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SOME REMARKS ON GLASS SEAL FROM THE TERRITORY OF POLAND FROM THE 17TH-19TH CENTURIES

Abstract: This paper presents information about modern glass seals obtained during archaeological excavations carried out on the territory of modern-day Poland after 1987. The author reviews finds and their characteristics and based on such collected data attempts to indicate their quantitative diversity, territorial range, and chronology. The paper also focuses on markings identified on glass seals divided by their types. These are individualised signs, monograms, symbols, descriptive signs, and numerical signs, mostly trademarks. This analysis aims to outline the state of research and indicate various research questions associated with the production and use of stamped glass vessels in Poland, which require further studies.

Keywords: glass seals, glass bottles, bottles with seals, glass finds, Poland, 17th-19th century

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Introduction

Glass bottles with stamps (seals) made of the same material and glass seals attached to parts of bodies of glass vessels, are one of the most interesting archaeological artefacts. They stand out among the mass finds classified as glass cullet obtained during excavations on sites dated to the modern period, particularly in the large volume of a rather uniform bottle glass, since they are artefacts recorded usually in small numbers. The seals themselves, although small and of a rather modest appearance, are characterised by considerable stylistic diversity, and in light of Polish publications released to date, similar specimens are usually registered on a rather limited territory. Furthermore, inscriptions and pictograms placed on the seals may have different meanings or are difficult to explain and remain a mystery. However, the artistic qualities of the seals are of secondary importance, being subordinated to their primary function – utilitarian, as stamps were predominantly carriers of information about production and commerce, regarding workshops, manufacturers, and purchasers of these products, potential outlets, the capacity of the vessels and the amount of liquid stored in them. Markings on bottles also conformed to officially imposed requirements or advertised the goods labelled with them (both the vessel and its contents). Such products were used for storing, transporting, and serving mostly alcoholic beverages, mainly wine, beer, vodka, gin, and spirits, as well as mineral water.

The use of such markings on modern glass vessels from the territory of Poland may be seen as the consequence of the relationships and economic and cultural influences between various countries on the European continent at that time. This was the result of reproducing practices already tested and widespread abroad, which were also applied to local glass manufacturing and gained a good reputation among the local consumers.
This was also the consequence of general tendencies towards the standardisation of glass packaging and the implementation of the imposed fiscal restrictions.

The custom of labelling glass containers in the form of stamps impressed in glass has western origins dating to around the mid-17th century. It subsequently became widespread and was used across the continent as well as in North America. It was most commonly used in the 18th century and in the first half of the 19th century.2

Such finds also spark interest among Polish archaeologists, leading to papers and monographs dedicated to the problem of stamped glass bottles and glass vessels. Based on the review of the Polish literature published since 1987, we can see a gradual increase in the number of such studies, particularly during the last few years.3 Despite the fact that the discussion on this type of artefacts was already included in many publications, this research problem is still far from being investigated thoroughly.

In this paper, I tried to collate the most important information about the above-mentioned finds published since that time, in order to bring them closer to readers and characterise them, as well as summarise the associated research problems and the current state of research at a national level. This discussion is of a preliminary nature. Its objective is to present the multitude and diversity of issues related to this type of artefacts, including outlining potential directions of further studies on the production, use, and distribution of glass vessels with seals in the territory of modern Poland.

A review of Polish finds of glass seals and main research findings

In Polish archaeological literature, such artefacts were recorded among other finds already as early as in the 1970s,4 although it was Leszek Kajzer who first paid more attention to them in his paper on the import of beer from the British Isles and glass containers used for that purpose, including bottles of English provenance.5 The breakthrough came with a paper written by Andrzej Gołębiewski, which was published several years later.6 It contained fundamental findings, which are still valid, concerning the formal analysis of glass seals, their classification, and comprehensive interpretation. From our current perspective, we may state, together with the progress of studies on this type of finds in other European countries,7 that both works became the impulse for other scholars to take up this research problem and set out a number of future research trends.

The result of the above-mentioned inspirations was the creation and publication in Poland during the last two decades of eight papers dedicated exclusively to glass seals and bottles.8 Those artefacts have also become a subject of a wider discussion in connection with descriptions of collections of glass artefacts that included such finds discovered in different parts of modern-day Poland.9 As a result, the subject of glass seals has been discussed relatively often in the context of publications on other types of modern glass vessels.10 However, researchers have concentrated mainly on the set of information discussing: the state of preservation and the appearance of finds, in particular of the symbols impressed on seals, their function and origin, and enumerating other sites with such finds. Among more recent publications, only a few authors have adopted a more comprehensive approach to studies on artefacts with glass seals.11

To gain an approximate, comprehensive image concerning the current state of glass seals finds from the territory of contemporary Poland recorded after the year 1987 basic data are compiled in Table 1. That set of information includes selected artefacts, i.e. varying in terms of the location and the category of sites on which they were discovered, and simultaneously recorded in publications that made it possible to establish in the relevant assemblages of finds the proportion between artefacts with glass seals and other the remaining glass finds without any stamps or markings.12

2 More information on this subject e.g. in Morgan 1976, 7-23; Polak 1981, 234-239, 261-264; Dumbrell 1983, 13-23; van den Bossche 2001; Veit and Huey 2014, 56-60; Jeffries and Major 2015, 132-133. Since there are numerous publications on this subject, I list here only several selected works. Research questions concerning the history of using glass bottles with seals have also been discussed many times in Polish archaeological publications. For this reason, in this paper, I decided to include only a short reference.

3 See Bis 2020a.

4 E.g. Cnotliwy et al. 1972, 216; Gajewska and Kruppé 1973, 629, footnote 20.

5 Kajzer 1981.

6 Gołębiewski 1997.

7 This phenomenon is manifested through, among other things, several key works published at the end of the 20th century and the beginning of the 21st century, including: Friese and Friese 1992; van den Bossche 2001; Humbsch 2001; Humbsch 2002.

8 Woźny 2001; Siwiak 2003; Siwiak 2004; Krukowska 2007a; Siwiak 2007a; Siwiak 2007b; Siwiak 2009; Szczepanowska 2013.

9 E.g. Nawracki 1999, 91-93; Krukowska 2007b, 35-46; Antowska-Gorączniak 2012, 151, 194, Pl. 6; Rais-Kufel and Kufel 2013, 237-278; Wojciechowska 2015; Grabny 2016, 261-263; Wilgocka 2016, 227-228, 238-239, Figs. 5 and 6; Baturo 2017, 217-223, 235, Pl. 5; Baturo and Kasprzak 2018a; Baturo and Kasprzak 2018b.

