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Sexy Plants: The Influence That Plant Sexual Strategies Have On The Modern Macrofossil Assemblage At Meijendel (Wassenaar) and the Application To An Archaeological Context

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Introduction

The project

The research done in this thesis is based on the project that took place in the course of the winter, on one of the lakes in the nature reserve of Meijendel. Under the supervision of Dr Michael Field, samples were taken from this particular lake at Meijendel. The project was made possible with the help of eight different students. With the assistance of Dr Field and Alem Gusinac, a big dataset could be produced. This data was presented in the form of a spreadsheet, with all of the taxa found in the samples. Meijendel is located close to the city of the Hague, in the province of South Holland. The location can be seen in detail on the map listed below in figure 1.

Figure 1: the location of Meijendel in the Netherlands (made with Google Earth)

The project, fortunately, came to a good end, but that doesn't mean that everything went as planned during the entire length of the project. It was a project which took a few months to entirely complete, and that could have been completed earlier in the year, but due to quite some restrictions and a few bumps along the road, it took longer than expected in the first place. Permission from the company of Dunea was a necessity to take any samples from the lake in the Libellenvallei. Permission from Dunea gave way to take samples from the lake in the Libellenvallei in the first place. This sampling got done over the course of the winter months. This will be also later on explained in the methodology part.

The main focus of the project was that of taphonomic processes. The analysis of taphonomic processes at sites is important for the reconstructions of past vegetations. Observations of taphonomic processes at different archaeological sites can allow predictive models to be constructed that can show palaeovegetation reconstruction (Greenwood 1991, 164). When talking about taphonomy, we mean the study of the various processes that lead to the formation of a fossil assemblage (Field, 2021). Examples of taphonomic processes are the dispersal of plants and the sexual strategies of plants, so how plants reproduce. Taphonomic processes can cause biases in the assemblage compared with abundance in the source vegetation in found macrofossil assemblages. This could have possible relevance to a better understanding of the plant macrofossil assemblage from archaeological sites to the original vegetation surrounding the site.

In a way, we can say that the present is the key to the past (Field, 2021) since taphonomic processes can help us understand how certain plant taxa ended up at a certain location and in what quantity. To gain a better understanding of the surrounding vegetation of Meijendel the choice was made to focus on the sexual strategies of the found taxa and also their life cycle. Sexual strategies and plant life cycles are important taphonomic process. These processes can help us to gain a better understanding of found biases and to understand the quantity of a found taxon. Sexual strategies of the taxa could influence the frequency of a found taxon together with its life cycle. The possible sexual strategies and life cycles will be explained extensively, later on.

Site description

The Netherlands is rich in many nature reserves across the whole county. Meijendel is one of these nature reserves which is unique in its own way. Meijendel is located in the village of Wassenaar bordering the North Sea and located close to the city The Hague. It can be considered a dune area with some inter-dune ponds or lakes, and Meijendel has plenty of these lakes or ponds that are spread around the whole nature reserve. The lake that has been studied for this research is located in the Libellenvallei and is surrounded by dunes. The site is unobstructed from urban development and industrialization and has a very diverse plant species composition (De Bonte *et al*. 1999, 59). Meijendel is, however, managed heavily by Dunea.

Figure 2: the lake at the Libellenvallei where the samples were taken from (photo made with Google Maps)

Many plant species can be found at Meijendel, but this hasn't been always the case. Since the 1950s the vegetation was gradually declining. To counteract this problem grazing animals were introduced in Meijendel. A few years after these grazing animals had been introduced it become clear that the vegetation structure did change in the course of years, but it did become more extensive, meaning that more plant species were present at the end of the experiment and that the experiment had a positive outcome (De Bonte *et al.* 1999, 66).

Taphonomic processes

Previous research did take place at Meijendel over the course of years during its existence only almost no research has been performed on the effect of taphonomic processes on the macrofossil (big enough to see with the naked eye) assemblage.

Taphonomy is also more than looking at the processes alone, it is also about understanding an important relationship. Plant macrofossils assemblages are likely to represent only the immediate vegetation (Greenwood 1991, 152) since plant taxa usually don't travel that far from their source. So, the first part of this relationship is the quantity and the location of the plant species in the vegetation where it came from (Field, 2021). The second part is about understanding the representation of a taxon by fossils in an assemblage from a point of sampling (Field, 2021). Understanding this relationship between these two parts is fundamental when attempting accurate reconstructions.

So, it is an important factor when looking at the sexual strategies and the life cycles to also look at the surrounding vegetation of the lake in Meijendel. Which can be considered as the original vegetation of Meijendel.

Sexual Strategy

Many plant species were found in these six taken samples and taphonomic processes play a big part in how these plant species were deposited here and why a certain plant taxon can be found more in one sample and less another. Plants are in a few ways like people, since just like people, plants also have sexual intercourse. So, researching plant sexual strategies can shed light on why this is the case.

The project that was executed at Meijendel was a very big project with very many different angles to focus on. For this research the choice was made to zoom in and focus on the sexual strategies and the corresponding life cycles of the found taxa at the lake. This is something that is out of the box when looking at other research performed on taphonomic processes at archaeological sites. This is something that isn't often done or even ever, which is strange considering sexual strategies and life cycles are a great source of information when it comes to biases in the macrofossil assemblage. Since identification of the sexual strategies and the life cycles of the found taxa made it clear that a possible bias could be presented in the original vegetation of Meijendel.

Sexual strategies of plants can influence the number of seeds found at a certain site (Barrett 1998, 335). Some plant taxa were found in greater numbers than others and there could be multiple reasons for this, but sexual strategies can play a part in this and therefore research questions can be asked concerning this theme: 1) To what extent does the sexual strategy of plants around the lake in the Libellenvallei influence the composition of plant macro remains in the surface sediment from the lake? 2) Which sexual strategy gives the plant the highest rate of success to reproduce at Meijendel?

The aim of this thesis is to answer these questions by looking at the complete macrofossil assemblage of the six samples taken from the lake. The next thing I will look at is what sexual strategy is used by the plant taxa that are found at the lake and, if possible, what the plants' life cycles are. If a pattern is found between the sexual strategies and the plant life cycles, meaning that one certain sexual strategy or plant life cycle stands out, it will also be mentioned in the results.

Case Study

To gain a better perspective for this research, the site in the Libellenvallei will be compared to multiple sample points. One of the sites where the Libellenvallei will be compared with is with the Greek Middle Pleistocene archaeological site of Marathousa. Marathousa is located in the basin of Megalopolis (Panagopoulou *et al.* 2018, 34). The basin of Megalopolis is located in the southwestern part of the Arcadia region of the Peloponnese, southern Greece (Michailidis *et al.* 2018, 85). The location of the site can be seen below on the map in figure 2. Marathousa was a butchery site, so no hominins lived here permanently.

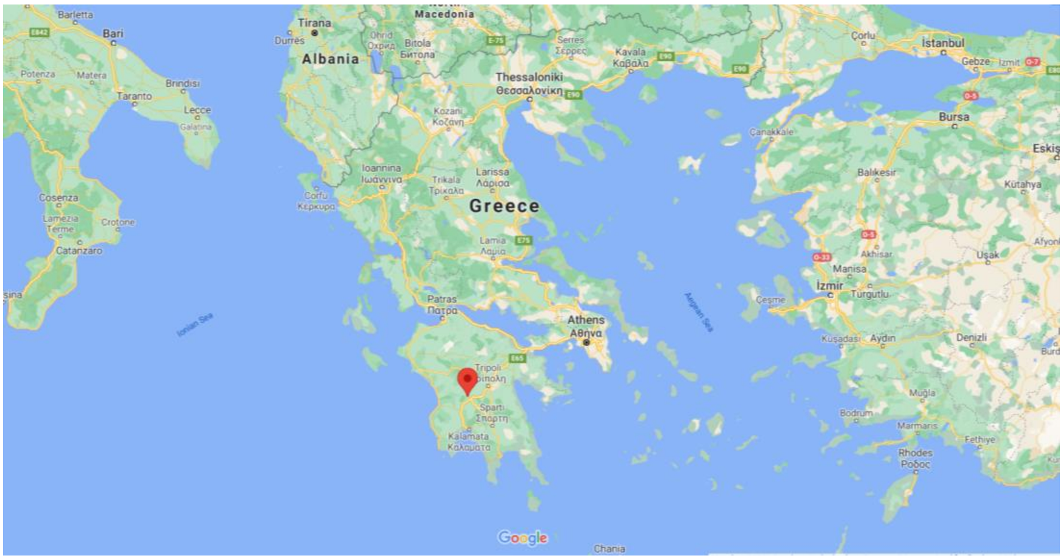

Figure 3: the location of Marathousa on the map (photo made with Google Maps)

The site of Marathousa can be considered a useful candite to compare to the lake in the Libellenvallei since it is also a lacustrine site (Field *et al.* 2018, 108). Much research at Marathousa was performed on the found skeleton of a Middle Pleistocene elephant. However, research was also performed on the plant taxa found at the site. This research on the plant taxa revealed an estimation of how the climatic conditions were when the elephant was butchered.

Plant macrofossils at Marathousa were investigated and just like the site at Meijendel high concentrations of plant macrofossils became apparent during the investigation of the sediments (Field *et al.* 2018, 110). There was also some focus on the issues of taphonomic processes, and all of the research done at Marathousa made a detailed reconstruction of the environment during the butchering of the elephant possible (Field *et al.* 2018, 117-121).

A complete list with all the plant taxa found at Marathousa was published. All the plant taxa found at the Meijendel site were collected, counted and written down after identification of all the plant taxa. Not all the taxa found at Marathousa matches with the taxa found at the site of

Meijendel. Even though this is the case, a comparison of the common taxa of both sites will be discussed later on in the discussion part.

The second site the Libellenvallei will be compared with is that of the site of East Farm, Barnham, Suffolk in the United Kingdom. Paleobotanical analyses were made on Middle Pleistocene fossiliferous lacustrine sediments (Field *et al.* 2021). Just as the Libellenvallei is this also a lacustrine site, so a good site to compare the results to. This will also be discussed in the discussion part.

Material and Methods

Sampling and sieving

The first step in the research process was to take samples from the lake at the Libellenvallei. The sampling wasn't so easy to carry out since we needed permission before the process could occur. Meijendel is under regulations from Dunea, and the samples were taken over the course of the winter after Dunea gave the team the green light to start with the sampling.

A total of six samples got extracted from the lake. All the samples were extracted from different parts of the lake, which influenced the plant taxa found in each sample. The samples that were located deeper in the lake were taken not by hand but were taken with a device called a clamshell sediment sampler (Field 2021). The clamshell sediment samplers are the most common method of retrieving soil samples from waterbed surfaces and can be used for any seabed or waterbed to recover samples (Audibert and Huang 2005, 1251-1252). A simple explanation of how a clamshell sediment sampler operates is portrayed in figure 3 down below. Multiple sizes are available, but for this project, only a smaller one was sufficient. This smaller one operates by hand and not any hydraulics. The lake at the Libellenvallei also did not contain many big cobblers or boulders. So, this makes the clamshell sediment sampler useful for this site. The grabs of a clamshell sediment sampler can only jam when a body of water does contain a lot of big cobblers and boulders (Audibert and Huang 2005, 1252).

