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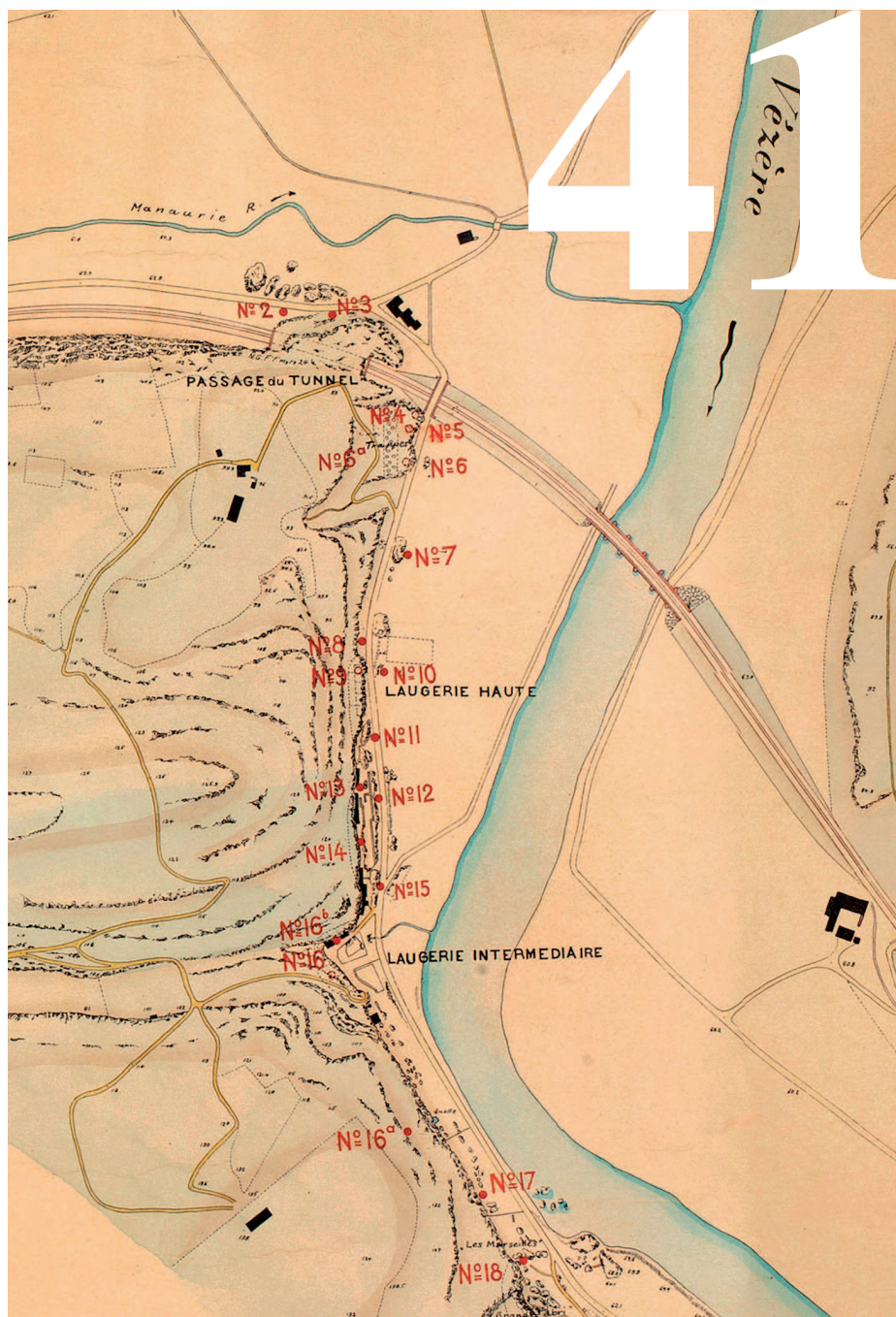
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ANALECTA PRAEHISTORICA LEIDENSIA



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Shipping pepper

Examining botanical contents of a 17th-century shipwreck at Texel Roads, the Netherlands

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From 1999 onwards, the Dutch shipwreck 'Burgzand Noord 14' has been investigated several times. This merchant ship had sunken between 1675 and 1680 AD. During the investigations, samples for botanical research have been taken from a number of places within the vessel. The samples largely consisted of black pepper (Piper nigrum) corns, alongside remains of cereals, crop weeds and other seeds. The large amount of pepper had presumably been meant for trade. The same could not be concluded about the other products, which could have formed part of the crew's diet. The last origin and destination of the shipment and the vessel itself remain unclear.

