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## SOME REMARKS ON THE ARMS PRODUCTION IN MEDIEVAL POLAND 13th–15th CENTURIES

The quality of weapons is one of the major factors determining the value of state's armed forces; it depends chiefly on the development of handicrafts, especially of its branches working for the army. Since problems regarding the production of arms are numerous this paper shall be confined to characterizing the specialization of the manufacture of offensive and defensive arms in the late Middle Ages in Poland and to naming production centers operating on its territory. Thus we are leaving apart important questions of horse-breeding and of manufacturing the equestrian equipment as well as those concerning fire arms, which ought to be dealt with separately.

In the Polish historiography it is generally agreed that in the 13th–15th centuries the urban handicraft was undergoing a considerable development, and it assumed its own specific character.<sup>1</sup> Yet the arms handicraft ceased to be anonymous only in the third quarter of the 13th century and only at that time the sources began to give names of craftsmen specialized in making mail-armours (1254),<sup>2</sup> shields (1267),<sup>3</sup> and swords (1290).<sup>4</sup> In Wrocław even in 1300 coats of

plates (Lat. „platae”) were manufactured,<sup>5</sup> which initiated the armourer's craft. It reflects a considerable development of Silesian towns and the division of labour, thanks to which the urban population could undertake non-agricultural activities, including crafts. It should also be emphasized that the region abounded in the necessary raw materials, especially iron.

Due to the progress in the technology of iron processing various specializations in the field of arms production began to appear (first of all side-arms and mail-armours).<sup>6</sup> In Cracow in the early 14th century three kinds of specialists in sword making could be mentioned, namely blade makers (Germ. “Klingensmed”),<sup>7</sup> blade polishers (Lat. “purgator gladiatorum”),<sup>8</sup> and hilt makers (Lat. “gladiator”, “gladifex”, “ensifer”; Germ. “Swertfeger”; Pol. “myeczownigk”, “mesznigk”).<sup>9</sup> As a rule they used blades from local ironworks<sup>10</sup> but also imported them from Silesia and Low German towns.<sup>11</sup>

<sup>5</sup> H. Pauper, *Rechnungen der Stadt Breslau von 1299–1358, nebst zwei Rationarien von 1386 und 1387, dem Liber imperatoris vom Jahre 1377 und den Ältesten Breslauer Statuten*, ed. C. Grünhagen, [in:] *Codex diplomaticus Silesiae*, vol. III, Breslau 1860, p. 5.

<sup>6</sup> *Kodeks dyplomatyczny miasta Krakowa. 1257–1506*, ed. F. Piekosiński, pars 4, Cracoviae 1882, p. 751; Z. Bocheński, *Krakowski cech mieczników*, Kraków 1937, pp. 7–8; F. Kiryk, *Cechowe rzemiosło metalowe. Zarys dziejów do 1939 r.*, Warszawa 1972, p. 221.

<sup>7</sup> *Księgi przyjęć do prawa miejskiego w Krakowie. 1392–1506*, ed. K. Kaczmarczyk, Kraków 1913, No 1865.

<sup>8</sup> *Najstarsze księgi i rachunki miasta Krakowa od r. 1300 do 1400*, ed. F. Piekosiński and J. Szujski, Cracoviae 1978, fasc. 1, No 326.

<sup>9</sup> *Ibid.* No 465; J. Kuciński, *Miejskie rzemiosło zbrojeniowe w państwie polskim w XIV i pierwszej połowie XV wieku*, „*Studia i Materiały do Historii Wojskowości*”, 1969, XV, 1, p. 32.

<sup>10</sup> *Stadtbuch von Posen*, ed. A. Warschauer, vol. II, Posen 1892, p. 14; F. Kiryk, *Rozwój urbanizacji Małopolski XIII–XIV w. Województwo krakowskie (powiaty południowe)*, Kraków 1985, pp. 148, 152.

<sup>11</sup> B. Mendl, *Breslau zu Beginn des 15. Jahrhunderts. Eine statistische Studie nach dem Steuerbuche von 1403*, „*Zeitschrift des*

<sup>1</sup> M. Małowist, *W sprawie badań nad historią rzemiosła miejskiego w średniowiecznej Polsce*, „*Roczniki Dziejów Społecznych i Gospodarczych*”, 1951, XIII, p. 6; M. Bogucka, H. Samsonowicz, *Dzieje miast i mieszczaństwa w Polsce przed-rozbiorowej*, Wrocław 1986, chapt. II.

<sup>2</sup> *Breslauer Urkundenbuch*, ed. G. Korn, vol. I, Breslau 1870, No 18, 22, 38; *Schlesisches Urkundenbuch*, ed. W. Irgang, vol. III, Köln–Wien 1984, No 140, 367; M. Młynarska-Kaletynowa, *Wrocław w XII–XIII wieku. Przemiany społeczne i osadnicze*, Wrocław 1986, pp. 133–134.

<sup>3</sup> P. Bretschneider, *Der Schilter Henko*, „*Zeitschrift des Vereins für Geschichte Schlesiens*”, 1939, LXXIII, pp. 94–102; M. Młynarska-Kaletynowa, *op. cit.*, p. 127, 133–134; A. Samsonowicz, *Wytwórczość skórzana w Polsce wczesnofeudalnej*, Wrocław 1982, pp. 204–205.

