DISSERTATIONES
ARCHAEOLOGIAE
UNIVERSITATIS
TARTUENSIS
13

MONIKA REPPO

Glass and its makers in Estonia, c. 1550–1950: an archaeological study

DISSERTATIONES ARCHAEOLOGIAE UNIVERSITATIS TARTUENSIS
13

DISSERTATIONES ARCHAEOLOGIAE UNIVERSITATIS TARTUENSIS
13

MONIKA REPPO

Glass and its makers in Estonia, c. 1550–1950: an archaeological study

UNIVERSITY OF TARTU
Press
1632

Institute of History and Archaeology, Department of Archaeology, Faculty of Arts and Humanities, University of Tartu, Estonia.

This dissertation was accepted for the commencement of the degree of Doctor of Philosophy (in Archaeology) on June 12th 2024 by the Council of the Institute of History and Archaeology, University of Tartu.

Supervisors: Associate Professor Andres Tvauri (University of Tartu)
Senior Researcher Erki Russow (Tallinn University)
Professor Georg Haggrén (University of Turku)

Opponent: Magdalena Bis, PhD (Polish Academy of Sciences)

Commencement: September 10th 2024 at 16.00 Senate Hall,
Ülikooli St. 18–204, Estonia

This research was supported by the Estonian Research Council grants no. PRG2026 and EKKD111, and a research grant from the Society for Post-Medieval Archaeology.

ISSN 1736-2733 (print)
ISBN 978-9916-27-618-1 (print)
ISSN 2806-2124 (pdf)
ISBN 978-9916-27-619-8 (pdf)

University of Tartu Press
www.tyk.ee.

TABLE OF CONTENTS

LIST OF PAPERS

I Reppo, M. 2019. Slow and disconnected? The historiography of 17th–18th century glass in Estonia and the prospects of interdisciplinary research based on a case study of Pärnu County. – *Baltic Journal of Art History*, 18 (Autumn), 211–230. https://doi.org/10.12697/BJAH.2019.18.06.

II Reppo, M. 2019. Kümme liitrit klaasikilde Haapsalu piiskopilinnuse käimlast ehk De la Gardie'd kui oletatav lüli Haapsalu ja Hüti vahel. – *Õpetatud Eesti Seltsi aastaraamat 2018 / Annales Litterarum Societatis Esthonicae 2018*, 7–28.

III Reppo, M. 2021. An engraved footed vessel from Tallinn, Estonia. – *Journal of Glass Studies*, 63, 375–378. https://www.jstor.org/stable/48635713.

IV Reppo, M. 2022. Eksootika, romantika ja poliitika – lindude ja teiste tiivuliste kujutised Eesti arheoloogilisel klaasil. – *Õpetatud Eesti Seltsi aastaraamat 2020 / Annales Litterarum Societatis Esthonicae 2020*, 75−101.

V Reppo, M. 2022. Lääne-Eesti ja muu maailm: võrdlevalt Haapsalu ja Pärnu klaasileidudest. – *Läänemaa Muuseumi Toimetised*, XXIV, 141−170.

VI Reppo, M. 2023. Moving skills, moving ideas – migrant glassworkers in 17th–19th-century Estonia. – *Post-Medieval Archaeology*, 57 (3), 390–408. https://doi.org/10.1080/00794236.2023.2286300.

LIST OF DATASETS

I Reppo, M. 2023. Dataset 1. Archaeological glass finds from Estonia (dataset). DataDOI. http://dx.doi.org/10.23673/re-450.

II Reppo, M. 2023. Dataset 2. 16th–19th-century glassworkers in Estonia (dataset). DataDOI. http://dx.doi.org/10.23673/re-448.

III Reppo, M. 2023. Dataset 3. 17th–20th-century glassworks in Estonia (dataset). DataDOI. http://dx.doi.org/10.23673/re-449.

1. INTRODUCTION

Founded in the 1620s, the Estonian glass industry relied heavily on the labour of foreign workers from the outset until the mid-19th century and even later due to a guild-based division of skilled professions and serfdom of the local population. During this period, particularly in the 1750s–1770s, numerous glassworks were founded and glass, which had previously been available to a limited number of consumers, became an increasingly ubiquitous material in the territory of modern-day Estonia (Reppo 2015).[1] The history of the local glass industry has been studied by geographers, genealogists, archaeologists, historians, artists, and family historians, to name a few. This list of specialists appears complimentary; however, the studies are mostly disconnected, and certain aspects of the industry have not been examined at all, especially archaeologically.

The main goal of this thesis is to bridge some of these gaps and provide a comprehensive overview of glass and the glass industry in Estonia during the early modern and modern period[2] employing principles of documentary archaeology and artefact studies (see Ch. 3 and 4). The objectives for this thesis are as follows. Firstly, revising the chronology of the Estonian glass industry and the study thereof (Articles I, VI). Secondly, identifying the role, the connections, and life histories of foreign workers in the industry (Article VI). Thirdly, the characterisation of local glass consumption based on archaeological finds (Articles II–V) from the founding of the first local production sites until the gradual mechanisation and introduction of machine-drawn glass in the first half of the 20th century and Haapsalu, Pärnu, and Tallinn as consumption sites (see Ch. 4.1).

The author's original contribution lies in the visual systematic analysis (see Ch. 4) of 24,067 glass fragments from the 12th–20th century from repositories across Estonia (Dataset I). This includes 19,726 finds from the early modern and modern period. The earlier finds are included for comparative purposes which are described in Chapter 4. Further contributions lie in the collection of genealogical data for 1,248 individuals that were part of the glassworking community in Estonia (Dataset II), and an updated chronology of 42 glassworks from the 17th–20th century (Dataset III). Raw data for the finds, glassworkers, and glassworks have been published as three Open Access datasets which follow the FAIR principle (Findable-Accessible-Interoperable-Reusable; Wilkinson et al. 2016; see Ch. 4.3). Further contributions lie in the development of terminology in Estonian (see Ch. 6).

[1] The dissertation was completed, submitted, and defended in January 2016.

[2] When referring to the early modern period, 1550–1800 A.D. is considered throughout this thesis (Laur 1999; Põldvee & Seppel 2020). In Estonian and European history, the modern period can be seen as a period between 1800–1900 or the long 19th century (until World War I; Hansen et al. 2023; Woodworth & Brüggemann 2020) and the contemporary period starts at beginning of the 20th century (Hansen et al. 2023), although it may also refer to a period from 1800 until today (e.g. Blanning 2001) or from 1800–1945 when the contemporary period begins (Brivati 1996, xvi). When speaking of the modern period, the widest periodisation is considered here.

Throughout this thesis, the focus is on the glassworks, the workers, and the artefacts. The study of glass finds (Articles I–VI) is the only part of the thesis which is a continuation of the author's MA research where 3,000 archaeological glass vessel finds from Tallinn from the late 13th–20th century were catalogued (Reppo 2015). The information about these finds has been brought up to date and they have been included on Dataset I. In the study of the workers, the networks of connections and the workers' movements between glassworks are hypothesised to demonstrate how the local migrant-led glass industry and the community functioned. Alongside glassworkers and their immediate families, glaziers, glass merchants, as well as bookkeepers, teachers, and pharmacists working at the glassworks and factories are included on Dataset II.

The glassworks were studied through a desk-based assessment to ascertain their locations, catalogue the coordinates (Article I; Dataset III), and revise information known about their dating and ownership (Articles I, VI). The cashflow, export, import, and other aspects of the day-to-day upkeep, workflow, and management of the glass production sites were not the focus of this study. No excavations were carried out as the physical remains and technological aspects of glass production sites were also out of the scope of the project (see Ch. 4). To aid cross-referencing, the Open Access dataset for glassworks (Dataset III) includes examples of products from local production sites that have either been found as archaeological finds (Dataset I) or stored at museums. Any known glassworking families linked with the glassworks based on Dataset II are listed as well.

1.1. Research overview

The scattered and fragmentary nature of the source material for this thesis, both as archaeological finds, archival records, and previous studies made the analysis of the historiography a priority. ***Slow and disconnected? The historiography of 17th–18th century glass in Estonia and the prospects of interdisciplinary research based on a case study of Pärnu County*** (**Article I**) was published in 2019 in the *Baltic Journal of Art History, Vol. 18 (Autumn)*. Four main themes in the historiography of the Estonian glass industry were identified (see Ch. 2). A case study was presented using previous research and additional sources to examine a previously unstudied glass production site in Pärnu County in Western Estonia (see Ch. 5) through a desk-based assessment. The main aim of the historiographical overview was providing comprehensive background information for future research. The following questions were also delved into:

- What are the possibilities of interdisciplinary research when studying the glass industry?
- When did glass production begin in Estonia and in Pärnu County?
- Where was the site in Pärnu County situated?

Of similar importance was the identification of locally consumed and produced glass (see Ch. 6). The find complex with 357 recorded glass fragments from Haapsalu Episcopal Castle, situated on the western coast of mainland Estonia

allowed for a closer look at the most widespread glass vessels in Estonia in early to mid-17th century alongside some late 16th-century vessel fragments. ***Kümme liitrit klaasikilde Haapsalu piiskopilinnuse käimlast ehk De la Gardie'd kui oletatav lüli Haapsalu ja Hüti vahel***[3] was published in *Õpetatud Eesti Seltsi aastaraamat 2018 / Annales Litterarum Societatis Esthonicae 2018* in 2019 (**Article II**). The author was able to work closely with the newly discovered finds over the course of several weeks at the Estonian History Museum and reconstruct multiple vessels. In this study, the objectives were developing terminology in Estonian, and the typological analysis of the main glass finds from this collection – the case bottles and octagonal beakers. The links between the De la Gardie family, Hüti glassworks on the island of Hiiumaa, and Haapsalu Castle, both in Western Estonia, were addressed which helped examine the potential of determining the origin of glass artefacts based on typology and context. Additionally, aspects of everyday life that can be studied through archaeological glass such as the use and repair of windows at Haapsalu Castle were discussed. This research is complemented by **Article V** which places the finds in a wider geographical and temporal context.

Local glass consumption had been dominated by imports (see Ch. 6); the establishment of the local industry did not make imports disappear. This means Estonian archaeological collections also hold fragments of numerous imported glass vessels and artefacts. The short article ***An engraved footed vessel from Tallinn, Estonia*** which was published in the *Journal of Glass Studies, Vol. 63* in 2021 (**Article III**) examined one of these objects in detail. Found in 1986, the study of this early 17th-century glass vessel highlights the potential of inter- and intradisciplinary research. The decorations, excavation report, and historic plot plans were used as a tool for dating the vessel which in turn provided information on its probable owner. The paper is a demonstration of how our knowledge of the history and provenance of vessels can change over time. These ideas and the study of vessels with such decorations found in Europe were developed further in a longer research article in Estonian for the museum this artefact is held at (Reppo 2022c). The extended version in English is in preparation.

Inspired by **Article III** to showcase the aptitude of using the dataset of artefacts (Dataset I) for a targeted study, a set of decorative motifs – depictions of birds and feathered creatures – were chosen as an example for ***Eksootika, romantika ja poliitika – lindude ja teiste tiivuliste kujutised Eesti arheoloogilisel klaasil***.[4] This article was published in *Õpetatud Eesti Seltsi aastaraamat 2020 / Annales Litterarum Societatis Esthonicae 2020* (**Article IV**) and it was awarded *Best article published in the Learned Estonian Society yearbook 2020.* When this analysis was undertaken, the dataset of artefacts (Dataset I) included a little over 17,000 fragments of archaeological glass. Data for finds from the 13th–20th centuries were used to employ the dataset to its full potential. The principles of the Open Access dataset and the original parameters used to catalogue the data

[3] In English: 'Ten litres of glass from a cesspit at Haapsalu Episcopal Castle – the De la Gardie Family as a supposed link between Haapsalu and Hüti.'

[4] In English: 'Exotic, romance, politics – depictions of birds on Estonian archaeological glass.'

were described in the article. The dataset was used to answer the following questions:

- What types of birds and feathered creatures were used as motifs and why?
- How did the techniques used for these motifs change over time?
- How did the use of glass change over time in Estonia?
- Why and how to publish raw data for artefacts as Open Access datasets in Estonia?

Lääne-Eesti ja muu maailm: võrdlevalt Haapsalu ja Pärnu klaasileidudest[5] (**Article V**) was published in *Läänemaa Muuseumi Toimetised* in 2022 as an extension of **Article II**. In this study, the typology of the most common glass artefacts found from Haapsalu and Pärnu (both in Western Estonia) was established using 5,830 finds from the two towns. Although finds from the early modern and modern period formed the bulk of the material, the inclusion of medieval finds was necessary to identify and highlight changes in glass consumption due to a lack of previous studies. The finds were compared with data collected for 8,809 glass finds from Tallinn to gain a wider understanding of glass consumption in Estonia. This was the first intraregional study of its kind on Estonian archaeological glass. Terminology in Estonian was also developed. The main goals were to identify:

- Which types of glass vessels were used in Pärnu and Haapsalu?
- What was the role of window and stained glass in either town?
- How did the consumption of glass in these two towns compare to each other and the capital?

All three datasets were used as the basis for a study ranging three centuries and focusing on three families in the Estonian glassworking community, parts of which were supported by a research grant awarded by the Society for Post-Medieval Archaeology. ***Moving skills, moving ideas – migrant glassworkers in 17th–19th-century Estonia*** (**Article VI**) was published in *Post-Medieval Archaeology, Vol. 57* in 2023. The Wentzell, Hagen, and Runge families were used as case studies to examine patterns of movement and life histories of the glassworkers and illustrate the changes that took place in the migrant-led industry throughout the period under study. The main research questions were:

- What was the role of foreign workers in the Estonian glass industry?
- Where did the foreign glassworkers originate from?
- How did foreign glassworkers migrate to and within Estonia?
- What was life for the glassworkers and their families in Estonia like?
- How were the glassworking families connected?

Although relying mostly on the datasets for workers and sites, the dataset for glass fragments was used to provide examples for the glassworks discussed in the article. It is planned to publish this article in Estonian in the future for the local reader.

[5] In English: 'Western Estonia: a comparative overview of glass finds from Haapsalu and Pärnu.'

1.2. Thesis structure and acknowledgements

Moving towards the objectives mentioned above, the following chapters discuss how this research was undertaken, describe the difficulties and problems that occurred, and make note of the results published in Articles I–VI and Datasets I–III. To situate the reader, the study of the glass industry is examined in a wider European context. The historiographical study (Article I) is expanded by including sources published after 2019 in Estonia and providing information on research and archival material that could prove beneficial for future studies. The theoretical framework and methodological aspects of this study are described as well including Open Access publishing and the increasing use of artificial intelligence in transcription and text recognition. In Chapter 5 and 6, an overview of the results is provided with the three original objectives in mind to present a comprehensive analysis of glass and its makers in Estonia during the early modern and modern period.

In conclusion, the author thanks her three supervisors, Erki Russow, Georg Haggrén, and Andres Tvauri for their guidance and help throughout the years. For the assistance in studying the collections in their care and other support relating to the artefacts, the author is thankful to Gundars Kalniņš (Cēsis History and Art Museum), Anne Ruussaar (Estonian History Museum), Jaak Mäll (Estonian History Museum and Haapsalu and Läänemaa Museums), Eve Otstavel (Haapsalu and Läänemaa Museums), Helgi Põllo (Hiiumaa Museum), Margo Samorokov (Pärnu Museum), Arvi Haak and Elis Visnapuu (Tartu Town Museum), Ülle Tamla and Irita Kallis (Tallinn University archaeological research collection), and Ain-Andris Vislapuu (Viljandi Museum). The author is grateful to Arheograator Ltd, Arheox Ltd, and Heiki Valk (University of Tartu) for their eagerness to invite her to identify glass from their sites. The author extends her gratitude to Gunnel Holmér (ex. Småland Museum), Johan Gåsste (Swedish National Archives), and the Finnish Glass Museum in Riihimäki for their kind support and help in several aspects regarding glass and its makers. The author would like to thank Freydis Ehrlich (ex. UT) for guiding her towards the birds and Ahti Niilisk (ex. UT) for useful discussions about the chemical composition of glass as well as Ragnar Saage (UT) for his help with preliminary attempts at pXRF-analysis of glass. The author is thoroughly grateful for the moral support, constructive feedback, and helpful words to Hugh Willmott (University of Sheffield), Aivar Kriiska (UT), Martin Malve (UT), and Janika Viljat (Arheograator Ltd), especially at times when she was unable to write. The author is thankful to the Society for Post-Medieval Archaeology not only for the financial assistance but also their PhD Research Group and all the members of the society who helped and supported her throughout this thesis. Finally, the author would like to extend special thanks to the reviewers and editors of the articles and this thesis, and everyone involved in the writing process at writing retreats and in writing groups which had an immense impact on her writing.

2. HISTORIOGRAPHY OF STUDYING 17TH–20TH-CENTURY GLASS IN ESTONIA

By the end of the 17th century, growing consumption and access to goods led to the consumer revolution in Europe (Kwass 2022; Rönnbäck 2010). Considering products consumed *en masse,* regional differences in material culture between European countries and places started to lessen through trade of goods and a busy market. During this period, glass production expanded significantly and glass as a commodity became available and affordable to a growing number of consumers. As research material, glass from the early modern and modern period has been studied to varying degrees in Europe and Estonia (Article I). Influenced by the timeline of the history of the glass industry in Estonia, the following section examines the historiography of studying glass from the 17th–20th century in areas geographically, historically, and/or culturally close to Estonia as an extension and update to Article I.

2.1. A comparative historiography of studying glass

This historiographical overview builds on the author's past work on European glass studies (Reppo 2015, 17–35) to provide a comprehensive overview of research on early modern and modern glass in Estonia, the Baltic States, Central and Western Europe, and Scandinavia. This original study is unpublished. It has been extended and revised here as part of one of the objectives of this thesis. The structure of this chapter follows Article I which was a detailed contribution to studying local historiography on glass. Based on this paper, studies in archaeology looking at the a) the glass industry, b) glass artefacts, c) genealogy, and d) art history have been considered (see Article I, 212), allowing for comparison with local historiography and providing reference material across Europe. As Article I was published in 2019 and focused on the 17th–18th centuries, in this chapter Article I is brought up to date with the inclusion of research on 19th-century sites and the glass industry published after 2019 in Estonia (summarised in Table 1). Information on studies about earlier vessels can be found in Reppo 2015.

Table 1. Timeline of published studies or personal accounts about the local glass industry in chronological order.

Reference	Topic
Hupel 1789	Laeva, Hoone, Tõrna, and Rõika-Meleski glassworks
Russwurm 1855	Hüti glassworks
Amelung 1876	Glassworks owned by von Lauw and Rõika-Meleski glassworks
Amelung 1892/1999	Glassworks owned by von Lauw
Reiman 1892a; 1892b; 1892c	Rõika-Meleski glassworkers' working and living conditions
Friedenthal 1929	Hüti, Lehtse (Rekka), Ravila (Meeksi), Nurmsi, Laashoone, Tõrna, and Rõika-Meleski glassworks
Feldmann 1935	Glassworkers (list)
Loone 1952	19th–20th-century glassworks
Soom 1954	Hüti glassworks
Renter 1958	19th–20th-century glassworks
Varep 1962a; 1962b	17th–20th-century glassworks
Karma 1963	17th–19th-century glassworks
Roosma 1966	Hüti glassworks
Roosma 1969	Piirsalu, Lehtse, Gorodenka, and Laashoone glassworks
Roosma 1977	Hüti glassworks (posthumously published summary of Roosma 1966)
Puss 1988	Glass furnace 'burial' customs at Meleski, Eidapere, and J. Lorup
Kriiska, Mägi & Peets 1991	Suitability of local raw materials for glass production
Heinsoo 2005	Järvakandi glassworks
Ruussaar 2006	20th-century glassworks (mainly Joh. Lorup)
Lilienthal, Kreutzer & Randloo 1986/2010	Vändra glassworks
Laos 2011	Rõika-Meleski glassworks (mirrors)
Alliksaar 2012	Järvakandi glassworks
Tvauri 2012	Utsali glassworks
Dreving 2013	Rõika-Meleski glassworks
Metsoja & Tvauri 2013	Pajusi glassworks
Tvauri 2013	18th-century glassworks in Central Estonia (Utsali, Laashoone, Laasme, Altnurga, Tõrna, Haava, Hoone)
Erpenbeck 2015	18th-century glassworks and glassworkers
Jürivete 2015	19th–20th-century glassworks
Lumiste 2015	Rutikvere glassworks
Article I	17th–18th-century historiography, Pärnu glassworks
Ruussaar 2021	Hüti, Eidapere, Järvakandi, Meleski, and Joh. Lorup glassworks
Raat 2023	Rõika-Meleski glassworkers' lodge
Article VI	17th–19th-century migrant glassworkers, Wentzell, Hagen, Runge families

2.1.1. Studies on the glass industry (sites)

Although explored by ethnographers and historians already in the 18th–19th centuries, the academic and archaeological study of the glass industry started almost seven decades ago in Estonia with the excavations at Hüti glassworks from 1958–1961 (Article I, 212–217). The excavations (Roosma 1966) were contemporaneous with other pioneering studies in industrial archaeology focusing on glass in Europe such as those in the Weald in the United Kingdom (Kenyon 1967). Nearly 4,000 artefacts were collected (Roosma 1977, 185), including tools and everyday items. 3,403 glass finds are included on Dataset I. The methodology developed for excavating glass production sites in Estonia at Hüti was later applied at glassworks in the Kärevere region and elsewhere (Roosma 1969). As shown in Article I, the only other excavations on glassworks have been conducted by Andres Tvauri in Central Estonia (Tvauri 2012; 2013). He and Kärt Metsoja also carried out fieldwalking at Pajusi glassworks in 2013 (Metsoja & Tvauri 2013).

In addition to studies already described in Article I, notable works from local historians focus on the development of Järvakandi glassworks and the borough (Alliksaar 2012; Heinsoo 2005) and Vändra glassworks and Võidula village (Lilienthal, Kreutzer & Randloo 1986/2010) which offer an insight into 19th-century glassworking communities. Hugo Puss has described customs related to the 'burial' of glass furnaces at Eidapere, Meleski, and Joh. Lorup (Puss 1988). The workflow, output, and working conditions at Rutikvere glassworks studied by Merlin Lumiste in her MA dissertation on Rutikvere manor (Lumiste 2015, 26–28, 62–64) was used to revise information originally collected for Dataset III. Most recently, Martin Raat has studied a type of workers' housing at Rõika-Meleski in his BA dissertation (Raat 2023). Anne Ruussaar's book on the history of the Estonian glass industry was published after Article I and was thus not included. It focused on five larger glassworks – Hüti, Järvakandi, Eidapere, Meleski, and Joh. Lorup, briefly describing other, earlier sites which she calls 'temporary' (Ruussaar 2021, 37). Emphasis was on the 20th century and subsequently, there is far less overlap with this study than may be expected from the title.[6] Her 2006 book on 20th-century glass factories was not included in Article I because of this (Ruussaar 2006).

Looking at 17th-century glassworks, the excavations carried out in Trestenshult (operating from 1628–1632) in Sweden in 1932 (Seitz 1936) and 1974–1975 (Hansson 2010, 55–57) and at Duhaino glassworks (opened after 1631) in Russia in the 1920s (Kosenkov 2018) are especially important for this study, as both were founded under master Pauell Gauwkunkell as was Hüti. Moving from Trestenshult to Duhaino to Hüti and then to Midingsbråte glassworks (1634–1639) in Sweden (Larsson 1973), and working at Glashytteudden (Karlenby 2006), Pauell's influence on the development of glassmaking in this region is substantial (Hansson 2010, 52; Stephan 2021, 114). Pauell is also one of the

[6] In English: 'Glass masters – the history and products of the Estonian glass industry.'

individuals with the most detailed migration history on Dataset II. The Wentzell family can be traced in a comparable manner (Article VI; Stephan 2021, 114), albeit on a smaller scale – for example Berthold Wentzel who worked at Bryggholmen, excavated in the 2000s (1586–c.1638; Henricson 2016) was probably an uncle of the Wentzells of Hüti (Article VI, 401).

Other glassworks from the early modern and modern period in the neighbouring areas have been studied near Moscow (Fehner 1955), Jamburg (Drozdov 2022a), and St. Petersburg (Drozdov 2022b; 2022c) in Russia, Stockholm (Kockum, Haggrén & Johansson 2023) and Henrikstorp (1691–1762; Noreen & Graebe 1964) and Kosta/Boda (A.D. 1742; Åstrand 2010, 69–70) in Sweden. In Finland, various 17th–19th-century glassworks were excavated and surveyed in the 1990s (Matiskainen & Haggrén 1996; see also Haggrén 1989; Matiskainen, Haggrén & Vanhatalo 1991; Seela 1974; Vanhatalo & Matiskainen 1986). A handy reference for literature and sites in the Nordic region until the late 17th century is *Renässansglas i Norden* (Hansson, Kock & Vellev 2010). Chronological information and comparison of Swedish, Finnish, and Danish sites from the early modern to industrial period has been useful as well (Holmér et al. 2020; Bielefeldt Bruun et al. 2021).

The influence of private entrepreneurs and political economy on glassworks has been noted in Norway (Amdam, Fredona & Reinert 2019) and Sweden (Krantz 2015) and was touched upon in Article II. Despite active glass production in 17th-century Courland, Latvia (Jakovļeva 2017, 154; Articles I, VI) and in 16th–18th-century Lithuania (Kogelytė-Simanaitienė 2000; Mikolaitienė 2002; but see also Strazdas 1992), there is minimal information on these sites. Slightly further south, Polish glassworks have been actively studied for a long time – already in 1991, 114 glassworks from the 14th–20th century were known (Rubnikowicz 1991, 463). Olga Drahotová's monumental book on the history of glassmaking in Czechia should also bear mention (Drahotová 2005). These and other reports and papers on excavations can be compared with similar works from Estonia providing a basis for an intra- and interregional analysis which is the goal for future research.

2.1.2. Artefact studies

Archaeological glass from the early modern and modern period in Estonia has been published almost exclusively by the author (see below and throughout this thesis), Maks Roosma (Roosma 1966; 1969; 1977), and Andres Tvauri (Tvauri 2012; 2013). The typological study of glass vessels in Estonia has its origins in research regarding medieval[7] glass (Mäesalu 1986). Glass beads, mirrors, stained glass, and glass portraits had seen minor interest (Article I, 217–219) before the author's contributions to the field which include several site-based overviews, ranging from statistical analysis to more condensed conclusions on the use of

[7] When referring to the medieval period, the Estonian periodisation of 1200–1550 A.D. is considered throughout this thesis (Selart 2012).

glass in Estonia and the region, mainly focusing on northern Estonia and the 16th–19th century (e.g. Kadakas, Reppo & Ööbik 2020; Reppo 2022a; 2022b; Russow et al. 2013; Russow et al. 2019; Varul et al. 2018). The author has also written on the following artefact types and topics: linen smoothers (Reppo & Tint 2022a; 2022b), 17th-century *Passglas* beakers and case bottles (Article II), 17th-century diamond-engraved beakers (Article III; Reppo 2022c), and 13th–19th-century depictions of birds on glass (Articles III–V). The research results of this thesis have been published in popular science journals to offer a wider audience access to this subject (Reppo 2019a; 2020a; 2023). The results have been used as the basis for a chronology of glass consumption and the typology of most common glass objects in Estonia in an e-course book (Johanson et al. forthcoming) and as the basis for a book draft, *Glass on the edge of Europe. Making and using glass in medieval and post-medieval Estonia* (Reppo forthcoming).

As is visible from Dataset I, some reference material has been of particular importance to the study at hand, especially from areas that are geographically and politically close to Estonia. Glass catalogues such as the richly illustrated volume for the J. Paul Getty Museum (Hess & Husband 1997), Falkenhof museum (Hülsmann 2013), or the online collection of Corning Museum of Glass (CMOG 2023) are of note for identifying vessels and their origin. Georg Haggrén's works on glass from Northern Europe have been especially helpful for parallels for early modern vessel and window glass (Haggrén 1994; 1999; 2005; 2009; 2010; 2014; 2016; 2018; Haggrén & Sedláčková 2007; Haggrén, Whatley & Dahlström 2020). Russian authors have published extensively on 16th–20th-century vessels and glass objects from Northwestern Russia, both high-status *façon de Venise* as well as utilitarian vessels (Lihter 2015; 2016a; 2016b; 2017; 2019; Salmin & Salmina 2014, 73; Veksler & Lihter 2014), most have a parallel in the material under study here. Collections from Sweden (Henricson 2002; Holmér et al. 2007), Poland (Biszkont 2005; Bis 2017), Germany (Baumgartner 2005; Grimm 1984), the Low Countries (Henkes 1994), Czechia (Sedláčková & Rohanová 2016), and England (Willmott 2002; 2005) should also be mentioned here.

Further use has been of works focusing on certain types of vessels, such as bottles (Jones & Smith 1985; Jones 1986) or finds from very precisely dated contexts, such as shipwrecks (Kärkkäinen 2017, 54–56; Mäss & Russow 2016) or graveyards (Siembora 2017, includes an extensive bibliography on Polish glass studies). Utilitarian glassware from the coastal town of Klaipėda in Lithuania focusing on the 16th–19th century (Šimkutė 2011a; Šimkutė 2013a; 2013b; Žigeu 2018; 2019) is of special importance due to the geographical similarities to Pärnu, Haapsalu, and Tallinn where most of the finds included in this thesis have been found from. Indrė Žigeu (née Šimkutė) has expertly covered the social, cultural, and economic factors of glass consumption, including alcohol consumption and healthcare. For sealed bottles, Magdalena Bis has given a thorough overview on more than 550 bottle seals from Poland (Bis 2020) which include examples of 'LONDON' seals which were also produced in Estonia (see Ch. 6.4.1). Due to the bulk size of the material, identification of later, 20th-century finds cannot be forgotten either (e.g. Annila 2013; Kaplūnaitė 2017; Ruussaar 2006; 2021).

During the final stages of this PhD study, the author was able to assist Latvian researchers with a large collection of glass vessels from Cēsis castle (Kalniņš et al. 2024).

Studies of the chemical composition of items made after the 17th century are not as common as compared to studies on ancient and medieval glass. The studies on Russian high-status and utilitarian vessels mentioned above stand out for the use of elemental analysis on later vessels but there are other examples. Roosma had two fragments from Hüti analysed (1966); three samples were included in a later investigation (Kuisma-Kursula, Räisänen & Matiskainen 1997). In 1990, local archaeologists experimented with different glass batches to study the suitability of local raw materials for glass production (Kriiska, Mägi & Peets 1991). David Dungworth's studies on bottles (Dungworth 2012) and window glass (Dungworth 2011; Dungworth & Girbal 2011) as well as his overview of 14th–20th-century glass production in England (Dungworth 2019) offer good comparative material with detailed descriptions. Some attempts have been made in the Netherlands and Belgium to identify local and foreign *façon-de-Venise* or *façon-de-Bohème* glass through elemental analysis (Bronk et al. 2000; De Raedt et al. 2000) but also for glass in general (Huisman et al. 2014; Herremans et al. 2013). Most recently, micro-X-ray fluorescence (μXRF) was used to analyse the finds from master Jung's workshop in Stockholm (Kockum, Haggrén & Johansson 2023, 201–214).

2.1.3. Genealogies and social history

Except for Roosma (1966) and Reppo (Article VI), research on genealogies of local glassworking families has not been conducted as part of studies in archaeology. In his notable survey of 18th-century glassworks in Estonia and Latvia, historian Dirk-Gerd Erpenbeck (2015) does mention archaeology as a source, however the work would benefit from a description of products for each listed site. Erpenbeck's research of the 18th-century sites goes into varying levels of detail for each site based on data collected about the individuals connected to the industry such as their birth, marriage, or death (Erpenbeck 2015). He based his work on glass manufacturer Robert Feldmann's research (1935) whose drafts are kept at the National Archives of Estonia (RA) and have been used for this study as well (Article VI; Dataset II). In Article VI, the interregional movements of glassworkers in 17th–19th-century Estonia and their life histories were introduced alongside three case studies (see Ch. 5.4).

In terms of studying the genealogies of the workers beyond material published in Estonia, Torbjörn Fogelberg's and Friedrich Holl's book on the migration of German and foreign workers and the Swedish glass industry from the end of the 16th until the 20th century is notable for this thesis (Fogelberg & Holl 1988). Sławomira Ciepiela-Kubalska's (1985) and Kristian Humbsch's (2002) studies of the genealogical side of glassmaking in Poland include information on glassworking families operating in Estonia as well. The author was unable to access Grimm's 1977 article on Estonian and Livonian glassmakers (Grimm 1977)

however it was available via Varep's archive as transcribed excerpts (e.g. Varep EKI, Surju, f. 2002565). Aimo Löfberg's research about Finnish glassworkers was a source with high potential but it was much less informative than expected as only 15 individuals were identified who worked in Estonia (Löfberg 1993). Ada Polak's seminal book is nearly 50 years old (Polak 1975), but it remains a classic and offers an overall understanding of migrant glassworkers in Europe having also inspired the title of this thesis.

2.1.4. Archaeological glass and art history

Despite a plethora of catalogues and publications on glass as an art subject, the use of art history as a tool when studying archaeologically found glass, especially glass from the early modern and modern period, is very infrequent (see e.g. Hülsmann 2013, 77–108). Locally, Maks Roosma looked at the stylistics of glass from Hüti in the 1960s and discovered parallels in decorations in folk art (Roosma 1966, 113–116) whereas depictions of glass vessels on local paintings or engravings are almost completely unstudied. Three glassmasters from Hüti used stylised vessels as part of their signature or seal (Roosma 1966, ill. 34, 109, 120) so already from this point of view it could be a fruitful exercise. European art has been used to illustrate works relating to glass vessels, but artworks have not been used to identify or date vessels in Estonia (Article I, 217–219). Recently, 16th–18th-century paintings have been used to discuss the consumption of beverages in Estonia (Allikvee 2023a; 2023b). It is worth noting that even though in Latvia the glass industry and artefacts remain largely unstudied, the workshops and craftsmen producing decorated flat glass have been examined by art historian Ilona Audere (2004) which could prove to be a useful source for future studies due to the region's close links. Decorated flat glass, mainly stained glass, is the most art historically studied type of archaeological glass and has been discussed in Articles I, IV, and V (see Ch. 6).

2.2. Remarks on historiography

There is hardly a need to justify the importance of studying the historiographical background of a subject. An understanding of the current level of study is important as it offers essential material for comparison and reference, for example of the distribution of certain types of vessels as well as the movement of glassworking families across Europe. In Estonia and most of the geographically, culturally, historically, and/or economically close areas viewed here, the research and excavations of glass production sites started in the late 1950s as shown in Article I. Artefacts have only received more extensive attention from an archaeological point of view in the last three decades as most catalogues were originally compiled for art historical or curatorial purposes. In terms of genealogy, glassworking families and their movements are well-studied in regions where the glassworkers originated from and less so in areas they moved to. Depictions of glass in historic

paintings and records are poorly studied in most if not all areas viewed here. Some regions have suffered from an overall lack of researchers in glass, like Latvia. Others stress the lack of comprehensive knowledge on certain aspects of study, like 18th-century glass production, trade, and consumption in Sweden (Åstrand 2010, 70). In terms of accessibility, it should be noted that most of the works listed here have been written in the authors' native languages. Often, these papers do not include summaries in English, German, or French. This chapter of the historiography of European glass studies and Article I offer a much-needed overview of the state of research in Europe.

3. THEORETICAL FRAMEWORK

This study focuses on glass production in the early modern and modern period through archaeological records and historical documents. These sources are used in interpreting the experiences and life stories of glassworkers (Article VI) and consumers in the past (Articles II–IV) but also deciphering the intricacies of making and using objects (Articles I–VI). This allows obtaining an understanding of the development of material culture, specifically that of glass. The theoretical background and the author's approach to history-writing and reconstruction of past experiences needs further discussion as it is important to the overall reading of this thesis. The following chapter looks at interpretative historical archaeology and documentary archaeology and the impact of systematicity, hermeneutics, and phenomenology on the author's research and writing.

3.1. Interpretative historical archaeology

Interpretative historical archaeology is a theoretical and methodological approach which started evolving in the 1990s because of challenges faced by historical and interpretative archaeologists. Interpretative archaeology had developed as a response to processualism which dominated the field in the second half of the 20th century. Interpretative archaeologists, also known as post-processualists or contextual archaeologists, rejected the processualists' notion that human actions are so uniform and predictable that they can be mathematically calculated and modelled and introduced a more interpretative style to the study of the past. It was a term coined by Ian Hodder to define his vision of a contextual, post-processual archaeology in the early 1990s (Hodder 1991, 5). Historical archaeology on the other hand was born in the 1960s with the study of everyday objects in the United States. Archaeologist Ivor Noël Hume is heralded as one of the founders or even godfather of historical archaeology (Miller 2013, 144, 146), advancing studies in archaeology by offering an interpretative, socio-economical, and socio-cultural prism from history (Noël Hume 1964). Today, historical archaeology is considered an international term, encompassing a period from AD 1450 to what could be called the contemporary past or even the modern day (Hicks & Beaudry 2006, 3–6; Majewski & Gaimster 2011).

Both have been heavily critiqued. Interpretative archaeology has been seen as subjective (Darvill 2008, 360–361) and accused by processualists of lacking 'a coherent and explicit logical framework which would permit critical analysis or evaluation in the light of further data' (Renfrew 2001, 123). Although his goal was to highlight the importance of the archaeology of historical sites, Ivor Noël Hume did denominate archaeology to 'the handmaiden of history' (Noël Hume 1964, 214). Despite this title mirroring the attitudes towards the then new discipline of historical archaeology, the catchphrase went on to live a life of its own (Miller 2013, 164). These issues and paradigm shifts in archaeology culminated in the 1990s and drove the development of interpretative historical

archaeology. In this thesis, it is seen as defined by Laurie A. Wilkie where a multitude of interdisciplinary sources are used to create strongly empirical, historically situated narratives of the past which are accessible to audiences beyond academia and contribute to discussions on modern social dialogues and circumstances (Wilkie 2011, 343).

In this study, those sources are documents, physical geography, material culture, and archaeological remains (Articles I–VI). The historical context – the political and social history of the area of modern-day Estonia and general developments in Europe form the contextual backdrop that these sources relate to. The local history – the changes that took place in the bigger and smaller towns and rural regions examined in this thesis – is no less important. Social media, popular science journals, and public presentations offer an avenue for members of the public to access this work and enable a discussion beyond academia. As the production of glass in Estonia relied on skilled foreign workers and was an ecologically straining one, the study allows for examination of migration (Article VI) and sustainability which are relevant today. In addition to discussions with a more general audience, the focus on more modern material has sparked dialogue amongst archaeologists and historians on the importance and impact of recording modern contexts in archaeology (see also Reppo, Viljat & Kriiska 2021, 239).

Wilkie has listed four defining elements for interpretative historical archaeology. In short, interpretative historical archaeologies are contextual, data driven, aware of being shaped by the present, and finally, they are committed to accessibility (Wilkie 2011, 338). John Moreland has gone even further and said that *all* archaeology should be like that – reflexive, mutualistic, multiscalar (Moreland 2003, 106). The social historical context shaped and was shaped by the actors we see in archaeology – the finds – traces of human activities. All the sources pointing to these actors have their own life histories but used together, they offer the possibility of holistic historical interpretations. The situatedness of the researcher in the present should be self-evident. Commitment to accessibility is now common in all fields of archaeology, employing various media such as TV, popular science outlets, social media, and public presentations to reach that goal. These four defining elements also apply to this study.

3.2. Documentary archaeology and writing about the past

According to Wilkie, the effective use of written sources in interpretation and the focus on microscalar levels of society for understanding the variety of past social experiences (Wilkie 2011, 337) is what lead to the formation of a separate theoretical framework. Already in 1988, Mary Beaudry called for a development of an approach to documentary analysis, unique to archaeologists (Beaudry 1988a, 1) – this is when the term *documentary archaeology* was coined. The use of a variety of documentary sources with other material traces of a past event offers multiple lines of evidence for a holistic interpretation. Although the overall

impact of these lines of evidence can vary significantly, documentary archaeology allows for a wider, even limitless selection of theoretical and methodological options (Wilkie 2006, 33) which can pose a challenge to being systematic yet allow creative liberty.

Interpretations about the past are informed by these documentary sources but they are also influenced by the way the sources were originally compiled (Brown 1988, 80–82), the way we read them and other material traces of the past or the lack thereof (see e.g. the interpretation of vessels listed in probate inventories: Beaudry 1988b). Interpreting past events and life histories we have not had any direct involvement in is believed to be possible thanks to a collective historical past. According to philosopher David Carr, we are part of the historical past through non-recollective experiences because of historical and social temporality (Carr 2014, 65–66). For Carr, this has a few implications which are useful when thinking about one's interpretations of past events, people, and objects.

Firstly, being a part of the historical past is the key that allows the capacity of retrospection (Carr 2014, 56). Secondly, the effect of past events becomes apparent only after they occur. Thirdly, each generation will have different interpretations of the same event, even if the differences are minor (Carr 2014, 57). This latter idea was already postulated in the 1760s by Johann Gottfried von Herder who stated that although the descriptions might be similar or same of the same event, their judgements might differ completely. Each consecutive event can also add to our insight of past events – events are historically cumulative (Herder 1768/1990, 688). However, this does not mean that all interpretations are valid or objective, and that caution should not be executed. The social context of the interpreter, the timescale over which events are viewed and their significance evaluated are some of these factors to consider (Uzzell 2004, 7–11).

John Moreland has warned about overwriting the past with the present (Moreland 2003, 116). Although archaeologists have a voice in countering oppression and exploitation today as we have seen for example in environmental issues (Butzer 1982; Isenberg 2014), we also run the risk of projecting our issues on the past – we interpret the world from the context of our own lived experiences (Uzzell 2004, 7). Moreland believes that these distortions of reality, of past experiences can be overcome with the accumulated knowledge and evidence we already have of the past. This way our understanding, our reading of the past as archaeologists will remain an evaluated approximation but a critically engaged one, attentive to multivocal experiences of a past event, place, or object (Moreland 2003, 117). Acknowledging this approximation, estimation, or crudely put – educated guess – is connected to postmodernism in history, however as Moreland puts it 'the perceived muteness and malleability of the material sources /---/ is part of 'everyday life' for archaeologists' (Moreland 2003, 112).

3.3. The issue of subjectivity and scientific optimism

This brings us to the topic of subjectiveness which is important when writing about interpretations of the past. Although the subjectiveness of post-processual *resp.* interpretative archaeology is no longer a pressing issue as objectivity has been rejected as an obtainable goal in archaeology for decades now (Renfrew 2001, 123), it is still noteworthy. The subjective nature of interpretation has been noted locally as well (most prominently, in the study of the Tallinn Town Hall Square: Mäll & Russow 2004 but see Konsa 2006, 49; Oras 2015). Subjectivity stems both from the author's academic background but also the circles they move around in, the people they interact with, and how they generate and use data (method, theory) in their studies which all contribute to the author's personal contextual influences on the process of research (Oras 2015, 115). For example, the basic training of the author of this study as an archaeologist who entered the field through an anthropology department is different from that of someone who entered the field through a history department.

The admittance of subjectivity – the idea that current theories only serve contemporary needs, and all historical research is inherently biased to some extent could be seen as a certain sense of pessimism which has intrigued historical philosophers in recent years. The question of scientific optimism in historical sciences has been raised by Adrian Currie (Currie 2018; 2019). He has called historical scientists 'methodological omnivores' as they are methodologically pluralistic – adapting and constructing new tools (i.e. methods) tailored for specific research needs. The theoretical frameworks of these studies are affected by this pluralism which is well-evidenced by this theory chapter. According to Currie, this omnivorous attitude allows producing hypotheses which are sophisticated although the evidence is usually fragmentary (Currie 2018, 158).

The main problem is that concentrating on traces can sometimes be misleading and obscures what is present with what is perceived to be present. This in turn affects the quality and depth of the reconstruction – the writing of history. Philosopher Paul Hoyningen-Huene has even gone so far to say that human knowledge is constantly threatened by error (Hoyningen-Huene 2008, 174). The author would argue that pessimism in the researcher's subjectivity in forming and interpreting sources is uncalled for as long as self-reflection is employed throughout the process. This is also one of the main goals in interpretative historical archaeology. For this, keeping in mind the potential pitfalls of relying on fragmented data is key and explicitly stating so when relevant to conclusions drawn from research of such kind should provide needed transparency (Article I). This is echoed again in the goals of interpretative historical archaeology which avoids blanket characterisations and employs a multitude of methods and sources to obtain various kinds of fragments of knowledge to combine when reconstructing the past.