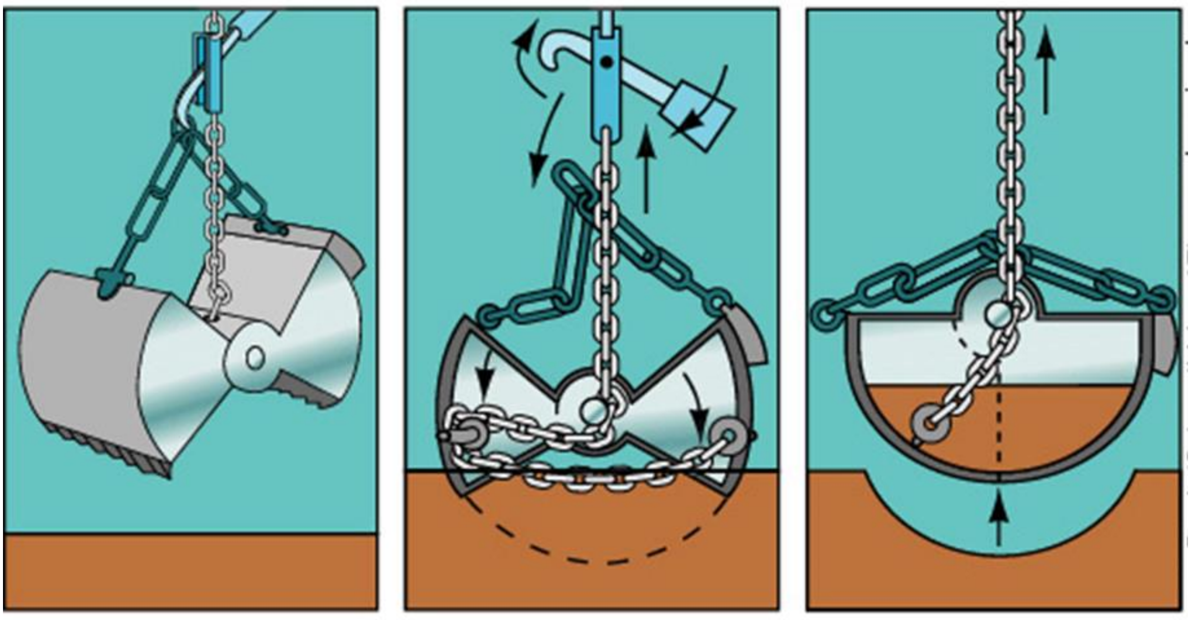

Figure 4: a simplification of how a clamshell sediment sampler works, image adapted from: http://geophile.net/Lessons/sediments/sediments_07.html

The sediment samples that were taken closer to the service were taken with the help of a sieve. This sieve can be operated also by hand just as the clamshell sediment sampler. In figure 4 the sieve is shown.

Figure 5: the sieve that was used for samples closer to the service (photo taken by Mieke Bulder)

Each sample contained a total of 150cm^3 sediment. All the taken samples got divided under eight students, and most students worked together on one of the samples, so no one had to investigate the 150cm^3 of material alone.

After dividing the samples among the students, the next step was to sieve the taken samples. We did the sieving to sieve out the bigger particles of sediment to end with mainly botanical material. The samples were sieved with four sieves before the team looked at them. When moving on to the next sieve, the holes of the sieve become smaller. When we started with the sieving, we began with the sieve with holes of 1mm large. The parts that get sieved out at this part are mainly large parts of sediment. The smaller parts that stay on the sieve were collected and were put into a beaker. The next sieve has smaller holes of 500 µm (1µm equal to 0.001 mm). The parts that don’t get sieved out are collected again and put in another separate beaker. This process is repeated with the sieve of 250µm, and repeated until the fourth and the last sieve of 150 µm is reached.

So, in the end, we are left with a total of four beakers of 1mm, 500µm, 250µm and 150µm. The material did need to be kept wet, so water had to be added to each of the beakers. The content of the last two beakers will contain smaller and fine-grained material. As already mentioned earlier, the lake is located close to the dunes. Due to this fact, means that it is possible that the material sieved with the last two sieves could contain portions of sand.

Picking

After sieving all the samples, the next step in the process was picking the already sieved samples. With the help of a stereomicroscope, the sieved samples were looked at by all the team members. All the possible botanical material from the beakers had to be picked and collected on multiple Petri dishes to identify later on. How the botanical material got identified will be explained in the following part of identifying and tubing.

Picking is a step-by-step process that can take a lot of time to finish, and the time spend on it relies on the size of the sample. Each of us started with the material of the beaker of 1mm. A portion of the material gets poured onto a petri dish together with water. Then looked at it through the microscope. With tweezer or otherwise, a small paintbrush is the botanical material collected from the petri dish and put onto a separate Petri dish. The material which was impossible to identify or what could not be considered botanical material got disposed of into a separate beaker. This beaker with the disposed of material was seen as the waste beaker. This waste beaker gave the opportunity if you disposed of something you weren't sure about that you could re-check it possibly with one of the team members to make sure that what you disposed of wasn't anything important. If it was indeed botanical material that was disposed of, you could still collect it and put it aside.

Picking the botanical material and disposing of the rest was done until all the botanical material in one beaker is collected. All that is left that couldn't be identified or wasn't botanical material could be disposed of in the waste beaker. After doing all of this means that you could start with the next beaker. The process is repeated over for each of the four beakers. So, after the first beaker of 1mm was processed means that the beaker of 500µm is next, then 250µm, and we ended with the one of 150µm. The last thing that had to be done, to make the next steps of identifying and tubing easier was to organize the Petri dishes with the collected botanical material. To make the upcoming steps easier comes down to putting all the same species or parts of the plants together.

The picking took quite a few weeks to complete. Some of the samples, even after being sieved, consisted out of a lot of sand. A lot of sand can make it quite difficult to check each petri dish for botanical material. When almost every petri dish contained a lot of sand, and barely any botanical material meant that you could use the rule of three. With the rule of three, a total of three Petri dishes viewed for botanical material. If all the three Petri dishes don't contain any botanical material, gives way to the remaining material in the beaker to be disposed of.

Identifying and tubing

After completing the picking meant that identification of the botanical material could take place. Identifying the material was mainly focused on the found seeds, nutlets or leaves since it can be difficult to identify other parts of plants. Identification of seeds and leaves could be made with the help of books that either contains photographs of the seeds and leaves or else drawings of them. The photographs or either the drawings in the books made identifications of the picked leaves and seeds possible.

When not entirely sure if the picture or drawing in the book corresponds with a seed or a leaf, the reference collection can offer a helping hand. The botany laboratory contains an extensive reference collection consisting of all kinds of seeds from all over the world. Seeing the actual contender for your seeds could help you to decide if your guess was correct or not. Unfortunately, not all the picked seeds or leaves were in the reference collection. So, that made it sometimes quite difficult to identify one of your seeds or leaves since photographs and drawings are one dimensional.

Extra resources used during identifying were the expertise of other team members or looking up photos from the internet to be sure what kind of species your leaf or seed is. Making a secure identification of your seed can only be difficult when you only have pictures when comparing. It is, therefore, in some cases sufficient to identify the seed to the family level if this can be said with certainty. With the help of the reference collection, it is easier to identify the seeds to the genus level or even the species level.

After the identification of all the seeds and leaves, the counting and the tubing could commence. All of this information was also gathered and written down. All the plant species that were identified in the process got written down in a digital spreadsheet, together with the quantity of that species.

After producing all of this data and writing it down in this digital spreadsheet the tubing was the next thing on the list. Tubing is essential to keep the found seeds and leaves together. It is also necessary to make sure that the species last for years to come.

For the tubing, we used smaller bottles, which got filled up with a mixture of 30% glycerol. After filling the bottle, the name of the species can get written down. The seeds or leaves from this species can then be collected from all the Petri dishes and put into the same bottle. Tubing is very time-consuming, and because of this, it was a smart move that the Petri dishes got organized beforehand. Organizing beforehand makes the counting and the tubing of a single species easier since there all grouped.

Sexual strategies and life cycles

After identifying all of the plant taxa, it was time to move on to the next step: looking at the sexual strategies of the plant taxa. The sexual strategies possible for the identified plant taxa were hermaphrodite, monoecious, dioecious and asexual.

When looking at people, we can't imagine them reproducing without sexual intercourse between a male and female partner. But when it comes to plants this isn't, however, a strange prospect. Plants can reproduce without the use of sex (Lehtonen and Parker 2014, 1161). The flowers of hermaphrodite plants have male and female parts, and reproduction by hermaphrodite plants is also the most common way of reproducing (Klinkkamer and De Jong 2002, 333). These plants, therefore, don't need another plant to reproduce.

The second sexual strategy is that of monoecious plants. Monoecious plants have both male and female flowers on the same plant, or that plant has flowers that contain both male and female reproductive components (https://www.gardeningknowhow.com)

Even though the names are similar, dioecious plants differ from monoecious plants. While as mentioned earlier, monoecious plants have male and female flowers or reproductive components, while dioecious plants only have either male or female flowers. For dioecious plants to reproduce, a female and male plant must be nearby for the plant to be able to reproduce (https://www.gardeningknowhow.com).

When looking at sexual reproduction, we see that it involves the transfer of pollen from an anther to the stigma of the pistil, which is then followed by germination (Halfhill and Warwick 2008, 35). Sexual reproduction can be seen as the traditional way of plant reproduction. Plants, however, can also reproduce through asexual reproduction. When we talk about asexual reproduction we talk about the process of cloning. The new produced plants are identical to their parent plant (Halfhill and Warwick 2008, 38).

How plants can reproduce is quite different, but the sexual strategies are not the only factor when looking at the macrofossil assemblage. Another factor that could play a part in this are the plant life cycles. In the following section, not only the sexual strategies of the found plant taxa will be identified, but, if possible, also the life cycle. Plant life cycles are different from sexual strategy but also play a role in the reproduction of plants. There are three plant life cycles: annual, biennial and perennial.

A plant with an annual life cycle will complete its life cycle in less than one year (http://www.illinoiswildflowers.info). There are two kinds of annual plants: winter and summer annuals. With winter annuals, the seeds will germinate during the autumn, and the plants themselves will reproduce in the spring. The summer annuals will reproduce in the summer, and their seeds will be germinating during the summer (Han *et al*. 2016, 17)

Plants with a biennial life cycle are similar to plants with an annual life cycle, but instead of one year, they require two years to complete their life cycle (http://www.illinoiswildflowers.info). In the first year, the plant will bloom, and in the second year, the plant will form seeds which, is then followed by the plant's death (https://aggie-horticulture.tamu.edu).

While biennials and annuals only last for one or two years, the perennials persist for many growing seasons. The top portion of a perennials dies back each winter and will regrow the following spring from the same root (https://aggie-horticulture.tamu.edu).

Results

Frequently found

The location where the samples had been taken from also influenced what kind of plant taxa were found. In figure 5 below, the locations from each of the taken samples are indicated. The location of the samples could also influence the found taxa in the samples. Each sample can be considered different from the other samples. Some plant taxa could be found in almost all of the samples. But there are some exceptions since some taxa were found in great numbers in one sample but were missing in other samples.

Figure 6: The locations of the samples in the lake (photo made by Alem Gusinac)

A taxon that we found in every one of the samples was that of *Hippophae rhamnoides*. Other taxa, as *Hippophae rhamnoides*, were found in every sample were *Characeae* and *Juncus acutiflorus / subnodulosus*. Two species have been written down for the found Juncus seeds since it was tricky to distinguish the species because these two taxa look much like another. So, the Juncus seeds were either *Juncus acutiflorus* or *Juncus subnodulosus* and were added together.

There were also some outliers when we look at the frequency of some of the taxa found. Sample 2 and 3 didn't contain that many taxa when compared to the other samples. Quite a few differences could be distinguished when we compare sample 1 to sample 2 and sample 3. Sample 1 contained a large amount of *Characeae* when compared to the other samples. Sample 1 alone already contained more than a thousand seeds of *Characeae.* In sample 4, we see a large number of *Berula erecta.* Sample 4 is also the only sample where this taxon was found in. Sample 4 also contained the most *Juncus acutiflorus / subnodulosus:* a thousand plus seeds of this taxon were found in this sample. As already mentioned all the other samples also consisted of *Juncus acutiflorus / subnodulosus,* but not even close to the number that was found in sample 4.