<sup>4</sup> A. Müller, *Die Ubsallung der Tabula proscriptorum provinciae Nizensis*, „*Zeitschrift des Vereins für Geschichte Schlesiens*”, 1920, LIV, p. 105; *Schlesische Urkunden zur Geschichte des Gewerberechts Insbesondere des Innungswesens aus der Zeit vor 1400*, ed. G. Korn, [in:] *Codex diplomaticus Silesiae*, vol. VIII, Breslau 1867, No 74.

In small towns the specialization did not go so far; polishing and handling of side arms were done by sword makers, and occasionally by cutlers (Lat. "cultellifaber"; Germ. "Messerer") making chiefly cutlasses and daggers but sometimes blades as well. Blade makers from Passau were referred to as cutlers till the 14th century when the two crafts became separate specializations.<sup>12</sup> In the second half of the 15th century cutlers and sword makers in Polish towns were in a serious conflict regarding the production of single edged weapon with sword hilt (i.e. big long knives or choppers), and later on—the production of widely used sabres. The conflict was concluded with a success of sword makers who gradually became sabre makers.<sup>13</sup> The competition took place in other countries as well. In the 15th century Paris cutlers began to forge sword blades. This conflict terminated in 1486 when they were allowed to manufacture blades and sword makers were granted the exclusive right to polish, harden, and fix swords.<sup>14</sup>

Ironworkers (Lat. "parvi fabri", "seratores"; Germ. "Kleynsmede", "Slosser") were also active in the weapon production: along with sword makers they manufactured heads for spears and other shaft weapons.<sup>15</sup> The ironwork craft comprised also arrow-head makers (Lat. "faber sagittarum", "sagittarius"; Germ., "Pfeilsmed", or "šipar" in Bohemian sources).<sup>16</sup> In more specialized centers there were craftsmen called in German "Schefters" fixing feathers (or their paper or parchment substitutes) to arrow shafts.<sup>17</sup> When such specialists were lacking, bolts and arrows were manufactured by ordinary smiths:

Vereins für Geschichte Schlesiens", 1929, LXIII, p. 164; R. Heck, *Struktura społeczna średniowiecznego Wrocławia na przełomie XIV/XV wieku*, „Sobótka”, 1952, VII, p. 87.

<sup>12</sup> A. Nadolski, *Polska broń, Broń biała*, Wrocław 1984, p. 74.

<sup>13</sup> *Kodeks dyplomatyczny miasta Krakowa...*, pars 1, Cracoviae 1879, No 379; pars 2, Cracoviae 1882, No 357, 364; *Akta radzieckie poznańskie*, ed. K. Kaczmarczyk, vol. II, Posnaniae 1931, No 1634, 1693; vol. III, Posnaniae 1948, No 2106; A. Chmiel, *Dawne wyroby nożowników krakowskich i znaki na nich*, „Rocznik Krakowski”, 1899, II, pp. 93–94.

<sup>14</sup> A. Wyrobisz, *Rzemiosło paryskie w XV wieku w świetle statutów cechowych*, „Kwartalnik Historii Kultury Materialnej”, 1956, IV, p. 691.

<sup>15</sup> Cz. Jarnuszkiewicz, *Dawne taryfy cen dla mieczników, „Broń i Barwa”*, 1939, VI, p. 76; *Cennik wydany dla rzemieślników miasta Książa przez Piotra Kmitę, wojewodę krakowskiego w r. 1538*, ed. B. Ulanowski, „Sprawozdania Komisji Językowej Akademii Umiejętności”, 1884, III, p. 355; A. Nowakowski, *Uzbrojenie wojsk krzyżackich w Prusach w XIV w. i na początku XV w.*, Łódź 1980, p. 119.

<sup>16</sup> E. Wagner, Z. Drobna, J. Durdik, *Kroje, zbroje a zbrańe doby prehusitské a husitské*, Praha 1956, p. 26.

<sup>17</sup> M. Lewandowski, *L'atelier du flechier, dans la tour de Pierre au château de Legnica*, „Fasciculi Archaeologiae Historicae”, 1986, I, pp. 49–53.

they were most versatile ironwork craftsmen in small towns and in the countryside and could even act as sword makers or armourers.

Defensive arms production also underwent the process of specialization. The first specialists were mail-armour makers (Lat. "loricator", "lorifex"; Germ. "Panzermacher", "Sarwechter"; Pol. "pancernik"); together with sword makers they founded in Cracow a separate guild, the unique one in the medieval Poland.<sup>18</sup> A similar guild was founded in Brunswick in the early 14th century.<sup>19</sup> Generally mail-armour makers were members of multidisciplinary ironworker corporations.

Coat of plates makers played an important part in the production of defensive arms (Lat. "armifex", "thoracifex", "thorifex"; Germ. "Platner"); at first they manufactured brigandines ("ioppae") and plates ("platae") which in the 14th century gave way to coat of plates. In Poland these specialists did not have a guild of their own: in all the Polish towns they worked within joint ironworkers' corporations.<sup>20</sup> In some prominent centers of arms production (Cracow, Lvov, Kazimierz) these was a separate specialization in helmet making. Yet helmet makers (Lat. "galeator"; Germ. "Helmsmed", "Eisenhuter") were always a part of the coat of plates maker groups in ironworker guilds.<sup>21</sup>

Among the raw materials utilized in weapon production wood and leather were of primary importance. They were used for making sheaths and sword hilts, but chiefly for the production of shaft and neuroballistic weapons. In the catalogue of the Polish handicrafts no specialists in making shaft weapons

<sup>18</sup> *Cracovia artificum*, ed. J. Ptaśnik, vol. I, Kraków 1917, No 147, 149 etc.; J. Szymczak, *Organizacja produkcji i ceny uzbrojenia*, [in:] *Uzbrojenie w Polsce średniowiecznej. 1350–1450*, red. A. Nadolski, Łódź 1990, p. 220.

