Reflecting on key themes in the study of plant and insect remains from the Troitsky excavations in Novgorod, 1994-2002

Penny Johnston and Mick Monk, drawing on the work of the late Eileen Reilly

Dedication

This paper is primarily a contribution to honour the memory of Evgenii Nikolaivich Nosov, and to highlight his significant addition to archaeological scholarship. From our perspective, we appreciate in particular his genuine interest in and support for the use of environmental archaeological techniques and his recognition of the potential value of these approaches when studying the development of urbanism in the Slavic lands. This was highlighted by the fact that archaeobotanical studies were a key component of his investigation of the site at Gorodishche. Our colleague Almuth Alsleben, from the University of Kiel in Germany, worked on material from Nosov's excavations (as well as from other sites) over several seasons, culminating in the publication of several scholarly studies into the archaeobotanical remains from Slavic settlements (e.g. Alsleben 1993; 1997; 2001 and 2012). The interesting archaeobotanical remains that Almuth uncovered at Gorodische as the seasons progressed were perhaps one of the factors that prompted Evgenij to encourage environmental archaeological studies at the excavations in Novgorod, these providing some context for the discoveries at his own excavations in Gorodishche.

As well as a renowned scholar, Evgenij was a memorable personality. One of us (Monk) recalls his early encounters with him on the very first trip he made to Novgorod in 1994. 'Evgenij suggested an evening meal by the Volkov just south of Novgorod. We walked to a point where he picked us up by rowing boat to take us to the spot along the river where he, his wife, the site supervisor and the driver, had set up a picnic table and chairs for the meal. There was a lot of salad and bread, plus alcohol. Then Evgenij announced that he would fish for our supper! He put a line out for the fishing and it was probably a while before he caught any fish, which were then cooked on an open fire. It was beautiful evening and little did we know then that many of plants that surrounded us in the flat natural water meadow would be well represented by the seeds that we later found in the samples from Novgorod!'[1]

For us, this paper is also an opportunity to honour the memory and highlight the work of our close friend and colleague Eileen Reilly, who lost her battle against cancer in July 2018. Eileen was an archaeoentomologist who began her career looking at samples from early urban sites in Ireland before coming to Novgorod on two occasions (in 2001 and 2002).[2] Eileen subsequently developed a reputation for pioneering archaeoentomological work that covered early urban sites across Northern Europe including medieval Waterford and Dublin in Ireland (REFERENCES) as well as material from Antwerp (Crabtree et al. 2017) and Novgorod. In

[1] A significant amount of the non-wood remains deposits on the Troisky sites (XI, XII and XIII) for all periods from the 10th to the 14th century were made up plant matter that included plants of damp ground and standing water that could have grown on the site but could also have been collected locally from marsh areas and the water meadows that border the Volkov river in the immediate hinterland of the town to the south and east. This plant material was most likely collected for hay for animal bedding and to stall feed the animals during the winter months, as we discuss in this paper.

[2] The results of her study were published in Reilly (2012).

Eileen's memory, we have devoted this paper to three specific themes that emerged from both the identified plant *and* the insect remains preserved in the deposits that we studied from Novgorod. These themes consider the use of food, fodder and the keeping of animals within the medieval town, the ways in which material from the hinterland of the town appears in the archaeobotanical and archaeoentomological records and the disposal of waste within individual properties in Novgorod. The approach taken in this paper of integrating the insect and the non-wood plant macro-remains is very much informed by the pioneering research of Anglo-Scandinavian and Roman Age environmental deposits in York and the surrounding area by Harry Kenward and Allan Hall of the Environmental Archaeological Unit of the York Archaeological Trust (Hall et al 1983; Hall and Kenward 1990 and Kenward and Hall 1995).

Background and aims

Between us we spent eight excavation seasons working on material from Novgorod; Monk 1994–2002 and Johnston 1997–2002 (with no visit in 2000). We were fortunate that Eileen joined us in 2001 and 2002. Our work concentrated on using a systematic but selective sampling strategy for the plant remains (outlined in Monk and Johnston 2012, 284; Monk and Johnston 2001, 113) and a complementary pilot study for the insect remains (the sampling strategy is detailed in Reilly 2012, 266).

