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SCHIPLUIDEN

A NEOLITHIC SETTLEMENT ON THE DUTCH NORTH SEA COAST *c*. 3500 CAL BC

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26 Insects

Tom Hakbijl

Six samples, taken from one deposition pit and three unlined wells, were analysed for insect remains. The Coleoptera (beetles), Siphonaptera (fleas), some of the Diptera (flies) and some other insects were identified to various levels. Inferences were made with respect to the use of wells, salinity of the environment, the presence of dung, the presence of synanthropics, such as Musca domestica*, the house-fly, and* Pulex irritans*, the human flea, possible agricultural pests, vegetation, biogeography, and the place of synanthropic insects in the Neolithic.*

26.1 Introduction

The insect kingdom with its large number of species and its variety of life forms and specialisations provides a large number of useful environmental indicators. Some insects play a part in the life of people and are literally closely associated with them. Therefore, the analysis of insect remains can be of great help in archaeology. A limitation, at least in temperate Europe, is that, like seeds, insects are only preserved in abundance under waterlogged conditions. That this was the case at specific localities at Schipluiden was demonstrated by the discovery, during the wet sieving of pit fills on the site, of the ambassador of archaeological insect remains analysis, the large dung beetle with its magnificent violet lustre (figs. 26.1-2). Although this particular species is very indicative, it is its combination with about a hundred or more other taxa that tells the story.

It was decided to use the insects primarily to arrive at a detailed description of local conditions, rather than an

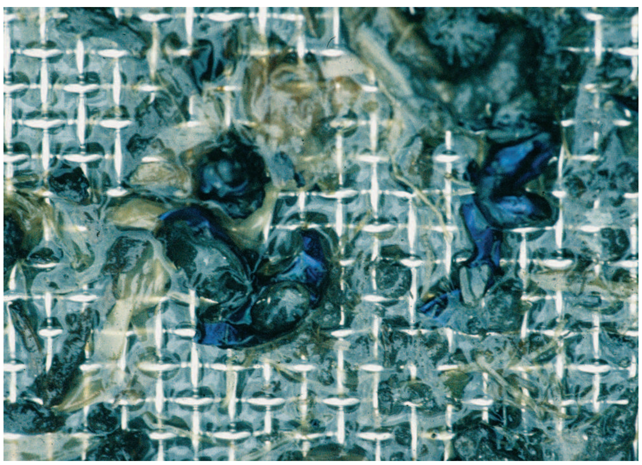
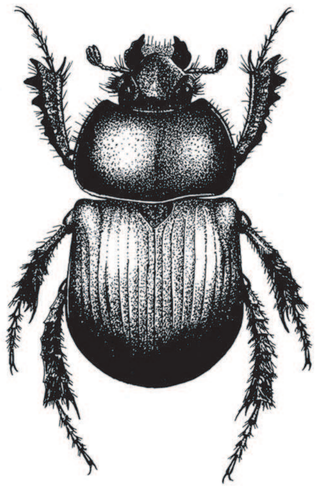


Figure 26.1 Remains of *Geotrupes spiniger* on the 2-mm screen during wet sieving.

a



b

Figure 26.2 *Geotrupes spiniger.*
a habitus (2×), drawing by Michele Reina (from I. Sparacio 1995. Coleotteri di Sicilia).
b fragments from sample 9415, in the centre a part of male hind femur with spine (magnification 8×)

environmental reconstruction on a landscape level. The straightforward, but time-consuming methods will be described in the following section after the procedure of sample selection. The results will be presented feature by feature followed by a discussion by aspect.

26.2 Material and methods

26.2.1 Sample selection

The research programme allowed for the analysis of only a restricted number of samples. Some features seemed promising, combining preservation with archaeological relevance, particularly deep pits on the higher parts of the dune with dark fills containing preserved plant remains. However, the dark colour proved to be attributable to small charcoal particles, the plant remains were roots and insect remains were absent. Therefore, samples had to be taken from deeper layers. As a result of the strategy, clear, man-made features were selected. Six samples were taken from four pits – three unlined wells and one deposition pit. Unfortunately, one much debated aspect, *i.e.* environmental change, could hardly be analysed due to the limitations of the sampling intensity.

First, one sample was taken from a deep unlined well (no. 9415), which was found to contain numerous large beetle parts during sieving on the site. A second sample was taken from the base of another deep unlined well (no. 7001). Because analysis revealed important finds, but in low concentrations, a sample was taken from a higher layer, too (no. 7002). Two distinctly different layers in the fill of another unlined well towards the northwestern slope of the dune were also sampled (nos. 8922 and 8923). One sample was taken from the matrix around a concentration of *Prunus* fruits in a deposition pit (no. 6086). Contextual information is given in table 26.1. The sampling points are given in fig. 26.3.

26.2.2 Methods

All samples were sieved over a 0.25 mm sieve, a widely used optimum between practicality and completeness. Some of the samples had to be extensively soaked to effect complete disaggregation of the matrix. The insect remains were concentrated by means of the paraffin floatation method described by Coope/Osborne (1968), using lamp oil as a nonpolar substance to adhere to the likewise nonpolar remains and force them to float in water. Identifiable parts were picked out and stored in alcohol. All heads, thoraxes (pronota) and elytra of Coleoptera, beetles, were systematically collected. Additionally, some distinctive other parts were selected. All identifiable remains of ectoparasites were taken out. A selection was made of the parts of the remaining insect orders, comprising adult flies, fly puparia, Hemiptera and Hymenoptera, but only a few were identified.

feature	context	sample no.	phase
12-314	unlined well	7002	2b
12-314	unlined well	7001	2b
15-21	unlined well	8922	1/2b
15-21	unlined well	8923	1/2a
15-23	unlined well	9415	1/2a
12-48	deposition pit	6086	1/2a

Table 26.1 Context of insect samples.