Admittance of subjectivity nor the highlighting of issues with reconstructing the past should be taken as a sign of pessimism in the field but an attempt at a higher degree of systematicity instead. For Hoyningen-Huene, the difference between other types of knowledge and scientific knowledge primarily lies in the

latter being more systematic, methodological, and logical (Hoyningen-Huene 2008, 169–170). He has stated that the process of quantification in humanities is appealing as it provides a sense of being scientific whereas the search for meaning resists quantification, resulting in tension (Hoyningen-Huene 2013). This can be sensed both in Currie's study of scientific optimism in historical sciences but also, most clearly for archaeologists, in the debates between processualists and post-processualists, resulting in a pluralism of values and opinions (see e.g. Lucas 2017, 263) and overall discussions on the scientificity of humanities (e.g. Forster & Gjesdal 2019). As Hoyningen-Huene demonstrates with his eight dimensions (Hoyningen-Huene 2008, 170, 179), there is no one rule to the degree of systematicity in science but there is an underlying tendency to increase the level of being systematic in any dimension possible. Descriptions,[8] explanations, predictions, the defence of knowledge claims, epistemic connectedness, an ideal of completeness, knowledge generation, and the representation of knowledge all vary in their level of systematicity by each field.

3.4. Hermeneutics and phenomenology – the process of interpretation

As is clear from above, the concepts of subjectivity and systematicity in history-writing and humanities are closely related to interpretation of past experiences. In turn, all three are related to developments and ideas in phenomenology and hermeneutics. The influence of both on the author's research has been acknowledged in the past (Reppo 2015, 7–11) and this remains the case today. This applies to information gathered about past events and experiences both from historical and archaeological sources but also the interpretation of artefacts. Hermeneutics is the 'theory of interpretation and understanding' which started developing in Germany in the 18th century after the Protestant Reformation and became influential in the 19th century although it is recognised that already early philosophers like Plato and Aristotle showed signs of hermeneutic thinking. Although closely related to philosophy and religion in its early stages, modern hermeneutics is and has by now influenced a spectrum of intellectual practices. In humanities, hermeneutics was the methodological tool of choice for the historicism movement which challenged, among other things, the perceived objectivity of researchers and raised questions of the field's scientific status (Forster & Gjesdal 2019, 1–3). Admittance of subjectivity, as shown above, has been the cause of feelings of pessimism, insecurity.

The core concept in hermeneutics is the hermeneutic circle which states the necessity of reference to individual parts of the whole to understand the whole while the reference to the whole is necessary to understand the individual parts (Gadamer 1997, 183). This is akin to Herder's concept of organicism in historical interpretation which postulated that 'works of human purpose had a structure

[8] For historical humanities, these are periodisation and classification.

analogous to that of living organisms' where all the parts are coordinated through a whole in which their function and particularity becomes clear (Zammito 2019, 117). Over the two and a half centuries that have passed since Herder's works were written, hermeneutic-historical thought has obviously been further developed and now employed in archaeology. Intellectual historian John H. Zammito has recently discussed the idea that the hermeneutical historicist seeks to give an account which is constructed by referring to texts, objects, archaeological remains, and other material or immaterial sources, the presence of which is also evidence of the past (Zammito 2019, 126). Zammito solves the issue of subjectivity by presenting the idea that 'objectivity is always the achievement of a community of inquiry, never of an isolated interpreter' (Zammito 2019, 127).

Applied in archaeology, hermeneutics deal with the process of interpretation in ways shown above. Already Ian Hodder defined interpretative archaeology as having three goals: a guarded objectivity of the past allowing empowerment of marginal subjects of study, reflexivity of knowledge-production allowing dialogue, and an internal hermeneutic interpretive component (Hodder 1991, 10). Although he changed some of these viewpoints later, he has been rightly critiqued for a nostalgic, romantic approach and for not considering debates about hermeneutics in general (Johansen & Olsen 1992, 420). Later, he has noted three components in the hermeneutical-archaeological approach – pre-understandings, historical nature of knowledge, and hermeneutic circle (Hodder 1999, 32–33).

Both hermeneutics and phenomenology are closely related, especially as phenomenology studies the structures of experience and consciousness which are both what historical hermeneutical interpretation tries to interpret, understand. Phenomenology asks a simple question to begin with – how do we know that something is the way we think it is (Carr 2012, 96)? In describing his first dimension for systematicity, Hoyningen-Huene makes a compelling point that in historical humanities descriptions are predominant and they appear in the form of systematic, historically continuous narratives (Hoyningen-Huene 2008, 171; see also Currie 2019, 44). The sources for these reconstructions of past events come from processed raw data of remnants of all kinds (Hoyningen-Huene 2008, 175). In this study, multiple kinds of these remnants, data – both qualitative and quantitative – are worked with. The emphasis has been on making connections, forming, and creating a coherent narrative based on:

1. interpreting past experiences, including social dynamics and migration patterns based on historical documents, maps, physical geography, and archaeological sites and finds (Articles I–VI),
2. interpreting the life history of objects from making and using to curating or discarding based on archaeological finds, private and museum collections (Articles II–V),
3. interpreting the credibility of different types of sources such as historical maps, church books, wills, personal accounts, archaeological finds without context, and so on (Articles I, III, VI).

As explained above, the author does not find the subjective predisposition of archaeological studies to be an issue if self-reflection is employed. Through a

critical assessment of data and interpretation, it is hoped that an informed and inclusive account of the past has been produced, attentive to multivocal experiences of (e.g. maker → seller → user) but a writer in archaeology is not a writer of fiction – the data are fragmentary and there will be gaps one may not be able to fill.

This chapter described the wider field of interpretative historical and documentary archaeology, played with the idea of subjectivity and systematicity, and examined the influence of hermeneutics and phenomenology on the author's work. It should be clear that the theoretical background presented here influences the choice of method and style of writing. Placing firmly in the realms of historical archaeology, this study has an interpretative leaning with an emphasis on documentary archaeology. Ideas from phenomenology and hermeneutics influence the data creation – the interpretation process – and have had a significant impact on the work. Acknowledging the strong effect of theoretical archaeology and material culture studies rather than natural sciences or mathematical models on this research, is perhaps, to some extent, an echo of postprocessualist influences on the discipline of archaeology in the late 20th century. This should not downplay the importance of understanding the role of the researcher as the history-writer and how views of this influence have changed over the years. After all, the way how a story is compiled, i.e. how the research is conducted, affects what is read from it.

4. METHODOLOGY AND METHODS

As is apparent from the multitude of theoretical starting points and the varied source material, this research is connected to various methodological approaches and their application. The first article in this thesis highlighted that 'The interdependence of archaeological and archival research in the study of the Estonian glass industry is unmissable' (Article I, 211) and this interdependence was true throughout this research. In the following chapter, the data collection principles for studying the physical artefacts, individual glassworkers, and glassworks are presented. Details on how the datasets were compiled and analysed are given, including how data are stored and published.

4.1. Glass artefacts

When starting this research, 3,015 13th–20th-century vessel fragments from Tallinn had already been studied as part of the author's MA project. From 2013–2015, 3,000 other glass fragments had also been documented which were omitted from the MA dissertation (see Reppo 2015, 15–16) with the intention of including them in a future (PhD) study. The research at hand started out with an initial interest in the earliest glassworks from Estonia, all situated in Western Estonia (Article I). During its early stages, a large assemblage of glass from Haapsalu Castle (Article II) was discovered and the author was invited to work with the collection. It was decided that the focus of this study would remain on the main port towns and import hubs in mainland Western Estonia – Haapsalu and Pärnu. Finds from Tallinn, another coastal import hub, would be used for comparison (see e.g. Article V), and finds from glassworking sites were included where possible for a better understanding of local *vs.* imported products.

From the author's previous experience with the finds from Tallinn, it was clear that the data collection needs to be conducted on a box-by-box basis because of mistakes, the lack of dating or descriptions in excavation reports (Article V, 142), and in some cases, the lack of all documentation altogether (Reppo 2015, 12). Data collection was thus carried out irrespective of the date of the finds, site, or lack of a report. In some cases, glass from the modern period was even present in Mesolithic collections as stray finds (e.g. TÜ 640: 305l). The initial plan was to remove all finds that predate the founding of the Estonian glass industry in the 17th century after the bulk identification during post-processing. However, as the data had already been collected and there are finds with wider date ranges, for example non-diagnostic fragments of window glass or finds without a context, it was decided to keep all the raw data in the published dataset (Dataset I; see further in Ch. 6). It would have also been impossible to characterise changes (Articles IV, V) in glass consumption without documenting medieval items as very few previous overviews, published or unpublished, exist.

Following data collection, the entries for 6,015 previously studied finds were brought up to date and included on Dataset I in .XLSX format together with a

further 18,052 fragments studied during this PhD project. The 24,067 finds are dated to the 12th–20th centuries[9] and they are stored in the following museums and institutions:

- Estonian History Museum Foundation (11 collections studied)[10]
- Foundation of Haapsalu and Läänemaa Museums (19 collections)
- Foundation of Virumaa Museums (1 collection)
- Hiiumaa Museums Foundation (4 collections, 1 private collection)
- Pärnu Museum Foundation (65 collections)
- Tallinn City Museum (35 collections)
- Tallinn University, Archaeological Research Collection (119 collections)
- Tartu Town Museum (4 collections)
- University of Tartu, Archaeological Research Collections (57 collections)
- Viljandi Museum (1 artefact as part of a study on linen smoothers, see Ch. 6.5)

The listed collections were visited or studied individually over the course of this study, apart from the linen smoother from Viljandi Museum which was studied remotely. Finds from several recent excavations by commercial archaeology companies (Agu EMS Ltd, Arheograator Ltd, Arheox Ltd) or research projects carried out at institutions (UT, project lead Heiki Valk; UT, project lead Martin Malve) which already had accession numbers, but which were not yet submitted to collections or museums were also included. In total, the 24,067 catalogued finds originate from 317 different archaeological studies carried out at 268 individual locations (Table 2). There are 117 artefacts from unknown sites in Pärnu (116 finds) and Tallinn (1 find); only two artefacts have no known provenance. The number of fragments on Dataset I does not represent the number of unique artefacts.

The 268 sites were chosen as follows. For Haapsalu and Pärnu, all glass finds kept at the local archaeological collections during the time of data collection were catalogued. For Haapsalu, this includes finds deposited until the end of December 2019; for Pärnu, finds deposited until July 2023 were catalogued. Finds that were on display and not accessible for study during this time, are not included on Dataset I as a rule. In addition to finds from the town, the collections from Haapsalu included finds from two glassworking sites (Hüti, Meleski) and three rural sites. At Pärnu, finds from five rural sites and two islands in Western Estonia (Hiiumaa, Ruhnu) were also kept and thus, catalogued. Due to Hüti's unique position as the only Estonian glass production site on an island and the author's personal connection and archaeological fieldwork there, finds from elsewhere in Hiiumaa were included as well. For Hiiumaa Museums Foundation, this includes finds deposited until November 2019, although finds from Hiiumaa were found

[9] Four beads from the 9th–11th century are included in this total from sites with a long use history, and the potential of a later date than initially proposed. Of the 9th–13th-century finds, 97 are beads, 38 are vessel fragments.

[10] Collection is seen here as all finds with the same accession number.

to be kept at collections in Tallinn, Haapsalu, and Tartu in addition to the regional museum in Kärdla.

Table 2. Total number of sites and finds from towns and islands. 'Other' represents rural sites (castles, chapels, churches, convents, hillforts, roads, settlements).

Site location	Total sites	Total finds
Tallinn	140	10170
Pärnu	46	6830
Other	37	573
Haapsalu	10	554
Glassworks	9	4906
Tartu	8	395
Hiiumaa island, total (without Hüti)	7	142
Põltsamaa	2	314
Otepää	2	49
Narva	2	14
Rakvere	1	97
Ruhnu island	1	19
Valga	1	2
Viljandi	1	1
Kõrgelaid islet (by Hiiumaa)	1	1
Total	**268**	**24,067**

For Tallinn, the sites included were dependent on the previously collected data – 105 sites were included in the author's MA study (Reppo 2015, 39). The 35 additional sites were added because of the author's own involvement in their excavation from 2015–2022 as a commercial archaeologist or because the author was invited as an expert to analyse the finds. In addition to finds from coastal Estonia, finds from excavations carried out across Estonia are included for the same reason (Narva; Põltsamaa; Rakvere; Tartu, Jakobi 5; Tarvastu; Vaabina). To gain a preliminary understanding of the glass consumption elsewhere in Estonia beyond these handful of sites, the Tartu Town Museum collection was visited in January 2021 for a preliminary examination of finds kept there. The research collection was studied partially, and the sites were chosen at random. The research collection at the University of Tartu was used throughout this study. When using Dataset I, all finds can be sorted by geographical region as well as the location where each individual find is deposited to facilitate future studies.

The methodology for cataloguing the finds was developed during the author's MA studies (Reppo 2015, 11–16; Article IV, 76–77) using visual systematic analysis (Caple 2006, 23). As described in Article IV, this encompasses the visual examination and physical measurement of the finds according to pre-set parameters (see below). The finds were measured using a manual calliper ruler and a rim chart (radius measuring chart) to assess the diameter of vessels where possible. The measurements were only collected for finds where it was possible and

deemed necessary to include this parameter.[11] The following information was obtained for each glass fragment (see Table 3 for an example): accession number, find number,[12] the region, name and type of the site, written information on the find (reference for a site report, published literature), context (general: e.g. churchyard, castle etc.), the type of artefact (59 categories), sub-type (369 categories), date, number of fragments, type of fragment (18 categories, e.g. rim, handle, base etc), description, colour (23 categories), diameter (mm), base size (mm), thickness (mm), height (mm), additional notes, the location of the object, reference (for identification, dating), and finally, whether the fragment has been published as part of this thesis or elsewhere. Some of the finds from the commercial units were handed over for expertise off-site (e.g. Malve & Reppo 2020; Reppo 2022a; 2022b) and in the case of initial finds sorting, the finds did not hold individual find numbers (Arheograator Ltd; UT). They are differentiated on Dataset I with lowercase letters (e.g. TÜ 2867: a, b, c etc.). The same is done for sites where the finds have been handed over to collections without individual find numbers.

Ascribing functional categories for the parameters shown above was directly dependent on the types of finds that were catalogued and no set format was used from the outset as it was unclear whether, for example, glass cups, sealed bottles from Surju, or purple glass objects would be present in the material or not. The method was inductive – categories were updated and modified as needed. Apart from clearly identifiable vessel or flat glass fragments, analysing production waste was not the goal of this study (see Roosma 1969; Malve & Reppo 2020; Tvauri 2012; 2013). The Deventer dating system (Clevis & Kottmann 1989) was used on Dataset I where the first or second half of the century is marked by a capital A or B respectively whereas quarter-centuries are marked by a lowercase a, b, c, or d unless a more precise date is known (e.g. on bottle seals). The hierarchical format of the dataset allows for easy access, comparison, and overview of data using PivotTables as well as manipulation in other programs such as RStudio IDE if converted to .CSV files. Some of the data analysed in this way has been published as part of this study (Articles II, IV–VI) or as part of complementary research (e.g. Reppo 2022c). The raw data are published as an Open Access dataset on the DataDOI repository (Dataset I; see Ch. 4.3) which is managed by the University of Tartu library and is freely available.

The literature and sources used to date artefacts are listed on Dataset I and the corresponding metadata file which includes the bibliography (see Ch. 4.3), both compiled in English (Article IV, 95). Where possible, digitised articles and reports were preferred to provide easily accessible references to the sites or finds. The lack of site reports was particularly noticeable with finds from Pärnu where many sites of interest unfortunately lack adequate documentation. Some of these

[11] In the case of measuring the height of kicks, it was decided early on during this study not to continue collecting this data, but earlier measurements were not removed.

[12] For collections where multiple finds had the same number, a letter was added (e.g. AI 5777: 961a, 961b).

finds only had handwritten field notes in the finds' boxes. The photographs of the archaeological finds, taken both during this study and during the author's MA studies, are stored in .JPEG, .PNG and .TIF formats. Photos were taken of each find as either individually or as part of larger assemblages. The publication or online storage of 16,577 photographs (over 100 GB) is not feasible at present. Photos of particularly significant finds are presented with this thesis or published with the articles. The photos not published with the thesis are stored with find numbers as file titles on the author's personal laptop and as two copies on external hard drives. The photos have also been shared in part or fully with the collections they were taken at for archiving and finds' monitoring purposes. The photos are available at request.

One of the questions in Article II was the possibility of determining origin based on typology and context only (Article II, 7). Although feasible for that complex – finds from a cesspit at Haapsalu Castle – a standardless pXRF (portable X-ray Fluorescence Spectrometer) analysis (Article V, 142) was conducted as a test for potential future studies, which included finds from the cesspit.[13] 118 samples were taken from 107 artefacts from seven sites (Reppo 2019b; 2020b) – Hüti glassworks (AM 17966), Valipe fortified house (AI 7284), Reigi parsonage (HKM 6514), Haapsalu Castle (Article II; HM 9206), and Pärnu (Articles I, V; PäMu 14350/A2501; PäMu 14350/A2505; PäMu 14489/A507). The preliminary test showed that the author of this thesis had been overly cautious in Article II of the feasibility of elemental analysis of forest glass objects (Article II, 22–23). Although Maks Roosma was unable to date or provenance the objects in his investigation of the glass (Article II, 21–22), there was some identifiable clustering of artefacts in the preliminary pXRF analysis (e.g. Reppo 2020b, 5). It should be noted again that the elemental analysis of artefacts was not the objective of this study, and no budget was allocated for this. As composition studies have focused on medieval and early modern glass in Estonia (e.g. Niilisk et al. 2017), examining later glass with the same methods does have potential, at least when it comes to sites not in the immediate vicinity of each other or if a standard is created.

4.2. Glassworkers and glass production sites

The most important methodologies in studying glassworks and glassworkers were certainly qualitative – documentary analysis and documentary archaeology, including desk-based assessments (CIfA 2014). For glassworkers and their family members, the goal was to build on previous studies by gathering additional genealogical information and identifying immediate family members (spouses, parents, children, siblings). The compilation of a complete list of glassworkers involved in the early modern and modern Estonian glass industry was not the purpose of

[13] Bruker Tracer III-SD. Settings: 15kV; 23μA; 30sec; 25 μm Ti filter + vacuum. The lightest element that could be measured was Mg. The studies were conducted in November and December 2019 at the University of Tartu archaeology laboratory under the supervision of Ragnar Saage as part of the course 'Interdisciplinary Archaeology' (FLAJ.01.126).

this research. Although some earlier and later entries are included (see below), the focus was on the glassworking community during the 1620–1860 period – from the founding of the first glass production site until the reliance on migrant workers began to decrease (Article VI, 397). For glassworks, the main goal was to put together a comprehensive chronology of the industry by identifying the location and coordinates of the sites and revising existing information about dating and ownership. As changes in the manufacturing techniques were slow (see e.g. Ch. 4.2) and some earlier sites continued to operate or were merged in the 20th century, the chronology includes all glassworks founded in Estonia before World War II (see Fig. 3).

For glassworkers, an initial list of individuals was compiled based on works published by Robert Feldmann (1935), Maks Roosma (1966; 1969), and Dirk-Gerd Erpenbeck (2015). In addition to the published works, Feldmann's personal archive and drafts which are stored at RA (RA, EAA.1850.1.1122–1127, 1130),[14] and Roosma's drafts kept at the Estonian History Museum (AM.296) were used. The preliminary version of Dataset II included 445 individuals from Feldmann's study, 46 individuals from Roosma's study, and 171 individuals from Erpenbeck's study. Endel Varep's personal archive which has been kept at the Institute of the Estonian Language (Varep EKI) was used for information on glassworks, but it also held information on 28 individuals. There was some overlap between the individuals in the four sources, so the initial dataset included preliminary information for 636 individuals connected to the glass industry. The entries given by Erpenbeck, Feldmann, Roosma, and Varep which related to church-books were double-checked and additional information was gathered where possible (see below for archival research and Ch. 5 for results). This original corpus was then expanded to include immediate family members and other individuals identified when using the church-books with the described period in mind. Exceptions were made for six individuals involved in glass-related fields in Pärnu in the 16th century as it was hoped their life histories might aid in locating the glassworks in Pärnu County (Article I). Ten individuals who worked at Zhabino (1705/1716–1738) glassworks in modern-day Russia are included as their life events are recorded in Narva congregation books. In total, data for 1,248 individuals was collected and published (Dataset II).

The following information for these individuals was gathered, where possible for Dataset II (see Table 4 for an example): surname (NN – *nomen nescio* – if unknown; maiden name displayed for women), forename, profession or link to glassworking (e.g. 'glassworker's wife'), glassworks the person is linked to in Estonia and elsewhere, date of birth (DOB), place of birth or origin (POB/POO), date of baptism (DOBM), place of baptism (POBM), date of marriage (DOM; if

[14] During this research, the author discovered that the partial transcription of the Lihula Church Book from 1765–1833 written by Feldmann in April 1920 was among one of the documents (RA, EAA.1850.1.1125a) in his collection. The original church book had later been stolen and sold as wastepaper and was one of the missing church books from the Saaga digitised collection. The author informed the archive and because of this discovery, this part of the Feldmann collection is now digitised and available online.

several, listed in numerical order), place of marriage (POM; if several, listed in numerical order), date of death (DOD), cause of death (COD), place of death (POD), parents, number of godparents (for Article VI), godparents (in the order presented in the sources), spouse (if several, in numerical order), children (forenames only, in order of age), notes, and source (reference or accession number). Several name forms are shown where relevant (e.g. Beck (Baeck)). Like with the dataset of the finds, the parameters allow for easy comparison and overview of the workers and their families, e.g. determining how many individuals with cause of death listed died in infancy, how many glassworkers were born at Lelle glassworks, or what the average age at marriage was (see Article VI and Ch. 5).

Similarly to the glassworks and their family members, an initial list was compiled for glassworks based on previously published chronologies of the industry by Endel Varep (1962a; 1962b), Maks Roosma (1969), Anne Ruussaar (2021), and others (see Ch. 2.1.1). Again, there was some overlap. In total, 42 glassworks and glass factories (Fig. 1–2; Appendix 2) known to have been founded in Estonia before World War II are included on Dataset III. After this, verification of published information (see Ch 5.1) and research into missing details such as geographical coordinates, location, duration, or founder began (see below for archival research and Ch. 5 for results). As noted in the introduction, no archaeological fieldwork was carried out as the physical remains of the glassworking sites were not the focus of this study, although it was noted for each site whether fieldwork has ever been conducted at the site (see Table 5 for an example). The day-to-day cashflow, operation, and management of the sites were not studied. Potential glass production sites at Olgina and Sõeru identified by Varep (Varep EKI, Olgina; Varep EKI, Sõeru) have not been included in this study as there was not enough information to verify their existence. Mirror workshops are also excluded as they were generally standalone operations although it should be noted mirror glass was polished and silvered in Kamari and mirrors were made at Rõika-Meleski, among other goods.[15]

For the glassworks (Dataset III; see Table 5 for an example), the dates, duration of operation in years, name of the site, alternative names of the site (German, Estonian), address, coordinates, founder, list of (known) products, description of the bottle seal or trademark stamp of the factory (if any), details about excavations (if any), examples of finds (Dataset I, some additional finds from museums), previously published dating of the glassworks, the family names of workers associated with the glassworks from Dataset II, the number of workers, notes, literature and references to publications within this thesis were of importance. Including the coordinates allowed for easy mapping of the data (see

[15] The mirrorworks excluded from the dataset were the Tartu mirror factory (1799–1816?) and several mirrorworks located in Tallinn – Johannes Friedrich Jürgens (1781–1796?), H. Mewes (1790s), Johann Lindemann (1925–1929), E. & G. Loderaud (1925–1940, nationalised), Fama (1932–1940), and Frankonia (1936–1940). Mirrors continued to be produced in Estonia after World War II.

Ch. 4.2.2). Just like for Dataset I, Datasets II and III and their bibliographies[16] which are supplied in the metadata files are compiled in English (Article VI, 393) and they are cross-referenced with each other. Dataset III is cross-referenced with Dataset I as well.

Leaving aside published research (see Ch. 2.1), the study of the individuals (Dataset II) and glassworks (Dataset III) was carried out using both digital and paper-based records. The identified archival documents were accessed either online or on site. The documents kept in Estonian archives were identified mainly via the Archival Information System[17] and the personal name indexes of registers of parishioners.[18] In terms of accessibility and reusability of the used documentary sources, RA has made around 34 million images of their physical records available online which they estimate to be around 5% of their collection.[19] These include indexed church records, revision lists, wacka-books (*vakuraamatud*), court documents, and other registries. Parish registers were taken into use in the 17th century in Estonia, but from this period, many are preserved fragmentarily. At the end of the century, the Swedish Crown produced revision books and area description books. All of these are accessible online.[20] Parish registers are more complete for Northern Estonia in terms of the data they present, whereas death records are incomplete both for Northern and Southern Estonia (Palli 1996, 8). A selection of these records was used based on the sites and individuals in focus. As most 18th- and 19th-century workers were active in Kursi and the neighbouring parishes (Fig. 1), several death, birth, and marriage records were chosen to be included from there.

The Digital Archive of Estonian newspapers (DEA) which includes newspapers from 1811 until today, was used to search for information regarding glassworks and glassworkers, for example from obituaries, news stories, and advertisements.[21] To identify the locations of production sites, the Estonian Nature Information System (EELIS) was used.[22] EELIS holds descriptions, photos, and estimated locations of cultural heritage objects which are accessible through the cultural heritage objects map in the Estonian Land Board (Maa-amet) map application.[23] Coordinates for glass production sites which are scheduled sites were obtained from the heritage objects map on the same application.[24] Documents and maps indexed on the National Archives Database at the National Archives of Sweden[25] and the digitised maps kept at the National Library of

[16] As can be seen from Tables 4 and 5, the archival records are given without the prefix 'RA' on the datasets. The references are explained within the metadata file.
[17] https://ais.ra.ee/, 14.05.2024.
[18] https://www.ra.ee/dgs/addon/nimreg/index.php, 14.05.2024.
[19] https://www.ra.ee/en/national-archives/about-us/, 14.05.2024.
[20] https://www.ra.ee/dgs/explorer.php, 14.05.2024.
[21] https://dea.digar.ee/, 14.05.2024.
[22] https://eelis.ee/artikkel/-294849174, 14.05.2024.
[23] https://xgis.maaamet.ee/xgis2/page/app/parandkultuur, 14.05.2024.
[24] https://xgis.maaamet.ee/xgis2/page/app/kultuurimalestised, 14.05.2024.
[25] https://sok.riksarkivet.se/nad, 14.05.2024.

Sweden[26] and on ALVIN[27] were also used. A full list of the documents used in the study of the sites and people can be found within the ReadMe files published in .TXT format with the respective datasets.

There were some limitations in the archival study of glassworkers – some promising sources turned out to be not informative – for example Vara manor revision sheets (1811; RA, EAA.1865.2.41/7), Vara congregation metrics (1776–1796; RA, EAA.1258.2.7), and the genealogical collection of the Törne archive for the surname 'Wentzel' (RA, EAA.4918.1.2088). In the parish register of EELC Vändra from 1817–1833 (RA, EAA.1284.2.7), the deaths recorded in the first few years were very difficult to decipher as forenames were mostly not given, ages were left out, and in the case of women or children, the person was listed by their link to a head of the house who was also listed by surname only. This part of the church book was perhaps the most poorly compiled record used during this study and as a result, it contains information that is not shown on Dataset II, but which could become helpful in the future. Further information for some glassworkers who migrated to modern-day Estonia from the territory of modern-day Latvia and vice versa, could have been obtained using the genealogical Genealogies (Raduraksti) service of the Latvian National Archives[28] as well but this would have significantly extended the time needed to carry out this research and for now, this will need to remain a potential future step in the study of Estonian glassworkers.

As the focus was on the genealogy of the workers and collecting basic information about the glassworks, leaving aside the economic and operational aspects, there is a corpus of archival sources that has only been used partially or not used at all – these include cash register books for manors which owned glassworks and the archival fonds for glassworks. The latter can be found through the Archival Information System. They mostly hold details for 19th- and 20th-century sites but for some factories which operated for a longer period, information on their management and upkeep in the 18th-century can be found, such as for Rõika-Meleski (RA, EAA.1806). Finally, only the data available online about the artefacts and information kept at Järvakandi Glass Museum (Järvakandi Klaasimuuseum) has been accessed. As Järvakandi is one of the later sites (founded in 1879), the basic information on this site had been obtained for Dataset I, and most of its workers fell out of the scope of this research due to its date, it was decided to limit the study at this time. The inclusion of data stored at this museum could be useful in future studies of sites active in the second half of the 19th century and the 20th century.

[26] http://libris.kb.se/form_extended.jsp?f=ext, 14.05.2024.
[27] Nordic platform for digital collections and digitised cultural heritage. https://www.alvin-portal.org/alvin, 14.05.2024.
[28] https://raduraksti.arhivi.lv/, 14.05.2024.

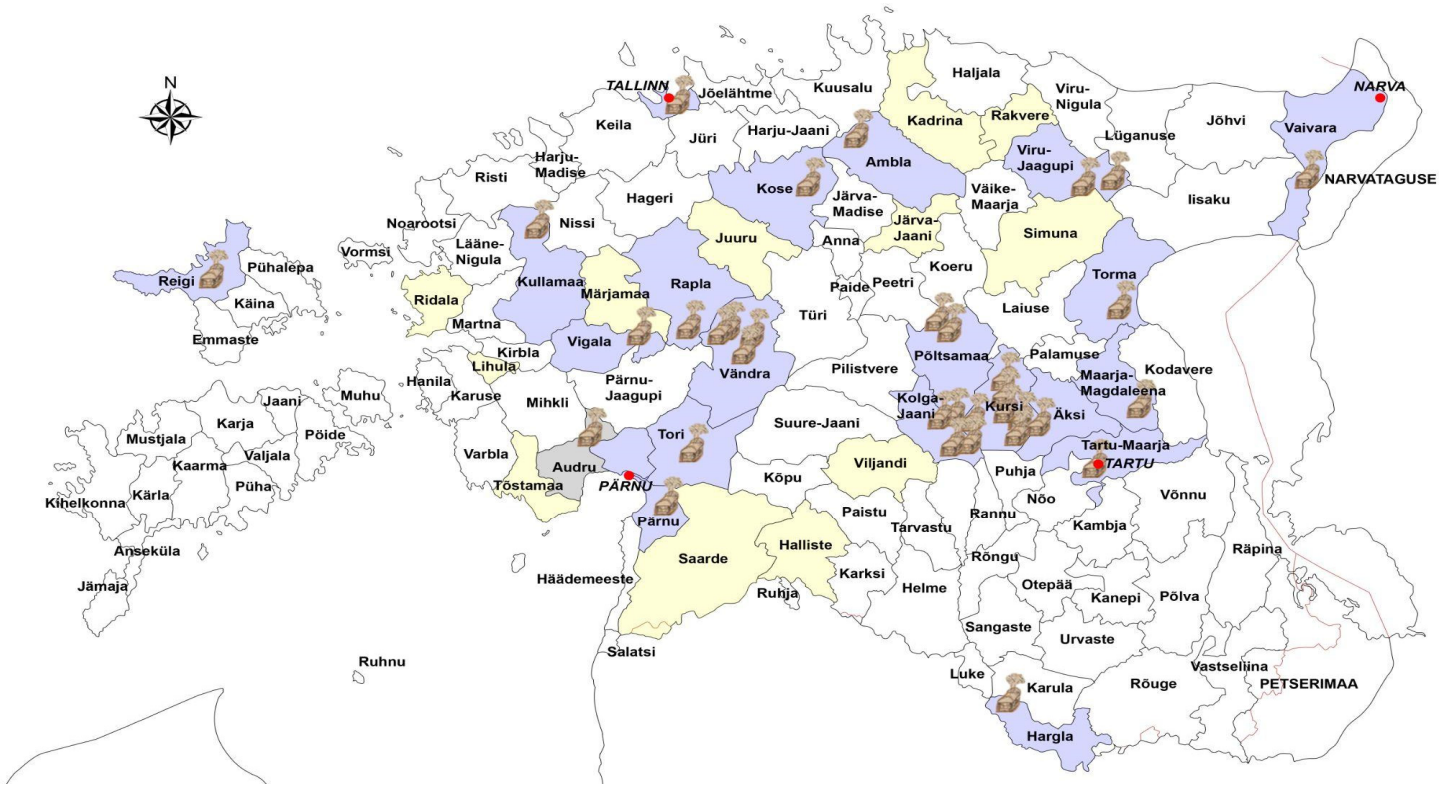

Figure 1. Parishes with known (blue) or assumed (grey) glassworks, and locations (births, marriages etc.) listed on Dataset II for glassworkers or their family members (yellow) beyond these areas. Four largest towns are also shown (red). The territory displayed is of pre-World War II Estonia which includes areas in modern-day Russia (parts of Petserimaa and Narvataguse). Modern border shown in red. *M. Reppo, RA, EAA.308.2.208, Regio 2009, Kihelkondade skeemiline kaart 1921, 'Eesti mõisad'.*

Over the course of this research, technological tools have been developed and are being continuously improved that could be particularly useful for future studies. For example, optical character recognition (OCR) is built into DEA which facilitated the study of old newspapers during this research. In October 2022, RA released the AI-powered full-text search of their collections via Transkribus.[29] Transkribus is a platform that employs AI in the transcription and text recognition of historical documents and handwritten text. The archive has trained the text recognition and transcription AI[30] to recognise and read a selection of locally compiled documents. This selection is expected grow significantly in the coming years. Transkribus was employed during this study on a handful of occasions for 17th-century documents compiled in Swedish; however, it was not possible to use the full-text search through the RA webpage at this time as the sources relevant to glassworking were yet to have been included in the full-text search.

4.3. Raw datasets – DataDOI & data visualisation

DataDOI is an Open Access repository for publishing research data. It is managed by the University of Tartu library.[31] As of date, there are 26 studies published on DataDOI that deal with archaeology including the three datasets described in this chapter. As discussed in Article IV, publication of datasets in material culture studies in Estonia has been uncommon, especially following the FAIR principles (Wilkinson et al. 2016; but see Roio 2013) although some data repositories besides DataDOI partially follow these principles such as the Museums Public Portal (MuIS) or the archaeology database for Tallinn University archaeological research collections (repository TALAR; see Article IV, 94). Datasets presented according to the FAIR principles follow a standard, include references, hold persistent interoperable identifiers (DOI, PURL), have defined licences (CC-BY), and are written in a clear manner, operable by using free universal software.

For the datasets in question, the standards are the parameters described in Chapters 4.1. and 4.2. The references are listed in the table and presented in a metadata (ReadMe) file. The DOI is provided by DataDOI and the datasets have been made public by the Creative Commons licence CC-BY 4.0.[32] DataDOI suggests using .ODS, .XLSX or .CSV data for tabular data and .TXT, .ODT, .DOCX, and .PDF for textual data.[33] These formats allow the use of raw data in future studies and data mining by other researchers. The datasets were published as .XLSX files and the documentation, including the bibliographies, as .TXT files. The information on the structure and methods for compiling the datasets were included in the metadata, a requirement of the FAIR principle and DataDOI as it advises the users on how the datasets were compiled and how to use them. The three described raw datasets are referenced as any other type of publication.

[29] https://rahvusarhiiv.transkribus.eu/, 14.05.2024.
[30] https://readcoop.eu/transkribus/, 14.05.2024.
[31] https://datadoi.ee/, 14.05.2024.
[32] https://creativecommons.org/licenses/by-nc-nd/4.0/, 14.05.2024.
[33] https://datadoi.ee/page/policy?locale-attribute=en, 14.05.2024.

The datasets contain tabulated data (see Tables 2–4) which are 30% raw (measurements, artefact codes) and 70% processed (description, dating, references, notes etc.):

- Dataset I – the finds, contains 13,807 rows by 22 columns, less than 2 MB, partially reused data from Reppo 2015.
- Dataset II – the glassworkers and their family members, contains 1,249 rows by 22 columns, less than 256 KB, no reused data.
- Dataset III – the glassworks, contains 43 rows by 18 columns, less than 256 KB, no reused data.

For further assistance, Appendix 1 in this thesis has been added with an A–Z of terminology used in Dataset I and relevant articles. In Appendix 2, a brief description is given for each site in alphabetical order based on Dataset II.

Using the 'mutability' (Leonelli & Tempini 2020, 6) of the data, queries and PivotTables were used to extract the data from the .XLSX files to transform them into .CSV files which were then used in RStudio and Gephi to visualise the data after data wrangling. To avoid errors during file type changes, all cells on all datasets are filled – 'NA' signifies an empty cell. For visualisation of the described data which focus on things, people, and locations, principles described throughout *Data Journeys in the Sciences* (Leonelli & Tempini 2020) were employed, keeping in mind that datasets are not 'given' – they are transformed and modified any time they are used. This can mean readapting or moving the data as well as the different forms of storage or dissemination (Leonelli & Tempini 2020, 6). On Dataset II, we may have data that marks the workplace of a glassworker, for example Lelle glassworks. If we move this information to Dataset III, we transform this information and use it to clarify the operating dates of Lelle glassworks based on the genealogical data accompanying the link formed with Dataset II.

Using Gephi, an open-source visualisation program (file format .GEPHI),[34] the networks the workers operated in were shown based on the data about locations on Dataset II, and the information collected about relatives – spouses, parents, and children (Fig. 5; Article VI, fig. 5). Reading the graph is straightforward – the larger the node, the more connections for that node on the network. Further steps could include processing the data to show connections between non-related groups, for example between children and their godparents. For genealogical charts, previous experience with compiling family trees was used.[35] This allowed visualising the kinship connections between individuals in the studies (Article I, fig. 3). For spatial analysis and producing geographical maps, RStudio[36] and the programming language R (file format .R) were used. These maps are included in Article I (fig. 1), Article III (fig. 1.1), Article VI (figs. 1–2), and in Figure 2 in this thesis. The codes and wrangled datasets used to make these maps and the network analysis are available at request. The dot charts that were used to identify the clustering of artefacts in the preliminary elemental analysis were also created in RStudio (Reppo 2019b; 2020a).

[34] https://gephi.org/, 14.05.2024.
[35] The author has been a member of the Estonian Genealogical Society since 2016.
[36] https://posit.co/products/open-source/rstudio/, 14.05.2024.

Table 3. An example from Dataset I.

Site code	Find no	Region	Site	Site type	Report/ Article	Context	Type	Sub	Date	Fr	Frags	Description	Colour	Size (mm)	Base size	Thickness	Height	Notes	Deposited	Reference	Published
HM 9206	1	Western Estonia	Haapsalu, Episcopal Castle (2017-2018)	Old Town	Article II	Castle	Bottle, quadri-lateral	Square	17AB	18	Intact	Flared, almost everted rim (17/26), short neck (15 mm), rounded shoulders, round corners, low domed kick with curved pontil mark. Glued together, some fragments missing	BG	70 x 70	65 x 65	NA	210	Site: latrine dated to 1580-1660 A.D.	Haapsalu Castle	Dated by context; Annila 2013, 70-71, 78-91, 160-161; Hülsmann 2013, 293-298; Šimkutė 2011, 163-165; Šimkutė 2013, 162-165; Willmott 2002, 86-89	NA

Table 4. An example from Dataset II.

Sur-name	Fore-name	Profession/ link	GW EST	GW other	DOB	POB/ POO	DOBM	POBM	DOM	POM	DOD	COD	POD	Parents	No of GP	Godparents	Spouse	Children	Notes	Source	Hypo-thesis
Runge	Johann Carl	Glassmaker (Glasmacher), glassworker (Glasfabrikant)	Lelle; Taali; Käru	NA	1790-06-29	Estonia, Kursi parish	1790-07-03	Estonia, Kursi parish	1. 1818-08-17; 2. 1825, ca	1. Estonia, Tori parish	NA	NA	NA	Johannes Wilhelm Runge + Charlotte Dorothea Forstberg	7	1. Johann Fleckenstein, 2. Wilhelm Hentz, 3. Johann Popp, 4. Erdmann [page torn], 5. Mrs Karl Wachtmann, 6. Regina Heybach, 7. Elisabeth Schönfelder	1. Maria Hagen; 2. Marie Adamowitsch/ Benowitsch	Anna Maria Dorothea Elisabeth, Amalie Sophie Helene, Johann Friedrich Carl, Wilhelm Ludwig Johann, Anna Annette Sophie, Marie Christine, Wilhelm Christian, Georg Joseph, Heinrich Leopold	Should have a brother named Georg, who was 27 in 1828	EAA.1257.2.1, f. 191; EAA.1850.1.1127	NA

Table 5. An example from Dataset III.

Date (range)	Duration (years)	Name(s)	Alternative names	Parish	Address	Coordinates	Founder	Produced	Seal/ stamp	Excavated	Example	Previous dating	Workers	No of workers	Notes	Literature	Scheduled
1764-1775	11	Laashoone	die neue Glashütte; Lasone	Kursi	Laashoone, Lalsi, Viljandi, Viljandimaa	58,470201, 26,100939	Woldemar Johann von Lauw (1712-1786)	Bottles (globular; large; rectangular; octagonal), phials (cylindrical; globular), milk-souring bowls, coach windowpanes, ornaments, jars, laboratory ware	Seal: Triple-branch crown, LONDON BJI; Triple-branched crown, LONDON, AC	Roosma 1.-15.07.1965 (Roosma 1969, 77-79)	AI 6713: 121; AI 7861: 1462; AM 18398 PK 4625	Heinsoo 2005, 23: ca 1764-1775	Albrecht, Brisemeister, Drewing, Göschel, Hagen, Lippardt, Mussom, Preuss, Reichardt, Reinthal, Siebers, Staack, Stichkorn	NA	For a very brief period was located in Sopi-metsa village (see Pajusi glassworks)	Erpenbeck 2015, 312-315; Heinsoo 2005, 23; Roosma 1969, 77; Tvauri 2013, 261; Varep 1962b, 199, 202; EAA.1348.2.169, f. 117-143	Yes

5. PRODUCING GLASS IN ESTONIA

Objects do not appear from thin air – they cannot be separated from their maker. The following chapter presents an overview of glass production sites and glass-workers in Estonia based on the results of this research. The study of the Estonian glass industry is briefly examined and the use of the raw datasets to revise the chronology of the industry is demonstrated which were the first objectives of this thesis (Articles I, VI; Dataset III). At the same time, the production sites are viewed in symbiosis with the life histories of the people (Article VI; Dataset II) involved in their day-to-day operation to show the role of the owners and workers in the development of the industry and to reconstruct the web of connections between sites and individuals (Articles II, VI), the second objective of this study.

5.1. Studying glass production in Estonia

As shown in Chapter 2, work with the historiography and locally consumed glass for Article I as well as the author's MA dissertation (Reppo 2015, 17–35) indicated that there are four main themes of inquiry, two of them relevant for this chapter – the study of the industry and the genealogy of the workers. In Article I and Chapter 2, it was described that interest in the history of the local glass industry began already in the 18th century with a wider range of overviews written in the 19th century (Article I, 212–213) but by the early 21st century, several questions about the history of the industry were unanswered (Tvauri 2013, 259). The sporadic studies are reflective of Estonia's complex political history which also influenced the consumption and production of glass. When speaking of 17th-century glassworks, it must be kept in mind that they operated in the Swedish Kingdom whilst all glassworks from 1710–1918 were founded when Estonia was part of the Russian Czardom. The influence of the German-speaking upper class, established already in the medieval period, did not disappear through either of the periods. Further information on the historical and demographic background is given in Articles I and VI.

Working on Article I, establishing a preliminary timeline of the industry provided information about potential challenges and limitations of previous research. Firstly, verifying the accuracy of the information presented in published works was not as straightforward as it had been hoped. In some cases, archival references were impossible to trace without the help of the staff at the National Archives of Estonia as collections had been renumbered over the decades. In other cases, information seems to have been just carried forward from one publication to another and references to original sources were not given, particularly in the case of the dating of the sites or owners. Secondly, previous authors had noted difficulties in the attribution of place names and workers from written records to archaeological sites, especially in the Kärevere-Laeva region (Erpenbeck 2015, 310; Roosma 1969, 79; Tvauri 2013, 262) so there were uncertainties whether some sites had been correctly matched up with their corresponding

records. Other sites described in written sources had not been located. Attributing the sites and verifying the sources was the most challenging part of the study of the industry and its workers as shown in the following subchapters.

