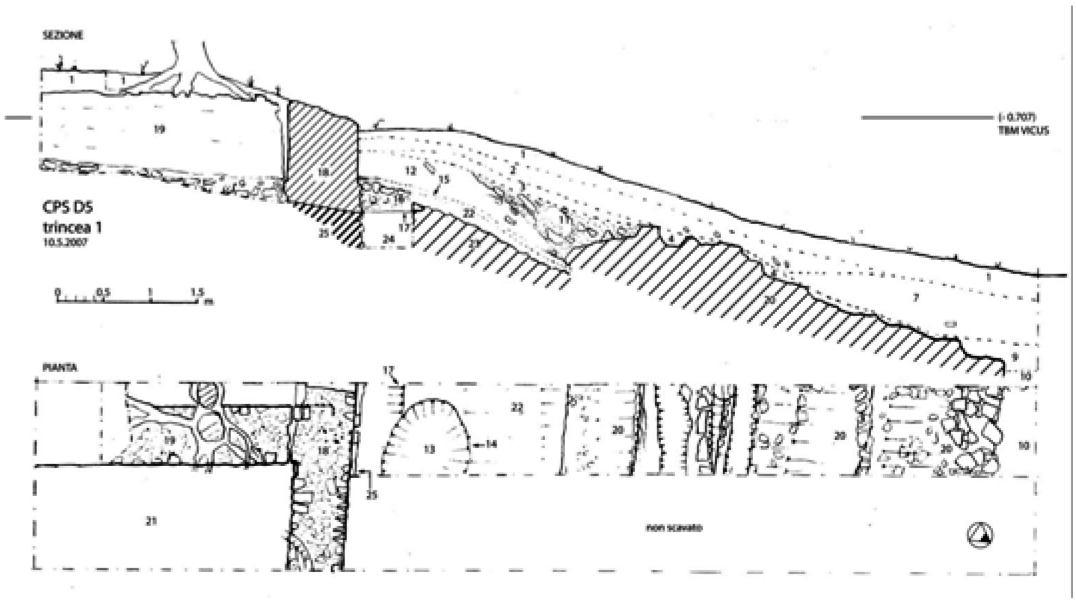
6.1 Results of analyses of bulk samples from archaeological excavations at Castelporziano

Summary

As well as taking cores from the dune slacks, bulk sediments from the archaeological excavation were analysed for archaeobotany remains, i.e. seeds, as well as molluscs, stonewort oospores, bryozoan statoblasts, daphnia ephippia, and geochemistry. The bulk samples were from the *Vicus* (the village part of the Roman settlement) and D5 (a fishpond). Additional material came from the excavation archives, which contained all the molluscs found during excavations over a fifteen year period, and molluscs found during flotation of other bulk material from the Vicus.

CPS 07 D5 Tr. 1 (1)
CPS 07 D5 Tr. 1 (5)
CPS 07 D5 Tr. 1 (6)
CPS 07 D5 Tr. 1 (7)
CPS 07 D5 Tr. 1 (8)
CPS 07 D5 Tr. 1 (9)
CPS 07 D5 Tr. 1 (10)
CPV 02 H3 11
CPV 02 H3 16
CPV 03 YG 24
CPV 04 YG 52
CPV 04 YG 81
CPV 05 YH 10
CPV 07 H Tr. 9 (6)
CPV 07 H Tr. 9a (1)
CPV 97 SA 69

Table 6: Locations of bulk sediment samples (CPV = Vicus; CPS = Survey)



Excavation plan of D5 Trench 1

Results

Molluscs

The molluscs from the flotation of excavation samples from the *Vicus* showed the presence of four species (Table 1): *Astarte Sulcata, Eobania vermiculata, Turritella communis* and *Truncatella pulchella*. Each species indicates different aspects of the local environment: *A. Sulcata* shows that this area of the Vicus was built on a peaty/sandy soil*; E. vermiculata* indicates a dry coastal location; *T. communis* and *T. pulchella* confirm that, at this time, the Vicus was located closer to sea than at present.

The second set of molluscs came from the excavation were all marine in origin, with the key species being *Donax variablis* and *Ostrea edulis* (figure 83), which can both be used as food. The samples came from four areas, Via Severiana, Street B (of the Vicus), the forum and building Y of the Vicus, which showed high abundances of remains, particularly the species *D. variablis* and *O. edulis*, whereas other areas did show the presence of molluscs, but not in as high numbers as these areas and only contained *D. ariablis* and *O. edulis*. Could the *O. edulis* have been growing in the fish ponds or were they living locally? Given the pottery dates for the contexts they were found, 1st century AD at the Via Severiana and Street B, this is later than the earliest pottery dates associated with the use of D5 from 1st century BC.

