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A life of luxury in the desert? The food and fodder supply to Mons Claudianus

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The site: its setting and inhabitants

Mons Claudianus, a quarry settlement known for its granodiorite which, as an imperial monopoly, was used for imperial building projects in Rome, lies in a remote part of the Eastern Desert of Egypt, some 500 km south of Cairo and 120 km east of the Nile, at an altitude of *c.*700 m in the heart of the Red Sea mountains (fig. 1). The site itself consists of a walled, defended settlement (or fort), animal lines (stables), a granary, wells, cisterns, a cemetery, temple, and bath-house, as well as substantial midden deposits (fig. 2). The archaeological remains are remarkably well preserved, and many buildings stand to roof height. The most intense occupation of the site occurred during the late 1st and 2nd c. A.D. Between 1987 and 1993 work was conducted under the auspices of the Institut Français d'Archéologie Orientale, Cairo by kind permission of the Egyptian Antiquities Organisation. The work was directed by Prof. J. Bingen with H. Cuvigny as chef de chantier, supported by an international team of archaeologists and papyrologists.

There is no archaeological evidence for permanent settlement in the Eastern Desert with the exception of the Roman quarry-settlements and way-stations (see below), nor is there evidence that agriculture was practised. The area was, and is, sparsely inhabited by Bedouin (Hobbs 1989). Most of the Eastern Desert is classified as hyper-arid: mean annual rainfall is 5 mm, though this figure does not reflect recurrent rainfall but 'accidental' cloudbursts; indeed, some years see no rainfall (Zahran and Willis 1992). The present arid conditions have prevailed since *c.*3000 B.C. (Butzer 1961, 1976; Zahran and Willis 1992). This means that the settlement at Mons Claudianus must have been supplied with food from elsewhere, most probably from the Nile valley, a journey of some 5 days in antiquity.

We do not know exactly how many people lived at Mons Claudianus. The number will have varied over the years but the presence of 920 people on a particular day has been recorded (*O.Claud.* inv. 1538 + 2921: Maxfield 1997, 95). To this figure we can add those working at the way-stations (thought to be some 30 at each station: Maxfield 1996) and those accompanying the transport of stone and the food caravan. The supply of food for so many people and over such a distance was obviously a major undertaking. Despite references in Josephus (*BellJ* 6.418) that Jewish captives were being sent to mines in Egypt, and in Aelius Aristides (*Aeg.* 67.5.12) mentioning the use of convicts at Mons Porphyrites, there is no documentary or archaeological evidence from Mons Claudianus for the use of forced labour. The ostraca refer to 4 groups of people: soldiers and officials (the site was administered by the army); skilled, civilian workers; unskilled workers; and women and children (*O.Claud.* I; Bülow-Jacobsen 1996; Cuvigny 1996). The skilled workers and many of the soldiers came from villages in the Nile valley and it is clear from the ostraca that their families continued to live there (Bülow-Jacobsen in *O.Claud.* I; Cuvigny in *O.Claud.* I; Cuvigny 1996).

Analysis of the biological data recovered from midden deposits at the site has indicated that a vast range of foodstuffs was available. The biological data from Mons Claudianus rank very high in terms of quality of preservation and abundance. The same arid conditions that made (and make) agriculture impossible in the area are responsible for the remarkable preservation of the site — and more specifically of the foodstuffs thrown away by its inhabitants. In addition to 3 large middens located immediately outside the walls of the settlement, there are refuse deposits in many rooms inside the fort, often filling the rooms to the ceiling. These deposits are full of organic materials such as wood, charcoal, seeds, fruits, straw, chaff, fibres,

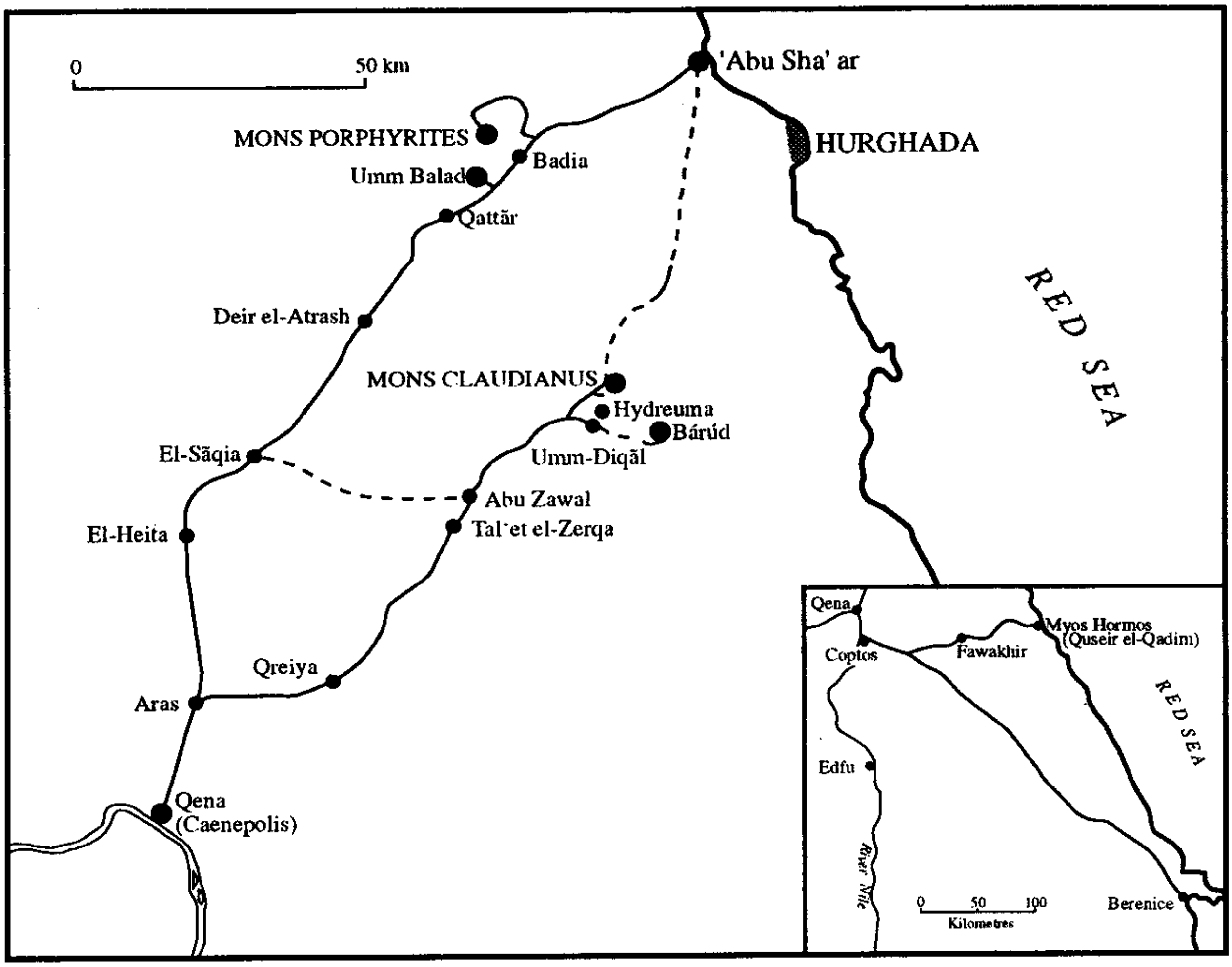

Fig. 1. Map of part of the Eastern Desert showing the Roman road from Mons Claudianus to the Nile valley and the sites mentioned in the text (after fig. 1.1 in Peacock and Maxfield 1997).

