

28. JURASSIC AMMONOIDEA FROM THE MAZAGAN SLOPE, MOROCCAN CONTINENTAL MARGIN, DEEP SEA DRILLING PROJECT LEG 79¹

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INTRODUCTION

The objective of Leg 79 was to improve our understanding of the paleotectonic and sedimentary evolution of the continental margin off Morocco during rifting and separation of the African and American Plates. Samples containing Ammonoidea were obtained from Site 545, located at the foot of the 3000 m high Mazagan Escarpment as well as from Holes 544A and 547B, both situated west of the Escarpment on the Mazagan Slope. A belt of diapiric salt structures lies seaward, separating the margin from flat-lying sediments and oceanic crust to the west.

In contrast to most oceanic deposits in which ammonite shells are usually compressed and septa generally dissolved, the ammonite shells found along the Mazagan margin were not flattened by overburden. The ammonites are preserved as internal molds, and the sutures are well preserved.

Site 545

Site 545 (latitude 33°39.86'N, longitude 09°21.88'W) is situated in 3150 m water depth near the foot of the steep Mazagan Escarpment (sub-bottom depth, 701 m). Jurassic sediments were first encountered between Core 545-56 and 545-57 at 530 m sub-bottom. The Jurassic sediments are unconformably overlain by Aptian nanofossil chalks. The deepest sediment drilled is limestone, Oxfordian in age; the age is suggested by the presence of *Sowerbyceras* obtained from Core 545-68.

Sample 545-68-3, 14–16 cm is a pale yellow-brown limestone. Abundant dolomite rhombs occur in a pelmicritic matrix (Pl. 1, Fig. 10). Foraminifers are rare and skeletal components mostly consist of echinoderm and mollusk fragments. Some intraclasts are enveloped by micrite, possibly of algal origin; however, internal structures are not visible. Terrigenous material is reduced to very small quartz grains and occasional mica flakes.

Family **PHYLLOCERATIDAE** Zittel, 1884
Genus **SOWERBYCERAS** Parona and Bonarelli, 1897
Subgenus **SOWERBYCERAS** Wiedmann, 1963

Sowerbyceras (*Sowerbyceras*) sp.
(Pl. 1, Fig. 2a, b)

The fragment represents the end of the phragmocone. One of the characteristic biconcave periodic constrictions is exposed. The tongue-

like, very pronounced inflection on the ventrolateral shoulder is clearly recognizable. Adapically, the dorsal part of the previous constriction is preserved, indicating the distance between constrictions. The external suture line, as far as preserved, compares satisfactorily with that of *Sowerbyceras* (*Sowerbyceras*) *protortisulcatum* (Pompeckj) dredged by *Vema* from the Mazagan Escarpment (Renz et al., 1975, pl. 1, fig. 1d). The external lobe, which should be equally long as the lateral lobe, is unfortunately not exposed (Pl. 1., Fig. 2b).

Hole 547B

Hole 547B (33°46.84'N, 09°20.98'W) is located on the southeastern down-faulted margin of a basement high west of the Mazagan Escarpment. The sub-bottom depth is 1030 m; however, basement was not reached. Jurassic to Lower Cretaceous limestone is unconformably overlain by Albian nanofossil claystones.

Punctaptychus punctatus (VOLTZ)
(Pl. 1, Fig. 1)

Sample 547B-6-3, 142–143 cm. A fragmental specimen of a right valve with its ventral end and lateral facet missing has been recovered from a dark brick-red, soft argillaceous limestone rich in *Saccocoma* and echinoderm debris. The fragment distinctly exposes specific features of *Punctaptychus punctatus*, a form known from the Upper Jurassic (Tithonian) sections of the Tethysian realm in Europe, where it is widely distributed. An excellently preserved specimen of *P. punctatus* has been recovered from the base of the continental rise in the western North Atlantic basin (Leg 11, 105-33-2, 89–91 cm; Renz, 1972, pl. 1, figs. 5a–c). Another fragmental specimen comes from the Cape Verde Basin (Leg 41, 367-34-4, 64–65 cm; Renz, 1977, pl. 1, fig. 16). Both specimens come from red marly limestones and can be correlated with the Rosso ad Aptici Formation in Italy. For Sample 547B-6-3, 142–143 cm, the occurrence of calpionellids in Core 6, Section 4, suggests a late Tithonian age (site report, this volume).

