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FLOODS IN WARSAW BEFORE 1800

There is little information on the earliest Vistula floodings in the area of Warsaw. Geological research indicates that the Vistula used to be a peaceful river; in the period between the 11th and the 12th century, the areas of today's Siekierki, Sielce, and Solec, located on the Vistula's left bank, consisted of aits or islands. According to Stefan Zbigniew Różycki¹, its water level was not subject to any significant fluctuations, floods were extremely rare, and the few overflows that did occur only affected limited areas. In the 13th century, due to the disturbance in its hydrological balance, the river became fickle. Its main stream flowed from one side to the other, causing the riverbed to move and changing the topography of the surrounding areas. The most probable cause of such a change is the development of settlements along the Vistula and its tributaries, which led to increased deforestation². The river became violent, with cut banks forming in the areas where it could not overflow. As described by Jędrzej Świącicki in his depiction of Warsaw: "It is located on a grand hill, which, reaching the very bank of the Vistula, cannot stop the impetus of the river, not with the numerous stones continuously washed

1 S.Z. Różycki, "Dzieje Warszawy widziane okiem geologa", *Biuletyn Państwowego Instytutu Geologicznego* 2006, no. 419, pp. 90, 91 (fig. 2 on p. 91 shows the changes of the Vistula riverbed from 10th to 18th century).

2 *Ibid.*, s. 90; T. Dunin-Wąsowicz, *Zmiany w topografii osadnictwa wielkich dolin na Nizinie środkowoeuropejskiej w XIII wieku*, Wrocław 1974, pp. 50-54; eadem, "Komunikacja i transport w węźle warszawskim", in: *Warszawa średniowieczna*, book 2, Warsaw 1975, pp. 107-109; A. Gieysztor, "Wisła w średniowieczu", in: *Wisła: Monografia rzeki*, ed. A. Piskozub, Warsaw 1982, p. 25.

out by the stream, nor by any other measure”³. The areas located close to the riverbank must have often suffered from major floodings, which were most likely the reason why the village of Solec was moved to another location. The relocation was carried out on the initiative of Leonard, the Mayor of Old Warsaw, by virtue of the document issued by Duke Janusz Starszy on 14 February 1410⁴. There is no information available on the original location of the village of Solec, with the issue long discussed by historians; some claim that it had once been situated on the right bank of the Vistula⁵.

The inhabitants of areas located close to the river, encompassed by today’s Powiśle neighbourhood, attempted to defend themselves against the Vistula and create secure living conditions. For that purpose they constructed levees, which made it possible to move around in flooded areas, and dug out drainage ditches. They protected themselves from floods by constructing dams, which were supposed to move the stream away from the left bank, thus defending it from the river’s destructive force. One of such dams is mentioned in the privilege issued by Masovian Duke Bolesław V on 5 May 1474. When citing the document, Aleksander Wejnert states: “It informs us that that year the Vistula swelled significantly and destroyed the dam located above the village of Solec. Having flooded the municipal meadows, it created a marshy lake, the ownership of which the aforementioned ruler granted to the town, together with the right to fish in the area, by virtue of this privilege”⁶.

The flood also affected St. Margaret’s Church in Solec. It was most probably located on the corner of the current Solec Street and Ludna Street, where a statue of St Barbara is situated at present. Initially it was a chapel of ease in St. John’s Parish, and later started to serve as a parish church; it is, however, possible that it had existed much earlier, already in the 13th century. The parish had jurisdiction over the neighbourhoods of Solec, Czerniaków, and Ujazdów. Ca. 1410 the church was moved to a different location. It was probably destroyed by floods in 1475 and 1493⁷. In 1593, Anna Jagiellonka moved the parish to the Ujazdów Church, today located within the Belweder complex. The small St. Anne and St. Margaret’s Church constructed at the time was modified in the 18th century and existed until 1818.