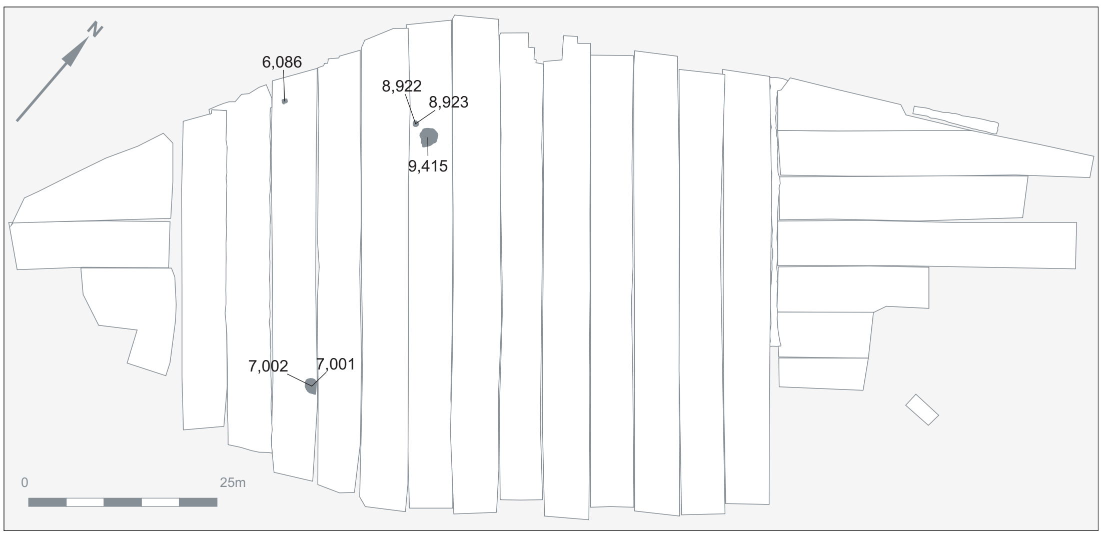


Figure 26.3 Sample points for insect remains.

Waterlogged insect remains fall apart into many loose elements, very much like vertebrates, and these parts break easily. For identification these parts and fragments have to be compared with complete specimens, in this case from the collection of the Zoological Museum of the University of Amsterdam. Regular checks were made to assess the correct-ness of the identifications of reference specimens from the collection. These identifications were based mainly on the *Die Käfer Mitteleuropas* series (Freude/Harde/Lohse 1965-1983). Nomenclature and taxonomy are also based on this series, in particular the extensive revisions in the supplement volumes (Lohse/Lucht 1989-1994).

The identification of some specimens deserves special attention. The *Bembidion* species of the subgenus *Emphades* are rather similar. The identification of the now rare species *B. tenellum* was based on two heads, one pronotum and one elytron. All distinctive characteristics given by Boeken *et al*. (2002) could be verified: frontal furrows also evident on clypeus, pronotum only moderately S-shaped, elytra with apical spot, elytral striae with moderately strong punctures.

Many parts were identified to species level. Some were not, mostly because not all fragments were distinctive enough. Sometimes in-depth identification was assumed to be too time-consuming for the information it was expected to yield. For this reason most of the Alaeocharinae remained unidentified. No counterparts, for instance a *Bembidion* species, for one or two parts with clear characteristics were found after a search of several hours in the collection of beetles from the Netherlands.

Although this is not usually attempted, parts of fly legs were successfully identified. The position of the implantation of setae, colour, size and shape enabled identification of *Scatophaga stercoraria* (fig. 26.4).

Figure 26.4 *Femur* of *Scatophaga stercoraria*, the yellow dung-fly, showing lighter distal end and sockets from which setae originally arose. Sample 9415 (magnification 20×).

Biological information is based mainly on Koch (1989-1992), with additional information from Drost *et al*. (1992), Boeken *et al*. (2002) and Turin (2000).

26.3 Analysis

About one hundred beetle taxa were distinguished. These taxa are presented in Appendix 26.1 along with the few other categories. The numbers represent minimum numbers of individuals.

26.3.1 Deposition pit, sample no. 6086

This sample was taken from feature 12-48, dated to phases 1/2a, a pit with a well-preserved fill containing fruits of *Prunus spinosa* (*cf*. section 4.5.3). This find is intriguing, because the fruits seem to represent a deliberate deposit. It was hoped that insect analysis would provide some information on the formation process.

The beetle assemblage of this sample is dominated by hygrophilous species. A few species, *Anthicus gracilis* for instance, need a heavily vegetated waterside. More important, the insects are predominantly from a brackish environment, as will be demonstrated in a following section. As this is not the natural environment of *Prunus spinosa,* natural deposition of the fruits is unlikely. There are no indications of any additional depositions in the same layer. However, it is not unthinkable that the people who made this deposition actually observed the relatively large, at least partly shining green beetle *Anomala dubia*, or even intentionally included it.