1 INTRODUCTION

On the Dutch sandbank called 'Burgzand', near the island Texel, the seventeenth-century shipwreck 'Burgzand Noord 14' (BZN 14) was found. During the archaeological investigations of this merchant vessel, the stern was sampled in order to perform archaeobotanical research. The results included, among other things, many black pepper corns (*Piper nigrum*), remains of cereals, other crops and crop weeds. These findings called for a number of questions considering the shipwreck and its contents.

The remains could have been either trade products or meant for consumption on board. One of the aims of the archaeobotanical investigation was an attempt to establish this. Were they once meant for trade at the ship's destination, or a small supply used in the galley?

The second aim was to assess the origins of the remains. Black pepper can not, like the ship, originate from the Netherlands. Therefore, it must have been imported. Where did it come from?

Finally, what can the results of this research contribute to the knowledge of the shipwreck itself? Is it possible to establish the origin or destination of the vessel, with the aid of botanical remains combined with what is already known about it?

To learn more about the products on board of the vessel and their possible purpose, it was necessary to more closely examine the background of seventeenth-century trade, navigation and the products themselves. Furthermore, an analysis of the geographical dispersal of the encountered crop weeds could be carried out.

Unlike black pepper, cereals can be from almost anywhere. The origins of cereals can sometimes be determined with help of the limited dispersal of certain crop weeds. When several weed species are found together, the overlap of their geographical ranges can be put to use, to establish a smaller area as the source of the crops. Previous research such as in the shipwreck Scheurrak SO1 (Manders 1993a), where the place of origin was limited to the Baltic area, has shown this possibility.

2 THE SHIPWRECK BZN 14

2.1 *Research on Burgzand Noord 14*

The vessel 'Burgzand Noord 14' owes its name to the sandbank 'Burgzand' that is located five or six kilometre to the east of Oudeschild, Texel (fig. 1). Many shipwrecks lie here, at the former 'Texel Road' (see chapter 3.1). Many of these ships are affected and eroded by the current conditions in the Waddenzee and therefore urgently need archaeological investigation (Vos 2003). The shipwreck was surveyed during the summer of 1999 by NISA (Netherlands Institute for Ship- and underwater Archaeology), and more thoroughly investigated in 2004. The investigations formed part of the extensive project '*Waardstellende verkenningen in de Waddenzee, Burgzand Noord*'.

2.2 *The archaeological site*

The site is approximately 50 meters long and 14 meters wide. The vessel itself measures 33,5 meters from stern to stem. As the wreck has collapsed, the maximum width, as measured at the stern, is 10,5 meters (fig. 2). The shipwreck was covered with characteristic stones that were used as ballast ('*potters*'), which provided the ship with its nickname '*potterwrak*' among local divers. Many artefacts were found at the shipwreck (Overmeer 2004; NISA A 1999).

2.3 *Age and origin of the vessel*

The ship was dated by means of dendrochronology, ceramics and numismatics, which showed the ship originated from 1675-1680 AD (Vlierman 1999; NISA: B 2004; Kleij 2004; Hanraets 2004). The dendrochronological examination also demonstrated the ship's Dutch origins.



Figure 1 Location of shipwreck BZN 14

2.4 *Archaeobotanical samples*

At the stern, several fragile-looking wooden barrels were noticed. Three samples for botanical research were taken during the investigations in 1999. These were analysed by W. Kuijper (2000). In 2004 ten samples were taken from five barrels (barrels B, C, E, F and G) and three additional samples were taken from the stern.

