# Portfield

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## Highlights

Portfield is a key site in the terrace stratigraphy of the Parrett catchment because amino-acid ratios on molluscs from the site provide rare chronological control in a largely undated set of terraces. The site is also important for its interglacial, non-marine fossil mollusc fauna. It is the type-locality for the Portfield Member of the Parrett Formation.

## Introduction

Portfield is the only surviving locality of the fifth terrace of the Parrett/Isle system. The site is complex. A basal weathered diamicton is overlain by silts which contain freshwater and terrestrial fossil molluscs of interglacial affinity. The silt unit extends to 12.5 m OD and is overlain by over 6 m of gravelly sands which contain a sparse and restricted mollusc fauna. These are succeeded by stony diamictons. Amino-acid ratios derived from shells in the interglacial silts suggest an Oxygen Isotope Stage 7 age.

Quaternary gravelly sands were briefly reported from Portfield by Hughes (1980), who equated them with the interglacial marine Burtle Formation of the Somerset Levels. The site was reinvestigated by Hunt (1987) and Hunt and Bowen (in prep.) who drilled a number of boreholes, conducted mollusc analyses and amino-acid geochronometric assays and attributed the interglacial deposits to Oxygen Isotope Stage 7. Campbell *et al.* (in prep.) accepted this correlation, and named the interglacial deposits the Portfield Member.

## Description

Near Portfield, the former existence of deposits of the fifth terrace of the Parrett/Isle system can be seen from 'flats' in the landscape underlain by extensive spreads of shallow gravel-based soil between [ST 409 260] and [ST 408 274]. Deep *in situ* Pleistocene deposits, however, survive only at Portfield. The sequence is shown in (Figure 9.5) and can be summarized as follows (maximum bed thicknesses in parentheses):

6. Sandy silty clays with abundant angular limestone fragments, crudely stratified and with clast long-axes pointing downslope. These slope deposits interdigitate with and overlie beds 5 and 4. (2.0 m)

5. Sandy silts, indistinctly and irregularly laminated, with abundant calcareous root tubules and rare fossil molluscs; pale orange-yellow. (0.5 m)

4. Fine to medium sands, often silty with indistinct lamination and rare fossil molluscs, and sometimes gravelly; pale reddish-orange. (6.5 m)

3. Fine sands with fossil molluscs, interdigitating with bed 2, and having a transitional lower junction with it; pale yellow. (0.65 m)

2. Clayey silts, sometimes indistinctly laminated, with rare to abundant fossil molluscs; light green to blue-grey. (1.1 m)

1. Stiff clayey silt with angular clasts of Rhaetic limestone, with rare fossil molluscs; blue-grey, mottled strong brown. (0.7 m)

Fossil molluscs are present in all of these stratigraphical units (Hunt, 1987; Hunt and Bowen, in prep.; (Figure 9.6)) and a few plant macrofossils are also present in some units. The basal stony clayey silts (bed 1) contain restricted assemblages characterized by taxa such as *Trichia* cf. *hispida, Succinea* cf. *oblonga, Lymnaea truncatula* (Müller), *Helicella* sp., Limacidae and extremely corroded fragments of *Pisidium* sp. and *Bithynia.* Plant macrofossils include seeds of *Saxifraga* sp., Polygonaceae, Chenopodiaceae and *Stellaria* sp.

The laminated silts of bed 2 (the Portfield Member of Campbell *et al.,* in prep.) contain mollusc assemblages characterized by considerable numbers of aquatic thermophilous taxa, especially 'river' species such as *B. tentaculata, V. piscinalis, Sphaerium corneum* (Linné) and *Pisidium amnicum* (Linné) but also 'ditch' taxa such as *Valvata cristata* (Müller), *Planorbis planorbis* (Linné), *Gyraulus laevis* (Alder), generalist species like *L. peregra,* and 'slum' species including *Anisus leucostoma* (Millet), *L. truncatula* and *Pisidium obtusale* (Lamarck). The terrestrial taxa are rare, but include occasional specimens of the shaded habitat species *Discus rotundatus* (Müller), and a variety of other mostly ecologically indeterminate species. Plant macrofossils are rare, but include the thermophilous aquatic species *Zannichellia palustris.* The mollusc assemblages from bed 3 are essentially similar (Hunt, 1987; Hunt and Bowen, in prep.).

Beds 4, 5 and 6 contain sparse assemblages characterized by rare 'slum' aquatic taxa, such as *P. obtusale* and *L. truncatula,* the marsh taxon *Succinea* cf. *oblonga,* grassland taxa such as *Trichia* cf. *hispida, Vallonia pulchella* (Mailer), *Vallonia excentrica* Sterki, *Vertigo pygmaea* (Draparnaud) and sometimes large numbers of the exposed-ground species *P. muscorum.* Also present is a mixture of rolled thermophilous taxa such as *M. balthica, P. amnicum, Viviparus* sp., *D. rotundatus* and *Pomatias elegans.* Hunt and Bowen (in prep.) have argued that the grassland taxa may be recycled from soil profiles of Stage 7 age. Plant macrofossils include *Carex* nutlets, seeds of *Stellaria,* and a prophyll of *Salix* (Hunt, 1987; Hunt and Bowen, in prep.).

