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Archaeological Classification of Age of Sail Shipwrecks Based on Genever's Material Culture

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Abstract: This article analyses archaeological evidence for *jenever* (spelled *genever* in English) in the Dutch Republic during the Age of Sail (1550–1850). Although excessive alcohol consumption among mariners is a stereotype, there has been surprisingly little critical scholarly work on the subject. Genever was used on ships for medicinal purposes during the seventeenth and eighteenth centuries, but no thorough analysis of alcohol consumption broadly in a Dutch (VOC, WIC, Admiralty) maritime context has been done to date. Since the Dutch stored genever in a distinctive bottle, the archaeological record is helpful to examine Dutch ship's genever consumption. This article theorises that material evidence of genever for personal consumption and as a commodity for export can be used to aid in identifying a shipwreck's nationality, and that hypothesis is tested through analysis of a sample of European wrecks excavated along the global shipping routes of Dutch commercial and naval sailing vessels. There is a strong correlation between the presence of both case bottles (*kelderflessen*) and, later in the period, stoneware bottles (*jeneverkruiken*) with Dutch shipwrecks or maritime archaeology sites and this is strongly suggested to consider for archaeologists faced with a shipwreck of unknown origin.

Keywords: alcohol; genever; sailors; shipwrecks; Age of Sail; The Netherlands; VOC; WIC; glass bottles; stoneware bottles



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1. Introduction

Des Zeemans allerbest Compas Is een gevult Jeneverglas: a line from an old Dutch poem saying that translates roughly into 'a sailor's best working compass is a glass full of genever' (Dutch gin) [1] (p. 22).¹ This aphorism underscores the centrality of alcohol generally, and genever specifically, as a key commodity aboard ships during the Age of Sail (1550–1850), both as a product for export and as an essential beverage consumed by the sailors who transported it. By the late seventeenth century, a precursor to today's gin was drunk in large quantities in Holland under the Dutch term *jenever*, translating from the Dutch term for juniper berries. However, despite the low cost, it was not until the eighteenth century that genever exports reached a significant volume [2].

Throughout the Middle Ages, beer, wine, and water were the predominant shipboard ration liquids for European sailors, but each had their drawbacks. Water was hard to keep fresh, beer spoiled quickly, and wine was expensive. Due to global exploration and expanded trade networks with Africa, the Americas, and the Indian and Pacific oceans, European trade shifted from short haul Mediterranean or Western Atlantic coastal transits to long voyages that lasted months, or even years. Ships' companies consequently required liquid rations that were both durable and concentrated, and distilled beverages met these requirements [3]. So-called 'hard' alcohol grew to be a significant economic commodity and its large-scale production, taxation, and transportation developed throughout the Age of Sail.

Aqua vitae and other spirits were consumed throughout Europe during the medieval period after the practice of distillation was adopted from Arab nations. Such distillation was

done for purely medicinal purposes and Johannes van Aalter first mentions distilling wine to *aqua vita* in 1351 for treatments. In the thirteenth and fourteenth centuries, as distilling became more sophisticated and spread across Western Europe, different regions created their own unique beverages. ‘Whiskey’ emerged as the Gaelic term for Scandinavian *aqua vitae*, while the Germans had their own version of ‘brandywine’. The term *brandewijn* (burnt wine) became, before the sixteenth century especially, a term used generically for all types of distilled spirits as well as a French grape-based brandy. By the fifteenth century these distilled spirits, especially brandy, were a staple in the Low Country [4–6]. This brandy was the predecessor of *korenbrandewijn*, a grain-based distilled spirit, and then *jenever* flavoured with juniper, which later became the dominant drink throughout Holland.

‘Juniper berry water’ was first mentioned in 1552, by M. Philippus Hermani in Antwerp in *Een Constelijck Distileerboec* [7].² Over the following decades, as the Little Ice Age cooled Europe’s climate, grape vintners struggled to make wine and grape-based spirits. Flemish distillers moved into The Netherlands, after the fall of Antwerp, and brought with them their production knowledge of spirits. Since Dutch ports, especially Amsterdam, were grain import centers, distillers could make genever cheaply using surplus or spoiled grain stock and export it quickly because they were based in port cities [8,9]. Franciscus de le Boë Sylvius, a doctor in Leiden, describes a juniper berry drink (*genièvre*) in 1650 and *jenever* eventually appeared for the first time in the Dutch National Dictionary in 1672—though the term *brandewijn* was still commonly used instead [10]. *Jenever’s* production grew enormously along with the expansion of the global Dutch economy. In the 1680s, The Netherlands exported 45 million L, mostly to England. By the end of the eighteenth century, the Dutch were producing 63 million L annually and there were 250 distilleries in Schiedam, where there had been only 37 in 1700 [11,12].

By the nineteenth century, genever consumption was impressively high in The Netherlands and it was known as the drink of the common man. At the start of the century, the Dutch drank twice as much alcohol per capita as Britain, Germany, and France [2,13]. Maritime demand and overseas markets were a major driving-factor in genever’s rise.

Dutch Maritime History with Genever

Genever became ubiquitous in Holland not only as a drink for commoners, but also as a staple on Dutch ships. The rise of genever in The Netherlands went hand in hand with an increase in Dutch maritime activity globally. Flemish distillers had been moving into The Netherlands around the same time that the *Vereenigde Oostindische Compagnie* (VOC) and the *Westindische Compagnie* (WIC) received their charters. As the Dutch colonised overseas and imposed their economic imperialism worldwide, they sold genever with them around the world and it grew famous as the ‘Holland Gin’ [14]. As Robert Hennebo said in the eighteenth century, ‘what ship would stand out from the Wall, if there were no gin [1] (p. 21)?’ The VOC, in particular, used the spirit as both cargo and provision. Strong spirits were issued for sailors not for intoxication but for health reasons and usually had to be consumed in front of officers [15,16].