26.3.2 Sample no. 9415

This sample was taken from feature 15-23 and dates from phase 1/2a. The field hypothesis, based on structural characteristics, was that this pit and many similar pits were unlined wells. The sample was taken from the lowest layer of a second backfill. Its contents, therefore, represents not the period of primary use, but either a period of secondary use or a period after use. The layer attracted attention during the standard on-site sieving due to the presence of numerous large beetle remains. The remains were from at least 5 dung beetles of the species *Geotrupes spiniger*, both males and females. The sex of beetles is usually irrelevant from an archaeological perspective, but a very useful characteristic for species identification is the spine on the male hind femur (fig. 26.2). Furthermore, in this species with its specialised behaviour males and females work together excavating and preparing breeding galleries in the soil that are filled with dung. It is during the collection of dung that the beetles can tumble into a pit and drown. There are several examples of archaeological wells, mostly Roman-period and medieval ones, in which remains of large dung beetles and carabids have accumulated, but the specimens found in this excavation, along with those found at the Wateringen 4 site (Raemaekers 1997, 150), represent particularly early cases. *Geotrupes spiniger* was also identified at Ypenburg (Hakbijl in Koot/van der Have 2001, 99).

Geotrupes spiniger is mostly found in association with cow dung, although it is also attracted by horse dung and human excrement. Given other information from this site, it is indeed most likely that it was cattle dung that attracted the beetles. The fly in this sample, *Scatophaga stercoraria*, the yellow dung-fly, is the one that can be seen sitting so abundantly on wet cow dung pads and other dung. Other species in this sample that feed on dung are one *Onthophagus* spec. and four species of *Aphodius*. These *Aphodius* species lay their eggs in the droppings and the larvae develop there. Among the staphylinids there are also many examples of coprophilous species, such as *Oxytelus rugosus* and *O. nitidulus*. For other beetles dung is hardly filthy enough. They are attracted to carrion, too, as in the case of *Creophilus maxillosus* and *Hister brunneus* (=*H. cadaverinus*). More specialised necrophilous beetles are *Silpha tristis* and particularly *Thanatophilus sinuatus*, indicating the presence of decaying animal remains.

Some *Cercyon* species and other hydrophilids breed in dung, but not the species in this sample. These species live mostly at the transition from land to water, sometimes under water, sometimes on land or in the mud, often below detritus and decaying plant matter. There is one real water beetle in this sample, the only one encountered in this study, the dytiscid *Ilybius ater*. These beetles prefer small waters with muddy bottoms, such as cattle watering places (Drost *et al*. 1992, 144). The presence of a caddis larva (Trichoptera) also proves that there was some continuity in the presence of water.

The sample also contained 14 species of carabids (at least 26 individuals). This seems like a concentration of insects that tumbled into the pit, as carabids are fast-walking beetles that are readily caught in pitfalls. However, a number of these species are small beetles that often live in small burrows. The concentration is not as extreme as in some of the more recently consolidated wells from which escape can be difficult. Given the limited number of phytophagous insects (Chrysomelidae and Curculionidae), this place was probably not very heavily vegetated, and probably trampled. *Ceutorhynchus erysimi*, predominantly feeding on *Capsella bursa-pastoris*, fits well in this description.

In the period in which the layer was formed, which was after the first use of the well, the well still contained some water which may have been of use. The animals had access to it at that time and dropped their dung. The fence is of a later date and could therefore not have influenced the accessibility of the well for the animals. The insect assemblage also indicates an influx of salt (*cf*. section 26.3.6), which will have made the well useless as a source of drinking water. It therefore remains unclear whether the animals may have used the well before it became saline.

26.3.3 Sample nos. 8922 & 8923

These samples were taken from feature 15-21, which, like the foregoing, was classified as an unlined well. The samples were dated to phases 1/2a and 1/2b. This feature is smaller and shallower than the foregoing. The section showed two distinct layers, but the beetle spectra are very similar. One or two specimens of the larger beetles appearing in both lists may have been cut in two during the sampling.

The majority of the species and the individuals are hygrophilous, with only two species (*Hoplia philanthus* and *Agrypnus murinus*) preferring dry conditions that may have prevailed higher op the dune. Most of the hygrophilous beetles live predominantly under or in plant remains, including the most abundant species *Megasternum obscurus*. Many of them are also quite common in natural environments. In the literature explicit reference is made to their occurrence in stems and detritus of reeds and sedges of *Bembidion assimile*, *Oodes helopioides*, *Rybaxis longicornis* and *Corylophus cassidioides*. The second most frequently encountered species, *Cyphon* sp., lives under water in the larval stage.

Other categories are almost completely absent. Dung beetles are restricted to a single *Aphodius* sp. in each layer, not enough to prove the slightest amount of dung. The silphid *Blithophaga opaca* is one of the few in the family that is not necrophilous. It is often found in association with *Beta vulgaris* and it is intriguing that remains of roots of this plant were actually found at the site (*cf*. section 20.3.1). On the other hand, we have no positive indications as to the feature's function. More information on the latter beetle will be provided in a following section.

26.3.4 Sample nos. 7001 and 7002

These samples were taken from feature 12-314, which, like the foregoing, was interpreted as an unlined well, situated higher up the slope on the other (SE) side of the dune and dated to a later stage (phase 2b). As wells will have been backfilled in one way or another, and as we are particularly interested in the period of normal use of the well, the transitional layer of the fill at the base was included in the lowest sample (no. 7002). Like other features at the site this layer was dark in colour due to the presence of charcoal. Sample 7002 contained a large amount of it, in minute particles, representing the secondary fill mixed with material from the occupation layer of Unit 20. The contents of the samples from this well were low in concentration and quite different from the contents of sample no. 9415, comprising neither of the species discussed in relation to that sample nor any other representatives of the ecological groups discussed above. Nevertheless, there were two important finds.

