INTRODUCTION

Site 100 is located at 24° 41.27'N, 73° 47.98'W in a water depth of 3525 meters. Seismic profiling and piston coring had shown that the Cat Gap area offered a good opportunity to penetrate old sediments with relative ease (Ewing et al., 1966; Windisch et al., 1968; Habib, 1968). Because of personnel injuries, Leg 1 drilling at this location was terminated before basement could be reached—in Valanginian-Tithonian deposits at a subbottom depth of only 259 meters (Ewing et al., 1969). The principal goal for Site 100 was, therefore, to complete the stratigraphic section in the Cat Gap area, sample the oldest sediment, and determine the nature of Horizon B.

Seismic profiling and drilling during Leg 1 indicated that Horizon B would be easiest to reach at a position about 30 miles north of Site 4. The position selected for the hole (Figure 1) was a few miles west of a small ridge, where the total amount of sediment above Horizon B, as recorded by the seismic profiler, corresponds to 0.3 second reflection time (Figures 2a and 2b).

An obvious, but not strong, reflector overlies Horizon B by approximately 0.08 second. According to previous surveys in the area (Windisch et al., 1968) most of the sediment between the sea floor and Horizon B is included in the zone of reflectors called Horizon Beta. This horizon has been traced over a considerable part of the North America Basin, particularly the southwestern region, and its age and lithology had not been satisfactorily established by the Leg 1 drilling.

Continuity of horizons observed in the profiler records between Sites 99 and 100 is uncertain, partly because of a major fault zone approximately half way between the two sites, but the deepest reflectors (Horizon B) at both places have definite similarities. The late Jurassic limestone drilled at Hole 99A marks a major lithologic change from the overlying Neocomian to Tithonian cherty limestone, and, after the completion of the drilling, there seemed to be a good likelihood that Reflector B corresponds to the top of the limestone sequence. However, the profiler records also show a moderately strong reflector 50 to 100 meters above B, which also might be correlated with the top of the late Jurassic limestone. There was good reason to expect that if a deep section could be obtained at Site 100, a stratigraphic connection with Hole 99A might be made to clarify the seismic picture, and thus provide a means of extrapolating the geological results over a broad region.

OPERATIONS

Positioning

The ship arrived at the site at 0600 hours on April 20, 1970, conducted a short survey to verify the anticipated sediment thickness, and dropped the beacon at 1430 hours. Apparently the ship was set toward the east more than expected, and by the time the beacon had been launched, it had drifted closer than planned to the small basement(?) ridge. However, as shown by the profiler record (Figure 2a) made on a west-east traverse over the beacon after completion of drilling, the hole appears to have been drilled far enough from the ridge so that the results can probably be considered to represent basin stratigraphy rather than ridge flank stratigraphy.

The beacon amplitude began to vary approximately twenty per cent after four days and seventeen hours of operations. The positioning system continued to operate in automatic by increasing the gains.

Drilling

The hole was drilled with a Smith 4-cone tungsten carbide button bit. The bit, the core barrel, and the lowermost four drill collars were lost on the trip out of the hole, and an inspection of the bit was therefore not possible.

Spudding-in was accomplished without difficulties at 2300 hours, April 20. The hole was washed to approximately 30 meters before rotation was necessary to obtain penetration.

The hole was drilled to a depth of 200 meters before the first sample was taken. Drilling during this interval was relatively easy, except between 120 and 130 meters subbottom depth.

A thin, hard layer was penetrated slightly above Core 1. The first core was composed mainly of chalk and contained some chert. Drilling was resumed in material of approximately the same consistency to a depth of 237 meters, where penetration became much more
difficult. Core 2 was taken at this level and recovered 3.6 meters of hard, late Jurassic limestone. Both from the drilling record, which is shown in Figure 3 (alternating periods of slow and fast penetration), and from the ratio of core recovery to cored interval, it was judged that the strata consist of hard limestone layers separated by much softer beds that were washed out by the drilling fluid. This material was drilled and cored to a subbottom depth of 317 meters, at which point Core 10 recovered 20 centimeters of basalt underlying a greenish-gray argillaceous limestone.

Coring was continued into the basalt for 14 meters; 4.5 meters of basalt were recovered. The basalt contains a few inclusions of limestone. The average penetration rate in the basalt was 2 m/hr.

Comparison of the core samples and the drilling record with the seismic data indicates that the top of the basalt sequence corresponds with Horizon B, and the top of the overlying sequence of the late Jurassic variegated limestone with the much less prominent reflector in Figure 2a. This latter reflector was traced during the traverse to Site 101 and becomes much stronger towards the north.

The ship departed from location on April 24, at 1130 hours.

Figure 1. Seismic profiler tracks between Sites 99, 100 and 101 (Cat Gap area).
Figure 2a. Profiler record AB (R/V CHAIN) between Sites 99 and 100; record CDE (GLOMAR CHALLENGER) between Sites 100 and 101. See Figure 1 for track locations.

203 meters. The lithology and fossil content of Core 1 correspond fairly well to Core 5 taken at Site 4 of Leg 1.

The core catcher of Core 1 contains only a few well-preserved specimens of dinoflagellates. These include *Diacanthum hollisteri*, new genus, new species, which was not observed above Core 22 at Site 105; and *Ctenidodinium elegantulum*, which has been described from the Lower Cretaceous of France.

The calcareous nannoplankton assemblage indicates a Valanginian to late Tithonian age (*Nannoconus steinmanni*, *N. dolomiticus*, *N. kamptneri*, *Parhabdolitus embergeri*, and others). Several species common to both stages are present in the core catcher and at this time it is very difficult to distinguish between the two stages.

Section 5 of Core 1 contains very rare isolated loricae of calpionellids (*Remaniella* sp. aff. *R. cadischiana*, *Calpionellopsis* sp. aff. *C. oblonga*, *C. sp. aff. C. simplex*, *Calpionella* sp. aff. *C. alpina*, and *Tintinnopsella* sp. aff. *T. carpathica*). This association indicates a Berriasian to latest Tithonian age.

The poor foraminiferal assemblages consist of simply structured arenaceous forms and a few lagenids. Radiolarians and ostracodes are rare to common in the washed residues.

Core 100-2 contains calcareous nannoplankton of a definite late Jurassic aspect (*Watznaueria britannica*,...
Hexapodorhabdus cuvillieri, Zygodiscus salillum, Diazomatolithus lehmani, and others).

A sample from the core catcher processed for palynomorphs is devoid of dinoflagellates.

The washed residue obtained from the core catcher of Core 2 contains only rare and poorly preserved radiolarians and very rare fragments of the pelagic crinoid genus Saccocoma.