Aboard its ships, the VOC issued fixed rations of food and drink. In the seventeenth and eighteenth centuries, ships were provisioned for 20 to 30 months at sea but later, as more intermediate ports of call developed, the provisioning interval fell to 9 months. Throughout the seventeenth and eighteenth centuries, the minimum daily ration amounts remained largely unchanged [17]. Beer and water tended to be unlimited while stocks lasted, but wine and spirits were controlled [18]. Actual ration amounts varied widely by ship, time period, and even time of year, so each voyage should be considered on a case-by-case basis. Some general trends do appear, however. Junior officers (boatswains and above) were allotted double drink rations while senior officers (captains and mates) and passengers were exempt from any restrictions and ate separately. Deck officers were allowed to bring their own stock of genever, usually two *kelders* (cases with 12–15 bottles), and wine [19,20].

The regular crew, on large ocean-going vessels, was divided into *bakken* (messes) of seven and ate together. Their drinks were meant to be handed out in small measures to prevent drunkenness, but in practice this does not seem to have happened, and there is evidence of the stronger drinks being used for intoxication. Additionally, many sailors were allowed their own private store of alcohol. A *vaatje* (a keg) of 20 L of genever was commonly provided in a VOC sailor's recruitment package (clothing and supplies needed for the voyage) and in the Dutch navy every man usually brought a *vaatje* of genever as well as purchasing more from the ships' stores later in the voyage [20–22].

In the seventeenth century, genever was becoming more common aboard ships, but it was still not as common as beer or *brandewijn*. The 1615 voyage of *'t Wapen van Amsterdam* notes two *mutjes* (0.30 L) of *korenbrandewijn* daily in the colder climates [23]. By the eighteenth century, however, genever was the more popular ration aboard Dutch vessels, and arrack was often used on the return voyages [17]. An *oorlam* is sometimes listed as the name for the genever rations (around 50 mL), a term that, coincidentally or not, was also used to refer to an old seaman [24] (p. 154).

The VOC used the spirit for daily health rations and the still famous Bols company, established in 1575, became one of the suppliers of these 'fine waters' to the company by 1719. In 1713, the VOC's *Lyste en Reglement* notes three *fleskelders* (wooden cases for square bottles) of genever allowed on board. A 1724 VOC ration list, for one month, provided 75 mL of brandy every other day after the *flapkan* (1.5 L) of water and one quarter-barrel of beer was gone [7,21,25]. By 1730, genever was often shipped with *lepelblad* (scurvy grass) for its supposed antiscorbutic health benefits [26]. In a 1760 Dutch book written on 'means for preserving health on warships', the author notes that sailors should be given brandy daily and for scurvy should be mixed 1/6th with lemon juice [27] (p. 12).

Based on some ships' success at preventing scurvy, a common health problem on the long voyages typical of the Company, in 1742 genever replaced *korenbrandewijn* or *brandewijn* on ration lists. One year before, the Amsterdam Admiralty required that all sailors must be given as much genever as the Captain allowed for their health. Many estimates of VOC rations put the amount of genever at 1/2 *mutse* to 2 *mutjes* (0.30 L) a day from 1760 until the end of the Company [20,22].³

A 1762 Dutch Admiralty College document details a debate examining whether, and to what extent, genever should be included in ship rations. This debate came after several successful voyages in the West Indies, where crews returned healthy with many citing genever as the reason. The Admiralty ultimately decided to allow genever rations, based on cost versus benefit calculations, but the document is valuable because it contains genever provisioning information. Ships of 40 *stukken* (directly translates to 'pieces', referring to cannon) were given 24 *ankers* of genever. An *anker*, at the time, was around 38.4 L. In the eighteenth century, West Indies voyages conducting triangle trade usually lasted around 18 months and as previously mentioned, had crews of around 40 (with genever rations of just under 50 mL a day per person if split evenly). A 1781 document from the same archival bundle notes a ship of 60 *stukken* received 60 *ankers* (240 L) for 12 months [28–30].⁴

Other, more personal, primary sources for the eighteenth century also mention Dutch genever and sailors. In 1732 Jacobus Carlier notes that as long as the genever was flowing, the sailors were drunk on it [20] (p. 129). A 1775 sailor's song titled *Zeemansliedje: Jan die sloeg Lijsje*, says '*Een oorlam aan de klok, Kunt gy ook krygen*' (an *oorlam* on the clock, you can also get) [31] (p. 7). William Hickey, a passenger on a Dutch East-Indiaman in 1780, noted that the captain washed down breakfast with a full glass of 'the favorite liquor, gin'—after consuming three small beers during the meal [32] (p. 229). Hickey relates that their midday meal was even more substantial, and perhaps the gin consumption was too. The captain drank throughout each day, though Hickey 'would not dare to guess how many *sopekys* (a small glass)' the man drank before dinner. He never seemed drunk, however. Hickey recalls that the servant was 'in perpetual motion with the gin bottle and glass' [32].

In 1899 the government attempted to curb the chronic drunkenness of Dutch sailors by only allowing alcohol rations to sailors over the age of 20. By 1905, liquor rations

were abolished by royal decree [33]. This debate was not limited solely to the Dutch among European nation's navies. Government control of sailors' alcohol consumption also occurred in the British Royal Navy.

2. Methods

If Dutch sailors in the Age of Sail were drinking genever and the ships were also used to export the spirit, then the archaeological record should reflect this with a high level of genever material on Dutch shipwrecks. Methodologically, this can be tested using a combination of historical and archaeological evidence. Historically, as shown in previous sections, cargo lists, ration lists, and shipboard journals and diaries can indicate when and how much alcohol was consumed onboard. The historical information is vital because it indicates the presence of genever on Dutch ships, but is not always clear in the type of vessel that it was consumed from.

Archaeological analysis does, however, reveal what type of drinking vessels were aboard ships. To determine if certain vessels were unique to the Dutch and to genever, this paper will evaluate Dutch shipwrecks in a variety of locations as well as shipwrecks of other nationalities to see if only the Dutch vessels contain case bottles, and in the later period, stoneware bottles, and see if it is possible to determine that they contained genever and not other liquids. Sites that have had scientific excavation, and with published information and artefact catalogues that the author could consult independently, are the most useful for this study. For ethical reasons, wrecks that have been plundered or salvaged by treasure hunters have not been examined, unless they have also been studied scientifically, in which case only the professional archaeological reports have been used.