10 See Bis 2020a.

11 Woźny 2001; Siwiak 2003; Siwiak 2007a; Szczepanowska 2013; Baturo 2017.

12 I have taken into consideration those publications, which in addition to the number of glass seals provided information about the total number of discovered bottles and their fragments or the total number of glass vessels.
| No. | Place of discovery | Number of glass vessels / Number of bottles | Number of seals, glass bottles or their fragments with seals | Types of signs on seals | Dating | Publication |
|-----|-------------------|------------------------------------------|-------------------------------------------------|---------------------|--------|-------------|
| 1   | Bąkowa Góra, manor house, Łódzkie Voivodeship | 875 fragments of glass vessels / no data | 8* seals | descriptive signs - with trademarks (FJL, TK); numerical (G1, G1/2, 1 KW); 3 without a stamp | 18th century | Głosek 1998 |
| 2   | Białystok, palace (Palacyk Gościnny, 2 Kilińskiego Street, site 2), Podlaskie Voivodeship | no data / 309 bottle* fragments (including: 2 squat bottles) | 1 specimen (a piece of a squat bottle with a seal) | a descriptive sign - with a town (?) name, partly preserved (Do […] to […]’?) | 2nd half of the 18th century | Pawłata 2010 |
| 3   | Brześć Kujawski, priory (Dominicans), Kujawsko-Pomorskie Voivodeship | 257 fragments of glass vessels / 45 bottles | 3 bottles with seals | a descriptive sign - with the name of the glass workshop (Art. Huta Zo[…]); numerical signs (K1, K2) | 2nd half of the 18th century–1820s-1830s | Andrzejewska 1996 |
| 4   | Bydgoszcz, town (plot located at 33 Pod Blankami Street, site 556), Kujawsko-Pomorskie Voivodeship | no data / 121 bottle fragments (storage containers and pharmaceutical glass) | 5 seals | a descriptive sign - with the name of the glass workshop (Glas Fab [T]hu[re]), symbols (star, eagle), monogram (K) | 2nd half of the 18th century – 2nd and 3rd quarter of the 19th century | Siwiak 2002 |
| 5   | Bydgoszcz, town (Przedmieście Gdańska, site 533), Kujawsko-Pomorskie Voivodeship | no data / 28 bottle fragments | 18 seals | descriptive signs - with the name of the glass workshop (Glas Fabrik Clementienhof), the glass workshop and town (Baeren Walde) | turn of the 18th century | Siwiak 2009 |
| 6   | Chojnice, school (Jesuit College), Pomorskie Voivodeship | 990 fragments of glass vessels / 741 bottle fragments | 8 seals | descriptive signs - with the name of the town (London, Londn, Londen) | 18th-19th century | Garas and Trzcinski 2010 |
| 7   | Dubno, manor house, Podlaskie Voivodeship | 1627 fragments of glass vessels / no data | 2 seals | descriptive signs - with the name of the town (London) and unidentified, partly preserved (Crus [...] Hirs […] Bo) | 18th century | Garas and Karwowska 2013 |
| 8   | Elbląg, town (Old Town), Warmińsko-Mazurskie Voivodeship | no data / many thousands of bottle fragments | 37 bottles with seals (and 11 fragments of necks with stamped reference numbers) | descriptive signs - with place names (including London in different spelling options); trademarks (FR), numerical (e.g. 1/2Q, 1/26, N*), symbols (crown?, a bunch of grapes), 8 seals without any imprints. | end of the 17th-18th century; 19th century | Gołębiewski 1997 |
| No. | Place of discovery | Number of glass vessels / Number of bottles | Number of seals, glass bottles or their fragments with seals | Types of signs on seals | Dating | Publication |
|-----|-------------------|---------------------------------------------|-------------------------------------------------------------|-------------------------|--------|-------------|
| 9   | Gdańsk, town (Market Hall, site 5), Pomorskie Voivodeship | 313 fragments of glass vessels / 205 bottle fragments (including: 94 from square bottles, 108 from cylindrical, 3 from demijohns) | 1 specimen (a piece of a rectangular bottle with a seal) | descriptive signs - with the name of the town (Londo) | end of the 17th -18th century | Krukowska 2007b |
| 10  | Gdańsk, town (Szafarnia-Angielska Grobla, site 100), Pomorskie Voivodeship | 3940 fragments of glass artefacts / 2405 fragments of bottles and demijohns | 8 specimens (including: 5 bottles with seals and three loose seals) | descriptive signs - with the name of the town (London, Londo, Dantzig); 1 seal without a sign | end of the 17th - 18th century | Szczepanowska 2013 |
| 11  | Łowicz, town (New Town Hall), Łódzkie Voivodeship | 1309 fragments of glass vessels / 240 bottle fragments | 6 fragments of bottles with seals | a descriptive sign - with the name of the glass workshop (Huta Olichawska, Huta Olchowsky), monograms (S.F, H.R), numerical (K2), symbols (crown?), 1 illegible sign | c. 2nd half of the 17th- beginning of the 19th century | Potursalska 1999 |
| 12  | Pomorzanki, village, Łódzkie Voivodeship | 504 fragments of glass vessels / 262 bottle fragments | 1 seal | trademark (?) - name of the manufacturer or the consumer (?), partly preserved (Zskow) | 18th-beginning of the 19th century (?) | Slomska 2013 |
| 13  | Poznań, town (Stawna/Żydowska Street), Wielkopolskie Voivodeship | 203 fragments of glass vessels / 172 bottle fragments | 5 seals | descriptive signs - with the name of the town (Ondo, Onde), trademarks (Ha […] Glais; Hartwig), symbols (the Star of David, fish) | 2nd half of the 18th-20th century | Kufel 2018 |
| 14  | Puck, town (town hall) Pomorskie Voivodeship | 2644 fragments of glass vessels / 72 bottle fragments and 4 whole bottles (reconstructed) | 3 seals | descriptive signs - with the name of the town (London, Lipusch), miscellaneous sign (Secken) | 4th quarter of the 18th-1st half of the 19th century | Starcki 2015 |
| 15  | Sandomierz, town (Collegium Gostomianum), Świętokrzyskie Voivodeship | 540 fragments of glass vessels / 204 bottles | 1 seal | a descriptive sign or a trademark (HP) | 17th-18th century | Rubnikowicz 1996, 447, Tab. V:14 |
| 16  | Siędlęcin, tower castle, Dolnośląskie Voivodeship | 2539 fragments of glass vessels / 29 storage bottles* | 3 seals | a descriptive sign - with the name of the town and glass workshop (Kolzig; [C]ristahl); numerical sign (K 7/4 Q) | year 1765; from 1754 to the 1890s | Grabny 2016 |
| 17  | Stargard, town (quarter V), Zachodniopomorskie Voivodeship | 186 fragments of glass vessels / 158 bottle fragments | 3 seals | descriptive signs - with the name of the town and glass workshop (Marienwalde 1739; M. L / Bernsee / Glasshol[t]; a trademark (?) (ICK) | end of the 17th-mid-19th century | Majewski 2012 |
| No. | Place of discovery | Place of discovery | Number of glass vessels / Number of bottles | Number of seals, glass bottles or their fragments with seals | Types of signs on seals | Dating | Publication |
|-----|-------------------|--------------------|---------------------------------------------|------------------------------------------------------------|--------------------------|--------|-------------|
| 18  | Stargard, church (of the Augustinians), Zachodniopomorskie Voivodeship | no data / 2589 bottle fragments* | 33 (?) seals (including: 28 identified loose finds and 5 (?) unidentified) | descriptive signs - with the name of the town and glass workshop (e.g. Piep Stock, Marienwalde, Cantreck), a trademark (Bergemann Erben), with unclear words (Minch), numerical (No 3; 1) | | 17th-19th century | Wilgocka 2016 |
| 19  | Średnia Huta, glass workshop, Kujawsko-Pomorskie Voivodeship | 1083 fragments of glass vessels* / 241 bottle fragments | 3 seals | descriptive signs - with the name of the town (Londo) | | 18th century | Rubnikowicz 1989a |
| 20  | Szczecin, castle (Castle of the Dukes of Pomerania), Zachodniopomorskie Voivodeship | no data / 68 bottle fragments* | 9 seals | descriptive signs - with the name of the town and glass workshop (Annenwalde, Marienwalde) | | 18th-19th century (after 1637) | Cnotliwy 2014 |
| 21  | Toruń, castle, Kujawsko-Pomorskie Voivodeship | 226 fragments of glass vessels / 61 bottle fragments | 7 seals | descriptive signs - with place names (London), with a monogram (R), with an unclear sign (KWD/Y); 2 without a stamp | | 18th century | Nawracki 1999 |
| 22  | Warsaw, town (Plac Zamkowy), Mazowieckie Voivodeship | no data / over 17,000 bottle fragments | 59 seals (including: 4 on whole bottles and 15 on bottles preserved in fragments) | descriptive signs - with names of glass workshops (e.g. Piekarska, Stanislawowa, Jezewicka, Blendow, Lochow); with unclear initials (e.g. HP; WD HW; FK); numerical signs - identifying measures (3 Quart, KIII); 7 without a stamp | | 2nd half of the 18th-19th century | Baturo 2017 |
| 23  | Warsaw, town (town hall), Mazowieckie Voivodeship | 948 glass vessels / no data | 2 seals | descriptive signs - with the name of the town (Dantzig, Londen) | | 4th quarter of the 18th-1st quarter of the 19th century | Blusiewicz 2013 |
| 24  | Wroclaw, town (Ostrów Tumski), Dolnośląskie Voivodeship | 2265 fragments of glass vessels / 33 (?) bottle fragments | 5 seals | a descriptive sign - with the name of the town and glass workshop (Corin), monograms (H E; K R Q; K), shape (triangle) | | Modern Period | Siemianowska 2015 |

* calculations made by the author based on data included in the publication
Observations made on the basis of the current state of research

Based on the collated data it is possible to state unequivocally that vessels with such seals and such loose finds are relatively rare. The total number of artefacts listed in Table 1, covering 24 regions of archaeological excavations, was over 220 specimens. Other sites (around 60 in total), where archaeologists discovered glass seals (overall at least 330) and which were mentioned in publications from that time include: Bierzwnik,13 Biskupice,14 Breń,15 Chelmno,16 Darłowo,17 Fordon,18 Gdańsk,19 Gdańsk – Wisłoujście,20 Gniewkowo,21 Inowrocław,22 Jeleń,23 Karczyn,24 Koszalin,25 Krosno Odrzańskie,26 Łabiszyn,27 Łomża,28 Lódź,29 Myślibórz,30 Pałkoś,31 Poznań,32 Poznań – Ostrów Tumski,33 Przecław,34 Radom,35 Radoszyce,36 Śląb,37 Stargard,38 Strzelno Klusztorne,39 Toruń,40 Trzemeszno,41 Warsaw,42 Warsaw – Royal Castle,43 Warsaw – Wilanów,44 Witów,45 and Wrocław.46

The total number of all finds mentioned in the collected publications would be at least 550. These numbers are only of an informative nature, as in several cases (Łomża,47 Poznań,48 and Trzemeszno)49 the number of glass seals obtained from excavations was not specified in detail. No doubt, at a national level the number of the discovered seals is much higher, but those finds have not been mentioned in published research results.50

Usually, on one site there were several to around a dozen of such finds. Greater numbers (several dozen specimens) were obtained only in a few cases, during archaeological excavations covering large areas – the Old Town in Elblag (37 specimens), the area of the Augustinian church in Stargard (33?), and Plac Zamkowy (Royal Palace square) in Warsaw (59), as well as finds from the Old Town in Stargard (86 in total),51

11 Glass workshop, total number of glass seals – 81 (Markiewicz 1999, 180, no figures), including: 46 seals (Stolpiak and Świercz 1997, 42-45, no figures) and 13 seals (Stolpiak and Świercz 1998, 39-41, no figures).