textiles, leather, and animal and fish bones. Most of this material is preserved in the state in which it was discarded, in desiccated form, as the extreme aridity at the site has prevented most, if not all, bacterial decomposition. Even though some of the faunal remains were damaged by salt impregnation (Hamilton-Dyer in press), the preservation of the biological remains was exceptionally good (flesh and hide were still present on some of the bones, and even onion skins were found). The amount of material available for study was therefore much greater than that encountered on most archaeological sites, and the analysis of the remains has raised many methodological issues which will be discussed elsewhere. Detailed specialist reports on the faunal and botanical evidence, including data tables, descriptions of the data, and discussions on quantification, sampling strategies and other methodological issues will be published in Maxfield and Peacock (in press). In advance of this, I have thought it worthwhile to bring a synthesis of the analysis of the faunal and botanical evidence for the food-supply to the attention of a general audience. The preservation of the biological remains at Mons Claudianus permits a detailed reconstruction of the food-supply to this quarry site, and eventually a detailed comparison between the archaeological material and the documentary information contained in the ostraca will also be possible. Over 9000 ostraca have been recovered, concerned with the organisation of the settlement, including the organisation of the food-supply.[1]

1 The first 387 of the ostraca have been published in *O.Claud.* I-II (1992, 1997).

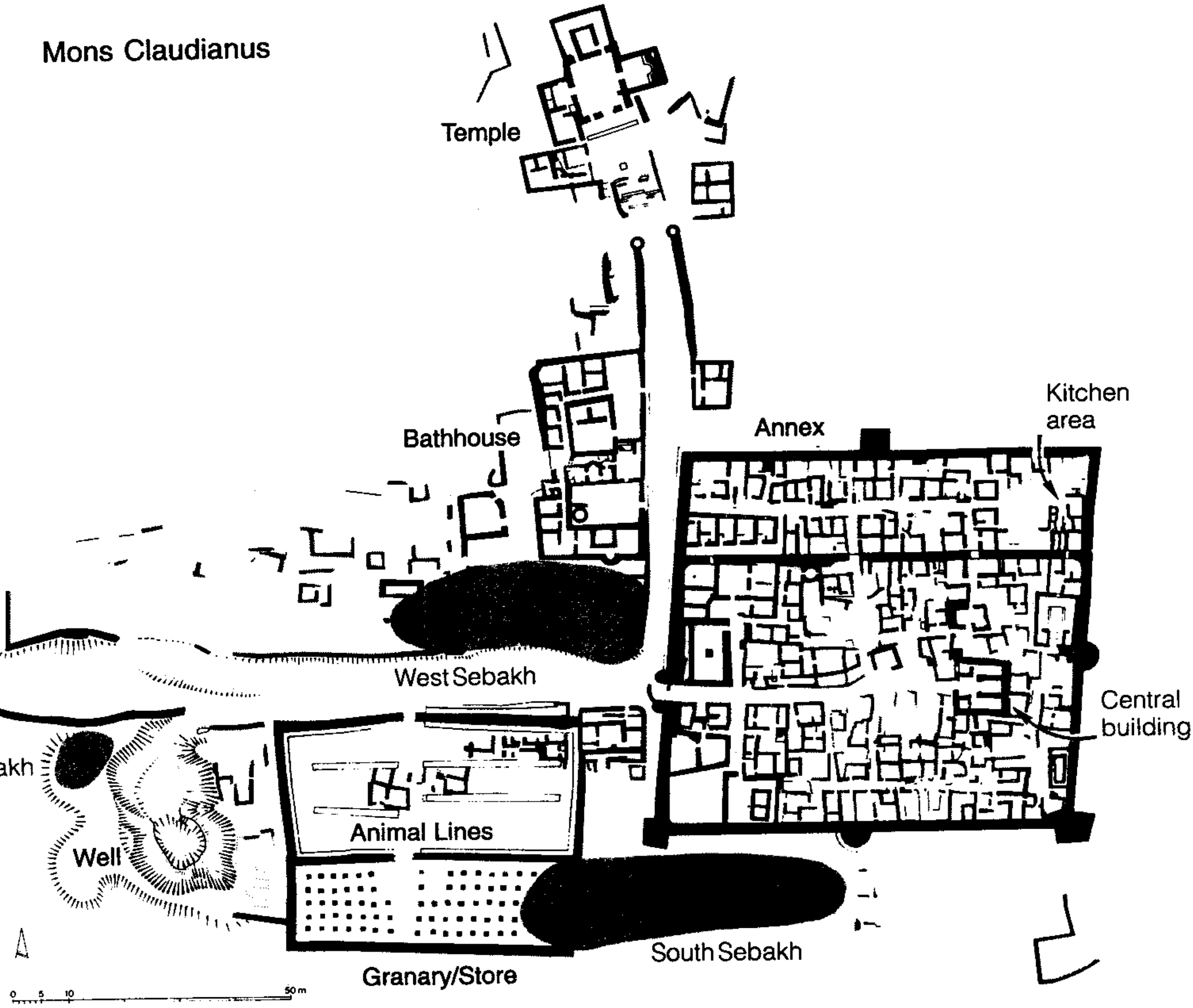

Fig. 2. Plan of the Roman complex at Mons Claudianus (after fig. 2.3 in Peacock and Maxfield 1997). *Sebakh* is arabic for midden.

The faunal evidence (with S. Hamilton-Dyer[2])

A full report on the faunal remains will appear in Maxfield and Peacock (in press). A brief summary of the results is given here, based on the unpublished report (Hamilton-Dyer 1996). In total some 22,000 bones were recovered, consisting of domesticates imported for food and work, wild mammals and birds hunted locally for food, fish mainly imported from the Red Sea coast, as well as non-food animals such as dog, fox and cat, rodents and reptiles, and several species of sea shell. The main food species identified are listed in Table 1.

Of the mammal bones those of donkey are the most common, and butchery marks demonstrate that the meat of this animal was eaten. The second most common mammal is pig; the

2 The analysis of the faunal remains was carried out by S. Hamilton-Dyer, and I am indebted to her for allowing me to refer to her unpublished data from which this section is compiled.

age-profile of the bones suggests that weaners were brought in alive, to be fattened up on site. The bones of camel, goat, sheep, chicken, and horse have also been found, but in much smaller numbers than those of donkey and pig. Butchery marks on the bones of camel and horse indicate that these two animals were eaten (Hamilton-Dyer in press). Cattle bones are extremely rare (only one occurrence), unlike at Quseir el-Qadim and Berenice (Hamilton-Dyer in press; Van Neer and Lentacker 1996), but it is possible that meat of this species was imported in the form of processed food (e.g., sausages). Chickens were probably brought to the site alive, like pigs. Other birds and wild animals form only a small part of the bone assemblage: dorcas gazelle, ibex, goose, and sandgrouse are the most common. While these game animals did not contribute much to the protein content of the diet, they did provide important variety, and they reveal some local food resource.

Fish bones are the second most important group of bones: while some freshwater fish were present (notably catfish from the Nile valley), the majority of the fishbones come from large marine fish, such as parrot fish, groupers, and emperors, all of which are common in the Red Sea. Fish and shellfish represents the only category of food that is known to come from the coast; all other foods come from the Nile valley (Hamilton-Dyer in press). Mollusc remains include oysters and the Roman or edible snail. Complete shells of the latter species, which was regarded as a delicacy in Roman times, were found. Most of the other mollusca are likely to have been used for their shells, though some are also edible. In short, the faunal remains demonstrate that the inhabitants had access to a good and varied supply of meat, with donkey and fish providing the main source of animal protein, with pig a major contributor (Hamilton-Dyer in press).