Recovery of Core 3 (246 to 259 meters below bottom) was very poor. Only 30 centimeters of a slightly argillaceous, cherty limestone in Section 1 and the core catcher were retrieved. The core catcher contains the dinoflagellate species Chytroeisphaeridia pococki, which indicates a late Jurassic age. The calcareous nanoplankton (Stephanolithion bigoti, Hexapodorhabdus cuvillieri, Zygodiscus erectus, Watznaueria britannica and W. barnesae) comprise mainly species which are hitherto known from the Oxfordian, but the tops of the ranges of these species are still poorly known.

The washed residues contain only a few radiolarians and sponge spicules.

Only one section and the core catcher were obtained from Core 4, whereas Core 5 is represented by 1.9 meters of sediment. The core catcher of Core 4 and Sample 100-5-2, 25 to 27 centimeters, contain a well-preserved assemblage of dinoflagellates, including Chytroeisphaeridia pococki, Gonyaulacysta ambiguа and G. nuciformis. These species suggest an early Kimmeridgian or Oxfordian age and can be found in Association H (Cores 35 to 37) at Site 105.

The calcareous nanoplankton assemblages of Cores 4 and 5 are all very rare and poorly preserved. Radiolarians are present in variable amounts. The foraminiferal assemblages consist mainly of simply-structured arenaceous forms, Spirillina, and a few lagenids. The remains of pelagic crinoids (Saccocoma sp. cf. S. quenstedti, S. sp. cf. S. schattenbergi) point toward a late Oxfordian to Kimmeridgian age.

The two samples processed from Core 6 for palynomorphs (100-6-1, 63 to 65 centimeters, and core catcher) are barren of dinoflagellates.

Hexapodorhabdus cuvillieri, Zygodicus salillum, Palaeoportephaera dubia, Diazomatolithus lehmani, Watznaueria britannica, and Podorhabdus perforatus are the most conspicuous species in the calcareous nanoplankton assemblages.

The foraminiferal faunas are still rather poor and badly preserved, but the number of specimens and species is greater as compared to the overlying cores, whereas the number of radiolarians is smaller. The assemblages are dominated by simply-structured forms (Spirillina tenuissima, S. elongata, S. orbicula, Turrisspirlina amoena, Ramulina spandeli, and others), but a few lagenids are also present (for example, Lenticulina quenstedti, Frondicularia linguliformis, Lingulina umbra). The genus Saccocoma is represented by a few broken skeletal elements.

Cores 7 and 8 contain numerous well-preserved cysts of dinoflagellates. The assemblages are the oldest ones recovered during Leg 11. Stratigraphically important species include Meiourogonyaulax valensiа, Paredodinia ceratophora, Gonyaulacysta nuciformis, G. scarburghensis, G. ambiguа, Seriniodium (Endoscrinium) galeritum, Chytroeisphaeridia chytroeides, Ch. pococki, and Tenua verrucosa. These species range throughout Cores 7 to 10. They indicate an Oxfordian age. Meiourogonyaulax valensiа is reported for the first time from sediments younger than the middle Jurassic (Bathonian).

The calcareous nanoplankton assemblages are very similar to those of the overlying cores, although a slight shift in species composition is apparent beginning with Core 8.

The foraminiferal assemblages of Cores 7 and 8 are, in places, fairly rich and diversified, but their preservation is generally poor. Besides representatives of Spirillina and simply-structured arenaceous foraminifera, a considerable number of lagenids was observed. Radiolarians and Saccocoma occur only scattered and in very small numbers. Ostracodes are common (Pontocyprilla sp., Acrocythere ? sp., Acratia sp., Polycope spp., Bairdia (Akidobairdia) farinacciae, and others).

The dinoflagellate assemblages of Core 10 contains the following species in addition to those already recorded from Cores 7, 8 and 9: Gonyaulacysta dangeardi, Tenua villersense, Seriniodium luridum aff. Eisenackia sp., Stephanelytron ? sp. A, and Dictyopsella reticulata. The admixture of Callovian and Oxfordian species, as well as Bathonian forms (for example, Dictyopsella reticulata and Meiourogonyaulax valensiа), suggests that this core may be Oxfordian or Callovian in age.

The calcareous nanoplankton from Cores 9 and 10 closely resemble those of Core 8. Zygodicus salillum, Z. bussoni, Ethmorhabdus gallicus, Palaeoportephaera dubia, Parhabdolithus liassicus, Loxolithus armillа and Watznaueria britannica are among the most obvious species. A differentiation of the mid-Jurassic stages immediately below the Oxfordian is not possible with calcareous nanoplankton at this time. Cores 8 to 11 are therefore dated as Oxfordian to Callovian based on calcareous nanoplankton.
Spirillina tenuissima, S. orbicula, Rhizammina sp., Tolypammina sp., Reophax helveticus, R. multilocularis, Bigenerina arcuata, B. jurassica, Dentalina jurensis, D. laevigata, and Lenticulina spp. ex gr. L. muensteri are the dominant species in the foraminiferal assemblages of Cores 9 and 10. Noteworthy is the presence of such species as Trocholina transversarii, Marssonella doneziana and Lenticulina polonica. The lowermost samples from Core 10 are largely composed of adherent arenaceous foraminifera. The question of whether the lowermost cores at Site 100 are Callovian or still Oxfordian in age cannot be decided on the basis of the foraminiferal faunas. An increase in species diversity toward the contact with basalt indicates a gradual shallowing, but water depth was probably never less than bathyal.

The composition of the ostracod assemblages in Cores 9 and 10 is the same as in the overlying interval.

The numerous calcite-filled cracks and inclusions of hard micritic limestone in the basalt from the core catcher of Core 10 and of Core 11 contain the same species of calcareous nannoplankton as Cores 9 and 10. Only fragmented specimens of coccoliths were observed in the limestone layers interbedded in the basalt of Cores 12 and 13.

Lithology

Coring was begun after drilling 203 meters, and the first sediments recovered are dated Valanginian-Tithonian. After this first core, twenty-five meters were drilled, then coring was almost continuous except for a short interruption in the Callovian ?-Oxfordian sediments between 292 and 302 meters. Basaltic rocks were encountered at a subbottom depth of 317 meters. All the overlying sediments are predominantly calcareous.