As noted in Chapter 4, 42 sites of interest were identified (Fig. 2; Dataset III). The production sites are not described in detail in the following subchapters, but a brief description of each site is presented in alphabetical order in Appendix 2. In this list, Tõrna and Kamari (Tõrna-Kamari), Rõika and Meleski (Rõika-Meleski), and Uulu and Surju (Surju) glassworks are combined due to the way work was structured at these sites. More detailed information and references regarding each site can be found in the corresponding dataset (Dataset III) that Appendix 2 and the articles are based on. The number of sites included in the study posed a third challenge which was more subjective in nature – at what point is a representative dataset for glassworkers obtained, i.e. when to terminate data collection?

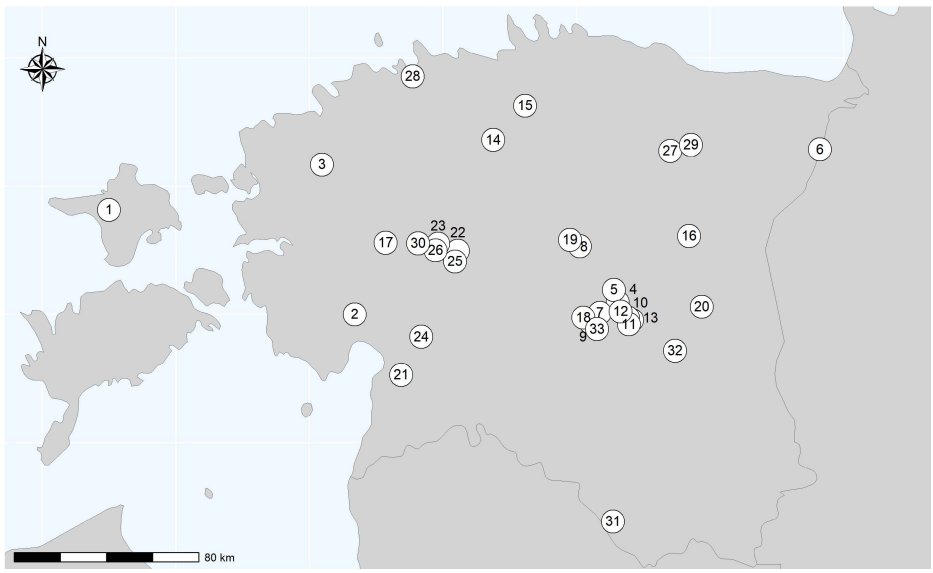

Figure 2. The studied glassworks: (1) Hüti, (2) near Pärnu, (3) Piirsalu, (4) Altnurga, (5) Laasme, (6) Gorodenka, (7) Utsali, (8) Pajusi, (9) Laashoone, (10) Laeva, (11) Hoone, (12) Tõrna, (13) Haava, (14) Ravila, (15) Lehtse, (16) Tarakvere, (17) Nurmsi, (18) Rõika-Meleski, (19) Rutikvere, (20) Alajõe, (21) Surju, (22) Käru, (23) Lelle, (24) Taali, (25) Vändra, (26) Eidapere, (27) Ädara, (28) Tallinn (Robert Elfenbein, Richard Mayer, H. Citron & J. Halbreich, Tallinna I Klaasivabrik, Estoklaas, Tallinna Klaasivabrik, Johannes Lorup, Tarbeklaas), (29) Tudu, (30) Järvakandi, (31) Koikküla, (32) Tartu (Tartu Klaasivabrik, Eesti Klaas), (33) Elija. *M. Reppo.*

Data collection principles for glassworkers were discussed in Chapter 4 and Article VI – with some exceptions, the focus was on the glassworking community from the earliest production sites until the reliance on migrant workers began to decrease in the second half of the 19th century (Article VI, 397). In alignment

with the development of the industry, the results from the research of the workers' life histories are viewed here in the same manner as in Article VI – chronologically. The following subchapters highlight the challenges that were faced during the study of the workers and the production sites as well as the possibilities of working with the raw data and presenting the data in context as done in Articles I and VI.

5.2. Owners and founders

Glass production in Estonia started in the 1620s. As noted, one of the most significant challenges was the erroneous assignment of founders or the landowners at the time of the factories' founding and dating of the sites in previous studies. When revising information about the glassworks, multiple discrepancies of this kind were discovered, a few of which were addressed in Articles I and VI. Misinterpreted data has often been reproduced in later works, thus consolidating it as fact which makes these errors difficult to trace or even discover. Later owners are credited as the owner during the founding of the glassworks, even if the information is clearly wrong as demonstrated below. The terms 'founder' and 'owner' are used interchangeably in published works, and this has not been challenged although it should be noted that in both cases it usually refers to the landowner of the glassworks who either granted rights to set up glassworks on their land or leased the site out to the smelter master or vice-master (see Ch. 5.4).

The necessity to verify previously published information was first presented in the case study in Article I. In 1966, Maks Roosma speculated that the **17th-century glassworks in Pärnu** ceased production in 1654 as the supposed owner, count Heinrich Matthias von Thurn had died (Roosma 1966, 43). In Article I, it was demonstrated that he had in fact died 14 years earlier. Roosma clearly mistook Heinrich Matthias for his grandson and heir, Heinrich von Thurn-Valsassina (1628–1656) but his life history showed that he could not have been the founder of the site. Secondly, he gained ownership of Pärnu County only in 1654 and his death likely had no effect on the closure of the site (Article I, 223–224). Based on the gathered information, it was proposed that the closure came about with the death of Heinrich Matthias' daughter-in-law, notable entrepreneur Magdalena Prüschenk von Thurn (?–1651) and the subsequent transfer of the estate to Heinrich. Revising the information known about the site also allowed for speculations of the site potentially being older than Hüti glassworks. Although it cannot be confirmed and thus this research question proposed in Article I remains unanswered, the area where the site may have been located (see Ch. 5.3) was owned by Magdalena's husband Franz Bernhard von Thurn-Valsassina (1592–1628) from 1625 and it was turned into Pärnu County (Ger. *Graftschaft Pernau*) in 1627. The latest it could have been founded is 1646 (Article I, 224).

As perhaps the most thoroughly researched glass production site in Estonia, for **Hüti glassworks** (1628–1664) there was no question about the ownership;

however, the owner's role was briefly discussed in Article II. At Hüti, this influence could be gleaned through the probable needs for certain types of glass objects based on the owner's properties and estate (Article II, 20–21), but at later sites the impact was more complex. At **Gorodenka glassworks** (1754/63–1770/71), Otto Magnus von Stackelberg leased the glassworks to Carl Adolph von Krusenstiern who appointed Erich-Johann Renter as vice-master, but the site was managed by von Krusenstiern's son-in-law Carl Philipp von Essen (Roosma 1969, 76–77). Neither the landowner nor the owner of the lease have left a physical mark on the products, but the bottle seal of Gorodenka bears a two-branch crown with London and either R (Renter; Fig. 17 upper left) or CE (Carl Philipp von Essen; AM 17967 PK 4522). Whilst with 18th-century sites revision was mainly needed for the dating (Fig. 3) and location of the sites (see Ch. 5.3 and Fig. 4), with 19th-century sites there were far more errors with the attribution of owners although locations were unclear for some as well.

With **Lelle glassworks** (1813–1853), Hermann Theodor Hoyningen von Huene (1813–1880) is mostly credited as the founder (e.g. Alliksaar 2012, 102). This is not possible as Theodor was born in the same year that Lelle was founded and only bought Lelle manor in 1870. It belonged to the Pilar von Pilchau family instead – Jakob Johann Pilar von Pilchau (1774–1814) died after a year of its founding and when his daughter, Pauline von Stackelberg (1812–1866) turned 18 in 1830, she became the sole owner of the manor (see Kinnistute register 2023a for more details). Hermann Theodor Hoyningen von Huene was the founder of **Eidapere glassworks** (1853–1929/30) which Lelle was later merged with. With **Tudu glassworks** (1858–1879), the later owner, Hermann von Walter is listed as founder in some sources (e.g. Eestimaa Looduse Fond et al. 2017, 24). Again, this is not possible – the factory had been closed for two decades when von Walter began the process of obtaining ownership of the manor in 1897. Tudu glassworks were founded during Felix Nikolai von Sivers' (1828–1872; Kinnistute register 2023b) time and rented by Johannes Reinhold Runge (Article VI, 404) who has been mistaken for his father Peter in the past (e.g. Karma 1963, 141).

This chapter has dealt with misleading, misinterpreted, or missing information about the owners of glassworks and factories that were discovered during work with Articles I, VI, and Dataset III. Revising these key facts was one of the objectives of this research. However, another interesting trend was noticed. There are a total of 37 owners listed on Dataset III, two of them as partners. When going through the genealogical information about the owners, it was discovered that around a third of them were related or connected through marriage. The manager of Gorodenka, Carl Philipp von Essen, was married to the leaseholder Krusenstiern's daughter. The owner of Ravila glassworks, Karl Reinhold von Manteuffel (1721–1779) and Andreas Gotthard von Manteuffel (1714–1768), the owner of Altnurga and Laasme, were brothers. Their father was the founder of Altnurga glassworks which was inherited by Andreas in 1764 after his father's death in November 1763. The owner of Lehtse glassworks, Christian Wilhelm von Zimmermann's (1739–1785) daughter was the third wife of the owner of Nurmsi glassworks, Friedrich Wilhelm von Wrangell (1743–1799). Jakob Johann Pilar

von Pilchau (1774–1814), founder of Lelle on the other hand, was the second husband of D. Gottlieb Suckny's (1743–1822) daughter. Suckny was the landowner of Surju glassworks, his daughter Juliane Elisabeth (1780–1838) also pawned Uulu to Suckny in 1807 (Poopuu 2014, 4). The role of the connections between the owners of the glassworks in their development and economic connections is a topic worth considering for future studies.

5.3. Locations and names

Whilst some glassworks had wrongfully attributed owners, in other cases they had been geographically not located or were mislocated. There were some issues connecting archaeological sites with site names from written records. Coming back to Article I, another problem with the **glassworks near Pärnu** was its location which had not been identified. Although the location of the site was not found through a desk-based assessment, Jõõpre and Ridalepa were proposed as the potential areas where the glassworks may have been situated, perhaps at the location shown on a map from 1704 (RA, EAA.308.2.28). It is also possible that this is another, yet unknown production site (Article I, 226–227). A third area is of interest as well since Magdalena rented Võlla manor to her court master Johann Liphart in 1632 (Kalm et al. 2008, 278). Although this branch of the (von) Liphart family was part of the Baltic German nobility, Lipharts are well-known glassmakers who worked in 18th-century Estonian glassworks. There are nine individuals with this surname on Dataset II but there is currently no information to link any of them to Pärnu.

During the 18th century, there were three notable groups of glassworks – those at Vana-Põltsamaa, Puurmani, and Laeva manor (Table 6). For the Vana-Põltsamaa group, which was owned by Woldemar Johann von Lauw, the general location of **Utsali and Laashoone glassworks** was known (Varep 1962b, 199) but specified by Tvauri and Roosma respectively who also carried out excavations on said sites (Roosma 1969, 77–78; Tvauri 2012). Varep had located **Pajusi glassworks** (Varep 1962b, 201) but seems to have been unaware that von Lauw had ownership of Pajusi manor from 1762–1784 through his father-in-law, Heinrich von Fick who had received the manor as a present from Peter the Great in 1720 (Erpenbeck 2015, 312–313). The workers from Laashoone likely worked here at least briefly and a member of the Hagen family was the despondent of Pajusi in 1766 (Article VI, 402–403). Pajusi was potentially a temporary site used only in the 1760s whilst Laashoone was being properly set up. Its distance from the other glassworks may have been another issue.

Table 6. 18th-century glassworks at Vana-Põltsamaa, Puurmani, and Laeva manor.

Manor	**Vana-Põltsamaa manor**	**Puurmani manor**	**(Kärevere-)Laeva manor**
Parish	**Põltsamaa**	**Kursi (Ger. *Talkhof*)**	**Kursi, Äksi (Hoone)**
Owner	**Woldemar Johann von Lauw (1712–1786)**	**Gotthard Johann von Manteuffel (1690–1763) & Andreas Gotthard von Manteuffel (1714–1768)**	**Harald Gustav Igelström (1730–1804)**
Site	Utsali (1755–1771)	Altnurga (1750–1782)	Laeva (1765?–1807)
	Laashoone (1764–1775)	Laasme (1768–1782)	Haava (1765?–1807)
	Pajusi (1764–1780?)		Hoone (1765?–1807)
			Tõrna-Kamari (1765?–1807)
Notes		Belonged under Vana-Põltsamaa manor during von Lauw's ownership (1767–1779)	Rented by von Lauw (1767–1786), then sold to the state

Before work started at Vana-Põltsamaa manor, a site had been established at Puurmani manor owned by the Manteuffel family – **Altnurga glassworks**. As shown in Article VI, members of the Hagen family, one of the earliest glass-working families in 18th-century Estonia worked here (Article VI, 402–403). Erpenbeck (2015, 314) proposed that of the three glassworks named in RA, EAA.1348.2.169, Utsali is the old glassworks and Laashoone the new glass-works, but the third, leased glassworks at Talkhof, that is Puurmani manor, is that of Altnurga. Based on the results of the current study with the sites and the glass-workers, the latter site is **Laasme glassworks** not Altnurga (Table 7). In Table 7, the alternative names found in written records or church books (Datasets II, III) for Altnurga and the other sites are given. It was possible to come to this division based on the movement and life events of the workers listed on Dataset II. This part of the study was important in building the case studies presented in Article VI and correcting the dating of the sites. A timeline of the industry with updated dating is shown in Figure 3. Previous dating of the sites by past researchers is presented in Database 2. Most notable in Table 7 is the use of Talkhof in the name or as part of the name used for Kursi parish (Table 6), Puurmani manor, Altnurga, Laasme, and Tõrna-Kamari glassworks. To avoid errors in the future, it should be noted that the plot where Laasme is situated is named Lasone today but Laashoone, also known as Lasone glassworks, was situated 17.5 km southwest.

Table 7. Names used for glassworks in written sources (typographical errors original).

Site	Alternative name
Altnurga	Puurmani (1764, 1766, 1772); die Hütte in Talkhof (1755, 1756, 1757); unter Talkhof (1750, 1771); Talkhof. Glashütte (1762, 1764, 1778, 1780)
Laasme	bey der Talckhofsche neu Glashütte; bey der Talckhofsche weissen Glashütte (1777); bey der weissen Hütte unter Talkhof; bey der neue weissen Hütte unter Talkhof (1779); Talckhofsche Glashütte (1768); bey der neuen Hütte (1768); T. Glasf. (1779)
Utsali	bey der Oberpalschen Glashütte (1759); die alte Glashütte unter Vizemeister Staack (1768); unter Oberpahlen (1755, 1756, 1757)
Laashoone	die neue glashütte; bey der neuen hütte (unter Göschel) (1767/69, 1770)
Pajusi	Pajus
Tõrna-Kamari	Spiegelfabrik unter Fleckenstein (1782); Spiegelf u. Laewa; Spiegelfabrik unter Laiwa; Talkhof. Spiegelfab u Kerafer; unter Laiwa/Laewa (1782); bey der Glashütte: den Staackshe Gesellschaft (1783)
Laeva	NA
Haava	bey der Kerrafersche Glashütte (1779, 1787, 1789); aus der Kerrafersche Glashütte (1788); der Kerraferschen Glashütte (1785); des Glashütte zu Hawa unter Kerrafer (1784)
Hoone	die Heintze Gesellschaft (1783); unter Kerrafer; Kerrew. Gl. (1783); Kerrafer (1786)

Whilst there were only some difficulties in finding the locations and identifying the alternative names of sites in Vana-Põltsamaa and Puurmani manor, doing the same for (Kärevere-)Laeva manor glassworks could be considered the most difficult part of this thesis. This difficulty has been noted before (Varep EKI, Kärevere, f. 2000995, 2000997, 2000999) and it is something Varep, Roosma (AM.296.1.68), and Erpenbeck (2015, 310–311) all struggled with. In 1765, Baron Reinhold von Igelström claimed that there were three large new glassworks in Kärevere-Laeva manor (RA, EAA.1348.2.153, f. 41–42). As Haava, originally Valgehoone, is thought to be the newest and **Kamari polishing workshop** opened in 1780 (AM.296.1.68, f. 63, 70; Friedenthal 1929, 15), the three sites must be Tõrna, Laeva, and Hoone. In his unfinished draft, Roosma claimed that **Tõrna glassworks** was one of the first on the estate (AM.296.1.68, f. 55). He is contradicted by Friedrich Amelung, who claimed that at Tõrna window glass production started in 1777 and in 1782, the site switched over to the production of mirror glass (Amelung 1892/1999, 18). Erpenbeck mentions in passing that Tõrna (Tirna) was active since 1769. He also claims workers from Tõrna and **Laeva glassworks** were grouped together in 1782 (Erpenbeck 2015, 311).

Varep believed that Laeva was located where Laeva village council was built in 1861 (Varep EKI, Laeva, f. 2001145). Presumably when glass production was reorganised at Laeva manor in 1777, a new team started working at Tõrna and

this is where the Staack's team later worked. Unfortunately, attempts at separating the workers of Tõrna-Kamari and Laeva in written sources were unsuccessful and they are all listed as working at Tõrna-Kamari. As one of the biggest 18th-century sites and predecessors to Rõika-Meleski, it is likely that most of the workers were employed here and Laeva may have been a small-scale operation or even a potash kiln. Fieldwork is needed to clarify this but in 1783 von Lauw is noted to have owned or rented six glassworks (AM.296.1.68; RA, EAA.1806.1.1, f. 39) which means Laeva had to have been still functional. In his manuscript, Roosma suggested that the team led by Johannes Friedrich Göeschel from 1779 until his death in 1787, was working at **Hoone glassworks** (AM.296.1.68). He did not indicate why he believed this to be true, even noting 'there is a lack of convincing evidence' (AM.296.1.68, f. 70).

Looking at the data, Hoone is unlikely to have been the site for Göeschel's team – it is **Haava glassworks** instead. Mostly as at his death, Göschel is the vice-master *bey der Kerraferschen Glashütte* (Ger. by the Kärevere glassworks; RA, EAA.1266.2.2, f. 261p) but less than three years prior, in 1784 his (second) wife Anna Maria died. In her death record, her husband is listed as vice-master *des Glashütte zu Hawa unter Kerrafer* (Ger. of the glassworks at Hawa under Kärevere; RA, EAA.1257.2.1, f. 423). Göeschel's team also had to work near the Reinthal-Briesemeister team as the two teams were planning to build a better link ('bridge,' i.e. road) in 1783 between the two due to the poor road conditions leading to Haava glassworks (AM.296.1.68). The two sites are only 2.25 km apart. In the manuscript, Roosma switched the names of the sites at points as well as some dates and there are numerous corrections in the text and its unfinished nature must be considered when using it as a source in future studies. The use of further written sources, for example working through all the letters in RA, EAA.1806.1.1, could provide further details and clarity on the attribution of these sites.

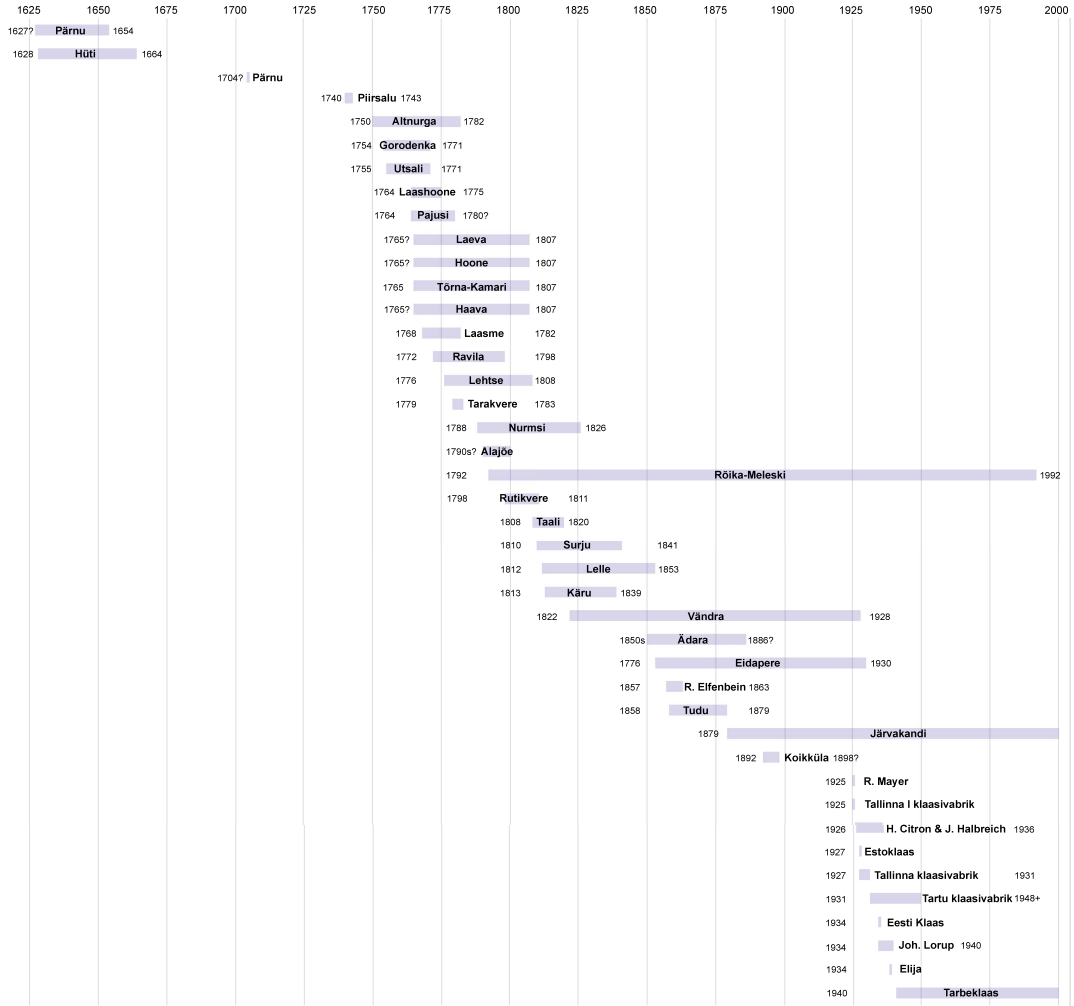

Figure 3. Timeline of the Estonian glass industry.

There were many other sites where it was possible to offer clarifications to provide as geographically accurate a map for Article VI and this thesis as possible (Fig. 2; Article VI, fig. 2). In fact, of the 42 sites, 23 are not scheduled monuments nor listed as cultural heritage objects (Fig. 4) which means they are also missing from the Map of Heritage Objects (Kultuurimälestiste kaart) and Map of Cultural Heritage Objects (Pärandkultuuri kaart). Using the sources indexed on Dataset III, their geographical coordinates have been provided. In addition to Altnurga, Haava, Hoone, Laeva, and Pajusi discussed above, the locations of **Alajõe, Ravila,** and **Tarakvere** 18th-century glassworks were clarified. With **Piirsalu glassworks**, Varep had discovered that the site is shown on the original Mellin atlas draft from 1790 but is missing from the 1798 publication (RA, EAA.1365.1.31)

and used this to date the cessation of work at the factory (Varep 1962a, 139). Erpenbeck was only able to identify workers from 1740–1743 (Erpenbeck 2015, 308). Based on the study at hand, it was not possible to support a later date using genealogical records.

Most of the 19th-century sites were shown on the Map of Cultural Heritage Objects apart from **Eidapere glassworks**, **Koikküla glassworks**, and **Robert Elfenbein's glass factory**. Using archaeological finds, old newspapers, archival material, and public maps, it was possible to determine their locations and clarify their dating. For example, it was discovered that Robert Elfenbein's glass factory in Tallinn operated from 1857–1863 on Lastekodu 44 // Odra 8 (see Dataset III; Kadakas, Reppo & Ööbik 2020, 158–159, fig. 9). It had been previously thought that Elfenbein only started producing glass in 1861 and on Wismari Street (then Vaestekooli; Varep 1962b, 203; Heinsoo 2005, 23). The longest continuously operating site, **Järvakandi**, is not scheduled nor listed as a cultural heritage object either. For sites which are present on Map of Cultural Heritage Objects (Pärandkultuuri kaart) and Map of Heritage Objects (Kultuurimälestiste kaart), some are off centre. More accurate coordinates have been provided on Dataset III based on previous excavations and the listed sources.

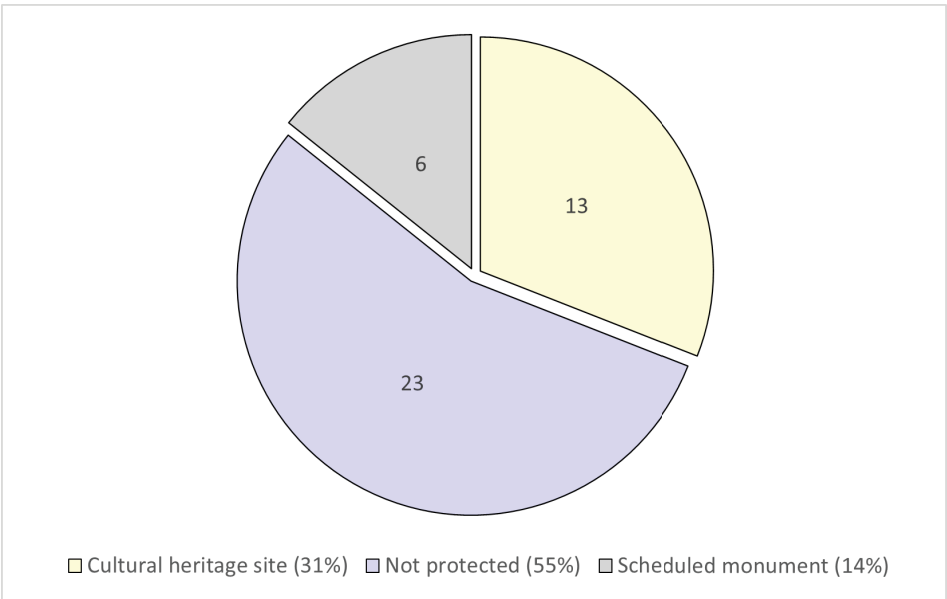

Figure 4. Glassworking sites that were scheduled (under heritage protection), cultural heritage sites (not under heritage protection but mapped) or not protected or mapped at all at the time of this study.

5.4. Glassworkers

In the previous subchapters, some instances where genealogical data has been helpful in revising key information about glassworks have been shown. The use of genealogical data to study the glass industry is in no way a novel idea as evidenced by Erpenbeck's research (Erpenbeck 2015). After the publication of the case study in Article I, another goal in data collection was to find information on glassworkers from the area to find out more about the glassworks. In Article VI, the patterns of movement and life histories of migrant workers in Estonia during the three centuries under study here were explored to find what the origin, life, and role of these workers was like. With the three case studies focusing on the Wentzell, Hagen, and Runge families, it was possible to demonstrate how the glassworking families were connected, how their everyday life may have looked like, and how it changed over the centuries (Article VI, 401–404).

On Dataset II, six individuals from **Pärnu** known to have been involved in glazing and glass trade from the 16th century onwards were included to explore how the industry may have evolved from a simple potash kiln (Põltsam-Jürjo 2009, 223) to a glass production site. Unfortunately, this did not give any leads on 17th-century workers as was hoped. Currently, no workers are known from Pärnu neither from the mid-17th nor the early-18th century. The commandant of Haapsalu manor complex since 1640, Berent Kihn from Kolga in Kuusalu parish was sent to Hiiumaa, Hüti in 1641 in some legal matters and it was claimed that he knows the issues of glassworks well although this claim was challenged already at the time (Roosma 1966, 29). Could it still be possible that the reason he knew about glassworks was that he was connected to one – perhaps the one in Pärnu? It is notable that Johann Kunckel (von Löwenstern), an alchemist who perfected the use of phosphorus and making of gold ruby glass, died in Pärnu in 1703 (Fogelberg & Holl 1988, 10). His laboratory in Berlin on Pfaueninsel was studied archaeologically in the 1970s (Stephan 2021, 233). As discussed in Article VI, Elsz Bredensteen also died in Pärnu in 1699. She was the daughter of Hüti vice-master Wilhelm Breidenstein and the wife of apprentice Jürgen Wentzell. The couple had left Hüti in 1662 (Article VI, 401; see below) but it is unclear whether Jürgen or their children were involved in glass production after this.

The Wentzell family is the first known glassworking family in Estonia – the other 17th-century workers at Hüti do not appear to have had other family members active in glassmaking in Estonia. The **Wentzell family** was chosen as the first case study in Article VI as a result. Information on 17th-century workers is much harder to collect as many church books compiled before 1712 were destroyed or lost in the Great Northern War (Palli 1997, 6–8). The copious letters connected to the glassworks would require a significant amount of time to go through in the hopes of piecing together genealogical information from fragmentary remarks about the workers. In this instance, it was possible to add a few more details to Jost Wentzell's[37] life history who is currently the first known glass

[37] Hans-Georg Stephan refers to him as Hans Wentzel (Stephan 2021, 114).

master in Estonia. Elias and Jürgen Wentzell's life histories were also examined. Based on the collected information it was suggested that Elias was probably not Jost's son as Roosma had postulated whereas Jürgen Wentzell likely was (Article VI, 401). Unfortunately, the original records referring to Jürgen Wentzell's profession were not located, but it should be noted that the term *apprentice* which is used in Article I is translated into English from Roosma's *sell* (Est.), but his original statement of Jürgen being an apprentice is questionable (Article VI, 401). Most importantly, if the original record described Jürgen as *Gesell* or *Gesseln* as is suspected, it referred to him being a journeyman – a migrant glassworker. For example, Berthold Wentzel was a journeyman glassmaker (*Glassmachher-Gesseln*) like several others on Dataset II.

For the second case study, the Stichkorn family was initially chosen but it was not possible to gather enough material for a case study of the same scope as for the other two families, so the **Hagen family** was opted for instead. The Hagen family was one of the first glassworking families to arrive in Estonia in the middle of the 18th century. With members of the family working at Gorodenka and the Põltsamaa-Kärevere region, their movements allowed for a good insight into internal, i.e. local migration of workers at the time as most of the sites were within a 20 km radius of each other. The geographical closeness in this region was important in building an intertwined community, evidenced most clearly in marriages between members of the community and godparenting (Article VI, 397). Anton Christopher Stichkorn and Maria Catharina Hagen's marriage and their daughters' 13 godparents, all from glassworking families (Stichkorn, Hagen, Staack, Garther, Göschel, Beck, Brisemeister, and Mussum) are good examples of this (Article VI, 397, 403; Dataset II).

There were some downsides to a community interacting very closely daily, such as disease outbreaks. It was noted that in 1769 four individuals of the Hagen family died (Article VI, 403) at Utsali glassworks. In addition to the four individuals, a fifth person from the Stichkorn family also died at Utsali in 1769 and there were several deaths in 1768 and 1770 at the same site (Dataset II). This and the potential dysentery or cholera outbreak in 1783 in the area which was mentioned in multiple letters as a diarrhoea outbreak (see AM.296.1.68, f. 73) would be an interesting case study into how working in close quarters and living in a close-knit community may have affected the health of the workers.

The **Runge family** was used in Article VI to introduce changes to the industry in the 19th century. At the time, smaller production sites were closing or merging with larger factories and the work environment changed as serfdom was abolished and local Estonians began to work at the factories more frequently. There were still troubles in incentivising Estonians to work in these factories so the reliance on an influx of foreign workers and the growth of the local glassworking community remained a necessity until the late 19th century (Article VI, 397). In the second half of the century, workers started to become less mobile, and they would spend longer at a single site, although Richard Runge's four decades at Järvakandi were certainly unusual (Article VI, 404). The Runge family is one of the most well-represented families in this study. The family was influential in the

19th- and 20th-century glassworking community in Estonia and looking at the connections between workers and sites shown in Figure 5 in Article VI, clearly stands out. An updated version of this figure is given below (Fig. 5). At first sight, this could be considered a bias introduced by using Robert Feldmann's records as his grandmother was Emilie Runge and thus his genealogical research inevitably includes many members of this family, however he was also directly and to the same extent related to the Beck, Grimm, Erdmann, Stichkorn, Liphardt, and Meissner families and these families do not stand out more than others (for his family tree, see RA, EAA.1850.1.1123).

Moving beyond the case studies and their connections to each other, information on the **everyday lives of glassworkers** in the industry was collected. The goal was not to describe the life experiences in minute detail but to offer an overview of what life was like for the workers and their families in Estonia. In Article VI, their life from birth to old age and death was followed with the questions presented in Chapter 1 in mind – where did the workers come from, and what was their role and life in the industry? It was possible to show that most 17th- and 18th-century workers came from Germany, mainly Lower Saxony and Mecklenburg-Western Pomerania and they moved frequently, every one to three years from site to site despite the lease (Ger. *Pacht*) of a site generally lasting 12 years. No areas stood out in the first half of the 19th century – most workers moved to Estonia from modern-day Germany but in the second half of the century, a significant number of workers arrived from Karelia in Finland (Article VI, 397, 399; Dataset II).

As workers in a wholly migrant-led industry with some supporting staff of local serfs, the vice-masters had a level of autonomy in organising the workflow, but this seems to have been challenged by higher management at the manors at times (e.g. manager Hake at Kärevere-Laeva glassworks in RA, EAA.1806.1.1 or Platzbeck at Hüti, Roosma 1966, 23–30). In Table 8, the different professions listed on Dataset II are shown. Several workers had multiple positions during their career, so the number of individuals involved in a profession does not reflect the overall number of workers. Interestingly, the word *fabricant* which could be read as *vabrikant* in modern-day Estonian – factory owner in English – refers to a worker of a factory, *vaaberkant* (archaic Estonian; see Uued Luuletused 1875; Lilienthal, Kreutzer & Randloo 1986/2010, 30). Before industrialisation, a worker or *fabricant* was referred to as glassmaker (Ger. *Glasmacher*). The workers who were named either glassmaker (*Glasmacher*) or glassworker (*Glasfabrikant*) have not been merged on Dataset II.

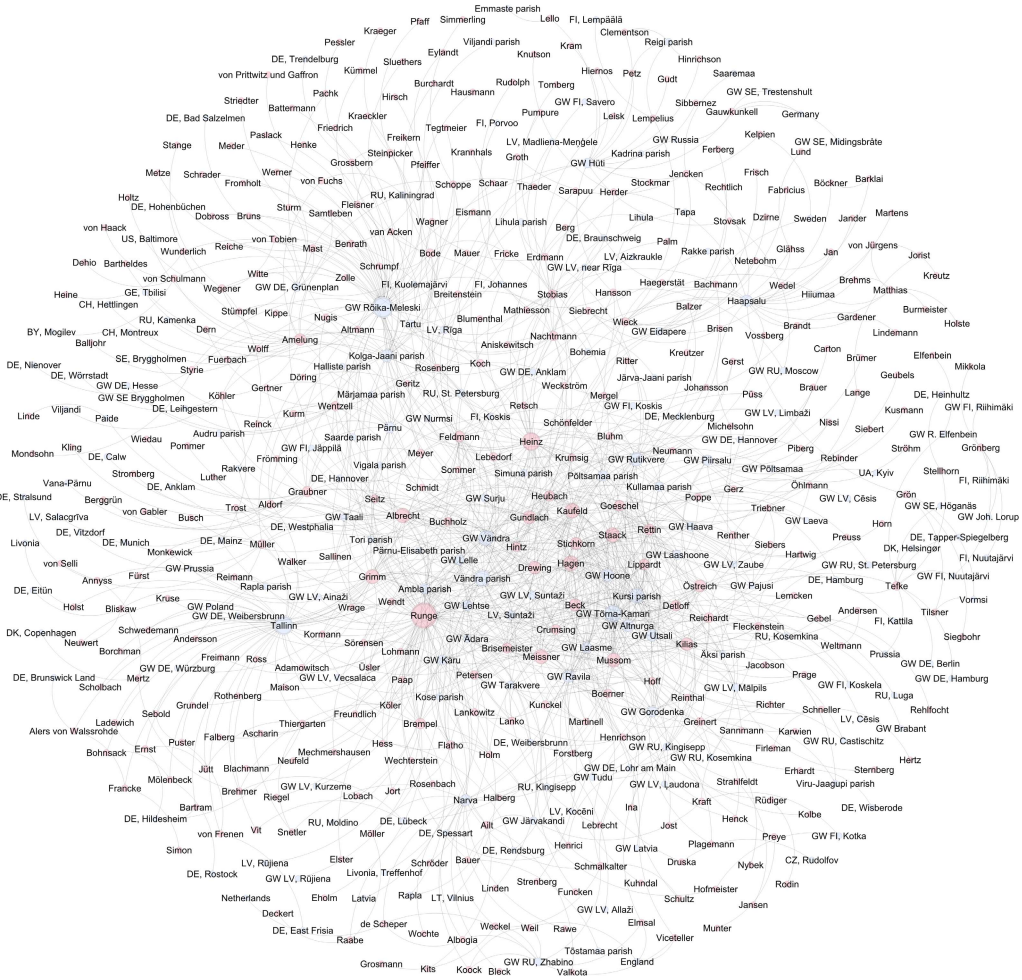

Figure 5. Connections between glassworking families (red) through marriages and locations (blue) on Datasets II and III. The larger the node, the larger the number of connections.

Working as a glassworker meant long shifts, especially for batchers as melting a new batch of glass took over 30 hours. In Article VI, the workflow of the workers was described in short (Article VI, 400). This has been covered in detail in many studies describing the production aspects of the industry (e.g. Alliksaar 2012; Dreving 2013; Karma 1963; Lumiste 2015; Reiman 1892a; 1892b; 1892c). There were likely as many workflow setups as there were glassworks. At the same time, non-working relationships as those described in the three case studies are much less commonly studied. Professions beyond glassmaking shown in Table 8 – cobblers and milliners, innkeepers, pharmacists, and teachers – hint at the life beyond the furnaces around the glassworks. The presence of teachers and their

work by glassworks from as early as the 1760s due to the reading comprehension requirement set forth by the Livonian Church Law was discussed in Article VI (Article VI, 398). Unfortunately, the history of education is currently the only way to study childhood at glassworks. Through written records, we can also find information on infant and childhood deaths. Most striking was the absence of the glassworkers' children's graves who died in infancy or before the age of 12 on the cemetery management database HAUDI (Article VI, 399).[38]

Table 8. Glassworking professions listed on Dataset II (typographical errors original).

Profession	Profession in German or in original source	Count
Alchemist	Alchimist	1
Apothecary glass maker	Apotequer Gläser	1
Apprentice	NA	3
Ashburner	Aschbrenner	2
Batcher	Boilmaster, Gemengemacher	3
Blacksmith	Schmid	1
Bookkeeper	Angeschreiberer, Buchhalter, Buchwächterin, Hüttengeschreiber, Hüttenschreiber, Schreiber	13
Bottle maker	Bouteillenmacher	1
Box maker	Kastenmacher	2
Builder	Baumeister	1
Carpenter	Tischlermeister, Zimmergesell	3
Chemist	Chemiker	3
Cutter, Journeyman cutter	Schneider, Schneidergesell, Wender	15
Director	Direktor	10
Doctor	Arzt	1
Distiller	Brenner	1
Elder of the Glazier's guild	Eltermann des Amt der Gläser	2
Forester	Rangergesell	1
Glassblower	Bläser	3
Glassmaker, Journeyman glassmaker	Glasbrenner, Glasbränner, Glasmacher, Glassmachher-Gesseln	33
Glassmaster	en glaaszmestare, Glasmachermeister, Glasmeister, Meister	12

[38] https://www.kalmistud.ee/Kalmistute-koduleht, 14.05.2024.

Profession	Profession in German or in original source	Count
Glassworker	Fabrikarbeiter, Glasarbeiter, Glassfabri. Beyarbeiter, Glasfabricant, Glasfabrikant, Glasfabriquent, Glaswerker	81
Glazier, Journeyman glazier	Glaeswerder, Gläser	51
Grinder	Schleifer	13
Hollow glass maker	Hohlgläser	20
Innkeeper	Gastgeber, Krüger	3
Lease owner	Commissarius	2
Manager	Disponent	2
Master bottle maker	Bouteillenmeister	1
Master grinder	Schleifermeister	1
Merchant	Kaufmann	3
Miller	der Müller, Mühlenzüchter	3
Milliner	Hutmacher	1
Mirror maker	Spiegeler, Spiegelfabrikant	27
Mirror master	Spiegelmeister	5
Pharmacist	Apotheker	4
Polisher	bey der Polier Meister fabrikant, Polierer	5
Polish master	Poliermeister	2
Potash burner	Potaschekocher	2
Preblower	Aufbläser, Vorbläser	6
Recruiter	Werber	1
Schoolmaster	Schulmeister, Lehrer	7
Shoemaker (Cobbler)	Schuster	2
Smelter master	Hüttenmann, Hüttenmeister	6
Starter	Anfänger	7
Stoker	Schürer	19
Stretcher	Strecker	7
Vice-director	Vizedirektor	1
Vice-master	Vicemeister, Vizemeister	16
Window glass maker	Fenstergläser	4
Worker	Fabricant, Fabrikant, Werker	76

The data gathered during this research make a viable contribution to further study of the industry and have helped produce a timeline of the Estonian glass industry, as shown in Table 1 in Article VI and in Figure 3, but the datasets are far from complete. There are numerous church books and private letters that could be used

to obtain further information as suggested already in Chapter 4. An examination of the connections between the landowners could be a potential research topic. Work accidents, endemic outbreaks, causes of death both on and off site, childhood mortality rates, and individual life histories are also promising topics when looking at the collected data.

Another multi-faceted topic is the use of local, non-German workforce at these sites from the end of the 18th century. For example, Nõlva glassworks was founded and run by the manor owner, Friedrich von Wrangell. Thus, in addition to German glassworkers, local serfs were employed – it would be an ideal site to study the two groups together. The recent results from the investigation of the housing of glassworkers at Rõika-Meleski could be interesting to compare with archaeological data of the same type of housing. This could provide researchers with information on what may be preserved of the workers' lodges underground and how to identify the living quarters by or at a glass production site as previous studies have been unsuccessful in this. The impact of raw data collection in identifying and growing the research potential of a topic is clearly visible here – there are endless avenues for future research.

As shown in this chapter, collecting, verifying, and correcting data about the sites and workers helped revise and clarify their locations as well as the ownership and dating of the sites to present a revised timeline in Article VI and Dataset III. One of the main aims of Article I was to examine what possibilities there were for an interdisciplinary study of the glass industry which was put to effect in Article VI. Using life histories of migrant glassworkers as a data source has been shown in this thesis both through the life experiences of the workers as a whole or through individual cases which illustrate the conditions and life courses of people involved with the glass industry from the 16th–19th century. In Chapters 5.3. and 5.4, glass finds, and other archaeological information helped identify dates and locations of sites but also the role of certain workers (managers, vice-masters, bottle masters). The use of cartographic material, including thematic web map applications (see Ch. 4.2) to collect spatial data proved to be particularly useful.

6. USING GLASS IN ESTONIA

The third and final objective of this study was the characterisation of local glass consumption and its change over time with a focus on the early modern and modern period. Finds from the second half of the 16th century to first half of the 20th century are discussed, but more specific focus is on finds from the 17th–19th century – a period from the founding of the first local glassworks to the first attempts at mechanisation of the industry. From utilitarian bottles and jars to elegant drinking vessels (Articles I–VI), countless glass objects were made and brought to the territory of modern-day Estonia during this period. The objects have been examined as witnesses of the past, as signs of affluence and art (Articles III, IV; Reppo 2022a; 2022b; 2022c), relationships between people and places (Articles I–VI), everyday life (Articles II, V; Reppo & Tint 2022a), as indicators of change (Articles IV, V), merrymaking and celebrating (Articles II–III), and production and storage (Articles II, V). In this chapter, early modern and modern glass consumption in Estonia is characterised using archaeological finds from Haapsalu, Pärnu, and Tallinn as examples. The typology of local glass during this period is given in Appendix 1 which accompanies Dataset I.