- 3 A. Świećicki, “Topograficzny opis Mazowsza”, trans. W. Smoleński, *Kłosa* 1877, vol. 2, p. 111. Qtd after: *Dzieje Warszawy i Mazowsza. Wybór źródeł*, eds. J. Kazimierski, R. Kołodziejczyk, Warsaw 1973, p. 82.
- 4 A. Wejnert, *Starożytności Warszawy*, vol. 3, Warsaw 1854, pp. 28-31. The author cites a document issued “on the very day of St. Valentine, the blessed martyr,” while the date of 23 May 1410 can be found in E. Suchodolska, “Funkcje i rola kancelarii na dworze książąt mazowieckich w XIV i 1. połowie XV wieku”, *Kronika Zamkowa* 2005, no. 1-2, p. 13.
- 5 T. Dunin-Wąsowicz, “Uwagi w sprawie osadnictwa wczesnośredniowiecznego na obszarze dzisiejszej Warszawy”, *Rocznik Warszawski* 1963, vol. 9, p. 27. The discussion on the original location of Solec is described by R. Żelichowski in the book *Ulice Solca*, Warsaw 1999, pp. 13-17, where he cites an extensive body of literature.
- 6 A. Wejnert, *Starożytności...*, vol. 3, p. 16 (chapter “O kępie przy Bełku”). See also: W. Korotyński, “Wylewy Wisły”, *Kurier Warszawski* 1909, no. 83, p. 2.
- 7 The year 1474 is provided in J. Nowacki, *Dzieje archidiecezji poznańskiej*, vol. 2: *Archidiecezja poznańska w granicach historycznych i jej ustrój*, Kraków 1964, p. 521; while the year 1493 can be found in *Słownik geograficzny Królestwa Polskiego i innych krajów słowiańskich*, vol. 13, Warsaw 1893, p. 48.

The overflow of the Vistula in 1475 is described by Franciszek Maksymilian Sobieszczęński as follows: “it took entire localities situated on the river-bank downstream”⁸. It was probably the same flood which had shortly earlier affected Kraków. It was mentioned by Jan Długosz: “Due to incessant torrential rain, on Monday, 24 July, and for the following three days, the Vistula River flooded Kraków to a horrid and never before seen extent. The water reached Kazimierz, Stradom, and all their suburbs”⁹.

From the 16th to the 18th century, the Vistula overflowed roughly every couple or dozen years. According to calculations carried out by Danuta Szmit-Zawierucha¹⁰, in the years 1593–1652 Warsaw suffered from eleven major floods which significantly damaged low-lying areas of the town. The following century saw much less floods of such magnitude. Stanisław Siegel¹¹ has documented thirteen floods in the years 1712–1799; they were described as “big overflow,” “terrible overflow,” “horrific overflow.” Władysław Korotyński has indicated a similar number of floods which affected Warsaw in the 17th and the 18th century¹².

Some historians indicate that there is very little information on the aftermath of the floods which occurred in Warsaw in the 16th and the 17th century¹³. There are naturally very few first-hand accounts of the floods, especially compared to the extensive descriptions popular in 19th-century press, but some data, especially dates, can be established on the basis of other accounts and events.

The 16th-century overflows of Warsaw are evidenced in the history of the Warsaw Fishermen’s Guild. Warsaw used to be a river brimming with fish, which were eaten during frequent periods of fast and given out as offerings. The book *Starożytności Warszawy* by Aleksander Wejnert features a chapter called “On fish offerings in 16th and 17th-century Warsaw,” where the author writes that “the abundance of fish” was very significant for the town. The municipal authorities, having rather poor financial means, sought to “win the favours of the wealthy in order to protect the townsmen from hardships”¹⁴ not with money but with material offerings, the most popular of which were fish. Fish served as both regular and extraordinary gifts. The Grand Chancellor of the Crown, the Alderman of Warsaw, the mayor, the president, the governors of villages, as well as the municipal councillors and judges all received

8 F.M. Sobieszczęński, *Rys historyczno-statystyczny wzrostu i stanu miasta Warszawy od najdawniejszych czasów aż do 1847 roku*, Warsaw 1974, p. 25. The 1475 flood was mentioned by numerous authors, cf. *Wyjątki ze źródeł historycznych o nadzwyczajnych zjawiskach hydrologiczno-meteorologicznych na ziemiach polskich w wiekach od X do XVI*, selected and translated by R. Girguś and W. Strupczewski, Warsaw 1965, entry 224.

9 Jan Długosz, *Roczniki czyli Kroniki sławnego Królestwa Polskiego*, book 12, 1462–1480, trans. J. Mrukówna, 2nd edition, Warsaw 2009, p. 379.

