
Tolsta Head

J.E. Gordon and D.G. Sutherland

Highlights

Deposits exposed in the coastal section at Tolsta Head include organic lake detritus formed during a Middle Devensian interstadial around 27,000 years ago. Pollen and diatoms preserved in these sediments provide an exceptionally detailed record of the vegetational and environmental conditions at that time.

Introduction

This site [NB 557 468] comprises a cliff-top section located on the south side of Tolsta Head in north Lewis. It shows a sequence of organic interstadial deposits underlying till deposited by Late Devensian ice. Although organic sediments containing marine shells were reported from near Tolsta Head by Dougal (1928), the present site was first described by von Weymarn and Edwards (1973) and further details of both the organic and glacial sediments have subsequently been given by Flinn (1978b), Edwards (1979a) and Birnie (1983).

Description

The section was described by von Weymarn and Edwards (1973), with further details being added by Birnie (1983) (Figure 12.6). At the base, resting on Lewisian gneiss bedrock, is approximately 0.6 m of bedded silts and sands with organic lake detritus. Overlying these is 2.5 m of reddish-brown till notable for a relatively high content of Torridonian sandstone erratics. The top of the organic sediments has been truncated and material from it incorporated as clasts into the base of the till (D. G. Sutherland, unpublished data). The uppermost 1 m of the till has been frost-disturbed.

Palynological, plant macrofossil and diatom studies have been carried out on the organic sediments (von Weymarn and Edwards, 1973; Edwards, 1979a; Birnie, 1983). Von Weymarn and Edwards (1973) reported grass–sedge-dominated pollen spectra (Figure 12.6), with a consistent increase in the percentage of juniper pollen towards the top of the profile. Birnie (1983) provided further details, subdividing the organic deposits into a lower, sandier unit and an upper, more organic unit. The lower unit was considered to have been deposited in more variable flow conditions than the upper one, and it is possible that there may have been a hiatus in deposition between the two. The diatom record indicates that alkaline water conditions were present throughout the upper zone and a succession developed from epipelagic and planktonic communities to epiphytic communities. With the notable exception of *Juniperus*, Birnie (1983) confirmed the pollen spectra as reported by von Weymarn and Edwards (1973) and she also recorded *Salix herbacea* macrofossils. A radiocarbon date of $27,333 \pm 240$ BP (SRR-87) was obtained from the uppermost 0.15 m of the organic sediments (von Weymarn and Edwards, 1973).

Interpretation

The radiocarbon date confirms that the deposits preserve evidence of a Middle Devensian inter-stadial. Von Weymarn and Edwards (1973) considered that the pollen spectra indicated a flora not inconsistent with a cool maritime climate. Birnie (1983) considered that the alkaline water, the inwash of minerogenic sediment and the occurrence of both pollen and macrofossils of open-ground herbs suggested soil instability, probably solifluction, throughout the period represented by the organic sediments. However, the degree of severity of the climate is uncertain, as the presence of *Nymphaea* in the uppermost 0.10 m and certain diatoms are compatible with temperatures not necessarily any lower than those of today. The radiocarbon date also indicates that the overlying till is Late Devensian in age, in agreement with the conclusions of Sutherland and Walker (1984) based on radiocarbon dating and amino acid analyses of shells from till in the north of Lewis (see North-west coast of Lewis).

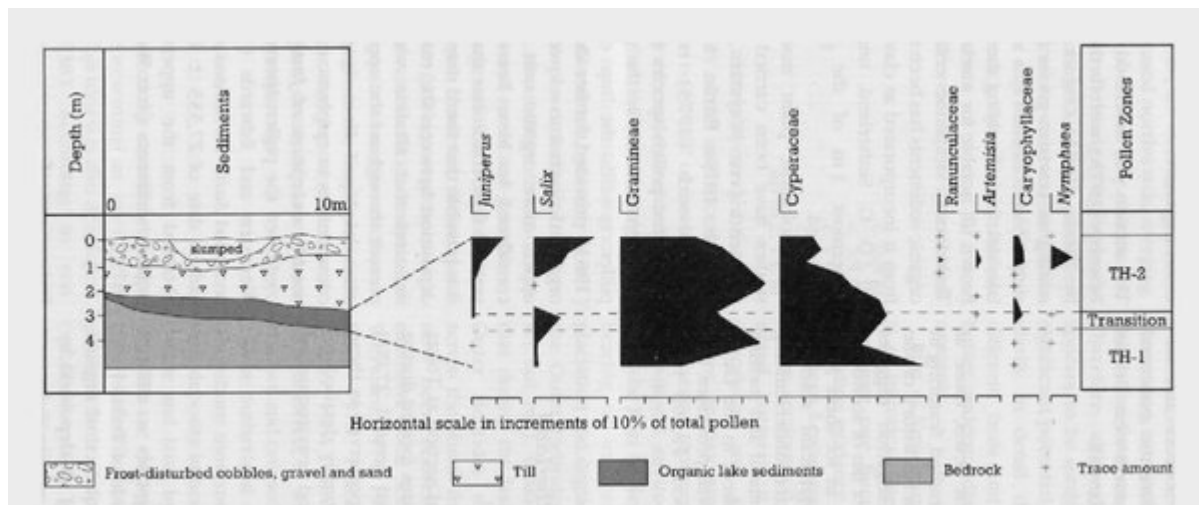
Von Weymarn and Edwards (1973) reported that till fabric measurements showed a predominant N50°W clast orientation and they inferred ice movement from the south-east. However, in the till Flinn (1978b) found fragments of a phyllonite, which crops out at the south-west corner of Tolsta Head, and he concluded that the direction of movement of the ice that deposited the till was towards the north-east. Von Weymarn (1979) suggested that during the Late Devensian, Tolsta Head was close to the junction of the Scottish ice-sheet (ice flow from the south-east) and the Outer Hebrides ice-cap (ice flow from the south-west), which may explain the apparently conflicting evidence (see also Sutherland, 1984a).

There are relatively few sites in Scotland, in addition to Tolsta Head, at which evidence for a Middle Devensian interstadial has been discovered and dated: Bishopbriggs (Rolfe, 1966), Hirta (St Kilda) (Sutherland *et al.*, 1984), Crossbrae (Hall, 1984b), Sourlie (Jardine *et al.*, 1988), Creag nan Uamh (Lawson, 1984), and possibly Teindland (Fitzpatrick, 1965; Edwards *et al.*, 1976). Of these, Tolsta Head is the site which has been studied in most detail and which has provided most information about the environment of that period. Three of the sites (Bishopbriggs, Crossbrae and Sourlie) were temporary exposures and as there is doubt as to whether Teindland does indeed date from the Middle Devensian, Tolsta Head remains the most important interstadial site of this age in Scotland.

Conclusion

Tolsta Head is important for showing one of the few deposits in Scotland that may be dated to a Middle Devensian interstadial (a warmer climatic phase during an otherwise intensely cold glaciation). It has provided the most detailed evidence for environmental conditions during the phase (approximately 27,000 years ago) immediately before the last glacial maximum, indicating a cool maritime climate and unstable soils. Tolsta Head is a key reference site for palaeoenvironmental reconstruction in Scotland.

References



(Figure 12.6) Tolsta Head: sediments and relative pollen diagram showing selected taxa as percentages of total pollen (from von Weymarn and Edwards, 1973; Birnie, 1983; Lowe, 1984).