A sample of shipwrecks was chosen for this purpose.⁵ This sample is formed by a large number of British, Portuguese, and French wrecks dating from the seventeenth to nineteenth centuries have been located and archaeologically assessed, representing a wide geographic spread and detailed archaeological reports. The dates for the chosen wrecks characterise a time before mass globalisation and trade started in the mid-nineteenth century, thus making it easier to assign specific, limited nationalities to diagnostic artefacts. Each of the following wrecks will be evaluated for their artefact assemblage and whether they contain stoneware vessels, case bottles, or both.

3. Results

3.1. Dutch Archaeological Record

Material culture complements the historical record of genever by providing further insights into alcohol and its consumption by the Dutch. The archaeological record shows trends in material goods, including the presence of case bottles and stoneware drinking vessels on nearly all known and studied Dutch wrecks from this period. So, what does the presence or absence of case bottles or stoneware on shipwrecks of the sixteenth through nineteenth centuries suggest about genever consumption on Dutch or other European vessels?

Dutch consumption and transportation of genever appears in the archaeological record in two distinctive beverage containers. Firstly, mostly green glass, square case bottles became synonymous with the spirit and were used to transport genever all over the Dutch maritime world and beyond. Additionally, in the late eighteenth and early nineteenth centuries, genever was consumed on ships in stoneware jugs more often, mirroring the transition to ceramic bottles that occurred on land.⁶ The relatively high concentrations of genever-related artefacts on sites shows the prevalence of this spirit in the Dutch world both for trade or for consumption as a commodity and as part of a sailor's daily life.

Large-scale glass production began in The Netherlands around the same time that the Dutch were emerging as a world maritime power in the mid-seventeenth century [35]. At this time, green glass was commonly used for bottles, especially in Rotterdam, but it was actually in the sixteenth century that the square bottle form started production, initially as small bottles, roughly 15 cm tall. Later, they measured up to 28 cm tall, and by 1656, they were packed into cases for transport. They were known as *kelderflessen*, named for the

cases (*kelder*) that they were stored in as groups of 6, 9, 12, or even 15 [35,36], as seen in Figure 1. By the eighteenth century, the fine glass industry was thriving and by 1736 most Dutch glass container factories were making these green case bottles seen in Figure 2. They were first used to bottle spirits (beer was not bottled in glass until later in the century). As genever grew in popularity, so did the style of bottle it came in [12,35]. By the nineteenth century, Dutch case bottles were used for the export of gin rather more than domestic consumption where stoneware storage was standard, as noted by Dutch archaeologist Wil Nagelkerken.⁷



Figure 1. A depiction of the *kelder* that *kelderflessen* were stored in. (Image from: Visscher, R. *Sinnepoppen* (original from 1614) (ed. L. Brummel); Martinus Nijhoff, The Hague 1949, p. 52).



Figure 2. A glass *kelderflessen* from the nineteenth or twentieth century. Height: 22 cm. (Image from: [1990.0961], National Maritime Museum, Amsterdam).

The other way liquids, and especially alcohol towards the end of the Age of Sail, were transported by the Dutch was in stoneware bottles [2] as seen in Figure 3. These bottles could also indicate genever consumed by sailors and domestic residents in The Netherlands, especially in the period of the liquor's popularity. By the eighteenth and early nineteenth centuries, large amounts of Westerwald stoneware bottles were filled with mineral water in Germany and brought to The Netherlands. The Netherlands imported this drinking water in stoneware *kruiken* and some distillers started using the bottles for genever too. Around 1850 The Netherlands stopped importing waters, after municipality-supplied sources were installed, and stoneware bottles usage for only genever greatly increased [37].⁸ Although the presence of this stoneware on archaeological sites does not indicate consumption of gin as obviously as case bottles do (since stoneware jugs and bottles were used for other purposes), it could reflect crew drinking. Nagelkerken shows nineteenth-century stoneware

bottles, examples shown in Figure 4, in his site report of Bonaire’s historic anchorage, many with manufacturer stamps from Weesp and Schiedam [39] (p. 39).



Figure 3. A stoneware jug from the wreck of The *Amsterdam*. Height: 28.5 cm, Width: 20 cm, Depth: 20 cm. (Image from: [RB.0004 (23) 1], National Maritime Museum, Amsterdam).



Figure 4. *Jeneverkruiken* from Bonaire. (Image sourced from: Nagelkerken, W. The Historical Anchorage, p. 37 and reprinted with STIMANA’s permission).

One of the bottles was stamped ‘Blankenheym & Nolet’, referencing Carolus Blankenheym who started distilling in Rotterdam in 1714, and a later dated bottle stamped with ‘Blankenheym’s Very Old Gin’ [39] (p. 80). An earlier example of a stoneware genever bottle (*jeneverkruiken*) can be seen in a bottle fragment dated 1775–1850 found in Amsterdam with the words ‘Weesp Gin’ stamped on it as seen in Figure 5 [40]. Further examples found in Sijtwende, Netherlands, are stamped with ‘Hulstkamp & Zn. & Moly Rotterdam’ [41] (p. 78). While the *jeneverkruiken* look similar to mineral water bottles, they often had stamps indicating the distilleries and tended to be smaller. The company marked was a distillery first opened in 1775, though the bottles are from after 1823 [41].



Figure 5. Fragment of a stoneware bottle with ‘Weesp Gin’ stamped on it. Found in Amsterdam dating to 1775–1850. (Image from Jerzy Gawronski’s ‘Below the Surface’ artefact compilation for the city of Amsterdam and reprinted under Common Use Licensing).

Dutch shipwrecks and maritime-related sites have been archaeologically identified mainly in the Caribbean and various points along the VOC trade routes from European waters to the Indian Ocean and Asia. Through Dutch global shipping, commerce, and colonisation the beverage was consumed in the West Indies, the East Indies, domestically in Holland, and everywhere else in between. This speaks to the universality of Dutch genever consumption.