The first is *Pulex irritans*, the human flea, represented by at least two individuals (fig. 26.5). The English name does

Figure 26.5 *Metathorax* of *Pulex irritans*, the human flea, part size 0.6 mm (magnification *c.* 150×).

not reflect the full ecological spectrum of this insect. It also feeds on badger, fox and pig/boar, but in this case man was the most likely host. Human fleas can end up in a well when a leap from their host takes them into the water, so the find probably reflects human activity, or at least human presence, near the well.

With the flea another of man's companions, *Musca domestica*, the house-fly, was found in the lowest layer. Unlike many archaeological occasions on which the resistant puparia are found, this was an imago, a fly. This species is now a common fly in rural areas all over the world. In cooler environments the most common breeding medium consists of heaps of manure and other fermenting organic remains. The adults follow man in and around his dwellings and rest on him and his food. Optimal conditions for a population of these flies would be a permanent settlement with robust winter quarters and an abundance of organic refuse. Unfortunately, there are too many limitations for us to infer such a settlement from the present entomological information.

A striking difference with respect to sample 9415 is the lack of dung beetles, which could be explained by the absence of animals and dung around the well. Another explanation could be that the deposit was laid down in winter, but that does not fit in with the presence of *Musca domestica*. Another striking difference is the lack of carabids. Only one was present, and that one belongs to the minority of carabids that climb into the vegetation.

A relatively well represented group consists of mycetophagous and mycetophilous beetles, such as *Agathidium* spec., *Ptenidium intermedium*, *Acrotrichis* spec., *Calyptomerus dubius*, *Enicmus* spec., Corticariini and *Orthoperus* spec. (14 inds. out of 46). These insects may have ended up in the well together with the plant material in which they lived.

There are no indications of salt influx (*cf.* section 26.3.6), no indications of matter that we would now consider dirty, and an indication of human presence in the form of two human fleas. This is what we would expect for the primary use of a well by humans, in which case the well will have been protected against pollution. Part of the protection could have been the fence, keeping out cattle. The section of the well shows vertical unlined walls, suggesting that the water could probably not be approached by cattle without causing damage to the structure.

26.3.5 Synanthropic species

Synanthropic species are a special and archaeologically particularly interesting category. Some of the species concerned evolved together with man, some followed him as he spread across the world and some thrive only in man-made environments. Entomoarchaeological research is gradually revealing a pattern. The results of the excavation at Schipluiden can be fitted into this pattern.

The oldest and most widespread synanthropics are the three species of human lice, which evolved together with man. Wild and domesticated animals also have their lice species. None of these parasites were found here, but there is no reason to assume that they were never present. Animal lice are normally attached to their host and are often found in dung samples. Human lice are attached to either hair or clothing and are usually found in special samples, particularly combs.

The ectoparasite that was found at Schipluiden is *Pulex irritans*, the human flea, presented above. This species was very common until the second half of the 20th century and is regularly encountered in entomoarchaeological studies. There are a few prerequisites. In its immature stages this ectoparasite lives in its host's dwelling. Consequently, it can only reproduce when the host has some sort of dwelling, but as the immature stages are independent of the presence of the host, intermittent use of a dwelling can also imply living conditions for a population of fleas. The presence of the species at this site has biogeographical implications, too, because it is a particularly early find.

Buckland/Sadler (1989) formulated several possible hypotheses for this species' arrival from the New World, where it must have originated. The discovery of the species at the site of the Early Iron Age House Q in the Assendelver Polders (Hakbijl 1989) disproved all hypotheses claiming its arrival in (proto)historic times (Sadler 1990). Older finds are known from a bog body, 2980 ± 35 BP, Emmererf-Scheidenveen (Hakbijl 1990, 170) and from the Middle Bronze Age settlement site of Eigenblok site 5 (Van Dijk/Schelvis 2002). And now, after numerous Neolithic finds in Chalain, France (Yvinec/Ponel/Beaucournu 2000), few possibilities remain. The species must have come from the New World during an early prehistoric period of contact between the continents, borne by man or by another host long before man's presence in the New World.

The second insect that plagued the people of Schipluiden is *Musca domestica* (house-fly). The adults of this species are a nuisance on account of their habit of resting and feeding on the human body, but their alternating feeding on excreta, human food, discharges from wounds, etc. also makes them a health hazard under less hygienic conditions. This find is also of biogeographical importance. The species' original distribution is uncertain, but it probably originated in the southern Palaearctic or the Middle East (Skidmore 1985, 235). At that time it was probably adapted to excreta of ungulates. Since then, it has spread to almost all inhabited parts of the world. Outside the tropics and subtropics it is an eusynanthropic species, *i.e*. living in close coexistence with man, frequenting indoor situations and breeding in all kinds of fermenting household wastes (Greenberg 1971, 70/71). It was also found in the Early Iron Age House Q, Assendelver Polders (Hakbijl, 1989), where it lived in abundance in manure. It may well be that *Musca domestica* made its appearance in the low countries, far outside regions with a climate favourable for this species, during the Neolithic, with its new way of life characterised by more permanent dwellings and the production of large amounts of agricultural waste, in particular dung and manure.

Stock-breeding implied new possibilities for many other insects, among which were dung beetles such as Geotrupids, *Onthophagus* spp. and *Aphodius* spp. and flies such as *Scatophaga stercoraria*. Most of these insects are also found outside occupation areas and pastures, and the Neolithisation process merely implied new opportunities for them.

