

## Early land plant spore assemblages from the Late Silurian of Skåne, Sweden

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**Abstract:** A palynological study based on sedimentary rocks (mainly calcareous siltstones and mudstones with minor carbonate beds) from the upper Silurian Öved-Ramsåsa Group in the Klinta 1 and Bjärsjölagård 2 drillcores, Skåne, Sweden, reveals a rich assemblage of well-preserved spores produced by early land plants. Thirty-four spore taxa belonging to 19 genera, including the new species *Scylaspora klintaensis* sp. nov., were identified. The palynoflora is characterized by cryptospores and trilete spores. The dominant spore species are the cryptospores *Gneudnaspora plicata* followed by *Gneudnaspora divellomedia*. Based on the presence of biostratigraphically important spore species such as *Hispanaedisca lamontii*, *Artemopyra radiata*, *Emphanisporites neglectus*, *Synorisporites* cf. *libycus* and *Synorisporites tripapillatus*, the age of the studied strata is interpreted to be of Wenlock (probably Homerian) to possibly Přídolí age. Although the palynological assemblages are strongly dominated by miospores and other land plant fragments, marine microfossils are also present and the sedimentary succession is interpreted to have been deposited in a nearshore marine environment.

**Keywords:** Silurian; trilete spores; cryptospores; palynology; taxonomy; flora.

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## Introduction

Middle Paleozoic miospore assemblages provide important insights into the rise of the terrestrial flora since macrofossils of early land plants are rare and a wealth of information on diversity, abundance, evolutionary patterns and the structure of early terrestrial ecosystems can be deduced from the palynological assemblages. Cryptospores are the spores produced by the earliest land plants and are argued to be of hepatic (liverwort) affinity (e.g. Gray 1984, 1989, 1993; Wellman et al. 2003), originating in the Middle Ordovician (Rubinstein et al. 2010). Trilete spores were likely produced by vascular plants, which probably first appeared during the Late Ordovician (Steemans et al. 2009). Records of spore assemblages produced by early land plants have been described from Avalonia (e.g. Gray & Boucot 1971; Wellman & Richardson 1993; Burgess & Richardson 1995; Richardson 1995; Steemans 2001), Laurentia (e.g. Gray & Boucot 1971, 1972; Strother & Traverse 1979; Johnson 1985) and Gondwana (e.g. Richardson & Ioannides 1973; Richardson 1988; Dufka 1995; Steemans 1995; Mizusaki et al. 2002; Steemans & Pereira 2002; Steemans et al. 2008; Rubinstein et al. 2010). Most studies have been carried out on Avalonian and Laurasian spore assemblages, whereas results from the Scandinavian part of Baltica are scarce. Among these, Gray et al. (1974) presented an ecological study of spores from Skåne and Gotland, Sweden. Steemans (1996) and Hagström (1997)

described the spores from early land plants from Gotland, and in Hagström & Mehlqvist (2012) plant remains with *in situ* cryptospores of Ludlow age from Gotland are presented. Smelror (1987) identified spores in the Ringerike district of Norway that had a Llandovery to Wenlock age. Le Hérisse (1989) described acritarchs and cysts of prasinophycean algae from Gotland, Sweden. Vecoli et al. (2011) studied cryptospore assemblages from Upper Ordovician strata from Estonia and Canada. Recently, Steemans et al. (2010) performed Fourier transform infrared spectroscopy on cryptospores from the Silurian of Gotland to assess the affinity through investigating their chemical composition. To date, the spore assemblages of the several hundreds of metres thick Ordovician–Silurian succession of Skåne have not been described.

This study aims to systematically describe Silurian land plant spore assemblages in two drillcores from Skåne in order to promote and ease future works on the biostratigraphy and paleoecology of plants in the early terrestrial ecosystems of paleo-Scandinavia.

## Geological setting and stratigraphy

The paleocontinent Baltica was in the Silurian situated in low latitudes, just south of the equator placing the continent in the