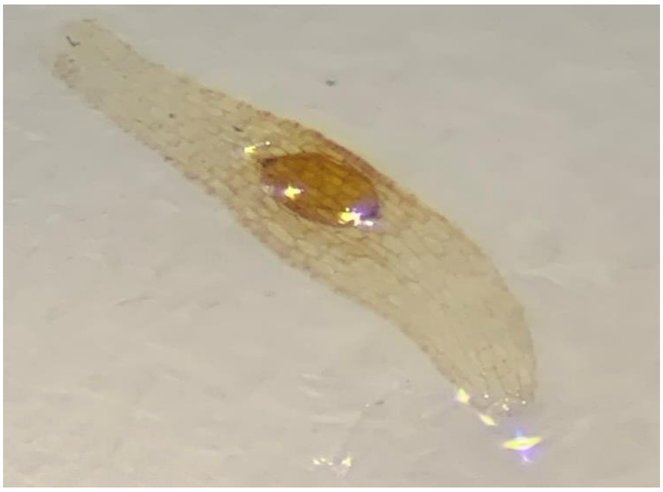

Figure 7: an *Orchidaceae* seed (photo made by me)

There are also plenty of taxa that were only a few seeds were found in only one or two samples. Examples of taxa that weren't found as much are *Salix repens* and *Orchidaceae*. In figure 6, listed above, a photo from up close can be seen from an *Orchidaceae* seed. All the mentioned taxa and all the others can be found in the spreadsheet. This spreadsheet is in the appendices.

Sexual strategies of the found species

All the sexual strategies of the taxa found were identified when possible. Identification of the sexual strategies for all the taxa was only possible if the family and at least the genus of the taxa were known. There were also some taxa where only the family level was known since it couldn't be said with complete certainty what the species was or even the genus. These taxa have been processed in a separate category of unknown/not possible since it wasn't possible to identify the sexual strategy. For some of the found taxa, it was also not possible to figure out the sexual strategy in the end and were also counted in this separate category.

When looking at the sexual strategies of the found taxa, we can see that the most common sexual strategy was that of hermaphrodite. A total of 36 different taxa were found at the lake at Meijendel. From these 36 taxa, a total of 18 taxa were hermaphrodite. So, almost half of the taxa were hermaphrodite. An example of a hermaphrodite taxon that was found very frequently is that of *Juncus acutiflorus / subnodulosus*. This taxon was found in each of the six samples.

Taxa with the sexual strategy of monoecious and dioecious were also found among these 36 different kinds of taxa. Only five taxa were monoecious, and seven taxa were dioecious. So, around ten per cent of the taxa were monoecious and around twenty per cent of the taxa were dioecious.

So, the sexual strategy that was most common amongst the taxa was hermaphrodite. While almost fifty per cent of the taxa being hermaphrodite was quite the other way round for asexual taxa. Only one taxon among all the 36 different taxa was found to be asexual: *Musci*.

The taxa with an identifiable sexual strategy make up for a total of 30 taxa. We are, therefore, left with the remaining seven taxa, which got classified into the separate category of unknown/not possible. An example of a taxon that got classified into this category was that of *Characeae*. *Characeae* was put into this category because only the family name was identified. No sexual strategy could, therefore, be identified for this taxon.

Identifying the sexual strategy wasn't possible for each taxon. Some of the sexual strategies were impossible to figure out for some of the found taxa. For some of the taxa, it was only known that the taxon was self-compatible. Taxa that were identified as self-compatible were *Carex* cf. *flacca* and *Baldellia ranunculoides*. Both *Carex* cf. *flacca* (Taylor 1956, 288) and *Baldellia ranunculoides* (Vuille 1986, 173) are considered self-compatible. Self-compatible taxa can reproduce from a single individual when mates are scarce or not in the near vicinity and are considered to have an advantage over self-incompatible taxa (Razanajatovo et al. 2016, 1-2).

A pie chart with the percentages of the sexual strategies can be found on the next page, in figure 8. This gives a quick overview of the frequency of the sexual strategies among all the samples. A diagram with an overview of the sexual strategies in the separate samples can be found in the discussion part.

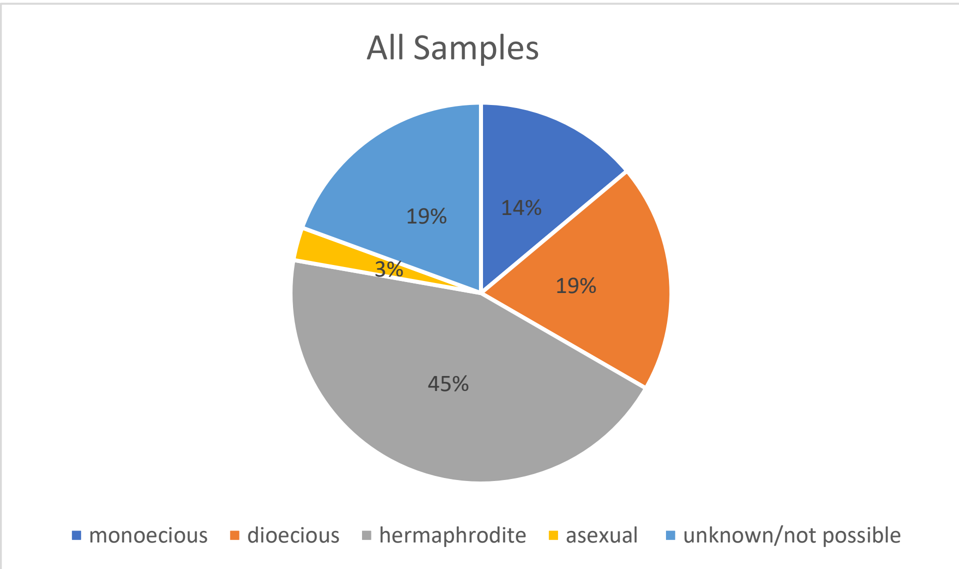

Figure 8: a pie chart with the data of the sexual strategies of the found taxa (made with Excel)

Life cycles of the found species

Just as the sexual strategies, also the life cycles of the found taxa were identified when possible. The life cycles of the found taxa weren't always possible to identify. This is similar to the case of the sexual strategy. Identification of the life cycle can only be done if three things are known: the family, the genus and the species.

There were taxa where the sexual strategy was unknown, but this wasn't the case with the life cycle. All the life cycles of the found taxa have been identified when this was possible. Only for the taxa where only the family was known, was it not possible to identify the life cycle. There was an extra category needed for the life cycle which was different from the sexual strategy part. This separate category for the life cycles of the taxa was that of two possible life cycles. Some of the taxa had two possible life cycles, so an extra category was created for this.

As already mentioned before, there was a total of 36 different taxa found among the taxa. There were three different kinds of life cycles: perennial, annual and biennial. There were only two taxa among the 36 that got classified into the two life cycles possible category. The taxa were: *Ranunculus* subgenus *Batrachium* and *Linum catharticum*. At first, it wasn't an easy task to identify the life cycle of *Linum catharticum*. After quite some extensive research it was made clear that *Linum catharticum* can be both annual and biennial. Annual forms of *Linum catharticum* can be found in the Netherlands, and *Linum catharticum* is considered as a facultative biennial (Kelly 1985, 293). *Ranunculus* subgenus *Batrachium* is considered to be both annual and perennial (Lumbreras 2011, 118)

Just as with the sexual strategies of the taxa, we can again see that one of the three life cycles was most common amongst the taxa. For the life cycle, the most common of the three was that of the perennial life cycle. A total of 25 taxa got identified as perennial. This total comes down to that 65% of all the taxa were perennials.

There were also some taxa where the life strategy couldn't be identified of. This was the case for a total of nine taxa. Nine taxa are more than the seven sexual strategies that couldn't be identified. The reason for this is that the sexual strategy can be identified for taxa where the family and the genus were known. For the life cycle, the species was also necessary. So, for nine taxa, it wasn't possible to identify the life cycle. This total comes down to about a quarter of all the 36 taxa.

The two life cycles that were left, were biennial and annual. With 25 taxa being perennial, two taxa with two life cycles and nine not being possible to identify means that only two taxa are left. Only one taxon was biennial, and one was annual. Barbarea vulgaris was the only taxon that was biennial, and *Blackstonia perfoliata* was the only taxon that was annual.

A pie chart with the percentages of the life cycles can be found below in figure 9. This gives a quick overview of the frequency of the life cycles among all the samples. A diagram with an overview of the life cycles in the separate samples can be found in the discussion part.

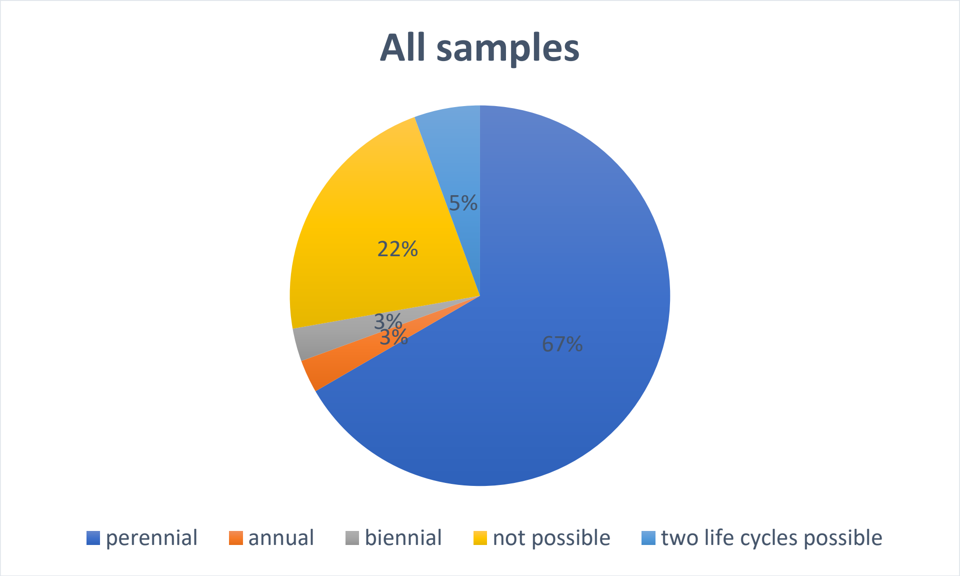

Figure 9: a pie chart with the data of the life cycles of the found taxa (made with Excel)

Discussion

Sexual strategies and life cycles

Modern assemblage

As we saw in the results, the most common sexual strategy was hermaphrodite, and the most common life cycle was that of the perennials. It was, however, quite interesting that almost a quarter of the total taxa got identified as dioecious. And the fact that almost no taxa got identified with the annual lifecycle.

Two diagrams have been made with the sexual strategies and the life cycles of the taxa. These diagrams have been made to give a simple overview of the percentages and can be found on two pages further.

Dioecious plants can cause a bias on the macrofossil assemblage since dioecious plants either have male or female flowers on them and need each other in the near vicinity to reproduce. We can see this clearly when we look at the taxon of *Hippophae rhamnoides*. Not one seed of this particular taxon has been found in any of the samples. Only scales have been found in all of the six samples which is indicated in the spreadsheet. *Hippophae rhamnoides* is part of the original vegetation of Meijendel, and it is therefore strange that no seeds were found in any of the samples from the lake at the Libellenvallei. A list of all the taxa that can be found in the original vegetation of Meijendel can be found in the appendix.

It is also interesting that only one taxon among the 36 found taxa got identified with an annual lifecycle. A smaller number of seeds was something that could be expected since annuals complete their lifecycle in less than a year and thus bloom for a limited time, which is different from the perennials. But it is still quite strange that only one taxon got identified as an annual considering that many annual species produce large numbers of tiny seeds that are dispersed shortly after maturation (Gutterman 2000, 117). This would mean that more seeds of taxa with an annual lifecycle would be expected in the samples. This could also be a possible bias similar to the case of the dioecious taxa. It is possible that by a certain disturbance that taxa with this particular lifecycle don't get much chance to reproduce at Meijendel.

Biases such as these could give us a better representation of the vegetation, which could be beneficial for paleoenvironmental reconstructions, as already said before in the introduction: the present is the key to the past (Field 2021). The same trends when focused on *Hippophae rhamnoides* can be seen when looking at the modern macrofossil assemblage at Meijendel. This sort of trend was also visible at the site of Barnham. Barnham consisted of a macrofossil assemblage from the Middle Pleistocene. Barnham will be discussed later on in the next part of the discussion.

Hippophae rhamnoides was not the only taxon where no seeds were found of. The same can be said for *Equisetum palustre*. *Equisetum palustre*, just as *Hippophae rhamnoides*, is a dioecious taxon, and only plant parts were found of this particular taxon. It is, therefore, possible that just as in the case of *Hippophae rhamnoides*, this can cause bias on the found macrofossil assemblage.

