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Brachiopods from Late Jurassic—Early Cretaceous hydrocarbon seep deposits, central Spitsbergen, Svalbard

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Abstract

Late Jurassic–Early Cretaceous (Late Volgian–latest Ryazanian) rhynchonellate brachiopods are described from eight out of 15 hydrocarbon seep deposits in the Slottsmøya Member of the Agardhfjellet Formation in the Janusfjellet to Knorringsfjellet area, central Spitsbergen, Svalbard. The fauna comprises rhynchonellides, terebratulides (terebratuloids and loboidothyridoids) and a terebratellidine. The rhynchonellides include: *Pseudomonticlarella varia* Smirnova; *Ptilorhynchia mclachlani* **sp. nov.**; and *Ptilorhynchia obscuricostata* Dagys. The terebratulides belong to the terebratuloids: *Cyrtothyris?* sp.; *Cyrtothyris* aff. *cyrta* (Walker); *Praelongithyris?* aff. *borealis* Owen; and the loboidothyridoids: *Rouillieria* cf. *michalkowii* (Fahrenkohl); *Rouillieria* aff. *ovoides* (Sowerby); *Rouillieria* aff. *rasile* Smirnova; *Uralella?* cf. *jani-maniensis* Makridin; *Uralella?* sp.; *Pinaxiothyris campestris?* Dagys; *Placothyris kegei?* Harper *et al.*; and *Seductorithyris septemtrionalis* **gen. et sp. nov.** The terebratellidine *Zittelina?* sp. is also present. Age determinations for all but one of the brachiopod-bearing seeps are based on associated ammonites. Five of the seep carbonates have yielded *Lingularia similis?*, and it is the only brachiopod species recorded from two of the seeps. Other benthic invertebrate taxa occurring in the seeps include bivalves, gastropods, echinoderms, sponges, and serpulid and non-serpulid worm tubes. The brachiopod fauna has a strong Boreal palaeobiogeographic signature. Collectively, the Spitsbergen seep rhynchonellate brachiopods exhibit high species richness and low abundance (<100 specimens from 8 seeps). This contrasts markedly with other Palaeozoic–Mesozoic brachiopod-dominated seep limestones where brachiopods are of low diversity (typically monospecific) with a super-abundance of individuals. The shallow water environmental setting for the Spitsbergen seeps supported a diverse shelf fauna, compared to enigmatic Palaeozoic–Mesozoic brachiopod-dominated seeps.

Key words: Brachiopoda, Rhynchonellida, Terebratulida, hydrocarbon seeps, Jurassic, Cretaceous, Spitsbergen, Svalbard, new genus, new species

Introduction

Fifteen carbonate bodies interpreted as fossil hydrocarbon seeps (Hammer *et al.* 2011) were identified during fieldwork (2006–2010) in the Janusfjellet to Knorringsfjellet area, Sassenfjorden, central Spitsbergen (Fig. 1). The seeps are hosted by the Slottsmøya Member, which is composed mainly of grey to black organic-rich shales with lesser silty beds and carbonate concretions, and was deposited on the middle-to outer shelf (Nagy *et al.* 1988; Dypvik *et al.* 1991; Collignon & Hammer 2012). The strata (Fig. 2) are part of the post-Devonian cover sequence of the Main Spitsbergen Basin (Harland 1997, fig. 3.9).

Based on ammonite biostratigraphy, the seep carbonates range in age from Late Volgian to latest Ryazanian, spanning approximately a nine million year interval (Wierzbowski *et al.* 2011). The Volgian and Ryazanian are informal Boreal stages established due to strong provincialism of ammonite faunas around the Jurassic–Cretaceous

affinity to *Zittelina* in contrast to faint uniplication that could suggest *Kingena* (based on generic diagnoses given by MacKinnon *et al.* 2006; although a rectimarginate anterior commissure is common to both genera). Species referred to *Dzirulina* Nutsudidze (considered a senior subjective synonym of *Belothyris* Smirnova by Sandy *et al.* 1995) typically have a more elongate outline than for *Zittelina* and *Kingena* (discussed by Owen 1970).

Stratigraphic and geographic distribution. Uppermost Ryazanian of Spitsbergen.

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