Dutch maritime sites in the Caribbean, are more common terrestrially, as the water conditions do not tend to preserve shipwrecks well, apart from a WIC vessel discussed later. On some major trading islands' anchorage spots (Sint Eustatius, Bonaire, and Curaçao) there is ample evidence for both case bottles and stoneware bottles, but it is difficult to assign a specific ship context to any.⁹ The Caribbean was a melting pot of cultures and trade squeezed into a small geographic region during the Age of Sail and diagnostic artefacts associated with particular national or geographic trends are less reliable in such internationally blended contexts, although the presence of stoneware bottles and case bottles together is representative of a probable Dutch context or site.

The second main source of archaeological sites where Dutch maritime culture predominated, and more reliably so than in the Caribbean, is the wrecks of East India Company (VOC) vessels. These shipwrecks are found all over the world, especially along the trade routes of the VOC. Unfortunately, because of their valuable cargoes, these sites are particularly prone to looting and salvaging—some even disturbed with the Dutch government's permission [42]. Although a complete record of known and studied wrecked VOC ships is hard to obtain, many general trends are evident. A few of these shipwrecks are introduced and their artefacts are discussed in this paper.

3.2. Shipwreck Data

Table 1 shows the shipwrecks discussed in this paper. The wrecks are placed in chronological order, with their date of wrecking and wreck location, as well as the nationality of the vessel. The presence of case bottles or stoneware material is also noted. Following the table, is a discussion considering the results shown in the table.

Table 1. Sample of Age of Sail Shipwrecks.

Date	Name	Nationality	Location	Case Bottles	Stoneware	Further Information
Mid-Sixteenth Century	Portuguese Wreck	Portuguese	The Seychelles	No	Yes	Typical Portugese <i>naus</i> type found by fishermen and investigated in 1976 by Warren Blake [43].
1593	Scheurrak S01	Dutch	Texel	Yes	Yes	Sank on Christmas Eve 1593 at anchor. Discovered in 1984 and surveyed in 1986 by The Netherlands Institute for Ship and Underwater Archaeology [44].
1629	<i>Batavia</i>	Dutch	Australia	Yes, and bottle tops	Yes	One of the most famous VOC ships, wrecked off of Western Australia with numerous surviving sources of the passengers and crews' time ashore. Re-discovered in 1963 and several expeditions and excavations have taken place in the following decades. The Western Australia Museum has conducted extensive research into the vessel and Jeremy Green consolidated a large publication of the vessel's artefacts [42,45].

Table 1. Cont.

Date	Name	Nationality	Location	Case Bottles	Stoneware	Further Information
Seventeenth Century	Blind Harbour Wreck	Unknown	Ireland	Bottle tops	unclear	Unknown vessel found off of Ireland and researched in 2009–2012 by archaeologists with the National Museum of Ireland in Blind Harbour, along with the <i>Zeepaard</i> [46].
1648	<i>Utrecht</i>	Dutch	Brazil	Yes	Yes	Dutch Admiralty ship sunk off the coast of Itaparica with salvage operation in 1980 and 2012 non-intrusive fieldwork as part of the Maritime Programme of the Dutch Cultural Heritage Agency (RCE) with the Museum of Archaeology and Ethnology of the Federal University of Bahia, Brazil [47].
1656	<i>Vergulde Draeck</i>	Dutch	Australia	Yes	Yes	Medium-sized VOC vessel that sank near Perth. Discovered in 1963, but much of the cargo and associated artefacts were looted. Excavated by archaeologists with the Western Australia Museum and Jeremy Green [48,49].
1659	<i>Avondster</i>	Dutch	Sri Lanka	No	Yes	A British ship captured by the Dutch and used by the VOC until wrecking in Galle Harbour. Found in 1997 and excavated in 2001 to 2004 by the Dutch/Sri Lankan Mutual Heritage Center [50].
1664	<i>Kennemerland</i>	Dutch	Shetland	Yes	Yes	Only three men survived this VOC ship's wreckage and there was heavy contemporary salvaging. It was excavated in the 1970s and heavily researched by Keith Muckelroy. After Muckelroy's death, work on the shipwreck continued intermittently through the 1980s [51–53].

Table 1. Cont.

Date	Name	Nationality	Location	Case Bottles	Stoneware	Further Information
1665	<i>Zeepaard</i>	Dutch	Ireland	Bottle tops	Yes	400-ton VOC ship returning from Batavia, wrecking off the coast of Ireland. Identity confirmed with archival documents and it was researched in 2009–2012 by archaeologists with the National Museum of Ireland in Blind Harbour, along with the Blind Harbour Wreck [46].
1670–1680	BVN2	Dutch	Texel	Yes	Yes	VOC wreck off the Dutch coast near Texel, locally known as the Polish Cannon Wreck. Wrecked leaving The Netherlands in the late seventeenth century (estimated to be 1670–1680) [36].
1704	<i>Dauphine</i>	French	Saint-Malo, France	No	Yes	French frigate built in the French Royal Shipyards and served as a privateer. It was found in 1995 and studied, along with the <i>Aimable Grenot</i> , by a team from the French Ministry of Culture [54].
1728	<i>Adelaar</i>	Dutch	Scotland	Yes	No	A VOC ship re-discovered in 1972 by a team of archaeologists, Chris Oldfield and Company, and an excavation began in 1974 by the St. Andrews Institute of Marine Archaeology [55].
1729	<i>Curaçao</i>	Dutch	Scotland	Yes	Yes	A Dutch warship found off of Scotland in 1972 by a Belgian-French expedition [56].
1735	<i>'t Vliegende Hart</i>	Dutch	Middleburg	Yes	Yes	VOC-retour ship wrecked off the coast and excavated in the 1980s by the North Sea Archaeological Group [57].
1740	<i>Rooswijk</i>	Dutch	England	Yes	Yes	Examined in 2017 and 2018 by the Dutch National Office for Cultural Heritage (RCE) and Historic England [58].

Table 1. Cont.