Today, *Blithophaga opaca* is a stenotopic species of arable and ruderal land, where it feeds on the leaves of crops and weeds, but mainly on *Beta vulgaris*. This species can consequently cause considerable damage in beet crops, particularly in coastal areas (Heinze 1983, 607). This relation with an agricultural crop obscures the beetle's original habitat and distribution. The combined find of the beetle and the plant at Schipluiden could reflect the natural coexistence of the two in the coastal area, the beetle becoming an agricultural pest when the crop began to be cultivated. More research will be needed to learn more about this.

A similar insect-plant combination is the halotolerant *Phyllotreta nemorum*, the turnip flea beetle, which feeds on *Brassica* spp. and is now an agricultural pest. It can destroy the smaller plants completely. Seeds of *Brassica rapa*, rape or turnip, were found at the site. They may have been used at the site, too (*cf*. section 20.3.1). If the plant was already being cultivated at the time of the site's occupation, the beetle would have posed a problem.

Long-term storage of large amounts of food, particularly seeds and fruits, implies possibilities for almost limitless local multiplication of some species, and the original spread of agriculture with the associated storage of produce, followed by gradually intensifying trade, led to the spread of a variety of stored-product arthropods. The Schipluiden site dates from the very beginning of this development, and is probably too early to contain many insects of this category. Indeed, none were found, but it is possible that they were missed due to the limited number of analysed samples.

26.3.6 Salinity

Although the insect study was not intended as an instrument for analysing environmental information on a landscape level, there is no reason not to use the assembled information for this purpose. Salinity of the environment is an obvious aspect, as 20 of the beetle species have some affinity with a saline environment. Four categories were distinguished for a more detailed analysis. The first three are *halobionts* (hb), beetles that live only in a saline or brackish environment, *halophilous* species (hph), having a preference for such environments, and *halotolerant* species (ht), which tolerate them. The fourth category is formed by beetles that live in wet environments to which no specific reference is made in the literature concerning a relation with saline conditions (*negative* information, h-). Selected for this category were all Dytiscidae, Hydrophilidae, Hydraenidae, Heteroceridae, many of the Carabidae and two other hygrophilous species that do not fall in any of the foregoing categories. It is assumed that the majority of the beetles of this category are not regularly found in saline environments. The remaining beetles are not hygrophilous, and were not used in the comparison as they have less contact with saline conditions. The main source of information was Koch (1989-1992), with additional information from Drost *et al*. (1992). The results are presented in table 26.2.

The highest percentage of halobionts (in terms of minimum number of individuals) is 33% in sample 6086, from the artificial deposit of *Prunus spinosa* fruits. The salt-related categories taken together (hb+hph+ht) account for 67% of this sample. The deposit must therefore be saline or brackish. Apparently there was at least occasional salt influx in this early phase (1/2a), which is most evident in this low-lying pit.

sample no.		9415	7001	7002	8922	8923	6086	
Pogonus chalceus (Marsh.)		1	.	.	.	.	.	hb
Ochthebius dilatatus Steph.		11	.	.	.	.	2	hb
Ochthebius marinus (Payk.)		1	.	.	.	.	2	hb
Paracymus aeneus (Germ.)		.	.	.	.	.	2	hb
Heterocerus flexuosus Steph.		.	.	.	.	.	1	hb
Bembidion fumigatum (Duft.)		3	.	.	1	.	1	hph
Bembidion cf. minimum (F.)		.	.	.	.	1	.	hph
Bembidion tenellum/normannum		.	.	.	.	.	1	hph
Ochthebius viridis/pusillus		5	.	.	.	.	.	hph
Limnoxenus niger (Zschach)		1	.	.	1	1	.	hph
Heterocerus obsoletus Curt.		2	.	.	.	.	.	hph
Bembidion tenellum Er.		2	.	.	.	.	.	hph/hb
Dyschirius luedersi Wagn.		1	.	.	.	.	.	ht
Bembidion varium (Ol.)		3	.	.	.	2	.	ht
Cercyon marinus Thoms.		7	.	.	.	.	1	ht
Cercyon tristis Ill.		5	.	2	2	8	2	ht
Cercyon sternalis Sharp		9	1	1	5	5	.	ht
Hydrobius fuscipes (L.)		1	.	.	.	.	.	ht
Cymbiodyta marginella (F.)		1	.	.	.	.	2	ht
Bledius limicola/tricornis/spectabilis		2	.	.	.	.	.	ht
Clivina fossor/collaris		1	.	.	.	.	.	h-
Dyschirius globosus (Hbst.)		6	.	.	.	2	.	h-
Bembidion assimile Gyll.		3	.	.	1	5	1	h-
Pterostichus vernalis (Panz.)		1	.	.	.	.	.	h-
Oodes helopioides F.		.	.	.	.	1	.	h-
Odacantha melanura (L.)		1	.	.	.	.	.	h-
Ilybius ater (Geer)		1	.	.	.	.	.	h-
Ochthebius minimus F.		4	.	.	.	.	.	h-
Coelostoma orbiculare (F.)		1	.	.	.	.	.	h-
Megasternum obscurum (Marsh.)		6	.	.	17	8	1	h-
Lesteva spec.		.	.	.	1	1	.	h-
Oxytelus rugosus (F.)		6	.	1	2	5	2	h-
Oxytelus nitidulus (Grav.)		1	.		.	.	.	h-
Paederus spec.		6	1	2	.	.	1	h-
Rybaxis longicornis (Leach)		.	1	.	1	.	1	h-
Anthicus gracilis Panz.		1	.	.	.	.	1	h-
Totals		*93*	*3*	*6*	*31*	*39*	*21*	
halobiontic	hb	14%	0%	0%	0%	0%	33%	
halophilous	hph	14%	0%	0%	6%	5%	10%	
halotolerant	ht	31%	33%	50%	23%	38%	24%	
	hb + ph + ht	59%	33%	50%	29%	44%	67%	
no relation specified	h-	41%	67%	50%	71%	56%	33%	

Table 26.2. Relation with salinity of selected Coleoptera from Schipluiden. Selected are: Dytiscidae, Hydrophilidae, Hydraenidae, Heteroceridae, many of the Carabidae and two other hygrophilous species.