Animals played a vital rôle in the functioning of Mons Claudianus as they brought in all the food for the inhabitants (see also below) and aided the transport of stone to the Nile valley. Until recently it was assumed that camels and oxen were used as draught animals (Meredith 1952; Peña 1989), but results of the present analysis demonstrate that oxen were almost certainly not used in this way (Hamilton-Dyer in press). The abundance of donkey bones strongly suggests that it was the main animal used in the transport of the stone. We do not know exactly how the stone was transported but the use of wagons and/or sledges is likely. The predominant output of the quarries was columns of *c.* 20 feet (Peacock 1997, 264), and they could certainly have been transported on wagons pulled by donkeys, harnessed in long teams. The larger columns, such as the 60-ft column still lying in the 'pillar wadi' near the site and estimated to weigh *c.*200 tonnes, may not have been pulled by donkeys (or any animal, for that matter), as the number of animals needed would have been impossible to control; instead, we may envisage the use of human muscle power, with donkeys providing logistical support (Maxfield 1997, 93; Peacock 1997, 264). Donkeys may have carried the food and water needed by men between their resting places at the way-stations.[3] Camels may be less useful for traction as their anatomy causes harnessing problems (Bulliet 1975; Hamilton-Dyer in press); they were more likely to have been used for communication and for the transport of food and water (they can carry twice the load of a donkey: Hamilton-Dyer in press); however, there is some documentary evidence that they were also employed for transporting columns (Bülow-Jacobsen 1996, n.14). Finally, the few horses may represent cavalry horses.

The botanical evidence

Just over 27,000 seeds and other plant fragments have been identified. The seed assemblage is extremely rich in species: 59 food taxa and 64 wild taxa have been found. The food plants can

3 Along the Roman road from Mons Claudianus to the Nile valley are a number of small forts, spaced at intervals of 20-25 km, which will have functioned as way-stations providing water, food and shelter for the people and animals involved in the transport of the stone (as well as for the caravans bringing food to the site).

be divided into cereals, pulses, fruits, nuts, oil plants, condiments, and vegetables (Table 1).

Table 1. Animal and plant foods recovered from Mons Claudianus
(Hamilton-Dyer 1996, in press; van der Veen in press).

DOMESTIC MAMMALS
Equus asinus, donkey
Sus domesticus, pig
Camelus dromedarius, camel
Capra hircus, goat
Ovis aries, sheep
Equus caballus, horse

WILD MAMMALS
Gazella dorcas, dorcas gazelle
Capra ibex, ibex

BIRDS
Anser sp., goose
Pterocles sp., sandgrouse
Gallus gallus, chicken

MOLLUSCS
Helix pomatia, Roman or edible snail
60 species of sea shell (some edible)

CEREALS
Hordeum vulgare, hulled barley
Triticum durum, hard wheat

PULSES
Lens culinaris, lentil
Pisum sativum, pea
Vicia faba, var. minor, fava bean
Lupinus albus, termis bean
Cicer arietinum, chick pea
Lathyrus cf. *sativus*, grass pea

NUTS
Pinus pinea, pine kernel
Corylus avellana, hazelnut
Juglans regia, walnut
Amygdalus communis, almond

OIL PLANTS
Carthamus tinctorius, safflower
Linum usitatissimum, flax
Moringa peregrina, behen nut
Sesamum indicum, sesame

VEGETABLES
Allium cepa, onion
Allium sativum, garlic
Cynara cf. scolymus, globe artichoke
Lagenaria siceraria, bottle gourd
Lepidium sativum, cress
Brassica spp., cabbage
Beta vulgaris, beet
Lactuca sativa, lettuce
Cichorium endivia/intybus, endive/chicory

MARINE FISH
Scaridae, parrotfish
Serranidae, groupers
Lethrinidae, emperors
Sparidae, seabream
Balistidae, triggerfish
Acanthuridae, surgeons, unicornfish
Carangidae, jacks
Lutjanidae, snappers
Carcharhinidae, sharks

FRESHWATER FISH
Siluridae, catfish

FRUITS
Phoenix dactylifera, date
Hyphaene thebaica, dom fruit
Olea europea, olive
Vitis vinifera, grape
Ficus carica, fig
Ficus sycomorus, sycamore fig
Cordia myxa, sebesten
Citrullus vulgaris, water melon
Citrullus colocynthis, bitter apple
Cucumis cf. melo, melon
Cucumis cf. sativus, cucumber
Punica granatum, pomegranate
Capparis spinosa, caper
Zizyphus spina-christi, Christ's thorn
Citrus medica, citron
Morus cf. nigra, mulberry
Mimusops schimperi, persea
Nelumbo nucifera, Indian lotus

CONDIMENTS
Coriandrum sativum, coriander
Foeniculum vulgare, fennel
Cuminum cyminum, cumin
Apium graveolens, celery
Anethum graveolens, dill
Trachyspermum copticum, ammi
Pimpinella anisum, anise
Nigella sativa, black cumin
Ocimum basilicum, basil
Mentha sp., mint
Ruta cf. chalepensis, common rue
Trigonella foenum-graecum, fenugreek
Piper nigrum, pepper
cf. *Sinapis alba*, white mustard

POSSIBLE FOOD PLANTS
Portulaca oleracea, purslane
Brassica nigra, black mustard

Cereals

Hulled, six-row barley and hard or durum wheat are the two principal cereal crops present; both were common grain crops in Roman Egypt. Barley had been grown since the Pre-Dynastic period, while durum wheat had become the dominant wheat crop sometime during the Ptolemaic period, replacing emmer wheat (*Triticum dicoccum*) (Crawford 1979; Germer 1985; Wetterstrom 1984). The samples also contained a trace of bread wheat (*Triticum aestivum*), here interpreted as a contaminant in the durum crop. It is not clear to what extent bread wheat was grown as a crop in its own right in Roman Egypt; at most sites it has been found in small quantities only, with the exception of sites in the Dakhla oasis (U. Thanheiser, pers. comm.).

There is clear evidence that the barley grain was used for human consumption. The samples contain large numbers of fragments of barley hulls (palea and lemma). The species of barley found at Mons Claudianus (*Hordeum vulgare*) is a hulled barley (the hulls being fused with the outer surface of the grain). The hulls cannot easily be digested by humans and need to be removed before the barley is prepared for human consumption as bread or porridge. By contrast, barley intended for animal fodder does not need to be de-hulled. The hulls are normally torn off the grains by pounding the grains in a mortar, after which the shredded hulls are removed by winnowing or sieving (Hillman 1985). Many of the samples examined contain shredded hulls, indicating not only that the de-hulling of barley was carried out on site but that it was eaten.

Wheat grains are much less common than barley grains. The rôle of wheat in the diet would be difficult to assess correctly on the basis of the archaeobotanical evidence alone. However, ostraca, particularly those from the *entolae*, demonstrate that wheat was an important staple (Cuvigny in *O.Claud* I; 1996). The *entolae* are documents written by the civilian workers, containing monthly instructions to the quartermaster on the site; they indicate that the civilian workers at Claudianus arranged for wheat bread to be delivered to them once a month (see below p. 109). The relative scarcity of wheat grains compared to barley grains in the samples suggests that wheat grains were imported in much smaller quantities, which is both corroborated and complemented by the documentary evidence, which indicates that much of the wheat was brought in as bread, not as grain. In contrast, barley is barely mentioned in the ostraca, yet it is common in the archaeobotanical samples, with clear evidence that it formed a major food for human consumption.