Lamellaptychus sparcilamellosus (Gümbel)
(Pl. 1, Fig. 4)

Sample 547B-7-3, 69–71 cm. A left valve is present with missing dorsal and ventral parts. Thus, only a short interval shows the characteristic, well-developed, adsymphyseal ridge against which the lamellae bend and lean towards the ventral termination of the valve. *L. sparcilamellosus* is widely mentioned as appearing in the Alpine-Mediterranean facies province. It also exists in the Kimmeridgian in Switzerland and southern Germany (Trauth, 1938, p. 165, pl. 11, figs. 23–27), as well as in the Carpathian (Gasiorowsky, 1962, horizon IV, table 1, p. 22). Juvenile specimens of *L. sparcilamellosus* were recovered from the Atlantic Cap Verde basin, during Leg 41 at Site 367. This form is present in Core 367-35 (367-35-5, 38–39 cm; 367-35,CC) which also contains other *Lamellaptychi* indicating a late Oxfordian to Kimmeridgian age (Renz, 1977, p. 502, pl. 1, figs. 8, 9). The occurrence of *Saccocoma*, *Protoglobigerina*, and *Stomiosphaera* and the absence of calpionellids in Core 547B-2 suggest a late Oxfordian to early Tithonian age, (site report, this volume).

Lytoceras sp.

Sample 547B-10-2, 96–98 cm is a light gray limestone that occurs as a clast in a debris flow deposit (Unit VIB, site report, this volume). This shallow water limestone clast consists of loosely packed cry-

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ptalgal oncoids set in a micritic to fine grained pelletal matrix (Pl. 1, Figs. 7, 9). Foraminifers, skeletal fragments of mollusks, and semi-rounded intraclasts are apparently coated by algae (Pl. 1, Figs. 7, 9). The obviously redeposited lithology closely resembles that of the oncoidal limestone with *Holcophylloceras* from Hole 544A. The pellets, however, are smaller (compare thin sections on Pl. 1, Fig. 5 with Figs. 7, 9). The sample encloses a small fragment of a *Lytoceras* test, similar to the one from the Blake-Bahama Basin (Site 391, Renz, 1978, pl. 1, fig. 21) associated with *Lamellaptychus angulocostatus* (Peters), suggesting a Barremian age at that location. A reliable age assignment for this fragment of the *Lytoceras* test is not possible, as *Lytoceras* with such fine riblets range from Liassic to Late Cretaceous.

Hole 544A

Hole 544A (33°46.00' N, 09°24.26' W) was drilled on the basement high situated on the northwestern margin of the Mazagan Slope, near Hole 547B. It penetrated 184 m of sediment overlying gneissic basement (184–235 m sub-bottom). Sample 544A-13-1, 115–117 cm, yielded a fragment of an ammonite, which most resembles *Sowerbyceras* (*Holcophylloceras*), suggesting a Jurassic, probably Oxfordian, age. It was recovered from a limestone sequence that is followed unconformably by lower Miocene sediments. Below the Jurassic limestone, mudstones and muddy sandstones of unknown age were crossed which, in turn, cover metamorphic basement (gneiss). The sample available is a pale yellow-brown, partly light brick-red, peloidal-oncoidal limestone. Color lines are sharp. It consists of loosely packed, complexly coated grains of various shapes. Some are elongated ellipsoidal to spheroidal with concentrically laminated, probably cryptalgal, cyanobacterial coatings. These coatings also contain sessile foraminifera (*Nubecularia*). Some of the algal-foraminiferal coatings surround formerly aragonitic mollusk shells that were replaced by solution-cavity fill (Pl. 1, Fig. 8, lower left corner). The centers of the coated grains may also consist of foraminifers, ostracodes, and subrounded small micritic intraclasts (Pl. 1, Figs. 5, 6). The peloids are embedded in a lime mud matrix with small skeletal debris. Echinoderm fragments are surrounded by an euhedral syntaxial calcite replacement rim. Terrigenous components are fine-grained quartz and a few mica flakes.