3 TRADE AND NAVIGATION IN THE 17TH CENTURY

3.1 *Texel Road*

In 1602 the VOC (Dutch East India Company) was founded. Amsterdam became a trade centre for products from the Eastern Indies, the Western Indies and the Baltic area. Merchandise such as spices and chinaware was imported and resold.

The waters before Amsterdam (Pampus) were too shallow to allow large trade vessels to enter. Products from abroad were therefore transhipped to smaller vessels at the island of Texel, which transported the goods to Amsterdam. Not only did this method make the local economy on the island flourish during the seventeenth and eighteenth century; it also became responsible for the large amount of shipwrecks in this specific area. The ships, often loaded with cargo, would be awaiting favourable wind to sail off. However, a rising storm would sometimes cause the waiting vessels to founder (Manders 1993b; Reinders 1992; Schaik 2002; pers. comm. M. Manders 2006). This combined with the fine sediments of the Waddensee caused the bottom of Burgzand to become covered with still preserved shipwrecks (Manders 1992).

3.2 *East Indiaman*

The vessels used by the VOC during the height of their trade journeys, would usually be of the type East Indiaman (in Dutch *spiegelretourschip*), fluyt, frigate, galiot, 'hoeker' or

pinnacle (Haalmeijer and Vuik 2002). The East Indiaman was mostly used for trade expeditions to Asia. An example is the Batavia, that was rebuilt in the 1980's (fig. 3). These three-masters were 40 meters long.

In the bottom the hold could be found (1), where an extra deck (2) could be added. Only 1,5 meter above the extra deck the gun deck (3) would be situated. This was where the galley and bottling room were situated, usually near the prow at the front (Haalmeijer and Vuik 2002). It was the crew's main abode, and furthermore the heavy artillery was located here (VOC-Kenniscentrum).

3.3 *Daily life on board*

It would take an East Indiaman approximately seven months to reach the far east. Daily life on board usually brought poor conditions for the crew. The quality of food declined rapidly, their diet showed little variation, consisting of rye bread, buckwheat porridge, beans and salted meat. Scurvy often occurred before the Cape of Good Hope was reached (Blussé & Ooms 2002; Magelhaes 1998). Cases of beriberi, caused by a diet of mainly white rice, also arose (Kalkman 2003). Out of almost one million Europeans who sailed to the East Indies, less than four hundred thousand returned. Some of them had settled in Asia, but the majority died during their service (VOC-kenniscentrum).

4 BOTANICAL REMAINS OF THE SHIPMENT

4.1 *Treatment of the samples*

Six samples for botanical investigation were taken from four barrels, four samples from under or near a barrel and three more from elsewhere in the stern (table 1). The samples were sieved with water, using four different mesh openings: 5mm, 2,5 mm, 1 mm and 0,5 mm. The botanical remains were identified with a magnification of 6-50 times. The cereal

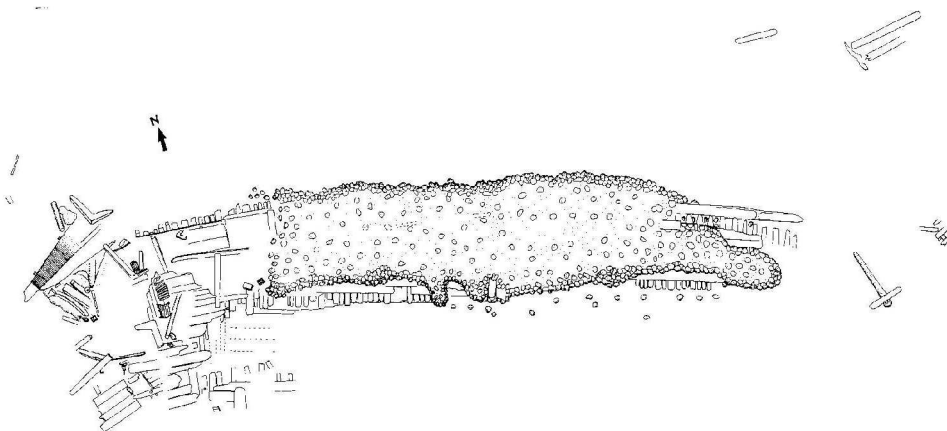


Figure 2 Shipwreck BZN 14, approximately 40 m. long. On the left: the stern. (drawing provided by NISA).