<sup>19</sup> A. Nadolski, *Broń i strój rycerstwa polskiego w średniowieczu*, Wrocław 1979, p. 74.

<sup>20</sup> *Prawa, przywileje i statuta miasta Krakowa 1507–1795*, ed. F. Piekosiński, vol. I, fasc. 1, Cracoviae 1885, No 370: „Statuta contubernii fabrorum, serrifabrorum, calcariorum, pangracerorum, caldeatorum, armificum et neglarorum Cracoviensium”; Z. Bocheński, *Uwagi o platnerzach krakowskich, „Broń i Barwa”*, 1937, IV, pp. 49–50; J. Szymczak, *Produkcja i koszty uzbrojenia rycerskiego w Polsce XIII–XV w.*, Łódź 1989, p. 94.

<sup>21</sup> *Najstarsze księgi i rachunki miasta Krakowa...*, fasc. 2, pp. 2, 7, 112; *Cracovia artificum...*, vol. I, No 139; *Księgi radzieckie kazimierskie. 1369–1381 i 1385–1402*, ed. A. Chmiel, Kraków 1932, p. 190; *Najstarsza księga miejska. 1382–1389*, [in:] *Pomniki dziejowe Lwowa z archiwum miasta*, ed. A. Czołowski, vol. I, Lwów 1892, No 16; *Księga przychodów i rozchodów miasta*, vol. I, [in:] *ibid.*, vol. II, Lwów 1896, p. 7; *Akta grodzkie i ziemskie z czasów Rzeczypospolitej Polskiej z Archiwum tak zwanego bernardyńskiego we Lwowie*, ed. K. Liske, vol. IV, Lwów 1873, No 11, 13–15; Z. Bocheński, *Uwagi o platnerzach...*, pp. 50–52.

(“hastator” in Bohemia)<sup>22</sup> are mentioned; in Poland their functions were taken over by sword makers and ironworkers (heads); shafts were made and adorned by decorators, and coats of arms—by tailors and embroiderers.<sup>23</sup> Since the construction of cross-bows was rather complex it soon became an object of specialization (Lat. “arcufex”, “balistator”, “balistarius”, “balistifex”; Germ. “Armbrust”, “Bogner”; Pol. “lucznik”, “szamostrzelnyk”).<sup>24</sup> The most common raw material used for cross bow making was yew wood: in the early 15th century yew trees were officially under protection, and the authorities of the Teutonic Order even prohibited exportation of yew wood.<sup>25</sup> Cross bow makers also made use of other kinds of wood, of iron, of animal bones, of antlers and horns. In big towns cross bow makers had corporations of their own, sometimes together with arrow makers, but most often cross bow making was associated with leather crafts whose representatives manufactured bow-and-arrow cases, cross bow-and-bolt cases, and shaft weapon sheaths; among them only bow case makers (Lat. “pharetrarius”; Germ. “Kochermacher”; Pol. “tulnig”) were specialized craftsmen.<sup>26</sup>

Shield makers (Lat. “clipeator”, “scutifex”; Germ. “Schilder”; Pol. “szczytnik”) also worked on the borderline between the wood and leather crafts. They were members both of the guilds comprising coopers and saddlers and of those including representatives of artistic crafts, namely illuminators, bookbinders, and first of all painters. The latter did not only decorate spearhafts, saddles and arrow cases but also made shields with coat of arms.<sup>27</sup> Thus shield makers formed a special section of secular painting. Such an organization of the crafts existed in many towns, e.g. in Cracow, Prague, Köln, Wien and Basel. In Strasbourg shield makers formed a specialized group, along

with coat of plates makers.<sup>28</sup> Still, the association of shield making with ironwork crafts was not often the case (the town of Chelmno in Pomerania was one of the few instances).<sup>29</sup>

When analyzing the organization of the Polish arm crafts, one can see a concentration of various crafts in multidisciplinary corporations, which resulted mainly from a small number of the specialists and from the absence of a material base necessary for their independent existence. In small towns there were usually guilds comprising all the crafts (or those using the same raw materials), and only the most prominent crafts succeeded in forming entirely independent corporations. Such an organization was common to the whole medieval Europe. Joint corporations were characteristic of the early period of the development of urban crafts. They protected the rights of their members, securing market for their products.<sup>30</sup> In the old Köln center in the 13th century arms manufacture (with sword makers in the first place) was included into an ironworkers' corporation.<sup>31</sup> A division of the metal crafts in the town of Świdnica (Silesia)<sup>32</sup> and in Toruń<sup>33</sup> and Gdańsk<sup>34</sup> took place in the 14th–15th centuries; a similar situation was in Freiberg.<sup>39</sup> In Prague a differentiation within the arms crafts could be seen even in the early 14th century.<sup>36</sup> Cracow is another example of this process. The resulting narrow specialization may be illustrated by the case of Prague where in the 14th century the records certify the presence of iron gauntlet makers and in the 15th century—that of spear makers, who were not to be met in Poland at that time.<sup>37</sup>

<sup>22</sup> J. Danka, A. Nowakowski, J. Szymczak, *Militaria w Liber viginti artium Pawła z Pragi czyli tzw. Księdze Twardowskiego*, „Kwartalnik Historii Kultury Materialnej”, 1988, XXXVI, pp. 45, 53, 57; Z. Winter, *Dějiny řemesel a obchodu v Čechách ve 14. a 15. století*, Praha 1906, p. 150.