Date	Name	Nationality	Location	Case Bottles	Stoneware	Further Information
1743	<i>Hollandia</i>	Dutch	Southwest England	Yes	Yes	VOC ship wrecked off of the southwest U.K. built in Amsterdam as a small East Indiaman. There were high ranking passengers onboard as well as typical VOC crew. It was discovered in 1971 by Rex Cowan and surveyed later [26,59].
1746	<i>Prince de Conty</i>	French	Western France	No	No	A French East Indiaman that sunk off the coast of Western France. Professionally excavated in 1985 after its discovery by divers [60].
1749	<i>Aimable Grenot</i>	French	Saint-Malo, France	No	Yes	A private French frigate studied in 1995 with the <i>Dauphine</i> by the French Ministry of Culture [54].
1749	<i>Amsterdam</i>	Dutch	England	Yes	Yes	A typical large VOC ship built in the Amsterdam shipyards and wrecked off the coast of Southern England. Some items were looted in 1827 and 1969 and major excavations took place in the 1980s. There has been extensive research by archaeologists Peter Marsden and Jerzy Gawronski and roughly three-quarters of the ship survived [26,34,61].
1761	<i>Griffin</i>	British	Philippines	Unclear	No	An English East India Company (EIC) ship in which the crew was able to escape with items during the wrecking. It was discovered by archaeologists with the National Museum of the Philippines and a private French organisation and excavated in 1986 [62].
1765	<i>Albion</i>	British	Thames Estuary	No	No	An outward bound EIC vessel that wrecked in the Thames Estuary and recorded by the Marine Archaeological Surveys charity after permission from the wreck's salvors in 1985–1986 [63].

Table 1. Cont.

Date	Name	Nationality	Location	Case Bottles	Stoneware	Further Information
1765	Sadana Island Wreck	Unclear	Egypt	Yes	No	An Ottoman-period wreck of mostly Chinese porcelain. It was excavated in 1995–1998 with the Institute of Nautical Archaeology and the Supreme Council of Antiquities for Egypt and vessel construction is not characteristic of European ships [64].
1770	HMS <i>Swift</i>	British	Argentina	Yes	No	A British sloop of war, sank off the Argentinian coast and preserved well. It was first excavated in 1997 by archaeologists with the Argentinian National Ministry of Culture [65,66].
1785	<i>General Carleton</i>	British	Baltic	No	Yes	A British ship serving regular Baltic trade routes and sunk in 1785. The discovery of the ship's bell with the vessel name engraved led to the wreck's identification. Excavated in the late 1990s by the Maritime Museum of Gdansk [67,68].
1788–1795	Dutch Cargo Ship	Dutch	Baltic	Yes	Yes	A probable Dutch cargo ship off the coast of Finland. Finds retrieved by the Nord Stream Company archaeologists [67].
1791	<i>De Jonge Seerp</i>	Dutch	Baltic	unclear	Yes	Cargo determined this to be a Dutch cargo ship and archival material confirmed its name. Starting in 1985, the ship was excavated over 13 intermittent seasons by the Maritime Museum of Gdansk [67].
1797	<i>Sydney Cove</i>	British	Near Australia	Yes	No	A vessel sunk off of present-day Sydney on a journey from Calcutta. The crew escaped with their possessions, but much of the cargo was left. It was rediscovered in 1977 and regular excavations were conducted in the 1990s with the Tasmania Parks and Wildlife Service and the Queen Victoria Museum of Art [69].

Table 1. Cont.

Date	Name	Nationality	Location	Case Bottles	Stoneware	Further Information
1803	<i>Hindustan</i>	British	Thames Estuary	No	No	An outward bound large EIC vessel that wrecked in the Thames Estuary and recorded by the Marine Archaeological Surveys charity after permission from the wreck's salvors in 1985-6 [63].
Early Nineteenth Century	Mardi Gras Wreck	Unclear	Gulf of Mexico	No	Yes	An undetermined vessel illustrating cargo tied to the United State's consumption patterns in the early nineteenth century. It was found in 2002 and recorded in 2007 as part of a pipeline installation survey and studied with Texas A&M University [70,71].

4. Discussion

4.1. Dutch Case Bottle Evidence

On nearly all of the Dutch vessels, evidence of case bottles is presented in the archaeological reports. As mentioned, *kelderflessen* are one of the most obvious forms of evidence for genever presence on a ship. This spirit could be onboard for crew consumption or for export. Starting in the sixteenth century, these green square bottles are found on Dutch ships. The Scheurrak S01 vessel shows evidence of glass case bottles on a ship that was part of the sixteenth-century Baltic grain trade with a cargo from Poland [44]. Other examples of case bottles on regional trade vessels include the eighteenth-century probable Dutch shipwreck off of Finland. Most objects recovered were from the galley area between the main and mizzenmast and along with onion-shaped wine bottles, square case bottles were discovered [67].

Case bottles are evident on Admiralty ships too with the *Utrecht* containing at least one complete case bottle [47] (the author believes possibly with Schiedam printed along the base) and the *Curaçao* showed scattered sherds of stoneware, a glass onion bottle, and a green glass case bottle [56].

The shipwrecks of the VOC provide several examples of case bottles onboard and give insight into the spatial context of the bottles. Unlike smaller merchant vessels, VOC ships were large enough to have designated cargo spaces and, on some wrecks, enough of the vessel survives to place artefacts in their original location. The *Batavia* collection includes pewter bottle tops, associated with case bottles, as well as square case bottle bases and necks [45]. Additionally, in Australia, the *Vergulde Draeck* shows two groups of glass case bottles were found with their associated pewter screw tops, and it is noted that there seem to be no onion-bottle remains. The large amount of case bottles grouped together suggests perhaps they were packed in their wooden cases when wrecked, but the wood has disintegrated. Archaeologist Jeremy Green suggests that these bottles probably held wine since the liquid was ordered in large quantities for the Indies [48,49] (p. 226). It is likely that they held spirits, though. Although genever was not on the VOC ration list at the date of sinking, there is contemporary evidence from a 1656 VOC provision list of *brandewijn* [48] (p. 375).