6.1. Studying glass consumption in Estonia

As shown in Chapter 4, visual systematic analysis on a box-by-box basis was used to document 24,067 glass fragments (Fig. 6; Articles I–VI) which formed the original dataset, ranging from the 12th–20th century (Dataset I). Most of these finds – 19,726 (82%) – can be dated to the early modern and modern period (1550–1950; see Ch. 1). However, in many cases, a more precise date was impossible to provide at this point and many finds are dated to wide periods, e.g. 13th–17th century. Dataset I allows filtering results, but due to the constraints mentioned here and in Chapter 4, the fragmentary nature of archaeological glass (see Article V, 145, footnote 19), and the sheer number of artefacts, further work with archival records (where possible) and compositional analysis would be required to provide a concise statistical overview in terms of dating.

As is apparent from Chapter 1, articles in this thesis have been published in either English or Estonian. When writing about some artefacts and decorative techniques, it was discovered that no terminology was available in Estonian. This may be a result of extended periods of inactivity in glass studies described in Article I and Chapter 2. New words had to be constructed which in turn is a direct contribution to the local scientific language. These words included *vaaliklaas* for linen smoothers (Reppo & Tint 2022a, 150), *kantkühmpeeker* for bossed beakers (Article II, 20), *kantlohkpeeker* for a beaker with concave bosses (Article II, 21), *silinderpeeker* for *Stangenglas* (Article II, 14) and *hallitoonitehnika* for *grisaille* (Article V, 149). Additionally, it was suggested to use *mõõdupeeker* (Article II, 14) instead of *mõõduklaas* (Roosma 1966, 61) for trailed communal beakers called passglass or more commonly, *Passglas* (Ger.). The change was suggested

as the term *mõõduklaas* can be translated as 'measuring cup' and as such, is misleading. The created words were also proposed to the Institute of the Estonian Language (Eesti Keele Instituut) and some of them can now be found on Sõnaveeb.[39] In Appendix 1, the A–Z of glass in Estonia in the early modern and modern period is presented. Each term is provided with an Estonian translation.

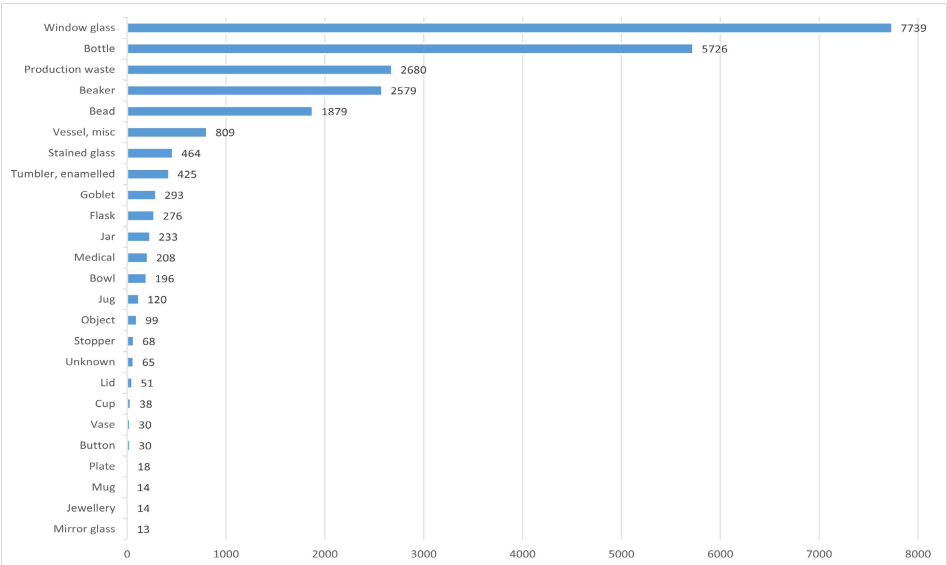

Figure 6. Distribution of all find types on Dataset I.

As a result of additional post-processing following the bulk identification of finds which in essence can already be error-prone due to time constraints and the fragmentary nature of artefacts, some errors are corrected in this chapter regarding published find numbers or site codes (see Table 9 footnotes for the erroneous codes). These have either come about as simple typographical errors or due to worn or incorrect numbers written on artefacts. While inked labels and find numbers covered with clear lacquer preserve very well, find numbers written directly on the fragments with no coating rub off easily, even during the initial packing. In some of these instances, it was impossible to determine the correct artefact number as several sites were also lacking original finds lists. After working with over 24,000 fragments of glass, the author would recommend evaluating the durability of the chosen labelling technique before committing to it to avoid loss of information.

As noted in the introduction and Chapter 4, this study focuses on finds from Haapsalu, Pärnu, and Tallinn which are all port towns and import hubs in their respective areas in coastal Estonia. Of all the fragments, 10,170 (42.3%) were from Tallinn, 6,830 were from Pärnu (28.4%), and 554 (2.3%) from Haapsalu.

[39] Online dictionary: https://sonaveeb.ee/, 14.05.2024.

The proportions are indicative of the number of archaeological excavations and surveys conducted in the respective towns (Article V, 142–143). These numbers are certainly influenced by the fragmentary nature of the finds and the material qualities of glass itself (fragility), changes in collection principles as well as development of urban and rescue archaeology in Estonia and lack or partial documentation of contexts as discussed in Chapters 2 and 4. As noted in Chapter 4, the number of fragments on Dataset I does not represent the number of unique artefacts. In the following chapter, the motivations behind studying the use of glass are discussed. The research results for the artefacts published on Dataset I and presented both individually and as bulk finds in Articles I–VI (see Table 9), are combined and presented in this chapter to characterise glass consumption in modern and early modern Estonia.

Table 9. Finds published in Articles I–VI and overall number of discussed finds.

Article	**Fragments studied**	**Published finds from Dataset I**
Article I	NA	PäMu 14350/A 2501: 18 (2 finds, photo)
Article II	357 (3175 for comparison)	HM 9206: 5 (photo), 7, 14, 15 (photo), 18, 21, 22, 24, 25, 28 (photo), 29; AI 6004: I/262; AI 6480: 946; AI 6881: 134, 377;[40] AI 7032: 443/6; AI 7284: 29–30; PäMu 14489/A2507: 9, 14; PäMu 14440/A2508: 506; PäMu 15552/A2598: 13/35; mentioned sites: AI 6480; AI 6568; AM 17966 PK 4521; TÜ 714; TÜ 1013; TÜ 1014; TÜ 1019; TÜ 1023
Article III	14	TLM 28149: 246–253, 271 [all with photos]
Article IV	17,069	AI 6004: I/58, I/519, I/539; AI 6109: 22,[41] II/36; AI 6332: 1099; AI 6480: 593; AI 6481: 47; AI 6957: 104–105; AI 6965: 115; AI 7032: 293/22–27, 293/30, 329/1, 332/11–19, 614/1, 670/13, 816/1; AI 7863: 630;[42] AI 7909: 3202, 10362, 12116; PäMu 14350/A2501: 131; PäMu 14489/A2507: 19;[43] PäMu 14641/A510: 471; PäMu 14642/A2512: 14; PäMu 15060/A2520: 50; PäMu 15136/A2532: 70; TLM 16316; TLM 28149: 246–253, 255–258, 271, 993;[44] TLM 5737: 812; TM A 51: no number; TM A 270: no number (Jakobi St.)

[40] The find number in Article II, 21 (AI 6881: 337) is incorrect. The correct find number is 377.
[41] The site code in Article IV, table 1 (AI 6019) is incorrect, the site code in Article IV, 93 (AI 6109) is correct.
[42] The address in Article IV, table 1 (Jahu 6) is incorrect. The find is from Tatari 13, Tallinn.
[43] The site code in Article IV, 78, 86 (PäMu 14489/A507) is partially incorrect. The correct side code is PäMu 14489/A2507.
[44] The information provided by the museum at the time of the study (A4: 993) turned out to be incorrect. The updated accession number is TLM 28149, the find is from Aida 2/4, Lai 21, 23, Tallinn not Dunkri 5.

Article	Fragments studied	Published finds from Dataset I
Article V	5,830 (8,809 for comparison)	HM 7364; HM 8241: 381 (photo), 642, 1024; HM 8850: 5, 28; HM 8929: 49, 50; HM 8966: 7, 90; HM 9206: 4 (photo), 21, 22, 24, 27; PäMu no number (photo); PäMu 14350/A2501: 18 (photo), 21, 34, 35 (photo), 40, 42,[45] 50, 75, 79 (photo), 81, 84, 99, 142, 145, 162, 168, 187, 218, 225, 420 (photo), 472, 534 (photo), 536, 541; PäMu 14440/A2508: 136 (photo), 302; PäMu 14456/A2506: 1274;[46] PäMu 14489/A2507: 12, 18, 156, 175, 199, 237, 279, 352; PäMu 14640/A2509: 1, 19, 28, 42, 97, 98, 122, 152, 157, 181,[47] 385, 437, 439, 764, 1401, 2808, 2970; PäMu 14641/A2510: 65, 838; PäMu 14642/A2511: 69, 365 (photo),[48] 764, 1093, 1094, 1191, 1681, 2137 (photo); PäMu 15010/A2518: 2, 3, 52; PäMu 15060/A2520: 44 (photo), 50 (photo), 52; PäMu 15136/A2532: 5, 12; PäMu 15405/A2558: 6; PäMu 15467/2569: no number; PäMu 15549/A2596: 17/212
Article VI	NA	AM 18398 PK 4625: 2; HM 7364; HM 9206: 4, 15, 28; PäMu 15060/A2520: 45; RM A 180: 150; TLM 20059: 432; TÜ 1968; TÜ 2302: 1, 20, 26, 51, 80 [all with photos]

6.2. Window glass

While in 2019, it could be claimed that flat glass, more specifically window glass was understudied in Estonian archaeology (Article I, 218, 221), this is no longer the case. In Articles II, IV, V, and VI, finds catalogued for Dataset I and details of the history of Estonian glassworks (Datasets II & III) were used to discuss the typological and technological developments of using and making flat glass in Estonia. Flat glass formed the second largest part of the catalogued finds at 34.1% (8,216 fragments; Fig. 6–7). The largest group among flat glass is window glass which constitutes 94.2% of all flat glass (7,739 fragments; Fig. 7); 67.8% of all flat glass is from the second half of the 16th until the first half of the 20th century (5,572 fragments). Having studied the glass from a 15th-century landfill at Jahu St. in Tallinn (Russow et al. 2019, 199–201), where undecorated window glass formed 74.8% of the glass finds, it became clear that despite the lack of

[45] The site code in Article V, table 4 (PäMu 14640/A2509) is incorrect. The correct side code is PäMu 14350/A2501.
[46] The find number in Article V, 167 (PäMu 14456/A2506: 1247) is incorrect. The correct find number is 1274.
[47] The find number in Article V, 166 (PäMu 14640/A2509: 1881) is incorrect. The correct find number is 181.
[48] The site code in Article V, fig. 4 (PäMu 1462/A2511) is partially incorrect. The correct side code is PäMu 14642/A2511.

decorations, discarded window glass represents a telling part of past townscapes. With this research, the aim was to see how the fragments can be used to study everyday life (Article II, 16) and the role of flat glass in Pärnu, Haapsalu, and Tallinn (Article V, 141). Changes in the use since its introduction to Estonia in the 13th century (Article V, 143) as well as changes in the technology of making flat glass (Article VI; Johanson et al. forthcoming) were also examined.

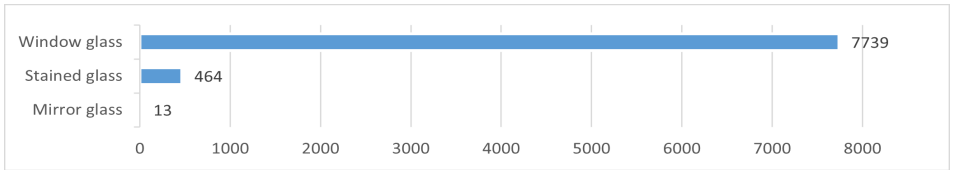

Figure 7. Distribution of flat glass on Dataset I.

According to written records, windows at Haapsalu Episcopal Castle were divided, depending on the room, into 1, 4, 6, 8, 12, 18, and 20 squares (Jaago 2009, 22–23) but the records do not describe the windows further. In Article II, fragments from a 1580s–1660s cesspit and information from written records were used to show that Haapsalu Castle had windows with triangular and rhomboid panes with grozed edges (HM 9206: 65) set in lead cames (Article II, 16–17). These types of windows had **fixed lights** which could not be opened, and the 'squares' listed in inventories refer to these lights rather than individual glass panes (Fig. 8). Based on Dataset I, rhomboid (diamond-shaped) and triangular panes as well as polygonal (quadrangular) panes (Fig. 9) set in lead cames were popular throughout the medieval and early modern period in Estonia (Fig. 10; Article V, 144–145) and this was the case elsewhere in Europe (e.g. Bis 2019, 155–158; Meulebroeck et al. 2021, 1).

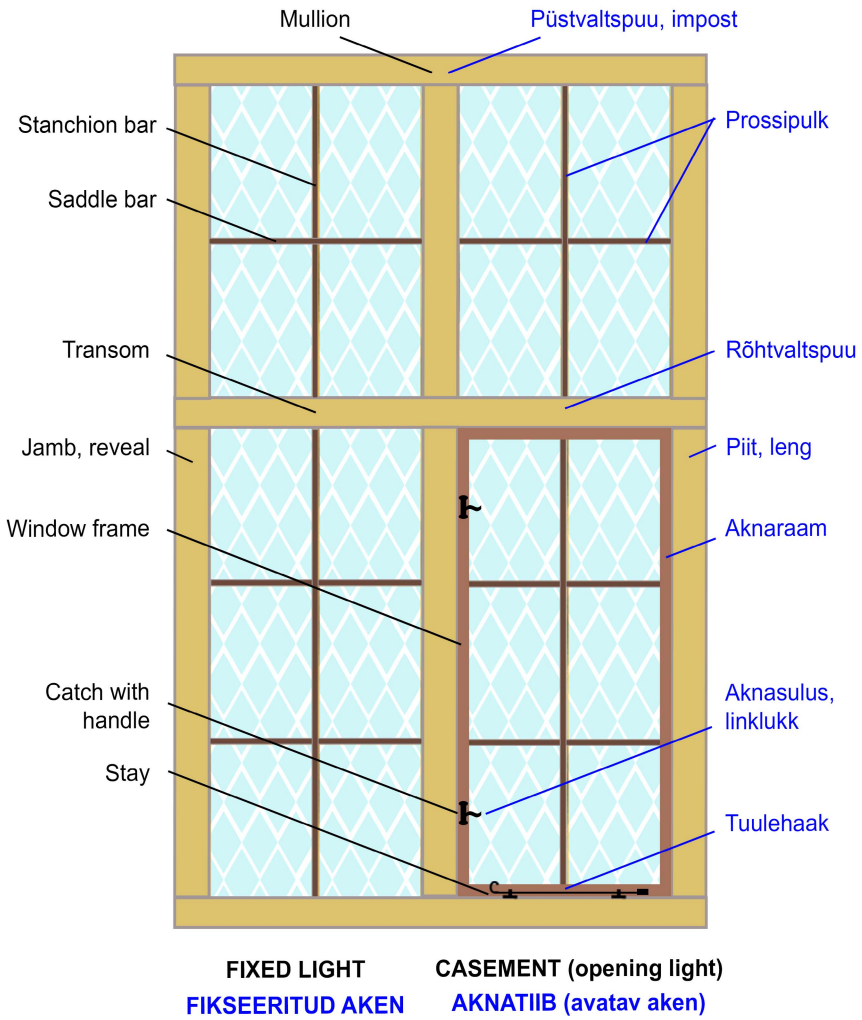

Figure 8. Parts of a window. *M. Reppo.*

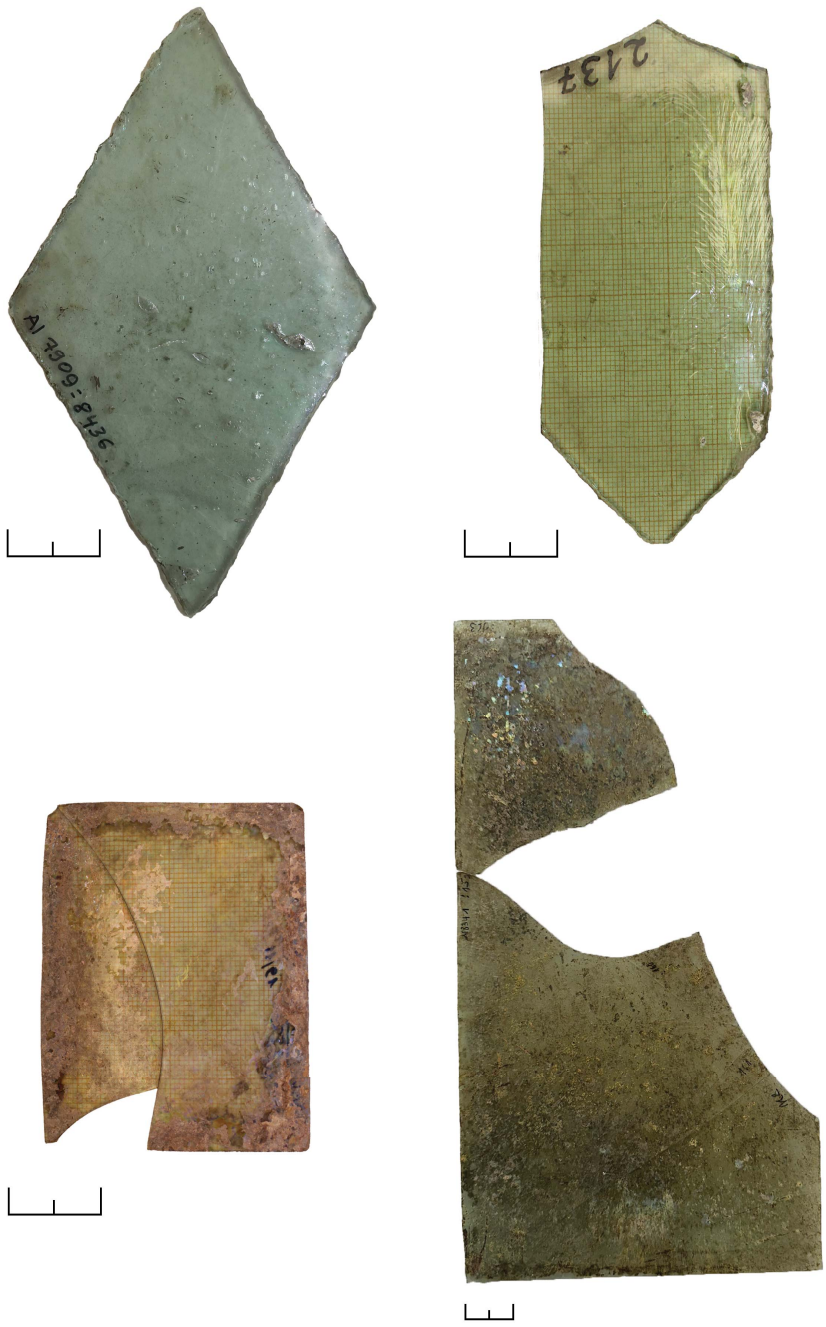

Figure 9. A grozed rhomboid (AI 7909: 8436), grozed polygonal (PäMu 14642/A2511: 2137), a small cut rectangular (PäMu 15552/A2598: 19/11–19/12) and large cut rectangular pane (AI 8341: 159–163). Scale: 2 cm. *M. Reppo.*

The panes were worked locally by glaziers even before the 1620s when local glass began to be used on façades like in Haapsalu Castle (Article II, 17). Indeed, glaziers have worked in Estonia since the medieval period (Kaplinski 2015, 72; Põltsam-Jürjo 2014, 15). It was possible to find traces of their trade which indicate a notable change in techniques in the 17th century in Estonia. Prior to the adoption of the diamond-cutter in the 16th century in Italy (Bugslag 1998, 169; Young 2008, 295) and the subsequent transfer of this technique across Europe, window glass, mainly produced as cylinder glass, less frequently as crown glass (e.g. AM 17966 PK 4521 XXVIIa: 6, 21, 22), was snapped in pieces of various shapes (Fig. 9) by a dividing iron and prepared for glazing by **knapping or grozing** with a grozing iron. The scalloped, nibbled edge had a snag which allowed the panes to stick better into the linseed putty that was used with the lead cames (see Article V, 145) and allowed for a tightly interlocked fit between panes (Brown 2019, 16).

As discussed in Article V, knapping was gradually replaced by **diamond-cutting** in the 17th century in Estonia (Article V, 146) which corresponds to the development in Europe (Brown 2019, 15–16). The learning curve in adopting this new technique is possibly indicated by fragments where both cutting and grozing (e.g. PäMu 14440/A2508: 302; PäMu 14440/A2505: 476) has been used. Although diamond-cut edges could be grozed as well, in these examples, the work is either left unfinished or the glazier has reverted to the old technique. This change could also be observed at Padise where a house built in the moat of the former monastery in the 1600s burnt down in 1766, leaving behind a large quantity of window and stained glass, either knapped or cut (Kadakas, Reppo & Ööbik 2020, 158). The same can be seen at Hüti where windowpanes were both grozed (e.g. AM 17966 V: 6) and cut (AM 17966 V: 33; Roosma 1966, 67). At both sites, glass with cut edges dominated which fits well with the dating of this technique.

Figure 10. A fixed light from St John's almshouse (AI 6467: 585) with cut rhomboid panes. Shown sideways. Scale: 2 cm. *M. Reppo.*

This study has shown that the adoption of diamond-cutting did not influence the **shapes of the panes** immediately. For example, the preserved 17th-century window light (square) from St John's almshouse in Tallinn (AI 6467: 585; Johanson et al. forthcoming) from a potential glazing workshop (Mäll, Kadakas & Vaheoja 2002, 29) had 15 triangular or rhomboid panes characteristic of the medieval period. All preserved panes have cut edges (Fig. 10). Windows continued to be symmetrically divided by the transom, mullion, and the supporting saddle bars (Fig. 8). By the 18th century larger, rectangular panes were in use as was seen at Padise (Kadakas, Reppo & Ööbik 2020, 158), Tallinn, Haapsalu, and Pärnu (Article V, 146–147; Dataset I; see Fig. 9). These let in more light and allowed for a better view. They could also be opened. Some original, restored 18th-century windows with rectangular panes can be seen on the façade of the Lithuanian Embassy on Uus St. 15 in Tallinn, built in 1751 (Mäeväli 1980, 13, 17). There are only nine intact or almost intact small rectangular or square cut panes on Dataset I that could date to this period.

With the founding of multiple factories in the second half of the 18th century and beginning of the 19th century, window glass started to become ubiquitous (see Ch. 5; Article V, 147; Article VI). The square and rectangular panes got larger, like at Toom-Kooli St. 15 (AI 8341: 159–163 and AI 8596: 312–315; Johanson et al. forthcoming, Ch. 4, fig. 38). The transom moved upwards, and the lower casements for the lights became larger than the upper ones (Mursu 2020). The 2 × 2 division of casements seen in early-to-mid-18th-century windows in urban

settings made its way to villages by the first half of the 19th century and window glass became an increasingly common occurrence among finds from rural sites (Dataset I; Article V, 148; Mursu 2020). Window glass makes up 32% of all catalogued glass artefacts, and that is similar for Tallinn, Pärnu, and Haapsalu individually as well (Article V, 144). In the final quarter of the 18th century, colourless window glass started to be produced at Ravila glassworks (Article V, 147; see Ch. 5). Prior to this, most window glass produced in Estonia had a greenish or bluish tinge.

Local production lowered the price which meant many more people could afford glazed windows. In fact, in the second half of the 18th century, **greenhouses** began to be built (Plath 2010). Around 30 historic greenhouses are currently under heritage protection in Estonia.[49] Only three greenhouses have been archaeologically studied in Estonia – two heated greenhouses from the second half of the 19th century in Tõnismägi 11A in Tallinn (Varul et al. 2018, 190) and a heated 19th–20th-century greenhouse in Kärdla in the garden of a broadcloth factory established in 1830 (Reppo & Malve 2023, 6). At these sites, window glass is abundant but further study is needed to gain an understanding of how and what types of panes were used. There were many things that stayed the same for a long period of time which complicates the dating of window glass. For example, rhomboid panes have remained in use in churches until today, so it was hard to say whether the intact, cut panes found at Pühalepa Church (HKM 6617: 9; Reppo & Malve 2022, 27) or Ruhnu Church (PäMu unnumbered; Dataset I) are from the 18th or 19th century. Window glass was made using the enhanced cylinder method in Estonia until 1928 when the Fourcault machine was set up at Järvakandi glassworks and the process of making flat glass was mechanised. The machine was used until 1995 (Alliksaar 2012, 94).

6.3. Stained glass and other flat glass

Although technology-wise, stained glass developed similarly to regular window glass, decoratively speaking, there were aspects that needed additional focus. The overall use of stained glass in Estonia was concentrated on with the aim of cataloguing finds to assist researchers in future studies (Article IV, 75) and developing terminology (Article V, 149; Ch. 4). Inspired again by the finds from Jahu St. (Russow et al. 2019, 200), decorative motifs were used – birds and winged creatures (Article IV) – and geographic locations – Haapsalu and Pärnu (Article V, 148–151) – to demonstrate the working potential of Dataset I. In Articles II, IV, and V, the use, and decorations of stained glass in Estonia was discussed. Some further ideas and sites were presented in expert reports (Reppo 2022a; 2022b) and fieldwork articles (Kadakas, Reppo & Ööbik 2020, 158). The motives behind using stained glass were also of interest to find out whether the

[49] National Registry of Cultural Monuments (Kultuurimälestiste register), 14.05.2024.

claims about the secular use of stained glass in Haapsalu (Article II, 18) had any bearing on the archaeological record (Article V, 148–151).

It was possible to identify that **painted glass** was more popular than brightly coloured plain glass at least in Pärnu and Tallinn (Article V, 148–151; Russow et al. 2019, 200; Dataset I). From all 464 stained glass fragments recorded on Dataset I (Fig. 7), 248 were from the early modern or modern period, mostly with dates up until the end of the 17th century (216 of the finds). 181 of these later stained-glass fragments had painted scenes or lines (Fig. 11). Although in terms of statistics, the most popular theme was angels and winged creatures, the data are skewed as most come from the same window found from Pärnu, Uus St. 5/7 (PäMu 14489/ A507: 19; Article IV, table 1). The most common decorations were various lines that could not be more precisely identified (see also Article V, table 2). The glass could be painted single-sided or double-sided and these techniques seem to have been equally used (Dataset I). While painted scenes could be used both in secular and ecclesiastical spaces, their size is not indicative of their use as smaller figures can be present in churches as well. For example, the pane with Anthon Thor Helle's name from 1718 is only 6 × 11.1 cm in size yet it was part of a stained-glass window at Jüri Church (AD 1220–1884) before being reused as a fire or window screen (AM 12422 PK 2324).[50] The same goes for the restored oval pane from Pühavaimu Church (AD 1300) which depicts the property mark of Jost Timmerman's family from the 17th century.[51] Of the total 321 painted fragments recorded on Dataset I, 14 were found in or by old churches.

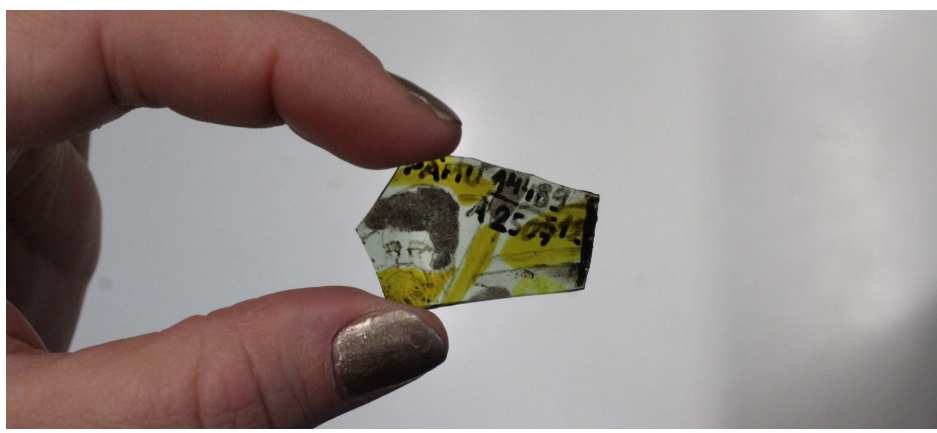

Figure 11. A fragment of a stained roundel from Pärnu (PäMu 14489/A2508: 12). *M. Reppo.*

[50] http://www.muis.ee/museaalview/416017, 14.05.2024.
[51] https://register.muinas.ee/public.php?menuID=monument&action=view&id=1994, 14.05.2024.

Although round colourful panes were used already in early medieval churches and chapels, most famously perhaps at the Cathedral of Notre-Dame of Reims (AD 1163), they became more popular by the late 15th century. By the Reformation, round panes, or stained **roundels** (Fig. 11) were produced at a semi-industrial scale in the Low Countries as in addition to churches, they were now used to decorate private houses and scientific studies have shown they let in more light than their rectangular or rhomboid counterparts (Meulebroeck et al. 2021, 1–2, 11). Sometimes, famous engravings were used as inspiration (Brown 2019, 12). This fashion did not surpass Estonian consumers and several of the 16th- and 17th-century curved stained glass fragments from Pärnu (Article V, 149) and Tartu (Reppo 2022a, 6–7) are from round panes. Roundels made for domestic use are generally from a single circular or oval panel which is fitted with lead cames in the middle of colourless panes. They could also be combined from multiple panes. Domestic roundels were decorated in silver staining (yellow) or grisaille (different shades of grey; Meulebroeck et al. 2021, 8; see Chapter 4 for the development of terminology). Identifying scenes from engravings could be a potential future project utilising Dataset I.

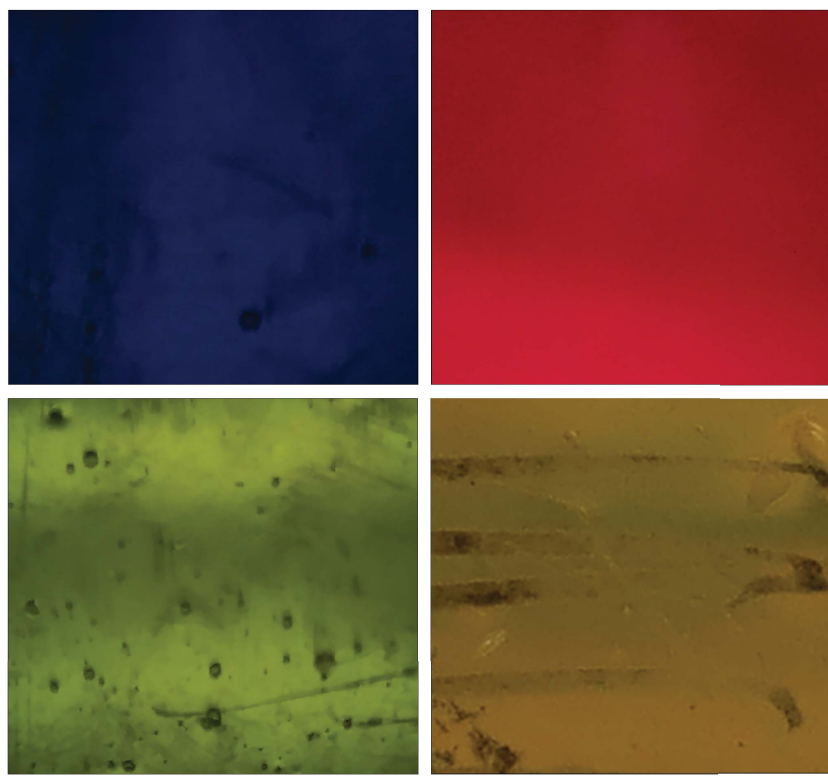

Figure 12. Colours of stained glass found from Estonia represented by finds from Jahu Street in Tallinn – cobalt blue (AI 7909: 14410), red flashed on both sides (AI 7909: 9426), emerald green (AI 7909: 5331) and golden brown (AI 7909: 18581). *M. Reppo.*

When studying the window glass from the cesspit from Haapsalu Castle (Article II), it transpired that similarly to the Low Countries, in the 16th century, residents of Haapsalu decorated their houses with painted or stained windows (Russow & Pärn 2013, 98). In the 18th century, wealthier residents devoted windows with stained crests to their friends who subsequently became donors of the window (Jaago 2001, 64; see also Polak 1975, 123). As no stained glass was found from the cesspit, it was questioned whether this custom was reflected in the archaeological record. After cataloguing the glass kept at museums in Haapsalu, it turned out that this was not the case (Article V, 149, 168). Only 14 fragments of stained glass have been documented from Haapsalu (Article V, 148–151), 11 from the late-15th to mid-16th century and three from the 16th–17th-century period (Dataset I). This is likely the result of the development of urban archaeology in Haapsalu (Article V, 142–143) – a meaningful collection of stained glass is yet to be assembled as large-scale excavations have been exceedingly rare.

For stained glass in **solid, plain colours**, blue and red were most common among the studied examples across Estonia. Dark or emerald green and golden brown are the only other types of brightly coloured stained glass listed on Dataset I (Fig. 12). According to the results from this study, red stained glass of the flashed variety (Article V, 151) was by far the most popular of the coloured glass. Whilst blue glass was obtained by adding cobalt to the batch, red glass was generally made by flashing a thin layer of red glass on colourless glass. Red stained glass has been produced from the 12th century onwards and the colour comes from copper, more rarely from gold, later also from selenium. From the 12th–14th century, the red was produced by multiple coloured striae within the glass but at the end of the 14th century, the more commonly known flashed red glass was adopted. Because of the raw materials, it has been considered one of the more expensive types of stained glass (Kunicki-Goldfinger et al. 2014, 102). Large quantities of red glass and a few fragments of emerald green glass were found from the 17th–mid-18th-century house in the moat in Padise (Kadakas, Reppo & Ööbik 2020, 158). The most peculiar plainly coloured stained glass were the fragments of brown stained glass that may indicate reuse (Article V, 150–151). It is unclear whether these pieces were added intentionally to a stained-glass window, i.e. they were part of a mosaic. They could be pieces used to repair a stained-glass window or pieces from an inexpensive window made of recycled glass.

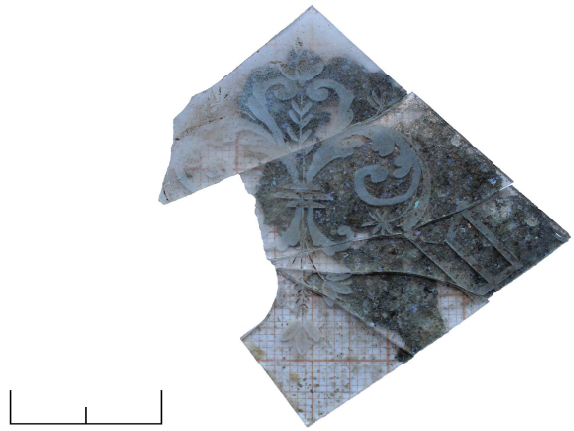

Figure 13. Engraved rhomboid mirror pane (TM A 270, no accession number at the time of study). Scale: 2 cm. *M. Reppo.*

Of other types of flat glass, only 13 fragments from **mirrors** were catalogued, five of them from an 18th-century engraved rhomboid pane, probably from a cupboard or commode (Fig. 13; Reppo 2022a, 12). Historically speaking, mirrors of varying quality, some achieving international awards by the early 20th century have been produced in Estonia (Roosma 1969, 88–89) and local museums do store many locally made mirrors (see examples in Jürivete 2015). Dataset II lists many 18th- and early 19th-century mirror glass makers (Ch. 5). Unfortunately, this aspect of everyday life cannot, at present, be studied archaeologically as there is simply not enough information to make conclusions on the use of glass mirrors in Estonia based (solely) on archaeological finds. There is some evidence of late medieval wooden mirror frames from Tartu with tin foil decorations (Tvauri, Bernotas & Läänelaid 2017, fig. 9) and some potential portable wooden mirror cases were also found from the landfill at Jahu Street (Russow et al. 2019, 196).

6.4. Drinking and dining – glass vessels

The focus of the author's original research (Reppo 2015) had been on glass vessels. As seen above, it was expanded to incorporate flat glass, but for glass vessels it was decided to include other regions and look at the overall typology of glass consumed in Estonia through the archaeological finds from Pärnu, Haapsalu, Tallinn, Tartu (Articles I–VI), and their decorations (Articles III–IV). The aim was to provide a dataset for consumption sites rather than production sites and to gather information for a variety of potential future studies (Dataset I) from consumption of imported and local wares, stylistic changes, and much more (see Ch. 1 and Ch. 7). The author examined whether it was possible to determine the origin of vessels without elemental analysis using typology and/or context (Articles I–III, V) and developed terminology in Estonian (Articles II and V).

6.4.1. Tare – utilitarian glass vessels

Whilst 34.1% of the finds are made up of flat glass, there are 10,876 glass vessels (including lids and stoppers) on Dataset I (45.2%, Fig. 6). The largest group of these are utilitarian vessels or tare from the early modern and modern period, the main product alongside flat glass at local glassworks (Fig. 14) which forms 57.3% of all glass vessels recorded on Dataset I.

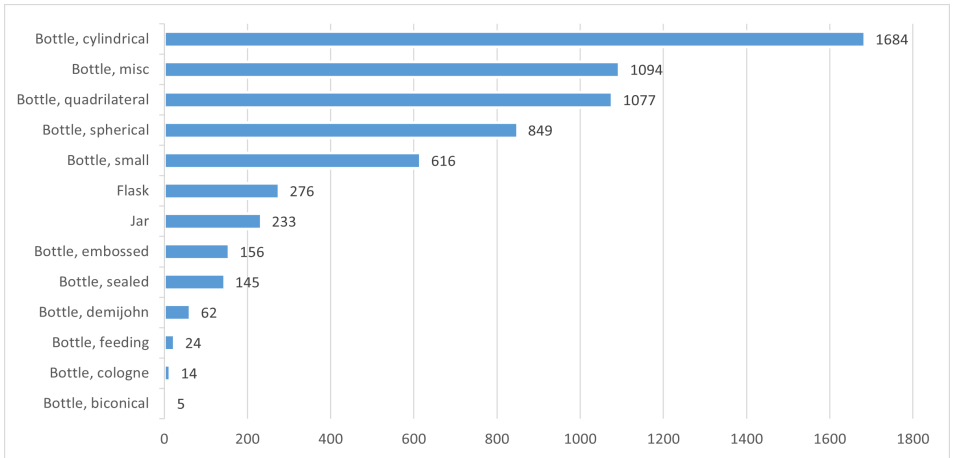

Figure 14. Distribution of utilitarian glass on Dataset I.

In Article I, it was speculated that the **small utilitarian jars**, made from forest glass, 3.2–5 cm in height, with thick uneven walls and bases (Fig. 15) could be the products of a local, Pärnu County-based glassworks (Article I, 225–226). This was assumed as the jars date to the 17th century, but they are dissimilar to the jars and phials from Hüti which are well-formed and thinly walled. This assumption was supported by the fact that all the examples were found from Pärnu except for one from Põltsamaa (TÜ 714: 432). Both are situated in former Livonia. As shown in Chapter 5, we still do not know where the glass production site of the von Thurn family was situated and thus, there is no comparative material from the production site. It is probable that at least some of the small jars were made locally and not in Hüti (Article V, 159). The type of small **footed vials** (Fig. 15) discussed in Article V were certainly made in Hüti in the 17th century (Article V, 157–158) and we know 18th-century **cylindrical vials** (without applied bases) were made at Laashoone (Article VI, fig. 11). The 19th-century vials described in Article V were an improved version of the latter, now mould-made and often embossed (Article V, 159). These small jars and vials were likely used for the storage of medical substances such as ointments, oils, powders, syrups, pigments, balms, salts, and the likes.

Figure 15. Small jars from Pärnu (PäMu 14350/A2501: 162) and Põltsamaa (TÜ 714: 432), footed vial from Pärnu (PäMu 14350/A2501: 35) and Tallinn (AI 7032: 745/8). Scale: 2 cm. *M. Reppo.*

In Article V and Reppo 2020a, other, locally made larger jars were described – **quadrilateral jars** with painted labels used in pharmaceutical contexts[52] and **cylindrical jars** for pickling and preserving, both in forest glass, generally with flared lips (Article V, 160; Reppo 2020a, 32–33). The beginning of their production and use coincided with changes in food culture in the 18th century (see e.g. Plath 2010). Whilst 17th- and 18th-century jars were made in green forest glass, from the late 19th century the jars could be colourless as well and were often embossed to show capacity. Jars were produced in large quantities locally from the 18th century and for example, Järvakandi was specialised in jar production until 1895 (Article V, 160). The rims of cupping therapy cups, small bowls, oil lamps, funnels, and large apothecary vessels (Annila 2013, 166–169) can be mistaken for jars. It is also difficult to tell apart the bases of quadrilateral bottles and jars if no other fragments are preserved.

Looking at other larger vessels, the typology of **square case bottles** made from forest glass was focused on in Article II. They were the most common 17th-century glass bottles in Estonia (Dataset I). Attention was on the finds from a single context – the cesspit at Haapsalu Castle. This collection of square case bottles is the largest found from a single context in Estonia (Article II, 11; Article V, 153). The most common case bottles here measured 70 × 70 × 210 and 90 × 90 × 225 mm and respectively, represented bottles with a capacity of 0.95 and 1.75 litres (Article II, 180). 18th–19th-century case bottles and jars found from Ravi Street in Tallinn had similar base sizes, but 40 × 40 mm bases were represented as well (Reppo 2020a, 32–33). Further research showed that square case bottles were used less frequently in Tallinn and Pärnu in the 17th century than in Haapsalu (Article V, 153). Looking at all periods, there are two more fragments

[52] Hundreds of preserved examples from the second half of the 18th century are on display at Järvamaa Museum in Paide.

of quadrilateral bottles from Pärnu than from Haapsalu, 227 and 225, respectively. The finds from Haapsalu are from four sites in total whereas in Pärnu, this number covers a total of 26 sites which would suggest a significantly higher number of fragments per site in Haapsalu (seven times more). 278 fragments are known from Tallinn from 48 sites, mostly from the 18th–19th century. In the final version of Dataset I, there are 1,077 fragments of quadrilateral bottles, 321 of which belong to square case bottles (Fig. 16 left).

Figure 16. *In situ* small square case bottle by a grave in Kaasani churchyard (AI 8346: 5), onion bottle from Tallinn (AM 34978: PK 12808), and large cylindrical bottle with a rounded heel from Pärnu (PäMu 14350/A2501: 79). *M. Reppo.*

While square case bottles were present at Haapsalu, Pärnu, and Tallinn, each area of focus had distinct consumption patterns. In Haapsalu, this was the use of case bottles in the 17th century as already noted. In Pärnu, 18th-century spherical, **onion or shaft and globe wine bottles** were most wide-spread (Article V, 151). Bottles with a base diameter of 110 and 120 mm were most common. There is not enough data to provide an average height but of the handful of preserved examples, the transitional shaft and globe bottle from Põltsamaa was 160 mm high (TÜ 2931: 46; Valk 2022, 212, fig. 7) and another onion-shaped bottle, potentially found from Tallinn, was 180 mm high (AM 34978: PK 12808; Fig. 16 middle). Of the 849 spherical bottle fragments (Fig. 14), 636 were found in Pärnu. At the end of the 18th century and during the 19th century, **cylindrical bottles** started to be used in increasing numbers, especially in Pärnu. The best examples of cylindrical bottles and their corks were found in piles and pits from the cellars in the northern range of Padise monastery used by the von Ramm family as a manor in the 19th century (Kadakas, Reppo & Ööbik 2020, 159) but these finds are not listed on Dataset I as they do not have accession nor find numbers yet.