<sup>23</sup> *Cracovia artificum...*, vol. II, Kraków 1936, No 259, 393; *Rachunki dworu króla Władysława Jagielly i królowej Jadwigi z lat 1388 do 1420*, ed. F. Piekosiński, Cracoviae 1896, pp. 181, 193, 207, 208.

<sup>24</sup> J. Werner, *Polska broń. Łuk i kusza*, Wrocław 1974, pp. 23–24.

<sup>25</sup> *Volumina legum*, ed. J. Ohryzko, vol. I, Petersburg 1859, p. 35; *Księga komturstwa gdańskiego*, ed. K. Ciesielska, I. Janosz-Biskupowa, Warszawa—Poznań—Toruń 1985, No 213.

<sup>26</sup> Z. Żygulski, *Ze studiów nad dawną sztuką siodlarską*, „Rozprawy i Sprawozdania Muzeum Narodowego w Krakowie”, 1959, V, p. 55; I Turnau, *Polskie skórnictwo*, Warszawa 1983, p. 68; Z. Winter, *op. cit.*, p. 206.

<sup>27</sup> *Kodeks dyplomatyczny miasta Krakowa...*, pars 2, Cracoviae 1882, No 346.

<sup>28</sup> L. Lepšy, *Cech malarski w Polsce od wieków średnich do końca XVIII wieku. Przyczynek do historii sztuki*, Kraków 1896, p. 28; Č. Zíbrt, *Dějiny kroje v zemích českých od dob nejstarších až po války husitské*, Praha 1892, p. 179; Z. Winter, *op. cit.*, pp. 190, 196; V. Denkstein, *Pavězy českého typu*, part III, „Sborník Národního Muzea v Praze. Historie”, 1965, XIX, p. 35.

<sup>29</sup> J. Tandecki, *Cechy rzemieślnicze w Toruniu i Chelmnie. Zarys dziejów*, Toruń 1983, p. 12.

<sup>30</sup> M. Haisig, *Rzemiosła kowalsko-ślusarskie na Śląsku do połowy XVIII wieku*, Wrocław—Opole 1962, p. 205; M. Bogucka, H. Samsonowicz, *op. cit.*, pp. 204–205.

<sup>31</sup> A. Nadolski, *Broń i strój...*, p. 74.

<sup>32</sup> M. Haisig, *op. cit.*, pp. 37, 41.

<sup>33</sup> S. Herbst, *Toruńskie cechy rzemieślnicze. Zarys przeszłości*, Toruń 1933, pp. 199, 208–209; T. Jasiński, *Rzemiosła kowalskie średniowiecznego Torunia*, „Kwartalnik Historii Kultury Materialnej”, 1975, XXIII, p. 226.

<sup>34</sup> T. Hirsch, *Handels- und Gewerbsgeschichte Danzigs unter der Herrschaft des Deutschen Ordens*, Leipzig 1858, pp. 300, 325–326; M. Bogucka, *Gdańsk jako ośrodek produkcyjny w XIV–XVII wieku*, Warszawa 1962, p. 107.

<sup>35</sup> F. Schulze, *Die Handwerkerorganisation in Freiberg*, „Mitteilungen des Freiburger Altertumsverein”, 1917, LXII, pp. 30–32.

<sup>36</sup> Z. Winter, *op. cit.*, pp. 190, 196, 206, 207.

<sup>37</sup> E. Wagner, Z. Drobna, J. Durdik, *op. cit.*, p. 26.

The town of Nurnberg was a famous center of specialized armour manufacture, providing the market with helmets, iron gauntlets, shoulder and leg pieces, and torso harness for the warrior.<sup>38</sup> However,

Nurnberg was one of the few European centers with a long tradition and considerable achievements in the field.<sup>39</sup> The Polish crafts, which had been developing only since the 14th century, presented a compara-