Surprisingly, sample 9415 (from the assumed cattle watering place) also contained halobiontic beetles (14%), and the salt-related categories together dominate the hygrophilous fauna at 59%. This is not what we would expect for a source of drinking water intended for human consumption. A possible explanation is that the period in which the deposit was laid down was characterised by one or more occasions of the influx of salt or brackish water, making the well useless.

The small pit from which sample no. 8922/3 was obtained occupies an intermediate position, with no halobionts and 5 or 6% halophilous beetles. It was less saline, or was under the influence of a less saline environment than the foregoing well and the deposition pit.

Different was the situation in the pit that yielded sample no. 7001/2, from occupation phase 2b: no halobionts, no halophilous species and only a few halotolerant and 'other' beetles. The low number of hygrophilous specimens and very low total number of specimens can be regarded as negative evidence of salt in this water-filled pit, which was in a preceding section assumed to have been a source of water for human use.

26.3.7 Vegetation

The presence of insect remains can often be used as additional information for the reconstruction of former vegetations. Some of the – scarce – information obtained at Schipluiden has been presented in previous sections. The insects are predominantly from open landscapes. Only *Nebria brevicollis* is often found in woods, but the species is by no means restricted to such a habitat. Furthermore, not a single insect favouring dead wood, less healthy trees, worked wood or decaying wood was found. Two beetles of species that live in, or feed on, the leaves of trees were represented: *Trachys minutus* (phase 2b) is polyphagous, but often lives on *Salix* spp. and adults of *Phyllopertha horticola* (phases 1/2a) are found on a variety of trees. So there are virtually no indications of woodland or the presence of trees nearby.

26.3.8 Special faunal elements

Identifying prehistoric insect remains often involves species that are now rare, or species for which no historical records exist in the area. In this case four of such species were found.

Trachys minutus is not known from the coastal provinces of the Netherlands (Brakman 1966 & ZMA collection). It is widespread in open woods in the higher parts of the Netherlands. Its current absence in the coastal provinces may be attributable to changes in habitat quality, as the area underwent drastic deforestation from medieval times onwards.

Anthicus gracilis no longer occurs in the Netherlands, but must have been quite common once, as it was encountered in a Neolithic well elsewhere in the Netherlands (Kolhorn; Hakbijl/Pals/Troostheide 1989) and also in the Early Iron Age House Q, Assendelver Polders (Hakbijl 1989).

Onthophagus taurus and *O. illyricus* are extremely similar. Taken together they are by far the rarest species of *Onthophagus* in the Netherlands. They are both thermophilous and have a southern distribution, suggesting that their present rarity may be attributable to climatic change.

The halobiontic *Bembidion tenellum* probably disappeared from the Netherlands during the last century (Turin 2000, 281). It was also found in a Roman well with marine influence at Valkenburg (Hakbijl, in progress). Its occurrence in the Netherlands is at the margin of this species' distribution area, suggesting that climate may have been a factor in its disappearance, but the habitat quality of the coastal zone has also suffered greatly due to land reclaims and the construction of water defence works.

26.4 Conclusions

All samples from phases 1/2a yielded insect evidence of at least occasional salt influx.

The sample from the deposition pit (no. 6086) contained the largest number of salt-indicating species, corroborating the artificial nature of the deposition of *Prunus spinosa* fruits.

The rich insect sample (no. 9415) from a second backfill of a well provided much information on that phase in the well's existence. Livestock, which were in those days not yet kept away by the fence (being of later date) had access to the well, dropped their dung and trampled the area. Decaying animal remains were present in/near the well. Salt influx will have made the well useless as a source of drinking water, but it remains unclear whether the animals used the well before its water became saline.

The insect assemblages in the samples from another unlined well, nos. 8922 and 8923, yielded no positive indications as to the feature's function.

The well from which samples 7001 and 7002 were taken yielded no evidence of matter that we would now consider dirty, nor of salt influx. Human presence is indicated by *Pulex irritans*. This is what we would expect from a well intended for human use that was protected against pollution. Part of the protection may have been the fence, keeping out cattle.

Two important synanthropic species were found: *Pulex irritans* and *Musca domestica*. These finds are particularly early and have biogeographical implications. The former may have occurred in this area earlier. As for the latter, the Neolithic may have been the first period in which this species could exist in this region. Many insects that benefit from stock-breeding were found. There was no evidence of any stored product pests; this was indeed the earliest period in which such pests could have occurred in this region. As a group, the synanthropic species fit in with the pattern that may be expected for this period.

The combined occurrence of remains of *Blithophaga opaca,* the beet carrion beetle, and *Beta vulgaris* at the site could reflect the natural coexistence of the two species in the coastal area. When the crop began to be cultivated, the beetle became an agricultural pest.

The insects are predominantly characteristic of open landscapes. Not a single insect favouring dead wood, less healthy trees, worked wood or decaying wood was found.

The samples contained a few species that are no longer found in this region, or that are now rare: *Trachys minutus,* *Anthicus gracilis*, *Onthophagus taurus*/*illyricus* and *Bembidion tenellum*. Their present rarity or absence may be attributable to both climatic change and changes in habitat quality.