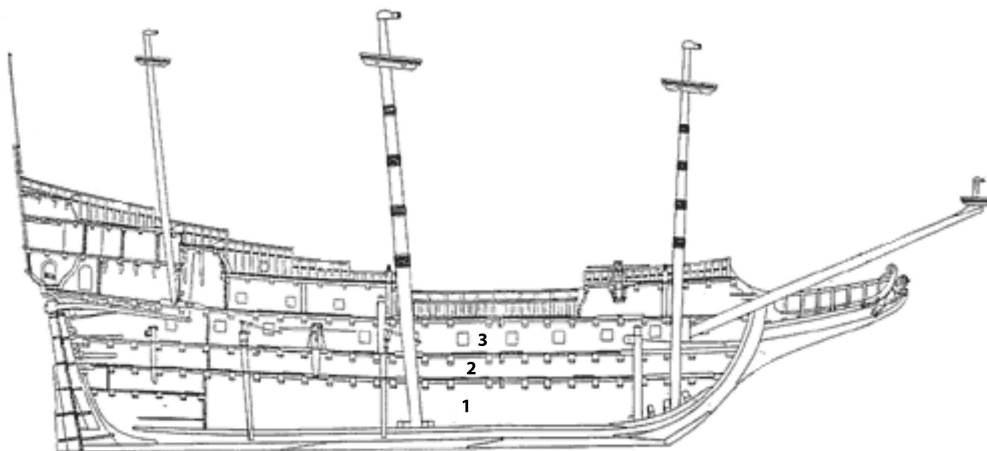


Figure 3 Example of merchant ship (after www.voc-kenniscentrum.nl)

Barrel	Sample	Positie	Main contents
B	PW-466	In barrel B	Gunpowder? Rust?
	PW-327	In barrel B	Cereals, weeds
C	PW-328	On barrel C	Black pepper
E	PW-535	Near barrel E	Black pepper
	PW-543	In barrel E	Cereals, weeds
	PW-546	Under barrel E	Black pepper
F	PW-544	In barrel F	Beans or peas
	PW-604	In barrel F	Beans or peas
G	PW-541	In barrel G	Wicker with ground cereals
	PW-545	Near barrel G	Beans or peas
No barrel	PW-309	Staves at stern	Black pepper, beans?
	PW-495	Put alongside north deck	Wicker with ground cereals
	PW-496	Put alongside north deck	Fish bones, cereals, black pepper

Table 1 Context of samples BZN 14

remains were examined more closely with a light microscope. The contents were thousands of black pepper corns, tens of thousands of cereal remains with many crop weeds, buckwheat, a dense substance consisting of legumes, and small quantities of rice and cucumber (table 2).

4.2 *Products and their background*

4.2.1 *Black pepper (Piper nigrum)*

Out of thirteen samples, eleven contained remains of black pepper. It mostly concerned large quantities, up to several hundreds or even thousands of corns per sample, with remarkable preservation (fig. 4). Small stalks with unripe berries of pepper were also present (fig. 5). The total amount of pepper corns from the samples lies somewhere around 6000.

Black pepper is a tropical climber requiring shade, high humidity and high temperatures. The berries are green when unripe, then turn red. They are harvested in different stages and processed accordingly. The unripe berry is salted or pickled to preserve its color, resulting in green pepper. Black pepper is obtained by drying and smoking the reddening berries, and white pepper by removing the mesocarp of fully ripened berries. The latter was the most expensive because it was the most labour-intensive, which is why trading companies focused on black pepper (Küster 1987; Ravindran 2000; VOC-kenniscentrum).

