CHAPTER 16

Woody species behaviour during primary succession in an inland drift sand area

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The first forest generation in the stabilized drift sand area is formed by Scots pine stands structured in age, heights, dimensions and spatial pattern. Successful establishment of broadleaved tree species (birch, oak, rowan, beech and others), which are expected to form the second forest generation under the canopy of Scots pine, depends on seed dispersal and animal browsing. Under favorable conditions, the second generation can be a forest closely resembling the potential natural forest communities of Betulo-Quercetum and/or Fago-Quercetum, indigenous to this area. However, elimination of broadleaves from spontaneous regeneration by ungulates leads again to dominance of Scots pine in the second generation.

**Introduction**

The original forests of the NW part of the European Pleistocene were formed predominantly by forest communities of various types of Betulo-Quercetum and Fago-Quercetum, with admixed species typical for nutrient poor, moist or dry sites (Ellenberg, 1963; Jahn, 1979; Bohn, Gollub & Hettwer, 2000). Already in the early stages of human colonization of the area in the Bronze Age, these forests were affected by felling and grazing. Their destruction was finalized in the early Middle Ages. Various types of heathland developed as substituting vegetation cover. Towards the end of the Middle Ages and especially since the 16th century, intensive agricultural use (grazing of heathland, frequent burning and sod cutting), probably in combination with extreme climatic fluctuations, led to development of extensive drift sand areas (Koster, 1978, 2005b; Spek, 2004). Reclamation of these waste areas started already in the 18th century. The usual method was afforestation by planting Scots pine (Pinus sylvestris), the only tree species which could survive under the harsh conditions prevailing in open sand. Scots pine seeds used for the production of planting stock originated from various parts of Europe (Kriek, 1981; Fanta, 1985a); their origin is not known. Towards the end of the 19th century the area of these “atlantic deserts” was assessed at about 14,500 ha (Schimmel, 1975).

Since the artificial establishment of the first Scots pine (Pinus sylvestris) stands in and around the drift sand areas some 250 years ago, the spontaneous regeneration of this tree species has played an ever increasing role in their stabilization. This spontaneous process represents the primary forest succession sere: establishment and development of a forest on a rough, undeveloped substratum, which did not bear any vegetation cover before. Similar situations along the Dutch North sea cost were studied e. g. by Joenje (1978), Van der Maarel (1979), Van der Maarel et al. (1985) and others. At the same time, primary succession on Dutch inland sand dune areas received concentrated attention within the theme of forest dynamics research on dry sandy soils (Fanta, 1982, 1986a, 1995). A detailed study conducted by Prach (1989) increased the understanding of primary succession on the very specific situation of the Dutch inland sand dunes (see chapter 9, this volume). Further research brought