12 Church, 1 seal (Ruszewska 2007, 148, Fig. 3:6; 149-150).

13 Glass workshop, 1 seal (Mucha 1994, 58, 79, Fig. 10:2).

14 Near monastery, 3 seals (Olczał 1991, 78-79, Fig. 5).

15 Old Town, 3 seals (Kuczkowski 2015, 2016, Fig. 1:19).

16 Town, 20 seals, including: 17 seals (Woźniak 2001, 248-251) and 3 seals (Siwiak 2003, 60-61).

17 Town, 8 items, including: 3 seals (Krukowska 2007a, 434-435) and 5 seals (Zespół Przedbramia, Krukowska 2016, 212-215, Fig. 4).

18 Fortress, 3 seals (Szczepaniok 2016, 307-310, Fig. 108:19).

19 Village, 5 seals (Sulkowska-Tuszyńska 2018, 123-124; 195, Figs. 92-93).

20 Old Town, 36 seals (Siwiak 2007b, 77).

21 Settlement (?), 1 seal (Siwiak 2004, 157-158, Fig. 1.a).

22 Settlement, 1 seal (Siwiak 2007b, 78-79, Fig. 1:4).

23 Old Town, 3 items, including: 2 seals and 1 bottle with seal (Borkowski and Kuczkowski 2011, 45, Fig. 34:1-1; 97, Fig. 107).

24 Castle, 1 seal (Dżiedzion and Kalagute 2002, 77 and 162, Pl. IX:1).

25 Castle, 5 seals (Siwiak 2007a).

26 Town, at least 3 seals, including: undefined number of seals and 1 published (Jurzysta 2014, 103), as well as 1 seal (Biena 2014, 151).

27 Town, 1 seal (Dziubek et al. 2002-2003, 368, 380, Fig. 6:5).

28 Town, 1 seal (Szymczyk 2014, 551).

29 Monastery, 1 seal (Siwiak 2007b, 78-79, Fig. 1:2-3).

30 Town, undefined number of seals, 1 published (Wawrzyniak 2000, 74, Fig. 17).

31 Town, 5 seals and one mark left by the seal on a fragment of a glass bottle (Antowska-Gorąciak 2012, 151, 194, Pl. 6:1-5).

32 Glass workshop, 2 seals (Mucha 1997, 118 and 114, Fig. 3).

33 Castle, 1 seal (Lechowicz 2012, 124, [Fig.] 108).

34 Castle, 1 seal (Kajzer 1988, 137).

35 Settlement, 1 seal (Siwiak 2007b, 79).

36 Stargard, Old Town, total number: 86 seals, including: 2 seals (Burdziej et al. 2013, 348); 6 seals (Burdziej et al. 2013, 350, 374, Fig. 28:3-7, 10); 1 seal (Burdziej et al. 2013, 352, 379, Fig. 32);
from the Old Town in Inowroclaw (36 items),\textsuperscript{52} and the Cistercian monastery in Bierzwnik (Marienwalde) (81),\textsuperscript{53} the location of a post-medieval glass workshop.\textsuperscript{54}

The percentage of glass seals and glass vessels with seals compared to the total number of discovered storage bottles usually ranged between 1-4\%, sometimes below 1\%, and only in rare cases was as high as 10\% (for the assemblage of finds from the castle in Toruń). The percentage of signed vessels compared to the total number of glass fragments discovered at individual sites was even lower – 0.1-0.6\%.\textsuperscript{55} Although these values give us only approximate information due to the selective nature of the compilation created for this paper, they still provide us with some notion of the scale of the phenomenon consisting in the use and presence of glass seals on the territory of Poland in the modern period. That low percentage may be the result of a number of factors. However, in this context, assumptions concerning the signing of only specific batches, series of products made to special (also individual) orders, seem to be fully justified.

The dating of the finds included in the discussed compilation generally falls to the period between the end of the 17\textsuperscript{th} century to the second half of the 19\textsuperscript{th} century, rarely exceeding either of these thresholds (the earliest dates being those concerning finds from the excavations at the site of the town hall in Łowicz – from around the second half of the 17\textsuperscript{th} century and the tower castle in Siedlęcin as well as the Old Town in Elbląg the latest – until the 1890s). This conforms with the conclusions regarding the production and use of similar signs in western European countries.\textsuperscript{56}

Vessels with seals are usually standard products, of average quality, most common on the market, and do not differ from unsigned specimens.\textsuperscript{57} They are made from green, greenish, or brown glass, with visible air bubbles. Since seals are usually found separately, with only small fragments of the bodies (upper parts of bottles), in most cases it was not possible to establish the specific shape and size of the vessel. They survived in Elbląg\textsuperscript{58} and Warsaw.\textsuperscript{59} They were attached to storage bottles with a round (cylindrical) or oval cross-section, as well as rectangular bottles (i.e. flasks),\textsuperscript{60} in the place where the neck transforms into the body (on the shoulder) and where glass is thinner and more fragile, which possibly made those batches of glass products more prone to damage.

Due to the fragmentary preservation of the majority of vessels and the still small available source database, no correlations between the shape of the container and a specific type of markings were observed. In this respect, the only link is associated with finds with different versions of the name “London”, which – based on descriptions provided by authors or figures of finds – more often are rectangular vessels. Their shape was adjusted for transporting them in travel cases (case bottles). However, the search for more specific relationships between individual vessels and details of representations on the seals at this stage would be premature. Among Polish finds, we may only observe a greater proportion of cylindrical bottles than squat ones (representing the following types: shaft and globe, onion bottles, and malet bottles). This is linked to the chronology of Polish finds, as they are mainly vessels from the 18\textsuperscript{th} and 19\textsuperscript{th} centuries, which saw a gradual increase (and then the dominance) of such slenderer forms.\textsuperscript{61}

Seals usually have small sizes, with diameters of around 3-4 cm and thickness below 3 mm. They are usually round (e.g. Figs. 1 and 2); only in few cases records showed a rectangular imprint, among finds from Warsaw (Fig. 7:b; another example see Fig. 2:c).\textsuperscript{62} This was the result of using a tool with an appropriate section. They also usually have a visible, convex rim made by the pressure created by the stamp being applied to the hot glass disc while attaching it to the published archaeological finds known from Łomża (Jurzysta 2014, 103; there is no figure depicting the seal).\textsuperscript{63}

\textsuperscript{52} Siwiak 2007b, 77, footnote 6.
\textsuperscript{53} For brief information on these finds see Markiewicz 1999, 180; see also Stolpiak and Świercz 1997, 42-45; Stolpiak and Świercz 1998, 39-41.
\textsuperscript{54} The latter three assemblages were not included in Table 1, due to insufficient information contained in publications about these finds.
\textsuperscript{55} This remains in line with the findings made by Andrzej Gołębiewski, who in his work published 23 years ago (likewise based on the literature and archaeological finds available at that time) also estimated that the “percentage of bottles with impressed stamps in the preserved assemblages did not reach even 1%” (Gołębiewski 1997, 184).
\textsuperscript{56} Among others, Morgan 1976; Dumbrell 1983.
\textsuperscript{57} See Gołębiewski 1997, 185. At the beginning of the 19\textsuperscript{th} century, the best and the most durable Polish bottles (appropriate for fizzy drinks and with a quality similar to that of English bottles) were believed to be vessels from Huta Sztabińska – glass workshop located in the village of Sztabin in Podlasie region (Wlodarczyk 2017, 145, footnote 15). Currently there is only one artefact among \textsuperscript{58} Gołębiewski 1997, 185.
\textsuperscript{59} Kozłowska 1994, 36, 38-39, 41; Baturo 2017, 201-217.
\textsuperscript{60} In the analysed archaeological materials I did not find any information about discoveries of bottles with glass seals that would have other shapes, for instance with triangular or octagonal bodies, which would also be manufactured around that time (such artefacts are mentioned in, e.g. Morgan 1976, 58-59, 68; Dumbrell 1983, 87-90, 141).
\textsuperscript{61} See e.g. Morgan 1976, 24-27; Dumbrell 1983, 100-119.
\textsuperscript{62} Baturo 2017, Pl. 5:4; Baturo and Kasprzak 2018b, 30, Figs. 1-2.
surface of the bottle and constituting the excess of glass mass gathered around the imprint (other examples see Figs. 1 and 2:a-b, d).

Much less often the stamp is on the glass strip below the lip of the bottle (Fig. 3). It is a separate and at the same time a simplified manner of signing glass containers, with a similar marketing as well as fiscal and inspection function. The signs were placed along a flattened circular glass tape (around 0.5-1 cm wide) under the rim of a bottle. In exceptional cases, they take the form of a quadrangular imprint. Markings on glass tapes are schematic, limited to letters (including unrelated, not forming legible inscriptions) and combinations of letters and numerals referring to the serial numbers of products or beverages, capacity, etc. (Fig. 3:a-d), without any pictograms. In a few cases they bear the name of a glass works (“H IEZEWIC:” or “H: IE[…]”, “H:LUTKOWSKA”, “H:SWYNC:”, “H: WALOWI”) (Fig. 3:e-f). Based on the collected material from Poland, it is possible to state that this method of counting post-medieval glass bottles was used much less often than the glass seals method.

