Available online at www.sciencedirect.com
SCIENCE DIRECT
ELSEVIER
Palaeogeography, Palaeoclimatology, Palaeoecology 222 (2005) 161–179
PALAEO
www.elsevier.com/locate/palaeo

Delta-influenced foraminiferal facies and sequence stratigraphy of Paleocene deposits in Spitsbergen

Jenő Nagy*

Department of Geosciences, University of Oslo, P.O. Box 1047 Blindern, 0316 Oslo, Norway

Received 17 March 2004; received in revised form 21 January 2005; accepted 18 March 2005

Abstract

The Paleocene Firkanten Formation of the Central Basin of Spitsbergen is a succession of terrigenous clastic sediments, interpreted as a major depositional sequence, formed in deltaic coastal plain, delta front and prodelta environments. The present study combines diagnostic features of foraminiferal facies with sedimentary data to elucidate this sequence stratigraphic development. Deposition was initiated by an early Paleocene transgression which led to the deposition of a delta plain to coastal marine sediment package forming the low stand and transgressive systems tracts; these includes coal swamp, lacustrine, lagoonal and barrier deposits. The lagoonal shales are characterised by an agglutinated foraminiferal assemblage of extremely low diversity indicative of hyposaline conditions. Shoreface sandstones overlying the lagoonal strata are interpreted as sand barriers reworked by the advancing transgression. These sandstones are succeeded by a package of prodelta silty shales, which in the lower part includes the maximum transgressive interval. The foraminiferal assemblage of the prodelta shales is also agglutinated but reveals increased diversities suggesting open marine conditions. The prodelta shales and overlying delta front sandtones form a succession of coarsening upwards parasequences of deltaic progradation, representing the regressive systems tract. The entirely agglutinated low diversity nature of the foraminiferal assemblages is in part attributable to the deltaic impact. The restricted character of the faunas is additionally accentuated by the effects of the Paleogene Boreal province.

Keywords: Sequence stratigraphy; Foraminifera; Biofacies; Paleocene; Marginal marine; Delta-influenced

1. Introduction

Tertiary sediments in Spitsbergen are confined to several depositional basins, of which the Central Basin (Fig. 1) is not only by far the largest, but also the one with the most complete Paleogene succession. Its present shape is a NW–SE trending synclinorium that occupies much of central and southern Spitsbergen; the original sedimentary basin must have covered a considerably larger area. The preserved sedimentary succession attains a maximum thickness of 2.3 km and is Paleocene to Eocene in age. Its dominant

* Tel.: +47 22 85 66 48; fax: +47 22 85 42 15.
E-mail address: jano.nagy@geo.uio.no.

0031-0182/$ - see front matter © 2005 Elsevier B.V. All rights reserved.
doi:10.1016/j.palaeo.2005.03.014

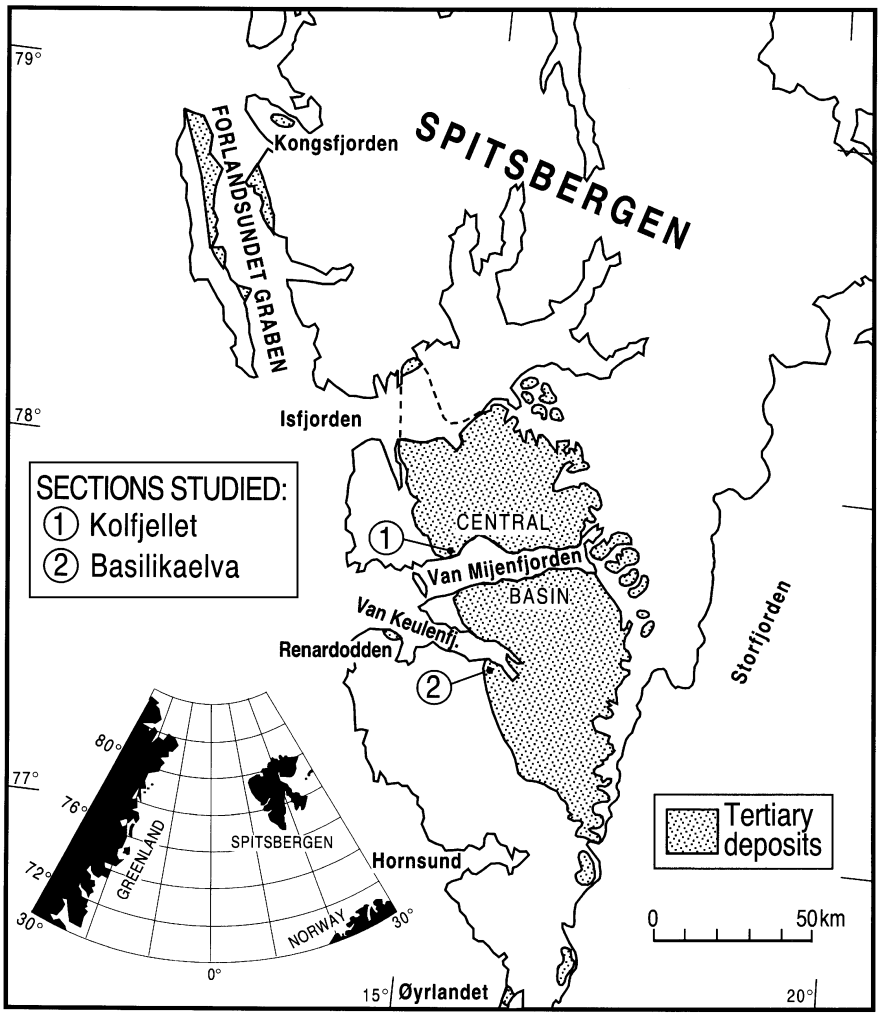

Fig. 1. Location map showing areas with Tertiary deposits in Spitsbergen. The analysed sections at Kolfjellet and Basilikaelva are located on the western outcrop margin of the Paleogene succession preserved in the Central Basin.

lithologies are shales, siltstones and sandstones deposited in delta-influenced shelf, deltaic and fluvial environments.

Depositional conditions during the Spitsbergen Paleogene have been extensively discussed by Livshits (1974), Kellogg (1975), Steel and Worsley (1984); Steel et al. (1985) and Nøttvdet (1985). A detailed overview of the geology and research history of this succession is provided by Harland (1997), while its lithostratigraphy was revised by Dallmann et al. (1999). The age relationships have been summarised by Manum and Throndsen (1986). The bathymetric significance of Paleogene foraminiferal facies of the Central Basin and the Barents Sea was discussed by Nagy et al. (2000).

The Paleogene sedimentary succession of the Central Basin comprises three depositional sequences. The lower one of these is made up of the Firkanten Formation (Fig. 2), which contains commercially important coal seams close to its base. The purpose of the present study is to elucidate the main aspects of transgressive–regressive developments within the Firkanten Formation by means of foraminiferal facies combined with sedimentary and stratigraphic data, and portray the results in a sequence stratigraphic model. The modelling applies the depositional