Pulses

Six species of pulses have been found: lentil, pea, fava or broad bean, termis bean, chickpea, and grass pea. Lentils are numerically the most common species, while grass pea is rare and may represent a fodder crop. Pulses provide an important source of protein in areas of the world where animal protein is scarce, often forming a substitute for meat: while their protein quality is not very high in itself, it will approach that of meat once combined with cereals (Fidanza 1991). They are also low in fat and provide carbohydrates and dietary fibre. Pulses store well and can be transported over long distances. Of all the pulses found, lentils are likely to have been an important staple food at Claudianus; by contrast the fava bean, the main ingredient in classic Egyptian dishes such as *ful medames* and *ta'amiya*, is not common, suggesting that the popularity of these dishes dates from after the Roman period.

Fruits and nuts

A total of 18 different species of fruit were found. Four are classic Mediterranean species — olive, grape, fig, and pomegranate. Others are native to Egypt or of African origin: dates, dom fruits, sebesten, sycamore fig, watermelon, bitter apple, melon, Christ's thorn, caper and persea. Still others originate from India (citron, cucumber, and Indian lotus), or Persia (mulberry). The varied origin of these fruits highlights the position of Egypt at the cross-roads between different continents. While some of these fruits occur in small numbers only, others are very common — dates, olives, grapes, figs, watermelon and sebesten — and must have been staples. All of them were cultivated in Egypt in Roman times. The presence of citron is noteworthy: it was the first of the citrus fruits (all native to SE Asia) to arrive in the Mediterranean world. The citron was cultivated in Graeco-Roman Egypt (Schnebel 1925) and was used both medicinally and as a condiment in meat dishes (the fruit flesh is very acid and not eaten on its own). Today it is used in the preparation of candied peel. The fruit is also associated with the Jewish Feast of the Tabernacle (Van der Veen in press). Records for the others (lemon, orange, etc.) do not exist before the 11th c. (Simmonds 1976; Zohary and Hopf 1994).

Nuts are rare but 4 species have been found: pine kernel, hazelnut, walnut, and almond. As none of these is native to Egypt, they may all represent imports from the Mediterranean, although the last three could have been grown in the Fayum (Schnebel 1925). All were expensive in Roman Egypt and are likely to represent luxury foods (R. Bagnall, pers. comm.).

Oil plants

Four species have been grouped under the category 'oil plants': safflower, linseed, behen nuts, and sesame. The first two were commonly grown in the Nile valley, the third species could have been collected from trees growing in the Eastern Desert itself, whereas the origin of sesame is uncertain, although by the Roman period the species is thought to have been grown in Egypt. The seeds of all 4 species contain edible oils which were used in cooking, and the seeds of all but the behen nuts were probably also eaten (roasted, mixed in bread, or porridge). There is one further oil plant, the olive (the oil being extracted from the fruit, not the seed). Olive oil was imported to Mons Claudianus in large quantities, as witnessed by the pottery assemblage (Tomber 1996 and in press). The many olive stones found at Claudianus are interpreted as representing table olives.

Condiments

Fourteen species (mainly herbs, but including one spice) have been grouped under the category of 'condiments'. Seven of them (coriander, fennel, dill, celery, cumin, ammi, and anise) are members of the umbellifer or carrot family, and seeds of all are used as flavourings in a range of different dishes, while the leaves of coriander, fennel, dill, and celery are also eaten. The latter four are widely used as anti-flatulents, often combined with cabbage and pulse dishes for this purpose. Most of these species originate in the Mediterranean and Near East and were widely grown in Egypt, but ammi is native to India. Few records are available for this species (Samuel 1995) and it is not known whether it was grown in Egypt or whether it represents an import from India. Black cumin is native to W Africa but was already widely grown in Egypt in Pharaonic times (Hepper 1990). The seeds of this species today are primarily used as a flavouring sprinkled on breads and cakes (Zohary 1982). The seeds of fenugreek are added to both sauces and breads, and its leaves are used as a vegetable. Mint, basil and rue are used as leaves, not seeds, and the fact that the seeds were found at Mons Claudianus suggests that these species were grown on site as pot herbs. Mustard is only tentatively identified. There is one seed which may represent white mustard (*Sinapis alba*), and several hundred seeds of black mustard (*Brassica nigra*), but the latter species is also a common weed in Egypt and may represent a contaminant of cereal crops rather than a deliberate import. Mustard may have been brought in as a processed food rather than as seeds. The only true spice is pepper. Pepper corns were imported from India during the Roman period via the Red Sea ports of Berenice and Myos Hormos.[4] At both these sites pepper corns have been found — at Berenice in large quantities (Cappers 1996; Wetterstrom 1982). We should assume that pepper represented a luxury item at Mons Claudianus since only two pepper corns were found.

Vegetables

Of great interest is the discovery of 9 species of vegetables, as vegetables are commonly

4 Peacock (1993) has convincingly argued that Myos Hormos should be equated with Quseir al-Qadim; this has since been corroborated by the discovery of ostraca naming Myos Hormos from El-Zerqa, located on the Coptos – Quseir road (Bülow-Jacobsen *et al.* 1994).

Of great interest is the discovery of 9 species of vegetables, as vegetables are commonly under-represented in the archaeobotanical record (Willerding 1991; Zohary and Hopf 1994). Onion and garlic have a long history of cultivation in Egypt. They can be stored for long periods and are easily transported. Globe artichoke is found in only a few deposits and is likely to have been a luxury; the remains found, consisting of the fleshy bracts of the flowerhead, represent, to my knowledge, the first archaeobotanical record of this species. The bottle gourd is now mainly grown for the dry, hard shell of the fruit which is used as a container for liquids, but the young fruits were, and are, boiled and eaten as a vegetable. The remaining 5 species of vegetables are cabbage, beet (leaf or spinach beet), cress, lettuce, and endive/chicory, often referred to as 'greens'. The presence of all these vegetables is very important as they provide a valuable source of vitamins and minerals, especially Vitamin C and iron.

Five of these vegetables (cabbage, beet, cress, lettuce, and endive/chicory), as well as three of the condiments (mint, basil and rue), are eaten as green leaves, not seeds. The presence of the seeds of these species is therefore significant: all these species are eaten before the seed is formed (i.e., before the plants have 'bolted') and it is unlikely that seeds would have been found at Mons Claudianus if the vegetables and herbs had been imported from the Nile valley as leaves or 'greens'. Imported vegetable plants would rarely contain seeds; in the case of lettuce, endive/chicory, mint, basil and rue, which were present as just a few seeds, it is possible that the seeds came in attached to the leaves, but the seeds of cabbage, beet, and cress were found in such numbers and in so many different samples that we must conclude that these seeds were brought in deliberately in order to be cultivated at Mons Claudianus itself. This, in turn, suggests that the inhabitants (or at least some of them) maintained small plots or gardens in which they grew green vegetables and herbs, revealing another source of food. Water must have come from the wells, and there would have been ample manure in the form of animal dung and *sebakh* (midden deposits) to create a good garden soil. The occupants of the site would have been familiar with the use of midden deposits as fertilizer (they were commonly used for that purpose in the Nile valley: Schnebel 1925). The growing of vegetables is also attested by the ostraca: requests for and delivery of vegetables and, in one case, seeds (*O.Claud.* 232) are recorded in several letters, and the sending of water and dung is mentioned in connection with a comment that 'the vegetables have not yet grown' (*O. Claud.* 280; Bingen 1997; Bülow-Jacobsen in *O.Claud* I-II).

Possible food plants

A final category of food plants, the 'possible food plants', can be noted. This category concerns species that are known in Egypt as both crops and common arable weeds. There are no morphological differences between the seeds of wild and cultivated varieties, making distinction between them impossible when only archaeobotanical information is available. Black mustard, already mentioned, is one such species; purslane, a green vegetable plant used in salads and in stews, is another; it was eaten in Roman Egypt and is mentioned in ostraca from the Wadis Hammâmât and Fawakhir (*Sittungsberichte* 6.9017 nr.9 lines 14-15, ἀνδράχνη; cf. Ruffing 1995, note 79).