10 D. Szmit-Zawierucha, *Wędrówki po Warszawie*, Warsaw 2001, p. 207.

11 S. Siegel, *Ceny w Warszawie w latach 1701–1815*, Lviv 1936, pp. 54–56.

12 W. Korotyński, “Wylewy Wisły,” *Kurier Warszawski* 1909, vol. 89 no. 83.

13 Cf. A. Karpiński, “Biedota miejska wobec zaraz i innych klęsk żywiołowych w Warszawie w latach 1526–1655,” *Rocznik Warszawski* 1981, vol. 16, p. 120.

14 A. Wejnert, *Starożytności Warszawy*, 2nd edition, vol. 4, p. 424, Warsaw 1856.

fish on Christmas and Easter. Higher ranking officials were given salmon and sturgeon, while others received pike, bream, carp, and zarte (vimba bream).

Fish were also given out on numerous grand occasions – they were most often welcome or farewell gifts for official guests or newly elected officials taking office. To give an example: “On the day of 10 October 1627, the town presented the Bishop of Poznań, who was leaving to take his office, with a sturgeon which cost ca. two red zloty”¹⁵, while “On the day of 5 December [1627] the town welcomed Father Vice-Chancellor Jakób Zadzik, Bishop of Chełmno [...] with a salmon and other fish [...]”¹⁶.

Warsaw’s local government donated fish to selected religious orders; until 1627, the Bernardines, Augustians, Dominicans, and Franciscans received a barrel of herring each during Lent. Later on, due to a considerable increase in the prices of fish, the support was granted in the form of financial donations.

Fish used as offerings – apart from herring, naturally – were sourced from the Vistula, which had been a fishing site for centuries, with fish first caught for personal use only and later also for sale. Warsaw-based professional fishermen lived in the area called Rybitwa (Rybitwia), later known as Rybaki, located at the foot of the hill, below Nowe Miasto¹⁷. It was a well-organised professional group, boasting one of the oldest guild statutes, drawn up in 1532 or even earlier¹⁸. The statute was written in Polish, probably due to the use of technical language concerning equipment and fishing techniques¹⁹. Privileges were granted to the fishermen’s guild by King Zygmunt III in 1592, and later confirmed by subsequent monarchs in 1635, 1659, 1670, 1683, 1752, and 1781²⁰.

The Warsaw Fishermen’s Guild had its own St. Barbara’s Chapel in the Church of the Blessed Virgin Mary (today’s Church of the Visitation of the Blessed Virgin Mary) in Nowe Miasto. The statute of the guild was kept in the chapel.

The number of working fishermen was subject to fluctuations. There were many reasons for such changes, one of them being floods. According to the 1564 Warsaw Survey, municipal fishermen lived in 80 houses; in 1569, there were 86 fishermen in Warsaw, while the survey of 1620 showed that “There were 86 fishermen in the survey of *anno quingentesimi sexagesimi noni*. But since we have been informed by the townsmen of Warsaw that the houses of some had been taken by the Vistula, and others lost their lives, we have no more than 38

15 Ibid, p. 425.

16 Ibid, p. 426.

17 For information on Warsaw-based fishermen, see: A. Karpiński, *Pauperes. O mieszkańcach Warszawy XVI i XVII wieku*, Warsaw 1983, pp. 45-60; idem, “Ubody przedstawiciele cechowego rzemiosła warszawskiego w latach 1526-1655”, in: *Z dziejów rzemiosła warszawskiego*, eds. B. Grochulska and W. Pruss, Warsaw 1983, pp. 126-130.

18 Full text of the statute of 1532 in: W.A. Maciejowski, *Historia miast i mieszczan w krajach dawnego Państwa Polskiego od czasów najdawniejszych aż do połowy XIX wieku*, Poznań 1890, Annex III, pp. 231-236. For more on the age of the statute cf. author’s note on p. 236.

19 B. Ślaski, *Rybołówstwo i rybołowcy na Wiśle dawniej a dziś*, Warsaw 1917, p. 10.

20 Full text of the privileges and slightly modified text of the statute cf. B. Ślaski, *Przywileje dawnego cechu rybackiego w Warszawie*, Warsaw 1909, pp. 71-88.

fishermen in the town [...]”²¹. The decreased number of fishermen was probably the result of the 1593 flood, which, as described by F.M. Sobieszczański, “flooded and destroyed almost the entire riverside and suburbs”²². In 1640, only 19 fishermen paid the chimney tax.