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63 Polish researches call them signature discs (Gołębiewski 1997, 201) or signature strips (e.g. Baturo and Kasprzak 2019a).

64 For this reason, it was not necessary to carry out additional technological actions consisting in the production of a glass disc. Such finds were recorded on several occasions: in Elblag (11 finds, Gołębiewski 1997, 201), in Warsaw – the Old Town area (7 items, including: 2 specimens, Baturo and Kasprzak 2019b, 38; 3 specimens, Baturo and Kasprzak 2019c, 28-29; 2 specimen, Baturo and Kasprzak 2018c, 37) and the town (6 items, Lipiec 2017, 170-173, Fig. 1:c, 2:b; Fig. 3:a; Fig. 5:a, i-j, k), the monastery in Pakość (2 items, Siwiak 2007b, 78-79, Fig. 1:2-3) and the village in Zajezierze (1 specimen, Siwiak 2004, 159). The total number of above mentioned items is 27.

65 Lipiec 2017, 171, Fig. 6:a.

66 See also Gołębiewski 1997, 200-201, Fig. 4:a-f.

67 The same inscriptions are the imprints on round glass seals, see Baturo and Kasprzak 2018c, 37, Figs. 1-3; Baturo and Kasprzak 2019a, 26-17; Baturo and Kasprzak 2019c, 28-29, Figs. 1-4.

68 Baturo and Kasprzak 2019b, 38, Figs. 1-2.
Seals differ in terms of their types, i.e. signs placed on seals and their iconography. These include individual signs, trademarks, monograms, as well as symbols, descriptive signs, and numerical signs. They have the form of positives – raised imprint on a concave background. They are usually made shoddily, without much care about details of the drawing and the shape of letters. In many cases they were impressed unevenly, thus only a part of the original stamp is visible. Most probably this was caused by the intensive use of presses for creating imprints. If glass mass stuck to the surface of presses, symbols and inscriptions on subsequent imprints would become blurred. Thus, the period of their suitability for use could be quite short. However, the examples analysed here show that those tools must have been used despite their faults, causing impressed images to be increasingly illegible. Another explanation of the above-mentioned defects could be impressing the stamp in still too molten glass, as well as insufficient skill on the part of craftsmen creating matrices that were necessary for making presses, the latter becoming worn out, or because of the haste or shoddiness of glasshouse workers.

According to the review of published finds from Poland, the dominating type are descriptive signs, i.e. with names of glass workshops and names of places in which they were located. They appear as full words or abbreviations, without diacritic signs or misspelled. They include, among other things, markings associated with glass workshops from the territory of Western Pomerania (Fig. 4), which – as indicated by the data presented here – are currently represented by the greatest number of identified and relatively well dated specimens, mainly from Bydgoszcz (as well as from Fordon, which currently is part of Bydgoszcz), Elbląg and Stargard. The following glass workshops have been identified:

- “BAERENWALDE” (Bärenwalde – Mysia Dziura, or other, located near Chojnice and

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69 Types of signs on seal identified by A. Gołębiewski based on finds from the Old Town in Elbląg (Gołębiewski 1997, 187). I use that classification while discussing signs on glass seals in this paper. Only in the case of signs containing names of glass workshops I allocate them to the group of descriptive signs and not trademarks, as in my opinion, the first term provides a better characteristic of inscriptions on the analysed artefacts.

70 See Friese 1995, 20.

71 Gołębiewski 1997, 192-193, Fig. 2:a-b, d, f.

72 Siwiak 2009, unpaged.
Kościernika)\(^73\) (Fig. 4:a-c); “BATTROW” (probably Batorowo);\(^74\) “BERNSEE” (Breń, 1660-1822/1824) (Fig. 4:y); “CANTRECK” (Łoźnica, 1806-1875) (Fig. 4:u-w); “FABRIQUE GRUNAU” (Gronowo) (Fig. 4:d-e); “LOTZEN” (Łośno, 1746-1785); as well as “MARIENWALDE” (Bierzwnik, 1607-1822/1824) (Fig. 4:i-j, m-p). The remains of the latter glass work shop have been investigated by archaeologists. During excavation works carried out before 1999 archaeologists discovered in total 81 glass seals.\(^76\) Those finds have not yet been fully published.

Other glass workshops that operated in that area and were identified on the basis of glass seals include: “MEHRENTHIN” (Mierzęcin?, 1797-1875) (Fig. 4:g); “PIEPSTOCK” (Podlipce, 1750 – after 1855) (Fig. 4:q-t); “PPWO” (Chłopowo?);\(^77\) furthermore “GLAS FABRIK CLEMENTIENHOF” and “[C]LEMENTIN” in modern-day village of Klementynowo;\(^78\) “[GL]AS FABRIK THURE” or “[GL]AS FA[BI]K [THURMUHL]” (in Tur, from 1842 or 1845)\(^79\) (Fig. 4:h), and Lipusz, with many spelling variations: “LIPUSCH”,\(^80\) “LIPUSCH”,\(^81\) “IPPUS” and “IPPUSCH”?\(^82\) (Fig. 4:k-l). As indicated by the relevant inscriptions – “[ST]UTHOF”?\(^83\) (Fig. 4:x), another glass workshop that manufactured glass bottles with seals was located in the village of Stuthof (currently within the administrative area of Szczecin) and operated from 1821 until the mid-19th century.

Products of five more glass workshops were also registered: „HAMMERSCHE GLAS FABR.”\(^84\) or “HAMMER Glas F” (Hammer[sche] Glas F[abrik]) (Rudnica, 1749-1855) (Fig. 4:f); as well as unspecified “GLAS MÜHL” – on seal found in Gniewkowo,\(^85\) “ANNENWALDE” (modern-day Germany, Brandenburg, 1755-1867) and “GRIMTZ” (Grimnitz, located near Potsdam), which are also known, e.g. from finds discovered in Szczecin,\(^86\) whereas from Wroclaw comes the seal

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\(^73\) Sulkowska-Tuszyńska 2018, 123, 195, Fig. 93:c.
\(^74\) Sulkowska-Tuszyńska 2018, 123, 195, Fig. 92:a.
\(^75\) Woźny 2001, 246, Fig. 1:5-6; 247, Fig. 2:1; 249-250; Siwiak 2007b, 77, footnote 6. Cnotliwy 2014, 278. The name of the glass works in Marienwald is known in different versions from the seals found in Stargard, e.g.: “KON PR MARIENWALDSCHE GLASFABRIQUE” (Burdziej et al. 2013, 349, 353). Other finds from Stargard, e.g.: Burdziej et al. 2013, 348-350; Bucka et al. 2015, 491, Fig. 17:3; Bucka et al. 2017, 224; Wilgocka 2016, 227; Szeremeta 2018, 390.
\(^76\) Stolpiak and Świercz 1997, 42-45; Stolpiak and Świercz 1998, 39-41; Markiewicz 1999, 180.
\(^77\) Gołębiewski 1997, 192-195; finds from Stargard, e.g.: Kwiatkowski 2010, 103, 108, Fig. 8; Burdziej et al. 2013, 354; Wilgocka 2016, 227-228, 238, Fig. 5; finds from Fordon: Woźny 2001, 250-251.

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\(^78\) Siwiak 2007a, unpaged, Fig. 7:1-2; Siwiak 2007b, 78-79, Fig. 1:2.
\(^79\) Sulkowska-Tuszyńska 2018, 123, 195, Fig. 93:a; Siwiak 2004, 157-158, Fig. 1:a; Siwiak 2007b, 78-79, Fig. 1:3-4.
\(^80\) Kuczkowski 2016, 162, no. 1.3; Woźny 2001, 247, Fig. 2:2.
\(^81\) Starski 2015, 160-163, Fig. 141:2.
\(^82\) Gołębiewski 1997, 194, 200, Fig. 4:g, h.
\(^83\) Wilgocka 2016, 228, 239, Fig. 6:6-7.
\(^84\) Woźny 2001, 247, Fig. 2:3; 251; Siwiak 2007a, unpaged; also on find from Myślęcinek (Szymczyk 2016, 551) and probably on the item from Krosno Odrzańskie (Dziedzic and Kałagate 2002, 77, 162, Pl. IX:1).
\(^85\) Sulkowska-Tuszyńska 2018, 123-124; 195, Fig. 93:b.
\(^86\) Cnotliwy 2014, 277-278. The author incorrectly identified the latter seal as coming from the town of Krynica. Another item
“CORIN”, which refers to the glass workshop located in Chorin, near Eberswalde (in Brandenburg). Associating the newly discovered artefacts from that area with the functioning of individual workshops is facilitated by the already available publications of German researches concerning glass workshops and their trademarks.

Markings associated with Mazovian glass workshops (Fig. 5:a-g) – several workshops located near Warsaw, which recently became the subject of research focusing on the recording of finds and their correlations with written records and cartographic sources. These workshops are characterised by the following signs discovered during excavations carried out in Warsaw: “BLENDOW” and „BLEndo” (a glass workshop that operated in Błędów, in the years 1801-1806/1807) (Fig. 5:d-e); “H: JEZEWIC:” (Huta Jeżewicka – Jeżwice

related to the glass workshop in Amnenwalde was found in Brein, Mucha 1994, 68, 79, Fig. 10:2.