Tithonian-Neocomian Carbonate Ooze (Core 1)

Core 1 consists of a white, soft to slightly indurated, nanoplankton ooze, with occasional hard gray chert layers. No sedimentary structures were observed. Coarse fragments of calcisiltite and pebbles of chert occur at the top of the core; these probably are contaminants from upper parts of the hole. Sediment composition shows a large predominance of coccolithid forms over common to abundant nannofossils. Small, recrystallized calcite fragments are rare in the soft zones; they are common to abundant in the indurated ones. Some greenish-gray layers contain rare organic matter. Chert fragments show replacement of radiolarians and nannofossils by quartz.

Cuttings from the drill bit that were recovered between Cores 1 and 2 consist of small fragments of quartzose chert and white chalk with some chalcedony spherules.

Red, Clayey Oxfordian-Kimmeridgian Limestones (Cores 2-6)

Hard, clayey limestones, showing alternating red and green beds were cored from 237 to 276 meters below bottom. The upper part of this unit (Cores 2, 3 and 4) is laminated and shows flow structures, current bedding, minor slump structures, and some burrowing. Abundant white clasts are present; these are lithified, small mud pebbles made up of pelagic material. Chert layers and cherty zones are observed to be common in the upper part of the section (Cores 2 and 3).

The red layers consist of a muddy limestone with abundant clay minerals, some coccoliths, and abundant, recrystallized calcite particles. The red color is due to the presence of hematite (staining associated with the clay minerals and some tiny hematite crystals).

The intercalated green layers appear less clayey and contain very abundant recrystallized calcite with rare to common coccoliths.

From Core 4 to basement most of the recrystallized calcite particles are "spindle-shaped" (narrow, fusiform grains).

Cores 5 and 6 appear to have sampled a transition zone between the highly laminated red and green limestone and the more homogeneous greenish-gray Callovian?-Oxfordian limestone. Their composition is almost similar to that of Cores 2 through 4, but the green, faintly laminated layers become predominant and evidence of current action is much less apparent.

Greenish Gray Callovian (?)-Oxfordian Limestone

All of this lower section appears rather homogeneous with the exception of the upper part of Core 7, where laminations and some current bedding are present. The homogeneous limestones consist mostly of greenish-gray calcitutite with some silty zones (calcisiltite). Laminations are usually faint or absent; burrowing is common. Dark gray specks and some large streaks, which appear to have an organic origin, are abundant throughout the interval. They consist mainly of plant debris (twigs and leaves). The inner parts of these concentrations have been replaced by pyrite coated by a thin film of carbonaceous matter.

Microscopic examination of the limestone shows very abundant "spindle-shaped" recrystallized calcite grains, some rare coccoliths and clay minerals, and hematite.

Cores 9 and 10 are slightly more laminated than the overlying sediments of this interval.
Basement (Lower Part of Core 10, Cores 11 and 12)

The top of the basalt lies in the lower part of Core 10. The contact with the overlying sediments is very sharp, and no transition zone (baked sediments, pyroclasts, etc.) is observed; the top 2-centimeter layer of basalt appears very glassy. Most of the basalt is rather massive and has some thin, calcite-filled cracks, but some zones show many thin (approximately 1 millimeter) veinlets of black, glassy material and curved, lamellar structures that are characteristic of pillow lavas.

Several limestone inclusions were observed. These are made almost exclusively of finely crystallized (micritic) calcite. One of these inclusions yielded microfloras of middle to late Jurassic age.

Thin sections of the basalt reveal numerous labradorite laths and a few olivine crystals in a pale brown glass with some magnetite. This indicates a hyalophitic structure. No pyroxene was observed.

RATE OF SEDIMENT ACCUMULATION

A compilation of the rate of sediment accumulation at Site 100 depends on several assumptions caused by the very few, and in part contradictory, geochronological data available for the late Jurassic (for discussion see, for example, Gygi and McDowell, 1970) and the somewhat inexact dating of the interval cored at Site 100.

If the duration of the late Jurassic is taken as 15 million years, and if it is assumed that Core 1 is close to the Cretaceous-Jurassic boundary (135 million years) and Core 10 is near the beginning of the middle Jurassic (150 million years), an average rate of sediment accumulation of 0.75/10^3 yr. results for the Upper Jurassic cored at Site 100. This is nearly identical to the rate recorded during a similar time interval in Hole 99 (0.6 cm/10^3 yr.).

DISCUSSION AND CONCLUSIONS

The regional aspects of Site 100 will be discussed in the chapter dealing with the geological setting of the Cat Gap area in the third part of this volume.

The seismic profiler record in Figure 2a (upper) was made as Glomar Challenger passed over the beacon after drilling Hole 100. The course was approximately east during the pass over the beacon and was changed to northwest after reaching the crest of the basement ridge. At the drilling site, Horizon B appears at 0.30 second below bottom; a weaker reflector appears at about 1.23 second. The latter reflector becomes much more distinct in the track north of the drilling site.

Inasmuch as the primary objective here was to sample the deeper part of the section, no cores were taken until 200 meters had been drilled. Thus, the first sample came from the rather homogeneous material between the reflector at 0.23 second and the highly stratified zone near the sea floor. This sample contained cherty carbonate ooze of Valanginian-Tithonian age. The hole was then drilled to a depth of 235 meters, where a distinct drilling break occurred (Figure 3). Core 2, taken just beneath the break, contained moderately hard limestone of late Jurassic age. The most reasonable assumption seems to be that the reflector at 0.23 second below bottom corresponds to the top of the limestone sequence. Accepting this assumption, we calculate an interval velocity of 2.05 km/sec for the upper 230 meters of section at this site. Assuming further that the basalt encountered at 315 meters produces reflector B, we calculate an interval velocity of 2.30 km/sec for the limestone sequence.

Close examination of the profiler record suggests some layering beneath Horizon B, yet this appearance of layering may be due only to the complex nature of the air-gun pulse. In an attempt to establish whether the apparent layering represents alternating layers of basalt and sediment, we drilled the basalt for a considerable amount of time. From the ratio of apparent penetration to basalt recovered (about 14:4), we judged at the time that there was a good possibility that the drill had penetrated two or three soft layers interbedded with the basalt, even though there was nothing in the recovered samples to indicate this. Further consideration has led us to the belief that the zones of apparently rapid penetration were actually the consequence of closing bumper subs which telescoped only when extra weight was put on the bit for drilling the basalt. Hence, penetration into the basalt may have been only about 4 meters; unfortunately this is not enough for a decisive test of whether the basalt is as layered as the profiler records suggest.

The basaltic rock found below the late to middle (?) Jurassic limestone could have been produced either by a Jurassic basalt flow or by a sill in the Jurassic sediments. The presence of a thin, glassy surface at the top of the basalt, as well as the absence of any type of “baked” or reworked sediments in the overlying limestone, suggests deposition of the first sediments on an already cooled surface.