Application

That no seeds of *Hippophae rhamnoides* were found, was also the case at the archaeological site of East Farm, Barnham, UK. The *Hippopahae rhamnoides* seeds were also absent from the sediments that were taken at Barnham. Only scales and pollen grains have been found at Barnham. It is a possibility that this could be a reflection of the sex ratio in the source population (Field *et al*. 2021).

That not one *Hippophae rhamnoides* seed got found in the samples taken from the lake at the Libellenvallei has multiple possibilities. A possibility could be that the original vegetation of Meijendel exists out of a high number of only males or females. Without both the females and the males in the near vicinity, it is difficult for this taxon to reproduce. A high proportion of male plants will only contribute to the potential number of pollen grains, and if there is a low number of female plants, then the likelihood of seeds being preserved will be reduced (Field *et al*. 2021).

Female dioecious plants produce not only flowers but also seeds and fruits. The assumption, therefore, can be made that female plants distribute more resources to reproduction than the male plants, and because of this present a higher reproductive effort than the male plants (Juvany and Munné-Bosch 2015, 6083-6084).

Other factors that can influence the effects of reproducing plants are the location of the plant and the plant size. As said before, it was expected beforehand that most found taxa would be hermaphroditic perennials. But these factors can influence the frequency of these hermaphroditic perennials even more. The factor of inbreeding depression is, for instance, also strongly affected by environmental conditions (Wang *et al.* 2016, 7). Perennial plants are, also influenced by the climate they grow in. Perennials need a stable environment to grow better, which means that Meijendel presents a stable environment for perennials since the majority were perennials.

Results from previous research have shown us that larger plants of particular hermaphroditic taxa allocated more resources to reproduction than smaller plants, and investment into female reproduction increased more rapidly with a size relative to male investment (Wright and Spencer 1999, 228). In perennial plants, size-dependent reproduction may be a key element of an adaptive response to temporal environmental variation, in which these plants expand their lifetime fitness (Andrieu *et al.* 2007, 435).

Hermaphroditic species can also employ different kinds of strategies in their lifetime. Dichogamy and herkogamy are two usual features of flowering plants (Duan *et al.* 2005, 225). Herkogamy is the spatial separation of male and female functions in flowers (Opedal 2018, 677), and dichogamy refers to the temporal separation of sexual functions within a flower which is considered as an effective mechanism to avoid self-fertilization (Naghiloo and Claßen-Bockhoff 2020, 1). These two strategies combined hinders autonomous and facilitated self-pollination, and the combination helps reduce sexual interference during pollination. Since hermaphroditic plants function as both maternal and paternal parents can cause conflict in these parental roles during the pollination and mating of plants. A combination of dichogamy and herkogamy can, however, alleviate such conflicts (Duan *et al*. 2005, 229).

Since only scales were found at the lake in Meijendel, and no seeds in the samples, it is a good possibility that only female or male plants represent the original vegetation of Meijendel. The gender of plants can be size-dependent, with an increase in the allocation to either male or female function with the size. This particular kind of gender bias can be frequently found in resource-poor environments (Andrieu *et al*. 2007, 435). It is, however, quite hard to say if the original vegetation of Meijendel consists of mainly female or male plants of *Hippophae rhamnoides*. This can't be said with much certainty since earlier research at the site of Meijendel has shown that the morphology of the scales is similar to whatever part of the plant they originate, whether from a male or female plant (Field *et al.* 2021). We can only make assumptions on this part. If we want to have more certainty, then we need to investigate this further.

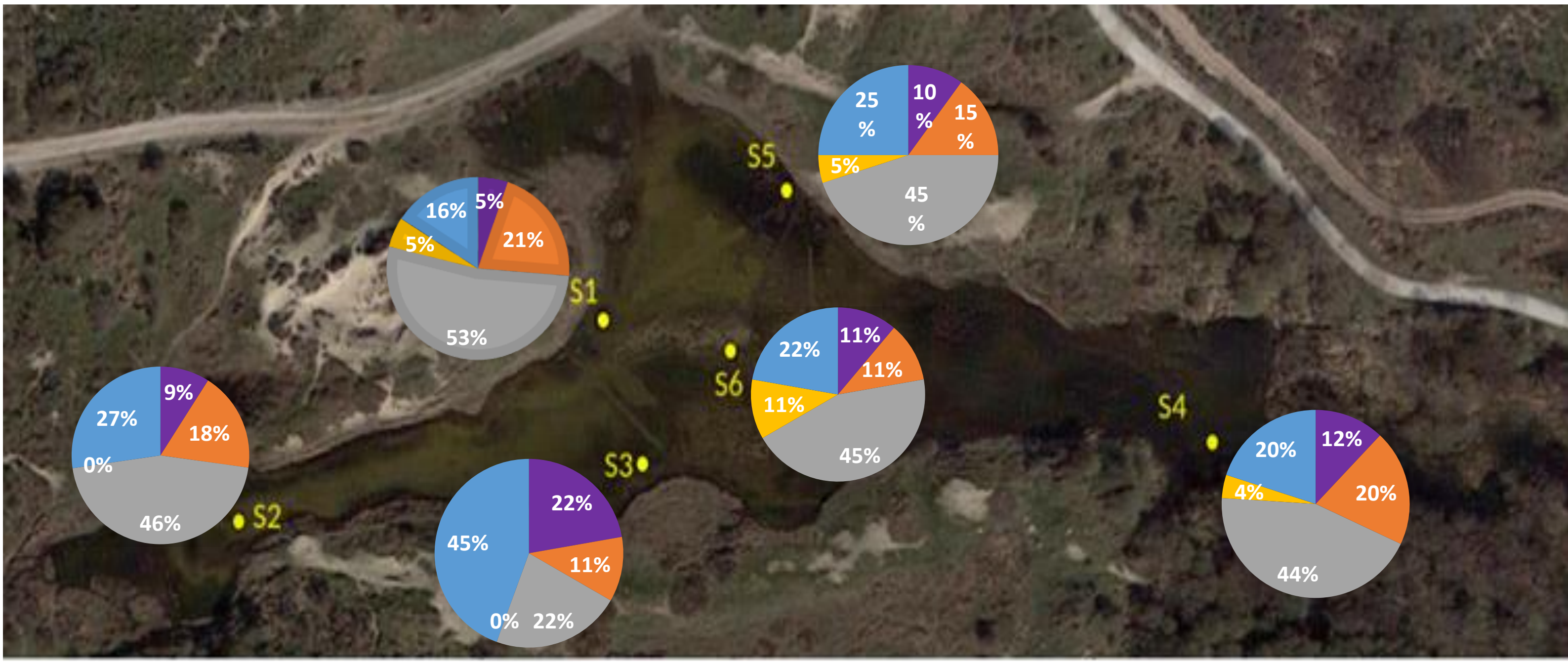

Figure 10: A diagram of all the percentages of sexual strategies in the separate samples (made with Excel)

Legend:

Unknown/not possible

Dioecious

Hermaphrodite

Asexual

Monoecious

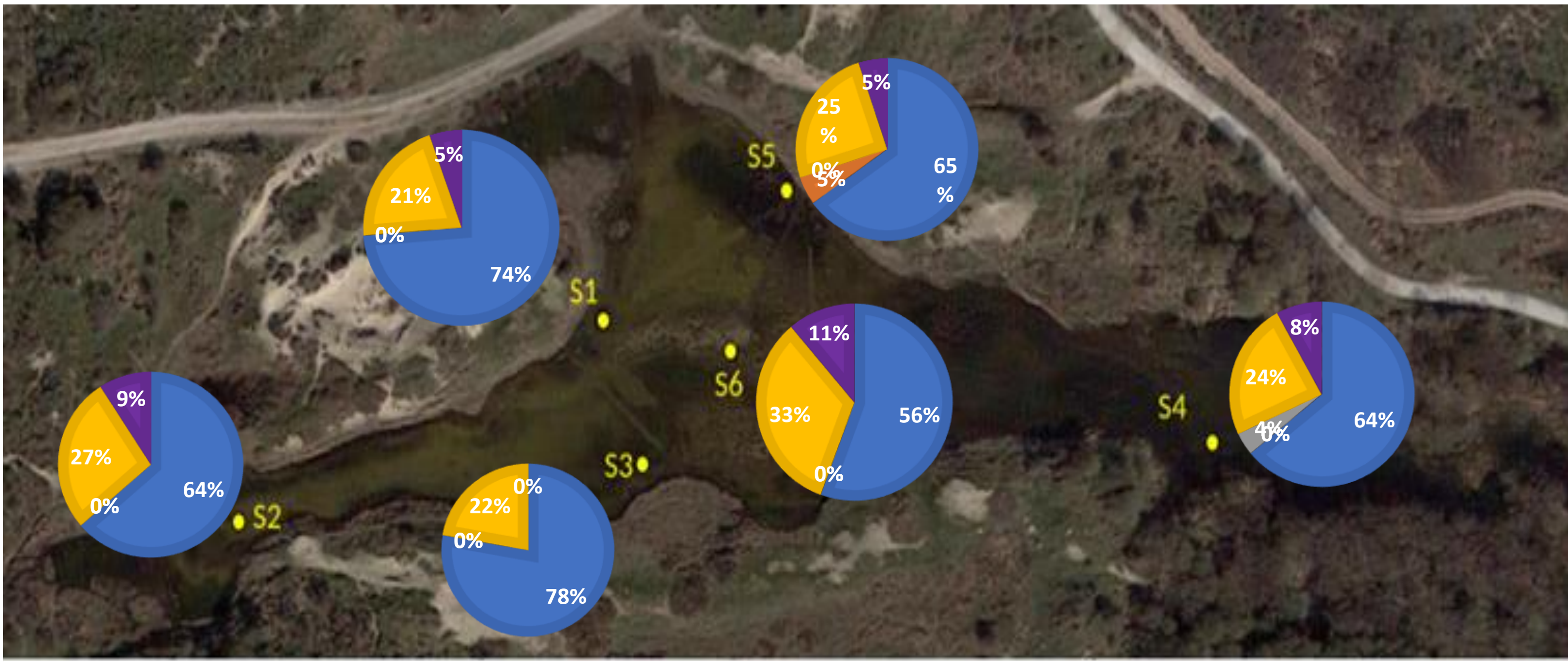

Figure 11: A diagram of all the percentages of life cycles in the separate samples (made with Excel)

Legend:

Annual

Perennial

Not possible

Biennial

Two life cycles possible

Another possibility is that when looking at *Hippophae rhamnoides* in the original vegetation of Meijendel is that the male plants start flowering at different times than the female plants. As said earlier: female dioecious plants present a higher reproductive effort than male plants (Juvany and Munné-Bosch 2015, 6083-6084). This higher reproductive effort necessitates a lengthier period of resource accumulation before the start of flowering. However, the flowering of male plants is not in itself adaptive (Forrest 2014, 338). And the males begin and reach their peak of flowering before the females do (Forrest 2014, 346). It is more often the case that in annual plants, the flowering seasons are more synonymous. Synonymous flowering seasons seem less applicable to perennial plants (Forrest 2014, 338). *Hippophae rhamnoides* has a perennial life cycle. It is, therefore, a good possibility that the flowering seasons of the male and female plants are not synonymous with each other.

Some trends that got identified at Meijendel were also visible at the site of Marathousa. Most of the waterside and damp ground and aquatic taxa identified at Meijendel were hermaphrodites and perennials. The Greek archaeological site of Marathousa contained quite a lot of waterside and damp ground and aquatic plants. Some of these taxa got also found at Meijendel, but a substantial portion differed from Meijendel (Field *et al.* 2018, 112). The same trend from Meijendel, however, can still be found in these different taxa. With some exceptions, we can see that the majority of taxa found at Marathousa are also perennials and hermaphrodites. So, in this aspect, the two sites are similar. A large portion of hermaphroditic perennials could also indicate the same at Marathousa. It is also possible at Marathousa that a bias could be present when it comes to the dioecious species.