The aim of the plant remains work was to identify the material and, using the resultant dataset, to isolate the different plant groupings by general habitat. This information was then used to explain the presence of the plant remains by reference to the location of the site and other archaeological and environmental evidence. As well as this, we identified different cultural plants, particularly plants like cereals, the products of agriculture, and the remains of fruit-bearing plants that may have been gathered or grown in a managed way.

The study of insect remains was a small-scale project that proved extremely informative, supporting the evidence from the plant remains as well as adding important extra information about the nature of the deposits that formed the site. The ecological indicator evidence from the insect remains cast light on the living conditions of the inhabitants, on the local environment, on human activities in the Troitsky area, as well as provided insights into the condition of the structural timber used in the Medieval buildings (Reilly 2012, discussion 277-280).

Our work focused on deposits from three separate areas of the early city of Novgorod, at Troitsky in the south-west corner of the early urban area. The sites (XI, XII and XIII) were of varying sizes and, along with Site X (which was not sampled), were conjoined, forming a large area of this part of the city that our Russian colleagues excavated during the 1990s and into the early 2000s. The deposits dated from as early as the 10th century, but many of the samples dated to the 12th and 13th centuries. The samples from Site XII were primarily taken from an area within that site that was investigated by a team of excavators from the Institute of Archaeology London, led by Andrew Reynolds. They explored the formation history of the deposits using the single context method of excavation and recording. The samples were designated "Environmental London Samples" or "ELS" (Reynolds and Sudds 2001). The majority of the samples taken for plant remains study came from Site XI.

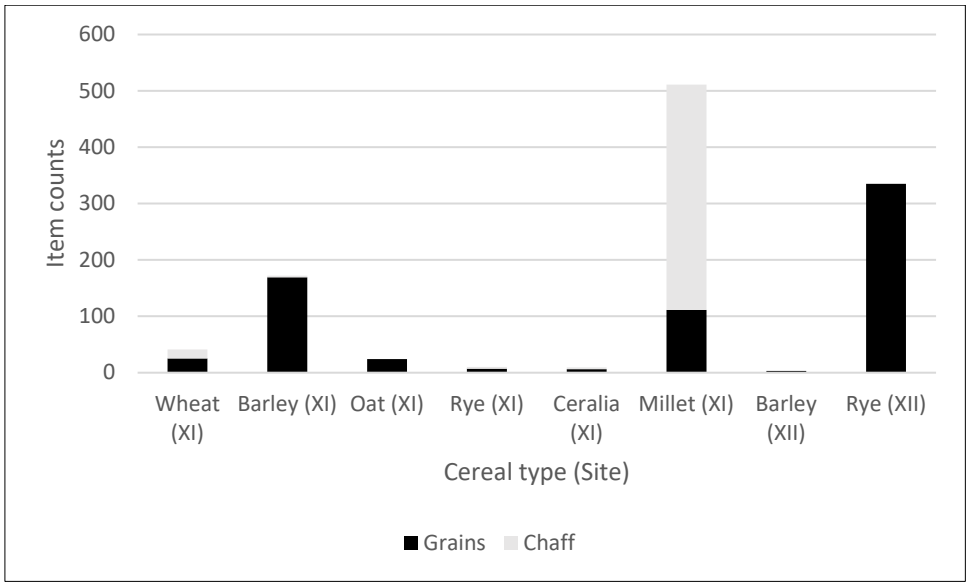
Themes

The plant and insect remains studies highlighted separate and overlapping themes and we have chosen three of the overlapping themes here, to highlight the advantages of combining the results from different proxies when examining the environmental, ecological and economic records from archaeological sites. The themes that we have selected centre around the evidence for the use of cereals as food and fodder within the town, the exploitation of the hinterland for animal fodder and bedding, and patterns of waste disposal (and the evidence that plant and insect remains can provide for this).

