, longitude 9° 52' 05"W; core 60, depth 4070m.
Lithology: Shale. Dark grey, irregular break, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: Lmhaifid.

Sample: OD 4070.1.
Location: Oum Doul-1; latitude 28° 05' 38"N, longitude 9° 52' 05"W; core 60, depth 4070.1m.
Lithology: Shale. Dark grey, irregular break, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: Lmhaifid.

Sample: OD 4214.5-4217.
Location: Oum Doul-1; latitude 28° 05' 38"N, longitude 9° 52' 05"W; core 61, depth 4214.5-4217m.
Lithology: Shale. Dark grey, irregular break, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: Lmhaifid.

Sample: OD 4214.6.
Location: Oum Doul-1; latitude 28° 05' 38"N, longitude 9° 52' 05"W; core 61, depth 4214.6.
Lithology: Shale. Greyish black, irregular break, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: Lamhaifid.

Sample: OD 4215.
Location: Oum Doul-1; latitude 28°05' 38"N, longitude 9°52' 05"W; core 61, depth 4215m.
Lithology: Shale. Dark grey, irregular break, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: Lamhaifid.

Sample: OD 4215.4.
Location: Oum Doul-1; latitude 28°05' 38"N, longitude 9°52' 05"W; core 61, depth 4215.4m.
Lithology: Shale. Dark grey, irregular break, micaceous.
Macrofauna observed: None.
Age derived from the macrofauna: None.
Formation: Lamhaifid.
APPENDIX II. Topographic maps used.


APPENDIX III. Geological maps used.