The food-supply

The faunal and botanical remains clearly demonstrate that the food-supply to Mons Claudianus was not restricted to a few basic staple foods, but that a wide variety of staples and luxuries was brought in. The inhabitants of the settlement had surprisingly good access to foodstuffs which could make up a healthy, balanced diet of carbohydrates (barley, wheat, pulses), protein (meat, fish, pulses, nuts), sugars (dates, figs, grapes), fats (meat, olive oil, and oil-containing seeds), and minerals and vitamins (fruits and vegetables). They also had a wide range of flavourings (condiments) available, with which they could have created a variety of tastes. This was no malnourished or undersupplied desert-station but a settlement which had access to most foods that were available in the Nile valley and the Mediterranean. Local emphasis on protein from donkey and marine fish, rather than from beef, pork and sheep/goat as elsewhere in the Roman world) but did not prevent access to such components. The ceramic evidence has demonstrated that Mons Claudianus was part of a long-distance trade network, receiving amphorae with wine, olive oil and fish products from both the eastern and western Mediterranean (Tomber 1996). To this we can add the import of pepper from India.

It is worth stressing that the environmental data have identified 4 different sources of food-supply: the Nile valley, the Red Sea coast, desert species, and local cultivation. All four are important: the caravan from the Nile valley brought most of the essential staples and luxuries; the supply-route from the coast provided animal protein in the form of marine fish; the desert provided a few plant species and wild animals to add variety to the diet; and local vegetable plots ensured a vital supply of Vitamin C and iron.

A distinction has been made between staples and luxuries. Staples are foods that form the main component of the diet, fundamental to human nutrition, while luxuries are defined as choice foods, expensive and desirable for enjoyment, but not indispensable in terms of nutrient requirements. It is not easy to identify which foods belong to which category as this will vary between cultures and through time. Nor is it possible simply to equate a numerical abundance in environmental assemblages with importance in the diet. Not only are there considerable differences in the number of seeds per plant (e.g., 1 fig contains up to 2000 seeds, 1 grape just 3 seeds), but the cultural and natural processes involved in the formation of the archaeological record influence the chance of certain foods being recovered. It is not possible to classify all foodstuffs recovered in one of these two categories, but what is clear is that both categories of food were present. Obvious staples are fish, donkey meat, barley, wheat (as evidenced by the ostraca), lentils, dates, grapes, olives, and probably onions, as well as wine and olive oil (attested by the ceramic evidence). Luxuries probably included game animals, oysters, snails, artichoke, pomegranate, and persea (all rare), nuts and pepper (expensive), and herbs. Luxuries form an important component of human life: they represent special foods, often purchased for a particular occasion.[4]

Documentary evidence for the food-supply

The archaeological evidence does not provide clear evidence as to who had access to these luxuries but the documentary sources are invaluable. The ostraca yield a wealth of information regarding the food-supply and two types of document are particularly informative: the *entolae* and the private letters (Bingen 1997; Bülow-Jacobsen in *O.Claud.* I-II; Cuvigny in *O.Claud* I; 1996). The civilian workers (*pagani*) who wrote the *entolae* were craft specialists from the Nile valley, drawn especially from the Theban region; they included stone-masons, smiths, and quarrymen. Their pay consisted of a monthly allocation of wheat (1 artaba = *c*.40 litres), a wine-ration, and a salary of (usually) 47 drachmae (Cuvigny 1996). Once a month they wrote down instructions to the quartermaster specifying which foods they wanted and how they wanted their wages spent. From these we learn that they usually arranged for their wheat allocation to be given to their female relatives in the Nile valley to be turned into bread before being brought to the site, and that their salary was used to buy oil, lentils, onions, and dates (Cuvigny in *O.Claud.* I; 1996). We know that the other, unskilled, category of workmen, the *familia*, was also paid a salary (amount unknown) and received 1 artaba of wheat, lentils and oil each month, and, once a year, a set of clothes (Cuvigny 1996). The private letters often concern personal matters but frequently mention foods which have been received or are requested from family and friends (Bülow-Jacobsen in *O.Claud.* I-II), not unlike such references

4 Unlike other living creatures, humans need more than just the right amount of nutrients: we use food to celebrate special occasions, as 'treats', at religious festivals, or as an excuse to socialise. Those who have lived on excavations in the desert will know the feeling when a visitor arrives with a good bottle of whisky or a box of Belgian chocolates.

in the Vindolanda writing tablets (Bowman and Thomas 1994). Meat and vegetables are often mentioned: pigs (*O. Claud.* 138, 148, 150, 153), jars of meat (*O. Claud.* 139, 145), fish (e.g., *O. Claud.* 157, 241, 242), meat and liver (*O. Claud.* 162), beet (e.g., *O. Claud.* 150, 228, 232), cabbage (e.g., *O. Claud.* 226, 229, 255, 256), and 'vegetables' unspecified (e.g., *O. Claud.* 238, 256, 258, 270; Bingen 1997; Bülow-Jacobsen in *O.Claud.* I-II).

It is thought that many of these letters were written by the soldiers (or their families and friends), though as soldiers and civilian workers generally had the same names and as the letters rarely mention the profession of the writer or recipient, it is difficult at present to assess the proportion of letters relating to each group (though a future detailed analysis of the names may provide more information; H. Cuvigny, pers. comm.). It would be unsurprising if the letters, and especially the foodstuffs described, turned out primarily to have belonged to the soldiers. Soldiers earned more than civilian workers (a legionary infantryman earned 100 drachmae per month in 2nd-c. Egypt: Cuvigny 1996; the exact salary of auxiliaries is not known). Yet the civilian workers at Claudianus earned considerably more than their counterparts in the Nile valley, where an average wage was *c.*25 drachmae (Cuvigny 1996), so they are likely to have had a certain amount of spare cash after the purchase of essentials with which they could have bought luxuries. We should remember also that the writing of letters is culturally and socially determined: thus, the workmen at Claudianus may have used other forms of communication to stay in touch with relatives and friends and to acquire extras (e.g., oral messages sent with the food caravan). At present, then, it is impossible to determine whether luxury foodstuffs (nuts, certain fruits, herbs and certain meats) and the produce from the gardens were available to all inhabitants or only to a select few.

Non-food plants

So far we have concentrated on the diet of the site's inhabitants. In the overall composition of the botanical assemblage (fig. 3) food plants make up only a very small component (15% of the total).[5] Cereal chaff and seeds of wild plants are numerically far more important. Many of the seeds of wild plants represent taxa growing in and around the settlement that probably found their way into the middens accidentally. Others are arable weeds that arrived at the site mixed in with crops and chaff. The category of cereal chaff consists primarily of the rachis segments of durum wheat but rachis segments of six-row barley and fragments of straw (culm nodes) are also present. Cereal chaff and straw are common in agricultural villages as they represent the by-products of the cereal harvest. At Mons Claudianus their abundance indicates that these plant remains were deliberately imported for one or more purposes. Several ostraca in fact mention the import of chaff: *O.Claud.* 124 mentions the unloading of "two loads of chaff" at Raima, a fort close to Mons Claudianus, in Trajan's eleventh year (A.D. 108/109); and *O.Claud.* 125 mentions the unloading of "one load of chaff" in the same year. It is not known whether these loads refer to a camel-load or donkey-load, nor are the purpose of the chaff or its origin recorded (Bülow-Jacobsen in *O.Claud.* I, 111-12).