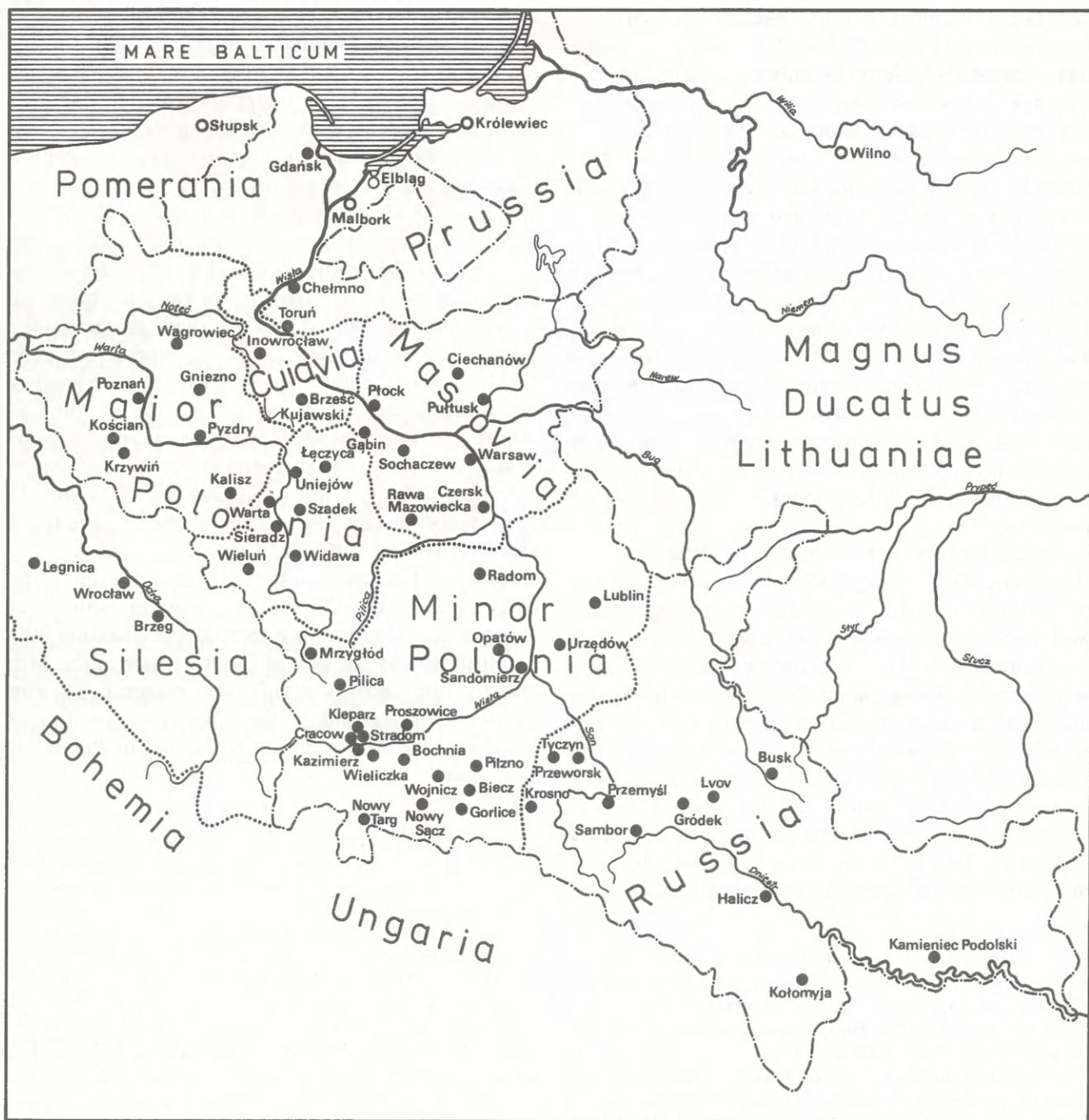


Fig. 1. Arms production centers in the Polish Kingdom in the 13th–15th centuries

- towns with certified production of offensive and defensive arms ○ other towns
- state frontiers ..... province frontiers

<sup>38</sup> *Die Nürnberger Bürger- und Meisterbücher. Archivalische Forschungen zur Waffenkunde*, „Zeitschrift für Historische Waffenkunde”, 1907–1909, IV, 5, pp. 147–152; A. Reitzenstein, *Die Ordnung der Nürnberger Plattner*, „Waffen und Kostümkunde. Zeitschrift der Gesellschaft für Historische Waffen- und Kostümkunde”, 1959, I, passim; A. Swaryczewski, *Platnerze krakowscy*, Warszawa–Kraków 1987, p. 91.

tively modest picture. Similarly, research on the Swedish crafts has also revealed an absence of high

<sup>39</sup> Z. Żygulski jun., *Broń w dawnej Polsce na tle uzbrojenia Europy i Bliskiego Wschodu*, Warszawa 1982, p. 105.

professional specialization,<sup>40</sup> the arms manufacture in Sweden was even below the level of such Polish towns as Cracow, Lvov or Poznan.

After the uniting of the Polish state in the early 14th century the towns of Little Poland, and especially Cracow, underwent a considerable economic development. When compared with other towns of the region Cracow was characterized by the most advanced social division of labour. In the defensive arms manufacture mail-armor makers, coat of plates makers, helmet makers, and shield makers were active, and in the offensive arms production—blade makers, sword polishers, sword makers, cross bow makers, arrow makers, and bow case makers (annex 1). The fact that inhabitants of the adjacent towns (Kazimierz, Stradom, Kleparz) were also active in this field adds to the importance of Cracow as a big center of arms production. The Greater Cracow area counted 195 offensive arms makers and 11 specialists in defensive arms, which makes 306 as compared with the total of 505 on the entire Polish territory. It ought to be borne in mind that the ratio is determined by the state of the sources, still it does indicate the primacy of Cracow. As early as in the 13th century the town of Sandomierz competed with Cracow but it lost eventually (only three kinds of specialists in the arms manufacture). In the town of Nowy Sącz in the 14th—15th centuries makers and cross bow makers and coat of plates makers were recorded. Among the other towns of the region we should mention Biecz (two specializations) as well as Lublin, Bochnia and Wieliczka (mainly sword makers).<sup>41</sup>

In Great Poland the capital town of Poznan was the most important center of arms production (six specializations; 22 blade makers, sword makers and cross bow makers and 12 mail-armor makers and coat of plates makers).<sup>42</sup> The dynamic economic development of Poznan in the middle of the 15th century and the town's increasing participation in the international trade resulted in a considerable growth of arms production. Among other centers of the region we should mention the town of Kalisz (specialized manufacture of offensive and defensive weapons) as well as Kościan and Pyzdry (sword makers, cross bow makers). They were centers of the regional

market, like Łęczyca and Sieradz in central Poland or Brześć Kujawski and Inowrocław in Cuiavia region (annex 1).<sup>43</sup>