The basalt contains inclusions of limestone with the same nannofossils as the immediately overlying sediments.

The 40 meters of greenish-gray argillaceous limestone immediately above the basalt contain assemblages of dinoflagellates and calcareous nannoplankton which
are different from those of the overlying reddish limestone, and point to an Oxfordian to Callovian(?) age. This limestone therefore represents the oldest sediments which have hitherto been recovered from the ocean floor in the western North Atlantic.

The foraminiferal and ostracod faunas indicate a trend to shallowing towards the base of the section, although water depth was probably never shallower than bathyal.

The approximately 50 meters of late Jurassic reddish limestone and calcareous mudstone contain numerous flow structures and clasts which indicate deposition in an active environment.

The nannoplankton ooze of Valanginian to Tithonian age can be attributed to a deep-bathyal environment.

The nature of the sediments and the microfaunas provides evidence for a gradually deepening depositional environment from middle (?) Jurassic to early Cretaceous time.

REFERENCES


Figure 3. Site 100 summary chart.
Hole 100

Latitude: 24°41.28'N
Longitude: 73°47.95W
Water depth: 5325 meters (drill pipe); 5336 meters (PDR)

<table>
<thead>
<tr>
<th>Core No. (Drilled)</th>
<th>Interval Cored (meters)a</th>
<th>Depth</th>
<th>Amount</th>
<th>Recovery</th>
<th>Subbottom Depth</th>
<th>Lithology</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(5335-5538)</td>
<td>(203)</td>
<td>9</td>
<td>6.5</td>
<td>212</td>
<td>Nannoplankton ooze and chert</td>
<td>Valanginian-Tithonian</td>
</tr>
<tr>
<td>2</td>
<td>(5547-5572)</td>
<td>(25)</td>
<td>9</td>
<td>3.6</td>
<td>246</td>
<td>Clayey red limestone and chert</td>
<td>Kimmeridgian-Oxfordian</td>
</tr>
<tr>
<td>3</td>
<td>(5594-5596)</td>
<td>2</td>
<td>1.4</td>
<td></td>
<td>261</td>
<td>Clayey red limestone</td>
<td>Kimmeridgian-Oxfordian</td>
</tr>
<tr>
<td>4</td>
<td>(5627-5637)</td>
<td>(10)</td>
<td>6</td>
<td>1.4</td>
<td>276</td>
<td>Clayey red limestone</td>
<td>Kimmeridgian-Oxfordian</td>
</tr>
<tr>
<td>5</td>
<td>(5637-5646)</td>
<td>9</td>
<td>2.1</td>
<td></td>
<td>311</td>
<td>Greenish-gray limestone</td>
<td>Oxfordian-Callovian?</td>
</tr>
<tr>
<td>6</td>
<td>(5646-5652)</td>
<td>6</td>
<td>2.0</td>
<td></td>
<td>317</td>
<td>Greenish-gray limestone and basalt</td>
<td>Oxfordian-Callovian?</td>
</tr>
<tr>
<td>7</td>
<td>(5652-5656)</td>
<td>4</td>
<td>1.4</td>
<td></td>
<td>321</td>
<td>Basalt</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>(5659-5666)</td>
<td>7</td>
<td>2.0</td>
<td></td>
<td>331</td>
<td>Basalt</td>
<td></td>
</tr>
</tbody>
</table>

---

aAll intervals are measured by drill pipe from the derrick floor which is 10 meters above water surface.

Figure 4. Core Summary table, Site 100.
<table>
<thead>
<tr>
<th>DEPTH</th>
<th>C. R.</th>
<th>C. I.</th>
<th>LITHOLOGY</th>
<th>AGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td></td>
<td>1</td>
<td>light gray to greenish gray nannoplankton ooze, in places recrystallized, with layers of light gray chert</td>
<td>EARLY CRETACEOUS to LATE JURASSIC (Valanginian to Tithonian)</td>
</tr>
<tr>
<td>250</td>
<td></td>
<td>2</td>
<td>reddish brown and grayish green argillaceous silty limestone, with chert beds and cherty zones. In places with flow structures (lamina- tions, clasts, cross-bedding, small slumps)</td>
<td>LATE JURASSIC (Kimmeridgian to Oxfordian)</td>
</tr>
<tr>
<td>300</td>
<td></td>
<td>3</td>
<td>reddish brown to grayish green argillaceous silty limestone with rare chert fragments; with fine and even laminations</td>
<td>LATE to MIDDLE (?) JURASSIC (Oxfordian to Callovian ?)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>greenish gray slightly argillaceous limestone, finely laminated and with flow structures, in places frequent carbonaceous specks and streaks</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>greenish gray slightly argillaceous limestone, in places silty, with fine laminations and burrows</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>greenish gray slightly argillaceous limestone, in places recrystallized, with layers of light gray chert</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>black massive basalt, with abundant calcite-filled cracks and inclusions of indurated micritic limestone</td>
<td></td>
</tr>
</tbody>
</table>

(Depth in meters below sea floor; C. R. = core recovered, C. I. = cored interval.)

Figure 6. Summary of lithology and age of cores recovered in Hole 100.
Drill cuttings from up-hole in soft white nanoplankton oozes, angular fragments of chalk and hard limestone, one well rounded fragment of chert. 

Nanoplankton oozes, soft to firm plastic, various shades of white (N9-5G6-3G5/1) with greenish-gray (5G6/1) beds in Sect. 3. Light gray (N6) and greenish white (5G9/1) banding throughout, thin gray (N4-5G5) chalk bands; coccoliths dominant, recrystallized calcite common, nanofossils common.

Angular fragments of greenish gray (5G6/1) soft chalk.

Greenish gray firm brittle indurated ooze.

Gray (N5-N7) chert fragments.

Angular dark gray (N4) chert fragments.

Light gray (N6) chert bed showing bedding planes and contacts with limestone.

Light gray (N5) chert bed showing contact with limestone.