In 1603, the Vistula destroyed the first permanent river bridge in the town, whose construction at the end of Mostowa Street had been initiated by Zygmunt August and concluded by Anna Jagiellonka in 1573. The bridge seemed to be durable; it was often praised and even immortalised in the trifle poem *Na most warszawski* by Jan Kochanowski, who lauded it as a force that had finally tamed the wild Vistula. The praise proved to be premature, as the bridge turned out to be much less solid than expected. Its piers were too densely packed, which proved dangerous during heavy ice floe drifts in the spring, while its deck was placed too low. It was repaired several times, not being able to tame the Vistula after all. Its history ended with a tragedy, which was described by Kazimierz Wójcicki as follows: “[The bridge] survived thirty years, until the year 1603, when it was viciously attacked by roaring waves of the Vistula and iceberg charging towards it in the winter. It stood strong against the barrage until the moment when, in the thirty-first year of its existence, an ice floe carried by the river in the spring destroyed one of the beams.” Unfortunately the bridge was not duly repaired and “year after year, [it] was going to ruin, and, being unguarded, fell victim to the inhabitants of the riverside”²³. The last issue is particularly interesting, especially since resourceful residents of Warsaw continued to collect fragments of riverside infrastructure washed away by the water and store it on the riverbank well into the century to follow, which is evidenced by one of the “regulations on tidiness” issued by Grand Marshal of the Crown Michał Mniszch in 1784:

When it so often happens that the swollen waters of the Vistula carry the wood swept off from the shore or taken by the impetus of the water, people will retrieve it and claim it for themselves, refusing to return the wood to its appropriate owners and using it as they will. Therefore to avoid the circumstances in which the loss of one man results in an unjust profit of another, everyone who takes wood from the Vistula is ordered to store it for two weeks on the riverbank, without hiding or using any part of it for private purposes, so that the owner will have the time and opportunity to find it and, having shown appropriate proof of ownership, retrieve it from the finder, presenting him in return with an appropriate reward. If no owner claims his property within the period of two weeks, the finder will be granted the ownership of the item²⁴.

21 A. Wejnert, *Starożytności Warszawy*, 2nd edition, vol. 6, Warsaw 1858, p. 159.

22 F.M. Sobieszczański, *Rys historyczno-statystyczny...*, p. 38.

23 K.W. Wójcicki, *Warszawa i jej społeczność w początkach naszego stulecia*, Warsaw 1875, pp. 25-26.

24 M. Mniszech: [Przepisy względem zachowania ochędostwa i dobrego porządku w mieście Warszawie i wszelkich jego przedmieściach] *Przepisy względem zachowania ochędostwa w mieście Warszawie*, [Warsaw 1784], p. 9.

Information on floods can sometimes be found in unexpected sources. A mention of the 1612 overflow appears in a price list drawn up at the time. In the aftermath of the damage done by the flood to a number of mills, the authorities imposed extraordinary prices of three types of bread and beer brewed in Warszawa and Warka: "Due to the destruction of big mills by the flood, bakers are not supplied with necessary amounts of flour; considering this, the following prices are officially imposed"²⁵.

In the 17th century, the floods did not affect exclusively the left side of the Vistula; in fact, they may have been even more harmful to the inhabitants of the right riverbank. The great overflow of the Vistula in 1635 was described by Grand Chancellor of Lithuania Albrycht Stanisław Radziwiłł:

When leaving Warsaw on 13 July [1635], the King [Władysław IV Waza] entrusted his fate to the Vistula River, which, in the expression of gratitude to the grand guest, opened its bosom and overflowed to an extent never witnessed before, with only the tips of the roofs visible in Praga and with all villages and crops flooded four miles into the land in the direction of Radzymin. The destruction left behind was widespread and the economically damaging wave moved towards the sea²⁶.

The damages must have been enormous. Similar floods must have reoccurred quite frequently, seeing that Łukasz Gołębiowski wrote: "Considering the damage inflicted to Warsaw by the plague and incessant floods, Jan Kazimierz freed it of military bases and outposts in 1653"²⁷.

A brief mention of the 1647 flood of Warsaw appears in a publication on Poland and Lithuania by Dutch-German geographer Andreas Cellarius: "Anno 1647. Vistulae exundatio hanc urbem cum vicinis locis haud parva clade affecit"²⁸. The Vistula probably overflowed once again in 1673; W. Adamczyk briefly notes: "A great flood in Kempa Solecka"²⁹.