This pattern at both Meijendel and Marathousa was easy to indicate and is indicated visually by two diagrams in figure 10 and 11 on the next page. It can be seen that also when looking at the separate samples, the majority of the taxa are perennials and hermaphrodites, with some exceptions. That most plants would be hermaphroditic perennials was the trend that was predicted from the start. This trend was the expected outcome because hermaphroditic reproduction is the most common way of reproducing between plants (Klinkkamer and De Jong 2002, 333). Even though most plants reproduce hermaphroditic does not mean that these taxa are always found most. Hermaphroditic reproduction can also be considered a liability. Hermaphroditic reproduction can cause incest, and by this, the gene pool can shrink over time what can cause mutations among these plants. And self-fertilization of plants often causes inbreeding depression. Inbreeding depression can reduce the fitness in a given population as a result, but in some cases, self-fertilization may increase the seed set (Wang *et al.* 2016, 1). The inbreeding depression affects the survivorship of both juvenile and adult plants (Wang *et al.* 2016, 6)

Most taxa found in the lake in the Libellenvallei got mainly identified as hermaphrodites. It can, therefore, be said with a probability that little inbreeding depression has taken place at Meijendel, and a small number of mutations caused by incest. It is more probable that the self-fertilization of the hermaphrodites has increased the seed set at Meijendel. This is a factor that can influence the frequency of found hermaphrodites at Meijendel. So, there are plenty of reasons why hermaphroditic perennials represented the majority of the taken samples.

This modern research can help with looking at sites such as Marathousa or Barnham. The hardship of researching these older sites is that researchers can only look at the end. So, it is only known what kind of taxa were found at these sites. But not how these ended up there or where these taxa came from. Meaning that the beginnings and the middle parts of these older sites are unknown and that conclusions have to be made based mainly on assumptions. How certain taxa got at these sites and why is something where only presumptions can be made of. This is, however, something that can be said for Meijendel. The found macrofossil assemblage is a modern one and the beginning of this assemblage is known since the original vegetation of Meijendel is known, so we know where these taxa came from and how they could have ended up inside the lake in the Libellenvallei. Since we know the beginning and the middle part of Meijendel means that we can use this information. This information can be used for researching archaeological sites where these parts are unknown, such as with the sites of Marathousa and Barnham. This is also what makes the research at Meijendel relevant to archaeological research.

Conclusion

It was a big project that got done at the site of Meijendel. One which produced plenty of data to interpret and manipulate. The mission of this project was to better understand the environmental context of archaeological sites. Many focuses were possible for this project. But for this thesis, the choice was made to focus on the sexual strategies and the lifecycles of the found taxa during the project.

The results indicated that the most common sexual strategy found among the taxa was that of the hermaphrodites, and the most common lifecycle was that of the perennials. That a big portion of the taxa would be identified as hermaphrodites and perennials was expected from the beginning. These results also answer one of the research questions: Which sexual strategy gives the plants the highest rate of success to reproduce at Meijendel? The sexual strategy that has the highest rate of success to reproduce at Meijendel is that of the hermaphrodites. The most successful lifecycle was that of the perennials. But even though this is the case, there are still some peculiarities when the results were interpreted in the discussion part.

The fact that almost a quarter of the taxa got identified with the dioecious strategy is quite a peculiar result. This result was also not expected from the beginning. Not a single seed of *Hippophae rhamnoides* and *Equisetum palustre* got found among the six taken samples from the lake. It may be that this could indicate that certain biases are present at Meijendel. If only male or female dioecious plants are represented in the original vegetation of Meijendel means that dioecious taxa can't reproduce since no sexual partners are in the near vicinity. These biases can offer a great deal of information to older archaeological sites about the original vegetation. It may be the case that this kind of information is missing from these archaeological sites. The beginning and the end of the taphonomic processes are known at Meijendel. Conclusions about the middle part are, however, mainly based on assumptions. Therefore, further research is recommended to see if other biases are represented at Meijendel and if it's the case that only female or male *Hippophae rhamnoides* are present in the original vegetation of Meijendel.

With all the results and this information, the main research question can be answered: To what extent does the sexual strategy of plants around the lake in the Libellenvallei influence the composition of plant macro remains in the surface sediment from the lake? The presented results of the found taxa showed that sexual strategies and the lifecycles play a substantial role in influencing the macrofossil assemblage at the lake in the Libellenvallei. Results showed that hermaphrodites were the most common among the macrofossil assemblage from the lake, which indicates that this is the most successful way of reproduction, but other sexual strategies might have more struggles reproducing, such as the case of the dioecious plants when no sexual partners are present. The sexual strategies are a key point in this and could determine the survival and success rate of the taxa in the original vegetation of Meijendel. So, sexual strategies are a very important taphonomic process. One that has a lot of influence on the macro assemblage in the lake and also at other archaeological sites.

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Figures and appendices

Figures

Page number:

Appendices

Appendix 1: spreadsheet of the found taxa

Table: results of which taxa were found in the samples with their frequency and their accessory sexual strategy and life cycle.

		Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	plant sexual strategy	plant life cycle
Taxon	**Plant part**	**Number of remains in 150 cm³**	**Number of remains in 150 cm³**	**Number of remains in 150 cm³**	**Number of remains in 150 cm³**	**Number of remains in 150 cm³**	**Number of remains in 150 cm³**		
Woodland									
Betula	catkin scale	-	-	-	2	-	-	monoecious	x
Betula	fruit	5	-	-	14 winged, 18 wingless	1	-	monoecious	x
Salix repens	leaf	1	1	-	2	-	-	dioecious	perennial
Dune scrub									
Hippophae rhamnoides	scale	318	10	13	33	113	9	dioecious	perennial
Disturbed ground									
Senecio cf. *inaequidens*	seed	-	-	-	1	-	-	hermaphrodite	perennial
Dry calcareous grassland									
Blackstonia perfoliata	seed	-	-	-	-	2	-	dioecious	annual
Carex cf. *flacca*	nutlet	-	-	2 utricle	30 nutlets, 2 utricle + nutlet	2 utricle + nutlet	-	unknown	perennial
Leontodon autumnalis	seed	1	-	-	-	-	-	hermaphrodite	perennial
Linum catharticum	seed	26, 1 frag	1	-	1	1	1	hermapohrodite	annual or biennial
Orchidaceae	seed	13	1	-	1	-	-	x	x
Waterside and damp ground									
Baldellia ranunculoides	embryo	2 fruits, 2 embryos	-	2	4 embros, 7 fruits	1	-	unknow (self compatible)	perennial
Barbarea vulgaris	seed	-	-	-	8	-	-	hermaphrodite	biennial
Eleocharis palustris	nutlet	-	1	1	97	2	1	hermaphrodite	perennial
Epilobium hirsutum	seed	-	-	-	1	-	-	hermaphrodite	perennial
Equisetum palustre	plant parts	-	-	-	1	-	-	dioecious	perennial
Equisetum	nodal sheath	-	-	-	3	-	-	dioecious	perennial
Eupatorium cannabinum	seed	3 seeds, 5 fragments	-	-	6	-	-	dioecious	perennial
Hydrocotyle vulgaris	fruit	2	-	-	3	-	-	hermaphrodite	perennial
Juncus acutiflorus / subnodulosus	seed	366, + 22 frag	45	80	1027	254	45	hermaphrodite/	perennial
Juncus	capsule	-	-	9	2	1	-	x	x
Lythrum salicaria	seed	6	-	-	-	1	-	hermaphrodite	perennial
Mentha cf. *aquatica*	nutlet	1	-	-	229	1	-	hermaphrodite	perennial
Parnassia palustris	seed	1	1	-	-	3	-	hermaphrodite	perennial
Phragmites australis	leaf	3	-	-	-	1	-	hermaphrodite	perennial
Samolus valerandi	seed	28	-	-	16	2	2	hermaphrodite	perennial
Scirpus lacustris	nutlet	2	1	-	-	4	-	hermaphrodite	perennial
Typha	seed	-	-	-	2	-	-	monoecious	x
Aquatic									
Characeae	oospore	1601 , + 89 frag	28	37	45	271	81	x	x
Berula erecta	fruit	-	-	-	727	-	-	hermaphrodite	perennial
Lemna minor	plant	-	-	-	3	-	-	monoecious	perennial
Myriophyllum spicatum	seed	-	-	1	-	-	-	monoecious	perennial
Ranunculus subgenus *Batrachium*	achene	-	-	-	1	-	-	hermaphrodite	annual/perennial
Unclassified									
Alismataceae	embryo	-	-	-	-	-	2	x	x
Carex	nutlet	100 nutlets, 27 utricle + nutlets, 11 utricles, 23 frag	11, 1 utricle + nutlet	11	-	20	14	almost all species monoecious, some are dioecious	perennial
Laminaceae	nutlet	-	-	-	-	1	-	x	x
Musci	stem with leaves	22	1	-	418	10	1	asexual	x
Urtica dioica	seed	-	-	-	-	1	-	dioecious	perennial

Appendix 2: list of the flora at Meijendel

List of the original vegetation at Meijendel (adapted from Dunea)

Nieuwe Naam	Oude Naam
Agrostis capilaris	A. tenuis
A. vinealis	A. canina ssp. montana
Amaranthus blitum	A. lividus
Ambrosia coronopifolia	A. psilostachya
Anchusa arvensis	Lycopsis arvensis
Asplenium scolopendrium	Phyllitis scolopendrium
Atriplex prostrata	A. hastata
Avenula	Helictotrichon
Berula erecta	Sium erectum
Bromus hordeaceus ssp. hordeaceus	B. mollis
Bryonia cretica	B. dioica
X Calamophila baltica	X Ammocalamagrostis baltica
Cardaria draba	Lepidium draba
Carex oederi ssp. oedicarpa	C. tumidicarpa
C. oederi ssp. oederi	C. serotina
Centaurea jacea (s.l.)	C. nigra
C. jacea (s.l.)	C. pratensis
Ceratocapnos	Corydalis
Chamerion	Chamaenerion
Consolida regalis	Delphinium consolida
Cytisus scoparius	Sarothamnus scoparius
Dactylorhiza maculata	Orchis maculata
D. majalis	O. praetermissa
Danthonia	Sieglingia
Elymus farctus	Elytrigia junceiformis
Elymus athericus	Elymus pycnanthus
Elymus repens	Elytrigia repens
Epilobium ciliatum	E. adenocaulon
Epilobium tetragonum	E. adnatum
Euphorbia esula ssp. tommasiniana	E. uralensis
Evonymus europaeus	Euonymus europaeus
Festuca rubra ssp. commutata	F. rubra ssp. rubra
Galinsoga quadriradiata	G. ciliata
Galium saxatile	G. hercynicum
Glyceria notata	G. plicata
Hypericum quadrangulum	H. tetrapterum
J. conglomeratus	J. subuliflorus
Koeleria macrantha	J. crustata
Leontodon saxatilis	L. nudicaulis
Leucanthemum vulgare	Chrysanthemum leucanthemum
Leymus arenarius	Elymus arenarius
Lythrum portula	Peplis portula
Matricaria discoidea	M. matricarioides
Milium vernale	M. scabrum
Ononis repens ssp. repens	O. repens
Phleum pratensis ssp. bertolonii	P. bertolonii
Poa angustifolia	P. pratensis ssp. angustifolia
Potentilla verna	P. tabernaemontani
Ranunculus ficaria	Ficara verna
Ranunculus peltatus	R. aquatilis ssp. peltatus
Rhamnus frangula	Frangula alnus
Rhinanthus angustifolius	R. serotinus
Rorippa palustris	R. islandica
R. nasturtium-aquaticum	Nasturtium officinale
Salsola kali ssp. ruthenica	S. kali ssp tenuifolia
Scirpus lacustris ssp. tabernaemontani	S. lacustris ssp. glaucus
Scrophularia umbrosa ssp. neesii	S. neesii
Silene latifolia ssp. alba	S. pratensis + M. album
S. dioica	M. rubrum
Stellaria uliginosa	S. alsine
Tanacetum parthenium	C. parthenium
Taraxacum: naamwijzigingen secties.	
Vaccaria hispanica	V. pyramidata
Vicia sativa ssp. nigra	V. sativa ssp. angustifolia