L. Hottinger (Geological Institute, Basel) recognized the following foraminifer genera: *Spirillina*, *Frondicularia*, *Lenticulina*, *Ammobaculites* cf. *coprolithiformis* sequana Mohler, *Robulus*, and *Dentalina*. A lithologically comparable algal limestone, with ammonites of Oxfordian age, including *Holcophylloceras*, was dredged by *Vema* on the lower part of the Mazagan Escarpment (Renz et al., 1975, p. 437, fig. 4; p. 444, fig. 5).

Family PHYLLOCERATIDAE Zittel, 1884
Genus *SOWERBYCERAS* Parona and Bonarelli, 1897
Subgenus *HOLCOPHYLLOCERAS* Spath, 1927

Sowerbyceras (*Holcophylloceras*) sp.
(Pl. 1, Fig. 3a, b)

Sample 544A-13-1, 115–117 cm. Specimen diagonally split into two halves of which the left half is available. The shell is dissolved and

filled by coarse sparry calcite cement and voids between septa are coated with calcite rhombohedra. The cross-section of the ammonite (Pl. 1, Fig. 3a) shows an oval whorl section and a narrow umbilicus. The external suture line (Pl. 1, Fig. 3b), relatively well-preserved, can satisfactorily be compared with the suture of a *Sowerbyceras* (*Holcophylloceras*) dredged on the steep slope of the Mazagan Escarpment (Renz et al., 1975, pl. 1, fig. 4d). It clearly exhibits the external lobe which is characteristically short compared with the longer lateral lobe. Based on the suture line of the ammonite and the microfossils present in the formation (site report, this volume), the interval is most likely of Oxfordian age.