Cores:

- Drill cuttings
- Angular fragments of chalk and hard limestone
- Soft white nanoplankton oozes
- Greenish gray (5G6/1) soft chalk
- Nanoplankton oozes, soft to firm plastic
- Gray (N5-N7) chert fragments
- Angular dark gray (N4) chert fragments
- Light gray (N6) chert bed showing bedding planes and contacts with limestone
- Light gray (N5) chert bed showing contact with limestone

Diagnostic Fossils:

- Ostracodes: Cytherelloidea sp., Polynoe sp., Nemocytherura 7 sp.
- Ostracodes: Aarooythere 7 sp.
- Calcareous nanoplankton: Dolomitiaus, N. kamptneri, Lithraphidites carniolensis, Parhabdolithus emborgi, Emborgiaceae quaternaria
- Ostracodes: Nemocytherura 7 sp., Pythocythere 7 sp, A & B
- Calcareous nanoplankton: Caelostoma stellemanni, A. globulus, Neomunroia sp. aff. C. simplex, Neomunroia alpina, Behanzogouella striata, Neomunroia alpina
- Gephyrellidaceae: Nemocytherura 7 sp. aff. A. globulus
- Calcareous nanoplankton: Caelostoma stellemanni, A. globulus, Neomunroia sp. aff. C. simplex, Neomunroia alpina, Behanzogouella striata, Neomunroia alpina
- Ostracodes: Nemocytherura 7 sp.

Cores:

- Oxychilinae sp., Oxychilinae sp. aff. T. ceratophora
- Calcareous nanoplankton: Stomatopoda species, Stomatopoda sp., Rhabdolithidae emborgii, Namurian Nanoplanktonic fossils, Neomunroia alpina, Behanzogouella striata, Neomunroia alpina

Natural Gamma Penetrator

- Counts/cm
- Weight%
- Volume%
- Wet Bulk Density
- Sonic Velocity
### Hole 100, Core 2 (237m to 246m)

**Lithology:** Limestone; slightly clayey and siltty, with chert beds and cherty zones; various shades of reddish brown (5YR3/3, 4/4, 6/4, 10YR 4/4) and grayish green (5G7/1, 5G1/2, 10G5/2, 10G5/6).

**Diagnosis Foils:**
- Fine laminations with common burrowing and rare pine white clasts; several zones of flow structures and penecontemporaneous deformations with abundant clasts (lithified mud pebbles) and minor recrystallized and cross-bedded thin chert beds.
- Cherty limestone; banded with light brown (5YR3/3) and grayish green (5G1/2) finely laminated with burrowing and flow structures.
- Cherty limestone; banded with light brown (5YR3/3) and grayish green (5G1/2) finely laminated with burrowing and flow structures.

**Calcareous Nanoplankton:**
- Watznauevi
- Zygodisauus
- Parhabdolithus
- Hexapodorhabdus
- Stephanoematolithus
- Stephanolithion

### Hole 100, Core 3 (246m to 259m)

**Lithology:** Limestone; slightly clayey, pale brown (5YR5/2), finely laminated with common burrowing, bands of light greenish gray (5G7/1) with flow structures. Brown chert (2.5YR2/4 to 5YR5/2) at the top; pale olive (10Y6/2) and yellowish gray (5Y7) larger chert fragment at bottom.

**Diagnosis Foils:**
- Fine laminations with common burrowing and rare pine white clasts; several zones of flow structures and penecontemporaneous deformations with abundant clasts (lithified mud pebbles) and minor recrystallized and cross-bedded thin chert beds.
- Cherty limestone; banded with light brown (5YR6/4) and grayish green (10GY5/2) finely laminated with burrowing and flow structures.

**Calcareous Nanoplankton:**
- Watznauevi
- Zygodisauus
- Parhabdolithus
- Hexapodorhabdus
- Stephanoematolithus
- Stephanolithion

### Hole 100, Core 4 (259m to 266m)

**Lithology:** Limestone; clayey, soft, grayish yellow green (5G7/2); distorted laminations and faulting, coccoliths and clay minerals abundant, recrystallized calcite rare.

**Diagnosis Foils:**
- Fine laminations with common burrowing and rare pine white clasts; several zones of flow structures and penecontemporaneous deformations with abundant clasts (lithified mud pebbles) and minor recrystallized and cross-bedded thin chert beds.
- Cherty limestone; banded with light brown (5YR6/4) and grayish green (10GY5/2) finely laminated with burrowing and flow structures.

**Calcareous Nanoplankton:**
- Watznauevi
- Zygodisauus
- Parhabdolithus
- Hexapodorhabdus
- Stephanoematolithus
- Stephanolithion

### Core Catcher

**Calcareous Nanoplankton:**
- Watznauevi
- Zygodisauus
- Parhabdolithus
- Hexapodorhabdus
- Stephanoematolithus
- Stephanolithion
Hole 100, Core 4 (259m to 261m)

**LITHOLOGY**

Limestone, slightly clayey, with occasional thin silty zones; dominantly reddish brown (5YR3/2, 6/2) with interbedded grayish gray (5G6/2, 6/2) zones.

**DIAGNOSTIC FOSSILS**

Calcareaous Nanoplankton:
- *Zygodiscus salillum*, *Z. erectus*, *Diazomatolithus lehmani*, *Watznaueria britannica*, *W. barnesae*, *Palaeopontosphaera dubia*

Pelagic Crinoid:
- *Saccocoma sp. cf. S. quenstedti*, *S. sp. cf. S. schuttleri*

Core catcher

Planktonic Foraminifera:
- *Gephyrocapsa sp.*

Coral:
- *Saccocoma sp.*

Limestones, slightly clayey, with occasional thin silty zones; dominantly reddish brown (5YR3/2, 6/2) with interbedded grayish gray (5G6/2, 6/2) zones. This lithology is typical of the section, with pelagic foraminifera, occasional thin silty zones, and penecontemporaneous deformations. In the darker zones, with pelagic foraminifera, occasional thin silty zones, and penecontemporaneous deformations, rare clasts (lithified small pebbles) are common throughout the section. In the lighter zones, with pelagic foraminifera, occasional thin silty zones, and penecontemporaneous deformations, rare clasts (lithified small pebbles) are common throughout the section.

Hole 100, Core 5 (261m to 267m)

**LITHOLOGY**

Limestone, slightly clayey, with some silty layers, various shades of greenish gray (5G6/1, 7/1, 8/1), and pale red (5YR3/2, 6/2) in the lower portion.

**DIAGNOSTIC FOSSILS**

Calcareaous Nanoplankton:
- *Uvigerina polita*, *U. pseudorugosa*, *Quinqueloculina bilobata*, *Quasitextularia notabilis*, *Diasmoceratites labini*, *Nanammina britannica*, *W. barnesae*, *Diasmoceratites labini*

Pelagic Crinoid:
- *Saccocoma sp. cf. S. quenstedti*, *S. sp. cf. S. schuttleri*

Core catcher

Planktonic Foraminifera:
- *Gephyrocapsa sp.*

Coral:
- *Saccocoma sp.*

Limestones, slightly clayey, with some silty layers, various shades of greenish gray (5G6/1, 7/1, 8/1), and pale red (5YR3/2, 6/2) in the lower portion. Even laminations and faint layering due to coring operations. Most of the core shows artificial layering due to coring operations. Recrystallized calcite (spindle-shaped grains) dominant, cocoliths rare, clay minerals abundant in darker zones.