Context (CPV 86)	Astarte Sulcata	Eobania vermiculata	Turritella communis	Truncatella pulchella
11 (1)	6	0	0	0
23 (8)	0	0	2	0
27 (6)	0	0	1	1
27 (7)	0	0	0	3
28 (9)	2	1	2	0
28 (10)	1	0	0	0
40 (12)	0	0	1	1
43 (13)	6	0	10	0
54 (17)	0	0	1	2
66 (20)	0	2	1	0
70 (21)	0	0	5	0
72 (22)	2	0	1	0
80 (25)	2	0	2	0
87 (31)	1	0	0	0

Table 1: Molluscs from flotation samples

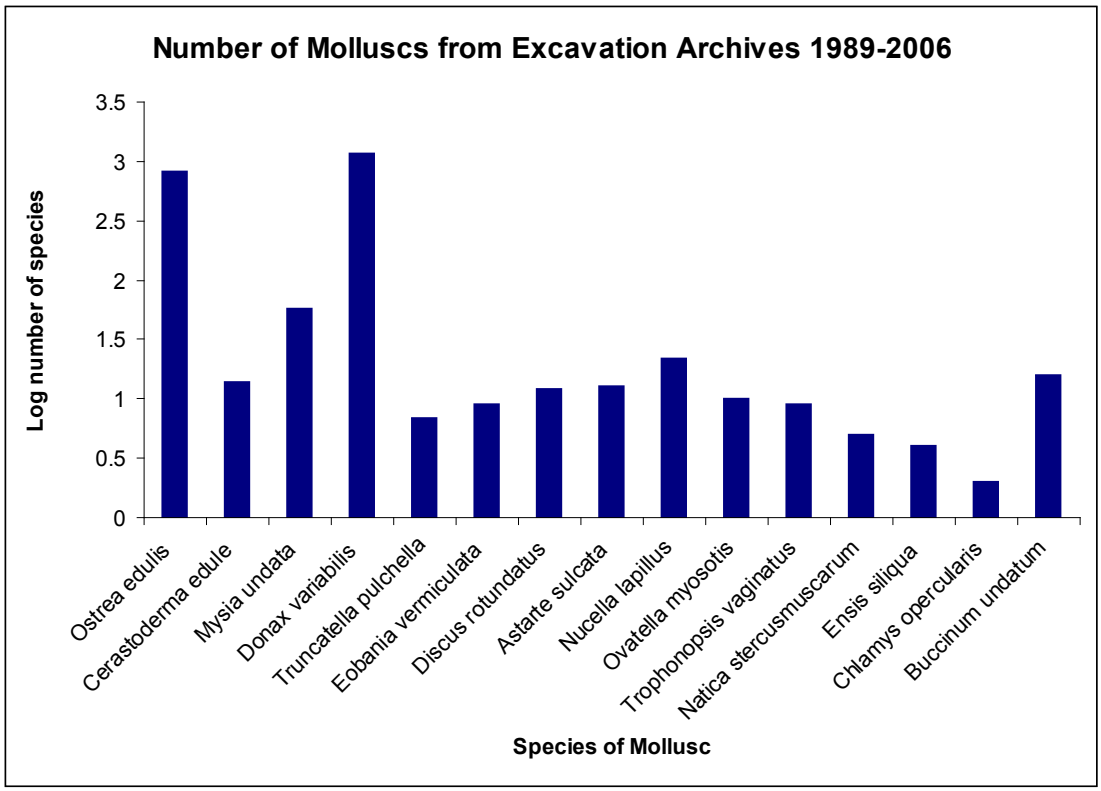


Figure 1: Log of individual species count from Excavation archives 1989-2006

Only two of the seven bulk sediment samples from D5 showed the presence of molluscs (Table 2), with context 9 showing the presence of *Zonitoides nitidus* and *Phenacolimax major* and in context 10 only *Acroloxus lacustris* was present. The presence of *Z. nitidus* and *P. major* show the local environment of D5 from context 9 to be either an alder carr and sedgy grassland. Whereas *A. lacustris* found in context 10, shows the presence of a marsh-type environment, which may relate to the pre-Roman environment of D5, as this was not established using material from core 5.

Trench 1/ D5 Context number	Zonitoides nitidus	Phenacolimax major	Acroloxus lacustris
9	5	3	0
10	0	0	6

Table 2: Molluscs from D5 bulk sediment

Archaeobotany

The results of the seeds, bryozoan statoblasts, daphnia ephippia and stonewort oospores in the bulk sediments from D5 varied in presence within the context but show general agreement with the molluscs of contexts 9 and 10, in terms of local environment. Context 9 shows the presence of *B. pubescence* and *Carex sp*. which would support the interpretation of a sedge or alder carr environment. Whereas context 10 shows the presence of grasses and a specific form of grass, Festuca,

which can be found in marshes, with the chara oospores indicating the presence of freshwater. The other contexts show the presence of seeds that would fit with a local wetland environment, similar to that found in context 9. Bryozoan statotoblasts were absent, apart from at context 5, and daphnia ephippia were absent from all contexts.