6564	Abies spp.	Zilverspar
0001	Acer campestre	Spaanse aak
5001	- negundo	Vederesdoorn
1850	- platanoides	Noorse esdoorn
0002	- pseudoplatanus	Gewone esdoorn
0004	Achillea millefolium	Gewoon duizendblad
0005	- ptarmica	Wilde bertram
0011	Aegopodium podagraria	Zevenblad
1851	Aesculus hippocastanum	Witte paardekastanje
0012	Aethusa cynapium	Hondspeterselie
0013	Agrimonia eupatoria	Gewone agrimonie
0015	Agrostemma githago	Bolderik
1544	Agrostis canina	Moerasstruisgras
*0019	- capillaris	Gewoon struisgras
0017	- gigantea	Hoog struisgras
0018	- stolonifera	Fioringras
*1545	- vinealis	Zandstruisgras
	Ailanthus altissima	Hemelboom
0020	Aira caryophyllea	Zilverhaver
0021	- praecox	Vroege haver
0024	Ajuga reptans	Kruipend zenegroen
0026	Alisma gramineum	Smalle waterweegbree
0028	- plantago-aquatica	Grote waterweegbree
0029	Alliaria petiolata	Look-zonder-look
	Allium moly	
0035	- vineale	Kraailook
0036	Alnus glutinosa	Zwarte els
0037	- incana	Witte els
0040	Alopecurus geniculatus	Geknikte vossestaart
0042	- pratensis	Grote vossestaart
*0046	Amaranthus blitum	Kleine majer
*1654	Ambrosia coronopifolia	Zandambrosia
1852	Amelanchier lamarckii	Amerikaans krenteboompje
0050	Ammophila arenaria	Helm
1658	Amsinckia menziesii	Amsinckia
0052	Anagallis arvensis (ssp. arvensis)	(Rood) guichelheil
	Anaphalis margaritacea	Prachtrozenkransje
	Anchusa azurea	Italiaanse ossetong
*0779	- arvensis	Kromhals
1660	- ochroleuca	Geelwitte ossetong
0054	- officinalis	Gewone ossetong
0056	Anemone nemorosa	Bosanemoon
0059	Angelica archangelica	Grote engelwortel
0060	- sylvestris	Gewone engelwortel
0061	Antennaria dioica	Rozenkransje
0062	Anthemis arvensis	Valse kamille
0064	- tinctoria	Gele kamille
0066	Anthoxanthum odoratum	Gewoon reukgras
0068	Anthriscus caucalis	Fijne kervel
0070	- sylvestris	Fluitekruid
0071	Anthyllis vulneraria	Wondklaver
0073	Apera spica-venti	Grote windhalm
0074	Aphanes arvensis	Grote leeuweklauw
0078	Apium nodiflorum	Groot moerasscherm
0081	Arabidopsis thaliana	Zandraket

0082	Arabis hirsuta (ssp. hirsuta)	Ruige scheefkelk
0083	Arctium lappa	Grote klit
0086	- pubens	Middelste klit
0089	Arenaria serpyllifolia (ssp.)	Zandmuur
0096	Arrhenatherum elatius	Glanshaver
0097	Artemisia absinthium	Absint-alsem
0098	- campestris ssp. campestris	Wilde averuit
0099	- campestris ssp. maritima	Duinaveruit
0101	- vulgaris	Bijvoet
0103	Arum maculatum	Gevlekte aronskelk
1904	Asparagus officinalis	
0104	ssp. officinalis	Tuinasperge
0105	ssp. prostratus	Liggende asperge
0112	Asplenium ruta-muraria	Muurvaren
*0934	- scolopendrium	Tongvaren
0117	Aster tripolium	Zulte
0119	Athyrium filix-femina	Wijfjesvaren
0122	Atriplex littoralis	Strandmelde
*0121	- prostrata	Spiesmelde
0123	- patula	Uitstaande melde
*0604	Avenula pubescens	Zachte haver
0129	Ballota nigra (ssp. foetida)	Stinkende ballote
0133	Barbarea vulgaris	Gewoon barbarakruid
	Beckmannia syzigachne	
0135	Bellis perennis	Madeliefje
0136	Berberis vulgaris	Zuurbes
*1215	Berula erecta	Kleine watereppe
0140	Betula pendula	Ruwe berk
0139	- pubescens	Zachte berk
0144	Bidens tripartita	Veerdelig tandzaad
0147	Borago officinalis	Bernagie
0148	Botrychium lunaria	Gelobde maanvaren
1802	Brassica napus	Koolzaad
	- oleracea	Kool
	- rapa	Raapzaad
0153	Briza media	Bevertjes
	Bromus catharticus	Paardegras
*0161	- hordeaceus ssp. hordeaceus	Zachte dravik
0165	- sterilis	IJle dravik
0166	- tectorum	Zwenkdravik
*0167	Bryonia cretica	Heggerank
0168	Bunias orientalis	Grote hardvrucht
0171	Butomus umbellatus	Zwanebloem
0172	Cakile maritima	Zeeraket
0173	Calamagrostis canescens	Hennegras
0174	- epigejos	Duinriet
*0049	x Calammophila baltica	Noordse helm
0184	Callitriche platycarpa	Gewoon sterrekroos
0187	Caltha palustris var. palustris	Gewone dotterbloem
0188	Calystegia sepium	Haagwinde
0194	Campanula persicifolia	Prachtklokje
0198	- rotundifolia	Grasklokje
0199	- trachelium	Ruig klokje
0200	Capsella bursa-pastoris	Gewoon herderstasje
0202	Cardamine flexuosa	Bosveldkers

0203	- hirsuta	Kleine veldkers
0205	- pratensis	Pinksterbloem
*0730	Cardaria draba	Pijlkruidkers
0208	Carduus crispus	Kruldistel
0209	- nutans	Knikkende distel
0211	Carex acuta	Scherpe zegge
	- acuta x trinervis	
0212	- acutiformis	Moeraszegge
0215	- arenaria	Zandzegge
0225	- disticha	Tweerijige zegge
0232	- flacca	Zeegroene zegge
0235	- hirta	Ruige zegge
0244	- nigra	Zwarte zegge
*0261	- oederi ssp. oederi	Dwergzegge
*0220	- oederi ssp. oedicarpa	Geelgroene zegge
0248	- panicea	Blauwe zegge
0249	- paniculata	Pluimzegge
0254	- pseudocyperus	Hoge cyperzegge
0259	- riparia	Oeverzegge
0260	- rostrata	Snavelzegge
0266	- trinervis	Drienervige zegge
0296	Carlina vulgaris	Driedistel
0270	Carpinus betulus	Haagbeuk
0273	Castanea sativa	Tamme kastanje
0279	Centaurea cyanus	Korenbloem
*1766	- jacea	Knoopkruid
0286	Centaurium erythraea	Echt duizendguldenkruid
0285	- littorale	Strandduizendguldenkruid
0287	- pulchellum	Fraai duizendguldenkruid
0292	Cerastium arvense	Akkerhoornbloem
0293	- diffusum	Scheve hoornbloem
*1465	- fontanum ssp. glabrescens	Glanzende hoornbloem
0296	- fontanum ssp. vulgare	Gewone hoornbloem
0295	- glomeratum	Kluwenhoornbloem
0298	- semidecandrum	Zandhoornbloem
*0362	Ceratocapnos claviculata	Rankende helmbloem
0299	Ceratophyllum demersum	Grof hoornblad
0300	- submersum	Fijn hoornblad
0303	Chaerophyllum temulum	Dolle kervel
*0450	Chamerion angustifolium	Wilgeroosje
0305	Chelidonium majus	Stinkende gouwe
0306	Chenopodium album	Melganzevoet
0310	- ficifolium	Stippelganzevoet
0311	- foliosum	Rode aardbeispinazie
0312	- glaucum	Zeegroene ganzevoet
0314	- murale	Muurganzevoet
0315	- polyspermum	Korrelganzevoet
0316	- rubrum	Rode ganzevoet
0325	Cichorium intybus	Wilde cichorei
0331	Cirsium arvense	Akkerdistel
0335	- palustre	Kale jonker
0336	- vulgare	Speerdistel
0338	Claytonia perfoliata	Witte winterpostelein
0339	Clematis vitalba	Bosrank
0342	Cochlearia danica	Deens lepelblad
5043	Colutea arborescens	Europese blazenstruik
0347	Conium maculatum	Gevlekte scheerling

*0396	Consolida regalis	Wilde ridderspoor
0349	Convallaria majalis	Lelietje-van-dalen
0350	Convolvulus arvensis	Akkerwinde
0353	Corispermum leptopterum	Smal vlieszaad
0355	Cornus sanguinea	Rode kornoelje
0358	Coronopus didymus	Kleine varkenskers
0360	Corrigiola litoralis	Riempjes
0366	Corylus avellana	Hazelaar
0367	Corynephorus canescens	Buntgras
0369	Crataegus monogyna	Eenstijlige meidoorn
0372	Crepis capillaris	Klein streepzaad
0379	Cuscuta epithymum	Klein warkruid
0380	- europaea	Groot warkruid
0385	Cynoglossum officinale	Hondstong
0386	Cynosurus cristatus	Kamgras
*1140	Cytisus scoparius	Brem
0390	Dactylis glomerata	Kropaar
0884	Dactylorhiza incarnata	Vleeskleurige orchis
*1616	- maculata	Gevlekte orchis
*0890	- majalis ssp. praetermissa	Rietorchis
*1199	Danthonia decumbens	Tandjesgras
0393	Datura stramonium	Doornappel
0394	Daucus carota	Peen
0397	Deschampsia cespitosa	Ruwe smele
0398	- flexuosa	Bochtige smele
0400	Descurainia sophia	Sofiekruid
6665	Deutzia sp.	Deutzia
5057	Dianthus barbatus	Duizendschoon
0404	- deltoides	Steenanjer
0406	Digitalis purpurea	Gewoon vingerhoedskruid
0408	Digitaria sanguinalis	Harig vingergras
0409	Diplotaxis muralis	Kleine zandkool
0410	- tenuifolia	Grote zandkool
0412	Dipsacus fullonum	Grote kaardebol
0426	Dryopteris carthusiana	Smalle stekelvaren
0419	- dilatata	Brede stekelvaren
0421	- filix-mas	Mannetjesvaren
1761	Echinops sphaerocephalus	Beklierde kogeldistel
0431	Echium vulgare	Slangekruid
2325	Elaeagnus angustifolia	Smalle olijfwilg
5061	- multiflora	Langstelige olijfwilg
1914	Eleocharis palustris	
0437	ssp. palustris	Gewone waterbies
0441	Elodea canadensis	Brede waterpest
0442	- nuttallii	Smalle waterpest
*0444	Elymus farctus	Biestarwegras
*0445	- athericus	Strandkweek
*0446	- repens	Kweek
*0448	Epilobium ciliatum	Beklierde bastaardwederik
0451	- hirsutum	Harig wilgeroosje
0453	- lanceolatum	Lancetbladige bastaardwederik
0454	- montanum	Bergbastaardwederik
0456	- palustre	Moerasbastaardwederik
0457	- parviflorum	Viltige bastaardwederik
0458	- roseum	Bleke bastaardwederik
*1642	- tetragonum	Kantige bastaardwederik