Food and fodder: the cereal remains and the insect evidence

Evidence from the plant remains studies indicate that cereals arrived on the site as grain. While we found both isolated, individual instances of charred grains and small caches of charred grain in some samples, they were only found in significant amounts in three deposits, samples 19 and 81 on Site XI and sample 1 on Site XII. These samples were charred in separate conflagrations at the site, with the evidence indicating that stored grain was present within the city and was occasionally destroyed in fires. The results from the caches of charred grain indicate that the grain was mostly barley (*Hordeum* spp.; the grain was indeterminate to species), followed by rye (*Secale cereale),* and, to a lesser extent, oat (*Avena* spp.) at Troitsky XI (Figure 1). The rich cache of grains from Troitsky XII, however, was almost entirely rye (also illustrated in Figure 1). In addition, while evidence for cereals was relatively rare in the anaerobic deposits sampled, some un-charred chaff was recovered; a spikelet fork from emmer wheat (*Triticum dioccum*) and a lemma fragment from oat (*Avena* spp.) were found (Monk and Johnston 2012, 295).

Figure 1: Cereals from Troitsky XI & XII



The most ubiquitous cultural plant remains found in the samples that we examined from Novgorod (Troitsky sites XI) were husk fragments (chaff) of millet (*Panicum miliaceum*). These were found in 50% of all the samples analysed (Monk and Johnston 2012, 295-6 and 304-5).

This high incidence of millet remains in the samples contrasts with the textual evidence for millet from the Novgorod birch bark documents (see Table 1). The corpus of birch bark evidence that we have access to comprises the 915 documents that were discovered in the period up to 2002. These documents were analysed for references to crops and aspects of the domestic economy in papers published and translated into English (Rybina 2001 and Konetskii 2003). This work indicates that there is no reference to millet in these birch bark documents, although other cereals such as oats, wheat, rye and barley are all mentioned (but see discussion in Monk and Johnston 2012, 304–5). This is in contrast to the remains from the archaeological deposits, where the very high representation of millet in the samples contrasts with the generally low presence of other starch grains.

Table 1: References to cereals in birch bark document, by comparison with presence in 66 samples from Troitsky Site XI (Novgorod)

	No. of samples where remains found	**No. of birch bark documents with reference to cereal types***
Millet	33	0
Oat	5	14
Wheat	7	13
Rye	5	34
Barley	9	14

*These figures are based on Rybina 2001 and Konetski 2003.

Most of the references to crops in the documents are in accounts that assess or quantify tribute and similar dues or transactions (Rybina 2001, 127). Rye was the most frequently mentioned cereal in the documents, whereas it was only found occasionally in samples. In addition, rye was only found in contexts that dated before the 12th century AD while the earliest mention of rye in the birch bark documents is from texts dating to the end of the 12th and the beginning of the 13th centuries (Rybina 2001, 127). The evidence suggests that the rye crop was a late introduction to the repertoire of crops grown in the vicinity of Novgorod. When it was first cultivated it could have had high social value and, consequently, a commensurate economic value. This could explain the frequent inclusion of rye as an item of tribute or exchange in birch bark documents and its relative paucity in samples, being worth more than other grain types it may have been relatively scarce (although in the cache of grains discovered at Troitsky XII it was the dominant grain type found). It is interesting to note, in this context, that the number of references to rye in the documents far out-weighs references to the other cereals, which have relatively low occurrence in the documents. There are 34 references to rye alone, whereas the other cereal grains (oat, wheat and barley) are mentioned between 13 and 14 times each (see Table 1).

This analysis suggests that, while the frequent references to rye in the birch bark documents does not match the occurrence within the archaeological samples, there are nevertheless historical and social reasons that may explain this. Similarly, there are perhaps indications in the archaeological record that could explain why millet was not mentioned at all in the birch

bark documents. Although millet remains were found in many deposits from across the site, the highest incidences of millet chaff were from samples 89, 90 and 91, all from a 10th century byre deposit at Structure 155, Property R, Troitsky XI; Monk and Johnston 2012, 296). Insect remains support the interpretation of the building as a byre, with sample 91 primarily containing beetles from the foul end of the decomposer group, an insect signature that suggests animal dung (Hall and Kenward 1998). Stable dung was also indicated by the dominance of *Cercyon unipunctatus* and *Plateystethus acrinarius* in the sample (both of these species are indicative of stable manure and foul, decomposing conditions) and the high incidence of fly puparia. These results appeared to support the interpretation of the structure as a byre. These 10th century results from Troitsky XI suggest that millet was sometimes associated with animal fodder or perhaps bedding. This in turn may indicate the origin of the millet chaff in many of the other deposits from the site, i.e. that it was present in many of the deposits at the site because of its use for animal fodder and bedding.