## Interpretation

A complex sequence of Quaternary events can be identified at Portfield. During an interglacial prior to Oxygen Isotope Stage 7, interglacial deposits were laid down. The evidence for these deposits is the presence of corroded specimens of freshwater molluscs such as *B. tentaculata* and *Pisidium* spp. in bed 1. At some time after the deposition of this ancient interglacial deposit, it was destroyed and the interglacial molluscs were incorporated into bed 1, most probably by mudflow, solifluction and wash processes in cold-stage conditions. The other molluscs and seeds in this unit are a mixed assemblage, but mostly point to open exposed (*Helicella* sp., Chenopodiaceae) or damp grassy (*Trichia* cf. *hispida, Saxifraga* sp.), or marshy conditions (*Succinea* cf. *oblonga, L. truncatula*)or are ecologically indeterminate (Limacidae, Polygonaceae and *Stellaria* sp.). It is presumed that these fossils were incorporated into the deposit as an early-interglacial soil profile began to form and was then swamped by rising waters as the interglacial marine transgression progressed and caused rising water levels on the site.

With further sea-level rise, the Portfield Member (beds 2 and 3) was laid down by a perennial, slow-moving freshwater river, perhaps under weak tidal influence. The preponderance of species typical of larger water bodies such as *B. tentaculata, V. piscinalis, S. corneum* and *P. amnicum* points to this being more than a small stream, while the presence of 'ditch' taxa such as V. *cristata, P. planorbis, G. laevis,* generalist species like *L. peregra,* and 'slum' species including *A. leucostoma, L. truncatula* and *P. obtusale* indicates the presence of a variety of submerged habitats. The presence of *D. rotundatus* and *B. tentaculata* is consistent with the climate at this time not having been cooler than southern Scandinavia today (Hunt and Bowen, in prep.). The amino-acid ratios are compatible with the Portfield Member being of Oxygen Isotope Stage 7 age. Assessment of the sea-level relationships of the silts, after allowances for tidal funnelling, suggests a mean sea level around 4.5–7.5 m OD (Hunt and Bowen, in prep.), comparable with other Stage 7 sites in South-West England at Portland and Torbay (Chapter 6).

The deposition of beds 2 and 3 was followed by climate deterioration and sea-level fall. The latter led to the exposure and deflation of substantial areas of interglacial marine sands of the Burtle Formation in Sedgemoor. The deflated sand then accumulated against the Langport-Curry Rivel escarpment, behind the Portfield site. At the same time, exposed soils on the escarpment were subject to erosion. The aeolian sands and eroded soil were then redeposited at the foot of the escarpment as bed 4. Sedimentary structures in this unit point to deposition in a multi-channel ephemeral stream. The molluscs and plant macrofossils in bed 4 may be partly recycled, especially the rolled thermophilous taxa such as *M. balthica, P. amnicum, Viviparus* sp., *D. rotundatus* and *P. elegans.* The 'slum' aquatic and marsh taxa, *P. obtusale, L.*

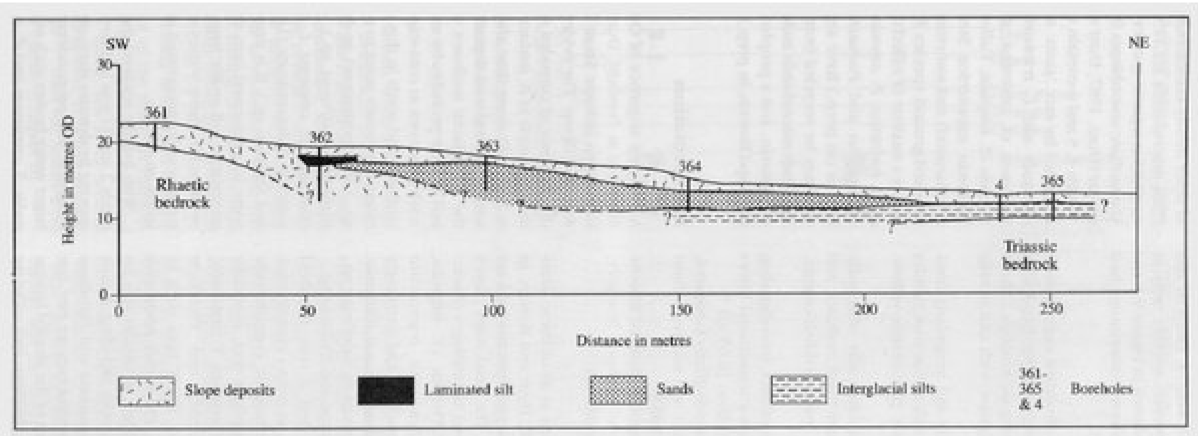
*truncatula* and *Succinea* cf. *oblonga,* are the type of assemblage that might colonize pools and wet ground in the bed of an ephemeral stream. Exposed ground is indicated by the presence of *P. muscorum,* but *Trichia* cf. *bispida, V. pulchella, V. excentrica,* and *V. pygmaea* may have lived in grassy vegetation. Hunt and Bowen (in prep.) have argued that the grassland taxa may be recycled from soil profiles of Stage 7 age.