A series of floods in the 17th century began with the overflow of the Vistula in 1713. The swollen river destroyed the second temple in Solec, that is the Trinitarian Church, which had been under construction for over a decade. The wall surrounding it was still unfinished when in 1713, "on 1 August, a flood of the Vistula, similar in size to a deluge, hit the foundations of the wall and

25 *Ustawy cen dla miasta Starej Warszawy. Od roku 1606 do roku 1627*, published by A. Chmiel, Kraków 1894, p. 77, entry 45. W. Adamczyk (*Ceny w Warszawie w XVI i XVII wieku*, Lviv 1938, p. 48) writes: "The number of lots in wheat bread is decreased by 5, while in whole wheat bread - by ½ pound [...]".

26 Albrycht Stanisław Radziwiłł, *Pamiętnik o dziejach w Polsce*, vol. 1, 1632-1636, translated and edited by A. Przyboś and R. Żelewski, Warsaw 1980, p. 458.

27 Ł. Gołębiowski, *Opisanie historyczno-statystyczne miasta Warszawy*, Warsaw 1827, p. 67.

28 Andreas Cellarius, *Regni Poloniae, Magnique Ducatus Lituaniae omniumque regionum juri Polonico subjectarum novissima*, Amstelodami 1659, p. 597. Cf. T. Święcki, *Opis starożytnej Polski*, Warsaw 1828, reprint, Warsaw 1984, p. 279: "[...] In 1647 the extraordinary overflow of water caused great damage to many suburbs and surrounding areas, says Cellarius". See also: S. Namaczyńska, *Kronika kłesk elementarnych w Polsce i w krajach sąsiednich w latach 1648-1696*. 1. *Zjawiska meteorologiczne i pomory*, Lviv 1937, p. 4.

29 W. Adamczyk, *Ceny w Warszawie...*, p. 54.

the entire Trinitarian temple³⁰. An account of the events was given by Urban of Jordanowo, a priest who had been appointed prior of the Trinitarian monastery shortly before the flood. He described all of the divine punishments recently brought upon humanity for its wrongdoings; they were wars, night air, bovine plagues, and, finally,

He brought upon us an extraordinary, sudden, and immense flooding of the Vistula, swelling the waters up to two ells over the courtyard of our monastery, which suffered terrible damage. The water remained at such level for 24 hours before slowly decreasing. The flood destroyed the meadows, croplands, gardens, and ponds located by the river, washed away wood stored near the riverbank, and spread diseases among people³¹.

Some years later, in 1724, an account of another flood was recorded by the economist of a manor in Bielany owned by Camaldolese priests, who took part in an unusual rescue mission:

On 9 July 1724, the waters in the area called Jakubówka started to swell rapidly at sunrise. We believed that it would cause no damage, but it proved to be very harmful, flooding all Kępa areas by noon. In the evening great amounts of wood started to float downstream; we saw some immense object and waited on the bank, intrigued about what we would see. It seemed to be a ship or other outlandish thing, but while we were discussing it, my son Felix shouted that it was a manor house. Paweł, the estate governor who was standing with us at the riverbank, said the water must have washed away the house and that there were probably people inside³².

A woman with her four children was in fact trapped inside the house; they were rescued by the people standing on the riverside.

The flooding of the Vistula in 14 February 1751 is described by Łukasz Gołębiowski as follows: "Praga and the village of Bródno resembled a sea; trees were broken down and houses were washed away"³³. Antoni Magier, meanwhile, reported on the events taking place on the left bank of the Vistula: "all manor houses in Rybaki, Solec, and the entire Furmańska Street were flooded, and many of them were destroyed by the rapid currents or carried downstream, often with people inside. The entire district of Praga, all the way to the village of Bródno and even further, seems to have turned in an immense lake"³⁴.

A dramatic description of this flood comes courtesy of its eye witness, a certain Jan Malinowski, whose account was printed 73 years later in *Kurier Warszawski*:

30 A. Krzyżanowski, "Pogląd na powołanie, dzieje i sprawy zakonu trynitarzy w Polsce", *Pamiętnik Religijno-Moralny* 1856, no. 6, p. 503.

31 Ibid.

32 *Kurier Warszawski* 1824, no. 162, pp. 337-338.