Pepper is rare in archaeological finds, due to its high value. Black pepper was expensive but popular in the Roman

Type	pw-309	pw-327	pw-328	pw-466	pw-494	pw496	pw-535	pw541	pw-543	pw-544	pw-545	pw-546	pw-604
<i>Knautia arvensis</i>													1
<i>Linum usitatissimum</i>							1						
<i>Lapsana communis</i>										1			
<i>Setaria spec.</i>										1			
Coarse chaff											1		1
Apiaceae							2						
Bud							1						
<i>Calluna vulgaris</i>													several
<i>Mentha/Origanum spec.</i>					1								
Indeterminatae							1						
Marine etc.													
<i>Zostera marina</i>													4
<i>Potamogeton</i>													4
<i>Sphagnum</i>													4
Other, not botanical													
Wicker					1			1					
Fishbones							several					x	
Mussels, cockles							several						
Gunpowder					1								
Small 'net', 6mm			1										

x = tens

xx = hundreds

xxx = thousands

xxxx = tens of thousands

NB. Numbers of cereals or beans are difficult to estimate in samples with large quantities of the material. They form the larger part of samples with a content of approximately 1500 cc.

Mere presence of gunpowder and wicker is also indicated with '1'.

Table 2 Contents of samples from BZN 14

Age. It was only for the very rich during the Dark Ages. Its purpose was to disguise the smell of meat gone bad.

The Malabar coast (south-western India) has the longest tradition in cultivating black pepper. It was imported via the same route since 400 BC until the late Dark Ages. Alexandria, Rome and later on Venice and Genua played a mayor part in trading pepper. The high prices led to the introduction of illegal substitutes such as grains of paradise (*Aframomum melegueta*), grains of selim (*Xylopiya aethiopica*), cubeb pepper (*Piper cubeba*) and hot bell pepper (*Capsicum annuum*). These spices often became permitted alternatives (Hellwig 1992; Küster 1987; Ravindran 2000; website uni-graz.at).

Pepper traders who took the traditional route made profits up to 1000 percent. In European countries the idea sprung to life to eliminate the intermediary and take advantage of the

profit. After the Portuguese success stories of Vasco da Gama in Calicut (the Malabar coast), companies as the British East India Company and the Dutch VOC were eventually founded (Magelhães 1998). But it was only from the nineteenth century onwards black pepper came within everyone's reach (Küster 1987).

4.2.2 Cereal crops (except rice) and their crop weeds
Cereals were found in nine samples. Only the husks of the uncharred and waterlogged grains had been preserved. In one sample the cereal remains were ground, and found attached to large fragments of wicker. The husk of a cereal's caryopsis consists of several layers, one of which can help to establish the species of grain. In order to do so, the hilum and cell structure are examined (Körber-Grohne 1991; Körber-Grohne & Piening 1980). However this layer was often absent. Two