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Appendix

26.1 Insect remains from Schipluiden, presented as minimum numbers of individuals. Taxonomy and nomenclature of Coleoptera after Lohse/Lucht (1989-1994) and Freude/Harde/Lohse (1965-1983).

sample no.	9415	7001	7002	8922	8923	6086
sample size in kg:	?	1	3,2	2,2	2,2	1,2
preservation:	++	+	+	±	±	+
COLEOPTERA						
Carabidae						
Nebria brevicollis (F.)	1	.	.	.	.	.
Clivina fossor (L.) or collaris Hbst.	1	.	.	.	.	.
Dyschirius luedersi Wagn.	1	.	.	.	.	.
Dyschirius globosus (Hbst.)	6	.	.	.	2	.
Bembidion varium (Ol.)	3	.	.	.	2	.
Bembidion fumigatum (Duft.)	3	.	.	1	.	1
Bembidion assimile Gyll.	3	.	.	1	5	1
Bembidion tenellum Er.	2	.	.	.	.	.
Bembidion tenellum or normannum Dej.	.	.	.	.	.	1
Bembidion cf. minimum (F.)	.	.	.	.	1	.
Bembidion spec. a	.	.	.	.	2	.
Bembidion spec. b	.	.	.	.	.	1
Pogonus chalceus (Marsh.)	1	.	.	.	.	.
Poecilus spec.	1	.	.	.	.	.
Pterostichus vernalis (Panz.)	1	.	.	.	.	.
Amara aenea (Geer)	1	.	.	.	.	.
Oodes helopioides F.	.	.	.	.	1	.
Odacantha melanura (L.)	1	.	.	.	.	.
Demetrias or Dromius spec.	1	1	.	.	.	.
Dytiscidae						
Ilybius ater (Geer)	1	.	.	.	.	.
Hydraenidae						
Ochthebius dilatatus Steph.	11	.	.	.	.	2
Ochthebius minimus F.	4	.	.	.	.	.
Ochthebius marinus (Payk.)	1	.	.	.	.	2
Ochthebius viridis Peyrhff. (or pusillus Steph.)	5	.	.	.	.	.
Hydrophilidae						
Helophorus spp.	2	.	.	.	.	.
Coelostoma orbiculare (F.)	1	.	.	.	.	.
Cercyon marinus Thoms.	7	.	.	.	.	1
Cercyon spec. (possibly marinus)	.	.	.	.	1	.
Cercyon tristis Ill.	5	.	2	2	8	2
Cercyon sternalis Sharp	9	1	1	5	5	.
Megasternum obscurum (Marsh.)	6	.	.	17	8	1
Paracymus aeneus (Germ.)	.	.	.	.	.	2
Hydrobius fuscipes (L.)	1	.	.	.	.	.
Limnoxenus niger (Zschach)	1	.	.	1	1	.
Cymbiodyta marginella (F.)	1	.	.	.	.	2
Histeridae						
Hister brunneus F. (=cadaverinus Hoffm.)	1	.	.	.	.	.
Silphidae						
Thanatophilus sinuatus (F.)	1	.	.	.	.	.
Blitophaga opaca (L.)	.	.	.	1	1	.
Silpha tristis Ill.	1	.	.	.	.	.
Liodidae						
Agathidium spec.	1	.	.	.	.	.
Ptiliidae						
Ptenidium intermedium Wank.	.	.	8	.	.	.
Ptenidium spec. not punctatum	2	1	.	.	2	2
Acrotrichis spec.	1	1	1	2	1	.
Staphylinidae						
Metopsia retusa (Steph.) (or clypeata (Müll.))	.	.	1	.	1	.
Lesteva spec.	.	.	.	1	1	.
Carpelimus spp.	3	1	3	1	3	2
Oxytelus rugosus (F.)	6	.	1	2	5	2
Oxytelus nitidulus (Grav.)	1	.	.	.	.	.
Bledius limicola, tricornis or spectabilis	2	.	.	.	.	.
Stenus spp.	1+1	.	.	2	.	1
Paederus spec.	6	1	2	.	.	1
Astenus spec.	.	.	2	.	.	.
Rugilus rufipes (Germ.)	.	1	.	.	.	.
Rugilus similis (Er.) or geniculatus (Er.)	1	.	.	.	.	.
Pseudomedon obscurellus (Er.)	.	.	.	1	.	1
Gyrohypnus spec.	1	.	1	.	1	.
Xantholinus spec.	1	.	.	2	2	.
Philonthus spec.	1+1	.	.	.	.	.
Creophilus maxillosus Mannh.	1	.	.	.	.	.
Tachyporus spec.	.	1	.	.	.	.
Drusilla canaliculata (F.)	.	1	1	.	.	.
Alaeocharinae gen. indet.	4	.	1	2	5	1
Pselaphidae						
Rybaxis longicornis (Leach)	.	1	.	1	.	1
Brachygluta spec.	.	.	.	.	.	1
Elateridae						
Agrypnus murinus (L.)	.	.	.	1	.	.
Buprestidae						
Trachys minutus (L.)	.	.	1	.	.	.
Clambidae						
Calyptomerus dubius Marsh.	.	.	1	.	.	.
Scyrtidae						
Cyphon spec.	2	.	.	6	8	.
Heteroceridae						
Heterocerus flexuosus Steph.	.	.	.	.	.	1
Heterocerus obsoletus Curt.	2	.	.	.	.	.
Heterocerus spec.	.	1	1	.	.	.
Cryptophagidae						
Atomaria spec.	.	1	1	.	.	1