Siemianowska 2015, 224, Fig. 10:g. The author did not identify the manufacturer of that artefact.

In particular Friese and Friese 1992; Humbsch 2001; Humbsch 2002; Humbsch 2006.
glass workshop, 1836-1840, previously Huta Tartak – Tartak glass workshop, 1835-1836)\(^90\) (Fig. 5:b); and “H: WALOWI” (Huta Wałowska – Wałowska glass workshop, 1830-1839);\(^91\) as well as “HEINZ STRZIZE” (in Strzyżewskie Budy);\(^92\) “HLO” (in Łochów);\(^93\) “PIEKARSKA”, also spelled “PIEKARY” (in Piekary, c. 1803-1839)\(^94\) (Fig. 5:f-g; other examples Fig. 1:c-d); and „STANISLAW”\(^95\) or „STANISLAWOWA” (in Stanisławów, which operated in two stages: the first glass workshop – 1796-1801/1803; and the second glass workshop – 1805-1806?)\(^96\) (Fig. 5:c; other examples Fig. 1:e-f).

Production was also confirmed in glass works located in Lutkówka (in the years 1838-1851/1852),

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\(^{90}\) Baturo and Kasprzak 2019c; other finds: Lipiec 2017, 172-173, Fig. 5:a, f-h, j.

\(^{91}\) Baturo and Kasprzak 2019b.

\(^{92}\) Baturo 2017, 220.

\(^{93}\) Baturo 2017, 219.

\(^{94}\) Baturo 2017, 221-222.

\(^{95}\) Kozłowska 1994, 41, no. 110.

\(^{96}\) Baturo 2017, 219; Baturo and Kasprzak 2018d.
as evidenced by the seal “H: L[UT]KOWSKA” (1838-1851/1852),97 and in Świnice (1829-1838), as well as in Trębaczów (1819-1829), the material evidence of which are seals, respectively, with the name “H:SWYNC”98 (Fig. 3:f) or “HUTA TREBACZOW”99 (other examples see Fig. 1:a-b).

Seals associated with glass workshops in Greater Poland (3): “RACADO[W]”, “RACADOWO” (in Racendów near Kotlin, on maps recorded as Racendower Glashütte, which operated from the end of the 18th century and in the 1st half of the 19th century) found on artefacts from Poznań100 and Fordon101 (Fig. 5:i-j); as well as “[B]EHLE” (in the village of Biała near Czarnków, which operated in the years 1800-1850) (Fig. 5:k), and “GLAS Fabr Alexandrowo” (in Aleksandrów, 1815-1866) on seals from Ostrów Tumski in Poznań102 (Fig. 5:h).

Silesian glass workshops (2) were identified in the basis of the following the signatures: “KOLZIG”, “K”,103 and “[C]RLSTAHL” found on pieces of glass excavated in Siedlęcin (Fig. 5:l-n). The first and the second specimen came from the glass workshop located in Kolsko (it operated in the years 1763 or 1764 – after 1830). Bottles with these versions of seals are dated, respectively, to the year 1765 and the years 1765-1811.104 The third specimen was manufactured in the Karlsthal glass workshop near Szklarska Poręba (active between 1754 and 1890s), which belonged to the Preussler Family.105

Glass workshops that operated at the territory of Gdańsk Pomerania (2), were confirmed by the seals discovered in Gdańsk itself106 and in Warsaw.107 These items are bearing the imprint “DANTZIG” (Fig. 5:p) or „Neuhof” (Nowy Dwór) (Fig. 5:q).108

The inscription “HUTA SZTABINSKA” on the seal attached to a bottle found in Łomża is the material evidence of the functioning of another glass workshop, this time in Podlasie region. It operated in the second half of the 18th century and the 1st half of the 19th century.109

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97 Baturo and Kasprzak 2018c.
98 Lipiec 2017, 172; Fig. 5: i, k; Baturo and Kasprzak 2019a, 26-27.
99 Baturo and Kasprzak 2018a.
100 Antowska-Gorączniak 2012, 151; 194, Pl. 6:4.
101 Siwiak 2003, 60, Fig. 1:20.
102 Antowska-Gorączniak 2012, 151; 194, Pl. 6:1, 3.
103 Cf. Humbsch 1998.
104 Grabny 2016, 262-263, Fig. 20:20-21; 271, Pl. 2:9, 11.
105 Grabny 2016, 263, Fig. 22; 271, Pl. 2:10.
106 Krukowska 2007a, 434; Fig. 4; Szczepanowska 2013, 285.
107 Błusiewicz 2013, 88-90, Pl. II:9.
108 Only on the bottle found in Gdańsk, Krukowska 2016, 212-213, Fig. 4:c.
109 Jurzysta 2014, 103; see also Kamieńska 1974, 94, 96, Map 5, no. 178.
Among the unidentified Polish glass workshops, there is one hiding behind the name “HUTA OLICHAWSKA” and “HUTA OLICHAWSKY”\(^{110}\) (Fig. 5:r-s), which probably was located somewhere in central Poland, assuming that it operated near the place of the discovery (in Łowicz).\(^{111}\)

Glass workshops that operated in more distant locations – most probably in Charlottenburg (currently a part of Berlin), in Bad Pyrmont in Westphalia, and in the Netherlands, as indicated by artefacts from, respectively, Gdańsk, with the inscription “H. Faselow. Charlottenburg”;\(^{112}\) from Stargard, with the signs “PYR[…]JONT W[…]TER”, “[…]RMONT WATI R” and “[…]RMONTER STALHWASSE[…]”\(^{113}\) (Fig. 6:a-c), and from Elblag signed “CON STANTIA WYN”\(^{114}\) (Fig. 6:c-f). Another bottle, with an inscription in the Cyrillic alphabet “[…] ЕНБЕР[…]Ъ”\(^{115}\), discovered in Łomża, most probably comes from the Russian Empire.

Other reordered specimens include symbols that most probably refer to the capacity of individual vessels, in the form of Arabic and Roman numerals and fractions (i.e. numerical signs) or letters – abbreviations or acronyms of units of capacity used in measuring liquid commodities. Producing bottles of a certain size and signing them appropriately was regulated and monitored by the state. For the Kingdom of Poland ordinances concerning the capacity of bottles were issued in the years 1819 and 1830,\(^{116}\) while for Prussia – in 1816.\(^{117}\) Primarily they were supposed to prevent the manufacturing of non-standard bottles. Signs found on published specimens include, for instance: “3”, “III”, “¾”, “III K” or “K 3” (i.e. three half-pints; letter K – from the Polish word kwarta – quart)\(^{118}\) – on seals discovered in Warsaw\(^{119}\) (Figs. 5:a, e and 7:b-c, g; other examples see Fig. 1:e-f, 2:c); “¾” – on the artefact discovered in Toruń\(^{20}\) (Fig. 7:h); “Q” (i.e. a quart from the Latin quarta pars – the fourth part)\(^{121}\) – on seals discovered in Bydgoszcz,\(^{122}\) “1 Qua[r]” – on the item from Krosno Odrzańskie\(^{123}\) and “K 4” – on finds from Warsaw;\(^{124}\) “K 1” and “K 2” – on bottles discovered in Brześć Kujawski,\(^{125}\) and in the variation “K II” and “2 K” recorded in the assemblage of glass from Łowicz;\(^{126}\) (Fig. 5:r-s) or “1 Kw” – on find from Bąkowa Góra\(^{127}\) (Fig. 7:j; other examples see Fig. 1:a-d). The last five signs are interpreted as units of measurement equal to one or two half-pints. There are also known artefacts with signs “G ½” and “G 1” found in Bąkowa Góra (Fig. 7:i, k), interpreted as the capacity of half a gallon and one gallon\(^{128}\) – the measurement used in English-speaking countries. The capacity expressed in a unit used in the Russian Empire (since 1835), including in the Congress Poland (since 1849), equal to “1/20 ВЕДРО”\(^{129}\) was impressed on a bottle discovered in Łomża.\(^{130}\)

The sign “IX” or “XIX” with raised dots in the circumference that filled the impression on the seal recorded in Łódź\(^{131}\) is perhaps a series number.

\(^{110}\) Poturska 1999, 318-319, Fig. 1:2-3.

\(^{111}\) That manufacture was not recorded in the inventory of glass workshops operating in Poland in the second half of the 18th century and the first half of the 19th century compiled by Zofia Kamińska (see Kamińska 1974, 94-97, Map 5).

\(^{112}\) Krukowska 2016, 213.

\(^{113}\) Wojciechowska 2015, 186-187, 199, Fig. 9:1-2. See also Kwiatoński 2010, 103; 108, [Fig.] 8:5 (the author incorrectly deciphered the inscription on that seal).

\(^{114}\) Gołębiewski 1997, 196-197, Fig. 3:b-c. The author suggested that these bottles come from Constance, on the border of contemporary Germany and Switzerland. After Roy Morgan the bottles with this inscription are Dutch vessels bearing the name after Constance, wife of Governor van der Stell (Morgan 1976, 102).