Three purposes for the chaff can be suggested: fodder for working animals, tinder and fuel for ovens and fires, and temper for wall-plaster and mud-brick. The evidence for all three is brief-

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5 The plant remains originate from three types of sample: hand-picked material, large samples and small samples. The hand-picked material represents large seeds and fruits identified by eye during the excavation. Large samples are samples of one basket of sediment (*c.*20 litres) which was sieved through a 2-mm mesh and sorted by eye for small bones and the larger seeds. Small samples are samples of 2 litres in volume, sieved through a mesh of 0.5 mm and sorted under a microscope at x10 - x15 magnification. It is this last category of samples that is used for detailed quantitative analyses, including the construction of fig. 3. As the remains of nuts were recovered only from the hand-picked and large samples, they are not represented on the bar chart in fig. 3. For more detail of the sampling strategy and quantification of the data, see Van der Veen in press.

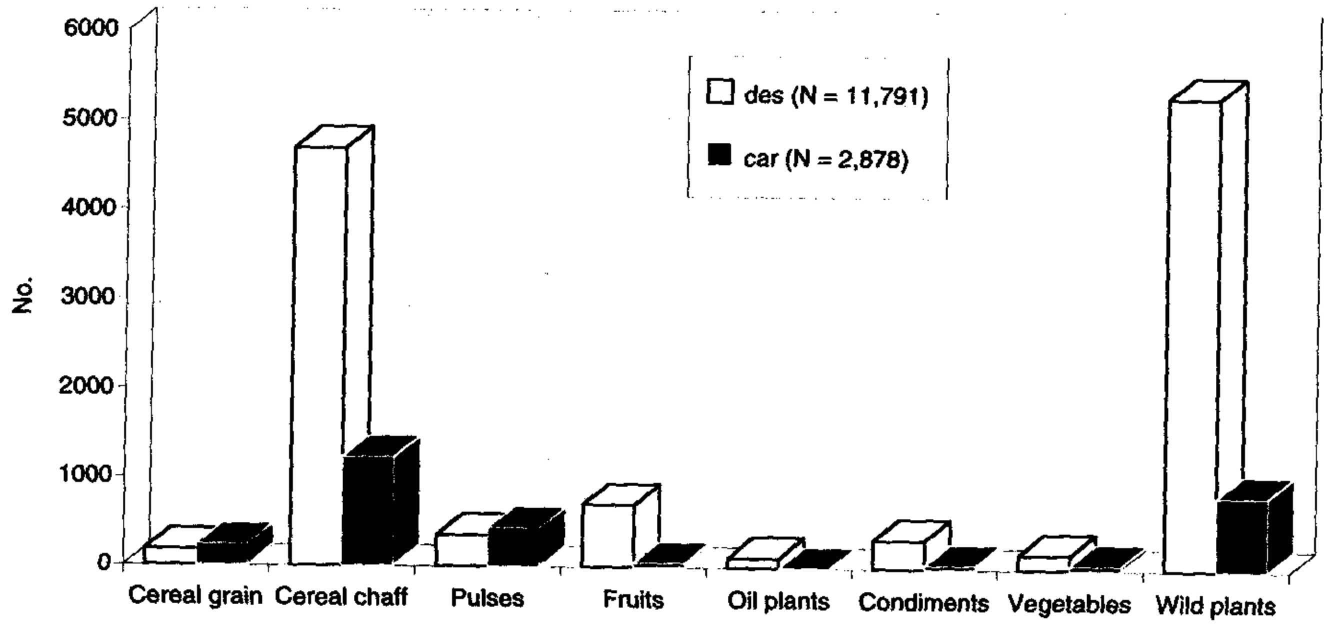

Fig. 3. Bar chart presenting the numerical abundance of the different plant categories present in the overall assemblage, by mode of preservation (based on 67 samples). des = desiccated; car = carbonized.

ly considered here.

(a) Fodder for animals, with an analysis of animal droppings

As noted above, camels and donkeys were the main working animals at Mons Claudianus. They were used to transport food to the site, to deliver water and food to the quarries, to transfer the stone from the quarries to the loading ramps, and to transport stone to the Nile valley. The transport of the food-supply alone would have required a considerable number of animals, all of which needed to be fed on the journey there and back (a round trip of some 10 days). To that we need to add the animals used in transport of the stone and their food requirements on the journey to and from the Nile valley, a journey which, due to the heavy loads, would have taken considerably longer. While we will never be able to calculate the exact number of animals present, it is clear that the amount of fodder required must have been enormous.

Whilst both camels and donkeys could have grazed on desert vegetation, it may not have been present in sufficient quantity along the roadside all year round. Furthermore, both camels and donkeys need concentrates, body-building foods such as barley grain, when being used for energy-intensive tasks. To test whether the camels and donkeys were given cereal chaff and straw as fodder, 4 camel droppings and 3 donkey droppings, with 8 sheep/goat droppings used as a control, were selected for analysis (Van der Veen in press). The macro-fossils in the camel and donkey droppings indicate that both contain cereal, chaff, straw and barley grain. Pollen analysis has established that between 5% and 50% of the pollen in these samples belongs to pollen of Poaceae, the grass family. Cereal pollen are similar but larger than those of wild grasses, and measurements indicate that the majority of Poaceae pollen belong to cereal (fig. 4), unlike the sheep/goat droppings which contain either no or negligible amounts of cereal pollen and no macrofossils of cereals.[7] Thus, both donkeys and camels were given fodder in the form of cereal straw, chaff and barley grain. The use of barley grain as animal fodder is also indicated in *P. Giss.* 69, thought to have originated from Mons Claudianus (Peña 1989). It is a letter addressed to Apollonios, *strategos* of the Heptakomia Apollonipolites nome, dated A.D. 118-19. He is asked to send all the barley in his nome to Qena as a great number of animals had been as-

7 I am grateful to Kevin Edwards and Rob Craigie of Sheffield University for their help with the pollen analysis. It is important to stress here that there is no one-to-one relationship between the percentage of cereal pollen in each dropping and the percentage of cereal-based fodder in the diet of the animal.