During the Anglo-Dutch wars (1652–1654, 1665–1667, and 1672–1674), VOC ships were forced to sail to Asia via a more northerly route around Scotland and Ireland to avoid the English Channel [46]. These vessels have case bottle evidence as well. Although there

were no glass finds on the *Zeepard*, excavators did recover pewter bottle top reinforcement rings [46]. These were used by many European merchants to pack glass bottles and protect their necks during travel. The same type of rings were found on the *Vergulde Draek*, and it can be assumed they, similarly, were used to protect square case bottles. The Blind Harbour Wreck likewise had nine pewter bottle protective rings among the finds [46].

The *Adelaar* finds include a green bottle base, a small piece of a bottle neck, four white glass bottle toppers, and a wine glass [55]. The *Rooswijk* wrecked with 15,000 L of beer, wine, and genever and in what the excavators think is the probable the cargo hold area, there were onion bottles, case bottles, and stoneware jugs that would have been part of a sailor's allowed 1 litre of beer and 1 *mutstje* of wine or genever [58].

A VOC shipwreck that provides evidence from an outbound voyage is the *Hollandia*. General cargo items included globular-shaped 'onion' bottle (still filled with wine), brass taps for barrels, and the square green glass bottles with pewter caps that indicate case bottles [26,59]. The officer cabin area contained a *brandewijn pimpeltje* (0.018 L). This vessel and the *Amsterdam* provide valuable insight into VOC East Indiamen and the culture onboard the ships, which included alcohol. Historical evidence tells us they were issuing alcohol on VOC ships, but without the cargo lists it is hard to know what Batavia-bound cargo was and what was intended for crew and passengers. The *Amsterdam* was provisioned for 300 men for at least a six-month voyage and was noted to be a typical large East Indiaman [26,34,61,72]. Additionally, being a typical Dutch ship, it was full of alcohol. In contemporary reports of the vessel's sinking, it was noted that many of the crew broke into these alcohol supplies and were drunk by the time the vessel went down.

Research on the *Amsterdam* shows that stoneware made in the Low Country and square glass bottles were taken from the wreck in the nineteenth century. Other finds came from a limited area but include the galley, gunroom, and a medical chest. There were 'a great many thousand dozen' bottles of wine in chests, some French and many with liquid still inside [72] (p. 75). There were case bottles in the hold area as well. Here, Peter Marsden found more stoneware jugs that held genever and green glass square bottles with corks that probably contained wine or genever. Marsden states that 'the presence of many hard-fired stoneware jugs in the excess cargo area makes it likely that she was carrying a quantity of spirits, most probably gin' [72].

For other vessels, historical information can also be combined with the material finds to further inform analysis. The *Vliegend Hart* excavations found glass onion bottles and stoneware seltzer bottles, as well as a tap for water or beer barrels [57]. Additionally, a square case bottle with a tin top was found. In the archival records for the ship's first voyage in December 1730, the victuals included 97.117 L of water, 5625 L of beer, 2300 L of French wine, 4608 L of Cape wine, and 697.5 L of *korenbrandewijn*. *Korenbrandewijn* is essentially genever without the juniper flavouring and would be represented in the case bottles.

Due to legal disputes after the wrecking of the *Kennermerland*, there is a wealth of historical information about the ship and its cargo. Throughout the course of excavations, many alcohol-related artefacts turned up, causing archaeologist Keith Muckelroy to remark that 'perhaps the most striking feature is the quantity of liquor'. Archival sources show there were an estimated 1604 gallons of *brandewijn* onboard the vessel at the time and Muckelroy theorises that some was cargo, and some was for the crew [51] (pp. 284–286). The artefacts included case bottles and Bartmann jugs (though at least two of these definitely contained mercury) and the bottles were found apart from a large collection of pipes, which would have been cargo for trade in Asia, and separate to artefacts that were most likely personal belongings. There was green glass all over the site and nearly all the bases recovered were square.

4.2. Dutch Stoneware Bottle Evidence

The evidence for genever presence on ships is less obvious when looking at stoneware material. As mentioned, stoneware bottles were used to store genever towards the end of the Age of Sail. Some archaeologists, including Marsden, have said that Bartmann

stoneware jugs could hold alcohol (and genever).¹⁰ Dutch paintings from this period show Bartmann bottles in tavern and home-drinking scene as well [73] (p. 11). Others, for example those on the *Avondster* project, argue that smaller, more simple than a decorated Bartmann, jugs were used for storing alcohols, oils, and wines and thus are found on many shipwrecks. It is difficult to prove what was inside the jugs found on shipwrecks and the historical evidence does not indicate whether genever rations were issued from *kelderflessen* or *kruiken*. Chemical analysis would be the most helpful method to interpret the use of bottles on shipwrecks, but it is not often possible. Without stamps, the shape alone does not indicate the contents of the bottle either [38] (p. 72). Additionally, the bottles could have been reused to store other liquids. Without further analysis or supporting historical documentation, the exact quantities of the bottles will not be known. Nevertheless, there are many examples of stoneware storage jars and bottles in the cargo area of Dutch ships and historic evidence to support alcohol onboard as cargo and provisions.

On Scheurak S01, among the 5000 artefacts from the wreck were Bartmann jugs from the Rhineland region found with the glass case-bottles. On the *Batavia* were a large array of stoneware jugs with medallions and in a variety of styles. The main group were Westerwald-Type blue-grey stoneware jugs and there were also some complete Bartmann style jugs. Ceramics from the *Vergulde Draeck* were mostly stoneware jugs of the salt-glazed Bartmann style and other plain stoneware jugs [44,45,48,49]. On these ships, the presence of case bottles and stoneware jugs may provide evidence of spirits both issued to the crew and also in the general cargo.

The VOC's *Avondster's* midship galley and crew area show a mix of Asian and European stoneware storage jars, including the Bartmann variety [50]. These were found near the galley area and thus would have held provisions of all sorts, not just alcohol. The vessel was returning to Europe from Asia and thus there would not have likely been any case bottles onboard but there were cylindrical wine bottles found. On the *Zeepaard*, the neck of a Bartmann jug, as well as one partial and two complete vessels, were among the ceramics finds [46].