\(^{115}\) The discussed chapter does not contain any description of the seal and it is not possible to decipher the full inscription in the circumscription (Bienia 2014, 151). Most probably it is the name of the glass workshop or the name of its owner.

\(^{116}\) They ordered using half-pint, pint, pint and a half, quart, three-quarter bottles, etc. and indicating the “capacity of bottles with a glass stamp on the shoulder or the bottom” (Wlodarczyk 2017, 145, footnote 15).

\(^{117}\) Siwiak 2007a, unpagged. The unit of measurement that was introduced at that time – 1 Berliner Quart equalled to 1.145 litre, whereas ¼ Berliner Quart – approximately 0.86 litre. In Saxony (since 1836), Bavaria (since 1868), and Mecklenburg (since 1872), the capacity of bottles was given only in litres. The signing of ready-made bottles was previously regulated by Prussian decrees, e.g. from the years 1728, 1733, 1739 (see also Mucha 1997, 118).

\(^{118}\) According to Polish units of capacity used in measuring liquid commodities prior to the Partitions of Poland, which were still used in the 19th century, kwarta (quart) = 0.942 litre, and kwa[terka = 0.235 litre (Inhatowicz 1967, 42, tab. 26).

\(^{119}\) Batur 2017, 218-222; other finds: Kozłowska 1994, 38, no. 102; Lipiec 2017, 142, Fig. 5:1-1; 198.

\(^{120}\) Nawracci 1999, 92-93, Fig. 15:d.

\(^{121}\) Quart (kwarta) = 1.17 litre, is a Prussian unit of measuring liquids capacity used until 1816 (Inhatowicz 1967, 46, Tab. 37). In the years 1817-1872 the official unit of measurement was the so-called Berliner Quart (Berlin quart) = 1.145 litre (Inhatowicz 1967, 47, Tab. 39).

\(^{122}\) Siwiak 2002, 24, Fig. unnumbered, nos. 3-5; Siwiak 2003, 60.

\(^{123}\) Dziezicz and Kalagata 2002, 77.

\(^{124}\) Lipiec 2017, 172, Fig. 5:c-d; 199.

\(^{125}\) Andrzejewska 1996, 129.

\(^{126}\) Poturska 1999, 318-319, Fig. 1:3-4.

\(^{127}\) Glosek 1998, 44, 74; Pl. XII:4.

\(^{128}\) Glosek 1998, 44; 74; Pl. XII:1-2, 5. Gallon – is a unit of measurement which in England around 1835 was equal to 4.54 litres (Inhatowicz 1967, 58; Tab. 58), whereas the the wine gallon, i.e. the old English unit of measurement equalled to 3.7852 litres (Inhatowicz 1967, 79).

\(^{129}\) Wiedro (wiadro, bucket) is a Russian unit of capacity used in measuring liquid commodities equal to 12.299 litres (Inhatowicz 1967, 49, Tab. 43).

\(^{130}\) Bienia 2014, 151.

\(^{131}\) Dziubek et al. 2002-2003, 368, 380, Fig. 6:5.
On the territory of contemporary Poland archaeologists also discovered seals with signatures in the form of signatures made from several letters put together, which now are incomprehensible, for instance: “AB” on seal from Chełmno; “IDB” – from Raciazek; “CKW”, “F.K”, “PMR”, “W.D H.W” HP S(?)AR”, “H.S.W”, “KAK H WOSK”, “WARSCH” – from Plac Zamkowy in Warsaw (see Fig. 7:a-g; other examples see Fig. 2:c-d); “S.F”, “H R” – impressed on specimens from Łowicz; “KWD(inverted)Y / S” – from Toruń (Fig. 7:h); “CFD”, “WPS”, “H”, “iG” – on artefacts from Elbląg as well as “H E”, “K R Q” – on finds from Ostrów Tumski in Wrocław; “C W” and “G” on seals from Stargard; “FW” – on one artefact from Szczecin, while “HAUBAQ” on a seal from Poznań. Perhaps they were monograms of the owners, tenants of glass

132 Olczak 1991, 78-79, Fig. 5:h.
133 Kajzer 1981, 163-166.
134 Batur 2017, 219, 221-222.
135 Poturska 1999, 318-319, Fig. 1:1, 4.
136 Nawrachi 1999, 92-93, Fig.15:d.
137 Gołębiewski 1997, 192.
138 Siemianowska 2015, 224, Fig. 10:e, j.
139 Wilgoeka 2016, 228; 238, Fig. 5:16; 239, Fig. 6:4.
140 Cnotliwy 2014, 279.
141 Rubnikowicz 1996, 447, Pl. V:14.
142 Kufel 2018, 181.
workshops or product distributors.\textsuperscript{143} Their exact explanation seems to be possible through further studies on written records. The recurring letter H, which appears several times alongside other letters or words (W; R; E; AUBA), in some cases probably is an abbreviation of the word huta (glass workshop in Polish), whereas the remaining symbols next to that letter may refer to location, for instance, like in the case of the known sign “HLO” – from the glass workshop (H/\textit{uta}) in Łochów (\textit{LO}chow) or “H:LU\textit{TKOWSKA}” (H\textit{juta} Lutkowska) near Warsaw. Most probably other markings, which have not yet been unidentified, played a similar role, although we still do not know if they are a part of an entire name or a monogram, for instance: “ZSKOW” on the specimen discovered in Pomorzanki,\textsuperscript{144} or “MINCH” – an ambiguous sign on the artefact from Stargard\textsuperscript{45} (Fig. 7:1).

Monograms in the form of stylised letters “FR” with a royal crown above them, presumably are initials of the Prussian king Frederick II the Great (reign: 1740-1786).\textsuperscript{146} They were recorded, for instance, in Elbląg,\textsuperscript{147} Toruń,\textsuperscript{148} and Warsaw\textsuperscript{149} (Fig. 7:m-o).

This group of seals is associated with another one, having a similar purpose, although artefacts from that category of finds are rarely recorded. These are stamps with individualised signs – i.e. inscriptions believed to be surnames or initials of individuals, companies, or manufacturers that ordered signed glass products (this category of finds will be hereinafter generally referred to as “trademarks”). Only a few such specimens have been identified, for instance, those discovered in Gdańsk: “I JO KEILER […]” – a seal with the surname of a 19\textsuperscript{th}-century merchant from Gdańsk, Johann Keiler, who owned a liqueur factory that operated in Gdańsk from the beginning of the 18\textsuperscript{th} century. These dates are mainly noted on artefacts from the western part of modern-day Poland (see

\textsuperscript{143} See Gołębiewski 1997, 187; Mucha 1997, 118.
\textsuperscript{144} Słomskas 2013, 142.
\textsuperscript{145} Wilgocka 2016, 228; 238, Fig. 5:15.
\textsuperscript{146} That sign resembles the monogram placed, for instance, on coins minted during the reign of that monarch, e.g. a pfennig from 1755, see Bucka et al. 2017, 224, 238, Fig. 28:1.
\textsuperscript{147} Gołębiewski 1997, 198.
\textsuperscript{148} Nawracki 1999, 92-93, Fig. 15:e.
\textsuperscript{149} Daturo 2017, 219.
\textsuperscript{150} Szczepanowska 2015, 310; 302, Fig. 105:10; see also Morgan 1976, 104.
\textsuperscript{151} Krukowska 2016, 212-213. Their meanings were not further clarified by the author. Based on the artefact from the Wilsoułście fortress, the identification of the first sign and linking it to the operations of the Gdańsk merchant Keiler seems to be the correct explanation.
\textsuperscript{152} Wilgocka 2016, 228, 239, Fig. 6:5. Information on that subject can be found, for instance, in press advertisements from the years 1820 and 1823, Humbsch 1999.
\textsuperscript{153} Wilgocka 2016, 228, 238, Fig. 5:16.
\textsuperscript{154} Majewski 2017, 103-104.
\textsuperscript{155} Kwiatkowski 2010, 103.
\textsuperscript{156} Kufel 2018, 181.
\textsuperscript{157} Kufel 2018, 182; see also Morgan 1976, 104.
\textsuperscript{158} Paduch et al. 2009-2016, „Szklane pieczęcie firmy Mampe”, glass seal on the right.
\textsuperscript{159} Gołębiewski 1997, 199-200, Fig. 4:i. The author suggested that was the name of a local entrepreneur – Ferdynand Schichau (1814-1896). He carried out wide ranging business operations, in particular the production of steam engines. He owned a factory of steam locomotive, a shipyard, and a ship company, see Dutkiewicz 2015.
\textsuperscript{160} An undated specimen, which was not described in the publication, recorded in the form of a photograph, Garas and Karwowska 2013, 278, Fig. 9.
Fig. 4: g, j, k, o), for instance, dates: 1712, 1764, 1772 from Stargard, referring to the year of the production of bottles or – as in the first case – possibly the year of the establishment of the pharmacy, for which they were manufactured.\textsuperscript{161} The year 1764 impressed on the seals from the Lotzen (Łośno) glass workshop;\textsuperscript{162} 1758 and 1785 – appearing on seals from the Annenwalde glass workshop discovered in Szczecin;\textsuperscript{163} 1744, 1749, 1750, 1754 and 1766 – on the bottles from the Marienwalde glass workshop;\textsuperscript{164} and the year 1789 – on the specimens from Darłowo,\textsuperscript{165} Fordon and probably from Labiszyn, produced in the glass work in Lippusch,\textsuperscript{166} as well as dates 1805 and 1811 – on the artefacts discovered in Stargard,\textsuperscript{167} Elbląg\textsuperscript{168} and Fordon,\textsuperscript{169} from the Pipstock or Mehrenthin glass workshops. In the group of analysed finds the youngest date – 1894 is impressed on the above-mentioned specimen found in Elbląg (Fig. 6:d).\textsuperscript{170}