Insect remains suggest that another two samples were also from stable or byre deposits, samples 5 and 9 from thirteenth century deposits at Troitsky XIII. The remains from these two samples produced insects typical of dung and stable manure. Sample 5 included beetles such as *Cercyon quisquillis* and *Aphodius fimentarius* and also insects associated with cadavers and carrion including *Acritus nigriornis, Necrodes littoralis, Dermestes* spp. and *Sipha* spp. (Reilly 2012, 276) and sample 9, produced a fauna suggestive of a wide range of habitats dominated by insects associated with damp conditions indicating dung and stable manure, as well as carrion, cadavers and discarded bones (for example insects such as *Hister impressus*, *Dermestes* spp., *Trox scaber* and *Omosita colon,* as well as abundant fly puparia).[3] However, there were no millet remains in either of these samples, suggesting that millet was not always used for animal fodder and bedding, and the evidence from 13th century deposits at Troitsky XIII suggested that it was not necessarily used universally across the entire site, or during all the long period of its occupation.

Exploitation of damp land meadows

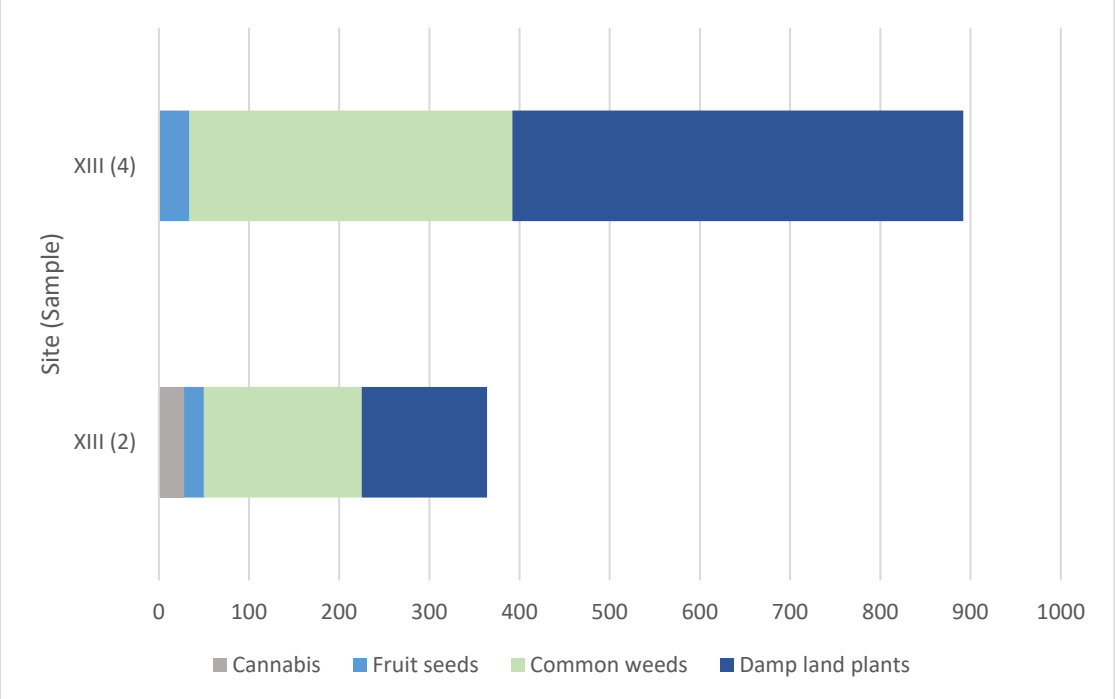
Millet and other cereals were not, of course, the only plant material that was used for animal fodder. The evidence from both insects and plant remains suggests that the immediate hinterland of the Volkov river, its natural flood plain and meadows, were widely exploited during the development of the town. Archaeological, soil, palaeobotanical and geochemical analyses of buried soils beneath Troitsky XI (Aleksandrovskaya *et al*. 2001, 17,19) have indicated that, at Troitsky, the medieval city of Novgorod expanded into an area that was originally meadow as well as an area that was formerly tillage, with evidence of cross ploughing found (ibid. 17-18). The evidence for meadow was based on a thick humus profile, which contained the roots of common meadow plants such as *Dactylis glomerata*, *Helictotrichon* spp., *Cynosurus cristatus* and *Glyceria* spp. (Aleksandrovskaya *et al.* 2001, 15–18).