0460	Epipactis helleborine	Brede wespenorchis
0462	Equisetum arvense	Heermoes
0463	- fluviatile	Holpijp
0464	- hyemale	Schaafstro
0466	- palustre	Lidrus
0471	- variegatum	Bonte paardestaart
0474	Erigeron acer	Scherpe fijnstraal
0475	- canadensis	Canadese fijnstraal
0476	Eriophorum angustifolium	Veenpluis
1917	Erodium cicutarium	Gewone reigersbek
0482	ssp. dunense	Duinreigersbek
0481	- glutinosum	Kleverige reigersbek
0483	Erophila verna	Vroegeling
0485	Eryngium campestre	Echte kruisdistel
0486	- maritimum	Blauwe zeedistel
*0489	Evonymus europaeus	Wilde kardinaalsmuts
0490	Eupatorium cannabinum	Koninginnekruid
0493	Euphorbia esula ssp. esula	Heksenmelk
*0502	- esula ssp. tommasiniana	Roedewolfsmelk
0495	- helioscopia	Kroontjeskruid
1919	Euphrasia stricta	
	ssp. stricta*	Stijve ogentroost
0513	Fagus sylvatica	Beuk
0514	Festuca arundinacea	Rietzwenkgras
0515	- gigantea	Reuzenzwenkgras
0518	- ovina	Schapegras
1474	ssp. tenuifolia	Fijn schapegras
0519	- pratensis	Beemdlangbloem
1921	- rubra	
0517	ssp. arenaria	Duinzwenkgras
*0520	ssp. commutata	Rood zwenkgras
0521	x Festulolium loliaceum	Trosraaigras
0526	Filipendula ulmaria	Moerasspirea
	Forsythia sp.	Chinees klokje
0529	Fragaria vesca	Bosaardbei
0531	Fraxinus excelsior	Gewone es
0532	Fritillaria meleagris	Wilde kievitsbloem
0533	Fumaria officinalis	Gewone duivekervel
0538	Galanthus nivalis	Gewoon sneeuwklokje
0540	Galeopsis bifida	Gespleten hennepnetel
0542	- speciosa	Dauwnetel
0543	- tetrahit	Gewone hennepnetel
*0544	Galinsoga quadriradiata	Harig knopkruid
0546	Galium aparine	Kleefkruid
0550	- mollugo	Glad walstro
2376	- palustre	Moeraswalstro
0551	- x pomeranicum	Geelwit walstro
*0549	- saxatile	Liggend walstro
0556	- uliginosum	Ruw walstro
0557	- verum	Geel walstro
0566	Gentiana cruciata	Kruisbladgentiaan
0562	Gentianella amarella	Slanke gentiaan

* Incl. E. officinalis, E. nemorosa, E. brevipila

0570	Geranium dissectum	Slipbladige ooievaarsbek
0571	- molle	Zachte ooievaarsbek
0574	- pusillum	Kleine ooievaarsbek
0576	- robertianum	Robertskruid
5072	- sanguineum	Bloedooievaarsbek
0579	Geum urbanum	Geel nagelkruid
0582	Glechoma hederacea	Hondsdraf
0584	Glyceria fluitans	Mannagras
0585	- maxima	Liesgras
*0586	- notata ssp. notata	Stomp vlotgras
0587	Gnaphalium luteo-album	Bleekgele droogbloem
0588	- sylvaticum	Bosdroogbloem
0589	- uliginosum	Moerasdroogbloem
0598	Hedera helix	Klimop
1859	Helianthus annuus	Zonnebloem
0606	Heracleum mantegazzianum	Reuzenbereklauw
0607	- sphondylium	Gewone bereklauw
1860	Hesperis matronalis	Damastbloem
0618	Hieracium laevigatum	Stijf havikskruid
0621	- pilosella	Muizeoor
0625	- umbellatum	Schermhavikskruid
0626	Hierochloe odorata	Veenreukgras
0629	Hippohae rhamnoides	Duindoorn
0630	Hippuris vulgaris	Lidsteng
0631	Holcus lanatus	Gestreepte witbol
0632	- mollis	Gladde witbol
0636	Hordeum murinum	Kruipertje
0639	Humulus lupulus	Hop
0641	Hydrocotyle vulgaris	Waternavel
0642	Hyoscyamus niger	Bilzekruid
0646	Hypericum humifusum	Liggend hertshooi
0649	- perforatum	Sint-Janskruid
*0651	- quadrangulum	Gevleugeld hertshooi
0654	Hypochaeris radicata	Gewoon biggekruid
0658	Ilex aquifolium	Hulst
0661	Impatiens parviflora	Klein springzaad
*0663	Inula conyzae	Donderkruid
0665	Iris pseudacorus	Gele lis
0669	Jasione montana	Zandblauwtje
	Jasminum nudiflorum	Winterjasmijn
0670	Juncus acutiflorus	Veldrus
1929	- alpino-articulatus	
*0672	ssp. atricapillus	Duinrus
0673	- articulatus	Zomprus
0675	- bufonius	Greppelrus
2343	- bulbosus	Knolrus
*0679	- conglomeratus	Biezeknoppen
0680	- effusus	Pitrus
0688	- subnodulosus	Padderus
*0693	Koeleria macrantha	Smal fakkelgras
2228	Laburnum anagyroides	Goudenregen
0700	Lamium album	Witte dovenetel
0701	- amplexicaule	Hoenderbeet
0704	- maculatum	Gevlekte dovenetel
0706	- purpureum (var. purpureum)	Paarse dovenetel
0708	Lapsana communis	Akkerkool
0714	Lathyrus palustris	Moeraslathyrus

0715	- pratensis	Veldlathyrus
0723	Lemna minor	Klein kroos
0724	- trisulca	Puntkroos
0725	Leontodon autumnalis	Vertakte leeuwetand
*0727	- saxatilis	Kleine leeuwetand
*0319	Leucanthemum vulgare	Margriet
*0443	Leymus arenarius	Zandhaver
2286	Ligustrum ovalifolium	Haagliguster
0736	- vulgare	Wilde liguster
0739	Limosella aquatica	Slijkgroen
0745	Linaria vulgaris	Vlasbekje
0747	Linum catharticum	Geelhartje
0750	Listera ovata	Grote keverorchis
0752	Lithospermum officinale	Glad parelzaad
0753	Littorella uniflora	Oeverkruid
0756	Lolium perenne	Engels raaigras
0759	Lonicera periclymenum	Wilde kamperfoelie
5181	- tatarica	Tartaarse kamperfoelie
0760	- xylosteum	Rode kamperfoelie
	Lotus corniculatus	
0761	ssp. corniculatus	Gewone rolklaver
0763	- uliginosus	Moerasrolklaver
0766	Luzula campestris	Gewone veldbies
0767	- multiflora (ssp. congesta)	(Dichtbloemige veldbies)
0768	ssp. multiflora	Veelbloemige veldbies
	Lychnis coronaria	Prikneus
0722	- flos-cuculi	Echte koekoeksbloem
0773	Lycium barbarum	Boksdoorn
0780	Lycopus europaeus	Wolfspoot
0782	Lysimachia nummularia	Penningkruid
0784	- vulgaris	Grote wederik
*0925	Lytrum portula	Waterpostelein
0785	- salicaria	Grote kattestaart
2101	Mahonia aquifolium	Mahonia
0786	Maianthemum bifolium	Dalkruid
6327	Malus sp.	Appel
0789	Malva moschata	Muskuskaasjeskruid
0790	- neglecta	Klein kaasjeskruid
0792	- sylvestris	Groot kaasjeskruid
0796	Matricaria discoidea	Schijfkamille
*0795	- maritima (incl. inodora)	Reukeloze kamille
0794	- recutita	Echte kamille
0799	Medicago lupulina	Hopklaver
0801	- sativa	Luzerne
0809	Melilotus alba	Witte honingklaver
0810	- altissima	Goudgele honingklaver
0812	- officinalis	Citroengele honingklaver
0813	Mentha aquatica	Watermunt
0820	- x verticillata	Kransmunt
0821	Menyanthes trifoliata	Waterdrieblad
0826	Milium effusum	Bosgierstgras
*0827	- vernale	Ruw gierstgras
0830	Moehringia trinervia	Drienerfmuur
0832	Molinia caerulea	Pijpestrootje
0834	Monotropa hypopithys	Stofzaad
	Morus sp.	Moerbei

0838	Muscari comosum	Kuifhyacint
0840	Myosotis arvensis	Middelst vergeet-mij-nietje
0842	- discolor	Veelkleurig vergeet-mij-nietje
0841	- laxa (ssp. cespitosa)	Zompvergeet-mij-nietje
0844	- palustris (ssp. palustris)	Moerasvergeet-mij-nietje
0843	- ramosissima	Ruw vergeet-mij-nietje
0851	Myriophyllum spicatum	Aarvederkruid
	Narcissus pseudonarcissus	Wilde narcis
0865	Nuphar lutea	Gele plomp
0509	Odontites vernus	
	ssp. serotinus	Late ogentroost
0872	Oenothera biennis	Middelste teunisbloem
0873	- erythrosepala	Grote teunisbloem
0874	- parviflora	Kleine teunisbloem
0876	Ononis repens ssp. repens	Kruipend stalkruid
0878	Onopordum acanthium	Wegdistel
0879	Ophioglossum vulgatum	Addertong
0896	Ornithogalum umbellatum	Gewone vogelmelk
0897	Ornithopus perpusillus	Klein vogelpootje
0907	Orobanche caryophyllacea	Walstrobremraap
0903	- purpurea	Blauwe bremraap
1716	Panicum miliaceum	Pluimgierst
0915	Papaver dubium	Bleke klaproos
0916	- rhoeas	Grote klaproos
1819	- somniferum	Slaapbol
0921	Parnassia palustris	Parnassia
2103	Parthenocissus quinquefolia	Vijfbladige wingerd
0922	Pastinaca sativa	Pastinaak
0926	Petasites hybridus	Groot hoefblad
0930	Phalaris arundinacea	Rietgras
6686	Philadelphus sp.	Boerenjasmijn
0931	Phleum arenarium	Zanddoddegras
*1411	- pratense ssp. bertolonii	Klein timoteegras
0932	- pratense ssp. pratense	Timoteegras
0933	Phragmites australis	Riet
2104	Phytolacca americana	Westerse karmozijnbes
2238	Picea abies	Fijnspar
2242	- sitchensis	Sitkaspar
0938	Picris hieracioides	Echt bitterkruid
0941	Pimpinella saxifraga	Kleine bevernel
2224	Pinus mugo	Bergden
2245	- nigra	Zwarte den
2247	var. maritima	Corsikaanse den
2246	var. nigra	Oostenrijkse den
2248	- pinaster	Zeeden
0943	- sylvestris	Grove den
0944	Plantago coronopus	Hertshoornweegbree
0946	- lanceolata	Smalle weegbree
0947	- major (ssp. major)	Grote weegbree
0945	ssp. pleiosperma	Getande weegbree
0949	- media	Ruige weegbree
*1500	Poa angustifolia	Smal beemdgras
0952	- annua	Straatgras
0956	- nemoralis	Schaduwgras
0957	- palustris	Moerasbeemdgras
0958	- pratensis	Veldbeemdgras

0959	- trivialis	Ruw beemdgras
0963	Polygala vulgaris	Gewone vleugeltjesbloem
0964	Polygonatum multiflorum	Veelbloemige salomonszegel
0965	- odoratum	Welriekende salomonszegel
0967	Polygonum amphibium	Veenwortel
0968	- aviculare	Varkensgras
0970	- convolvulus	Zwaluwtong
1873	- cuspidatum	Japanse duizendknoop
0971	- dumetorum	Heggeduizendknoop
0972	- hydropiper	Waterpeper
0973	- lapathifolium	Beklierde duizendknoop
0975	- minus	Kleine duizendknoop
0976	- mite	Zachte duizendknoop
0977	- persicaria	Perzikkruid
0978	Polypodium vulgare	Gewone eikvaren
0980	Populus *) alba	Witte abeel
2254	- x canadensis	Canadapopulier
0981	- canescens	Grauwe abeel
5115	- deltoides	Amerikaanse populier
2302	- gileadensis	Ontariopopulier
0982	- nigra	Zwarte populier
0983	- tremula	Ratelpopulier
	- trichocarpa	Zwarte balsempopulier
0987	Potamogeton berchtoldii	Klein fonteinkruid
0990	- crispus	Gekroesd fonteinkruid
0995	- natans	Drijvend fonteinkruid
0998	- pectinatus	Schedefonteinkruid
1002	- pusillus	Tenger fonteinkruid
1003	- trichoides	Haarfonteinkruid
1006	Potentilla anserina	Zilverschoon
1007	- argentea	Viltganzerik
1008	- erecta	Tormentil
0346	- palustris	Wateraardbei
1010	- reptans	Vijfvingerkruid
*1013	- verna	Voorjaarsganzerik
1017	Prunella vulgaris	Gewone brunel
1018	Prunus avium	Zoete kers
2257	- domestica (ssp. domestica)	(Pruim)
5120	- mahaleb	Weichselboom
1019	- padus	Vogelkers
1020	- serotina	Amerikaanse vogelkers
1021	- spinosa	Sleedoorn
	- viginiana	Virginische vogelkers
1022	Pteridium aquilinum	Adelaarsvaren
1029	Pulicaria dysenterica	Heelblaadjes
1030	- vulgaris	Vlooienkruid
1034	Pyrola rotundifolia	Rond wintergroen
1035	Pyrus communis	Peer
5122	Quercus cerris	Moseik
1036	- petraea	Wintereik
1037	- robur	Zomereik
1876	- rubra	Amerikaanse eik
1040	Ranunculus acris	Scherpe boterbloem

