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Ancient Monuments Laboratory
Report 143/87

THE EXAMINATION OF IRON WORKING SLAG AND OTHER TECHNOLOGICAL MATERIAL FROM FISHERGATE, NORWICH.

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Summary

Approximately 10kg of material excavated from 10th to 11th century contexts was examined. Most of the material was found to be iron smithing slag (although two pieces of smelting slag were also noted) suggesting that small scale iron smithing was taking place on, or near to, the site in the medieval period. A fragment of 'heating tray', of a type probably used for small scale refining or cupellation in the early medieval period, was also noted.

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THE EXAMINATION OF IRON WORKING SLAG AND OTHER TECHNOLOGICAL MATERIAL FROM FISHERGATE, NORWICH.

Approximately 10kg of material recently excavated from 10th to 11th century contexts at Fishergate (732N), Norwich, and thought to be associated with iron working, was examined. The great majority of the material was found to be slag and this has been divided into two basic groups, fuel ash slags and fayalitic slags. The latter group are associated with iron working and have been further divided into those derived from smithing and those derived from smelting processes.

There were only a few pieces of fuel ash slag amongst the material examined. These alkali silicate slags are formed as a result of the accidental fluxing of silicate-rich materials, such as clay, by the ash in a fire during strong heating. Fuel ash slags are not therefore diagnostic of any particular process, they merely indicate the presence of a fire burning at high temperature.

The majority of the material examined was found to be fayalitic (iron silicate) slag although it also included lumps of metallic iron, some of which may be badly corroded iron objects. Not all of the slag was easily recognizable since in many cases iron corrosion products had concreted soil and stones from the burial environment in a thick layer around the slag pieces. These fayalitic slags are far denser than fuel ash slags as they contain a high proportion of iron. They are produced as a result of reactions between iron oxides and silicate-rich materials at elevated temperatures during either smelting or smithing operations. It is the morphology of the slag rather than its compositional variation which normally differentiates between the two processes.

The great majority of fayalitic slag examined was found to be smithing slag. Smithing slag results from the working of iron in the blacksmith's hearth and is produced at a lower temperature than smelting slag. It tends to be highly vesicular but with a relatively small vesicule size. Some of the smithing slag had formed into "hearth bottoms", roughly circular pieces of slag with a lens shaped cross section formed as a result of molten slag collecting in the bottom of the hearth and solidifying on cooling.

Two pieces of smelting (tap) slag (Δ276 and Δ204) were also noted from the site. Smelting slags tend to have fewer, but much larger, vesicules separated by dense, non-vesicular material. Smelting slags may also be characterized by the presence of flow lines caused by the solidification of the liquid slag as it is run out (or "tapped") from the furnace.

In general the nature of the slag examined and the quantities which have been discovered are consistant with small scale iron smithing either on or near to the site. Iron working of this nature is to be expected on virtually every Medieval occupation site. The few fragments of smelting slag recovered are not particularly significant since if iron smelting had been carried

out on the site the presence of far larger amounts of such material would be expected. However, such material is unlikely to be transported over large distances and the presence of the two fragments does suggest that smelting was being carried out somewhere in the area.

A few fragments of material recovered from coarse sieving of a peat layer beneath the main archaeological deposits were also examined. These are of natural origin and are not archaeologically significant.

Also included with the slag was a rim fragment from a shallow, circular, dish shaped crucible or "heating tray". The fragment was 8-12mm thick and the tray would have been 60-70mm in diameter. The fabric, which was only sparsely tempered and contained some finely divided charred organic matter, was reduced fired to a grey colour. The top surface was deeply vitrified, indicating that the tray had been heated from above, and the fabric near to the top surface was altered by high temperatures. Qualitative analysis of the upper surface of the sherd by energy dispersive X-ray fluorescence revealed traces of copper, zinc, lead, silver and tin.

Heating trays of this type have been recovered from a number of late Saxon and Anglo-Scandanavian sites in England including Lincoln, York, Thetford, and Northampton (Bayley 1982). There has been some debate regarding the use of the trays, however quantitative analyses of slag deposits on a number of heating trays from Netherton, Hampshire (Tite et al 1985) and a re-assessment in view of the continuing examination of such material at the Ancient Monuments Laboratory (Bayley, forthcomming) has led to the general conclusion that some form of refining or cupellation (to extract precious metals from impure alloys) was being practiced. The small size of the heating trays has led to speculation that the process may have been one of assaying; the cupellation of a small sample from a batch of alloy to determine its precious metal content.