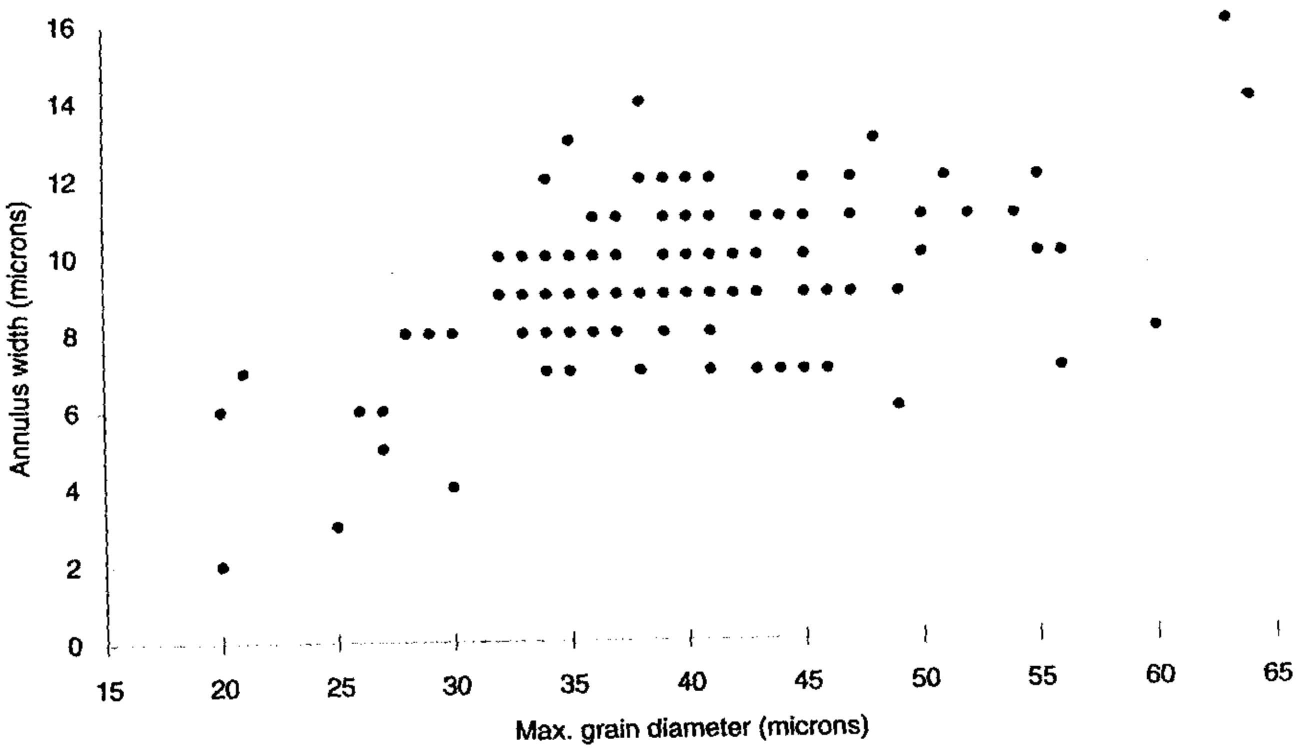

Fig. 4. Scatter plot of measurements of Poaceae pollen (N = 100) from one donkey dropping. Pollen with a maximum grain diameter of ≥ 38 micron and an annulus width of ≥ 8 micron represent cereal pollen; those smaller than this represent cereal *or* grass pollen.

-sembled for the purpose of bringing down a 50-ft column.

Only a few samples have been analysed so far, but brief inspection of a further 15 droppings has indicated that the results are likely to be representative. Vast quantities of cereal chaff and straw, as well as barley grain, must have been brought to the site for fodder. Some will have been blown around the site and accidentally become incorporated in the refuse and midden deposits; some of it will have entered the deposits after it had passed through the digestive system of animals. Complete droppings are found in the samples, but many more must have been present, crumbled into small fragments (donkey droppings are particularly fragile). A considerable proportion of the cereal straw, chaff, and arable weed seeds found in the samples is likely to originate from animal fodder and dung.

(b) Fuel for ovens and fires

Cereal chaff and straw were also used extensively as tinder and fuel. Six samples taken from ashy deposits in and around the cylindrical ovens in the kitchen area (in the SE corner of the Annexe: see Maxfield 1997) consist almost exclusively of cereal chaff and wild plants (fig. 5). The category of chaff in fig. 5 includes both straw and chaff, the latter especially of wheat; the wild plant category is dominated by the seeds and twigs of *Zilla spinosa* and *Cornulaca monacantha*, both of which are small desert shrubs, still growing in the Eastern Desert, and the former is the most common species growing in the wadi today. Charcoal samples from the same deposits contained further evidence for the use of desert species as fuel;[8] 7 of the 16 samples, mostly remains of small twigs, were identified as belonging to desert shrubs (*Leptadenia pyrotechnica, Calotropis procera, Acacia raddiana* type, and Leguminosae indeterm.). Of the 16 samples 4 belonged to *Acacia nilotica*, a species growing in the Nile valley. The majority (80%) of the charcoal samples from the other areas of the site belongs to the same species. Most originate from wood rather than twigs, and are very hard, suggesting that they may be the result of intentional charcoal-making (K. Neumann, pers. comm.). In short, two types of fuel were im-

8 I am grateful to Katharina Neumann of Frankfurt University for these identifications.

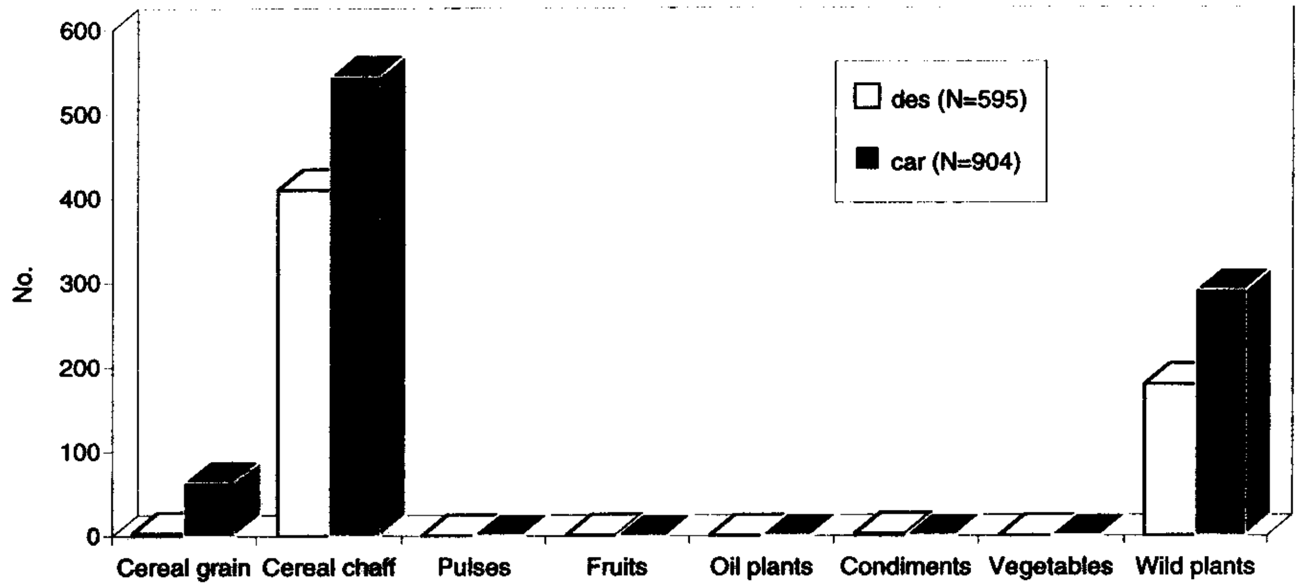

Fig. 5. Bar chart representing the numerical abundance of the different plant categories present in 6 samples from the ovens and associated deposits in the SE corner of the Annexe, by mode of preservation. des = desiccated; car = carbonized.

ported from the Nile valley: cereal chaff and straw for domestic purposes, and charcoal (*Acacia nilotica*) for more specialist use at the smithies (van der Veen in press). Twigs of desert plants growing in the immediate vicinity of the site were also used, but primarily for domestic fires. Cereal chaff was a common fuel used in the bath-houses of Roman Egypt and numerous ostraca record the delivery of chaff for that purpose (e.g., *O. Bodl.* II 1660 and 1667; W. Cockle, pers. comm.). No excavations took place in the bath-house at Claudianus. However, during the survey of the buildings no ash deposits were recorded and there was no evidence for heat or burning on the *pilae*, suggesting that perhaps it was never used (Maxfield 1997, 132). Some of the cereal chaff in the midden and refuse deposits should represent used as well as unused fuel.

(c) Temper for wall-plaster and mud-brick

Most of the rooms and walls inside the fort were constructed of stone, with large stone slabs serving as ceilings (see Peacock and Maxfield 1997); mud-brick was used in only one building (the Central Building: fig. 2). Intact wall-plaster was preserved in some rooms, and in one the plaster was decorated with three layers of wall paintings, including a geometric design, a rural scene of a shepherd with his flock, and a floral design. Samples were collected from the plaster and mud-brick to test whether the tempering used could be another source for the ubiquitous cereal chaff and straw in the midden and refuse deposits.