Arms manufacture on the Russia territories<sup>44</sup> had a rich tradition dating back to the Rurykowicz dynasty and the tradition was preserved under the rule of the Jagiellonian monarchy. The towns of the region were important centers of side-arms and ballistic weapons production, especially Lvov (at least seven kinds of specialized craftsmen, 33 offensive arms makers and 15 defensive arms makers—second to Cracow in the 15th century (annex 1). Like Cracow, Lvov accepted craftsmen not only from the Polish Kingdom territories but also from Hungary and even from Silesia.<sup>45</sup> The towns of Przemyśl and Przeworsk were also important centers of offensive arms production (mainly side-arms) in Russia.<sup>46</sup>

In the Mazovia region, linked economically and politically with the last representatives of the Piast House and the first Jagiellonian monarchs, the crafts were undergoing a considerable development beginning with the 4th decade of the 15th century. Warsaw was an exception here: the first side-arms makers were recorded even in the late 14th century, and cross bow makers—in the 15th century (altogether 18 representatives of these specializations).<sup>47</sup> In the town of Płock three specializations were certified; Rawa Mazowiecka, Czersk and Sochaczew were centers of arms production on the regional scale (with the town of Ciechanów in the late 15th century)—annex 2.<sup>48</sup>

Pomeranian towns constitute a separate question; till the Thirteen Year War (1454—166) the whole of their economic potential was utilized by the Teutonic Order. After the war markets in the Jagiellonian Poland became more easily accessible to the towns of Gdańsk, Toruń, Chełmno and Elbląg (map).

Weapon production was most likely to develop in the towns with relatively advanced industries and rich in raw materials; therefore it flourished in all the centers of international commerce (Cracow, Lvov, Poznan, Gdańsk, Toruń, Elbląg), in 41% of the towns

<sup>40</sup> А.А. Сванидзе, *Средневековый город и рынок в Швеции XIII—XV вв.*, Москва 1980, pp. 202—205.

<sup>41</sup> F. Kiryk, *Rozwój urbanizacji...*, passim; idem, *Z badań nad urbanizacją Lubelszczyzny w dobie jagiellońskiej*, „Rocznik Naukowo-Dydaktyczny WSP w Krakowie”, 43, „Prace Historyczne”, 1972, VI, pp. 93—165. Cf. annex 1.

<sup>42</sup> M.J. Mika, *500 lat cechu ślusarzy i rzemiosł pokrewnych w Poznaniu*, part I, Poznań 1958; Z. Zaleski, *Przemysł skórzany w średniowiecznym Poznaniu*, „Kronika Miasta Poznania”, 1928; VI, J. Wiesiołowski, *Socjotopografia późnośredniowiecznego Poznania*, Warszawa—Poznań 1982, pp. 64—78. Cf. annex 1.

<sup>43</sup> J. Szymczak, *Produkcja i koszty...*, p. 216—217.

<sup>44</sup> The term “Russia” is used for the Old Russia (Cf. H. Paszkiewicz, *The origin of Russia*, London 1954, p. 133) or Red Russia. Cf. the map.

<sup>45</sup> L. Charewiczowa, *Lwowskie organizacje zawodowe za czasów Polski przedrozbiorowej*, Lwów 1929; A. Gilewicz, *Przyjęcia do prawa miejskiego we Lwowie w latach 1405—1604*, [in:] *Studia z historii społecznej i gospodarczej poświęcone prof. dr. Franciszkowi Bujakowi*, Lwów 1931, pp. 393—394.

<sup>46</sup> K. Arłamowski, *Dzieje przemysłowych cechów rzemieślniczych w dawnej Polsce*, Przemyśl 1931. Cf. annex 1.

<sup>47</sup> E. Koczorowska-Pielińska, *Rzemiosło Starej i Nowej Warszawy do 1525 r.*, [in:] *Z dziejów rzemiosła warszawskiego*, red. B. Grochulska and W. Pruss, Warszawa 1983, pp. 27—79.

<sup>48</sup> J. Szymczak, *Produkcja i koszty...*, p. 220—221.

Table 1

Number of arms makers in the Polish towns in the 14th–15th centuries

Specialization	Period	1301–1310	1311–1320	1321–1330	1331–1340	1341–1350	1351–1360	1361–1370	1371–1380	1381–1390	1391–1400	1401–1410	1411–1420	1421–1430	1431–1440	1441–1450	1451–1460	1461–1470	1471–1480	1481–1490	1491–1500
Offensive arms	Blade makers										2	2	2	2			2		1		
	Sword polishers		1																		
	Sword makers		1		3	1		6	4	8	18	23	21	22	14	23	15	14	18	17	21
	Cross bow makers	2					2	8	6	19	30	22	20	26	25	16	21	19	20	18	
	Arrow makers									2			2				5		2		
	Bow case makers												2	4	5	3	2	1	1	1	1
	Total		2	2		3	1	8	12	14	39	55	47	50	47	51	40	36	41	38	40
Defensive arms	Mail-armor makers				1	1	1	6	3	6	15	11	8	9	10	11	6	5	5	6	5
	Coat of plates makers				1	1	1	8	9	8	5	7	6	9	7	9	9	14	7	6	
	Helmet makers						2		3	6	4	3	2	1							
	Shield makers			1							1	1	1	1	1					1	
Total			1	2	2	2	9	11	18	29	21	19	18	21	19	15	14	19	14	11	
General total		2	2	1	5	3	2	17	23	32	68	76	66	68	70	55	50	60	52	51	

being centers of the regional markets. Only 9% of the arms manufacture fell to local centers and 0,6% to private estates, both church and secular. There was also a connection between the localization of arms making centers and that of the centers of state administration as well as of court rooms and gentry's regional councils.<sup>49</sup>