[3] The results from this sample were characterised by significant indicators of damp, marshland areas, with at least some of the insect results suggesting that plants from these areas were collected for animal fodder and bedding (Reilly 2012, 275).

The plant and insect remains that were examined suggest that exploitation of these areas continued as the town developed. For example, the beetle remains from sample 9 from Troitsky XIII (an early to mid. 13th century deposit) contained indicators of damp land species such as *Bledius subterraneus* and *Pterostichus strenuous* and it also included wetland plants (perhaps used for bedding and/or for fodder), indicated by the presence of the beetle *Prasocuris juncii*, which lives on such plants (Reilly 2012, 275). There were further indications of the exploitation of damp land areas in another two 13th century samples from Troitsky XIII (samples 2b and 4), which were taken from between two buildings. It is likely that these were areas that were used as outdoor middens (or, at least, an accumulation of organic material between two buildings). The insects in these samples included foul decomposers, but also contained a high percentage of marshland indicators, e.g. ground beetles *Dyschirius globosus* and indicators of bare riverine clay indicators *Bledius subteraneus* (Reilly 2012, 276).

Damp land plants were found rather frequently in these samples, mirroring the results from the insect remains (see Figure 2). Amongst these were *Ranunculus scleratus* (occurs in wet nutrient rich open ground on edge of areas of muddy standing water), *Alisma plantago-aquatica* (occurs in shallow water), *Juncus* spp., *Eleocharis palustris* (found in marshy ground and in ditches) and *Carex* spp. (a damp land plant that is from a family that has a wide habitat preferences). Other, less frequent, damp land plants included *Bidens tripartia* (which was found with particular frequency in sample 89 from Site XI), which is usually found in damp field edges, and found locally in ditches, ponds and streams. Also found, but in relatively small amounts (in particular in byre samples 89 and 91 from Site XI), were meadow species such as *Ranunculus acris* and *Thalictrum flavum*. Pond weed seeds (*Potamogeton* sp.) were also found in some samples, but these were relatively rare apart from in sample 63 from Site XI and Sample 79 from Site XII (an ELS sample, see above).

Figure 2: Common plant remains from between buildings at Troitsky XIII



This significant overlap in the evidence from the plant and insect remains suggests sustained exploitation of the damp land hinterland of Novgorod, mainly from the natural water meadows of the Volkov and its tributary streams to the south and east. This is where cattle would have been raised, as they are today, and the hay plants from the area would have been harvested for over-wintering of the animals in the byres, in the surrounding farms as well as within the developing town.

Waste disposal

Waste disposal emerged as a theme from the plant remains, particularly with relation to the evidence for plants that were recovered in yards and along the property boundaries, where the evidence suggests that waste was habitually disposed.