33 Ł. Gołębiowski, *Opisanie historyczno-statystyczne...*, p. 59.

34 A. Magier, *Estetyka miasta stołecznego Warszawy*, Wrocław-Warsaw-Kraków 1963, p. 201.

Severe frost was followed by a thaw and warm weather, and the large amounts of snow which had fallen in January, now melting before our eyes, gave us a scare which we hopefully will never experience again. At night, around 2AM, we heard a mighty sound, resembling mortar fire, and we jumped out of our beds thinking that there was an attack or robbery under way, but it was merely the ice breaking; at dawn the water broke through the ice and was swelling rapidly; at noon Praga disappeared under a sea of water, which reached the village of Bródno at 4PM. All of Warsaw's manor houses located by the river toppled over or were significantly damaged; the wailing of women could be heard all around as the uninvited, violent guest had taken not only their property but also their children, who were washed away in their cribs so quickly that nobody managed to save them³⁵.

When the water receded, the corpses of several elderly people were found in a manor house in Rybaki; they had not been able to escape in time. All houses at the riverside were destroyed but, as indicated by the author of the report, there were still many people who looted them, stealing any preserved equipment.

In the second half of the 18th century the area of Powiśle was slightly elevated with the soil dug out during the construction of houses and through dumping waste at the riverbank. Despite this change, the 1774 flood inflicted considerable damage. On 27 July, *Gazeta Warszawska* reported:

These days we have suffered a great flood, the likes of which has not been seen for the last 30 years. Last Saturday [23 July] the Vistula reached Gnojowa Hill, flooded the dams and houses by the riverside, destroying numerous goods and causing great losses in storages of wood, which the water washed away down the stream. Old accounts, however, show us that today's flood has not yet reached the magnitude of past disasters³⁶.

One of last major floodings of the Vistula in Warsaw in the 18th century took place on 6 March 1782. It was a spring flood, caused not by heavy rainfall in southern Poland but by an ice dam which first blocked and later released great masses of water. *Gazeta Warszawska* from 9 March featured a short notice on its second page: "Last Wednesday [6 March] the Vistula overflowed when a swollen wave partially flooded wood storages and washed some timber down the river"³⁷. It may have been this particular event which in 1784 led Marshal Michał Mniszch to issue the aforementioned order to return wood to its legitimate owners.

Until the end of the 18th century, the swelling and floods of the Vistula were described as "immense," "enormous," "vast," "extensive." In 1798, on the

35 *Kurier Warszawski* 1824, no. 39, p. 1.

36 *Gazeta Warszawska* 1774, no. 60, p. 2.

37 *Gazeta Warszawska* 1782, no. 20, p. 2.

initiative of Antoni Magier, the first stream gauge appeared on the Vistula. It was installed by the captain of the pontonier service, Jan Chrystian Fierling³⁸, near the pontoon bridge at the end of Bednarska Street³⁹, and on 1 February 1799, measurements of the water level in the Vistula started to be taken on a regular basis. We know, therefore, that on 16 April 1799 the water rose to the level of 6 ells and 16 inches⁴⁰. It was the last swelling of the Vistula in the 18th century and the first one to have been properly measured.

Floods in Warsaw before 1800 - summary

There were hardly any floods in the Warsaw region until the 13th century. With the development of settlements along the valley of the Wisła River and the clearance of forests, the river was becoming progressively volatile and unpredictable. The river stream changed its course, the water eroded the high left bank while islands were created on the right bank. The floods began. The residents of old Warsaw defended themselves from the river's overflow already in the 15th century by building dams and levees, and digging drainage ditches. Despite that, the low-lying areas such Praga or Powiśle were being flooded. The overflow of 1475 destroyed one of the oldest Warsaw churches, the St. Margaret Church. In 1635, the Wisła River flooded all the houses in Praga, and in 1713 the Trinity Church on Solec was partially damaged. Up to the year 1800, over a dozen major floods happened in Warsaw, as well as many minor overflows.

Keywords: Warsaw, Wisła, floods, fisherman

38 A. Magier, *Estetyka...*, p. 201.

39 Z. Mikulski, "O najstarszych systematycznych obserwacjach wodowskazowych na ziemiach polskich," *Przegląd Geofizyczny* 1965, vol. 10, no. 2, p. 153.

40 Cf. *Kurier Warszawski* 1866, no. 193, p. 1123.