Fifty five towns have a certified activity in the field of arms production for the needs of the army. Each of the towns was supposed to provide with arms the gentry warriors from a territory whose average surface amounted to 4,4, thousand square km. Little Poland with its 18 centers had the highest ratio, namely one center for 3,5 thousand square km. This was due to the fact that the region had a wide access to raw materials of the very best quality, both of local and foreign origin. The fact that Cracow was a big center of international trade also made for a ready market; besides, the arms makers supplied the royal court with their products. The indices in the remaining Polish territories were as follows: Great Poland – 16 centers, i.e. one center for 4,1 thousand square km; Mazovia – 8 centers which makes 1 center for 4,4, thousand square km; Russia – 11 centers, i.e. 1 center for 7,8 square km. The latter is indicative of Russia's low urbanization and the relatively small number of inhabitants (vide map). If we take the demographic factor as a basis for the calculation it will appear that the indices are rather even in particular regions, i.e. one town ought to provide arms to 5,1 thousand gentry buyers on the average

(from 4,9 to 5,5 thousand in particular regions). This shows that the market operated on the county's scale; yet it was the case only in the second half of the 15th century when the local market was fully formed. In the 14th century Poland we still have to do with the regional market; only at the end of the century a radical change occurred, together with the rapid growth of the number of arms manufacture centers (table 1). This was undoubtedly due to the political and military situation in Poland and preparations to the war with the Teutonic Order. At that time Cracow, Lvov and Poznan (and soon also Warsaw) became arms making centers of almost national importance. The development of capitals of the particular voivodships enabled them to provide their territories with arms; they were aided by local centers, most often county towns.

The relation between development of the crafts and the state's foreign policy is clearly confirmed by the entries in the civic rights book of Cracow (table 2),<sup>50</sup> where the influx of arms makers decreased by 60 per cent after the Grunwald (Tannenberg) campaign; it showed a growing tendency in the 1430's, which resulted from the growing demand for arms at the time of the war with duke Świdrygiełło, war with the Teutonic Prussia, campaign regarding the Bohemian crown for Kazimierz Jagiellończyk, Hussite unrest, and defense of Podolia and Halicz territories (war with Tartars). The last increase of entries in the Cracow civic rights book took place during the Thirteen Year War and it lasted till the 1470's, due to

Table 2

Number of arms makers who received freedom of a city in Cracow

Specialization		Period										Total	
		1392– –1400	1401– –1410	1411– –1420	1421– –1430	1431– –1440	1441– –1450	1451– –1460	1461– –1470	1471– –1480	1481– –1490		
Offensive arms	Blade makers		2	2			1					5	
	Sword makers	8	4	1	6	2	2	5	4	2	2	36	
	Cross bow makers	4	7	4		6	1	4	9	1	2	42	94
	Arrow makers	1					2					3	
	Bow case makers			1	3	2	1			1		8	
Defensive arms	Mail-armour makers	6	2	1	3	4	1	2		1		20	
	Coat of plates makers		1		2	8		5	2	5	1	25	48
	Helmet makers	1	1	1								3	
Total		20	17	10	14	22	5	14	16	12	5	7	142

<sup>49</sup> *Ibid.*<sup>50</sup> *Księgi przyjęć do prawa miejskiego w Krakowie...*, passim.

Table 3

## Arms makers in the Polish and Bohemian towns in the 14th–15th centuries

Specialization	1310–1350		1351–1400						1401–1437					1438–1500				
	Prague	Cracow	Prague	Jihlava <sup>a</sup>	Cracow	Poznan	Lov	Warsaw	Prague	Jihlava <sup>a</sup>	Cracow	Poznan	Lov	Warsaw	Cracow	Poznan	Lov	Warsaw
Blade makers			11	2					2		4	1			3			
Sword makers		4 <sup>b</sup>	15	3	21	1	1		10	2	18	4	7	1	26	6	8	6
Cross bow makers	2	2	3	2	17	3			7	6	28	2	10		37	6	6	9
Arrow makers			2		2				2		2							
Mail-armor makers	2	1	6	2	18	1	1		11	2	12	2	1		16	1	2	
Coat of plates makers	7	1	34	3	9	4			18	2	11	3	1		27	4	3	
Helmet makers	2		4	1	7		1		2		2		1					
Shield makers		1	2						1		2							
Total	13	9	77	13	74	4	7	1	53	12	79	12	20	1	109	17	19	15

<sup>a</sup> for the years 1361–1400    <sup>b</sup> for the years 1400–1438    <sup>c</sup> with 1 sword polisher

the war with Mathias Corvinus. In the case of offensive arms makers there is a positive correlation with the periods of the state's increased military activity; and since the 1430's ballistic arms makers were more numerous in Cracow than sword makers. Mail-armour makers were arriving to Cracow in greater number till 1430 and after that year they gave way to coat of plates makers.

We have at our disposal some interesting comparative material regarding Bohemian and German towns. In the first half of the 14th century Prague had more arms makers than Cracow but the discrepancy disappeared in the subsequent years. Prague had more coat of plates makers but Cracow ranged first as far as all the other specializations were concerned, especially in offensive weapons (both sidearms and ballistic weapons). In a rather small town of Jihlava there were in the 14th century more arms makers<sup>51</sup> than in the big centers in Poland, with Lvov and Poznan. The differences disappeared only in the early 15th century, which was partly due to the fact that the Polish towns were rather attractive to craftsmen. In Frankfort on the Mein the newly arrived specialists in arms making were entered in the books every 4th year on the average,<sup>52</sup> in Prague every year,<sup>53</sup> and in Cracow every tenth month. Defensive arms makers were accepted to Frankfort every—fifth year on the average, to Cracow - every 2,2 nd year, to Prague—every 1,9th year; offensive arms makers came to Frankfort every 17,5th year, to Prague—every 2nd year, to Cracow—every 1,3rd year. The above data prove that the capital of the Polish Kingdom was undergoing a steady development and was prepared to accept considerable numbers of craftsmen, and to secure a market for their products.