Images, geometric symbols, floral and zoomorphic representations, being iconographic symbols, and constituting the main motif on the seal, were recorded only in a few individual cases. For instance, these include a ship – a three-masted vessel with lowered (folded) sails, with diagonal rigging (also referred to as Latin), which was popular in the Mediterranean, on one find from Gdański (Fig. 7:p);\textsuperscript{171} a schematic crown, being the symbol of the monarchical power, on a seal from Fordon (Fig. 7:q);\textsuperscript{172} an isosceles triangle on the artefact from Ostrów Tumski in Wrocław;\textsuperscript{173} the Star of David on the artefact from Poznań,\textsuperscript{174} also with an inscribed letter “W” and a fish facing left underneath it, on the specimen discovered in Toruń (Fig. 7:r).\textsuperscript{175} The hexagram and the fish are common symbols characteristic for Judaism, which were placed, e.g. on Jewish ritual vessels;\textsuperscript{176} It is assumed that they were impressed on glass products by Jewish manufacturers and/or intended for Jewish customers. However, it is also possible that simultaneously this also served as a confirmation that the liquid stored in such a container was kosher.\textsuperscript{177}

Other pictograms include a bunch of grapes on the seal from Elbląg (Fig. 7:s)\textsuperscript{178} – a symbol of abundance, a popular motif used at that time for decoration of numerous goods (e.g. modern stove tiles); and the representation of an eagle with spread wings – the emblem of the Kingdom of Prussia, known for instance from seals discovered in Bydgoszcz\textsuperscript{179} and Gniewkowo.\textsuperscript{180} However, signs in the form of a six-pointed star, grapes, and the Prussian eagle are usually only graphic additions to inscriptions.\textsuperscript{181}

Published glass seals from the territory of Poland sporadically have heraldic signs on them, in the form of standalone marks or grouped with inscriptions. We know only a few such signs, including several from Stargard, of which one remains unidentified,\textsuperscript{182} and three are coats of arms of the Principality of Waldeck and Pyrmont (2 specimens) and the Pyrmont region (1 specimen). The latter were accompanied by the name of spring water – Pyrmont Water and Pyrmonter Stahlwasser (Fig. 6:a-b),\textsuperscript{183} transported in bottles bearing the above-mentioned signs. At the same time, a glass seal discovered in Elbląg shows the view of the Mill Gate (Mühlentor in German) in Stargard, one of the four gates of that medieval town and important local monument (Fig. 6:d).\textsuperscript{184}

Among the recorded finds, a relatively high percentage and territorial range characterises vessels with seals bearing the name “London” (Fig. 8). According to the division created by A. Gołębiewski, they can also be classified as descriptive signs. They represent various forms – there are specimens with inscriptions in the full form (“LONDON”), as well as with abbreviations or misspelled, but always written in capital letters. Usually, the seal contains a crown above

\textsuperscript{161} Kwiatkowski 2010, 103-104. Another item from Stargard with date probably 1772, see Majewski 2017, 103-104.
\textsuperscript{162} Burdzij et al. 2014, 380, Fig. 11:4; Szeremeta 2018, 390, 392, Fig. 5:4.
\textsuperscript{163} Cnotliwy 2014, 278.
\textsuperscript{164} Stolpiak and Świercz 1997, 44-45; Woźny 2001, 246, Fig. 1:5; 249; Burdzij et al. 2013, 349; Burdzij et al. 2014, 389, Fig. 19:7; Bucka et al. 2015, 488, 491, Fig. 17:3; Bucka et al. 2017, 224, 238, Fig. 28:2.
\textsuperscript{165} Kuczkowski 2016, 162, no. 1.3.
\textsuperscript{166} Siwiak 2007a, unpaged.
\textsuperscript{167} Burdzij et al. 2013, 354.
\textsuperscript{168} Gołębiewski 1997, 195.
\textsuperscript{169} Woźny 2001, 247, Fig. 2:2; 250-251.
\textsuperscript{170} Gołębiewski 1997, 199-200, Fig. 4:1.
\textsuperscript{171} Kruczkowska 2007a, 434, Fig. 6.
\textsuperscript{172} Siwiak 2003, 60-61, Fig. 1:1.
\textsuperscript{173} Siemianowska 2015, 224, Fig. 10:h; 228, Fig. 14:e.
\textsuperscript{174} Kufel 2018, 181.
\textsuperscript{175} Nawrcki 1999, 88-89, Fig. 12:h.
\textsuperscript{176} See Piątkowska and Żebrowski 2008-2020; Sieramska 2008-2020.

\textsuperscript{177} Another seal that may be associated with Jewish symbols can be the artefact with the inscription in capital letters “ARIEL”, which is the only element placed on the seal attached to the bottle discovered in Stargard (Burdziej et al. 2013, 352, 379, Fig. 32). Ariel is a Hebrew man’s name or a poetic name for Jerusalem (Zebrowski 2008-2020).
\textsuperscript{178} Gołębiewski 1997, 197-198, Fig. 3:a.
\textsuperscript{179} Siwiak 2007a, Fig. 7:4, 6, 8, 12.
\textsuperscript{180} Gołębiewski 1997, 199-200, Fig. 4:1.
\textsuperscript{181} Siwiak 2007a, Fig. 7:4, 6, 8, 12.
\textsuperscript{182} Siwiak 2003, 60-61, Fig. 1:1.
\textsuperscript{183} Siwiak 2007a, Fig. 7:4, 6, 8, 12.
\textsuperscript{184} Siwiak 2007a, Fig. 7:4, 6, 8, 12.
\textsuperscript{185} See Siwiak 2007a, Fig. 7:4, 6, 8, 12.
\textsuperscript{186} See Siwiak 2007a, Fig. 7:4, 6, 8, 12.
\textsuperscript{187} See examples in Gołębiewski 1997.
\textsuperscript{188} Burdzij et al. 2013, 354, 384, Fig. 39. That coat of arms was not identified in the source publication. The author also was not able to identify it on the basis of the printed photograph.
\textsuperscript{189} Wojciechowska 2015, 186-187, 199, Fig. 9:1-2. For more information on the form of such inscriptions see page 11.
\textsuperscript{190} See Paduch et al. 2009-2016.
the text and a five-pointed star below it (Fig. 8:b, j), with various additional monograms (e.g. AC, AHB, AHN, CFD, DG, H, HN, IDB, iG, MM, PG, RG, WPS), although in the case of some sites archaeologists recorded also other forms. For instance, we know the following versions: “LONDON”, “[L]ONDEN”, “LON DON” on artefacts from Warsaw (Fig. 8:j-m);185 “LONDON”, “LOND”, “OND” discovered in Elbląg (Fig. 8:a-e);186 “LONDON”, “LONDEN” on specimens from Chojnice;187 “LONDIN” – in Gdańsk (Fig. 8:g);188 “LONDON”, “ONDEN” on seals discovered in Toruń (Fig. 8:i);189 “ONDO”, “ONDE” – in Poznań (Fig. 8:f);190 “OND” and “ONDON” – on seals from Fordon (Fig. 8:n-q). The name spelled as “LOndo” impressed on artefacts from excavations in Średnia Huta,192 Gdańsk (Fig. 8:h),193 Poznań,194 Radom,195 and Witów,196 as well as the item found in Chelmno.197 The full mark “LONDON” is impressed...

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185 Baturo 2017, 220-223; name „LONDON” – also on the seal from Warsaw town hall, Blusiewicz 2013, 88-90, Pl. II:8.
186 Gołębiewski 1997, 188-190, Fig. 1.
187 Garas and Trzcński 2010, 38.
188 Krukowska 2016, 213, Fig. 4:d.
189 Rubnikowicz 1989b, 77, Pl. II:1; Nawracki 1999, 92-93, Fig. 15:a-b.
190 Kufel 2018, 181.
191 Woźni 2001, 246, Fig. 1:1, 3, 248.
192 Rubnikowicz 1989a, 52-53, Pl. I:7-8.
193 Krukowska 2007b, 36-37, Fig. 1; Szczepanowska 2013, 285.
194 Antowska-Gorączniak 2012, 151.
195 Lechowicz 2012, 124, [Fig.] 108.
196 Andrzejewski and Kazjer 2001, 334.
197 Olczak 1991, 78-79, Fig. 5:a.
also on finds from Biskupice, Dubno, Fordon, Gdańsk, Poznań, Puck, and Radoszyce.