The results (fig. 6) demonstrate the importance of chaff and straw as a tempering agent in these building materials. Both the plaster and the mud-brick samples contain large amounts of plant remains — more than 300 identifiable fragments per litre. The plaster samples are dominated by cereal chaff, in particular rachis segments of durum wheat. The second most common plant category is that of wild plants, represented primarily by arable weeds (*Brassica nigra, Coronopus niloticus, Crypsis aculata/schoenoides, Francoeuria crispa, Raphanus raphanistrum*, and a small-seeded legume). The mud-brick samples contain approximately equal quantities of cereal chaff and wild plants. Here the cereal chaff contains large amounts of straw, all prepared for the purpose (the fragments are chopped to a length of *c.*2 cm). The wild plants include arable weeds (such as *Francoeuria crispa, Coronopus niloticus*, and a small-seeded legume), but are dominated by the seeds of desert plants (*Forsskalea tenacissima, Zilla spinosa, Trichodesma africanum*, and *Cleome droserifolia*). Both the plaster and the mud-brick samples also contain a few seeds of pulses, fruits, herbs, and vegetables, which suggests that, while the main components of the tempering were cereal chaff, arable weeds and desert plants, some kitchen waste or midden material was also used. Thus, in contrast with the import of other

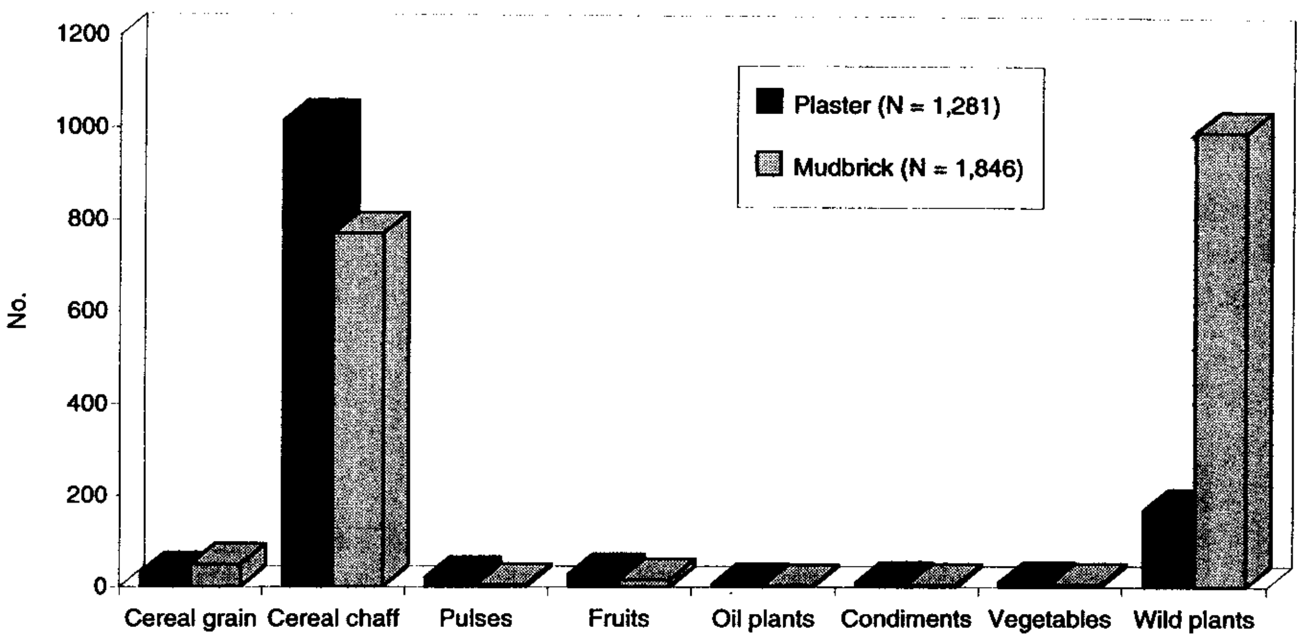

Fig. 6. Bar chart representing the numerical abundance of the different plant categories present in 5 plaster and 5 mud-brick samples (desiccated remains only).

items from the Nile valley, both plaster and mud-brick were produced locally. Small fragments of Mons Claudianus granite were found in all the samples, reinforcing this conclusion. While the amount of mud-brick used at Claudianus is minimal (it would appear that mud-brick is more common in forts nearer the Nile, away from the mountains and from a source of stone, such as El-Heita), the amount of plaster used in the fort is very considerable. If we add the fact that the outside wall of the fort was evidently also plastered (Peacock and Maxfield 1997), large amounts of plaster, and therefore large amounts of tempering, are involved. Some of the cereal chaff and wild plants in the deposits will therefore have originated in unused tempering material, and some from tempering which fell out of decaying mud-brick and especially wall-plaster.

Conclusions: a life of luxury?

Discussions on Mons Claudianus and its neighbour Mons Porphyrites usually focus on the remarkable achievements in terms of the quarrying and the transport of the stone. I would suggest that the logistics of organising the supply of food, fodder and fuel was another extraordinary achievement, on a par with that of extracting the stone.

The faunal and botanical remains recovered have provided a remarkable record of life at Mons Claudianus. They have yielded evidence that a wide range of foodstuffs was transported to the site, primarily from the Nile valley, but fish were brought from the Red Sea, wild animals hunted in the desert, and vegetables cultivated locally. Many inhabitants had access to a healthy and well-balanced diet of staple foods, enriched by a large number of condiments, as well as luxury foods such as game (gazelle, ibex, sandgrouse), snails, nuts (almond, hazel nut, walnut, pine kernel), certain fruits (pomegranate, persea, citron), and certain vegetables (artichoke). The supply of green vegetables from the Nile valley was augmented by those grown in small garden plots at the site itself (cabbage, beet, cress).

Animals played a vital rôle at the site. Without them life would not have been possible: they brought foodstuffs for the workers and soldiers and were employed in the process of transporting stone. Vast quantities of cereal chaff, straw, and barley grain had to be brought to sustain the donkeys and camels. In terms of the functioning of the site, the supply of fodder was as important as that of food for humans.

Considerable quantities of plant remains were imported for purposes other than food and fodder. Cereal chaff and charcoal were imported for fuel, to light ovens and fires in the kitchens and smithies. Cereal chaff and straw were used as tempering agents in wall-plaster and mud-brick. We note the rôle of the by-products of the cereal harvest as an economic resource (van der Veen forthcoming a). The biological data as a whole is being complemented by the evidence from the ostraca. A few examples of how these very different sources of data both corroborate and complement one another have been presented; a more detailed discussion is planned (van der Veen, forthcoming b).

What was the quality of life at Mons Claudianus? The excavations have revealed a temple (dedicated to Serapis), a bath house, and wall-paintings in various rooms, while the midden deposits have also produced jewellery, fine glass tablewares, dice and gaming pieces (Maxfield and Peacock in press), as well as imported pottery, some of it on a par with that found in major Roman ports such as Carthage and Ostia (Tomber 1996). In addition, exploitation of these imperial quarries was facilitated by the import and availability of a surprising variety of foodstuffs. The inhabitants had access to a wide range of luxury foods, although we cannot state how many of them had access to all of those. Yet differences in social status existed throughout the Roman world, and it may be more useful to consider the overall quality of life reflected in the biological and archaeological assemblages. Despite being posted to or working in a remote part of the Roman world, the inhabitants had access to foods that significantly enhanced the quality of their lives. This may well be the most important conclusion: Mons Claudianus was embedded in a complex logistical network linking the Eastern Desert with Rome, the eastern and western Mediterranean, India, the Red Sea coast, and with the Nile valley. The results go far beyond the specifics of this particular site and have implications for our understanding of 'industrial' sites in the Roman world as a whole. Environmental archaeology has a major contribution to make to the study of the history of specialised technology by identifying the nature of the food economy.

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