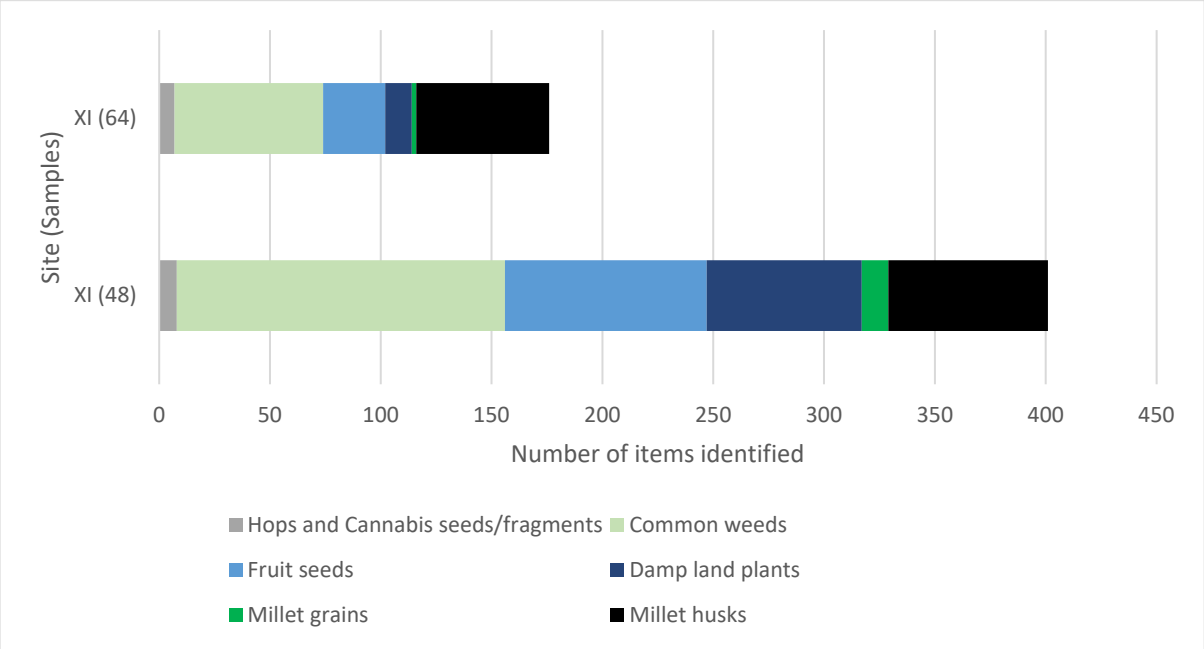
The plant evidence took the form of remains of gathered and/or managed fruits, which were frequently concentrated in areas that were outside houses and were particularly found along property boundaries. This was especially true of the remains from raspberry (*Rubus idaeus*) and apple (*Malus sylvestris*), which were biased towards property boundaries (Monk and Johnston 2012, 300–302). This was interpreted as possible evidence for the disposal of waste alongside property boundaries and at roadsides.

There is some limited support for this interpretation in the insect remains examined from Troitsky. For example, an early to mid 13th century deposit (sample 64 from Troitsky XI) found built up against the south wall of Structure 88 produced a small assemblage of insects with a limited species range. The beetles were mostly from the foul decomposer group, dominated by one species *Platystethus arenarius*. This beetle is found in both and human animal dung, but it will also colonise carrion and putrefied plant matter and it can be found in wet riverside areas. The suggestion from the insect remains is then of liquefied debris or a possible dung origin (Reilly 2012, 272).

Another sample from a property boundary, sample 48 Troitsky XI, dated to the later 13th or early 14th centuries, included a diverse assemblage of insect remains. It particularly included species characteristic of foul conditions and suggestive of decaying animal or human faecal material, *Platestethus acrinarius*, found in cess and dung, and carrion indicators such as *Trox scaber* (Reilly 2012, 274).

Although Eileen was sceptical about a dung origin of these deposits (see Reilly 2012, 272–3 and 274), the plant remains from the two boundary samples nevertheless include some species typical of cess material; significant quantities of fruit seeds that are generally interpreted as indicators of human cess (see Greig 1982, 50). This is a pattern that is repeated in both property boundary samples. The plant remains from samples 48 and 64, while including some damp ground species, also included the remains of human food such as apple (*Malus sylvestris*), sour cherry (*Prunus cerasus*), bilberry (*Vaccinium myrtillus*), flax (*Linum usitatissimum*), hop (*Humulus lupulus*) and cannabis (*Cannabis sativa*) , as well as millet (*Panicum miliaceum*) husks (see Figure 3).

Figure 3: Common plant remains from property boundaries at Troitsky XI



This perhaps indicates that at least some of the dung and waste from the samples had a human origin. The presence of millet chaff in both samples, interpreted above as a potential indicator of animal fodder and bedding, may perhaps also indicate that some animal dung was incorporated into the deposits. While there may have been some specific locations within the city for the disposal of human and animal waste; for example, in gradually accumulating middens, as indicated for sample 5 Site XIII (discussed in the section on food and fodder, above); there was no evidence for cess pits at Novgorod. The results from the study of plant and insect remains also seem to indicate that waste and debris was widely distributed across the deposits at the site and the evidence from environmental studies suggests that this may have been a deliberate strategy, particularly to distribute deposits across the site once a building was abandoned (as discussed below).

