



Belmont: Thin Section Micromorphology

L E Hamlet & I A Simpson

1. Introduction

As part of the Viking Unst Project – Belmont excavations undisturbed sediments from the site were collected in two Kubiëna tins from context [156], located in a 20cm x 20cm sondage pit of area 3. These samples were collected to test, using thin section micromorphology, the initial field-based hypothesis that this complex and micro-stratified context represents occupation floor layers.

2. Methods

Thin sections were prepared from undisturbed soil blocks collected in Kubiëna tins at the Thin Section Micromorphology Laboratory, University of Stirling following standard procedures (MacLeod 2011, Murphy 1986). The thin sections were analysed using an Olympus BX-50 petrological microscope at a range of magnifications (x10- x400) and with several different light sources: (plane polarised light (PPL), crossed polarized light (XPL) and oblique incident light (OIL)). Each allows identification of specific microscopic features, such as mineral and organic components, pedofeatures and microstructure. Soil / sediment features and properties observed in thin section were described and recorded semi-quantitatively (Bullock et al., 1985; Stoops, 2003).

Interpretation of the observed features rests on the accumulated evidence of a number of workers, notably Courty, *et al.*, (1989) FitzPatrick (1993), and more recent research carried out at the University of Stirling.

3. Results and discussion

In the field 19 layers were described as clearly visible within context [156]. In thin section micro-laminations (fig.1) of material form up to 10% of several of the ten layers captured in thin section, labelled [156A] - [156J] and described in table 1. The microstratigraphy shows 'reactive' and 'active' zones typical of occupation surfaces (Simpson et al., 1999). Within [156H] micro-laminations characterised by a groundmass of red hue in OIL and amorphous black in PPL can be interpreted as iron panning. Such iron pan formation is often found directly below occupational surfaces as the subsoil becomes compacted and drainage is inhibited, representing the 'reactive' zone of occupation surfaces.

The active zone within and above [156H] is represented by a series of microstratigraphies characterised by linear compaction and striation of both mineral and organic materials indicating pressure from trampling. Textural pedofeatures, including, pendant pedofeatures, together with accumulation iron and manganese are also evident and indicate the wet nature of the occupation surface to the extent that there was localised movement of fine material through the stratigraphy. Attempts to alleviate wetness associated with the occupation surface were made by application of fuel residues and latterly turf. This was a continuous process contributing to the persistent accumulation of the microstratigraphy although thin (ca. 30 micron thick) crusting of the upper parts of some micro-laminations indicates short-lived periods of non-deposition. There is switching of fuel residue use evident in the stratigraphy. Fine amorphous organic material, morphologically typical of wood charcoal fragments, (Umbanhower & McGrath 1998) is evident in the earlier phases - [156J] - [156D] with peat ash appearing in [156H] and [156D] before replacing wood charcoal in later layers [156C]-[156A]. Fabric pedofeatures present in the upper layers [156D]-[156A] establish the addition of turf, some of which was also burnt, and possibly moss, perhaps to help further create a drier environment. Diatoms are visible within [156D], [156C] and [156A], and these microscopic algae morphologically conform to the *pinnularia borealis ehrenb* type which are typically related to raised peat bog habitats (Smol & Stoermer 2010:486). That the occupation surface was associated with domestic activity is indicated by burnt bone in [156J] and [156D] - [156B], unburned bone in [156G], [156F], [156D] and [156C] together with occasional (2-5%) iron phosphate pedofeatures found in [156D] and rarely (1-2%) in [156E].

THIN SECTION REFERENCE	CONTEXT	COARSE MINERAL MATERIAL (>63µm)	FINE MINERAL MATERIAL (<63µm)	COARSE ORGANIC COMPONENT (>63µm)	FINE ORGANIC COMPONENT (<63µm)	OTHER INCLUSIONS	STRUCTURE			PEDOFEATURES					
		Quartz Feldspar Muscovite Quartzite Serpentine Weathered schist/gneiss Phytoliths Diatoms	NATURE OF FINE MINERAL MATERIAL GROUNDMASS b FABRIC (XPL)	Plant tissues (slight/moderate decomposition) Plant tissues (strong/very strong decomposition) Charcoal Fungal Spores/Fungal Tissue	Organic fine material (black) Amorphous reddish brown Amorphous yellow Amorphous orange	Rubified Material (OIL) Peat ash or carbonised peat Ash Turf Burned Bone Unburned Bone	MICROSTRUCTURE COARSE MINERAL ARRANGEMENT COARSE/FINE RELATED DISTRIBUTION	Fe/Mn Nodules Excremental Silty Clay Coatings/Infill Impure clay/Limpid Clay Coatings Pendent Coatings Capping Link Capping Coatings Fabric Calcium Iron Phosphate Fe/Mn Accumulation Microlaminations Psuedomorph Manganese / Ferruginous							
Bel 08 C156 UP	156A	• t t t •	Pale Orange (PPL) Organo mineral Stipple-speckled micro crystallitic	t	• t		Spongy with vughs cracks	Random, some striations	OP	◊		◊	◊◊		
	156B	• •• t	Dark Brown, Mottled Gray (PPL) Organo mineral Stipple-speckled micro crystallitic	• t	••• • •	• t	Spongy with cracks	Random	OP			◊	◊◊		
	156C	•• t • •	Dark Brown, Mottled Gray (PPL) Organo mineral Stipple-speckled micro crystallitic	••	•• • •	t t t	Spongy with cracks	Random, some striations	OP			◊	◊ ◊◊◊		
	156D	• t t • t • •	Mid Brown (PPL) Organo mineral Stipple-speckled micro crystallitic	•• t	••• • • •	t t	Spongy with cracks	Random	OP			◊ ◊	◊◊◊ ◊◊◊ ◊		
	156E	• • t ••• •	Organo mineral Stipple-speckled micro crystallitic	•	•••		Compact with	Random	OP		◊ ◊		◊ ◊		
BEL C156 LOW	156F	• • • t	Dark Brown (PPL) Organo mineral Stipple-speckled micro crystallitic		••• • •• •	• t t	Compact with vertical cracks	Random	OP		◊ ◊ t		t ◊◊		
	156G	• t • • •	Reddish Brown, Mottled Gray (PPL) Organo mineral Stipple-speckled micro crystallitic		••• • • •	• •	Medium separated angular blocky with chambers	Random	OP		◊ ◊◊		◊◊ ◊◊◊		
	156H	•• t t •• • •	Dark Reddish Brown, Mottled Mid Brown (PPL) Organo mineral Stipple-speckled micro crystallitic	t	••• t • •	• •	Medium separated angular blocky with chambers	Random with some striations	OP		◊◊◊		◊◊◊+ ◊◊◊		
	156I	•• • • • •	Grayish Brown (PPL) Organo mineral Stipple-speckled micro crystallitic		• t		Compact; weakly separated angular blocky with chambers	Random with some striations	OP				◊◊		
	156J	•• • • •	Mid Brown (PPL) Organo mineral Stipple-speckled micro crystallitic	••	•• •• •	t	Crack with chambers	Random with some striations	OP		◊◊ ◊ ◊				

t = trace (<1%) • = very few (1-5%) •• = few (5 -15%) ••• = (frequent (15-25%) •••• = very frequent (25-49%) ••••• = dominant (>50%)
t = trace (<1%) ◊ = Rare (1-2%) ◊◊ = Occasional (2 – 5%) ◊◊◊ = Many (5 – 10%)
OP = Open Phorphyric