Deposition of bed 4 was followed locally by the accumulation of the wash deposits of bed 5. These laminated sandy silts were most probably laid down by shallow overland flow in a sparsely vegetated landscape during 'cold-stage' conditions. Interdigitating with, and overlying beds 4 and 5, are the slope deposits of bed 6. These were most probably laid down by mudflow, solifluction and wash processes in cold-stage conditions.

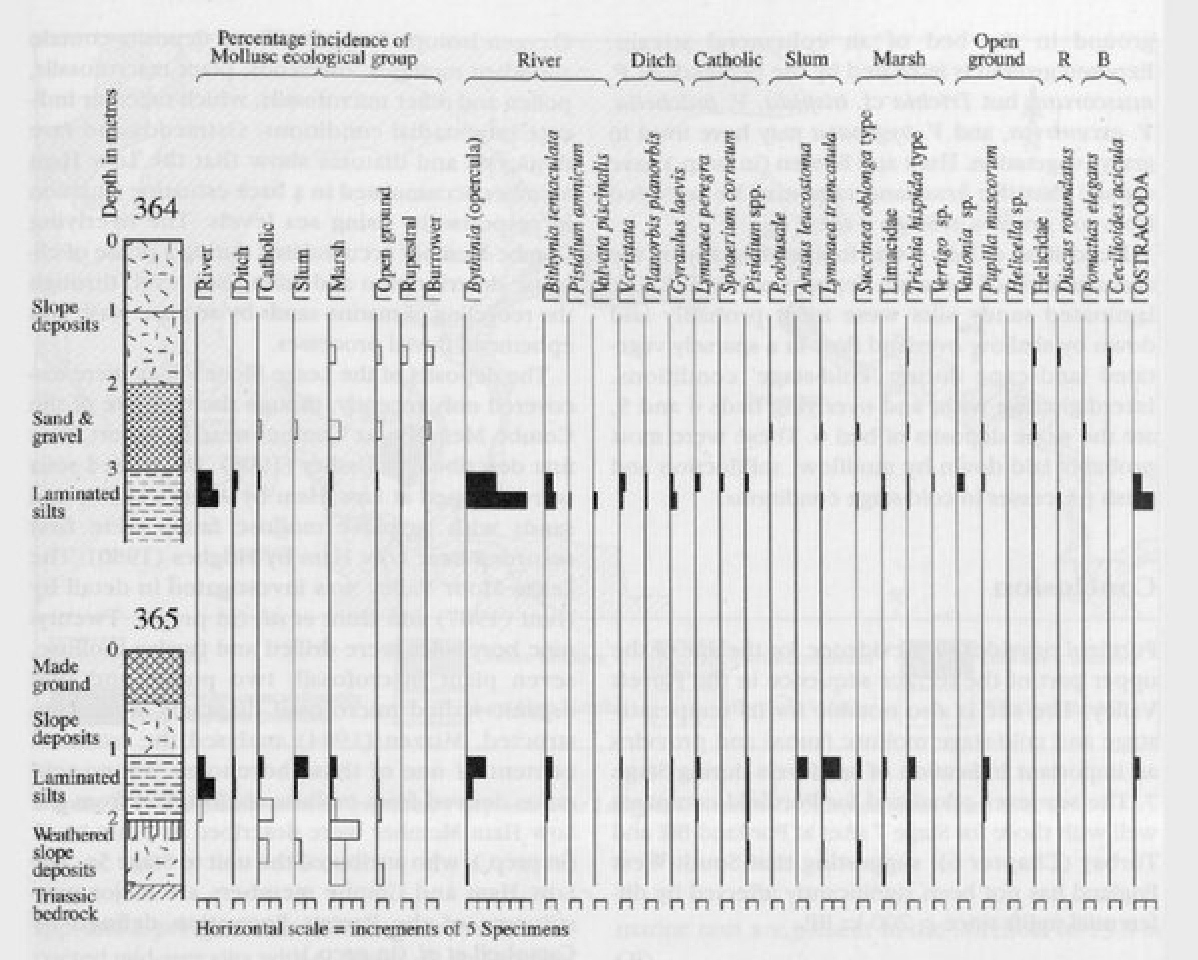
## Conclusion

Portfield provides vital evidence for the age of the upper part of the terrace sequence in the Parrett Valley. The site is also notable for its temperate-stage and cold-stage mollusc faunas and provides an important indication of sea levels during Stage 7. The sea level calculated for Portfield compares well with those for Stage 7 sites at Portland Bill and Torbay (Chapter 6), suggesting that South-West England has not been significantly affected by differential uplift since *c.* 200 ka BP.

**References**




*(Figure 9.5) A cross-section of the Pleistocene deposits at Portfield. (Adapted from Hunt, 1987.)*



(Figure 9.6) The molluscan biostratigraphy of Pleistocene deposits at Portfield, adapted from Hunt (1987). Numbers 364 and 365 refer to boreholes shown in (Figure 9.5).