Looking at the combined data, there are a total of 5,726 bottle fragments listed on Dataset I, 5,714 of which are dated from the second half of the 16th to the first half of the 20th century. The most wide-spread type of bottle in archaeological collections is the late-18th–19th-century cylindrical bottle with 1,684 fragments

(Fig. 16 right; see also Article V, 152). A further 1,094 fragments that are preserved too fragmentarily to securely identify the bottle subtype may belong to cylindrical bottles (Fig. 14 as Bottle, misc). When compiling Article V, it was discovered that Tallinn stands out due to the low number of bottles compared to all glass finds (Article V, 152). With the completion of Dataset I, the ratio of bottles to other glass finds dropped even further – from 18% to a mere 13.3%. In comparison, the numbers for Pärnu and Haapsalu stayed similar – bottles form 43.8% and 49.6% of all finds, respectively. In addition to preference and contacts, this might indicate collection principles.

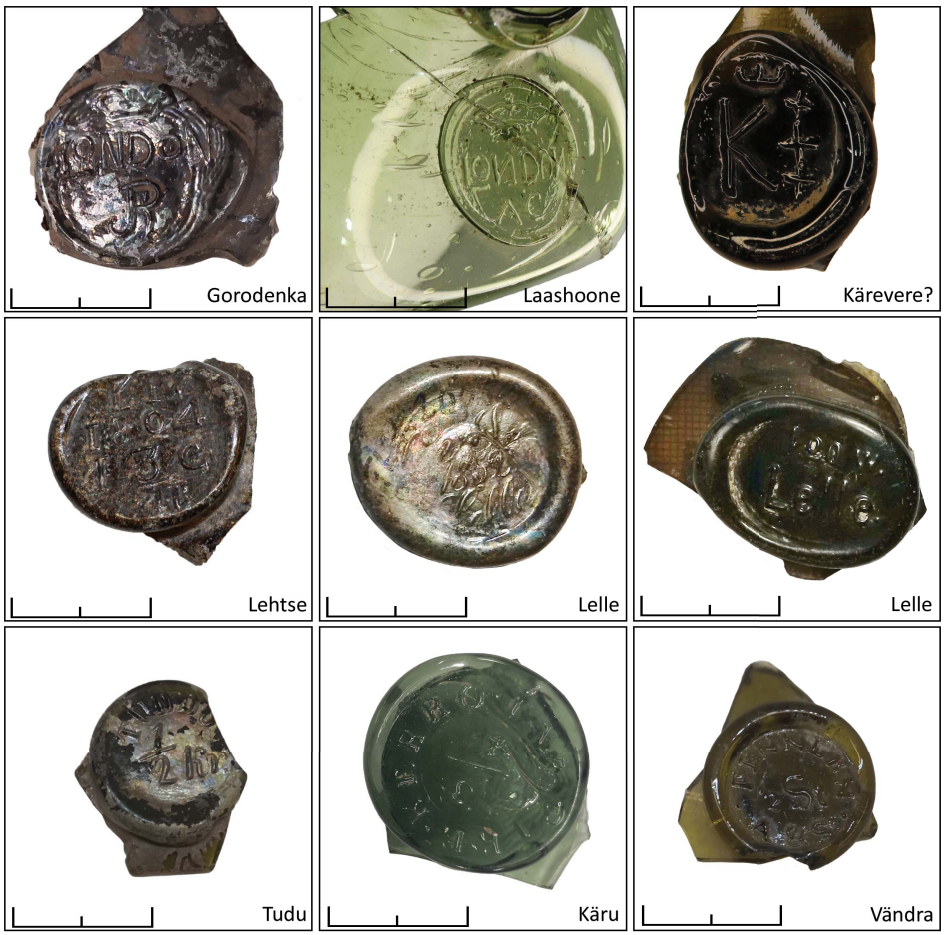

Figure 17. A variety of bottle seals from Estonia: Gorodenka (AM 17967: PK 4522 III/5), Laashoone (PäMu 15060/A2520: 45), 'K +++', likely Kärevere area, potentially Hoone (PäMu 14640/A2509: 98), Lehtse (HM 7364), Lelle (TLM 20059: 431; TLM 20059: 432), Tudu (HM 7364), Käru (RM A 180: 150), and Vändra (PäMu 14640/A2509: 385). *M. Reppo.*

Determining the origin of bottles without elemental analysis was the easiest for **sealed and embossed bottles**. From 1774, seals detailing information about the vessel were compulsory (Article V, 155) and in the 19th century, embossing started to be used for the same purpose. Both enabled bridging the gap between the factories and consumption sites in this study. 145 sealed and 156 embossed bottles were recorded (Fig. 14). They were useful in updating the chronology of the glass industry and illustrative of the impact of vice-masters and owners of the glassworks (Article VI, 405, fig. 12). Thanks to bottle seals it was possible to identify that at Padise, the von Ramm manor got at least parts of their supply of glass bottles from Lelle, Vändra, Tudu, and Robert Elfenbein (Tallinn; Kadakas, Reppo & Ööbik 2020, 158). The latter seals had previously never been published. Trade relations could be gleaned through 19th-century bottles with embossed labels (Article IV, 92; Article V, 157) as these were also present on imported bottles. One of the goals of this thesis was to provide local researchers tools to identify locally consumed glass. The transcriptions of bottle seals found from Haapsalu and Pärnu have been published (Article V, table 4; Article VI, fig. 12) and images of the seals are presented in several articles (Article V, fig. 4; Article VI, fig. 12; Kadakas, Reppo & Ööbik 2020, fig. 9). Some of the seals catalogued on Dataset I are included in Figure 17. Seals from Lelle (23 finds), Lehtse (21), and Vändra (15) were the most common.

Although it could be argued whether **flasks** (Fig. 14) are in fact tare, they are included here as vessels intended for short-term storage of drinks despite their other functions (decanting). Of the 276 flask fragments, 155 are from Hüti glassworks and several of the recorded fragments from this period could very well have been made locally. There were only a few other examples from Western Estonia (Article V, 151). Of the 93 examples from Tallinn, a little over a third were late medieval finds from Jahu Street and Tartu Rd 1 (Dataset I). Although **jugs** are admittedly not tare, they are utilitarian hence their inclusion in this section but exclusion from Figure 14. In this category, no medieval finds were present. When Article V was published, no jugs had been catalogued from Pärnu or Haapsalu (Article V, 151). Whilst cataloguing finds from additional sites from Pärnu, 18 fragments were identified, mainly from the second half of the 19th, early 20th century. On Dataset I, jugs (120 fragments) include all vessels intended for decanting which have a handle – jugs, pitchers, and ewers.

6.4.2. Drinking vessels

There are a total of 3,349 drinking vessel fragments listed on Dataset I (Fig. 18) – 2,264 are dated to the early modern and modern period. Drinking vessels were discussed in Articles II–VI. Alongside the bottles examined in Article II, the find complex at Haapsalu Castle included 63 fragments of trailed octagonal beakers (*Passglas*) which all dated to the 17th century (Fig. 19 left). These were compared to 107 other fragments, mainly from Tallinn but also elsewhere in Estonia (Article II, 15–16) and later, 68 fragments from Pärnu (Article V, 162–163). In total, there are 459 catalogued *Passglas* fragments on Dataset I, listed under trailed

beakers (Fig. 18). 30 of the fragments are from **cylindrical *Passglas* beakers** and 429 from **octagonal *Passglas* beakers**, clearly showing a preference for the latter. Of the 141 fragments, where the width of the panels could be measured, vessels with 20 mm and 25 mm width facets formed 47.5% of the finds. Based on the results, these were the most popular glass drinking vessels in the 17th century (see also Article V, 162). Many of the undiagnostic fragments in the pedestal or miscellaneous beaker category may be from *Passglas* beaker bases (Fig. 18).

As discussed in Articles II and V, this type of beaker was generally of the forest glass variety, with a greenish or bluish tint from the impurities in the raw materials. The vessel was separated into horizontal segments or *Passen* (Ger.) by plain or rigaree trails applied to the surface (Article II, 13–16) and although they usually have eight facets and are called octagonal beakers in literature, they may have six, seven, or nine facets. For the finds from Haapsalu Castle, it was proposed that the beakers as well as the case bottles mentioned above were made in Hüti (Article II, 21–23). This was further supported by the rare bright blue cut and orange-yellow tinge on at least one of the bottles (HM 9206: 7; Article II, 13). Roosma noted the same cut and tinge when describing bottles from Hüti (Roosma 1966, 69) and it is still visible on the finds stored at the Estonian History Museum.

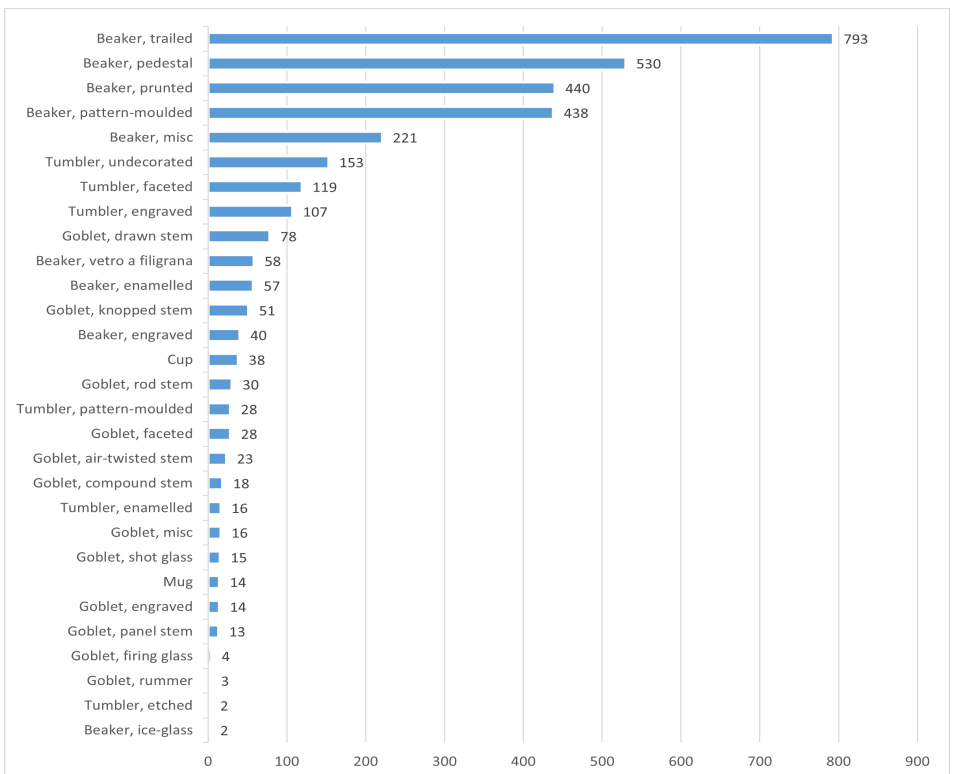

Figure 18. General types of drinking vessels on Dataset I.

Drinking vessels with applied and optical decorations such as those on *Passglas* beakers were also highly popular in medieval Tallinn (Reppo 2015, 76). The trend continued in the 17th century. Alongside *Passglas* beakers, prunted beakers in forest glass, especially raspberry-prunted **Römers** (Fig. 18; Fig. 19 middle) were made at Hüti and widely used in the 17th century Estonia – they have been identified in Padise (Kadakas, Reppo & Ööbik 2020, 158), Tallinn (Reppo, Viljat & Kriiska 2021, 229; Russow et al. 2013, 158; Russow et al. 2017, 174), and elsewhere (Dataset I). The vessel continued to be used in the 18th and 19th century albeit in brighter colours and sturdier forms. Reconstructions were produced at Järvakandi in the 20th century as well (Johanson et al. forthcoming). The most intricate vessels with applied decorations were however imported **compound stem goblets**, also known as wound serpentine goblets. Only 18 fragments of these late 16th–17th-century vessels have been recorded from Estonia (Fig. 19 right; Article IV, 87–88; Article V, 163–164) to date. These baroque vessels help illustrate one of the main conclusions of Article IV – depictions of birds on Estonian archaeological glass from the modern period are less realistic, more figurative, and stylised than on medieval and early modern glass (Article IV, 88). An article of the studied goblet fragments with compound stems has been submitted for publication recently (Reppo forthcoming).

Figure 19. Fragments of an octagonal beaker from Haapsalu (HM 9206: 15, 28), Römer with raspberry prunts from Tallinn (AI 6332: 1263), and goblet with a compound stem from Pärnu (PäMu 15060/A2520: 50). Scale: 2 cm. *M. Reppo.*

Imported high-status ***vetro a filigrana*** beakers, **enamelled beakers,** and **bossed beakers** are similarly rare in Estonia (Article II, 20–21; Article V, 161–162; Reppo 2015, 134). In the final version of Dataset I, there are 58 fragments of *vetro a filigrana* beakers (Fig. 18; see App. 1) from nine sites in Haapsalu, Pärnu, and Tallinn. The rarity of *vetro a fili* beakers becomes more striking when we consider that of the 58 fragments, 44 are from two vessels (Dataset I). This is an interesting result considering their popularity in Northwestern Russia during the same period (see Ch. 2.1.2). While their rarity could indicate that they were just uncommon, they could have also been passed down and ended up in museum and private collections. No items are described as *vetro a filigrana* or *vetro a fili* on MuIS, but this may be due to lack of expertise. Bossed beakers on the other hand are a type of a pattern-moulded beaker (Fig. 18; see App. 1) which seem to have been equally rare in Estonia. There are only 16 fragments of bossed beakers from 11 sites in Haapsalu and Tallinn recorded on Dataset I.

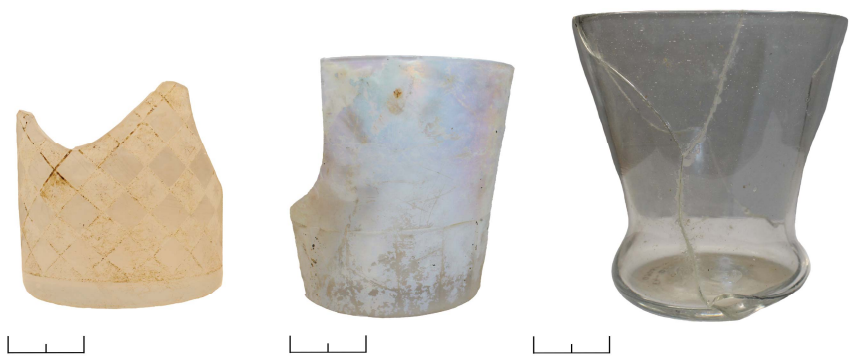

Figure 20. Engraved, faceted, and undecorated tumblers from Pärnu (PäMu 15549/A2596: 17/191; PäMu 14640/A2509:385; PäMu 15060/A2520: 43). Scale: 2 cm. *M. Reppo.*

The colourless **engraved drinking vessel** *resp.* beaker (TLM 28149: 246–253, 271) found from Aida St. 4, Tallinn in 1986 at the centre of Article III turned out to be even rarer. Like Article II, Article III was a case study of a single site but also of a single vessel. In total there are 40 engraved beaker fragments on Dataset I, 14 of those were discussed in Article III. It was discovered that the vessel had been engraved with floral and bird motifs around 1600 in Innsbruck and was connected to the Royal Chamber of Glass at Hall-in-Tirol in Austria (Article III, 377). At the request of Tallinn City Museum, the museum the vessel is held at, the typology was studied further and 11 vessels with the same 'handwriting' were discovered across Europe (Reppo 2022c, 101). Whilst these articles were being prepared, excavations were carried out on a neighbouring plot on Lai Street. Four fragments from an almost identical vessel were found (AI 8553: 18, 500, 1292, 1296; Reppo 2022b, 11–12). Two fragments were identified during this study amongst the finds from Cēsis castle, Latvia that bear similar decorations (CM

41567; CMP-77: 84). Considering that in Article III it was demonstrated how our knowledge can change over time; these fragments are a welcome addition to the collection. The finds will be included in a future publication on vessels with this type of engraving.

The research of bird depictions was expanded in Article IV. The results highlight what can be gleaned from Dataset I – engraved drinking vessels began to be preferred over painted and optic mould-blown as well as vessels with applied decorations during the 18th century. A variety of colourless tumblers started to be used (see Fig. 18). They generally have a tapering cylindrical body with a poorly polished pontil mark at the base. Colourless drinking glasses were made at Laasme, Utsali, and Lehtse (Ch. 5). There are only very few examples of **enamelled tumblers** (Fig. 18; Article IV, 78, 90) from the first half of the 18th century whereas in the second half of the 18th century, locally produced colourless **engraved tumblers** (Article IV, 79, 91; Article V, 166; Reppo 2022a, 14) with plant, abstract, and geometrical decorations (Fig. 18; Fig. 20 left) became the most popular drinking vessels partially as a result of the growing popularity of consuming mineral water (Jones & Smith 1985, 35). **Undecorated tumblers** (Fig. 18; Fig. 20 right) were also relatively common. At the same time, **faceted tumblers** (Fig. 20 middle; Article V, 166) appear in the archaeological material. Based on this research, these have 8, 11, 15, 16, or 24 facets. As discussed in Article V, they were especially popular in Pärnu. In the final dataset, 78 of the 119 fragments were found in Pärnu (Dataset I). None are recorded for Haapsalu. First produced in the 18th century, tumblers like this remained in production well into the 20th century (see e.g. Hülsmann 2013, 242).

Figure 21. Goblets with a drawn stem (PäMu 15060/A2520: 44), knopped stem (TLM 20059: 420), and panel stem (PäMu 15549/A2596: 17/186), all from Pärnu. Scale: 2 cm. *M. Reppo.*

This also applies to faceted and stemmed **shot glasses** and **firing glasses** (Fig. 18). It could be speculated that their appearance may be a result of the increasing production and consumption of hard liquor at the time (Article V, 165; Põltsam-Jürjo 2020, 123–125). The latter could be consumed from goblets with **air-twisted, drawn** (Fig. 21 left)**, faceted, knopped** (Fig. 21 middle)**, panel** (Fig. 21 right) as well as **rod stems** (Fig. 18) made from clear, colourless glass although these were the preferred vessels for consuming wine in the 18th century in Estonia and Europe (Article V, 164–165). In addition to cold beverages, sweet and bitter hot drinks – coffee, tea, and chocolate – began to be consumed in wealthier households and designated coffee shops (Article IV, 93) from the end of the 17th century onwards. Alongside porcelain, opaque white enamelled **cups** were used (Fig. 22). Of the 38 fragments kept at the studied collections, 37 were from Tallinn and one fragment was from Pärnu. Glass **mugs** were mentioned in passing (Article V, 167–168) – they seem to have been rare in Estonia (Fig. 18).

While **stoppers and lids**, like the two potential 16th-century beaker lids from Haapsalu (Article II, 17, 21) and the 20th-century stopper with a rooster from Tartu (Article IV, 84) cannot hold liquids or solids, they are parts of vessels and have been included in the total of this section as a result (but see Fig. 6 for results). In total, 68 stoppers and 51 lids, all dated to the 16th–20th century, mainly from colourless glass, were catalogued. These were mostly flask or decanter stoppers, and jar or beaker lids (Article V, 167–168).

Figure 22. Tea or coffee cup (AI 7032: 293/22–27). Scale: 2 cm. *M. Reppo.*

6.4.3. Bowls and plates

As mentioned in Chapter 6.4.1, the 18th century brought about notable changes in food culture in the sense of preparation, presentation, and preservation. One of the most notable locally produced forest glass vessels was related to this change – the **milk-souring bowl** (Fig. 23). Just like pickle jars, milk-souring bowls are found across Estonia from late-18th- and 19th-century contexts (Dataset I). Although it is the most popular type of local bowl, no fragments have been found from Haapsalu (Article V, 167). Lehtse, Laashoone, Laasme, and Haava glassworks are represented with 25 milk-souring bowl fragments on Dataset I which forms a third of all finds (Fig. 24). The milk-souring bowls seem to have had a long use-life as they are still sometimes sold on auction sites today. The largest on the dataset had a rim diameter of 295 mm; the base sizes were between 130–200 mm.

Based on the results of this study, glass bowls were rarely used in Estonia before the 18th century, but they became more common in the 19th century when **mould-pressed and stemmed glass bowls** started to be produced. These stemmed bowls were used as sugar, salt, fruit, and candy bowls (Article V, 167). They are often decorated in extremely stylised and abstract ways (Article IV, 83–84) so the motifs can be hard to identify. **Glass plates** seem to have been very rarely used in Northern and Western Estonia with only 18 fragments from the 17th–20th century recorded on Dataset I. The majority (11) are pressed glass plates, indicating that the use of glass plates in Estonian homes did not start before

Figure 23. Milk-souring bowl from Põltsamaa (TÜ 2931: 29). Scale: 2 cm. *M. Reppo.*

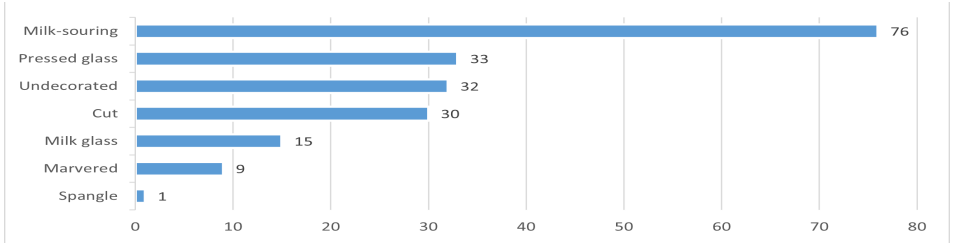

Figure 24. Distribution of bowls on Dataset I.

6.5. Trinkets, decorations, and everything in between

The smallest but most varied group of artefacts catalogued during this study are various decorations, personal aids (spectacles, monocles), costume fittings, jewellery, and household articles, including electrical items to name a few with a total of 4,975 artefacts listed on Dataset I. Although the focus of this research was on flat and vessel glass, the cataloguing technique meant that all glass objects were recorded. For artefacts beyond vessels and flat glass, the goal was to catalogue and photograph them to enable future studies and show the variety of glass objects. These artefacts help examine aspects of everyday life and the changing use of glass, one of the main themes in this study. In Figure 6, the variety of artefacts becomes clear.

The most widespread of these are **beads.** As most of the sites are urban, the finds represent the use of glass beads in urban areas. There are a total of 1,879 beads on Dataset I (Fig. 6), 84.1% of these were found from Tallinn. Beads form 7.8% of all finds. Most of them are dated from the second half of the 16th century until the first half of the 20th century (1,511 finds), although some have wider dates and may be medieval instead. In Article V, it was noted that there are only 21 beads from archaeological sites in Pärnu and Haapsalu. After the publication of Article V, it was possible to identify 54 more beads from currently unknown locations (graves?) in or near Pärnu (Fig. 6; PäMu 2960/A2451; PäMu 2961/A2452). Oval and oblong colourless **chandelier pendants** (30 finds, all but one from Tallinn) which gained popularity in formal interiors at the end of the 17th century and replaced rock crystal completely by the 18th century (Polak 1975, 127, 143) may be mistaken for beads. The main difference is in the location of the holes – on chandelier pendants they go through perpendicularly, generally at both ends.

As discussed in Article I, glass and mineral beads have been studied by Irita Kallis as part of her unfinished PhD thesis,[53] but her focus was on Viking and early medieval beads (Article I, 219). Although early modern and modern beads are often described in fieldwork articles on burial sites (e.g. Malve & Tvauri 2022, 242–244) or hoards (e.g. Russow 2022) and beads have been discussed as

[53] 'Klaasist ja mineraalidest helmed Eesti arheoloogilises materjalis' ('Glass and mineral beads in Estonian archaeological material') at the University of Tartu.

part of ethnographic studies on 19th-century folk dress (e.g. Kont 2014), there is no published overview of locally used beads and no agreed terminology. On Dataset I, the most common types of beads were doughnut-shaped beads (585 beads), referred to as Biser[54] beads in Estonia which are a type of small wound bead, mostly blue or yellow, that were often sewn onto textiles. These were used from the early medieval to the early modern period and made locally in the 13th–14th century in Tartu and Tallinn (Russow 2020, 138–143). Round globular (502) and oblate (365) beads are the second and third most common beads (see Fig. 25). Most of them are dated to the 17th–18th century. Hopefully, this preliminary overview will encourage future studies as beads not only represent the aesthetical side of everyday life (necklaces, decorations) but can also represent religious attitudes and customs (rosaries, grave goods, barter goods).

Figure 25. 17th–19th-century beads from several findspots strung up as one (PäMu 2960/A2451). Scale: 2 cm. *M. Reppo.*

The other items in Figure 6 have only been discussed in passing both during this research and elsewhere. They mostly belong under general glass objects (Fig. 26), or glass items related to medical or laboratory purposes (Fig. 27). In Article V, glass buttons, light bulbs, and spectacles or glasses were mentioned (Article V, 167–168). Of these items**,** glass **buttons** have seen the most attention in specialist

[54] Russian influence – *бисер* is Russian for bead.

literature as like beads, they are present on burial sites (see e.g. Sokolovski 1996, 124, 130; Malve et al. 2022). There are a total of 30 glass buttons on Dataset I. The black bulb-shaped glass buttons with iron wire loops are the most common with 22 examples, and these appear across the globe in the Western world in the 17th–18th century. A mass production site of these was situated in Bavaria in Fichtelgebirge (Karklins et al. 2016, 24). Interestingly, they also produced the globular white beads (Karklins et al. 2016, 28) found all over Estonia on burial sites (see e.g. Malve & Tvauri 2022, 243).

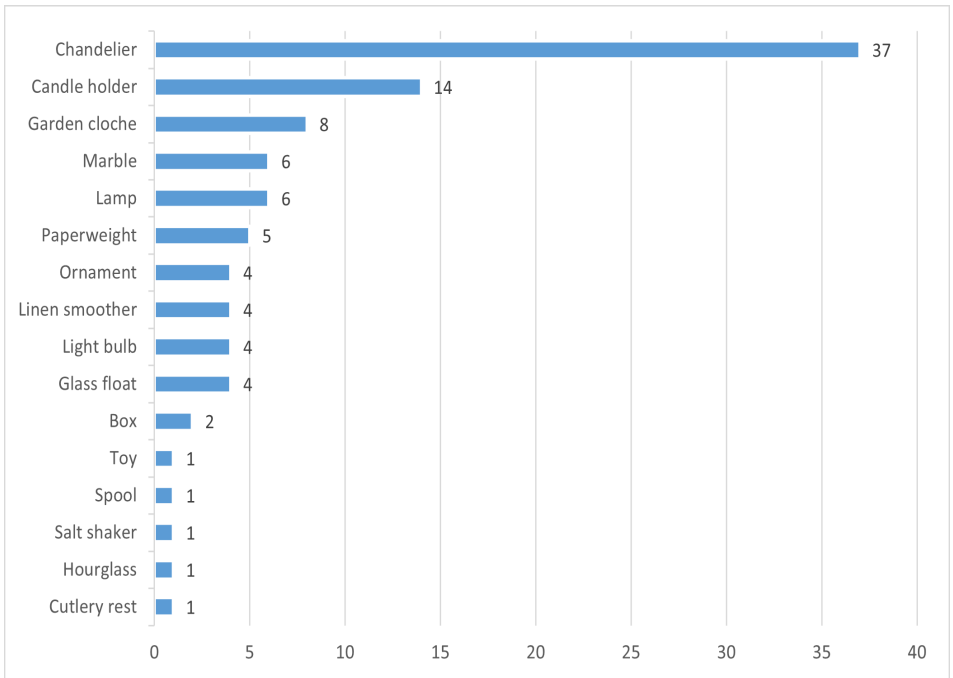

Figure 26. Items under the glass objects category on Dataset I.

Of the more obscure items on this list, some **light bulbs** were stored in archaeological collections – two from Pärnu Old Town (Article V, 167) and two from Tallinn suburbs (AI 6109: 212; AI 7032: 809/1), all from the late-19th, early 20th-century. The use of electrical lighting in Estonia started in the early 1880s (Vaimann & Risthein 2018, 18–19) however studies on electrical lighting have focused on the electrical network and not the local use of light bulbs which could be an interesting topic for a future study. Another promising research avenue are visual aids in archaeological collections – **spectacles** (Fig. 27). Spectacle lenses were produced in high quantities at Hüti glassworks – for example in 1644, 900 spectacle lenses were sent to Stockholm (Seppel 2015, 290). As mentioned in Article V, two spectacle lenses, one circular and one oval, were found from Pärnu that could belong to either monocles or glasses (Article V, 168). From Tallinn, a

17th-century spectacle lens was catalogued from Jahu St. (Russow et al. 2019, 201). Although the site was used from the 13th century onwards, just as spectacles (Rosenthal 1996, 390), the lens with a grozed edge found from Sauna St. 10 (AI 6332: 1212) is also likely from the 17th century based on its context. The lens with a cut edge, possibly from the 18th century from Kooli St. 9 (AI 7039: 2294) has turned opaque white because of weathering or it may not be a lens after all.[55] For example, a similar small circular glass disk has been identified as a window-pane in Cēsis (Lapiņš 2017, 82). In 2023, a pair of early 18th-century glasses were found in Saastna in Western Estonia (Pärn, Valk & Malve 2024, 9, fig. 5). Further examination of these was out of the scope of this thesis. No magnifying glasses were catalogued during this study.

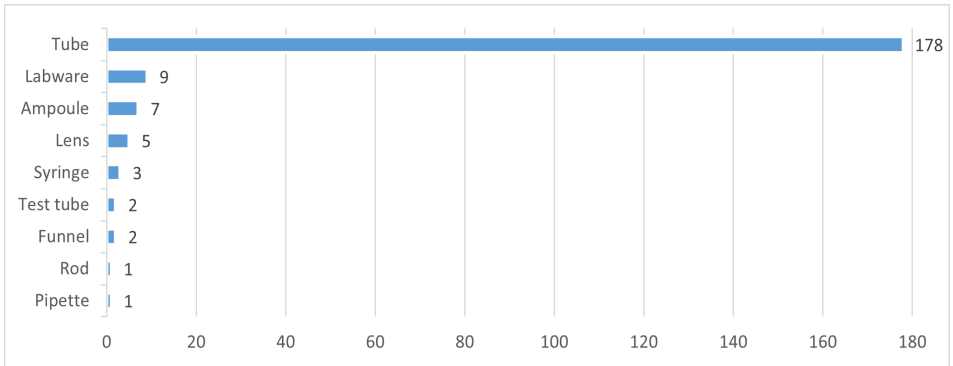

Figure 27. Items under the medical and labware category on Dataset I.

In publications connected with the thesis, glass **linen smoothers** have also been studied by the author together with Küllike Tint. Four finds were initially described – three from Tallinn, and one from Viljandi (Reppo & Tint 2022a; 2022b). Recently, the author received information about a fifth fragment from Lihula which is currently unpublished and not listed in this thesis. Although glass linen smoothers were used from the 2nd until the 20th century in Europe, all four published examples found from Estonia date to the 16th–18th century and were likely imported. Similarly rare are glass **garden cloches** which are glass domes that were used to protect and shelter small plants and seedlings. Only eight fragments have been found. All are dated to the second half of the 18th and first half of the 19th century (Varul et al. 2018, 190). Six were found by the greenhouses at Tõnismägi 11A (see Ch. 6.2). Further analysis could complement the archaeological research of gardens and gardening. One final type of object representing another aspect of everyday life are **marbles**. Whilst five of the six marbles on Dataset I were found from the landfill at Jahu Street and cannot be dated later than the early

[55] TLM collection manager Mirey Rütman had the glass lens AI 7909: 1884 assessed by an optometrist in 2024 but due to weathering it was not possible to obtain a result on the focal length nor any other characteristic of the lens.

16th century (Russow et al. 2019, 201), the finely caged solid core marble from Viru 8 in Tallinn (AI 6709: 34) is probably from the mid-19th century. Just like marbles could be used to study play and childhood, the rest of the items in Figure 6, 26 and 27 not discussed here could all be used to research minute aspects of everyday life.

6.6. Using glass in Estonia

In Chapter 1, it was indicated that the main research questions about the artefacts published in Articles I–VI and on Dataset I were the changes in glass consumption in terms of artefacts, use in everyday life, decorative styles, and the differences in consumption between different areas in Estonia with a focus on flat and vessel glass. In Article II, focus was only on one site in Haapsalu and in Article IV, only on one type of motif. In Article V, the results from data collection in Pärnu and Haapsalu were combined to compare glass consumption in the towns. The data for Tallinn were used for further observations on the use of glass in Estonia during the early modern and modern period. As Article V includes the finds introduced in Article II, it can be seen as an extension of Article II. It is the first intraregional archaeological study of glass consumption published in Estonia (Article V, 141). Article IV on the other hand is an extension of Article III.

As shown in Article V and this chapter, the founding of the local industry in Western Estonia in the 17th century impacted regional glass consumption. With the availability of local forest glass, consumption shifted from being dominated by imported colourless and decorated glass to (local) utilitarian as well as more presentable forest glass of higher quality before colourless glass started to be produced locally in the second half of the 18th century. The proximity of the glass factories and changes in dining culture and food preparation had an influence on the material culture of the towns examined here as the consumption of speciality glassware increased during this time. The best examples of this are pickle jars and milk-souring bowls. Other changes in glass consumption were brought about by changes in legislature and technological advancements – for example, the use of bottle seals from 1774 to support fair trading and curtail fraud or the use of glass light bulbs since the 1880s.

As many factories were opened in the second half of the 18th century, the share of local produce kept on growing and glass became an easily available commodity as witnessed by the increasing number of finds in the archaeological record. Stylistically, applied and mould-blown optic decorations continued to be popular for vessels during the 1600s, followed by engraving and etching in the 17th and 18th centuries. In the 19th century, embossing, moulded, and pressed glass began to be used but a lot of the vessels studied here were utilitarian and not decorated at all. Enamelled vessels were not common in Estonia during any of the periods but there is a larger number of painted and coloured stained glass from the 16th–18th century. Focusing on Haapsalu and Pärnu and building on previous research with finds from Tallinn, it was possible to show that pickle jars, hard

liquor bottles (case bottles), and apothecary wares in forest glass had a stronger impact on consumption in the province towns than in the capital. By the beginning of the 20th century, glass goods were an everyday item in all studied locations, and they are found in substantial quantities in the archaeological record.

Arriving at these results did not happen without its difficulties. Some errors have been corrected (Ch. 6.1) but some deeper issues prevail. Missing and incomplete excavation reports, different levels of research in the examined regions, unclear collection principles, durability and reuse of utilitarian vessels (tare, e.g. in pharmacies), lack of elemental analysis, and the fragmentary preservation of glass remain the main limitations. The collection principles of early modern and modern glass as part of excavated material and in archaeological collections also skews the results. Hopefully, the statistical information presented in this chapter will be helpful in forming and modifying collection principles for both units conducting fieldwork and collection managers. This chapter summarised the results from the largest analysis on glass consumption in Estonia. It serves as a reminder how research builds over time, in this case over the course of a PhD study, demonstrated most clearly by the study of window and stained glass. Although much has been covered, there is almost an endless array of opportunities for future studies.

7. CONCLUSIONS

Providing a comprehensive overview of the Estonian glass industry in the early modern and modern period – the things, the people, and the places – was the main goal of this thesis. Using documentary archaeology and artefact studies, three objectives were undertaken: 1) revising the chronology of the industry, 2) identification of the role of the workers and their life histories in the development of the industry, and 3) the description and typology of locally consumed glass. The results of this research have been presented in three raw datasets and six articles as the author's original contribution to the study of the industry, which have been examined and introduced in this thesis to provide an account of the development of the industry and glass consumption.

For Dataset I, 24,067 fragments of locally consumed glass from the 12th–20th century were documented using a method devised during the author's MA research (Reppo 2015, 12–13). Due to the physical constraints of collections, the error-prone nature of rapid and bulk identification of finds, finds with wider date ranges, the presence of stray finds, and mixed contexts, it turned out to be impossible to skip earlier finds when carrying out the visual systematic analysis. Although earlier finds could have been removed from the published dataset, filtering the data to display a selection of finds demands just the click of a few buttons and thus, there was no acute need to remove already collected data. Finds are discussed in Articles I–VI and Chapters 5 and 6. Hopefully, the scope and variety of data will inspire researchers to start studying glass or at the very least, assist them in dating finds assemblages. Unfortunately, collecting detailed contextual information for each artefact was difficult and requires extensive archival research in the future, although it has been considered when dating the finds wherever possible. Dataset I and the working photos have been shared with the relevant collections to assist in monitoring the physical condition and the inventory of glass finds, which is an additional, unintended outcome of this research.

On Dataset II, the original contribution lies in the compilation of biographical data for 1,248 individuals in an accessible way. Gaps were identified in the works of previous researchers. Areas where data are missing or incomplete were highlighted. The collected and updated data were successfully used to show how the life histories of workers influenced the development of the industry in Article VI and Chapter 5. The future uses for Dataset II should extend beyond the interest of archaeologists and historians as it will hopefully assist genealogists and local history enthusiasts in their work as well. As church books from selected parishes and periods were used, it is hoped that future researchers will be able to fill in the gaps on Dataset II and take the data further with the use of additional archival sources.

The chronology of the glass industry was significantly revised on Dataset III where the updated information for 42 glassworks founded before World War II was presented. As with Dataset I, one can filter later sites however the extended period was necessitated by the fact that several of the sites founded in the 18th and

19th centuries continued to operate well into the 20th century. The gaps that were discovered when first collating the data were addressed by using information collected for Datasets I and II. In Articles I, II, VI, and Chapter 5, it was shown how using the tabulated data to construct narratives about local glassworks is envisioned. It has been six decades since any author has described all known industries. During the study it became clear that many of the glass production sites are not protected and could come under risk from property development or looting which was a troublesome discovery. A potential use beyond the realm of archaeology for Dataset III could very well be desk-based assessments to identify the need for heritage protection.

A similar idea was proposed in Article I, where the historiography of studying the local glass industry was under scrutiny. Four distinct research categories – industrial archaeology, artefact studies, genealogy, and art history – and their shortfalls were identified which has provided a comprehensive framework for future studies. In Chapter 2, local historiography was updated (Article I was published in 2019) and presented in a wider, European context. As highlighted in Article I, production and the producers have dominated in the research of the Estonian glass industry in the 17th–19th century, leaving the products and consumers aside (Article I, 229). The case study about Pärnu County in Article I was an experiment which illustrated the unmissable interdependence of archaeological and archival research (Article I, 211) in such cases. No fieldwork was undertaken in the region as studying the physical remains of the sites was beyond to scope of this thesis. Fieldwalking and test pits in the areas identified in Article I are one of the potential avenues for future research.

Having examined whether the study of the Estonian glass industry is indeed slow and disconnected and assessed the feasibility of an interdisciplinary study, Article II, albeit a typological analysis, was an example of the interdependence of the source material already mentioned. The fragments of artefacts from a 16th–17th-century cesspit at Haapsalu Castle were reconstructed and then joined, metaphorically speaking, through historical data and the excavation results (context and finds processing), bringing together the artefacts, the consumers, and the makers. This was one of the gaps identified in Article I. A plausible connection with a local production site and its owner could be made (Article II, 23) which together with the results of the case study in Article I guided the development of Datasets II and III, and Articles V and VI. Contributions were also made to the advancement of terminology of artefacts in Estonian (Article II, 13–15, 20; Ch. 4). The typology and terminology described in Article II was supplemented with an analysis of the most common glass artefacts from Haapsalu and Pärnu (Article V) and with Chapter 6 in this thesis.

In Article II, apprehension about the value-add of elemental analysis in identifying the differences between products from local glassworking sites producing forest glass was expressed based on results from previous studies and discussions with researchers (Article II, 22–23). Extraneous to this study, a preliminary, standardless pXRF analysis (Article V, 142) was conducted on a small selection of finds. Although preliminary, the analysis did not support this theory and

indicated that the compositional differences were significant enough to identify finds by chemical composition (to an extent). The elemental analysis of artefacts from forest glass as well as other artefacts listed on Dataset I is certainly a project worth considering as focus has remained on the composition of medieval vessels in Estonia.

While in Article II the focus was on utilitarian glass which became increasingly available and affordable with local production, in Articles III and IV attention was turned to imported vessels which had directed local consumption habits as described in Chapter 6. In Article V, local and imported glass objects were viewed together. All four articles demonstrate the research capacity and usability of Dataset I. Article III was a short case study of a single unpublished artefact found in the 1980s with no known parallels at the time of publishing, whereas in Article IV, compiled at the half-way point of data collection, focus was on a decorative element utilising a key feature on Dataset I, the option to filter data. In Article III, the likely owner of an imported glass vessel with diamond-engraved bird motifs was identified. The early 17th-century vessel was dated and provenanced using previously published archival research, excavation notes, and decorations (Article III, 377–378). As it is only a short example of the potential of inter- and intradisciplinary research, Article III has been supplemented with an extended version in Estonian including an article on other examples of vessels with similar engravings found from Europe (Reppo 2022c) which is planned to be published in updated form in English soon.

In Article IV, focus was on the decorative motif examined in Article III, but all artefacts with winged creatures, irrespective of the decoration technique and period were included. Article IV is a classical comparative study of artefacts, but it is also an introduction and guide to using Dataset I (Article IV, 77). In addition to characterising the changes in themes and techniques and listing the features of the dataset, the lack of Open Access data and employing the FAIR data principle (Findable-Accessible-Interoperable-Reusable) in Estonian archaeology was addressed. Being against research monopoly, the intended application of the datasets is providing raw data for future studies to all interested parties (Article IV, 94–95). With the amount of data that have been gathered as part of this thesis, the possibilities for future research projects and data mining are nearly endless.

Article V was the first large-scale systematic study classifying archaeological glass vessels and flat glass published in Estonia. It was shown that although imported wares dominated in the medieval period, utilitarian as well as more decorative, locally made glass was widespread in Pärnu and Haapsalu after the 17th century as was hypothesised based on the results of the author's 2015 dissertation with finds from Tallinn. This coincided with the advent of conspicuous consumption alongside the founding of the local industry. It is hoped that the article will be a useful aid in the collection and curation of glass artefacts locally. This study influenced the structure and content of Chapter 6 and the chapter on glass for the e-course book *Materjalid arheoloogias*[56] (Johanson et al. forthcoming). The

[56] In English: 'Materials in archaeology.'

identified changes in food and drink culture and urban environment due to shifts in glass consumption have also become the basis of the draft of a book, *Glass on the edge of Europe* (Reppo forthcoming).

All three datasets were used to revise the chronology of the industry in Article VI. The impact of migrant workers on industry and the patterns of movement through three centuries were shown using three family trees as case studies – Wentzell, Hagen, and Runge (Article VI, 401–404). Dataset I was used to supply examples of finds for the discussed sites, Dataset II to follow the life histories of members of the chosen families and to update previously accepted or unknown dates for the industry on Dataset III. No such study has been published in the past on the Estonian glass industry and similar studies are rare elsewhere. The publication of this article in Estonian for the local audience is one future goal of the author. As the operation, management, and cashflow of the sites was not focused on in this thesis, a follow-up could include information from sources not used here.

The strength of this research lies in that the parts – articles and datasets as well as these analytical chapters – can be viewed as separate, in groups, or as a whole and thus aid the reader based on their research goals. For historiography, one can refer to Article I, Chapter 2, and Dataset III, for the identification of individual finds or the overall development of consumption, Articles I–VI, Chapter 6, and Dataset I, for information on glassworks and glassworkers Articles I, II, VI, Chapter 5, and Datasets II–III. The datasets, articles, and chapters address the shortfalls in the study of distinct aspects of the 16th–20th-century glass industry in Estonia. With the completion of this thesis, the concluding remarks in Article IV are as true as ever – hopefully, the prepared datasets will be applied to study a variety of topics to improve our knowledge on glass found from Estonia.