On the *Hollandia*, personal items and tableware included sherds of Bartmann jugs and other salt-glazed stoneware [26]. On the *Amsterdam*, the hold and the main hatch area of the ship also contained items related to alcohol. Here, Marsden found more stoneware jugs that he believes held genever and green glass square bottles with corks that probably contained wine or genever [72]. The date of the *Amsterdam* (1749) supports the general narrative of substantial Dutch genever exports. High eighteenth-century rates of genever production suggests that genever could be the liquid in these ceramics.

The *Utrecht* wreck contained stoneware bottles [47] and after consulting the artefact catalogue it seems some possibly had 'Herzogthum Nassau Selters' stamped on them indicating mineral water. On the *Curaçao*, three stoneware jugs were also found, though they contained oil [56]. On the *Jonge Seerp*, most of the artefacts were found in the bow and midship area. Of the ceramic material, 14 percent were stoneware storage vessels, including bottles and jugs, from Frechen makers [67]. The site reports do not include obvious evidence of case bottles onboard, but there was evidence of wine consumption. Given that the vessel was not a VOC ship, and was probably used for Dutch European coastal trade, it would be unlikely that genever was a high export cargo (since the ship was not supplying overseas colonies) and it may have only been stored in the stoneware.

4.3. Non-Dutch Shipwreck Evidence

4.3.1. British Wrecks

The English East Indiaman *Sussex* was caught in a storm and sank off the eastern coast of the Cape of Good Hope [74]. The cargo mainly consisted of porcelain ceramics and no stoneware was noted. Approximately 15 fragments of dark green bottle glass were recorded, described in the report as 'characteristic of the period' by archaeologists with the French Ministry of Culture [74] (p. 83). It is unclear if this included case bottles, but it is

unlikely, given these bottle fragments had curved profiles indicative of cylindrical bottles rather than the square case bottles.

The *Griffin*, also an English East India Company (EIC) vessel, wrecked in the Philippines in 1761 after the ship struck an uncharted reef [62]. The passengers and crew were able to escape and took some of the ship's cargo and personal items with them. The surviving cargo included several English bottles from the early eighteenth century and a fragmented wineglass stem. The report on the project listed neither case bottles nor stoneware jugs from this wreck [62].

HMS *Swift*, a British sloop of war, sank off the coast of Argentina in 1770 [65,66]. On the site, more than 20 cylindrical wine bottles were found as well as smaller beer bottles. Additionally, more than 12 mold-blown case bottles were found on the wreck with the characteristic short neck and square cross section. Some of the bottles were inside a wooden case, and all were found in the stern area, which belonged to the ship's officers. Analysis was done on the liquids in the bottles and found a sweet wine substance in the cylindrical bottles but due to seawater contamination, the square bottles could only be confirmed as having alcohol of some sort inside.

The *Sydney Cove* wrecked in 1797 on a journey from Calcutta to Port Jackson, Australia (present-day Sydney) [69]. The crew was able to escape and take their personal possessions, so very little evidence of shipboard-life remains. The vessel's cargo consisted mainly of Indian goods, despite the vessel being British and heading towards a British colony. The cargo included wineglass fragments and earthenware jars or bowls. The largest group of finds from the cargo, however, related to alcohol consumption and exports. Around 7000 gallons (31,500 L) of alcohol was noted to be in wooden casks in the hold. The ship captain wrote a maritime protest detailing the abandonment of the vessel and noted that 105 casks of rum, 2 casks of brandy, and 4 pipes of Madeira were salvaged.

Additionally, alcohol was brought onboard the vessel in bottles. Thirty-seven intact examples were found during the excavations, including 22 bottles that were still sealed. The ship had wine-style quart bottles (confirmed by liquid sampling) as well as beer-style quart bottles, but most importantly there were at least 12 cases of gin and brandy according to archaeological and archival material. Interestingly, even though this was a British ship, the shipping company operating the vessel was known to advertise 'Holland Gin'. Thus, the author believes, the 12-dozen case bottles recovered by archaeologists most likely held genever and reflected the international blend of European trade items among European ships operating in Indian Ocean waters.

The *General Carleton* sunk in 1785 in the Baltic [67,68]. During excavation, 43 ceramic vessels and 169 pottery sherds were found. This included stoneware, in the form of English-made brown jars, and bottles and pitchers of German origin. Glass finds included complete round wine bottles and fragments of four to five case bottles.

4.3.2. Other European Wrecks

Fishermen found a mid-sixteenth-century shipwreck near the Seychelles and the hull characteristics and the armament indicated Portuguese origin, typical of the *naus* vessel type [43]. Although the wreck date is perhaps too early for genever consumption and shipping, some artefacts were noted to be similar to those on Dutch VOC shipwrecks. A German-made Bartmann jug was found and compared with one found on the *Vergulde Draek* wreck. Some stoneware storage jars were like those found on the Dutch *Batavia*. No case bottles were found on this wreck, although their production was rare during the sixteenth century.

The *Dauphine* was a French frigate and the wreck (dating to 1704) was found off the coast of Saint-Malo, France and studied, along with the *Aimable Grenot*. Archival sources on the ships and the wrecking confirmed their identities [54]. The *Dauphine* contained Frechen Bartmann jugs and wine bottles. No case bottles were found, but there were pewter screw caps. The *Aimable Grenot* was another French privateering frigate and the archaeological finds included German stoneware and wineglass bottles.

The Sadana Island Ottoman-period wreck was excavated off the coast of Egypt and its finds date to around 1765 [64]. The cargo consisted mainly of Chinese porcelain, with 4000 artefacts recovered in total (though many were looted already). Only earthenware ceramics are mentioned. Four dozen broken green glass case bottles were found around mid-ship, and archaeologist Cheryl Ward notes that these were probably part of the cargo [70,71]. The vessel has not been identified, but the researchers note the construction methods are not indicative of Portuguese, English, or Dutch craftsmanship.