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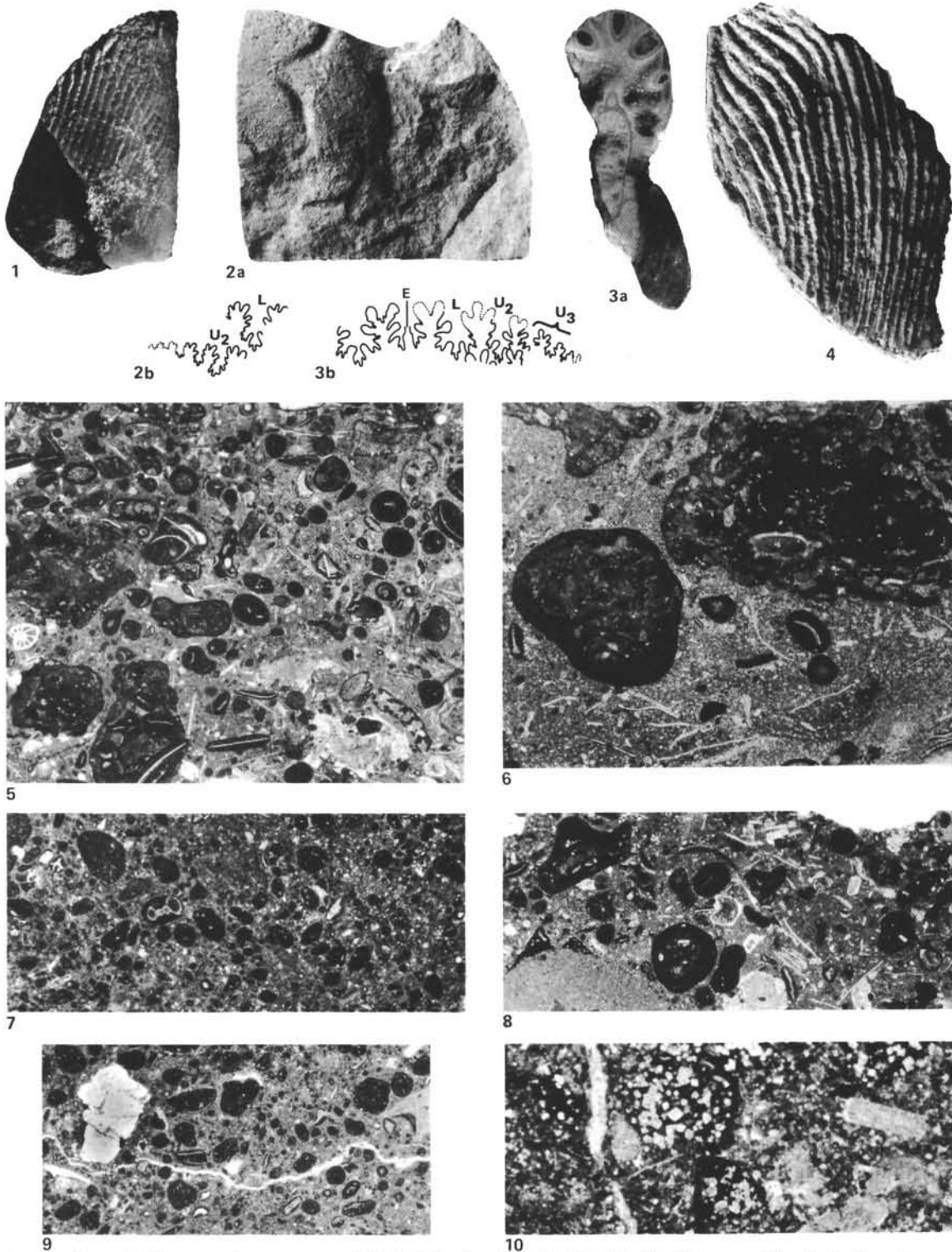


Plate 1. Ammonoidea. 1. *Punctaptychus punctatus* (VOLTZ), Tithonian, Sample 547B-6-3, 142-143 cm, $\times 1.7$. 2a-b. *Sowerbyceras* (*Sowerbyceras*) sp., Oxfordian, Sample 545-68-3, 14-16 cm, (2a) Phragmocone with constrictions, $\times 1.7$, (2b) External suture line, $\times 3.4$. 3a-b. *Sowerbyceras* (*Holcophylloceras*) sp., Oxfordian, Sample 544A-13-1, 115-117 cm, (3a) Cross-section with fragment of body chamber, $\times 1.7$, (3b) External suture line, $\times 3.4$. 4. *Lamellaptychus sparcilamellosus* (GÜMBEL), late Oxfordian to early Tithonian, Sample 547B-7-3, 69-71 cm, $\times 1.7$. 5. Oncoidal limestone with *Lenticulina* (left edge) and lituolid foraminifers (lower right), Sample 544A-13-1, 115-117 cm, thin section, $\times 8.6$. 6. Large oncoids consisting of intraclasts, encrusted by laminated algal material, Sample 544A-13-1, 115-117 cm, thin section, $\times 17.2$. 7. White oncoidal limestone with remains of a mollusk and brittle star vertebrae (left side), coated by cryptoalgal material, Sample 547B-10-2, 96-98 cm, thin section, $\times 8.6$. 8. Oncoidal limestone with sessile foraminifers on left side (*Nubecularia*), Sample 544A-13-1, 115-117 cm, thin section, $\times 8.6$. 9. Oncoidal limestone with a lithoclast derived from the basement, Sample 547B-10-2, 96-98 cm, thin section, $\times 8.6$. 10. Dolomitic limestone with echinoderm fragments, dark micritic margins might indicate algal oncoids, Sample 545-68-3, 14-16 cm, thin section, $\times 8.6$.