8. REFERENCES

Abbreviations

AI	Tallinn University archaeological research collection (Tallinna Ülikooli arheoloogia teaduskogu)
AM	Foundation Estonian History Museum (SA Eesti Ajaloomuuseum)
AVE	Arheoloogilised välitööd Eestis, 1997–. (Archaeological Fieldwork in Estonia)
CM	Cēsis History and Art Museum, Latvia (Cēsu Vēstures un mākslas muzejs)
CMOG	Corning Museum of Glass (Corningi klaasimuuseum)
CMP	National History Museum of Latvia (Latvijas Nacionālais vēstures muzejs)
EELK	Eesti Evangeelne Luterlik Kirik (The Estonian Evangelical Lutheran Church)
ENSV TA	Eesti Nõukogude Sotsialistliku Vabariigi Teaduste Akadeemia (Estonian Soviet Socialist Republic Academy of Sciences)
HKM	Foundation Hiiumaa Museums (SA Hiiumaa Muuseumid)
HM	Foundation Haapsalu and Läänemaa Museums (SA Haapsalu ja Läänemaa Muuseumid)
MA	National Heritage Board of Estonia (Muinsuskaitseamet)
MuIS	Museums Public Portal (Muuseumide Infosüsteem)
PäMu	Foundation Pärnu Museum (SA Pärnu Muuseum)
RA	National Archives of Estonia (Rahvusarhiiv)
RM	Virumaa Museums Foundation (SA Virumaa Muuseumid)
TATÜ	ENSV TA Toimetised. Ühiskonnateadused, 1967–1989. (Proceedings of the Estonian Soviet Socialist Republic Academy of Sciences. Social Sciences)
TLM	Tallinn City Museum (Tallinna Linnamuuseum)
TLPA MKO	Tallinn Urban Planning Department's Heritage Conservation Department (Tallinna Linnaplaneerimise Ameti Muinsuskaitse osakond)
TLÜ AT	Tallinn University archaeological research collection (Tallinna Ülikooli arheoloogia teaduskogu)
TM	Tartu City Museum (Tartu Linnamuuseum)
TÜ	University of Tartu archaeological collections (Tartu Ülikooli arheoloogiakogud)
TÜ AAI	UT Institute of History and Archaeology (Tartu Ülikooli ajaloo ja arheoloogia instituut)
UT	University of Tartu (Tartu Ülikool)
UV	Archaeological Excavations Department at the Swedish National Heritage Board (Arkeologiska uppdragsverksamheten)
ИА РАН	Russian Academy of Sciences, Institute of Archaeology (Институт археологии Российской академии наук)
РГХПУ	Russian State Stroganov University of Industry and Applied Arts (Российский государственный художественно-промышленный университет имени С. Г. Строганова)

Unpublished sources

CIfA 2014 = Chartered Institute for Archaeologists. 2014. *Standard and guidance for historic environment desk-based assessment*. https://www.archaeologists.net/sites/default/files/CIfAS&GDBA_2.pdf, 12.05.2024.

Dungworth, D. & Girbal, B. 2011. Walmer Castle, Deal, Kent: analysis of window glass. Technology report. – *English Heritage Research Department unpublished report series*. https://doi.org/10.5284/1033688, 12.05.2024.

Eestimaa Looduse Fond, Tartu Ülikool, Arheovisioon & Riigimetsa Majandamise Keskus. 2017. *Tudusoo looduskaitseala soode taastamiskava*. https://soo.elfond.ee/wp-content/uploads/2017/12/Tudu-taastamiskava-kooskolastatud-21.11.2017.pdf, 12.05.2024.

Fehner 1955 = Фехнер М. В. 1955. *Селища: у д. Болошнева, Панфёрова, Вышгорода, Горетова; развалины завода по производству стекла. Средневековье, новое время. XV–XVII вв*. (Manuscript in ИА РАН archive.)

Jürivete, T. 2015. *Eesti klaasitööstus 19. sajandist 20. sajandi alguseni suuremate klaasivabrikute näitel.* (Unpublished BA thesis). Manuscript in TÜ AAI DSpace. http://hdl.handle.net/10062/48561, 12.05.2024.

Kärkkäinen, S. 2017. *Paloja Karjalasta Itämeren pohjassa. Esineitä arkielämästä puisella purjelaivalla 1600- ja 1700-luvuilla*. (Unpublished MA dissertation.) Manuscript in University of Turku.

Karlenby, L. 2006. Mäster Påvels hytta vid Glashytteudden och Västra Sundby glashytta. I: Blick för Bergslagen. – *UV Bergslagen Rapport 2006:13*. (Manuscript in Riksantikvarieämbetet.) https://bergdala-glastekniska-museum.se/Inventarieforteckning/Open/BGM_ 00_352.pdf, 12.05.2024.

Laos, H. 2011. *Peegli- ja klaasitööstus Eestis*. (Unpublished BA thesis.) Manuscript at Mainor Business School.

Lumiste, M. 2015. *Von Pistohlkorside Rutikvere mõis 18. sajandi lõpul ja 19. sajandi esimesel veerandil*. (Unpublished MA dissertation.) Manuscript in TÜ AAI DSpace. http://hdl.handle.net/10062/72041, 12.05.2024.

Mäeväli, S. 1980. *Tallinn, Uus tn. 15. Väliuurimiste aruanne.* (Manuscript in MA.) ERA.T-76.1.10658. https://register.muinas.ee/public.php?menuID=archivalmaterial& action=view&id=5367, 12.05.2024.

Mäll, J., Kadakas, V. & Vaheoja, I. 2002. *Arheoloogilised uuringud Tartu mnt. läbimurde lõigul Kivisilla tänavast Tornimäe tänavani*. (Manuscript in TLPA MKO archive.) N.10.130-B.

Malve, M. & Reppo, M. 2020. *Arheoloogilised uuringud Kopli kalmistupargis Vene loodearmee matmispaigal 27.–30.10.2020.* (Manuscript in TLPA MKO.)

Malve, M., Visnapuu, E., Viljat, J., & Kask, S.-K. 2022. *Arheoloogilised päästekaevamised Tallinna Kaasani Jumalaema Sünni kirikaias 2020.–2021. aastal.* (Manuscript in TLPA MKO.)

Metsoja, K. & Tvauri, A. 2013. *Arheoloogiline luure Põltsamaa khk alal, Pajusi klaasikoja asemel 26.05.2013*. (Manuscript in MA.)

Raat, M. 2023. *Rõika peeglivabriku tööliselamu*. (Unpublished BA thesis.) Manuscript in UT Viljandi Culture Academy DSpace. https://hdl.handle.net/10062/90101, 12.05. 2024.

Reppo, M. 2015. *Consuming glass vessels in medieval and post-medieval Hanseatic towns: the case of Tallinn (Reval), Estonia*. (Unpublished MA dissertation). https://www.etera.ee/s/SN0Y6Ggya8, 12.05.2024.

Reppo, M. 2019b. *pXRF analüüs – Klaasileiud Valipelt (AI 7284). Aruanne*. (Manuscript in TLÜ AT archive.)
Reppo, M. 2020b. *pXRF analüüs – Klaasileiud Pärnust (PäMu 14350, PäMu 14440, PäMu 14489). Aruanne.* (Manuscript in PäMu.)
Reppo, M. 2022a. *Klaasist esemed Jakobi tn 5, Tartu arheoloogilistelt uuringutelt (TM A-270). Eksperdihinnang.* (Manuscript at Arheox Ltd.)
Reppo, M. 2022b. *Klaasist esemed Linnateatri arheoloogilistelt uuringutelt (AI 8553). Eksperdihinnang.* (Manuscript at Arheox Ltd.)
Reppo, M. & Malve, M. 2023. *Arheoloogiline uuring hiiurootslaste kalmistul Hiiumaal. Aruanne*. (Manuscript in MA.)
Sokolovski, V. 1996. *Aruanne arheoloogilistest uuringutest endisel Püha Barbara kalmistul. III köide. Luustike kirjeldused (1992. a. kaevand ja kaevandid III–V). Leidude nimekiri (1988–1995)*. (Manuscript in MA.)

Archival sources

AM.296, Maks Roosma, professor, AM, Tallinn, Estonia.
AM.296.1.68, Ülevaated Puurmani ning Kärevere-Laeva klaasikodadest. Mustandkäsikiri, 1970s, Maks Roosma, professor, AM, Tallinn, Estonia.
RA, EAA.308.2.28, Saaremaa, Hiiumaa ja Lääne-Eesti rannikualade kaart, 1704, Liivimaa kubermangu joonestuskoda, RA, Tartu, Estonia.
RA, EAA.1257.2.1, Sünni-, abielu- ja surmameetrika ja muud andmed koguduse tegevuse kohta, 1750–1792, EELK Kursi kogudus, RA, Tartu, Estonia.
RA, EAA.1258.2.7, Sünni-, abielu-, surmameetrika ja muud andmed koguduse tegevuse kohta. Vara abikogudus, 1776–1796, EELK Maarja-Magdaleena kogudus, RA, Tartu, Estonia.
RA, EAA.1266.2.2, Sünni-, abielu-, surmameetrika ja andmed koguduse tegevuse kohta, 1749–1788, EELK Äksi kogudus, RA, Tartu, Estonia.
RA, EAA.1284.2.7, Sünni-, abielu, surmameetrika ja andmed koguduse tegevuse kohta, 1817–1833, EELK Vändra kogudus, RA, Tartu, Estonia.
RA, EAA.1348.2.153, Briefwechsel des Majors W. von Lauw mit den Verwandten, Amts- und Privatpersonen, 1765, Vana-Põltsamaa mõis, RA, Tartu, Estonia.
RA, EAA.1348.2.169, Wackenbuch des Gutes Pajus, Vorstreckungsspetzifikation, Korn-, Geld-, Glashütte u. a. Kontos, 1768–1769, RA, Tartu, Estonia.
RA, EAA.1365.1.31, Krahv Mellini Liivi- ja Eestimaa kaardid, 1798, Kärde mõis, RA, Tartu, Estonia.
RA, EAA.1806, Rõika-Meleski klaasivabrik, RA, Tartu, Estonia.
RA, EAA.1806.1.1, Kirjad Joh. Hake'lt Käreverest major W. J. von Lauw'le Põltsamaa klaasi- ja peeglivabriku sulatusahjude töö, telliste veo, summade laekumise jm asjus, 29.03.1780–23.03.1784, Rõika-Meleski klaasivabrik, RA, Tartu, Estonia.
RA, EAA.1850.1.1122, Ülemõpetaja Robert Feldmann'i (+1927) perekonna genealoogilised materjalid – I osa, Tartu Saksa Perekonnaajaloo Uurimise Selts, RA, Tartu, Estonia.
RA, EAA.1850.1.1123, Ülemõpetaja Robert Feldmann'i (+1927) perekonna genealoogilised materjalid – II osa, Tartu Saksa Perekonnaajaloo Uurimise Selts, RA, Tartu, Estonia.

RA, EAA.1850.1.1124, Ülemõpetaja Robert Feldmann'i (+1927) perekonna genealoogilised materjalid – III osa, Tartu Saksa Perekonnaajaloo Uurimise Selts, RA, Tartu, Estonia.
RA, EAA.1850.1.1125, Ülemõpetaja Robert Feldmann'i (+1927) perekonna genealoogilised materjalid – IV osa, Tartu Saksa Perekonnaajaloo Uurimise Selts, RA, Tartu, Estonia.
RA, EAA.1850.1.1125a, Ülemõpetaja Robert Feldmann'i (+1927) perekonna genealoogilised materjalid – IV osa, Tartu Saksa Perekonnaajaloo Uurimise Selts, RA, Tartu, Estonia.
RA, EAA.1850.1.1126, Ülemõpetaja Robert Feldmann'i (+1927) perekonna genealoogilised materjalid – Auszüge aus dem Kirchenbuch Leal (Lihula) 1765-1833, angefertigt von Oberlehrer Robert Franz Leopold Feldmann in März und April 1920, Tartu Saksa Perekonnaajaloo Uurimise Selts, RA, Tartu, Estonia.
RA, EAA.1850.1.1127, Ülemõpetaja Robert Feldmann'i (+1927) perekonna genealoogilised materjalid – VI osa, Tartu Saksa Perekonnaajaloo Uurimise Selts, RA, Tartu, Estonia.
RA, EAA.1850.1.1130, Ülemõpetaja Robert Feldmann'i (+1927) perekonna genealoogilised materjalid – IX osa, Tartu Saksa Perekonnaajaloo Uurimise Selts, RA, Tartu, Estonia.
RA, EAA.1865.2.41/7, Vara (Warrol) mõis: revisjonilehed, 1811, Liivimaa kubermangu revisjonilehtede kollektsioon, RA, Tartu, Estonia.
RA, EAA.4918.1.2088, Wentser, Wentzel, Wentzer, Wentzev, Wenzel, 1699–1939, Genealoogiliste materjalide kollektsioon Törne arhiiv, RA, Tartu, Estonia.

Datasets and repositories

CMOG. 2023. Online collections. https://glasscollection.cmog.org/collections, 12.05. 2024.
Kinnistute register. 2023a. Kinnistu nr 1. RA, Estonia. https://www.ra.ee/apps/ kinnistud/ index.php/et/kinnistud/view?id=17275, 12.05.2024.
Kinnistute register. 2023b. Kinnistu nr 144. RA, Estonia. https://www.ra.ee/apps/ kinnistud/index.php/et/kinnistud/view?id=17031, 12.05.2024.
Varep EKI = Endel Varepi asustusajalooline kartoteek, 1940–1988, Eesti Keele Instituudi kohanimekartoteek veebis, https://www.eki.ee/kohanimed, 12.05.2024.

Publications

Alliksaar, E. 2012. *Klaasipealinn Järvakandi*. Järvakandi: MTÜ Järvakandi Arendusselts.

Allikvee, A. 2023a. Unistus küllusest. Söögist, köögist ja kunstist 16.–17. sajandil. – *Pööning*, 3 (39), 74–77.

Allikvee, A. 2023b. Maias ajastu. Toidud ja joogid 18. sajandi kunstis. – *Pööning,* 4 (41), 75–78.

Amdam, R. P., Fredona, R. & Reinert, S. A. 2019. Breaking Even: Political Economy and Private Enterprise in the Norwegian Glass Industry, 1739–1803. – *Business History Review*, 93, 2, 275–317.

Amelung, F. 1876. Die älteren Glashüttenanlagen des Major von Lauw seit 1764 und die Gründung der Spiegelfabrik Catharina-Lisette im Jahre 1792. – *Neue Dörptsche Zeitung*, 1876, Nr. 271.

Amelung, F. 1892/1999. *Oberpahleni ajaloost ja tööstuslikust õitseajast*. Dorpat: C. Mattiesen.

Annila, M. 2013. *Vanhat lasini. Suomalaista lasia 1700-luvulta 1900-luvun alkuun*. Riihimäki: Suomen Lasimuseo.

Åstrand, J. 2010. "…since 1742" – en glasarkeologisk undersökning i Kosta. – *Renässansglas i Norden. Hikuin*, 37, eds. M. Hansson, J. Kock, & J. Vellev, 69–82.

Audere, I. 2004. *Glass paintings in Latvia. Heritage of masters and workshops*. Author's summary. Latvian Academy of Art. https://studylib.net/doc/7689604/ilona-audere.-paintings-on-glass-in-latvia.-heritage-of-m, 12.05.2024.

Baumgartner, E. (ed.). 2005. *Glas des Mittelalters und der Renaissance. Die Sammlung Karl Amendt.* Düsseldorf: museum kunst palast.

Beaudry, M. C. (ed.). 1988a. *Documentary archaeology in the New World*. Cambridge: Cambridge University Press.

Beaudry, M. C. 1988b. Words for things: linguistic analysis of probate inventories. – *Documentary archaeology in the New World*, ed. M. C. Beaudry, 43–50. Cambridge: Cambridge University Press.

Bielefeldt Bruun, M., Holmér, G., Koivisto, K. & Outsen, S. 2021. Introduction and a Select Bibliography on Scandinavian Glass. – *Journal of Glass Studies*, 63, 297–302.

Bis, M. 2017. Nowożytne naczynia szklane znalezione w Warszawie – możliwości i ograniczenia badań. – *Kwartalnik Historii Kultury Materialnej*, 65(3), 371–396.

Bis, M. 2019. Thrown Away or Put Away? Window Glass from the Second Half of the 17th Century Deposited in Tykocin Castle. – *Fasciculi Archaeologiae Historicae*, 32, 147–163.

Bis, M. 2020. Some Remarks on Glass Seals from the Territory of Poland from the 17th-19th Centuries. – *Fasciculi Archaeologiae Historicae*, 33, 133–157.

Biszkont, J. 2005. Późnośredniowieczne szklarstwo na Śląsku. *Wratislavia Antiqua*, 7. Wrocław: Uniwersytet Wrocławski. Instytut Archeologii. http://wratislavia.archeo.uni.wroc.pl/index.php?sw=71, 12.05.2024.

Blanning, T. C. W. (ed.). 2001. *The Oxford Illustrated History of Modern Europe*. Oxford: Oxford University Press.

Brivati, B. 1996. Introduction – *The Contemporary History Handbook,* eds. B. Brivati, J. Buxton & A. Seldon. Manchester and New York: Manchester University Press, xv–xxiv.

Bronk, H., Schulze, G., Ritsem, P. C. & Bartel, H.-G. 2000. Distinction of Venetian glass from *façon de Venise* glass on the basis of chemical analysis. An assessment of

the chances and limitations. – *Annales du 14e Congrès de l'Association Internationale pour l'Histoire du Verre (Milan, 2000)*, 341–345.
Brown, M. R., III. 1988. The behavioral context of probate inventories: an example from Plymouth Colony. – *Documentary archaeology in the New World*, ed. M. C. Beaudry. Cambridge: Cambridge University Press, 79–82.
Brown, S. 2019. The Medieval Glazier at Work. – *Investigations in Medieval Stained Glass. Materials, Methods, and Expressions. Reading Material Sources,* 3, eds. B. Kurmann-Schwarz & E. Pastan. Brill: Leiden; Boston, 9–22.
Brüggemann, K. & Woodworth, B. D. 2020. Estonian Modern History in the Twenty-first Century. – *Acta Historica Tallinnensia*, 26 (1), 79−102.
Bugslag, J. 1998. Valentin Bousch's Artistic Practice in the Stained Glass of Flavigny-sur-Moselle. – *Metropolitan Museum Journal*, 33, 169–182.
Butzer, K. W. 1982. *Archaeology as human ecology*. Cambridge: Cambridge University Press.
Caple, C. 2006. *Objects: reluctant witnesses to the past*. London: Routledge.
Carr, D. 2012. Kogemus kui ajalugu. – *Tuna. Ajalookultuuri ajakiri,* 1/2012, 96–108.
Carr, D. 2014. *Experience and history: phenomenological perspectives on the historical world.* Oxford: Oxford University Press.
Ciepiela-Kubalska, S. 1985. Les verreries polonaises au XVIIe siècle. – *Annales du 10e Congrès de l'Association Internationale pour l'Histoire du Verre (Madrid-Segovie, 1985)*, 449–464.
Clevis, H. & Kottmann, J. 1989. *Weggegooid en teruggevonden. Aardewerk en glas uit Deventer vondstcomplexen 1375–1750.* Vechtstreek: Stichting Archeologie IJssel.
Currie, A. 2018. *Rock, Bone and Ruin: An Optimist's Guide to the Historical Sciences*. Cambridge, MA: MIT Press.
Currie, A. 2019. *Scientific Knowledge and the Deep Past*. Cambridge: Cambridge University Press.
Darvill, T. 2008. *Oxford Concise Dictionary of Archaeology*. Oxford: Oxford University Press.
De Raedt, I., Janssens, K., Veeckman, J. & Adams, F. 2000. Composition of *façon-de-venise* and Venetian glass from Antwerp and the Southern Netherlands. – *Annales du 14e Congrès de l'Association Internationale pour l'Histoire du Verre (Milan, 2000)*, 346–350.
Drahotová, O. 2005. *Historie sklářské výroby v českých zemích: Od počátků do konce 19. století. I.díl.* Prague: Academia.
Dreving, V. 2013. *Meleski klaasivabriku kolm sajandit*. Tartu: Eesti Ajalookirjastus.
Drozdov 2022a = **Дроздов, А.А. 2022a.** О производстве стекла на Ямбургском заводе. – *Декоративное Искусство И Предметно-Пространственная Среда. Вестник РГХПУ Им. С. Г. Строганова*, 3 (1), 341–363.
Drozdov 2022b = Дроздов, А.А. 2022b. Производство стекла на Жабинском заводе по данным письменных источников. – *Декоративное Искусство И Предметно-Пространственная Среда. Вестник РГХПУ Им. С. Г. Строганова*, 2 (1), 326–340.
Drozdov 2022c = Дроздов, А.А. 2022c. Стекло Жабинского завода. – *Декоративное Искусство И Предметно-Пространственная Среда. Вестник РГХПУ Им. С. Г. Строганова*, 3 (1), 326–340.
Dungworth, D. 2011. The Value of Historic Window Glass. – *The Historic Environment*, 2, 1, 21–48.

Dungworth, D. 2012. Three and a half centuries of bottle manufacture. – *Industrial Archaeology Review*, 34, 1, 37–50.
Dungworth, D. 2019. *Glassworking in England from the 14th to the 20th century*. Swindon: Historic England.
Erpenbeck, D.-G. 2015. Glasmacher und Glashütten im Baltikum im 18. Jahrhundert. – *Die baltischen Länder und Europa in der Frühen Neuzeit*, eds. N. Angermann, K. Brüggemann & I. Põltsam-Jürjo. Vienna: Böhlau, 301–328.
Feldmann, R. 1935. Verzeichnis sämtlicher Glasmacher-Familien in Est- u. Livland. – *Baltische Familiengeschichtliche Mitteilungen*, 3, 40–42.
Fogelberg, T. & Holl, F. 1998. Wanderungen Deutscher Glashüttenleute und Schwedens Glasindustrie in den letzten fünf Jahrhunderten. – *Smålands Museums skriftserie*, 3.
Forster, M. N. & Gjesdal, K. 2019. *The Cambridge Companion to Hermeneutics*. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781316888582, 12.05.2024.
Friedenthal, I.-M. 1929. *Die Entwicklung der Industrie in Estland bis zum Ausgang des 19. Jahrhunderts. Inaugural-Dissertation zur Erlangung der Doktorwürde.* Tallinn: Estländische Druckerei Aktien-Gesellschaft. https://dspace.ut.ee/handle/10062/76990, 12.05.2024.
Gadamer, H.-G. 1997. *Gadamer on Celan: "Who am I and who are you?" and other essays*, eds. R. Heinemann & B. Krajewski. Albany: State University of New York Press.
Grimm, C. 1977. Zur Geschichte der Glasmacher in Est- und Nordlivland. – *Genealogie: Deutsche Zeitschrift für Familienkunde*, 26, 1, 403–425.
Grimm, C. (ed.). 1984. *Glück und Glas: zur Kulturgeschichte des Spessartglases*. München: Verlag Kunst und Antiquitäten.
Haggrén, G. 1989. Someron Åvikin lasitehdas Suomen Lasimuseon tutkimuskohteena. – *Muinaistutkija*, 3, 14–23.
Haggrén, G. 1994. Pikarit, ikkunat ja muut lasit – Helsingin porvarien haurasta ylellisyyttä ja arkiesineistöä. – *Narinkka 1994. Helsinki 1550–1640*, 282–307.
Haggrén, G. 1999. Medieval glass finds from Turku, especially from the Aboa Vetus excavations. – *The medieval town in the Baltic: Hanseatic history and archaeology, Proceedings of the First & Second Seminar, Tartu, Estonia, 6–7 June 1997 and 26–27 June 1998*, eds. R. Vissak & A. Mäesalu. Tartu: Tartu City Museum, 65–74.
Haggrén, G. 2005. Lasiastiat keskiajan ja renessanssin Suomessa. – *Suomen keskiajan arkeologian seura*, *2005* (4), 41–53.
Haggrén, G. 2009. Askaisten kirkon ikkunat: kulttuurihistoriallinen aarre 1600-luvun Suomesta. – *Finskt Museum*, *2008*, 83–110.
Haggrén, G. 2010. Bordskultur och glashandel i renässansens Nordeuropa. – *Renässansglas i Norden. Hikuin*, 37, eds. M. Hansson, J. Kock, & J. Vellev, 123–142.
Haggrén, G. 2014. Bohemian glass in the north: producers, distributors and consumers of Late Medieval vessel glass. – *Everyday products in the Middle Ages: crafts, consumption and the individual in Northern Europe c. AD 800–1600*, eds. G. Hansen, S. Ashby & I. Baug. Oxford: Oxbow Books, 319–338.
Haggrén, G. 2016. Glaskärl berättar om 16 stadshushåll i Kalmar. – *Kalmar mellan dröm och verklighet: Konstruktionen av den tidigmoderna staden*, eds. G. Tagesson & P. Carelli. Stockholm: Arkeologerna – Statens historiska museer, 334–337.
Haggrén, G. 2018. Ikkunalasi ja lyijypuitteet. – *Koroinen: Suomen ensimmäinen kirkollinen keskus. Turun historiallinen arkisto, 71,* eds. J. Harjula, S. Hukantaival, V.

Immonen, T. Ratilainen, & K. Salonen. Turku: Turun historiallinen yhdistys ry, 179–182.

Haggrén, G. & Sedláčková, H. 2007. Ribbed beakers with applied glass threads in Europe. – *Číšky s taženými kapkami v Evropě. Památky archeologické 98*, 185–250.

Haggrén, G., Whatley, S. & Dahlström, H. 2020. Medieval and Early Modern Utility Glass in Denmark. – *Journal of Glass Studies,* 62, 185–212.

Hansen, J., Hung, J., Ira, J., Klement, J., Lesage, S., Simal, J. L. & Tompkins, A. (eds.). 2023. *The European Experience: A Multi-Perspective History of Modern Europe, 1500–2000.* Cambridge: Open Book Publishers.

Hansson, M. 2010. Trestenshult och den tidiga småländska glashanteringen. – *Renässansglas i Norden. Hikuin*, 37, eds. M. Hansson, J. Kock, & J. Vellev, 49–62.

Hansson, I.M., Kock, J. & Vellev, J. 2010. *Renässansglas i Norden. Hikuin*, 37.

Heinsoo, H. 2005. *Klaas ja Järvakandi: lühiülevaade klaasist ja tema kohast inimtegevuses läbi ajaloo laias ilmas ning Eestimaal.* Järvakandi: Järvakandi Klaasimuuseum.

Henkes, H. E. 1994. Glas zonder glans: vijf eeuwen gebruiksglas uit de bodem van de Lage Landen 1300–1800 – Glass without gloss: utility glass from five centuries excavated in the Low Countries, 1300-1800. *Rotterdam Papers*, 9. Rotterdam: Coördinatie Commissie van Advies inzake Archeologisch Onderzoek binnen het Ressort Rotterdam.

Henricson, L. G. 2002. ”Drycke glass” i Stockholms jord från 1200-tal till 1900-tal. – *Upptaget: arkeologi i Stockholm inför 2000-talet*, ed. B. Hallerdt. Stockholm: Samf. S:t Erik, 225–236.

Henricson, L. G. 2016. Johan III:s glasbruk på Bryggholmen. – *Situne Dei. Årsskrift för Sigtunaforskning och historisk arkeologi*, eds. A. Söderberg, A. Kjellström, C. Hedenstierna-Jonson, M. Källström & J. Runer. Sigtuna: Sigtuna Museum, 66–79.

Herder, J. G. 1768/1990. An den Herrn Direktor der Historischen Gesellschaft in Göttingen. – *Ausgewählte Werke in Einzelausgaben: Schriften zu Literatur, 2/1: Kritische Wälder,* ed. R. Otto. Berlin: Aufbau.

Herremans, D., Cagno, S., Vincke, A., Janssens, K. & de Clercq, W. 2013. All crystal clear: 18th-Century glass *à la façon de Bohème* from the Cistercian Nunnery of Clairefontaine, Belgium. – *Journal of Glass Studies*, 55, 137–151.

Hess, C. & Husband, T. 1997. *European glass in the J. Paul Getty Museum*. Los Angeles: The J. Paul Getty Museum.

Hicks, D. & Beaudry, M. (eds.). 2006. *The Cambridge Companion of Historical Archaeology*. Cambridge: Cambridge University Press.

Hodder, I. (ed.). 1991. *Archaeological Theory Today*. Cambridge & Malden: Polity.

Hodder, I. 1999. *The Archaeological Process: An introduction*. Oxford: Blackwell.

Holmér, G., Ernstell, M., Heuer, M., Arfvidsson, B. & Thor, L. 2007. *Svenskt glas under sex sekler.* Växjö: Kulturspridaren förlag.

Holmér, G., Koivisto, K., Outzen, S. & Bielefeldt Bruun, M. 2020. Scandinavian Glass from Sweden, Finland, and Denmark: From the Early Modern Period to Industrial Glass Production. – *Journal of Glass Studies,* 62, 167–183.

Hoyningen-Huene, P. 2008. Systematicity: the nature of science. – *Philosophia,* 36, 167–180.

Hoyningen-Huene, P. 2013. *Systematicity: The Nature of Science*. Oxford: Oxford University Press.

Huisman, D.J., Os, B. van, Lange, G. & Post, F. 2014. Of times and shapes: Compositional variation in post-medieval glass from the Netherlands. – *Proceedings of the 39th International Symposium for Archaeometry, Leuven (2012),* 223–227.

Hülsmann, G. (ed.) 2013. Glas. Funde aus einem unterirdischen Kanalsystem. – *Falkenhof Museum – Bestandskatalog,* 1. Regensburg: Schnell & Steiner.

Humbsch, K. 2002. *Alte Glashütten in Polen: Studien zur Produktionsgeschichte und den Markungen unter besonderer Berücksichtigung Pommerns, Schlesiens und Ostbrandenburgs*. Neustrelitz: Lenove.

Hupel, A.W. 1789. *Die gegenwärtige Verfassung der Rigischen und der Revalschen Stadthalterschaft. Zur Ergänzung der topographischen Nachrichten von Lief- und Ehstland.* Riga: Bey Johann Friedrich Hartknoch. http://dspace.utlib.ee/dspace/handle/10062/1887, 12.05.2024.

Isenberg, A. C. (ed.). 2014. *The Oxford Handbook of Environmental History*. Oxford: Oxford University Press.

Jaago, K. 2001. Haapsalu esimene aukodanik ja tema aeg. Casper Joachim Landensen (1712–1787). – *Läänemaa Muuseumi toimetised V*, 58–87.

Jaago, K. 2009. Haapsalu krahvilossi varaloend aastal 1664. – *Läänemaa Muuseumi toimetised XII*, 16–37.

Jakovļeva, M. 2017. Stikla ražošana Kurzemes hercogu uzņēmumos. Glass Manufacturing at Companies Owned by Courland Dukes. – *Starptautiskais simpozijs "Smilts un stikls." Zinātnisko rakstu krājums.* Rīga: Latvijas Universitāte, 154–155.

Johansen, H. & Olsen, B. 1992. Hermeneutics and Archaeology: On the Philosophy of Contextual Archaeology. – *American Antiquity*, 57, 3, 419–436.

Johanson, K., Haak, A., Kiudsoo, M., Luik, H., Lõugas, L., Malve, M., Rammo, R., Rannamäe, E., Reppo, M., Saage, R., Sarv, K., Tamla, Ü. & Vilumets, L. (forthcoming). *Materjalid arheoloogias. Kõrgkooliõpik*. E-course book.

Jones, O. R. 1986. *Cylindrical English Wine and Beer Bottles 1735-1850. Studies in Archaeology, Architecture and History*. Ottawa, Ontario: National Historic Parks and Sites Branch, Environment Canada-Parks.

Jones, O. R. & Smith, E. A. 1985. *Glass of the British military ca. 1755–1820. Studies in Archaeology, Architecture and History*. Ottawa: Canadian Government Publishing Centre.

Kadakas, V., Reppo, M. & Ööbik, P. 2020. Archaeological studies in the Cistercian monastic complex in Padise. – *AVE 2019*, 147−162.

Kalm, V., Pae, T., Sillaots, A. & Tamla, T. (eds.) 2008. *Pärnumaa. 1.* Tallinn: Eesti Entsüklopeediakirjastus.

Kalniņš, G., Skalberga, E. & Vecmuktāne, R. 2024. Stikla trauki Cēsu pilī: ieskats galda trauku fragmentu kolekcijā. – *Cēsu pils raksti V*, 244–255.

Kaplinski, K. 2015. *Tallinn – meistrite linn*. Tallinn: Tallinna raamat.

Kaplūnaitė 2017 = Каплунайте, И. 2017. Исследования на улице Майронё, 19. Отражение ремесел и торговли в Вильнюсе в XIX – начале XX в. – *Археология и история Пскова и Псковской земли. Семинар имени академика В. В. Седова: Материалы 62-го заседания*, 32, 384–397.

Karklins, K., Jargstorf, S., Zeh, G. & Dussubieux, L. 2016. The Fichtelgebirge Bead and Button Industry of Bavaria. – *BEADS: Journal of the Society of Bead Researchers,* 28, 16–37.

Karma, O. 1963. *Tööstuslikult revolutsioonilt sotsialistlikule revolutsioonile Eestis*. Tallinn: ENSV TA.

Kenyon, G.H. 1967. *The glass industry of the Weald*. Leicester: Leicester University Press.

Kockum, J., Haggrén, G. & Johansson, M. 2023. Melchior Jung och hans glasbruk …at giöra glas på fenidische maneret. Glastillverkning under tidigmodern tid på

Södermalm i Stockholm. – *Rapport angående arkeologisk undersökning i form av schaktningsövervakning i del av fornlämning L2015:7789 inom Tranbodarne 11, Stockholms stad, Stockholms län*. Upplands Väsby: Arkeologikonsult.

Kogelytė-Simanaitienė, R. 2000. Profesionalaus lietuviško meninio stiklo vystymosi tendencijos. – *Menotyra*, 4 (21), 51–61.

Konsa, M. 2006. Estonian Archaeology from 1991–2005. – *Estonian Archaeology 1. Archaeological Research in Estonia 1865–2005,* eds. V. Lang & M. Laneman. Tartu: Tartu University Press, 41–50.

Kont, Ü. 2014. Helmevöö – kas linnasakste poekaup või Eesti talunaiste käsitöö? – *Studia Vernacula 5*, 94–111.

Kosenkov 2018 = Косенков, К. 2018. В Духанино работал первый в России стекольный завод. *Истра.рф*, January 19. https://xn--80apydf.xn--p1ai/story/istorii/v-duhanino-rabotal-pervyy-v-rossii-stekolnyy-zavod/, 12.05.2024.

Krantz, O. 2015. *Den småländska glasregionens uppgång och fall: en ekonomisk historia.* Möklinta: Gidlunds förlag.

Kriiska, A., Mägi, T. & Peets, J. 1991. Neues in der Experimentalarchäologie. – *TATÜ,* 40, 4, 400–412.

Kuisma-Kursula, P., Räisänen, J. & Matiskainen, H. 1997. Chemical analyses of European forest glass. – *Journal of Glass Studies*, 39, 57–68.

Kunicki-Goldfinger, J. J., Freestone, I. C., McDonald, I., Hobot, J. A., Gilderdale-Scott, H. & Ayers, T. 2014. Technology, production and chronology of red window glass in the medieval period – rediscovery of a lost technology. – *Journal of Archaeological Science*, 41, 89–105.

Kwass, M. 2022. *The Consumer Revolution, 1650–1800*. Cambridge: Cambridge University Press.

Lapiņš, A. 2017. Durvis un logi Cēsu pils arheoloģiskajā materiālā. – *Cēsu pils raksti I*, ed. G. Kalniņš, 59–83.

Larsson, L.-O. 1973. *De äldsta småländska glashyttorna*. Kronobergsboken.

Laur, M. 1999. *Eesti ajalugu varasel uusajal 1550–1800.* Tallinn: Eesti Entsüklopeediakirjastus.

Leonelli, S. & Tempini, N. (eds.). 2020. *Data Journeys in the Sciences*. Cham, Switzerland: Springer Open.

Lihter 2015 = Лихтер, Ю. А. 2015. Новое находки стеклянных изделий в Москве (Замоскворечье). – *Археология Подмосковья: Материалы научного семинара*, 11. Москва: ИА РАН, 501–525.

Lihter 2016a = Лихтер, Ю. А. 2016a. Стекло façon de Venice из раскопок в Москве и других городах (Вязьма, Мангазея). – *Вестник Томского государственного университета. История,* № 5 (43), 51–55.

Lihter 2016b = Лихтер, Ю. А. 2016b. Стеклянных изделия из раскопок на территории московской Огородный слободы (работы 2004 года). – *Археология Подмосковья: Материалы научного семинара*, 12. Москва: ИА РАН, 253–264.

Lihter 2017 = Лихтер, Ю. А. 2017. Стеклянные сосуды из раскопок в Черниговском переулке (Москва). – *Археология Подмосковья: Материалы научного семинара*, 13. Москва: ИА РАН, 284–298.

Lihter 2019 = Лихтер, Ю. А. 2019. Стекло XVII–XVIII веков из раскопок на Биржевой площади (работы Столичного археологического бюро 2017 года). – *Археология Подмосковья: Материалы научного семинара*, 15. Москва: ИА РАН, 283–290.

Lilienthal, E., Kreutzer, P. & Randloo, H. 1986/2010. *Võidula: Vändra Klaasivabriku küla ajaloost*. Võidula-Nõmme: Self-published.
Löfberg, A. 1993. Suomen lasinpuhaltajat vuosina 1748–1917. – *Lasitutkimuksia – Glass Research VII. Suomen lasimuseon tutkimusjulkaisu*. Riihimäki: Suomen Lasimuseo.
Loone 1952 = Лооне, Л.А. 1952. Из истории промышленного переворота в Эстонии. – *Вопросы истории*, 5, 77–96.
Lucas, G. 2017. The paradigm concept in archaeology. – *World Archaeology*, 49, 260–270.
Mäesalu, A. 1986. Unikale Glasfunde aus Tartu. – *TATÜ*, 39, 4, 400–402.
Majewski, T. & Gaimster, D. (eds.). 2011. *International handbook of historical archaeology*. New York: Springer.
Mäll, J. & Russow, E. 2004. Archäologie und Stalinismus – die Anfänge der Stadtarchäologie in Estland und die Ausgrabungen auf dem Tallinner Rathausplatz 1953. – *Zeitschrift für Archäologie des Mittelalters,* 2003/31. Bonn, 145–158.
Malve, M. & Tvauri, A. 2022. The 1710 plague burial ground on the outskirts of Tallinn. – *AVE 2021*, 235–248.
Mankin, U. 1995. Vanu pudeleid Tallinna Linnamuuseumi kogust. – *Tallinna Linnamuuseumi aastaraamat 1994/95,* 62–73.
Mäss, V. & Russow, E. 2016. A delivery for a pharmacy? Exceptional collection of Early Modern Age finds from the sea bed of the Tallinn Bay. – *AVE 2015,* 211–224.
Matiskainen, H. & Haggrén, G. 1996. Finland's oldest glass furnaces. Studies in industrial archaeology. – *Annales du 13:e Congres de l Association internationale pour l Histoire du Verre 1995*, 449–451.
Matiskainen, H., Haggrén, G. & Vanhatalo, S. 1991. The Archaeology of the Early Glass Industry in Finland: the glassworks of Åvik in Somero (1748–1833) and Mariedal in Sipoo (1776–1824). – *Lasitutkimuksia – Glass Research VI. Suomen lasimuseon tutkimusjulkaisu*. Riihimäki: Suomen Lasimuseo.
Meulebroeck, W., Nys, K., Patin, M. & Thienpont, H. 2021. The interaction between daylight and fifteenth and sixteenth century glass windows from the Low Countries. – *Scientific reports, 11: 21338*. https://www.nature.com/articles/s41598-021-00359-7/, 12.05.2024.
Mikolaitienė, R. 2002. Archeologinio XVI–XVII amžiaus stiklo radinių iš Biržų pilies konservavimas, stiklo dirbinių formų rekonstrukcija. – *Lietuvos dailės muziejus. Metraštis*, 348–353.
Miller, H. M. 2013. The Odyssey of a Transatlantic Archaeologist: Conversations with Ivor Noël Hume. – *Historical Archaeology*, 47, 4, 144–166.
Moreland, J. 2003. *Archaeology and Text*. London: Duckworth.
Mursu, K. 2020. Akende stiiliaabits. – *Pööning*. https://www.ajakiripooning.ee/akende-stiiliaabits-2/, 12.05.2024.
Niilisk, A., Ritslaid, P., Kikas, J., Haak, A. & Mäesalu, A. 2017. Elemental and Raman investigation of 13th–14th and 16th century enamelled glass beakers found in Estonia. – *Journal of Archaeological Science: Reports*, 16, 205–212.
Noël Hume, I. 1964. Archaeology: handmaiden to history. – *The North Carolina Historical Review*, 41, 2, 214–225.
Noreen, S. E. & Graebe, H. 1964. *Henrikstorp. Det skånska glasbruket 1691–1760.* Göteborg: Tre tryckare.
Oras, E. 2015. My research – my identity. Context and hermeneutic nature of archaeological research. – *Interarchaeologia*, 4, 107–121.

Palli, H. 1996. *Eesti rahvastiku ajalugu aastani 1712. Academia 6*. Tartu: Teaduste Akadeemia Kirjastus.
Palli, H. 1997. *Eesti rahvastiku ajalugu 1712–1799. Academia 7*. Tallinn: Teaduste Akadeemia Kirjastus.
Pärn, A., Valk, H. & Malve, M. 2024. Saastna kabel Matsalu lahe lõunakaldal. – *Tutulus: Eesti arheoloogia aastakiri*, 2023, 7–9.
Plath, U. 2010. Liivimaa spargel: kustunud mälestusi Balti aiandusajaloost 18. ja 19. Sajandil. – *Õpetatud Eesti Seltsi aastaraamat 2009 / Annales Litterarum Societatis Esthonicae 2009*, 72–101.
Polak, A. B. 1975. *Glass: Its tradition and its makers*. New York: G. Putnam's Sons.
Põldvee, A. & Seppel, M. 2020. Eesti varauusaja uurimine 21. sajandil. – *Acta Historica Tallinnensia*, 26 (1), 62−78.
Põltsam-Jürjo, I. 2009. *Liivimaa väikelinn Uus-Pärnu 16. sajandi esimesel poolel*. Tallinn: Argo.
Põltsam-Jürjo, I. 2014. Kellele kuulub öö? Elust pimedal ajal 13.–16. sajandi Liivimaal. – *Tuna. Ajalookultuuri ajakiri*, 3/2014, 14–32.
Põltsam-Jürjo, I. 2020. *Viin, vein ja vesi. Joogikultuur Eestis kesk- ja varauusajal.* Tallinn: Argo.
Poopuu, U. 2014. See lugu räägib Uulu külast. – *Oma leht. Tahkuranna valla ajaleht*. November 2014, 4–6. https://dea.digar.ee/cgi-bin/dea?a=is&oid=omaleht20141101&type=staticpdf, 12.05.2024.
Puss, H. 1988. Ühest klaasipuhujate omapärasest kombest. – *Keel ja Kirjandus*, 9, 557.
Reiman, V. 1892a. Rõika-Meleski peeglivabrik 1792–1892. – *Postimees*, 169, 3 August, 3.
Reiman, V. 1892b. Rõika-Meleski peeglivabrik 1792–1892. – *Postimees*, 170, 4 August, 3.
Reiman, V. 1892c. Rõika-Meleski peeglivabrik 1792–1892. – *Postimees*, 171, 5 August, 3.
Renfrew, C. 2001. Symbol before Concept. Material Engagement and the Early Development of Society. – *Archaeological Theory Today*, ed. I. Hodder. Cambridge & Malden: Polity, 122–140.
Renter, R. 1958. *Suurtööstuse tekkimine ja arenemine Eestis XIX ja XX sajandil*. Tallinn: Eesti Riiklik Kirjastus.
Reppo, M. 2019a. Pudelid, peekrid ja killud – klaasist Haapsalu piiskopilinnuses. – *Tutulus: Eesti arheoloogia aastakiri*, 2019, 20–21.
Reppo, M. 2020a. Uusaegsed apteegid: klaasist pudelid ja purgid Tallinnast Ravi tänavalt. – *Tutulus: Eesti arheoloogia aastakiri*, 2020, 32–33.
Reppo, M. 2022c. Kukk ja kana, kotkast rääkimata: linnukujutistega klaaspeeker Tallinna Linnamuuseumi kogust. – *TLM Toimetised*, 2. Linnaloom. Tallinna Linnamuuseum: Tallinn, 82−105.
Reppo, M. 2023. Linnud klaasil. – *Tiirutaja*, 62, 1–3.
Reppo, M. (forthcoming). *Glass on the edge of Europe. Making and using glass in medieval and post-medieval Estonia*. British Archaeological Reports publishing: Oxford.
Reppo, M. (forthcoming). Viguriga jalad Tallinna Linnamuuseumi kogust ja mujalt. – *TLM Toimetised,* 3.
Reppo, M. & Malve, M. 2022. Arheoloogilised uuringud Pühalepa kirikuaias. – *Hiiumaa Muinsuskaitse Seltsi Toimetised*, 4, 9–32.