sample no.	9415	7001	7002	8922	8923	6086
Phalacridae						
Stilbus oblongus (Er.)	.	.	1	.	.	1
Latridiidae						
Enicmus transversus (Ol.) or histrio Joy	1	.	.	.	.	.
Corticariini indet.	.	.	1	.	.	.
Corylophidae						
Corylophus cassidioides (Marsh.)	.	.	.	1	1	.
Orthoperus spec.	.	.	1	.	.	.
Coccinellidae						
Adalia or Oenopia spec.	1	.	.	.	.	.
Anthicidae						
Anthicus gracilis Panz.	1	.	.	.	.	1
Geotrupidae						
Geotrupes spiniger (Marsh.)	5	.	.	.	.	.
Scarabaeidae						
Onthophagus taurus (Schreb.) or illyricus (Scop.)	1	.	.	.	.	.
Aphodius consputus Creutz. or prodromus (Brahm)	1	.	.	.	.	.
Aphodius foetidus Hbst.	1	.	.	.	.	.
Aphodius spec. (a)	2	.	.	.	.	.
Aphodius spec. (b)	3	.	.	.	.	.
Aphodius spec.	.	.	.	1	1	.
Anomala dubia Scop.	1	.	.	.	.	1
Phyllopertha horticola (L.)	1	.	.	.	1	.
Hoplia philanthus Füssl.	.	.	.	1	2	.
Chrysomelidae						
Chrysolina fastuosa (Scop.)	.	.	1	.	.	.
Chrysolina spec. (other species)	.	.	.	.	1	.

sample no.	9415	7001	7002	8922	8923	6086
Phyllotreta nemorum L.	.	1	.	.	.	.
Longitarsus spec.	1	.	.	.	.	.
Altica spec.	1	.	.	.	.	.
Curculionidae						
Sitona spec. a	1	.	.	.	.	.
Sitona spec. b	1	.	.	.	.	.
Ceutorhynchus erysimi (F.)	1	.	.	.	.	.
Nedyus quadrimaculatus (L.)?	.	.	1	.	.	.
gen. indet.	.	.	.	.	.	1
Sum MNI Coleoptera	145	13	33	52	72	34
Heteroptera						
Corixidae indet.	.	.	.	.	.	1
indet.	+	+	+	+	+	.
Anoplura & Mallophaga	–	–	–	–	–	–
Siphonaptera						
Pulex irritans L.	.	.	2	.	.	.
Diptera						
Scathophaga stercoraria L. (adult)	1	.	.	.	.	.
Musca domestica L. (adult)	.	.	1	.	.	.
other Diptera (adults)	+	.	+	.	.	+
Nematocera (larvae)	+	.	.	.	.	+
Brachycera (pupal remains)	+	+	+	.	+	+
Lepidoptera						
mandibles of larvae, indet	+	.	.	+	+	+
Trichoptera						
Larval frontoclypeus, indet.	1	.	.	.	.	.
Hymenoptera						
parasitic wasps, ants, etc, indet.	+	+	+	.	.	+
addenda:						
perisarc Hydrozoan polyp	.	.	.	.	.	1

26.2 Glossary of scientific, English and Dutch names of insects mentioned in the text.

scientific	English	Dutch
COLEOPTERA	beetles	kevers
Carabidae	ground beetles	loopkevers
Odacantha melanura (L.)		rietloopkever
Dytiscidae	predatious diving beetles	waterroofkevers
Hydraenidae	minute moss beetles	waterkruipers
Hydrophilidae	water scavenger beetles	spinnende watertorren
Histeridae	hister beetles/Steel beetles	spiegelkevers
Silphidae	carrion beetles	aaskevers
Blitophaga opaca (L.)	beet carrion beetle	doffe bietenaaskever
Ptiliidae	feather-winged beetles	haarvleugelkevers
Staphylinidae	rove beetles	kortschildkevers
Creophilus maxillosus Mannh.	hairy rove beetle	grauwe aaskortschild
Pselaphidae	short-winged mould beetles	knotskevers
Elateridae	click beetles	kniptorren
Buprestidae	jewel beetles	prachtkevers
Heteroceridae	variegated mudloving beetles	oevergraafkevers
Latridiidae	plaster beetles	gegroefde schimmelkevers
Coccinellidae	lady birds	lieveheersbeestjes
Anthicidae	ant-like flower beetles	snoerhalskevers
Geotrupidae	(dung beetles)	mestkevers
Geotrupes spp.	dor beetles	
Geotrupes spiniger (Marsh.)		doornmestkever
Scarabaeidae	scarab beetles	bladsprietkevers
Aphodius spp.		veldmestkevers
Phyllopertha horticola (L.)	garden chafer	rozenkever
Anomala, Hoplia spp. etc.	chafers	
Chrysomelidae	chrysomelids	bladhaantjes
Phylloterta nemorum L.	turnip flea beetle	grote gestreepte aardvlo
Curculionidae	weevils	snuittorren
SIPHONAPTERA	fleas	vlooien
Pulex irritans L.	human flea	mensenvlo
DIPTERA	true flies	vliegen en muggen
Scathophaga stercoraria L.	yellow dung fly	strontvlieg
Musca domestica L.	house-fly	huisvlieg
Nematocera	midges	muggen
Brachycera	flies	vliegen
LEPIDOPTERA	butterflies and moths	vlinders
TRICHOPTERA	caddisflies	schietmotten/kokerjuffers