The provenance and function of those bottles have been discussed many times in Polish publications. It is assumed that they were products imported from England together with their contents (mostly beer) or without it, or they were locally produced goods. The latter interpretation seems to be equally probable, as evidenced by the artefacts containing typos in the word London. In such cases, signs on the seals were supposed to increase the commercial value of the labelled goods; emphasizing the provenance of the foreign beverage imported in barrels and sold in bottles manufactured in the country of the importer. This option (Polish origin of the glass) was already confirmed as a result of physicochemical analysis of such finds from the area of the post-medieval glass workshop in Średnia Huta. We could also look at this practice from another point of view – possibly as an indented falsification of the country of origin of the vessel and the liquid it contained. How such products were distributed is also interesting. Currently, as indicated by the above-mentioned examples, we know at least a dozen or so towns and villages, in which such finds, have been recorded. Generally, they are located in different parts of Poland – from Radom to Puck, from Dubno to Poznań. A concentration of such finds can be observed in the central, longitudinal part of the country, from the south – Lesser Poland, through Mazovia and Kuyavia to the north – to Gdańsk Pomerania. Perhaps this phenomenon is associated with the ways of distribution (the Vistula route) or the cumulation of domestic production centres – both explanations are probable.

An interesting problem, which so far has been discussed only sporadically in Polish archaeological publications, is the use of glass bottles with seals for the distribution of mineral water in the late modern period. Water from popular springs, which were believed to have healing properties, was distributed in branded containers since the end of the 17th century. In such cases, seals also confirmed the origin and the reputation of the beverage stored in the bottles. Four finds from Stargard give us the basis to state that glass containers with seals were used to import spring water from Bad Pyrmont in Lower Saxony and from Szczawno Zdrój in Silesia (Fig. 6:a-c).

Archaeologists sometimes also record glass seals only in the form of blank discs attached to walls of glass vessels but without any imprints. Such finds, for instance, were discovered in Bąkowa Góra in Elblag; in Fordon; in Gdańska; in Labiszyn; in Toruń; and in Warsaw as well as in Wilanów. Usually archaeologists record several such finds on a given site, but their percentage compared with the total number of glass seals is rather high, ranging between 13.5% and 37.5%. The exception is the latter find – a single specimen discovered at that archaeological site. We also know artefacts with illegible or fuzzy signs, recorded, for instance, in Trzemeszno (several specimens); Warsaw (2 items) or Chełmno (1 item) (other examples see Fig. 2:a-b). These are, however, atypical specimens, the genesis of which has no easy explanation. It is possible that these matters were discussed by Iwona Wojciechowska in her paper on the consumption of mineral waters in modern Stargard (Wojciechowska 2015). For information on the potential of such studies and the possibility of identifying finds see, for instance, Brinkmann 2019; Brinkmann 2020.

Most of those finds were discovered in Biskupice; in Elblag; in Fordon; in Gdańsk; in Labiszyn; in Toruń; and in Warsaw; as well as in Wilanów. Usually archaeologists record several such finds on a given site, but their percentage compared with the total number of glass seals is rather high, ranging between 13.5% and 37.5%. The exception is the latter find – a single specimen discovered at that archaeological site. We also know artefacts with illegible or fuzzy signs, recorded, for instance, in Trzemeszno (several specimens); Warsaw (2 items) or Chełmno (1 item) (other examples see Fig. 2:a-b). These are, however, atypical specimens, the genesis of which has no easy explanation. It is possible that these matters were discussed by Iwona Wojciechowska in her paper on the consumption of mineral waters in modern Stargard (Wojciechowska 2015). For information on the potential of such studies and the possibility of identifying finds see, for instance, Brinkmann 2019; Brinkmann 2020.
they are examples of flawed seals, the result of an oversight or mistakes made during the production process, for instance as a result of a shoddy application of the glass disc and impressing the stamp in still too molten glass. Perhaps they are the evidence of abandoned orders placed for signed vessels, which despite the withdrawal of the specific commission were sold to another customer. We cannot rule out, however, that it was a deliberate action aimed at hiding the scale of production from the tax authorities, or at least understating it. Smooth surfaces of glass discs may also be a secondary effect, a result of removing (grinding down) the existing imprint.222

Conclusions

Based on the literature concerning this subject and archaeological sources, it is possible to state that finds from the territory of Poland correspond with the general tendencies in terms of the quality, form, and function of this type of artefacts described by foreign scholars, whereas their specific feature (as far as it was possible to establish on the basis of published materials) is the more slender shape of vessels with seals – a greater proportion of cylindrical bottles than squat ones (of the shaft and globe, onion bottle and mallet bottle types). This is associated with the chronology of Polish finds, which are primarily vessels from the 18th and 19th centuries, when the slenderer forms gradually became the most popular type of manufactured glass bottles. The square-bodied bottles kept in cases (case bottles) more often are containers with seals bearing the name “London”. This results from the fact that their large part constituted goods imported from England, and their domestic imitations repeated the form of the original bottles. Bottles with the name of the English capital city with the correct spelling or in a modified (also misspelled) are discovered relatively often in different parts of Poland. Their use may be seen as a deliberate marketing practice at that time. Placing a word or expression directly related to England on the seal suggested to the customers that the product was an original import from that country, even if it actually had a domestic or different provenance (for example Dutch).

Artefacts from the territory of contemporary Poland are characterised by a limited and schematic set of signs placed on the seals, and the quality of imprints is usually not very good. This is manifested through rare occurrence of dates (just on several specimens from Bierzwnik, Darłowo, Elblag, Łomża, Pipstock, Stargard and Szczecin,), full surnames (two identified finds from Gdansk associated with the merchant named Johann Keiler and one with the owner of the Szczecin brewery Bergemann), and complete names of glass workshops (among other things, Piekarska, Olichawska, Sztabinśka, Glas Fabrik Clementienhof). The latter are usually identified based on place names written on seals – locations of the glasshouses (Bernsee – Breh, Bledow – Bledow, Danzig – Gdansk, Lippsch – Lipusz, Lotzen – Lośno, Marienwalde – Bierzwnik, Racado[w] – Racendorf, etc.). Seals bearing only emblems: a ship, crown, triangle, the Star of David, a bunch of grapes, eagle, as well as coats of arms are rare. The majority of the discovered heraldic stamps are related with containers for spring water. Only some of the Polish finds can probably be considered as products made to order of definite breweries, liqueur factories or alcohol distilleries (with inscriptions “BERGEMANN ERBEN”, “CGS”, “HARTWIG”, “I. JO KEILER”, “J.J. KEILER”, “GESETZ Z. SCH[UTZ d. WAARENBEZ.]”).

The largest group comprises seals with inscriptions that are probably abbreviations or initials, which today are impossible to decipher, but – as we may assume – were usually trademarks.

This can be attributed to the still limited knowledge about manufacturers and buyers of modern bottles in Poland, primarily due to the insufficient recognition of written records. The exemptions are already published results on studies on glass workshops and finds of glass seals from western part of Poland as well as the recently carried out and disseminated research concerning such workshops and finds from Mazovia. For this reason, in the case of many artefacts from territory of Poland we are usually unable to establish the cause and circumstances associated with placing orders for vessels stamped with specific seals. Furthermore, there is no evidence of an occasional production of signed wares similar to those recorded abroad.223 Also because of the small number of finds, so far it has not been possible to undertake other analyses on their basis, including those concerning ownership aspects (changing leases of glass workshops or commercial counterparts). That problem will persist until we see progress in studies on various types of historical sources and issues concerning the history of Polish glass making and use of glass vessels, and in particular in relation to other regions of Poland – although the identification of people and places hidden behind enigmatic signs may still not be possible.

In my opinion, the greatest potential lies in the research into the range of products manufactured in the so-called forest glass works, namely main producers of storage bottles, and orders for glass containers that were placed with them. Furthermore, another very important

222 See Gołębiewski 1997, 199; Mucha 1997, 118; Siwiak 2003, 61; Siwiak 2007a, unpaged.

223 E.g. associated with private important occasions or events, see Morgan 1976, 11; Jeffries and Major 2015, 151.
research topic may be details of commercial correspondence from the 17th-19th centuries regarding the organization and supply or manors, purchasing beverages and ways of storing them in such estates, and the functioning of breweries, wineries, distilleries, and inns, as well as merchants trading in alcoholic beverages or spring water. Studies concentrating on the history of individual glass workshops and enterprises associated with this sector of economy may also provide valuable data on this subject. Such information may give us a better idea about the scale of production of the analysed wares, conditions, and places in which purchases were made, their frequency, quantities, and costs.

Furthermore, glass seals, particularly identified seals with proven chronology, can be good sources for archaeological dating, and thus help us with the analysis of stratigraphy and establishing the time of use of other finds from the same assemblages or deposits. Additionally, as demonstrated by the above-mentioned findings, they can be very good sources for studying selected aspects of the history of glassmaking in Poland, being the evidence of the functioning of individual glass workshops – particularly those less known – and the assortment of their products.

Without a doubt, Polish publications released to date provide valuable material for comparative studies, increasing our knowledge about types of marks that were used, their territorial diversification, and chronology, and observations compiled by me in this paper will hopefully become a starting point for further detailed analyses.

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