Geochemistry

The geochemistry results from the bulk samples of D5 (Table 4) are harder to interpret without a depth, however if on examination of the results with the excavation drawings some remarks can be made. Based on the previous results, of molluscs and plant macrofossils, then context 1 is the modern top soil and context 10 is the bottom of the trench, which may indicate the pre-Roman level, when compared with the findings of core 5. Context 9 is the context that may cover the Roman period, which shows high levels of phosphorous, and sulphur, which would agree with the with the absence daphnia ephippia and bryozoan statoblasts. Context seven, although not shown on the excavation drawing, shows the same high levels of phosphorous and sulphur as context 9, and in core 3 Juncus effusus was also found with the absence of Betula pendula, which suggests this to may be a Roman layer. This correlates with the finding in the cores 3 and 14 of eutrophication at the adjacent fish pond of D6, with the phosphorous and sulphur cycles associated with eutrophication, although dune slack groundwater has been found to have high levels of sulphate (Stuyfzand 1993). The levels of lead throughout the contexts is lower than found in other studies such as Settle and Paterson (1980), Hong *et al.* (1994) Shoytk *et al.* (1997), Renberg *et al.* (2009), which have suggested heavy pollution in the Roman period due the use of lead in this period. However, the source of lead in this context is more likely to be related to leaching from the lead pipework found during excavation, relating it to the Roman use of the site as a fishpond, rather than smelting (and there is no archaeological evidence to date of industry at Castelporziano).

Discussion

The results from the mollusc archives and flotation samples add to the picture of Roman life at Castelporziano, indicating aspects of diet, and the general environment at the Vicus. The results from the analysis of samples taken during the excavation of the D5 fish pond are valuable for reconstructing the environment there, as the presence of macroremains in core 5 did not extend to Roman period. Analysis of the bulk sediment shows evidence for eutrophication, with high levels of sulphur and phosphorous, leading to the absence of the bryozoan *Plumatella repens* at both sites, and possible absence of Chara oospores being related to the increase of local fires, as noted in core 3 and context 7. The phosphorous levels may also be an indication of anthropogenic impact, which would further aid contexts 7 and 9 being of Roman date, and context 1 being the current top soil (as indicated in the excavation drawing/figure1). General sources of anthropogenic phosphorus include: human waste; refuse, especially organic discard derived from bone, meat, fish, and plants; burials; and ash from fires. The levels of chlorine in contexts 9 and 10 appear to be far higher than the other contexts, which maybe related to the nearshore position of the site at that time. The other elements relate to the minerals discussed in the pilot study in regard to core 1, and not directly to the environment. The seeds suggest that the local environment of D5 changed from a fixed dune (similar to base of core 3), to a birch and sedge fen.

Trench 1/ D5 Context number	Quercus	Betula	Carex	Juncus	Eleocharis	Poaceae	Festuca	Chara oospores	Plumatella repens statoblasts
1	5	0	0	0	0	0	0	0	0
5	0	17	0	0	0	0	0	4	2
6	0	17	4	0	7	0	0	2	0
7	0	0	0	1	0	0	0	0	0
8	0	4	0	5	0	0	0	5	0
9	0	19	1	0	0	0	0	3	0
10	0	0	0	0	0	23	5	3	0

Table 3: Archaeobotany results from D5 bulk sediment

Trench 1/ D5 Context number	Na	Mg	Al	Si	P	S	Cl	K	Ca	Ti	Fe	Ni	Hg	Pb
1	2.16	1.38	4.68	26.07	1092.0	42.4	194.2	1.52	2.66	0.1955	3.25	111.9	4.7	104.3
5	1.55	1.02	2.85	18.03	634.0	42.0	100.0	1.01	3.93	0.1568	2.15	69.8	5.0	209.0
6	2.18	2.80	2.32	24.21	419.0	27.0	99.7	1.07	1.05	0.1556	2.53	104.6	4.6	100.5
7	1.56	2.34	2.80	13.36	792.0	51.2	136.1	0.68	0.86	0.1234	2.34	49.3	5.0	125.5
8	1.95	1.22	2.34	23.61	419.0	20.0	82.9	1.08	1.06	0.1388	2.41	100.7	5.7	87.1
9	2.09	1.04	3.23	25.19	722.0	81.0	526.5	1.23	0.95	0.1206	2.15	82.9	6.7	72.9
10	2.02	1.13	3.11	16.29	686.0	47.4	540.3	1.61	0.84	0.1355	3.22	74.8	8.0	89.3

Table 4: Geochemistry from D5 bulk sediment

**Na, Mg, Al, Si, K, Fe and Ti are in %; P, S, Cl, Ni, Hg, Pb all in ppm (parts per million)*