Reppo, M. & Tint, K. 2022a. Riided sirgu – vaaliklaasid Eesti arheoloogilises materjalis. – *Ilusad asjad, põnevad lood. Muinasaja Teadus*, 29, eds. V. Lang, H. Luik, Ü. Tamla. Tallinn: Tartu Ülikooli kirjastus, 145−167.

Reppo, M. & Tint, K. 2022b. Unustatud vaaliklaasid. – *Tutulus: Eesti arheoloogia aastakiri*, 2022, 20–22.

Reppo, M., Viljat, J. & Kriiska, A. 2021. Plague, pottery production and plenty of bullets – excavations at Pärnu Rd 59, Tallinn. – *AVE 2020*, 227–242.

Roio, M. (ed.). 2013. *Shipwreck heritage: digitizing and opening access to maritime history sources*. *Muinasaja Teadus*, 23. Tallinn.

Rönnbäck, K. 2010. An Early Modern Consumer Revolution in the Baltic? – *Scandinavian Journal of History*, 35 (2), 177–197.

Roosma, M. 1966. *Hüti klaasikoda. Jooni klaasimanufaktuuri tegevusest Eestis XVII sajandil*. Tallinn: Kunst.

Roosma, M. 1969. The glass industry of Estonia in the 18th and 19th century. – *Journal of Glass Studies*, 11, 70–85.

Roosma, M. 1977. The Estonian Glasshouse of Hüti 1628–1664. – *Journal of Glass Studies*, 19, 183–184.

Rosenthal, J. W. 1996. *Spectacles and Other Vision Aids: A History and Guide to Collecting*. San Francisco: Norman Publishing.

Rubnikowicz, M. 1991. Late Medieval and Early Modern glass furnaces in Northern Poland. – *Archeologia e storia della produzione del vetro preindustriale. Atti del Convegno Internazionale (Colle di Val d'Elsa-Gambassi, 1990)*. *Quaderni del Dipartimento di Archeologia e Storia delle Arti. Sezione Archeologia*, 26–27, ed. M. Mendera. Siena: Università di Siena, 463–480.

Russow, E. 2020. *Lood ja leiud Tallinna algusest*. Tallinn: Stilus.

Russow, E. 2022. 16th century Mõdriku hoard from Vetiku village, Virumaa. – *AVE 2021*, 197–208.

Russow, E., Lõugas, L., Maldre, L., Hiie, S., Kihno, K., Luik, H., Kadakas, V., Sarv, K., Kadakas, U., Kalm, A. & Reppo, M. 2013. Medieval and early modern suburban site in Tallinn, Tartu Rd. 1: artefacts and ecofacts. – *AVE 2012*, 149–170.

Russow, E., Öövik, P., Reppo, M. & Toos, G. 2017. Pre-urban and urban settlement activities at Pärnu Road 22, 22a and 24, Tallinn. – *AVE 2016*, 163–180.

Russow, E. & Pärn, A. 2013. Majalugu ehk millest kõnelevad Osutitorni müürihoone jäänused. – *Läänemaa Muuseumi toimetised XVI*, 88–130.

Russow, E., Randoja, K., Bernotas, R., Tvauri, A., Rammo, R., Reppo, M., Ratas, J., Kreem, J. & Lõugas, L. 2019. A late medieval treasure trove of Tallinn. Salvage excavations of the 15th-century landfill between the Jahu and Väike-Patarei streets. – *AVE 2018*, 185−218.

Russwurm, C. 1855. *Eibofolke oder die Schweden an den Küsten Ehstlands and auf Runö. Erster Theil.* Reval: J. J. Kelchen.

Ruussaar, A. 2006. *Võsaklaasist kristallini. Eesti klaasitööstused ja -disain 1920.–1930. aastatel*. Tallinn: Eesti Ajaloomuuseum.

Ruussaar, A. 2021. *Klaasimeistrid. Eesti klaasitööstuse ajalugu ja toodang*. Tallinn: Äripäev.

Salmin & Salmina 2014 = Салмин, С. А. & Салмина, Е. В. 2014. Археологические раскопки на Никольском IV раскопе (у «Солодёжни») в 2012 г. – *Археология и история Пскова и Псковской земли. Семинар имени академика В. В. Седова: Материалы 59-го заседания*, 29, 67–74.

Sedláčková, H. & Rohanová, D. 2016. *Renaissance and Baroque Glass From the Central Danube Region.* Brno: Archaia.
Seela, J. 1974. The early Finnish glass industry. – *Journal of Glass Studies*, 16, 57–86.
Seitz, H. 1936. *Äldre Svenska Glas*. Stockholm: Nordiska Museet.
Selart, A. (ed.). 2012. *Eesti ajalugu II. Eesti keskaeg*. Tartu: Tartu Ülikooli ajaloo ja arheoloogia instituut.
Seppel, M. 2015. Rootsi ajal 1563–1710. – *Hiiumaa: Loodus, aeg, inimene,* eds. H. Põllo, A. Telvik & E. Mäeots. Kärdla: Hiiumaa Teabekapital, 279−304.
Siembora, S. 2017. Wyroby ze szkła odkryte w trakcie badań archeologicznych przy kościele w Górze Świętej Małgorzaty w pow. łęczyckim. – *Acta Universitatis Lodziensis. Folia Archaeologica*, 32, 47–63.
Soom, A. 1954. *Der Herrenhof in Estland im 17. Jahrhundert*. Lund: Skånska Centraltryckeriet.
Stephan, H.-G. 2021. Alchemie, Archäologie, Glas und Keramik. – *Veröffentlichungen des Landesamtes für Denkmalpflege und Archäologie Sachsen-Anhalt – Landesmuseum für Vorgeschichte*. Band 80. Halle an der Saale: Landesmuseum für Vorgeschichte.
Strazdas, K. 1992. *Lietuvos stiklas nuo seniausių laikų iki 1940 metų*. Vilnius.
Šimkutė, I. 2011. Glass bottles from the 16th century to the 19th century in the old town of Klaipėda: data from archaeological excavations. – *Archaeologia Baltica 16. Settlements and Towns*, ed. V. Žulkus. Klaipėda: Klaipėda University Press, 152–167.
Šimkutė, I. 2013a. Svaigieji gėrimai ir jų importas Klaipėdoje XIII–XIX amžiais. – *Klaipėda Europos istorijos kontekstuose*, ed. V. Safronovas. Klaipėda: Klaipėda University Press, 54–65.
Šimkutė, I. 2013b. XVI–XIX a. stikliniai buteliai Klaipėdoje: tipologija, chronologija, reikšmė. – *Lietuvos archeologija*, 39, 145–176.
Tvauri, A. 2012. Archaeological investigations of the 18th century glassworks at Utsali. – *AVE 2011*, 113–124.
Tvauri, A. 2013. Archaeological investigations on the sites of the glassworks of Central Estonia. – *AVE 2012*, 259–270.
Tvauri, A., Bernotas, R. & Läänelaid, A. 2017. Archaeological excavations at the courtyard of Lutsu Street 12, Tartu. – *AVE 2016,* 147–154.
Uued Luuletused. 1875. *Uued Luuletused: Seal seas ka mõned naljakad kupleed teatrites laulda.* Tallinn: Lindforsi pär.
Uzzell, D. 2004. The dialectic of past-present relations. – *The Archaeology of Industrialization. The Society for Post-Medieval Archaeology Monograph*, 2*,* eds. D. Barker & D. Cranstone. Leeds: Maney Publishing, 5–13.
Vaimann, T. & Risthein, E. 2018. *Eesti energeetika 100 aastat.* Tallinn: Post Factum.
Valk, H. 2022. Finds from the moats of Põltsamaa castle. – *AVE 2021*, 209–214.
Vanhatalo, S. & Matiskainen, H. 1986. Suomen lasitehtaiden teollisuusarkeologinen inventointi. – *Lasitutkimuksia – Glass Research III.* Riihimäki: Suomen Lasimuseo.
Varep, E. 1962a. Klaasitööstusest Eestis. Peatükk Eesti loodusvarade kasutamise ajaloost. – *Eesti Loodus*, 3, 137–141.
Varep, E. 1962b. Klaasitööstusest Eestis. Peatükk Eesti loodusvarade kasutamise ajaloost. – *Eesti Loodus*, 4, 199–204.
Varul, L., Kask, S.-K., Kiudsoo, M., Maldre, L., Mäeorg, K., Reppo, M., Russow, E. & Kriiska, A. 2018. Archaeological investigations on Tõnismägi 11a and Pärnu Road 44 plots in Tallinn. – *AVE 2017*, 15−32.

Veksler & Lihter 2014 = Векслер, А. Г. & Лихтер, Ю. А. 2014. Об одном виде на стеклянных штофах XVIII века. – *Археология Подмосковья: Материалы научного семинара*, 10. Москва: ИА РАН, 247–250.

Willmott, H. 2002. Early post-medieval vessel glass in England, c. 1500–1670. *Council for British Archaeology Research Report*, 132. York: Council for British Archaeology.

Willmott, H. 2005. *History of Glassmaking in England*. Stroud: Tempus.

Wilkie, L. A. 2006. Documentary archaeology. – *The Cambridge Companion of Historical Archaeology*, eds. D. Hicks and M. Beaudry. Cambridge University Press: Cambridge, 13–33.

Wilkie, L. A. 2011. Inessential archaeologies: problems of exclusion in Americanist archaeological thought. – *World Archaeology,* 37, 3, 337–351.

Wilkinson, M. D., Dumontier, M., Aalbersberg, I. J. et al. 2016. The FAIR guiding principles for scientific data management and stewardship. − *Scientific Data*, 3, 160018. https://doi.org/10.1038/sdata.2016.18, 12.05.2024.

Young, R. A. 2008. *Historic Preservation Technology: A Primer*. New Jersey: Wiley.

Zammito, J. H. 2019. Hermeneutics and history. – *The Cambridge Companion to Hermeneutics,* eds. M. N. Forster & K. Gjesdal. Cambridge: Cambridge University Press, 109–132.

Žigeu, I. 2018. *Glassware and the Culture of Its Use in Klaipėda within the Context of the Baltic Sea Region (16th–19th Centuries): summary of doctoral dissertation*. Klaipėda: Klaipėda University Press.

Žigeu, I. 2019. Stikliniai geriamieji stalo indai Klaipėdos pilyje XV–XVII amžiais. – *Klaipėdos pilis tyrimai ir šaltiniai,* ed. G. Zabiela. Klaipėda: Druka.

SUMMARY IN ESTONIAN

Klaas ja selle valmistajad Eestis (ca 1550–1950): arheoloogiline uuring

Käesoleval väitekirjal oli kolm eesmärki. Esiteks, anda kronoloogiline ülevaade Eesti klaasitööstusest ja selle uurimisest ning täiendada varem kogutud andmeid. Teiseks, teha kindlaks rändklaasitööliste roll uusaegse klaasitööstuse arengus, kasutades selleks eluloolisi andmeid. Kolmandaks, anda põhjalik ülevaade klaasi tarbimisest Eestis uusajal. Lisaks oli eesmärgiks täiendada eestikeelset terminoloogiat. Uurimistöö käigus kirjeldati, mõõdeti ja pildistati 24067 klaasist eseme katket 12.–20. sajandist (**andmekogu I**), koguti kirjalikke andmeid 16.–19. sajandi klaasitööstusega seotud 1248 isiku kohta (**andmekogu II**) ning koondati ja uuendati andmeid 17.–20. sajandil Eestis tegutsenud 42 klaasikoja ja -tehase kohta (**andmekogu III**). Kõik alusandmed on avaldatud avaandmetena järgides avatud teaduse ja FAIR-põhimõtteid. Väitekiri põhineb arheoloogilistel leidudel ja kirjalikel allikatel ning koosneb kuuest artiklist, kolmest andmekogust ja siintoodud analüütilistest peatükkidest.

Esimene artikkel keskendus 17.–18. sajandi klaasi ja selle tootmise uurimise historiograafiale ning interdistsiplinaarsetele uurimismeetoditele Pärnumaal asunud 17. sajandi klaasikoja näitel (**artikkel I**). Teise artikli fookus oli Haapsalu piiskopilinnusest leitud 17. sajandi võsaklaasist tahulistel pudelitel ja mõõdupeekritel ning leiupaiga seostel Hüti klaasikojaga (**artikkel II**). Kohaliku toodangu kõrval kasutati Eestis ka imporditud klaasi – kolmandas artiklis vaadeldi lähemalt ühte Tallinnast leitud 17. sajandi alguse graveeritud lindudega peekrit Austriast (**artikkel III**). Neljas artikkel keskendus aga kõikidele lindude või tiivuliste olendite kujutistega leidudele andmekogus I (**artikkel IV**). Artiklis käsitleti muutusi klaasi kaunistamises 13.–20. sajandini, leidude andmekogu (andmekogu I) rakendamise võimalusi ja avaandmete kasutamist Eesti arheoloogias. Viies artikkel täiendas teist artiklit laiema geograafilise ja ajalise taustaga – vaadeldi 5830 kesk- ja uusaegset leidu Haapsalust ja Pärnust ning 8809 leidu Tallinnast, mis võimaldasid kirjeldada klaasi tarbimist ja selle muutumist Lääne- ja Põhja-Eestis (**artikkel V**). Kuues artikkel kujutas endast leidude, isikute ja klaasikodade andmekogudes esitatud andmete sünteesi, millega anti ülevaade klaasitööstusest ja -tööliste elust kolme sajandi vältel, keskendudes Wentzelli (17. sajand), Hageni (18. sajandi) ja Runge (19. sajandi) suguvõsadele (**artikkel VI**).

Uurimislugu

Eestis võib uusaegse klaasi uurimise jaotada neljaks – tööstusarheoloogia ja -ajalugu, esemeuuringud, genealoogia ning kunstiajalugu. Euroopas algas uusaegsete klaasikodade arheoloogiline uurimine valdavalt 1950. aastatel. Eestis on uuringud toimunud vaid 1950.–1960. ning 2010. aastatel (tabel 1). Suurema osa andmeid kohaliku klaasitööstuse kohta on kogunud kodu-, kunsti- ja majandusloolased ning geograafid. Arheoloogilist võrdlusmaterjali klaasikodade kohta

leiab Rootsist, Venemaalt, aga ka Soomest ja Poolast. Paraku on Läti ja Leedu klaasikojad väheuuritud. Esimestega on Eesti rändklaasitöölistel palju sidemeid. Uusaegset arheoloogilist klaasi on Eestis tüpoloogiliselt kõige laialdasemalt uurinud väitekirja autor. Geograafiliselt, kultuuriliselt ja/või ajalooliselt on oluliseks võrdlusmaterjaliks uurimused Põhja-Euroopast, sh. Rootsist (G. Haggrén; L. Henricson; G. Holmér), Suurbritanniast (D. Dungworth; H. Willmott) ja Loode-Venemaalt (J. Lihter) ning Saksamaalt (E. Baumgartner; C. Grimm), Madalmaadest (H. Henkes), Poolast (J. Biszkont, M. Bis) ja Tšehhist (H. Sedláčková), samuti muuseumite kataloogid ja kindlatele esemeliikidele keskendunud tööd. Märkimisväärsemad on ülevaated Klaipėda 16.–19. sajandi taaraklaasist (I. Žigeu). Uusaegse klaasi keemilist koostist on antiik- ja keskaegse klaasiga võrreldes Euroopas käsitletud vähe.

Eesti klaasitööliste genealoogiat ning elulugusid on uuritud juba enam kui sada aastat. Neid täiendavad Rootsi (T. Fogelberg ja F. Holl), Poola (S. Ciepiela-Kubalska; K. Humbsch), Soome (A. Löfberg) ja Liivimaa (C. Grimm) rändtöölistele keskenduvad uurimused, kuid enamasti ei ole nende autoriteks arheoloogid. Selle väitekirja pealkirja inspireeris aga Norra kunstiajaloolase Ada Polaki Euroopa klaasi ja klaasitööliste ajalugu koondav uurimistöö. Nagu töölised, pole klaasesemete kujutised kunstis ja kirjalikes allikates arheoloogiliste uuringute keskmes enamasti olnud. Eestis on lühidalt arutletud rahvakunstis ja Hütis toodetud klaasil leiduvate kujutiste sarnasuste (M. Roosma) ning anumate ja vitraažklaasi kaunistusvõtete üle (see väitekiri). Kuigi klaasesemete kujutiste kaasamine esemete uurimisel võiks olla tulemuslik, on arheoloogid maale ning teisi pildilisi kujutisi kasutanud siiski pigem illustratsioonidena. Eesti ja Euroopa uusaegse klaasi ja klaasitööstuse uurimisloo vaatlemine nelja teema kaudu annab hea võrdlusmomendi ning on lähtepunktiks murekohtade ja väheuuritud teemade väljaselgitamisel tulevasteks uuringuteks.

Teoreetiline taust

Selle väitekirja kirjutamist mõjutasid enim dokumentaalarheoloogia ning tõlgendava uusaja arheoloogia põhimõtted, mis omakorda on mõjutatud hermeneutikast ning fenomenoloogiast. Tõlgendavas uusaja arheoloogias kasutatakse suurt hulka interdistsiplinaarseid allikaid empiiriliste ja ajaloolise taustaga arvestavate narratiivide loomiseks, mis on kättesaadavad ka mitteakadeemilistes ringkondades ja aitavad kaasa täna oluliste teemade arutamisel. Nendeks allikateks olid siinkohal kirjalikud allikad, loodusgeograafia, materiaalne kultuur ja arheoloogilised leiukohad, mida vaadeldi Eesti ja Euroopa poliit- ja sotsiaalajaloo ning paigaloo kontekstis. Väitekirja kirjutamise vältel käsitleti uurimistulemusi nii populaarteaduslikes ajakirjades, televisioonis kui ka sotsiaalmeedias. Uusaegne klaasitööstus baseerus välistööjõul ja oli keskkonda kurnav – need teemad on olulised ja päevakajalised ka täna. Seda lähenemist täiendab dokumentaalarheoloogia, mis kasutab kirjalikke allikaid terviklikkusele püüdlevate narratiivide loomisel, mis võimaldavad tõlgendada ajaloolisi elukogemusi ja sündmusi, sh. igapäevaelu. Tõlgendamisel aitab aga arusaam ühisest ajakogemust – seosest minevikuga,

kõikide sündmuste mõju avaldumisest peale nende toimumist ning sama kogemuse erinevast tõlgendamisest ajas. Selline lähenemine ajaloole on fenomenoloogiline. Tõlgendamise ja mõistmise teooria ehk hermeneutika valguses ei peeta täielikku objektiivsust ajalookirjutuses võimalikuks – autori mõju uurimistööle on paratamatu. Kuigi subjektiivsuse tunnistamist on peetud teadusliku pessimismi tekitajaks, leiab väitekirja autor, et pessimismiks pole uurimistöö käigus pidevalt enesereflektsiooni ning arvukalt allikaid ja lähenemisi rakendades ja lünklike andmete põhjal tehtud üldistusi vältides põhjust. Pigem on see märk humanitaarteaduste süvenevast süstemaatilisusest, mis on teadusele omane.

Metodoloogia ja meetodid

Väitekirja peamised allikad olid esemed ja kirjalikud allikad. Leidude, klaasitööliste ja -kodade kohta kogutud andmed avaldati CC-BY 4.0 litsentsi alusel Tartu Ülikooli raamatukogu hallatavas DataDOI repositooriumis kolme ingliskeelse .XLSX vormingus tabeldatud, filtreeritava andmekoguna (vt tabel 3–5), mis on koostatud FAIR-printsiipi (leitavus, juurdepääsetavus, koostöövõimelisus, taaskasutavus) järgides. Vabalt kättesaadavad andmekogud on omavahel ristviidatud ning varustatud metaandmetega (.TXT), kus on kirjeldatud uuringu eesmärk ja allikad. Vaadeldud leiud asusid üheksa muuseumi kogudes. Mõningad leiud olid uuringute ajal Tartu Ülikooli teadlaste ning eraettevõtete valduses. Kokku kaasati töösse 317 erineva uuringu käigus kogutud leide 268 paigast (tabel 2), kaks leidu, mil puudub igasugune leiukontekst ja 117 leidu teadmata leiukohtadest Pärnus või Tallinnas.

Esemete uurimisel rakendati autori magistritöös välja kujundatud ja visuaalsel süstemaatilisel analüüsil põhinevat meetodit. Leidude puhul koguti andmeid iga leiu kohta 22 erineval väljal (tabel 3), kusjuures igal väljal on võimalik filtreerimine (leiukoht, tüüp, alaliik, värv, hoiustamiskoht jne). Nii jagunevad näiteks 59 peamist leiutüüpi 369 alaliigiks. Leidude mõõtmisel kasutati vajadusel nihikmõõdikut, joonlauda või raadiuse mõõtmiseks mõeldud skaalat. Leiud kirjeldati ning pildistati, osaliselt kasutati ja täiendati autori varasemaid leiukirjeldusi ning -fotosid. Leiufotod (16577) on salvestatud .JPEG, .PNG või .TIFF kujul, pealkirjastatud leiunumbriga, jagatud leide hoiustavate asutustega, salvestatud koopiatena erinevatele andmekandjatele ning on kättesaadavad nõudmisel.

Esemed dateeriti analoogsete leidude, konteksti või tüpoloogia põhjal. Kuigi väitekirja fookus on uusaegsel klaasil, on andmekogus I loetletud andmed 12.–20. sajandi leidude kohta. Selle tingis eelneva ülevaate puudumine kogudes hoiustatud klaasist, millest oleks võinud leidude uurimisel lähtuda (kogud tuli läbi vaadata karpide kaupa) ning 3000 anumakatke kaasamine autori magistritööst. Samuti on leide, mille dateering on lai või teadmata või leiukoht ootuspäratu, näiteks uusaegsed klaasileiud kiviaegsete muististe leiumaterjalis, mistõttu kindlalt ajaliselt piiritletud statistika esitamine on raskendatud. Ka andis varasema klaasi kaasamine võimaluse kirjeldada muudatusi klaasi tarbimises, mida poleks muidu olnud võimalik teha. 24067 leiust 19726 on võimalik kitsa või laia dateeringuga ajaldada uusaega. Klaasi terminoloogia on indekseeritult

esitatud lisas 1. Klaasi keemilise koostise ega tootmisjääkide analüüs polnud käesoleva töö eesmärk. Katse eesmärgil kontrolliti klaasistandardita pXRF mõõtmiste potentsiaalset võimekust Haapsalu, Hüti ja Pärnu klaasi eristamisel.

Klaasikodade ja -tööliste uurimiseks rakendati kvalitatiivseid meetodeid – digitud või arhiivides hoiustatavate kirjalike allikate analüüsi ning dokumentaalarheoloogiat, sh. leiupaikade (klaasikodade) kaugseiret. Varasemate uuringute põhjal koostatud nimekirjas oli 636 klaasitööga seotud isikut, mida täiendati ning millele lisati nende perekonnaliikmete ning teiste klaasitööliste andmed. Kokku koguti nii 1248 isiku andmed keskendudes 1620.–1860. aastatele – klaasitootmise algusest eestlastest tööliste laialdasema rakendamiseni klaasikodades. Erand tehti Pärnus 16. sajandil tegutsenud töölistele lootuses leida lisainfot Pärnumaale 17. sajandi alguses rajatud klaasikoja kohta, kuid see ei kandnud vilja. Eestis töötanud klaasitööliste täieliku nimekirja koostamine ei olnud väitekirja eesmärk. Klaasitööliste kohta koguti andmekogude koostamiseks andmeid 22 kategoorias (tabel 4; andmekogu II). Klaasikodade puhul on andmekogusse kantud 42 kuni Teise maailmasõjani rajatud ettevõtet, sest mitmel juhul olid need saanud alguse varem tegutsenud tehastest. Samuti oli klaasikodade mehhaniseerimine pikem protsess, mis hoogustus alles 1930. aastatel. Klaasikodade uurimisel keskenduti nende kronoloogiale ning omanike ja asukoha kindlakstegemisele. Kaubandussuhted ning teisi klaasikoja igapäevase majandamisega seotud andmeid ei uuritud. Iga klaasikoja lühikirjeldus on esitatud lisas 2. Peeglikodasid ei uuritud, kuigi Kamaris ja Rõika-Meleskis peegleid siiski tehti. Kõrvale jäeti Olgina ja Sõeru klaasikojad, mille kohta kindlam info puudus. Klaasikodade kohta koguti andmekogude koostamiseks andmeid 18 kategoorias (tabel 5; andmekogu III).

Allikad tehti kindlaks läbi Eesti Arhiivinduse Infosüsteemi (AIS), Digiteeritud Eesti Ajalehed (DEA) andmebaasi, Rootsi Riigiarhiivi (Riksarkivet) veebiotsingu ning varasemate uurijate tööde ja märkmete (R. Feldmann, E. Varep, M. Roosma). Pärandkultuuriobjektide kohta saadi infot Eesti Looduse Infosüsteemist (EELIS), kaitsealuste klaasikodade kohta Maa-ameti kultuurimälestiste kaardilt (jn 4), kasutati ka Rootsi Rahvusraamatukogu (Kungliga biblioteket) kaardiarhiivi ja Põhjamaade digitud kultuuripärandi andmebaasi (ALVIN). Mõningad neist portaalidest kasutavad allikate transkribeerimiseks optilist märgituvastust (OCR) või tehisintellekti (AI). Andmete visualiseerimiseks kasutati RStudiot ja programmeerimiskeelt R ning avatud lähtekoodiga visualiseerimisprogrammi Gephi. Kasutatud skriptid on kättesaadavad nõudmisel.

Klaasi valmistamine uusaegses Eestis

Töö tulemusel tuvastati 42 klaasikoda- või tehast (jn 1–2; andmekogu III), kusjuures Tõrna ja Kamari, Rõika ja Meleski ning Uulu ja Surju klaasikojad on esitatud koondatult lähtudes nende tööjaotusest. Töö käigus selgus tõsiasi, et vaid kuus klaasikoja aset on kaitse all (jn 4). Peamised raskused uurimistöös seisnesid varem avaldatud info kontrollimises säilikunumbrite muutumise või viidete puudumise tõttu ning mõningate kohanimede ja tööliste seostamises teadaolevate

klaasikodadega Kärevere-Laeva piirkonnas. Mitmel juhul osutus varem avaldatud informatsioon ekslikuks, eriti klaasikodade rajajate või maaomanike (rendileandjate) puhul, kus korduvalt on näiteks hilisemaid omanikke algseteks omanikeks peetud. See avastati tänu tööle Pärnumaa 17. sajandi klaasikojaga, kus selgus, et Heinrich Matthias von Thurni (1567–1640) surm ei saanud olla 1654. aastani tegutsenud klaasikoja sulgemise põhjus (artikkel I). 18. sajandi klaasikodade puhul vajasid enamasti täpsustamist klaasikodade dateering, nimi ja koordinaadid. 19. sajandi puhul tuvastati, et peamiselt esineb eksimusi klaasikoja rajaja isikus, seda Lelle, Eidapere ja Tudu klaasikoja puhul. Omanike suhted on aga perspektiivikas uurimisteema, sest töö käigus tuvastatud 37 omanikust olid omavahel sugulased või abielu kaudu seotud pea kolmandik.

Pärnumaal 17. sajandil asunud klaasikoja puhul pakuti väitekirjas Jõõpre ja Ridalepa piirkonnad võimaliku asukohana, kuid täpse paiga määramine kaugseire teel ebaõnnestus (artikkel I). 18. sajandi puhul on varasemad uurijad tõstatanud probleemi Vana-Põltsamaa, Puurmani ja Laeva mõisa alla kuulunud klaasikodade meeskondade töökohtade ning teadaolevate klaasikodade vastavusse viimises (tabel 6). Segadus on tekkinud erinevates allikates kasutatud nimekujudest ning Woldemar Johann von Lauwi rendil olnud ja talle kuulunud klaasikodade eristamises. Kui esimese grupi, von Lauwi rajatud Utsali ja Laashoone puhul oli asukoht selge, mõlemad arheoloogiliselt uuritud ja täpsustamist vajasid vaid tegutsemisaastad ning meeskonnaliikmed, siis Pajusit pole Vana-Põltsamaa alla märgitud, kuigi Pajusi mõis kuulus 1762.–1784. aastal Lauwile. Klaasikoda rajati ilmselt Laashoone ajutise eellasena. Puurmani mõisas asunud Altnurga ja Laasme klaasikoja puhul oli peamiseks probleemiks kihelkonna (Kursi) ja mõisa sama saksakeelne nimekuju (*Talkhof*), mida kasutati ka klaasikodade nimedes ja samas kihelkonnas Laeva mõisa alla kuulunud Tõrna-Kamari klaasikoja nimes (tabel 7).

Klaasikodade nimede ja asukohtade täpsustamisel olid väitekirjas oluliseks tööliste ja nende perekonnaliikmete kirjed kirikuraamatutes (jn 1). Kõige keerulisem oli Laeva mõisa klaasikodade (Laeva, Haava, Hoone, Tõrna-Kamari) eristamisega, mis olid 1767.–1786. aastal von Lauwi rendil. Siin täpsustati nii tegevusaegu, asukohti kui ka meeskondi. Tõrna-Kamari ja Laeva meeskondi polnud kirjalike allikate põhjal võimalik eristada, kusjuures tehtud töö tulemusel on ebaselge, kas Laevas asus üldse täiemahuline klaasikoda või on tegemist näiteks potaseahju või ajutise, väikese klaasikojaga. Täiendavat infot annaksid välitööd. Lisaks täpsustati veel mitme klaasikoja asukohta ja tegutsemisaega ning näidati leidude põhjal omanike mõju toodetud klaasile, seda pudelimärkide (Gorodenka) ja klaasikoja omanikuga seostatava leiukompleksi (Hüti; artikkel II) põhjal.

Klaasikojad ja -tehased töötasid inimjõul ning neid vaadeldi väitekirjas omavahelises seoses, et näidata klaasitööstusega seotud isikute rolli tööstuse arengus, mis oli väitekirja teine eesmärk. Kokku koguti eluloolisi andmeid 1248 isiku kohta (andmekogu II), mida kasutati nii tööstuse kronoloogia täpsustamisel (jn. 3) kui tööliste elu kirjeldamisel. Artiklis VI võeti kokku 17.–19. sajandil tegutsenud rändtööliste ja nende pereliikmete elukäik lapsepõlvest raugaeani ning vaadeldi iga sajandi kohta juhtumiuuringuna ühte klaasitööliste sugukonda –

vastavalt Wentzelli, Hageni ja Runge perekondi. Wentzelle võib lugeda esimeseks teadaolevaks klaasitootjate sugukonnaks Eestis, kuid erinevalt Põhjasõja järel siin töötanud töölistest, on 17. sajandi tööliste kohta allikate säilivuse tõttu keerulisem informatsiooni koguda. Siiski õnnestus nende elulugu veidi täiendada ja vaadelda nende seoseid Saksamaa ja Rootsiga.

18. sajandi keskpaigas Eestisse saabunud Hageni perekonna esindajate elukäigud pakkusid aga paremat ülevaadet tööliste sisemigratsioonist ja kogukonna arenemisest, eriti abielude ja ristivanemluse näitel. 19. sajandil toimus mitmete klaasikodade ühendamine suurteks tehasteks ning pärisorjuse kaotamise järel mõlemas kubermangus asus sajandi keskpaigast aina enam eestlasi klaasikodades tööle. Sellel muudatuste ajal olid üheks suurimaks rändtööliste suguvõsaks Runged, kel oli uuritud töölistest kõige enam sidemeid (jn 5). Kogutud info põhjal vaadeldi üldisi muudatusi tööliste elus ning loodi Eesti klaasitööstuse ajajoon (jn 3).

Esiteks saab uuringu tulemusel väita, et töölised jäid aja jooksul paiksemaks – 1–3 aasta asemel 18. sajandil võidi 19. sajandil samas töökohas veeta kümneid aastaid. Need rändtöölised, kelle puhul oli võimalik määrata päritolu, olid 17.–18. sajandil üldiselt pärit Saksamaalt, peamiselt Alam-Saksimaalt ja Mecklenburg-Vorpommernist. 19. sajandil kindlat rände alguspunkti ei tuvastatud, kuigi valdav osa töölisi tuli Saksamaalt, sajandi teisel poolel ka Soomest, Karjalast. Tootmiskohtade tööjaotust täpsemalt ei käsitletud, kuid kirjalikes allikates esinev ametite nimekiri annab aimu tööliste spetsialiseerumisest (tabel 8). Uuringu tulemusel on täpsustunud arheoloogiliselt olulised paigad, millest suurem enamus pole kaitse all. Andmekogus III koondatud andmetest lähtudes tasuks täiendavalt uurida klaasikodade omanike omavahelisi suhteid, rändtööliste ja nende perekonnaliikmete surmapõhjuseid, sh laste suremust ja kogukonnasiseseid haiguspuhanguid, õnnetusjuhtumeid ning eestlastest tööliste kaasamist klaasitehaste töös.

Klaasi kasutamine uusaegses Eestis

Väitekirja kolmandaks eesmärgiks oli selgitada välja, millist klaasi tarbiti Eestis uusajal ning kuidas see ajas muutus. Kokku vaadeldi 24067 leidu (jn 6). Kuna doktoritöö artiklid on avaldatud nii inglise kui eesti keeles, arendati koostöös Eesti Keele Instituudiga ka eestikeelset terminoloogiat, sest mitmed terminid eesti keeles varasemalt puudusid. Lisas 1 on ingliskeelsetele terminitele lisatud eestikeelne vaste. Keskenduti Pärnu, Haapsalu ja Tallinna leidudele. Kõik kolm on olnud ka olulised kaubalinnad. Lisaks kaasati klaasikodade leiud ning mõned kogud Lõuna-Eestist, et saada parem ülevaade klaasi tarbimisest kogu Eestis. Seoses Hüti unikaalse asukohaga saarel, kaasati ka arheoloogilised leiud mujalt Hiiumaalt. Leide käsitleti kõigis kuues artiklis (tabel 9). Väitekirja märkimisväärsemaks panuseks esemeuurimuses võib lugeda tahvelklaasi, täpsemalt akna- ja vitraažklaasi süstemaatilist uurimist (jn 7). Tahvelklaasi leidude abil oli võimalik vaadelda klaasi retušeerimise asendumist lõikamisega Eestis 17. sajandil,

värvitu aknaklaasi tootmise algust Eestis 1770. aastatel, tahvelklaasi valmistamisel kasutatud tehnoloogia püsivust ning akende muutumist kinnistest väikeste, peamiselt rombi- ja teemandikujuliste ruutudega paneelidest 17. sajandil avatavateks, suurte ruutudega akendeks 19. sajandiks (jn 8–10), mis mõjutas linna- ja eluruumide välimust.

Väitekirjas ja avaldatud artiklites näidati, et kohaliku tootmise tõttu muutus tahvelklaas ajas jõukohasemaks – 18. sajandi II pooles asuti mõisates ehitama klaasist kasvuhooneid ning 19. sajandi I pooles jõudsid esimesed klaasitud aknad ka küladesse. Vitraažklaasi puhul vaadeldi kaunistusvõtteid ja geograafilist kasutust. Arheoloogilised leiud ei toetanud kirjalikes allikates mainitud vitraažide kasutamist Haapsalu eramajadel, kuid see erinevus seostub tõenäoliselt arheoloogiliste uuringute väikese mahuga Haapsalus, sest ilmalikke vitraaže on leitud mitmelt poolt mujalt Eestist. Seda eriti 16.–17. sajandil Euroopas levinud ovaalsete ja ümmarguste maalitud paanide näol (jn 11). Maalitud klaas osutus levinumaks kui ühevärviline klaas. 464 vitraažklaasi killust oli 248 uusaega dateeritavad ning neist 181 olid maalitud, enamasti *grisaille* ehk hallitoonitehnikas (väitekirja autori termin). Ühevärviline klaas oli enamasti punane või sinine, esines ka smaragdrohelist ja kuldpruuni klaasi (jn 12). Täiendavat uurimist vajavad kindlasti peeglid (jn 13).

Andmekogus I on kirjeldatud 10876 anumakildu, mis moodustavad 45.2% kogu leidudest. Suurima osa neist (57.3%) moodustab omakorda uusaegne taaraklaas ehk purgid ja pudelid (jn 14), mis olid aknaklaasi kõrval kohalike klaasikodade põhitoodanguks. Väikeste paksu põhjaga silindrikujuliste purkide puhul on alust arvata, et need on toodetud 17. sajandil Pärnumaal; jalaga, väikesed ümarad pika kaelaga pudelikesed ehk Läänemere tüüpi rohupudelid on samal ajal aga olnud Hüti toodanguks (jn 15; artikkel I). 18. sajandil asuti Eestis tootma silindrikujulisi väikseid rohupudeleid, mida 19. sajandil hakati valmistama mitmeosalistes vormides ning sageli kõrgreljeefsete kirjade või erikujulisena. Suuri tahulisi purke kasutati peamiselt apteekides ning suuri väljapoole pööratud tilgavõruga ehk suuga purke kasutati hoidiste sisse tegemisel. 19. sajandil hakati purke tootma värvitust klaasist, varasemad purgid on rohekast võsaklaasist. Purkide tootmisele oli 1895. aastani spetsialiseerunud näiteks Järvakandi.

Pudelitest olid leiumaterjalis Haapsalus arvukaimad 17. sajandi tahulised ja Pärnus 18. sajandi kõhukad, kera- ja sibulakujulised ning 18. sajandi lõpul, 19. sajandil silindrikujulised veinipudelid (jn 16). Kõige levinumad pudelid olidki 1684 killuga viimased; tõenäoliselt leidub määramata pudelikildude (1094 tk) seas veel silindrikujulised pudelit kilde. Tallinn paistis silma Haapsalust ja Pärnust tunduvalt madalama pudelite üldarvuga kogu klaasileidude seas (artikkel V). Andmekogu I lõplikus versioonis oli Tallinnast küll kõige enam klaasileide, kuid vaid 13.3% olid neist pudelid, samas kui Haapsalus oli see suhe teiste leidudega 49.6% ning Pärnus 43.7%.

Taaraklaasi päritolu oli klaasi koostist analüüsimata võimalik määrata 1774. aastast kohustuslikuks muutunud pudelimärkide (jn 17; artikkel VI) ning 19. sajandi anumate kõrgreljeefsete kirjade põhjal. Kohalikud klaasikojad tootsid ka

jooginõusid ja kausse. Kokku vaadeldi 3349 jooginõud, millest 2264 on dateeritud uusaega. 17. sajandil toodeti Eestis mõõdupeekreid (väitekirja autori parandatud termin) ja nuppudega röömereid. Samal ajal kasutati barokist mõjutatud filigraanseid importnõusid – serpentiin- ehk vigurjalaga pokaale (jn 18), harvem *vetro a filigrana* peekreid, kantlohk- ja kantkühmpeekreid (väitekirja autori terminid) ning graveeritud jooginõusid. Artiklis IV vaadeldud kaunistusvõtted näitasid ilmekalt ka muutusi klaasi üldises tarbimises – 17. sajandi reljeefsete kaunistuste või aplikatsioonide asemel eelistati 18. sajandist graveeritud või dekoreerimata nõusid, 19. sajandil lisandus pressklaas. Kõik see kajastus ka jooginõude üldises valikus (jn 19).

18. sajandi II pooles hakati Eestis värvitust klaasist joogiklaase valmistama. Neid kaunistati tagasihoidliku graveeringu või happesöövitusega, joogiklaasi ainsaks kaunistuseks võis olla ka 8-, 11-, 15-, 16- või 24-tahuline kuju. Selliseid joogiklaase seostatakse mineraalvee tarbimisega ja need olid leidude põhjal eriti levinud Pärnus (jn 20). Selgest, värvitust klaasist olid ka tõmmatud, nupuga jalaga või paneeljalaga pokaalid (jn 21). Kuumade jookide lisandumisega linnaelanike menüüdesse 17. sajandi viimasel veerandil asuti kasutama ka piimklaasist tassikesi (jn 22). Dekoreerimata olid ka piimahapendamise kausid, mida toodeti 18. sajandist kohapeal (jn 23). Enne seda olid klaasist kausid leidude põhjal Eestis haruldased (jn 24).

Tahvel- ja anumaklaasi kõrval kasutati klaasi dekoratiivsetel või praktilistel eesmärkidel. Sellised esemed kirjeldati eelkõige ülevaate andmiseks tulevaste uuringute tarbeks. Enim leidus helmeid (jn 25), eelkõige pikalt kasutatud siniseid ja kollaseid kudrus- ja peamiselt 17.–18. sajandil kasutatud kerakujulisi ja lapikud helmeid. Nööpidest olid arvukaimad 17.–18. sajandi ümarad mustast klaasist traadist aasaga nööbid. Peale selle kirjeldati korke ja kaasi, lambipirne, prille ja monokleid, meditsiini ja laboriga seotud klaasi, vaaliklaase (väitekirja autori termin), aiakupleid ja nipsukuule (jn 26–27). Joonisel 26 ja siin loetletud esemetest on rahuldaval määral uurituid vaid vaaliklaase.

Kokkuvõte

Selle väitekirja peamiseks eesmärgiks oli uusaegse Eesti klaasitööstuse kronoloogiast, töölistest ja klaasi tarbimisest põhjaliku ülevaate saamine. Töö käigus täiendati ja täpsustati klaasikodade kasutusaegu, asukohti ja omanikke, kirjeldati tööliste ja nende elukäikude rolli tööstuse arengus ning tehti kindlaks Eestis tarbitud uusaegse klaasi tüpoloogia. Avaldatud artikleid on osaliselt juba täiendatud ning töös on mitme artikli täiendamine ja avaldamine eesti või inglise keeles. Lisaks artiklitele on töö käigus kogutud toorandmed avaldatud avaandmetena, mis loodetavasti aitavad kaasa klaasi uurimise hoogustumisele. Kuigi kogutud ja vaadeldud andmete hulk on märkimisväärne, võib samavõrra märkimisväärseks lugeda teemaderingi, mida klaasi tootmise ja tarbimise põhjal veel uurida võiks.

APPENDICES

APPENDIX 1. A–Z of glass in Estonia

A glossary of terms used in this thesis, Datasets I–III and Articles I–VI either in English or Estonian. An English-Estonian translation is provided for each term.

A

Abrupt heel – sirge kand – abrupt, straight base of a completely cylindrical bottle, often achieved by a mould. Often without a kick. *Example: PäMu 25187/A2662: 3217 (mould-made abrupt heel on a cylindrical bottle)*.

Air-twisted stem – pöörisega jalg, filigraantehnikas jalg – a type of highly decorative goblet stem where a coloured (red, white) or colourless *vetro a filigrana* swirl is encased in the stem, usually in a drawn stem or rod stem. *Example*: *PäMu 15549/ A2596: 17/185 (short colourless stem with white vetro a retorti swirls)*.

Ampoule – ampull – sealed cylindrical glass capsule, usually filled with a measured quantity of liquid for injecting with a syringe. First used around 1840 to store chloroform; hermetically sealed ampoules were developed in the 1890s. Produced locally in the 20th century. *Example: AI 8596: 285 (broken ampoule)*.

Annealing – lõõmutamine, lõõmutus – the process of slowly cooling hot glass objects to avoid breakage due to internal stress introduced during the manufacturing process.

Applied base ring – klaasniidist põhi – a trail of glass that forms a ring on which the vessel stands, attached after the vessel is formed. Also known as foot-ring. See also: piled coil base. *Example: PäMu 14350/A2501: 534 (trailed beaker with an applied base ring)*.

B

Bead – helmes – a small piece of colourless, coloured, or decorated glass, generally round or faceted, with a hole through it, worn threaded as a necklace or bracelet or sewn onto or woven into fabric. Glass beads are wound, drawn, moulded, blown, or cut (lead crystal). Used from the beginning of the Roman Iron Age (50–450 A.D.) in Estonia. *Example: PäMu 2960/A2451 (necklace)*.

Beaker – peeker – vessel intended for the direct consumption of liquids, generally with a height greater than the width with applied base-rings, piled coil bases, or pedestal bases. Squat, barrel, cylindrical, or fluted in shape. Due to preservation, tankards and tumblers may be falsely attributed as beakers. Dataset I includes enamelled (email-), engraved (graveeritud), ice-glass (jääklaasist), pattern-moulded (optilise mustriga), pedestal (pjedestaal-), prunted (nupp-), ribbed (ribi-), trailed (niit-), undecorated (kaunistamata), and *vetro a filigrana* (filigraanklaasist peeker) beakers.