Taphonomy and implications

Our discussion so far has highlighted the ways in which the Novgorod plants and insect remains studies complimented each other, with the insect remains sometime verifying tenuous suggestions based on the plant remains studies, for example, high quantities of fruit seeds in samples from along property boundaries at Troitsky XI suggested the presence of human faecal remains, and the presence of foul decomposer insects, including some particularly associated with dung, reinforced the suggestion from the plant remains. This example was, however, also a point of divergence as Eileen was sceptical about the presence of *in situ* dung in a location such as a property boundary and argued that the insect remains from, for example sample 48, along the property boundary at Troitsky XI, was a mixed deposit with a large component of "outdoor" insect species and many fragmented beetle components (Reilly 2012, 281). This means that despite the plant remains signature from this sample (including many common

weeds, fruit seeds, damp land plants and millet husks; as illustrated in Figure 3) it is possibly from a very mixed source.

Mixing was also suggested by the fact that "house fauna" insects were recovered in small amounts at Novgorod, and indeed the fact that some of the exterior samples produced an interior house fauna component. While Reilly (2012, 281) suggests that this may have been partly the result of the difficulties associated with sampling and excavation methodology (a spit excavation system was used), in fact both Monk and Johnston were present on site when the vast majority of the samples were taken. In addition, it became clear over the years and despite language barriers that our Russian colleagues distinguished and differentiated separate event horizons within the excavated layers, even though they used a spit system to excavate and record the results. In any case, Reilly concedes that the same fragmentation and mixing was evident in samples from a portion of Troitsky XI and XII that was excavated using the single context system (reported in Reynolds and Sudds 2001, 31–46). This raises the question; why all this mixing of deposits? Did it occur at the time when the properties were abandoned, with the buildings taken down to their basal timbers and then infilled with general debris? Or was this mixing because waste from a number of different activities occurred when the properties and buildings were in use?

It is possible that for disused buildings with byres, all the waste byre deposits and the timber that was not re-usable were spread around the site and used to infill and level the buildings and their surrounding yards. The archaeologists at Novgorod have argued for a progressive levelling up of the site using the organic debris that accumulated at the settlement, including that derived from animals that were kept within the properties. As these buildings went out of use it seems the roofs were taken off and the wall timbers were taken down to the basal layers to be re-used elsewhere. The almost completely demolished building was infilled with refuse to level the area. This often appears to have coincided with repair and building up the surrounding roads; as the surface timbers were worn away they were replaced with another layer of corduroy laid timbers, which were placed over them. Thus, both the levels in the properties and the roads were constantly being raised. This work would have involved significant mixing of deposits. This may have, to some extent, accounted for the mixing of different faunas and the occurrence of "house" fauna in exterior locations. A more systematic and larger scale sampling strategy, tied in with a context-driven recording system, could help to further explain the issues associated with taphonomy that have emerged during the interpretation of the environmental remains.

Conclusion

In this paper we have explored some points of convergence in the results from plants and insect remains examined at Troitsky, Novgorod. There is some coherence in the results from our studies and in particular we have looked at the use of cereals as food and fodder, the exploitation of the river meadows in the hinterland for animal fodder and bedding, evidence for waste disposal, the evidence for mixing of deposits and the consequent problems of interpretation. The overall picture is that stratified deposits at Troitsky, as the evidence from the identifiable plant and insect remains show, came almost exclusively from the local and the immediate hinterland of Novgorod, building up as the town developed. Many of these represented plants growing in the locality that had been harvested, gathered and dried for hay

to feed and bed animals kept within the city, and possibly to stall feed them over the winter months. Whether this picture from Troitsky is replicated in other parts of the town is unknown. Such a question can only be answered by strategic and systematic sampling for floral and faunal remains in other areas within the city. The value of our results will only be fully realized when incorporated into a larger sustained study of the environmental remains, where both plant and insect remains (and other proxies) are analysed and interpreted together; such a study would provide a perspective on the results outlined here and more fully covered in earlier papers (Monk and Johnston 2012 and Reilly 2012).

Added

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