Hole 100, Core 6 (267m to 267m)

**LITHOLOGY**

Limestone, slightly clayey, with some silty layers, various shades of greenish gray (5G6/2, 2/1, 7/1, 6/2), and pale red (5YR3/2, 6/2) in the lower portion.

**DIAGNOSTIC FOSSILS**

Calcareaous Nanoplankton:
- *Uvigerina polita*, *U. pseudorugosa*, *Quinqueloculina bilobata*, *Quasitextularia notabilis*, *Diasmoceratites labini*, *Nanammina britannica*, *W. barnesae*, *Diasmoceratites labini*

Pelagic Crinoid:
- *Saccocoma sp. cf. S. quenstedti*, *S. sp. cf. S. schuttleri*

Core catcher

Planktonic Foraminifera:
- *Gephyrocapsa sp.*

Coral:
- *Saccocoma sp.*

Limestones, slightly clayey, with some silty layers, various shades of greenish gray (5G6/2, 2/1, 7/1, 6/2), and pale red (5YR3/2, 6/2) in the lower portion. Even laminations and faint layering due to coring operations. Most of the core shows artificial layering due to coring operations. Recrystallized calcite (spindle-shaped grains) dominant, cocoliths rare, clay minerals abundant in darker zones.
Limestone, slightly clayey, with some silty layers; interbedded layers of grayish red (10R4/2), pale reddish brown (10R5/4), grayish green (10G4/2, 10G5/6, 5G8/1) and pale to dark brown (5YR3/2, 5YR6/2).

Fine and even laminations; artificial bedding due to coring operations.

Recrystallized calcite (spindle-shaped grains) and coccoliths common to abundant, clay minerals and hematite staining abundant in red zones.

Sand size chert fragments in core catcher sample.

**DIAGNOSTIC FOSSILS**

**CALCAREOUS NANNOPLANKTON:**
- *Eexapodorhabdus auvillier*
- *Zygodisaus balillum*

**FORAMINIFERS:**
- *Turrispirillina amoena*
- *Lentiaulina quenstedti*
- *Frondiaularia lingulaefornis*
- *Lingulina umbra*

**PLANKTONIC CRINOIDS:**
- *Saoaoa sp. cf. S. subo;

**Hole 100, Core 7 (276m to 286m)**

Limestone, very slightly clayey, various shades of greenish gray (5GY6/1, 5G7/1, 5G7/2). Fine laminations and flow structures with minor slumps, abundant burrows, carbonaceous specks and streaks abundant in Section 2. Some burrows filled with pyrite and lined with films of carbonaceous matter.

Recrystallized calcite (essentially spindle-shaped grains) largely dominant, coccoliths rare.

See section summary for Section 1.

**DIAGNOSTIC FOSSILS**

**DINOFLAGELLATES:**
- *Meiourogonyaulax vaZensi*

**FORAMINIFERS:**
- *Frondiaularia lingulaefornis*
- *Lingulina umbra*

**CALCAREOUS NANNOPLANKTON:**
- *Zygodisaus salillum, Watznaueria britannia, W. barnesae, Diazomatolithus lehmani, Palaeopontosphaera dubia*

**FORAMINIFERS:**
- *Dentalina jurassica*
- *Frondiaularia lingulaefornis, Lingulina umbra*

**OSTRACODES:**
- *Orthonotaaythere ? sp.*

**Hole 100, Core 7 (276m to 286m)**

**LATE JURASSIC (SHARKWATER)**

**DIAGNOSTIC FOSSILS**

**DINOFLAGELLATES:**
- *Pareodinia aeratophora, Gonyaulax stromatophora, Chytrone phyraea*

**FORAMINIFERS:**
- *Palaeopontosphaera dubia*

**CALCAREOUS NANNOPLANKTON:**
- *Zygodisaus salillum, Staurolithites bouchianae, Palaeopontosphaera dubia*

**FORAMINIFERS:**
- *Dentalina jurassica, D. communis, Pseudonodosaria andela, Pontoayiprella sp.*

**SEAFLOOR FLUIDS:**
- *Chromatopyrae sp., Acreospyra sp.*
Hole 100, Core 8 (286m to 297m)

LITHOLOGY DIAGNOSTIC FOSSILS

DINOFLAGELLATES:
- Meinogonyaulax valensii
- Chytroeisphaeridia poaoki
- Chytroeisphaeridia zidbyti
- Tenua verruosa
- Endosarinium galeritum

CALCAREOUS NANNOPLANKTON:
- Stomacholithus biporus
- Stomacholithus polissensis
- Stomacholithus quadrangularis
- Dentalina jurensis
- Dentalina laevigata

FORAMINIFERS:
- P. amoena
- Holothurigloea jurensis
- S. jurensis
- S. laevigata

OSTRACODES:
- Belinda (Belinda) farinacea
- Aerothoe sp., Polyopyle sp., Acanthopalaella sp.

CALCAREOUS NANNOPLANKTON:
- Dentalina jurensis
- Dentalina laevigata
- Stomacholithus quadrangularis
- Stomacholithus polissensis
- Holothurigloea jurensis

FORAMINIFERS:
- S. jurensis
- S. laevigata
- Dentalina jurensis

OSTRACODES:
- Belinda (Belinda) farinacea
- Polyopyle sp., Polyopyle sp., Polyopyle sp., Polyopyle sp.

DINOFLAGELLATES:
- Meinogonyaulax valensii
- Stomacholithus biporus
- Stomacholithus polissensis
- Dentalina jurensis
- Dentalina laevigata

OSTRACODES:
- Belinda (Belinda) farinacea

See section summary for Section 3.
Hole 100, Core 9 (100m to 311m)

Limestone, very slightly clayey, with occasional silty zones, hard, greenish gray (5G7/1) with some pale red (5R8/2) layers. Faint and rare laminations and minor current action evidences, common burrowing. Abundant plant debris and occasional pelecypod shell fragments. Recrystallized calcite (spindle-shaped grains) abundant, coccoliths rare.