The Mardi Gras Wreck, in the Gulf of Mexico, dates to the 1820s and gives insight into the consumerism patterns of the United States during this time period [60]. A number of ceramic and glass vessels were recovered, mostly from the cabin area of the vessel, indicating that they were for shipboard use and not cargo. There were 14 complete or near-complete bottles and 43 fragments, including 13 French wine bottles and 2 British beer bottles. There were no case bottles, and the small number of bottles suggests they were for personal crew consumption. For ceramic artefacts, there were 14 complete, 6 broken but identifiable, and 3 sherds found, mostly found together aft of the bulkhead. Of these, three were stoneware, produced in Germany: two were Rhenish dating to 1780–1830 and one was a small bottle for ink or oil. The nationality of the vessel has not been determined, but no characteristically Dutch artefacts have been recovered.

Other European shipwrecks are worth noting in this analysis because of their lack of either German stoneware or case bottles. The *Prince of Conty* was a French East Indiaman that sunk off the coast of Western France in 1746. Neither stoneware nor case bottles were listed in the excavations report. The *Henry Addington* was an EIC vessel that wrecked in 1798 off the Isle of Wight in England. None of the listed cargo included alcohol and there were no case bottles found in the excavations, which is very different to the VOC wrecks of the period. The *Hindustan* and the *Albion* were both British and wrecked in the Thames Estuary in 1765 and 1803, respectively. Of the ceramics discussed in the site reports by the Marine Archaeological Surveys charity, none are German stoneware. Glass bottles are also never mentioned [63,75].

5. Conclusions

Based on the researched sample of Dutch and non-Dutch ships from the sixteenth to early nineteenth centuries, wreck sites with both square case bottles and stoneware drinking vessels are likely to be Dutch ships. Table 1 showed that of the 14 Dutch vessels studied, only 2 (*Avondster* and *Adelaar*) did not have indications of both case bottles and stoneware bottles onboard. British, French, and Portuguese ships generally do not contain both types of material. However, this theory needs to be studied further, as only a sample of archaeological sites was used in this paper. Archaeologically, the study of genever could yield interesting results and a tentative method for shipwreck nationality determination. This does not necessarily mean that genever was in the bottles at the time of sinking of the ship, or that genever was not present on other European ships, but given the historical evidence, it is likely that these two types of containers were on the Dutch vessels.

Some of the shipwrecks (the *Kennemerland* and *'t Vliedend Hart* for example) have documentary evidence of *korenbrandewijn* and *brandewijn* on the vessel at the time of wrecking or a voyage before. VOC ration lists and written sources from the VOC, WIC, and Admiralties also indicate that genever (or genever's precursors) were present on ships and that would have been in *kelderflessen*. Though genever (and case bottles) became a global product during the Age of Sail, its place of manufacture and main area of usage was The Netherlands.

The stoneware component of genever storage is more difficult to quantify. It is not until the nineteenth century that stoneware bottles are used primarily for genever and not for mineral water. Perhaps, stoneware jugs, like Bartmann jugs, were used for alcohol before, but it is difficult to tell. Alcohols could be decanted into stoneware jugs, pitchers, and bottles for serving, but again, there is not a reliable way to tell what was in a vessel. In several wrecks, the stoneware items were found around the galley, and can then assumed

to have been used for crew consumption (of oils, vinegars, maybe alcohols) unless an analysis of the content can be performed (which will depend on preservation conditions and research design) and that allows a to determine more precisely what such content actually was. Contemporary Dutch art does indicate the use of stoneware jugs and bottles for alcohol, and it can be assumed that continued at sea.

When faced with a shipwreck of unknown origin, archaeologists look at a number of factors to try and determine its nationality. Ship construction techniques, historical documentation, armament, and geographic factors are good indicators, but material culture can also provide signs. The artefacts from cargo areas, cabins, and crew areas can shed light not only on the day-to-day life of those onboard, but also to the consumption habits of the crew. Additionally, at sea, alcohol was consumed in great amounts. The Dutch vessels issued genever and genever was stored in distinct ways. Archaeologists should look to these distinct bottles as clues to a possible identification of a ship.

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Notes

- ¹ A large part of this article was made possible thanks to the generous support provided by Het Scheepvaartmuseum's Warnsinck Fellowship. The author will be continuing her work on Dutch sailors and alcohol, specifically the social history of the drink and how it impacted the reputation of the sailors, for the rest of her time as a fellow.
- ² Though, this juniper flavoured water mentioned consisted of the addition of juniper to the already common grape-based brandy. The various terminology used contemporarily for the various spirits is difficult to use to determine the exact alcohols being discussed. Most contemporaries used the terms interchangeably and it can be assumed were referring to a range of beverages, including genever and grain spirits.
- ³ Bruijn and Lucassen [16] use 1 mutsje (0.15 litres) as an estimation while De Hullu [23] uses the larger one. Some sources, such as Diebels [22], say only 1/2 mutsje every 2 days.
- ⁴ Ships of 60 guns were given 40 ankers, 50 guns received 32 ankers, 30 guns received 20 ankers, and 20 guns received 12 ankers.
- ⁵ The wrecks chosen come from a variety of geographic locations and were used for a range of purposes within the Dutch maritime world. Wrecks that have been subjected to the abhorrent practice of 'excavation' for profit have not been chosen.
- ⁶ A number of archaeological studies of maritime-related sites have made this claim [2,34].
- ⁷ Nagelkerken claims bottles of this type have not been found in the Netherlands [2]. This is striking and strongly suggests the bottles represent genever as an export commodity and for maritime consumption.
- ⁸ For a very good overview of stoneware bottles in this region and this period see [38].
- ⁹ For these archaeological reports see [2,39].
- ¹⁰ Marsden states in 'The Wreck of' that 'the presence of many hard-fired stoneware jugs in the excess cargo area makes it likely that she was carrying a quantity of spirits, most probably gin' [34]. In Finn, C. P. The Material Culture of Drinking and the Construction of Social Identities in the Seventeenth-Century Dutch Republic. PhD dissertation, University of Sheffield, 2014, the claim is also made that these stoneware jugs may have been used for gin transport.

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