References

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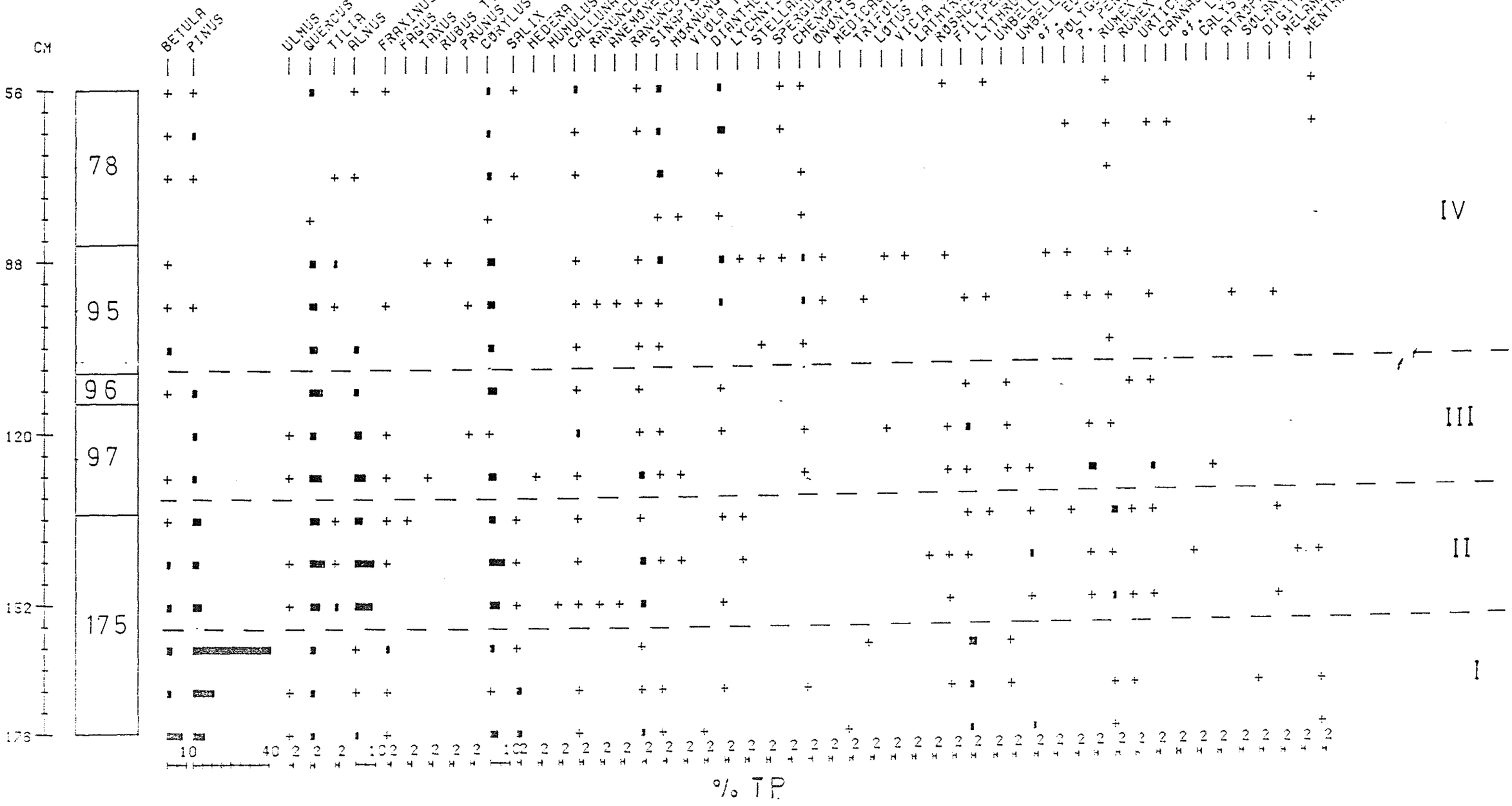
Tite,M.S., I.C.Freestone, N.D.Meeks & P.T.Craddock (1985) The examination of refractory ceramics from metal-production and metal working sites. in P.Philips (ed.) The Archaeologist and the Laboratory CBA Research Report No.58