Diagnostic Fossils

DINOFLAGELLATES:
- Gonyaulax sp.
- Chrysochromulina pococki, Ch. chytroeides, Endoscevatophora

FORAMINIFERS:
- Dentalina jiaensis
- Lentiaulina

CALCAREOUS NANNOPLANKTON:
- Loxolithus armilla, Phaerobabdolithus ziczac
- P. pontosphera

CORE CATCHER

DINOFLAGELLATES:
- Gonyaulax sp., Chrysochromulina pococki, Ch. chytroeides

FORAMINIFERS:
- Bolivina rugosa, Bolivina jauracae, Bolivina antennula

CALCAREOUS NANNOPLANKTON:
- Ethmorhabdus gallicus, Zygodiscus lusoni, Variababdolithus liassicus

FORAMINIFERS:
- (X. ourensiss, D. laevigata, V. oppeli, Lingulina)

OSTRACODES:
- Pontocypris sp., Cytherea sp.

NATURAL GAMMA PENETROMETER

WATER CONTENT-POROSITY

WET-BULK DENSITY

SONIC VELOCITY
Hole 100, Core 10 (311m to 317m)

**LITHOLOGY**

1. Limestone, slightly clayey, with occasional silty zones, hard with softer disturbed zones, greenish Dictyopyxie reticulata & grey (5Y4/1) interbedded with light gray (5Y6/1) and olive gray (5Y6/1).

- Rare laminations, common burrowing, abundant plant debris.

- Artificial bedding, due to coring operations, in darker zones.

2. Gray (6Y6/2) massive, black (NI) with abundant fine calcite filled cracks; Top 1.5 cm appear more glassy.

- Thin sections show a hyalophitic structure with abundant glass, abundant labradorite needles, some olivine.

- See section summary for Section 2.

**DIAGNOSTIC FOSSILS**

- Gonyaulacysta ambigua, G. nucifera, Chryseisphaerella procula, Ch. aysenensis, Turritella terebriformis, Eucyrtodiscus quinquecostatus

**FORAMINIFERS**

- Acrocodium sp., Globigerinoides rubescens, Globigerina bulloides, Globigerinoides inflatus, Globorotalia truncatulinoides, R. marquesiana

- See section summary for Section 2.

**RARE CALCAREOUS MATERIAL IN CORE-CATCHER (DEBRIS OF LIMESTONE INCLUSION OR CONTAMINATION FROM UP-HOLE)**
### Hole 100, Core 11 (317m to 321m)

<table>
<thead>
<tr>
<th>AGE</th>
<th>JEAR</th>
<th>SECTION NO.</th>
<th>SAMPLE NO.</th>
<th>LITHOLOGY</th>
<th>DIAGNOSTIC FOSSILS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LATE IN MIDDLE EMISSARIAN</td>
<td>T5</td>
<td>T5</td>
<td>Basalt, massive, black (NI) with abundant thin calcite-filled cracks. Inclusions of hard micritic limestone.</td>
<td>CALCAREOUS NANNOPLANKTON: <em>Ammonia beccarii</em>, <em>Cypholina asarillum</em>, <em>Dickinsoniella lemani</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lenticular basaltic fragments in limestone matrix.</td>
<td>CODE OXYGEN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Thin sections of basalt show a hyalophitic structure with abundant glass, abundant labradorite needles, and some olivine.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>See section summary, for Section 1. Some limestone chips and basalt in core-catcher.</td>
<td></td>
</tr>
</tbody>
</table>

### Hole 100, Core 12 (321m to 324m)

<table>
<thead>
<tr>
<th>AGE</th>
<th>ZONE</th>
<th>SECTION NO.</th>
<th>SAMPLE NO.</th>
<th>LITHOLOGY</th>
<th>DIAGNOSTIC FOSSILS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LATE IN MIDDLE EMISSARIAN</td>
<td>T5</td>
<td>T5</td>
<td>Basalt, massive, black (NI) with greenish black cast on some surfaces, abundant thin calcite-filled cracks. Hyalophitic structure with abundant glass, abundant labradorite needles and some olivine.</td>
<td>CALCAREOUS NANNOPLANKTON: <em>Ammonia beccarii</em>, <em>Cypholina asarillum</em>, <em>Dickinsoniella lemani</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Inclusion of limestone, light greenish gray with faint pink tint in places (completely recrystallized micritic limestone).</td>
<td>CODE OXYGEN</td>
</tr>
</tbody>
</table>

### Hole 100, Core 13 (324m to 331m)

<table>
<thead>
<tr>
<th>AGE</th>
<th>ZONE</th>
<th>SECTION NO.</th>
<th>SAMPLE NO.</th>
<th>LITHOLOGY</th>
<th>DIAGNOSTIC FOSSILS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LATE IN MIDDLE EMISSARIAN</td>
<td>T5</td>
<td>T5</td>
<td>Basalt, massive, black (NI), with abundant calcite-filled cracks.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Bottom 2 cm: Very abundant subhorizontal calcite-filled fractures.</td>
<td></td>
</tr>
</tbody>
</table>
### Smear Slide:
Nannoplankton dominant, recrystallized calcite common.

**LITHOLOGY**
- **Smear Slide:** Nannoplankton dominant, (common nannoconids), recrystallized calcite abundant.
- **Chert (broken fragments):** dark gray (N4), at top of a greenish gray band.
- **Smear Slide:** Nannoplankton dominant, (common nannoconids), recrystallized calcite abundant.
- **Chert fragment:** light gray (N6) showing bedding planes and sharp contact with hard white chalk at top and bottom—this fragment is at top of a light gray (N7) band in which some organic debris are present.
- **Light gray (N8 and N7) diffuse banding from 115 to 150 cm.**

### DIAGNOSTIC FOSSILS
- **CALCAREOUS NANNOPLANKTON:**
  - Nannoconus steinmanni,
  - N. globulus,
  - Apertapetra vonosa
  - Braarudosphera discula,
  - Arkhangelskiella striata,
  - Watznaueria striata
**Hole 100, Core 2, Section 2**

<table>
<thead>
<tr>
<th>AGE</th>
<th>ZONE</th>
<th>LITHOLOGY</th>
<th>DIAGNOSTIC FOSSILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LATE JURASSIC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 0 cm | Smear slide in white layer: Recrystallized calcite dominant (spindles), nannoplankton rare. |
| 25 cm | Smear slide in red layer: Clay minerals and nannoplankton abundant, recrystallized calcite common, hematite rare (+ staining). |
| 50 cm | Clayey limestone, slightly silty, with occasional chert; reddish brown (10R 4/6) and grayish green (5G-7/1) with some pink white clasts and rare Aptychi. |
| 75 cm | -0 to 103 cm = abund. flow structures, penecontemporaneous disturbances, minor slumping, numerous clasts (pink white small lithified mud pebbles). Some finely laminated zones. |
| 100 cm | -103 to 145 cm = rare flow structures, common burrowing and abundant laminations, rare small white clasts. |
| 125 cm | Smear slide: Clay mins. and nannoplankton abundant, recrystallized calcite common. |
| | Chert, dark reddish brown (2.5YR 2/4). |