*) Vele kruisingen/bastaarden

1041	- aquatilis	Fijne waterranonkel
2401	var. aquatilis	Fijne waterranonkel
1042	- arvensis	Akkerboterbloem
1045	- bulbosus	Knolboterbloem
1046	- circinatus	Stijve waterranonkel
*2402	- ficaria	Speenkruid
1048	- flammula	Egelboterbloem
1051	- lingua	Grote boterbloem
*1055	- peltatus	Gewone waterranonkel
1056	- repens	Kruipende boterbloem
1057	- sardous	Behaarde boterbloem
1058	- sceleratus	Blaartrekkende boterbloem
1061	Raphanus raphanistrum	Knopherik
-1827	- sativus	Radijs
1764	Rapistrum rugosum	Bolletjesraket
1062	Reseda lutea	Wilde reseda
1063	- luteola	Wouw
1064	Rhamnus catharticus	Wegedoorn
*0530	- frangula	Sporkehout
*1066	Rhinanthus angustifolius	Grote ratelaar
	Ribes aureum	Gele ribes
1071	- rubrum	Aalbes
1072	- uva-crispa	Kruisbes
1877	Robinia pseudoacacia	Robinia
1074	Rorippa amphibia	Gele waterkers
0860	- nasturtium-aquaticum	Witte waterkers
*1076	- palustris	Moeraskers
1078	- sylvestris	Akkerkers
1643	Rosa canina s.l.	Hondsroos
1083	- pimpinellifolia	Duinroosje
1645	- rubiginosa s.l.	Egelantier
1085	- rugosa	Rimpelroos
1089	Rubus caesius	Dauwbraam
1634	- fruticosus s.l.	Gewone braam
	- gratus	(Braam)
1091	- idaeus	Framboos
2017	- praecox	(Braam)
1093	Rumex acetosa	Veldzuring
1094	- acetosella	Schapezuring
1097	- conglomeratus	Kluwenzuring
1098	- crispus	Krulzuring
1099	- hydrolapathum	Waterzuring
1100	- maritimus	Goudzuring
1101	- obtusifolius	Ridderzuring
2382	ssp. obtusifolius	Ridderzuring
-1105	ssp. transiens	Ridderzuring
1102	- palustris	Moeraszuring
1111	Sagina nodosa	Sierlijke vetmuur
1112	- procumbens	Liggende vetmuur
1114	Sagittaria sagittifolia	Pijlkruid
1116	Salix *)alba	Schietwilg
1117	- aurita	Geoorde wilg
1118	- caprea	Boswilg
1119	- cinerea	Grauwe wilg

*) er komen veel bastaarden voor!

1121	- fragilis	Kraakwilg
1122	- pentandra	Laurierwilg
1123	- purpurea	Bittere wilg
1124	- repens	Kruipwilg
1125	- triandra	Amandelwilg
1126	- viminalis	Katwilg
*1524	Salsola kali ssp. ruthenica	Zacht loogkruid
	Salvia nemorosa	Bossalie
1130	- verticillata	Kranssalie
5139	Sambucus canadensis	Amerikaanse vlier
1133	- nigra var. nigra	Gewone vlier
-1884	- nigra var. Laciniata	Peterselievlier
1135	Samolus valerandi	Waterpunge
1139	Saponaria officinalis	Zeepkruid
1141	Satureja acinos	Kleine steentijm
1146	Saxifraga tridactylites	Kandelaartje
1150	Schoenus nigricans	Knopbies
1151	Scilla non-scripta	Wilde hyacint
*1161	Scirpus lacustris	
	ssp. tabernaemontani	Ruwe bies
1156	- maritimus	Heen
1160	- sylvaticus	Bosbies
1162	- triqueter	Driekantige bies
5141	Scorzonera hispanica	Grote schorseneer
*1170	Scrophularia nodosa	Knopig helmkruid
2406	- nodosa	Gevleugeld helmkruid
1169	- umbrosa ssp. neesii	Middelst helmkruid
1171	- umbrosa ssp. umbrosa	Rivierhelmkruid
1172	- vernalis	Voorjaarshelmkruid
1173	Scutellaria galericulata	Blauw glidkruid
1175	Sedum acre	Muurpeper
1179	- telephium (ssp. telephium)	Hemelsleutel
1184	Senecio congestus	Moerasandijvie
1188	- jacobaea ssp. jacobaea	Jacobskruiskruid
1530	- jacobaea ssp. dunensis	Duinkruiskruid
1190	- sylvaticus	Boskruiskruid
1191	- viscosus	Kleverig kruisktuid
1192	- vulgaris	Klein kruiskruid
1202	Silene conica	Kegelsilene
*0807	- dioica	Dagkoekoeksbloem
1204	- nutans	Nachtsilene
1205	- otites	Oorsilene
*0805	- latifolia ssp. alba	Avondkoekoeksbloem
1207	Sinapis arvensis	Herik
1208	Sisymbrium altissimum	Hongaarse raket
1213	- austriacum	Maasraket
1211	- officinale	Gewone raket
1216	Sium latifolium	Grote watereppe
	Solanum cornutum	Stekelnachtschade
1218	- dulcamara	Bitterzoet
2323	- nigrum	Zwarte nachtschade
	- sisymbriifolium	Raketbladige nachtschade
1220	- triflorum	Driebloemige nachtschade
-1890	Solidago canadensis	Canadese guldenroede
1222	- virgaurea	Echte guldenroede
2324	Sonchus arvensis	(Akkermelkdistel)
1223	var. arvensis	Akkermelkdistel
2025	var. maritimus	Zeemelkdistel

1224	- asper	Gekroesde melkdistel
1225	- oleraceus	Gewone melkdistel
5146	Sorbus aria	Meelbes
1227	- aucuparia	Wilde lijsterbes
1231	Sparganium emersum	Kleine egelskop
1229	- erectum s.l.	Grote/Blonde egelskop
1234	Spergula arvensis	Gewone spurrie
1237	Spergularia rubra	Rode schijnspurrie
1243	Stachys arvensis	Akkerandoorn
1245	- palustris	Moerasandoorn
1246	- sylvatica	Bosandoorn
1248	Stellaria graminea	Grasmuur
1250	- media	Vogelmuur
1252	- pallida	Duinvogelmuur
1254	- palustris	Zeegroene muur
*1247	- uliginosa	Moerasmuur
1258	Succisa pratensis	Blauwe knoop
	Symphoricarpos orbiculatus	Radijsboompje
2107	- albus	Sneeuwbes
1259	Symphytum officinale	Gewone smeerwortel
2390	Syringa vulgaris	Gewone sering
	Tamarix sp.	Tamarisk
*0320	Tanacetum parthenium	Moederkruid
1767	Taraxacum officinale s.l.	Gewone paardebloem
1261	Taxacum laevigatum	Zandpaardebloem
9475	- agaurum	
9474	- aphanochroum	
9483	- brachyglossum	
	- commixtum	
9476	- dunense	
	- grootii	
9473	- lacistophyllum	
9484	- laetiforme	
2031	- rubicundum	
9477	- scanicum	
	- silesiacum	
2251	- taeniatum	
1266	- tortilobum	
1263	Taraxacum obliquum	Oranjegele paardebloem
2429	Taraxacum hamatum	Haakpaardebloem
1267	Taxus baccata	Taxus
1268	Teesdalia nudicaulis	Klein tasjeskruid
1273	Teucrium scorodonia	Valse salie
1275	Thalictrum flavum	Poelruit
1953	- minus	Kleine ruit
1281	Thlaspi arvense	Witte krodde
1283	Thymus pulegioides	Grote tijm
1285	Tilia cordata	Winterlinde
2277	- x vulgaris	Hollandse linde
1289	Torilis japonica	Heggedoornzaad
1954	Tragopogon pratensis s.l.	Morgenster
2418	ssp. pratensis	Gele morgenster
1296	Trifolium arvense	Hazepootje
1298	- campestre	Liggende klaver
1299	- dubium	Kleine klaver
1302	- medium	Bochtige klaver

1305	- pratense	Rode klaver
1306	- repens	Witte klaver
1308	- striatum	Gestreepte klaver
1311	Triglochin palustris	Moeraszoutgras
1312	Trisetum flavescens	Goudhaver
1316	Tussilago farfara	Klein hoefblad
1317	Typha angustifolia	Kleine lisdodde
1318	- latifolia	Grote lisdodde
6541	Ulmus sp.	Iep
1321	Urtica dioica	Grote brandnetel
1322	- urens	Kleine brandnetel
*1328	Vaccaria hispanica	Koekruid
1332	Valeriana dioica	Kleine valeriaan
1333	- officinalis	Echte valeriaan
1336	Valerianella locusta	Gewone veldsla
1338	Verbascum blattaria	Mottenkruid
1342	- densiflorum	Stalkaars
1340	- nigrum	Zwarte toorts
1341	- phlomoides	Keizerskaars
1749	- phoeniceum	Paarse toorts
1343	- thapsus	Koningskaars
1345	Veronica agrestis	Akkerereprijs
1346	- anagallis-aquatica	Blauwe waterereprijs
1347	- arvensis	Veldereprijs
1349	- beccabunga	Beekpunge
1350	- catenata	Rode waterereprijs
1351	- chamaedrys	Gewone ereprijs
1352	- hederifolia s.l.	Klimopereprijs
1353	- longifolia	Lange ereprijs
1355	- officinalis	Mannetjesereprijs
1362	- scutellata	Schildereprijs
1363	- serpyllifolia	Tijmereprijs
2109	Viburnum lantana	Wollige sneeuwbal
1367	- opulus	Gelderse roos
1369	Vicia cracca	Vogelwikke
1370	- hirsuta	Ringelwikke
1371	- lathyroides	Lathyruswikke
1372	- sativa (ssp. sativa)	Voederwikke
*1368	- sativa ssp. nigra	Smalle wikke
2387	- villosa	Bonte wikke
5158	Vincetoxicum nigrum	Zwarte engbloem
1378	Viola arvensis	Akkerviooltje
1380	- canina	Hondsviooltje
-1381	- curtisii	Duinviooltje
1382	- hirta	Ruig viooltje
1387	- riviniana	Bleeksporig bosviooltje
1388	- rupestris	Zandviooltje
1964	Zannichellia palustris	Zannichellia
1396	ssp. palustris	Zittende zannichellia
1397	ssp. pedicellata	Gesteelde zannichellia

Abstract

For a project, sediment samples of a lake located in the Libellenvallei, Meijendel (Wassenaar), were taken throughout the winter.

Botanic macrofossils were extracted from these taken samples. These macrofossils got identified by multiple students of the University of Leiden. Taphonomic processes were the main focus of this project, and the choice was made to focus on the sexual strategies and the lifecycles of the found taxa.

Sexual strategies can be considered a key element when it comes to the forming of a macrofossil assemblage. That can grant researchers plenty of information.

The present can serve as a good indication of taphonomic processes that happened in the past. The mission of the project at Meijendel was to better understand the environmental context of archaeological sites. Knowing the taphonomic processes of a modern macrofossil assemblage and having good indications of how these macrofossils ended up at this location, can be a good source of information for less modern archaeological sites.

The present can help us with making conclusions of vegetations of the past. Observations of taphonomic processes at different archaeological sites can allow predictive models to be constructed that can show palaeovegetation reconstruction. These predictive models are the reason why this research can be considered valuable for future archaeological research.