FISHERGATE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BETULA
PINUS
ULMUS
QUERCUS
TILIA
ALNUS
FRAXINUS
FAGUS
TAXUS
RUBUS TYPE
PRUNUS TYPE
CORYLUS TYPE
SALIX
HEDERA
HUMULUS TYPE
CALLUNA
RANUNCULACEAE UNDIFF.
ANEMONE TYPE
RANUNCULUS TYPE
SINAPIS TYPE
HORNUNGIA TYPE
VIOLA TYPE
DIANTHUS TYPE
LYCHNIS TYPE
STELLARIA TYPE
SPERGULA TYPE
CHENOPODIUM TYPE
ONONIS TYPE
MEDICAGO TYPE
TRIFOLIUM TYPE
LOTUS TYPE
VICIA TYPE
LATHYRUS TYPE
ROSACEAE UNDIFF.
FILIPENDULA
LYTHRUM
UMBELLIFERAE UNDIFF.
UMBELLIFERAE TYPE 2
UMBELLIFERAE TYPE 3
EUPHRASIA
POLYGONUM AVICULARE TYPE
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RUMEX
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CANNABIS TYPE
CALYSTEGIA TYPE
LYSIMACHIA
ATRIPA
SOLANUM
DIGITALIS TYPE
MELAMPYRUM
MENTHA TYPE
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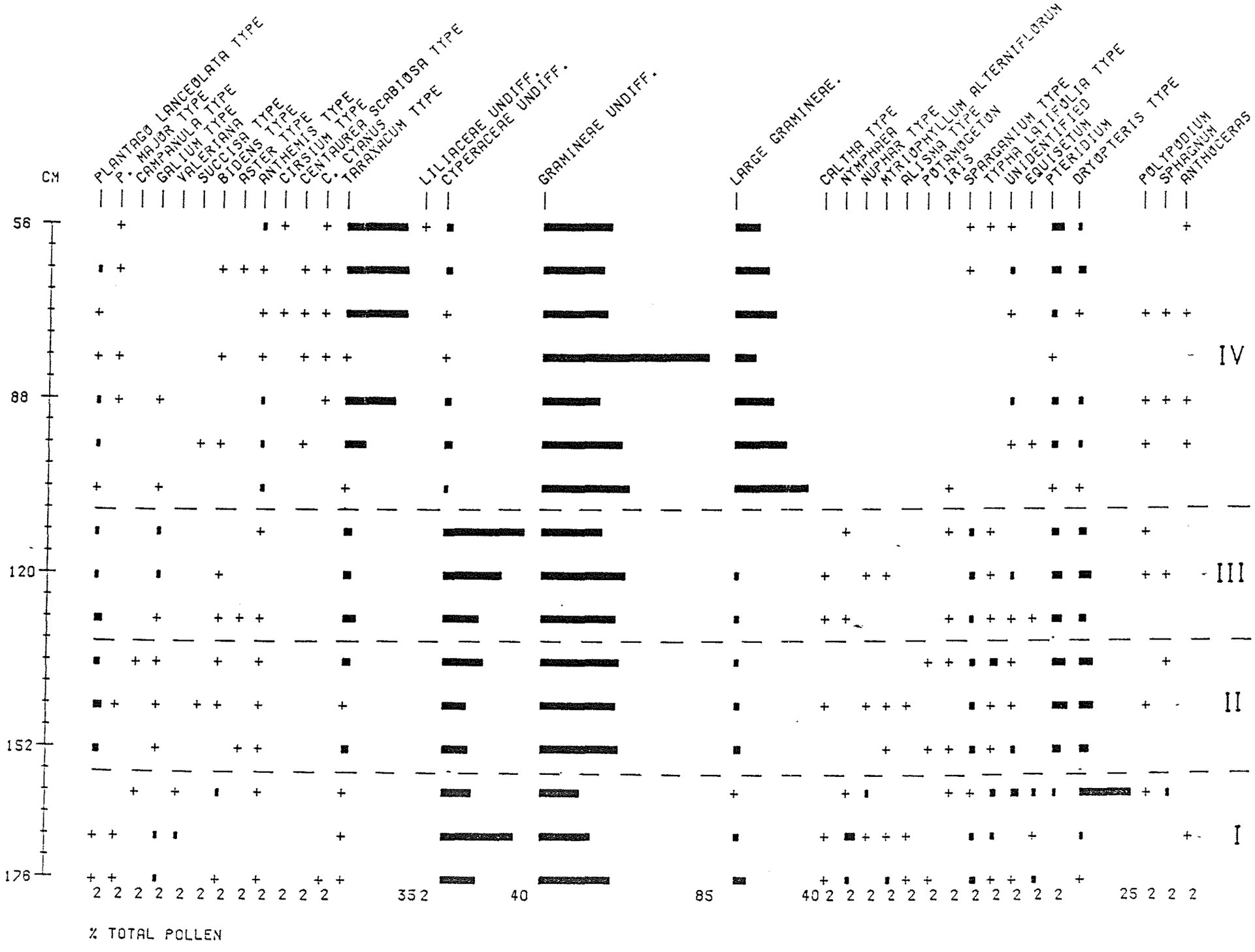
CM
PLANTAGO LANCEOLATA TYPE
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GALIUM TYPE
VALERIANA
SUCCISA TYPE
BIDENS TYPE
ASTER TYPE
ANTHEMIS TYPE
CIRSIUM TYPE
CENTAUREA SCABIOSA TYPE
C. CYANUS
TARAXACUM TYPE
LILIACEAE UNDIFF.
CYPERACEAE UNDIFF.
GRAMINEAE UNDIFF.
LARGE GRAMINEAE.
CALTHA TYPE
NYMPHAEA
NUPHAR TYPE
MYRIOPHYLLUM ALTERNIFLORUM
ALISMA TYPE
POTAMOGETON
IRIS
SPARGANIUM TYPE
TYPHA LATIFOLIA TYPE
UNIDENTIFIED
EQUISETUM
PTERIDIUM
DRYOPTERIS TYPE
POLYPODIUM
SPHAGNUM
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