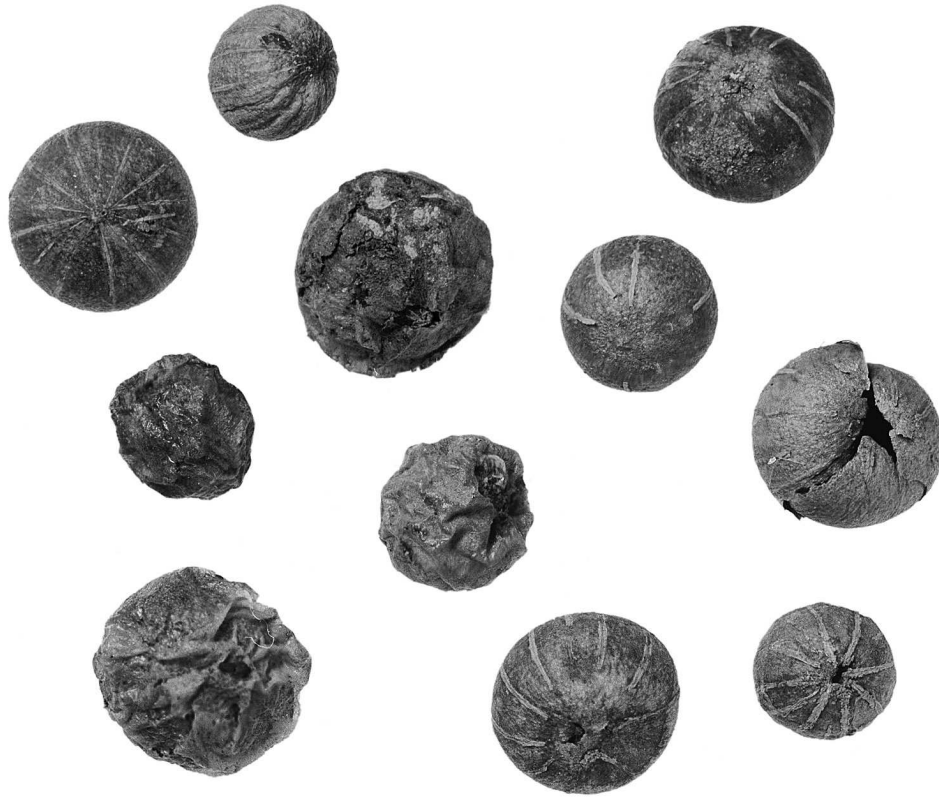


Figure 4 Pepper corns from BZN 14 (photo J. Paupit)

species could be distinguished with this method. The first was rye (*Secale cereale*), a cereal that was common and regularly eaten in the seventeenth century. The second was rye brome (*Bromus secalinus*). This is not really a cereal, but a crop weed. It is often tolerated because of its likeliness to cereals (pers. comm. W. Kuijper 2006).

Although cereals are grown all over the world, it is possible to identify the place of origin. This can be done by examining the available crop weeds connected with the grain. To establish the origin of the crops, the limited dispersal of crop weeds may be used. Manders (1993a) used this approach for his research on the shipwreck Scheurrak SO1, to conclude its cargo came from the Baltic area. The closed context of a shipwreck is especially suitable for conducting this type of research. Crop and crop weeds are most likely in situ and connected.

In the samples from BZN 14 containing cereals various weed species were found. Many of these are very common and occur globally. There were however several exceptions. Yellow chamomille (*Anthemis tinctoria*) is rare in Western Europe and Asia. False cleavers (*Galium spurium*) does not grow in Spain and Britain. Wild radish (*Raphanus*

raphanistrum) is restricted to Europe and cornflower (*Centaurea cyanus*) is rare in Spain, the Near East and Asia. Also rye brome grows within a restricted area, north of Spain and east of Ireland (Kästner, Jäger and Schubert 2001). Nevertheless, unlike the case of Manders's study, the dispersal of these weed species can not point out one specific area in Europe where the cereals were cultivated.

4.2.3 Other crops

Buckwheat (*Fagopyrum esculentum*) was found once, in sample PW-545. Buckwheat is not botanically speaking a cereal (belonging to the Polygonaceae instead of Poaceae), but it had a similar position in a common man's diet during the 17th century. The presence of only one buckwheat seed in the samples could indicate this was brought in accidentally, but it could be a matter of representativeness as well. As the samples were just taken from the stern, more buckwheat might have been present elsewhere in the shipwreck. The crew on ships were often served buckwheat porridge (VOC-kenniscentrum).

A dense substance from samples PW544, PW545 and PW604 was recognized by means of many hilums. The



Figure 5 Stalk of pepper from BZN 14 (drawing M. Oberendorff)

substance appeared to consist of legumes like peas (*Pisum sativum*) or beans (*Vicia faba*). These species are usually preserved through carbonization in archaeological samples, which makes this find quite rare. Just hilums are not enough to distinguish exactly what species is present here. Both peas and beans have played an important role in the European food supply for many centuries. Just like buckwheat, they could be on the daily menu during long travels by ship up to the eighteenth century (Körber-Grohne 1987).

Somewhat more special were the finds of cucumber (*Cucumis sativus*) in sample PW-546 and rice (*Oryza sativa*) in PW-328, PW-535 and PW-546. Cucumber can be transported fresh or pickled. Pickles could be stored longer (Kalkman 2003; pers. comm. C.C. Bakels 2006). Cucumber has been cultivated in India for 3000 years. Although it was

grown in the Netherlands in the seventeenth century, fresh cucumbers can hardly be expected to be taken in for travels to the East Indies (Dodoens 1554; pers. comm. C.C. Bakels 2006).