Berkemeier – *Berkemeier* – a type of prunted beaker with a funnel-shaped mouth and pulled prunts on the lower, cylindrical half of the body. *Example: AI 6172: 12 (intact Berkemeier)*.

Bottle – pudel – a sealable vessel intended for the short- or long-term storage, transportation, and serving of liquids. Can also be used in the process of brewing or wine-making (e.g. demijohns). Bottles have hand-tooled or machine-made string rims, neck length and shape varies, heels are abrupt, rounded, or bulged. Multi-faceted (quadrilateral) bottles were mould-blown until shoulder level and had hand-tooled rims and necks, cylindrical bottles began to be produced entirely with moulds from the 1830s onwards, although in Estonia, handmade bottles were still made in the 20th century. Dataset I includes cylindrical (silindrikujuline), demijohn (kääritus-), embossed

(kõrgreljeefse kirjaga), medicine (bottles with medical symbols or from pharmaceutical contexts; rohu-), onion (sibulakujuline), oval (ovaalse põhjaga), quadrilateral (tahuline), sealed (pudelimärgiga), shaft and globe (kerakujuline), and small (less than 100 ml; väike pudel) bottles.

Bottle seal – pudelimärk – a blob of hot glass pressed onto the surface of a hot bottle which is then sealed with a matrix. Bottle seals were a legal requirement from 1774 onwards in the territory of modern-day Estonia and they had to include the volume and details of the production site. They often included the date as well. Most common volumes on bottle seals were ½ B – half of a bottle (a butylka, бутылка was 768.7 ml), ¾ Kr – ¾ of a mug (a kruzhka, кру́жка was 1.23 l). *Example: AI 7861: 450 (Lelle glassworks, 1826, ¾)*.

Bowl – kauss – a deep open vessel with a width almost always bigger than the height, used for food or liquids, sometimes with a stemmed base. Milk-souring bowls made in forest glass were the most used and produced bowls in 18th–20th-century Estonia. Also: the uppermost part of a goblet or wine glass. *Example: AI 6480: 186 (milk-souring bowl)*.

Box – karp – a container with a flat base and a lid, usually square, rectangular, or round. *Example: PäMu 15136/A2532: 55 (round light blue pill box)*.

Broad sheet glass – tahvelklaas – an early type of flat glass of inferior quality, made during the medieval period by blowing a closed tube, cutting the ends off and slicing the side open whilst the tube was still hot. The sheet was then flattened on an iron plate.

Bulged heel – kumer, lössis kand – sagging base of a cylindrical bottle, common in the second half of the 18th century. *Example: AI 6480: 584 (bottle with a bulged heel)*.

Button – nööp – a fastener to be passed through a buttonhole or loop to secure textile. Flat buttons generally have two or four visible holes, round or shaped buttons have holes or loops (glass or wire). *Example: PäMu 15732/A2611: 7 (black glass button with wire)*.

C

Compound stem – liitjalg, vigurjalg – a type of highly decorative goblet stem where the stem is formed of convoluted tubes reminiscent of serpents, often decorated with wings. Developed in Venice in the 17th century. Also known as dragon stem, *vetro a serpenti,* winged goblet and *Façon de Venise* (imitation of the original Venetian vessels). *Example: AI 6109/II: 36 (dragon stem fragment)*.

Crizzling – klaasi õitsemine, mikropraod – a network of microscopic cracks on the surface of the glass because of imbalances in the batch exacerbated by moisture. Glass turns hazy until it cracks and completely defragments. Also known as glass bloom, sickness, weeping or whitening. *Example: PäMu 15549/A2596: 17/193 (ribbed tumbler)*.

Crown glass – taldrikklaas – type of flat glass with a pontil mark (bull's eye, swelling) in the middle of the pane, this type of flat glass is formed by spinning the hot gather on a pontil until a disk forms. The ripples are visible even on smaller pieces of this glass. *Example: AI 7909: 19301 (pontil mark)*.

Cup – kohvi- või teetass – small bowl-shaped vessel intended for the direct consumption of hot liquids, typically with a handle. Opaque white cups were used as cheaper alternatives to porcelain. *Example: AI 7032: 293/1–12, 332/2–7 (floral opaque cup)*.

Cut – lõigatud – a type of decoration which is achieved by removing glass from the surface of the object with wheels and abrasives. Also known as carving. *Example: PäMu 14640/A2509: 458 (colourless lid)*.

Cutlery rest – noaalus, võikoer – an object to rest your cutlery when not in use, usually a long rectangle. *Example: AI 5937: II/365 (fragment of a colourless cutlery rest)*.

Cutter – klaasimurdja, servalõikur – worker whose task is to cut the glass sheets, or the machine or tool used to cut glass. Glass cutting was adopted in Italy in the 16th century.

Cutting table – murdelava – a flat table for cutting glass sheets.

Cylinder glass – silinderklaas – a type of flat glass, made during the early modern and modern period by blowing a large closed tube, cutting the ends off to form a large cylinder, cutting one side open and flattening the formed sheet on a smooth stone or metal surface when still hot and malleable. The larger size and better quality compared to broad sheet glass is obtained by blowing it into an iron mould and then swinging the tube in the trench by the furnace. The formed edges of this type of flat glass are wavy.

D

Demijohn – käärituspudel, käärimisnõu – a large bottle used in the process of brewing, fermenting or winemaking. With a short neck, thick string rim, sometimes with handles by the neck and encased in wickerwork. *Example: PäMu 14642/A2511: 295 (base of a demijohn bottle)*.

Drawn stem – tõmmatud jalg – a type of goblet or vessel stem, generally of colourless glass, where the stem is drawn out from the main gather rather than separately applied to the bowl. Longer stems tend to have elongated air bubbles, teardrops (small bubbles) or air twists as decorative elements within the stem. *Example: PäMu 15060/A2520: 44 (intact goblet)*.

E

Embossed – kõrgreljeefne kiri – raised or relief images or lettering on any part of a glass vessel which are achieved by using a relief or raised mirror image of the desired label inside the glass mould. Often includes the volume of the vessel. *Example: PäMu 15136/A2532: 154 (Bliebernicht brewery, 19th century)*.

Enamelling – emailimine, emailmaaling, email – a type of decoration which was achieved by applying a vitreous substance (powdered glass, metallic oxide) to the surface of the glass object with a brush after which the object was fired in a kiln, sometimes numerous times to fuse different layers of colours. See also: *Grisaille. Example: AI 6860/IX: 528 (enamelled beaker fragment with letters)*.

Engraving – graveerimine, graveering – a type of decoration which was achieved by scratching the surface of a glass object with a diamond-tipped tool. Gained popularity in 16th-century Venice. Also known as diamond-point engraving. *Example: TLM 29149: 246–253, 271 (drinking vessel with bird and foliage engravings)*.

Etching – happega söövitamine, hapesöövitus, etsing – a type of decoration which is achieved by etching the surface of the glass with hydrofluoric acid whilst the area left undecorated is covered with an acid-resistant substance (wax) in which the design is scratched. Patented in 1857 in England. *Example: PäMu 14640/A2509: 19 (tumbler with an etched band)*.

F

Faceted – tahuline – a type of decoration which is achieved by blowing the object into a faceted mould. Mostly used for *Passglas* beakers, tumblers, and quadrilateral bottles. Facets are mostly even but there are four 15-faceted items on Dataset 1. *Example: PäMu 14640/A2509: 98 (colourless tumbler base)*.

Firing glass – toostiklaas – a type of shot or toasting glass with a thick disk-shaped foot and drawn stem. Often associated with Freemasons. The name derives from the sound of slamming the glass against the table loudly (like gunfire) during ceremonies. *Example: AM 5560 PK: 76 (firing glass)*.

Flashed glass – kahelisklaas – colourless glass covered with a thin layer of coloured glass, generally on one side. This technique can be used both for flat glass and vessels.

Flask – plasku, välipudel, kolb, karahvin – a vessel intended for the short-term storage and serving of liquids, generally with a wide, unsealable mouth and funnel-shaped neck which may be covered with a cap. *Example: AI 6426: 16 (ribbed flask fragments)*.

Flat glass – tahvelklaas – also known as sheet glass. See also: broad glass, crown glass, cylinder glass, Fourcault machine, plate glass.

Forest glass – võsaklaas, metsaklaas – potash glass which has a greenish or bluish tinge due to impurities in the raw ingredients (sand or potash). Made locally. *Example: AM 17966 PK 4521 (finds from Hüti glassworks)*.

Fourcault machine – klaasitõmbemasin, Fourcault' masin – a machine for making continuous sheets of flat glass by pulling the glass vertically upwards by a set of rollers. Invented in 1901 by Emilie Fourcault and used at Järvakandi from 1928–1994.

G

Goblet – pokaal – a vessel intended for the direct consumption of liquids which is composed of a bowl supported by an applied or drawn stem which rests on a disk-shaped base. The stem can be hollow or solid. Both the bowl and stem can be decorated. Dataset I includes goblets with air-twisted (filigraantehnikas jalaga), compound (vigurjalaga), drawn (tõmmatud jalaga), knopped (nupuga jalaga), panel (paneeljalaga), and rod (jalaga) stems as well as engraved goblets (graveeritud pokaal).

Grisaille – hallitoonitehnika – a type of monochrome grey decoration on stained glass or the iron oxide enamel paint used to define details on stained glass and enamelled beakers. *Example: PäMu 14640/A2509: 346 (outline of a net on stained glass)*.

Grozing – retušeerimine – edge of a glass sheet which has been broken away with a grozing iron or pliers. The scalloped edge adheres better to linseed putty which was used in setting the panes into lead cames. Also known as knapping. *Example: PäMu 14642/A2511: 2137 (diamond-shaped pane with grozed edges)*.

Grozing iron – retuširaud – a tool used to clip the edges of a sheet of glass which leaves a scalloped edge.

H

Humpen – Humpen – a type of large cylindrical enamelled beaker (*Stangenglas*) used in German-speaking areas in Europe in the 16th–18th century for drinking beer. Often decorated with crests. *Example: AI 6481: 47 (base of a Humpen). A preserved example from Haapsalu dates to 1656 (HM 2736)*.

I

Ice glass – jääklaas, krakleeklaas – a type of decoration resembling ice crystals, frost and cracked ice which was achieved by quickly dipping the glass object into cold water whilst hot or rolling raw glass in glass shards and annealing to melt the shards. *Example: AI 6332: 1263*.

Iridised – iriseerunud – the lamination of the surface of the glass as the glass decomposes due to chemical imbalances, in the preliminary stages the vessel may have an iridescent sheen or start shedding iridescent flakes.

J

Jar – purk – a sealable vessel intended for the making, storage and transport of pickled and fermented products and preserves. Cylindrical, round, or quadrilateral in shape. Generally, with a flared rim (turned outwards at an almost 90-degree angle). *Example: AM 18398 PK 4625: 5/19 (rim and body of jar from Laashoone glassworks)*.

Jewellery – ehted – in this thesis, any type of jewellery (e.g. earrings, rings, pendants) which have glass inserts, or the glass inserts of such items. *Example: PäMu 14489/ A507: 357 (ring with a cobalt blue glass gem)*.

Jug – kann – a larger vessel intended for the serving of liquids for drinking or handwashing. Jugs always have a handle, and their rims are wide, with pinched lips or they have a spout. *Example: AI 8340: 33 (jug body fragment from Tarbeklaas)*.

K

Keulenglas – nuipeeker **–** a type of tall cylindrical beaker with a bulged upper half associated with the consumption of beer. Usually light green or colourless, with a pedestal base and decorated with optic moulding or applied decorations. Also known as club beaker. *Example: PäMu 14640/A2509: 5475 (beaker rim and body fragments)*.

Kick – kõrgele surutud põhi (Mankin 1995, 62) – concave area at the bottom of a vessel, often with a pontil mark. Also known as punt. *Example: PäMu 15136/A2532: 193 (base of an onion bottle with a large round kick and pontil mark)*.

Knapping – retušeerimine – see Grozing.

Knopped stem – nupuga jalg – a type of goblet or vessel stem where the stem has a hollow or solid bulbous or disk-shaped (merese) component which can be placed in groups, spaced or singly. *Example: TLM 20059: 433 (engraved beaker with a balustroid stem)*.

Krautstrunk – kapsajuurikakujuline peeker – a type of 15th–17th-century barrel-shaped or cylindrical prunted beaker with round flat pulled prunts all over the body of the vessel. *Example: AI 7032: 847/1 (rim of a Krautstrunk)*.

L

Lead came – tinaraam – a grooved lead alloy strip used to join windowpanes. *Example: AI 6467: 585 (a rectangular window light with lead cames and rhomboid panes)*.

Lid – kaas – cover of a vessel, sometimes with a knop on top. *Example: TM A 174: 20 (jar lid by Johannes Lorup)*.

Light bulb – valgusallikas, lambipirn – an ovoid glass object intended to encase filaments which are used to turn electricity into light by the heat resistance of the filaments. Early bulbs had pointy tips. Electric bulbs started to be used in Estonia in the 1880s. *Example: AI 6109: 212 (light bulb)*.

Linen smoother – vaaliklaas – a smooth round glass object used as a pressing iron. Earlier examples are teardrop-shaped, later examples are bulged disks which may have cylindrical handles. *Example: TLM 7432 A1: 1502 (linen smoother)*.

M

Maigelein – *Maigelein*, veinikausike **–** a type of pattern-moulded beaker, mostly ribbed or with swirled ribs, bowl-shaped and low. Made in the 15th–16th centuries. *Example: TLM 23290: II/27 (intact Maigelein)*.

Marble – klaaskuul, nipsukuul – a ball of glass used as a toy or in early soda bottles (Codd-bottles) to preserve the carbonation. *Example: AI 6709: 34 (a caged solid core swirl marble)*.

Mirror glass – peegel – a type of colourless flat glass where one side is covered with a tin-mercury amalgam, or it is silvered (invented in 1835) which offers a reflective surface. Mirrors were produced locally from the late 18th century. *Example: AI 8596: 305–307 (fragments of a mirror)*.

O

Onion bottle – sibulakujuline pudel – globular bottle with a short tapering neck, necks with applied string rims, bases with domed or round kicks and pontil marks. *Example: TÜ 2931: 46*.

P

Pane – aknaruut, paan – a small piece of a larger sheet of flat glass which was used to glaze windows, usually by setting several panes into lead cames. *Example: HM 8241: 381 (a rhomboid pane)*.

Panel stem – paneeljalg – a type of hollow, faceted goblet or vessel stem which evolved from four to six to eight sides over the course of the 18th century. *Example: TLM 20059: 422 (goblet with a hexagonal stem)*.

Passglas – mõõdupeeker – a tall cylindrical or faceted beaker with applied or enamelled horizontal trails (Passen) which were used to play for accuracy when drinking. Produced locally at Hüti. *Example: HM 9206: 15, 28 (Octagonal Passglas beaker)*.

Pattern-moulding – optilise vormiga puhumine – a type of decoration which was achieved by blowing the object into a mould with a raised pattern which then transferred onto the hot glass. By swirling the object on the rod, various patterns could be achieved. Most common pattern-moulded vessels are crossed ribbed beakers (*Kreuzrippenbecher*, ristribipeekrid), ribbed beakers (*Rippenbecher,* ribipeekrid), Maigeleins and tumblers, octagonal *Passglas* beakers, and flasks. *Example: AI 7909: 19358 (lower half of a crossed ribbed beaker)*.

Pedestal base – pjedestaalpõhi – a type of goblet or beaker base with a high conical kick. Formed from a large flattened or folded concentric ring to offer stability. *Example: HM 9206: 16 (pedestal base of a Passglas beaker)*.

Piled coil base – kuhjatud klaasniidist põhi – a trail of glass that forms a conical foot on which the vessel stands. Characteristic for a Römer. See also: applied base ring. *Example: TLM 20059: 365*.

Plate – taldrik – a flat, usually round vessel with a flat or slightly everted rim intended for the consumption or presentation of solid foods. *Example: AI 6709: 31 (ornamented crystal plate)*.

Plate glass – plaatklaas – a type of high-quality flat glass that has been rolled on a metal plate, then grinded and polished until smooth.

Pontil mark, pontil scar – naabli jälg – a ring-shaped scar where the pontil, punty, or blowpipe was broken off the blown glass object whilst hot. *Example: TÜ 2931: 46*.

Production waste – tootmisjääk – cullet, leftover, and misfired glass. *Example: AM 17968 PK 4523 LIV: 20 (a droplet from Lehtse glassworks)*.

Prunts – nupud – a type of decoration which was achieved by covering the surface of the vessel with hot glass blobs which were then flattened, pulled, or stamped with a dotted prunt stamp to form raspberry prunts. Prunts are considered both decorative and practical. *Example: AI 7909: 4857 (Römer fragment with raspberry prunt)*.

Q

Quadrilateral bottle – tahuline pudel – multi-faceted bottle which was mould-blown until shoulder level, mostly into a square, rectangular, or hexagonal mould from a single parison of glass. The squat necks and rims are hand-tooled. Production began in the 16th century in Germany and continues today in mechanised form. This type of bottle is associated with hard liquors, especially gin. Also known as case bottle. *Example: HM 9206: 4 (17th-century square case bottle)*.

R

Ribbed – ribi-, rillitud – applied vertical strips of glass or pattern-moulded decorations, mostly on beakers. Often used during the medieval period with blue blobs or threads (*Fadenrippenbecher* – niitribipekeer) or during the early modern period as wrythen ribbing where the vessel that is being made is dipped into a ribbed mould and then spun on the blowpipe while hot. *Example: PäMu 15549/A2596: 17/193 (ribbed tumbler)*.

Rod stem – jalg – a type of goblet or vessel stem which is a simple narrow solid vertical rod. *Example: AI 7476: 210 (disk-shaped base with a rod stem)*.

Römer (Roemer) – röömer – a type of prunted beaker which has an ovoid mouth, cylindrical bowl and a piled coil base, the lower half of the bowl is decorated by raspberry or pulled prunts. *Example: AI 6332: 1215 (Römer with raspberry prunts)*.

Rounded heel – ümar kand – base of a cylindrical or onion bottle which is not sagged outwards like a bulged heel but not completely straight. A kick, even a low one is always present. In use from the late 18th century. *Example: AI 5777: 588 (base with a rounded heel)*.

Rummer – rummer – a half-pint wine or water glasses which have thick round or square (lemon squeezer) feet, short stems, and large bowls. *Example: PäMu 14640/A2509: 385 (lemon squeezer base)*.

S

Shaft and globe bottle – kerakujuline pudel – globular bottles with long tapering necks, crudely cut rims, and applied trails, bases with kicks and pontil marks. *Example: PäMu 15136/A2532: 193 (long tapering necks from two shaft and globe bottles)*.

Shot glass – pits – a type of small goblet with a short stem and a square or round foot, generally for the consumption of hard liquor and toasting. See also: firing glass, rummer. *Example: AI 6721: 38 (multifaceted stemmed shot glass)*.

Silver stain – hõbedakollane – a type of deep yellow enamel, which is achieved by using silver, often used together with *grisaille*. *Example: PäMu 25187/A2662: 3171 (fragment of a silver-stained roundel)*.

Stangenglas – kõrge peeker, silinderpeeker – a type of slender, cylindrical beaker associated with the consumption of beer. Usually light green or colourless, with a

pedestal base and decorated with engravings, optic moulding, enamel, or applied decorations. Also known as pole glass. *Example: AI 6332: 570 (fragments of a Stangenglas base), HM 9206: 21 (Stangenglas lid)*.

Stopper – kork – a glass plug used in lieu of a cork on flasks and bottles. *Example: TM 2126 A 51 (stopper with a rooster-shaped knop)*.

String rim – tilgavõru – a trail of flattened or unflattened glass applied at the mouth of a bottle which was later achieved by using a mould. The string rim was originally used to tie the string that secured the cork. *Example: PäMu 15136/A2532: 194 (string rim on the neck of an onion bottle)*.

Syringe – süstal – a glass tube which has a nozzle and a piston, used for cleaning wounds, injecting, or withdrawing fluids. *Example: TM 2126 A 51 (syringe)*.

T

Tankard – joogikann, õllekann **–** a vessel with a handle, intended for the direct consumption of liquids, with a height greater than the width. Cylindrical or bellied in shape. *Example: PäMu 15060/A2520: 51 (a bellied tankard)*.

Trails – niidid – a type of decoration which is achieved by applying strands of glass on the surface of a vessel. Mostly circular in section or flattened; rigaree trails are flattened and crimped. *Example: TÜ 2959: 287 (beaker body fragment with one blue trail)*.

Tube – toru – a hollow glass cylinder of any circumference. *Example: HM 4090: 3 (a tube made at Hüti glassworks)*.

Tumbler – joogiklaas – vessel intended for the direct consumption of liquids, cylindrical with a height greater than the width. With flat, polished bases with or without a pontil mark. Due to preservation, may be falsely attributed as beakers. Dataset I include enamelled (emailitud), engraved (graveeritud), etched (söövitatud), faceted (tahuline), pattern-moulded (optilise mustriga), and undecorated (kaunistamata joogiklaas) tumblers.

V

Vase – vaas – a type of cylindrical or quadrilateral vessel which is intended for decorative purposes or temporary storage of flowers. *Example: AI 6798: 6 (quadrilateral trailed vase)*.

Vetro a filigrana – filigraanklaas – a type of decoration which was achieved by fusing blown glass with colourless, white (*lattimo*), and coloured canes which form parallel (*vetro a fili*) or netted (*vetro a retorti*) lines which can also be swirly. Originated from 16th-century Murano. Also known as filigree glass. *Example: AI 6426: 15 (vetro a retorti tankard fragments)*.

W

Window – aken – frame with cut or grozed (knapped) glass panes set in fixed lights or casements (see Fig. 8 for individual parts of the window) to fill openings (in walls, furniture, coaches etc.). *Example: AI 6467: 585 (a rectangular window light with lead cames and rhomboid panes)*.

APPENDIX 2. A–Z of Estonian glassworks

A/Ä

Ädara – 1850s–1886?; Rasivere village, Viru-Jaagupi parish, Lääne-Viru County. Likely founded by Joseph Georg Runge (1830–1852). Produced vessels (bottles, czarist army flasks). No known seal. Surface finds documented in 2002. Also known as: Eddara; Muuga. Not protected, cultural heritage object.

Alajõe manor – 1790s; Alajõe village, Maarja-Magdaleena parish, Tartu County. Likely founded by Johann Georg Wrangel (1732–1805). Products unknown. No known seal. Workers unknown. Surface finds documented. Also known as: Vara; Warrol. Not protected, not a cultural heritage object.

Altnurga – 1750–1782; Altnurga village, Kursi parish, Jõgeva County. Founded by Gotthard Johann von Manteuffel (1690–1763), inherited by his son in 1764. Produced flat glass (including window glass) and vessels (globular bottles, milk-souring bowls). No known seal. Test pits by Andres Tvauri in 2011–2012. Also known as die Hütte in Talkhof; Kursi; Puurmani; Talkhof. Glashütte; unter Talkhof. Not protected, not a cultural heritage object.

E

Eesti Klaas – 1934; Teguri St. 45, Tartu. Founded by Nikolai Kodassov (1902–1941). Likely produced vessels (plates, bowls). No known trademark. Not excavated. Not protected, not a cultural heritage object.

Eidapere – 1853–1929/1930; Eidapere village, Vändra parish, Rapla County. Founded by Hermann Theodor Hoyningen von Huene (1813–1880). Produced window glass and vessels (bottles, beer bottles, vases, dishes, jars, 600 separate articles). Trademark: embossed 'EKO' in a circle (from 1920). Not excavated. Also known as: Eesti Klaasitootmise Osaühing EKO; Eidaperre; EKO Eidapere. Not protected, not a cultural heritage object.

Elija – 1938–1939; Meleski village, Kolga-Jaani parish, Viljandi County. Founded by the Brahmanis family. Produced hand-blown (apothecary) bottles. No known trademark. Not excavated. Also known as: Brahmani; Eila; London. Not protected, cultural heritage object.

Estoklaas – 14.03.1927–07.1927; Pärnu Rd 326 (formerly Suur-Pärnu Rd 92), Tallinn. Founded by Robert Masing (1895–1943). Produced hand-blown bottles and jars. No known trademark. Not excavated. Also known as: Robert Masingi Tallinna klaasivabrik. Not protected, not a cultural heritage object.

G

Gorodenka – 1754/63–1770/71; Kuningaküla village, Vaivara parish, Ida-Viru County. Founded by Otto Magnus von Stackelberg (1704–1765). Produced window glass and vessels (bottles). Seal: two-branched crown with 'LONDON R' (Renter) or 'LONDON CE' (Carl-Philip von Essen). Excavated by Maks Roosma 30.07.–6.08.1963. Also known as: Gorodinka; Kuningaküla; Pagari. Under heritage protection.

H

H. Citron & J. Halbreich – 1926–1936; Vabriku St. 57/59, Tallinn, Harju County. Founded by Jakob Halbreich (1898–1965) & Haim Citron (1888–1945?). Produced vessels (bottles, jars, cartons, 25 litre bottles). No known trademark. Not excavated (see also **Richard Mayer**). Not protected, not a cultural heritage object.

Haava – 1765?–1807; Laeva village, Kursi parish, Tartu County. Founded by Harald Gustav Igelström (1730–1804). Produced milk-souring bowls and laboratory ware. No known seal. Surface finds collected by Andres Tvauri in 2010–2012. Also known as: Awa; Awasche Glashütte; des Glashütte zu Hawa unter Kerrafer; Kerrafersche Glashütte. Not protected, not a cultural heritage object.

Hoone – 1765?–1807; Laeva village, Kursi parish, Tartu County. Founded by Harald Gustav Igelström (1730–1804). Produced flat glass (including window glass) and vessels (globular bottles, milk-souring bowls). No known seal, potentially with 'K +++.' Surface finds collected by Andres Tvauri in 2010–2012. Also known as die Heintze Gesellschaft; Kerrew. Gl; unter Kerrafer. Not protected, not a cultural heritage object.

Hüti – 1628–1664; Hüti village, Reigi parish; Hiiu County. Founded by Jacob de la Gardie (1583–1652). Produced window glass and vessels (bottles, beakers, apothecary ware) as well as other speciality glass (laboratory ware, hourglasses). No known seal. Excavated by Maks Roosma in 1958–1961. Under heritage protection.

J

Järvakandi – 1879–2015/today; Tehaste St. 7, Järvakandi, Rapla parish, Rapla County. Founded by Otto Woldemar Friedrich von Taube von der Issen (1833–1911). Produced window glass, vessels (jars, bottles), and isolators. No known seal or trademark. Not excavated. Also known as: AS Järvakandi Klaas; AS Järvakandi Tehased Klaasi- ja Puidutöötlemise kombinaat; Jerwakandi; Järvakandi klaasikoda; Järvakandi klaasivabrik; Pärna. Not protected, not a cultural heritage object (still operational).

Joh. Lorup – 1934–1940; Marati St. 4, Tallinn, Harju County. Founded by Johannes Lorup (1901–1943). Produced vessels (carafes, drinking glasses, fruit bowls) and decorative objects. Embossed trademarks K.V. J. L. T; J. L.; REFORM ÕHUKINDEL SOONEGA, stickers: blue for half-crystal, gold for crystal (Joh. Lorup Kristall). Waste pit excavated in 2020 by Martin Malve, production waste uncovered by Gurly Vedru in 2021. Also known as: Johannes Lorupi klaasivabrik. Not protected, not a cultural heritage object.

K

Käru – 1813–c. 1839; Kullimaa village, Vändra parish, Järva County. Founded by J. D. Elster. Produced vessels (including bottles). Seal: 'Fabrik Kerro F. Stecher ⅝' or '¾.' Surface finds documented. Also known as: Fabrik Kerro; Kullimaa. Not protected, cultural heritage object.

Koikküla – 1890s (1892–1898?); Pargi Rd 2a, Koikküla village, Hargla parish, Valga County. Founded by August Hamilkar Alexander Friedrich von Fölkersahm (1863–1934). Produced vessels (small and large bottles). No known seal. Surface finds documented. Also known as: Adsel-Koiküll. Not protected, not a cultural heritage object.

L

Laashoone – 1764–1775; Lalsi village, Kursi parish, Jõgeva County. Founded by Woldemar Johann von Lauw (1712–1786). Produced window glass (coach windows), vessels (globular, large, rectangular, and octagonal bottles, cylindrical and globular phials, milk-souring bowls, jars), ornaments, and laboratory ware. Seal: triple-branched crown and 'LONDON BJI' (Woldemar von Lauw) or 'LONDON AC' (Anton Stichkorn). Excavated by Maks Roosma 1.–15.07.1965. Also known as die neue Glashütte; Lasone. Under heritage protection.

Laasme – 1768–1782; Laasme village, Kursi parish, Jõgeva County. Founded by Andreas Gotthard von Manteuffel (1714–1768). Produced vessels (bottles, globular phials, opaque teacups, colourless drinking glasses, milk-souring bowls). No known seal. Surface finds collected by Andres Tvauri in 2011–2012. Also known as: neuen Hütte; Puurmani; bey der Talckhofsche weissen Glashütte; Talckhofsche Glashütte; Talckhofsche neu Glashütte; T. Glasf; Talkhof. Glashütte; weissen Hütte unter Talkhof. Not protected, cultural heritage object.

Laeva – 1765?–1807?; Väänikvere Rd 7, Laeva village, Kursi parish, Tartu County. Founded by Harald Gustav Igelström (1730–1804). Produced window glass and vessels (bottles). No known seal. Not excavated. Also known as: Kärevere-Laeva. May have been a potash kiln or a temporary site. Not protected, not a cultural heritage object.

Lehtse – 1776–1808; Pillapalu village, Ambla parish, Tartu County. Founded by Christian Wilhelm von Zimmermann (1739–1785). Produced window glass, vessels (bottles, colourless drinking glasses) and laboratory ware. Seal: 'LF 1804 I 3/4 G B' (Gundlach). Excavated by Maks Roosma in 1963. Also known as: Hütte in Ampel; Lehtse-Rekka; Lehtssche Fabrik; Recka; Rekka. Under heritage protection.

Lelle – 1812/13–1853 (1928); Saarepõllu village, Vändra parish, Rapla County. Founded by Jakob Johann Pilar von Pilchau (1774–1814). Produced window glass and vessels (bottles, phials). Seal: 'Lelle Fabrik 1/2 KRUSHKA', 'LELLE FABRIK 1826 ¾'. 'Lelle 1860 1/2 St OVSI', 'G. F. 1852 Lelle' or embossed with '2 K Lelle'. Surface finds documented. Also known as: Lellesche Glasfabrik. Not protected, cultural heritage object.

N

Nurmsi – 1788–1826; Inda village, Vigala parish, Rapla County. Founded by Friedrich Wilhelm von Wrangell (1743–1799). Produced flat glass (colourless window glass, carriage windows, mirror glass) and vessels (bottles). No known seal. Surface finds documented in 2003. Also known as: Nelwa; Nelva bei Nurms; Nurms; Nurtu; Nõlva. Not protected, cultural heritage object.

P

Pajusi – 1764–1780?; Sopimetsa village, Põltsamaa parish, Jõgeva County. Founded by Woldemar Johann von Lauw (1712–1786). Produced window glass and vessels (bottles). Surface finds documented in the 1950s and collected in 2013. Seal: 'L 3/? 18'. Also known as: Pajus; Pajusi-Vabriku. Not protected, not a cultural heritage object.

Pärnumaa – 1625/27?–1654; Pärnu County, precise location unknown (near Audru, potentially in Jõõpre or Ridalepa). Founded by the von Thurn family. Likely produced window glass and vessels. No known seal. Not excavated. Not protected, not a cultural heritage object.

Pärnumaa – 1704?; Pärnu County, precise location unknown. Depicted on RA, EAA.308.2.28. Potentially the same as previous. Not protected, not a cultural heritage object.

Piirsalu – 1740–1743; Piirsalu village, Kullamaa parish, Lääne County. Founded by Gustav Reinhold von Löwen (1690–1766). Produced window glass and vessels (bottles, jars, jugs). No known seal. Excavated by Maks Roosma 20.07.–03.08.1965, surface finds documented in 1996 during forest plantation. Also known as: Järnu; Järsu; Pirsalsche Glase Fabrik. Under heritage protection.

R

Ravila – 1772–c. 1798; Laane village, Kose parish, Harju County. Founded by Karl Reinhold von Manteuffel (1721–1779). Produced window glass and vessels (bottles, dishes), both in forest and colourless glass. Seal with 'Nappu.' Surface finds documented in the 1960s. Also known as: Meeks; Meeksi; Napu; Nappo. Not protected, not a cultural heritage object.

Richard Mayer – (1889–)1925; Paldiski Rd 25, Tallinn, Harju County. Founded by Georg August Richard Mayer (1860–?). Produced bottles (chemical industry). No known trademark. Not excavated. Also known as: AS Tallinna Keemiatehas; Revaler Chemisch-Technische Fabrik Wold. Mayers Wwe & Sohn (see also **Tallinna I Klaasivabrik** and **H. Citron & J. Halbreich**). Not protected, not a cultural heritage object.

Robert Elfenbein – 1857–1863; Lastekodu St. 44 // Odra 8 (former Tartu Rd 752A), Tallinn, Harju County. Founded by Robert Elfenbein. Produced vessels (bottles, jars). Seal: 'Robert Elfenbein Reval 1/2 K'. Not excavated. Also known as: R. Elfenbein. Not protected, not a cultural heritage object.

Rõika-Meleski – 1792–1992. Meleski and Lalsi (Rõika) villages, Kolga-Jaani parish, Viljandi County. Founded by Carl Philipp Amelung (1769–1817). Produced flat glass (including mirrors) and vessels (dishes, vodka, milk, liqueur, and pharmaceutical bottles). Trademark: stamped triangle inside a circle with a stylised M in the middle (Meleski, 1930s) or embossed with stylised 'M', 'Meleski', or 'TET' in a rhombus (after 1960), usually with size underneath and date above. Not excavated. Also known as: Catharina-Lisette unter/bei Woiseck; Meleski-Lisette; Rõika-Catharina; Sozietät der Spiegel-Glas Fabrik unter Woisek; Spiegelfabrik Katharina Lisette; Spiegelfabrik Woiseck; Tartu Ehitusmaterjalide Tehase pudelitsehh. Both are under heritage protection.

Rutikvere – 1798–c. 1811; Rutikvere village, Põltsamaa parish, Järva County. Founded by Otto Friedrich von Pistohlkors II (1754–1831). Produced window glass and vessels (bottles). No known seal. Surface finds documented. Also known as: Ruttigfer. Not protected, cultural heritage object.

S

Surju – 1810–c. 1822/1841; Metsaääre village, Pärnu parish, Pärnu County. Founded by Daniel Gottlieb Suckny (1743–1822). Produced window glass and vessels (bottles). Seal: 'C.K. Surr? 1/?'. Not excavated. Also known as: Surrischer Glasfabrik; Surry; Uhla; Uulu-Surju. Not protected, cultural heritage object.

T

Taali – 1808–1820; Kildemaa village, Tori parish, Pärnu County. Founded by Johann Georg Anton Grimm (c. 1751–1830). Produced vessels (bottles, jars). No known seal. Surface finds documented. Also known as: Paist; Paixt; Staelenhof. Not protected, cultural heritage object.

Tallinna I Klaasivabrik – 1925; Paldiski Rd 25, Tallinn, Harju County. Founded by Julius Sepp. Produced vessels (bottles, bottles for chemicals, other vessels). No known trademark. Not excavated. Also known as I Tallinna Klaasivabrik (see also **Richard Mayer**). Not protected, not a cultural heritage object.

Tallinna klaasivabrik – 18.07.1927–1931; Pärnu Rd 326 (former Suur-Pärnu Rd 92), Tallinn, Harju County. Founded by Jüri Vanaveski. Products unknown. No known trademark. Not excavated. Not protected, not a cultural heritage object.

Tarakvere – 1779–1783; Tarakvere village, Torma parish, Jõgeva County. Likely founded by Carl von Liphardt (1719–1792) and produced bottles. No known seal. Surface finds documented in the 1920s. Also known as: Torma. Not protected, not a cultural heritage object.

Tarbeklaas – 1941–1993/2006; Marati St. 12, Tallinn, Harju County. Founded by Johannes Lorup (1901–1943). Produced a large variety of vessels and decorative objects. Embossed trademark: 'T' inside a circle with the unit underneath. Waste pit excavated in 2020 by Martin Malve. Also known as: Lorup; Glasstone; Scankristall. Not protected, not a cultural heritage object.

Tartu klaasivabrik – 1931–after 1948; Riia St. 125, later at Teguri St. 47/49, Tartu, Tartu County. Founded by Ivan Grishakov (1906–?) & Antonina Grishakov. Produced vessels (jars, milk bottles, jugs, ink bottles, apothecary, and chemical ware). No known trademark. Not excavated. Also known as: klaasitööstus 'Säde;' Ivan Grischakov ja Ko. Not protected, not a cultural heritage object.

Tõrna-Kamari – 1765–1807; Siniküla village, Kursi parish, Tartu County. Founded by Harald Gustav Igelström (1730–1804). Produced flat glass (green and colourless window glass, mirror glass), vessels (globular and rectangular bottles) and laboratory ware. Seal: 'R I 3/4 L'. Surface finds collected by Andres Tvauri 2010–2012. Also known as: Glashütte: den Staackshe Gesellschaft; Kammari; Kärevere-Laeva; Spiegelfabrik unter Fleckenstein; Spiegelfabrik unter Laiwa; Talkhof. Spiegelfab u Kerafer; Tirna; Tõrna-Kamari; Tõrna-Kamari-Põltsamaa. Not protected, cultural heritage object.

Tudu – 1858–1879; Suigu village, Viru-Jaagupi parish, Lääne-Viru County. Founded by Felix Nikolai von Sivers (1828–1872). Produced vessels (bottles). Seal: 'Tuddo ½ Kr.' Surface finds documented. Also known as: Alutaguse; Tuddo. Not protected, cultural heritage object.

U

Utsali – 1755–1771; Jüriküla village, Kursi parish, Jõgeva County. Founded by Woldemar Johann von Lauw (1712–1786). Produced window glass and vessels (globular, rectangular, and octagonal bottles, phials, milk-souring bowls, colourless drinking glasses, jars, jugs) as well as laboratory ware. No known seal. Test pits and excavations by Andres Tvauri in 2011–2013. Also known as: alte Glashütte; alte Glashütte unter Vizemeister Staack; die alte Hütte; Oberpahlen; Oberpalschen Hütte; unter Oberpahlen; Uttzal. Not protected, cultural heritage object.

V

Vändra – 1822–1928; Võidula village, Vändra parish, Pärnu County. Founded by Carl Georg Amelung (1795–1851). Produced flat glass (photographic plates, window glass) and vessels (bottles, jars). Seal: ‘A.S. FENNERN 1/2 St.’, ‘M. Graubner: Fennern Fab. 1/20 W’, ‘1/2 K. P. ФЕНЕРЕНЬ’, ‘4 K.p. Каролинен гофъ.’ and ‘1/2 Kr Ф. АМЕЛУНГ’. Not excavated. Also known as: Carolinenhof; Glasfabrik Fennern; Kaarlimõisa; Karolinenhof. Not protected, not a cultural heritage object.

PUBLICATIONS

CURRICULUM VITAE

Name: Monika Reppo
Date of birth: October 13, 1989
Contact: monika.reppo@ut.ee, monika.reppo@tlu.ee
Jakobi 2, Tartu 51014, Estonia

Education:

2017–2024	University of Tartu, doctoral studies (archaeology)
2013–2016	Tallinn University, master studies (history), *cum laude*
2009–2013	Tallinn University, bachelor studies (anthropology)
2006–2009	Tallinn Mustamäe Gymnasium
2001–2006	Käina Gymnasium
1997–2001	Männamaa Kindergarten and Primary School

Career:

2023–....	Tallinn University, Archaeological research collection, Archaeology Specialist
2020–….	Arheograator Ltd, Project Lead (archaeology)
2020–2021	University of Tartu, Institute of History and Archaeology, Junior Research Fellow
2016–2019	Agu EMS Ltd, Project Lead (archaeology)
2018–2019	Archaeology magazine Tutulus, Social Media Manager
2016	Axon Moore Ltd, Database administrator
2014–2015	University of Sheffield, UK/EU/PG student ambassador
2011–2015	Agu EMS Ltd, Field supervisor and technician (archaeology)
2012, 2013	University of Tartu, Institute of History and Archaeology, Technician
2011	Tallinn University, Institute of History, Technician

Field of research: glass, glassworkers, post-medieval archaeology, urban archaeology

ELULOOKIRJELDUS

Nimi: Monika Reppo
Sünniaeg: 13. oktoober 1989
Kontakt: monika.reppo@ut.ee, monika.reppo@tlu.ee
Jakobi 2, Tartu 51014, Eesti

Haridustee:

2017–2024	Tartu Ülikool, doktoriõpe (arheoloogia)
2013–2016	Tallinna Ülikool, magistriõpe (ajalugu), *cum laude*
2009–2013	Tallinna Ülikool, bakalaureuseõpe (antropoloogia)
2006–2009	Tallinna Mustamäe Gümnaasium
2001–2006	Käina Gümnaasium
1997–2001	Männamaa Algkool-Lasteaed

Karjäär:

2023–….	Tallinna Ülikool, arheoloogia teaduskogu, arheoloogia spetsialist
2020–….	Arheograator OÜ, vastutav spetsialist arheoloogia alal
2020–2021	Tartu Ülikool, Ajaloo ja arheoloogia instituut, nooremteadur
2016–2019	Agu EMS OÜ, vastutav spetsialist arheoloogia alal
2018–2019	Arheoloogia aastakiri Tutulus, sotsiaalmeedia haldur
2016	Axon Moore Ltd, andmebaasihaldur
2014–2015	Sheffieldi Ülikool, UK/EU/PG tudengisaadik
2011–2015	Agu EMS OÜ, välitööde juhendaja ja tehnik
2012, 2013	Tartu Ülikool, Ajaloo ja arheoloogia instituut, laborant
2011	Tallinna Ülikool, Ajaloo Instituut, laborant

Uurimisala: klaas, klaasi valmistajad, uusaja arheoloogia, linnaarheoloogia

DISSERTATIONES ARCHAEOLOGIAE UNIVERSITATIS TARTUENSIS

1. **Heidi Luik.** Luu- ja sarvesemed Eesti arheoloogilises leiumaterjalis viikingiajast keskajani. Bone and antler artefacts among Estonian archaeological finds from the viking age until the middle ages. Tartu, 2005, 137 lk.
2. **Tõnno Jonuks.** Eesti muinasusund. Tartu, 2009, 430 lk.
3. **Gurly Vedru.** Põhja-Eesti arheoloogilised maastikud. Archaeological landscapes of North-Estonia. Tartu, 2011, 148 lk.
4. **Riina Rammo.** Tekstiililеiud Tartu keskaegsetest jäätmekastidest: tehnoloogia, kaubandus ja tarbimine. Textile finds from medieval cesspits in Tartu: technology, trade and consumption. Tartu, 2015, 336 lk.
5. **Mari Tõrv.** Persistent Practices. A multi-disciplinary study of hunter-gatherer mortuary remains from c. 6500–2600 cal. BC, Estonia. Tartu, 2016, 416 p.
6. **Eve Rannamäe.** Development of sheep populations in Estonia as indicated by archaeofaunal evidence and ancient mitochondrial DNA lineages from the Bronze Age to the Modern Period. Tartu, 2016, 269 p.
7. **Pikne Kama.** Arheoloogiliste ja folkloorsete allikate kooskasutusvõimalused: inimjäänused märgaladel. Tartu, 2017, 259 lk.
8. **Kristiina Johanson**. Missing interpretations natural and residual finds in Estonian archaeological collections. Tartu, 2018, 429 p.
9. **Maarja Olli**. From individuality to regionality in the distribution area of tarand cemeteries in the Roman Iron Age. Tartu, 2019, 251 p.
10. **Ragnar Saage.** Metallitööpaigad Eestis 7.–17. sajandil. Tartu, 2020, 240 lk.
11. **Freydis Ehrlich.** Birds in Estonian zooarchaeological material: diversity, importance and the earliest appearance of domesticated species. Tartu, 2022, 155 p.
12. **Alessandra Morrone**. Children of the Grave: a multidisciplinary study of non-adults from medieval and early modern southern Estonia. Tartu, 2022, 266 p.