**CALCAREOUS NANNOPLANKTON:**
- Watznaueria britannica
- Hexapodohabdus ouwillieri
- Zygodiscus salillum
**HOLE 100, CORE 7, SECTION 1**

<table>
<thead>
<tr>
<th>AGE</th>
<th>ZONE</th>
<th>LITHOLOGY</th>
<th>LITHOLOGY</th>
<th>DIAGNOSTIC FOSSILS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>0 cm</strong></td>
<td><strong>Limestone, grayish green (5G 7/1) with occasional flow structures clasts and laminations; abundant burrowing.</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Smear slides:</strong></td>
<td><strong>Smear slides:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nannoplankton abundant, recrystallized calcite (rare spindles) common.</td>
<td>Nannoplankton abundant, recrystallized calcite (rare spindles) common.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Flow structures and clasts</strong></td>
<td><strong>Flow structures and clasts</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Smear slide:</strong></td>
<td><strong>Smear slide:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sand size chert grains and recrystallized nanno-calcite common, nannoplankton rare</td>
<td>Sand size chert grains and recrystallized nanno-calcite common, nannoplankton rare</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Large lens, burrow?</strong></td>
<td><strong>Large lens, burrow?</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Flow structures</strong></td>
<td><strong>Flow structures</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Smear slides:</strong></td>
<td><strong>Smear slides:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nannoplankton abundant, recrystallized calcite (no spindles) common.</td>
<td>Nannoplankton abundant, recrystallized calcite (no spindles) common.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>(in a black speck)</strong></td>
<td><strong>(in a black speck)</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spindle-shaped recryst. calcite abundant, organic matter common, nannoplankton rare</td>
<td>Spindle-shaped recryst. calcite abundant, organic matter common, nannoplankton rare</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Numerous burrows with carbonaceous matter fillings from 105 to 150 cm.</strong></td>
<td><strong>Numerous burrows with carbonaceous matter fillings from 105 to 150 cm.</strong></td>
<td></td>
</tr>
</tbody>
</table>

**DINOFLAGELLATES:**
Meiourogonyaulax valensii

**FORAMINIFERS:**
Frondicularia lingulae-formis, Lingulina umbra
### Lithology

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Lithology</th>
<th>Diagnostic Fossils</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-25</td>
<td>Smear slides: Recrystallized calcite (spindles) dominant; clay min., hematite, nannoplankton and organic matter rare.</td>
<td><strong>Calcereous Nannoplankton:</strong> Parhabdolithus liasicae, Zygodiscus salillum, Staurolithites quadriarculatus, Ethmorhabdus gallicus, Watsnaueria britannica. <strong>Foraminifers:</strong> Dentalina jurensis, D. laevigata, Trocholina transversarii. <strong>Ostracodes:</strong> Bairdia (Akidobairdia) farinacae, Pontocepyrella sp., Polycopes sp.</td>
</tr>
<tr>
<td>25-50</td>
<td>Limestone, very slightly clayey, hard; greenish gray (5G 7/1). Rare faint laminations with minor deformation. Common burrowing.</td>
<td></td>
</tr>
</tbody>
</table>
### Diagnostic Fossils

**Dinoflagellates:**
- Gonyaulacysta nuciformis
- G. ambigua
- Chrythrooeisphaeridia poocki
- Ch. chrythrooeisphaeridee
- Tenua verrucosa

**Calcereous Nannoplankton:**
- Zygodiscus salillum
- Ethmorhabdus gallicus
- Parhabdolithus liasicus
- Diasomato-lithus lehmani
- Watanaueria britannica

**Foraminifers:**
- Reophax helveticus
- R. multilocularia
- Bolivinopsis jurassica
- Bigenerina arquata
- B. jurassica
- Dentalina jurensis
- Trocholina transversarii

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### Lithology

<table>
<thead>
<tr>
<th>Age Zone</th>
<th>Lithology</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late to Middle (?), Jurassic (Oxfordian to Callovian?)</td>
<td>Limestone, slightly clayey, greenish gray (5G 7/1). Massive, no laminations, rare burrowing.</td>
<td>SS</td>
</tr>
<tr>
<td></td>
<td>Recrystallized calcite (spindles) dominant, nannoplankton and organic matter rare.</td>
<td>WR</td>
</tr>
<tr>
<td></td>
<td>Soft clayey limestone, olive gray (5Y 4/1), with artificial bedding due to coring operations.</td>
<td>CN</td>
</tr>
<tr>
<td></td>
<td>Clay mins. and recrystallized calcite (spindles) abundant; hematite, nannoplankton and organic matter rare.</td>
<td>WR</td>
</tr>
<tr>
<td></td>
<td>Limestone as in upper part of the section. Recrystallized calcite (spindles) dominant; clay mins., nannoplankton and organic matter rare.</td>
<td>SS</td>
</tr>
<tr>
<td></td>
<td>No contact metamorphism Basalt, massive, black (NI), with abundant thin calcite-filled cracks. Top 1.5 cm appear more glassy.</td>
<td>CN</td>
</tr>
</tbody>
</table>

---

**Contact Metamorphism:**

- Alt. massive, black (NI), with abundant thin calcite-filled cracks. Top 1.5 cm appear more glassy.
<table>
<thead>
<tr>
<th>AGE</th>
<th>ZONE</th>
<th>LITHOLOGY</th>
<th>DIAGNOSTIC FOSSILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LATE to MIDDLE (?) JURASSIC (OXFORDIAN to CALLOVIAN?)</td>
<td>Limestone (micritic) Inclusion</td>
<td>Massive basalt w. thin calcite-filled cracks. Glassy veinlets and vesicular texture.</td>
<td>CALCAREOUS NANNOPLANKTON: Watanaueria bamesae, Zygodiscus salillum, Diazomatolithus lehmani.</td>
</tr>
<tr>
<td>0 cm</td>
<td>Calcite inclusions (thick veinlets)</td>
<td>Basalt (black = N1), massive with thin calcite-filled cracks; thin sections show a hyalophitic structure.</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Glassy veinlets (very thin) and more or less vesicular texture.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Glassy thin veinlets and vesicular texture Curved lamellar and glassy surface.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>Massive, with thin calcite filled cracks.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>Lamellar texture with calcite veinlets surrounding a limestone inclusion with small glassy particles of basalt at lower part.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>125</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>