Rice was grown in Asia, but it was not exported to Europe on a large scale. The very rich in the Netherlands would eat it (Haaster and Cavallo 1997), but it was mainly used for trading within Asia and as a food supply on trading posts or ships (VOC-Kenniscentrum). The brans of rice contain thiamin or vitamin B1, which helps to prevent beriberi. This tropical disease occurred where people mainly consumed white rice (Kalkman 2003).

5 DISCUSSION AND CONCLUSIONS

Black pepper on board of a seventeenth-century ship was not always meant for trade. A small can of pepper in the galley could serve the meals of the (important members of the) crew. In this case however, this is not the most probable option for three reasons. Firstly, the galley of a 17th-century ship that would sail for the East Indies was often situated below deck, near the front of the vessel. This was the case in the East Indiaman as well as frigates, galiots and 'hoekers' (Haalmeijer and Vuik 2002). However the botanical samples were taken from the stern of the ship. Although food supplies for the crew could be stored in the stern, pepper is only used for seasoning. It may very well be worth the trouble to store larger quantities of food elsewhere, but walking up and down the hold for a small can of spices would not be so. Secondly, the amount of retrieved pepper, which is still less than the amount that could be on board in all at the time of recovery, is larger than what one could hope to consume during one journey. Finally, the ship was found at the location where merchandise was usually loaded and unloaded. These reasons make it plausible that the pepper was meant for trade, not primarily for own use during travels.

The grain on board of the ship could partly be identified. It consisted of rye and rye brome, the latter of which can easily be taken for cereals. Cereals on a ship could either be meant for trade or as nourishment for the crew. Amsterdam was a distribution centre for all sorts of products in the 17th century, and grain was one of them. For the greater part this came from the Baltic region, the European 'granary' of that time.

With the help of the distribution of crop weeds, it can be possible to establish the region of origin of cereals. By determining the overlap of their range, one smaller area where all species occur remains. Crop weeds that might limit the possible places of origin are *Galium spurium*, *Centaurea cyanus*, *Anthemis tinctoria*, *Raphanus raphanistrum* and *Bromus secalinus*. Unfortunately, these species do not exclude enough places to identify one specific region, such as the

Baltic. Excluded areas are Asia, the Near East, Spain, Britain and Ireland. The rest of Europe is a possible place of origin, however a smaller, more specific area can not be pointed out.

A trade expedition is not a small undertaking, and requires well organized logistics. A great deal more rye than a crew could consume, would have to be taken on for a profitable trade in cereals. For someone to export both pepper and rye on the same ship is not inconceivable yet refutable.

This does not explain the presence of rice and cucumber on the ship. Rice was mainly eaten on the trading posts in the East Indies and on board of the merchant vessels. More wealthy people would consume rice in the Netherlands, but there was no vast import and trade of this product during the 17th century. Cucumber as a product was mostly imported. The cucumbers cultivated in the Netherlands were not likely to be found on board of a merchant ship.

Both rice and cucumber were found in very small quantities on the ship: six grains of rice and one seed of cucumber. This is off course not the whole shipment, but in comparison with the rest of the finds it is a relatively small amount. When the preserved grains form an exception to a shipment of threshed rice, this might have been taken on for consumption on board. This would be less plausible with a shipment of rice with the chaff still attached. Rice and pickled cucumber could be preserved for a long period of time and were possibly suitable for further trade after their journey from the East Indies.

The destination of the Burgzand Noord 14 can not be established with certainty with the help of botanical remains only. It is certain that the amount of pepper on board was substantial. Several products of exotic origins were present on the vessel, which forms a contrast with the more mundane shipment such as rye, buckwheat and horse beans or peas.

When the cargo of a shipwreck can be established, its goal can still be debated. Geographical analyses can be useful in establishing the origins of the cargo and thereby the ship's last point of departure. Without further knowledge of the vessel, information can be obtained through archaeobotanical studies. However, the combination of these data and their context are still the most valuable.

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