Apart from the arms manufacture organized within guilds in the big centers there was also production on a modest scale in small localities. Simple elements of arms were made in local smithies and in blacksmith's shops in castles, where mending of the equipment was also possible (e.g. Siedlątków near Sieradz).<sup>54</sup> In village smithies bolts and heads were forged on a large scale,<sup>55</sup> as well as arms for the

peasant infantry. Numerous elements of arms were made by smiths and ironworkers in every locality; yet those were products of lower quality, intended for warriors of modest means (though not necessarily of common origin).

Polish warriors also used arms of foreign provenance; it was acquired by means of commercial exchange or as a war trophy. Sometimes it was brought from voyages abroad, especially at the time of the first Jagiellons when Polish warriors were fighting outside their own country. Foreign arms often served as a model for the home production, which had favorable effects on its quality. Generally the Polish military equipment did not differ much from that of foreign warriors. During the Teutonic Order's invasions in the first half of the 14th century Teutonic knights could be identified only by their white cloaks with black crosses. In the Grunwald battle King Władysław Jagiełło made his warriors wear straw bands on their armours<sup>56</sup> to make them look different from the Teutonic knights and from the West-European troops aiding the Order.

The development of arms manufacture differed with the specializations (annex 2). The centers of offensive arms production were more numerous (50 towns) than those making defensive arms (16 towns). Most probably it resulted from the bigger demand for side-arms produced in many varieties. Similarly, the demand for cross bows may be accounted for by the fact that they were damaged more easily than helmets or breast-plates.

In the Polish Kingdom sword making was the most common specialization in arms production (39 centers). Their number was steadily growing, and the growth was most dynamic in the second half of the 15th century, as 56% of all the sword making centers came into existence at that time. Ballistic weapons were manufactured in 29 towns but in 64% of them cross bow makers were active till about the middle of the 15th century. Later on in the century the demand for cross bows declined, as an obvious result of the introduction of fire arms. Mail-armours were manufactured in few centers (apart from Wrocław in the 13th century, only five were recorded in the 14th—15th centuries), which could be accounted for by the fact that defensive arms makers operated mainly within joint ironworkers' corporations. The coat of plates production was certified in 13 towns of which 8 were recorded even in the second half of the 14th century. Sword making, on the other hand, underwent an impressive development in the second half of the 15th century.

<sup>51</sup> E. Wagner, Z. Drobna, J. Durdik, *op. cit.*, pp. 28, 31.

<sup>52</sup> K. Büchler, *Die Bevölkerung von Frankfurt*, Tübingen 1886, p. 398.

<sup>53</sup> E. Wagner, Z. Drobna, J. Durdik, *op. cit.*, pp. 27, 30.

<sup>54</sup> A. Nadolski, *Helm i fragmenty zbroi z Siedlątkowa*, Prace i Materiały Muzeum Archeologicznego i Etnograficznego w Łodzi. Seria Archeologiczna, 1968, 15, pp. 89—93.

<sup>55</sup> A. Kola, G. Wilke, *Produkcja grotów beltów do kuszy w średniowieczu w świetle współczesnych prób eksperymentalnych. Uwagi o odkryciach na grodzisku późnośredniowiecznym w Słoszewach, pow. Brodnica, w 1973 r.*, „Acta Universitatis Nicolai Copernici. Nauki Humanistyczno-Społeczne”, 68, „Archeologia”, V, 1975.

<sup>56</sup> *Cronica conflictus Wladislawi regis Poloniae cum Cruciferis anno Christi 1410*, ed. Z. Celichowski, Poznań 1911, p. 22.

## ANNEX 1

Production centers and number of arms makers in the Polish Kingdom in 13th–15th centuries

Towns		Blade makers	Sword polishers	Sword makers	Cross bow makers	Arrow makers	Bow case makers	Mail-armor makers	Coat of plates makers	Helmet makers	Shield makers	Total
1	2	3	4	5	6	7	8	9	10	11	12	13
1	Biecz			1	1							2
2	Bochnia			2								2
3	Brześć Kujawski			2								2
4	Busk			1					2			3
5	Ciechanów			x	x				x			3
6	Czersk				1							1
7	Gąbin				1							1
8	Gniezno				1							1
9	Gorlice			1								1
10	Gródek										1	1
11	Halicz				1							1
12	Inowrocław								x			1
13	Kalisz			2	4				1			7
14	Kamieniec Podolski			1								1
15	Kazimierz			4	8		2		2	1		17
16	Kleparz			x								1
17	Kołomyja				1							1
18	Kościan			x	x	2						4
19	Cracow	7	1	68	84	4	9	47	48	9	3	280
20	Krosno			1								1
21	Krzywiń			1								1
22	Lublin			2								2
23	Lvov			16	16	x		4	8	2	x	48
24	Łęczycza			1	2	3						6
25	Mrzygłód			1								1
26	Nowy Sącz	x		x	1				2			5

1	2	3	4	5	6	7	8	9	10	11	12	13
27	Nowy Targ				1							1
28	Opatów			1								1
29	Pilica			1								1
30	Pilzno			1								1
31	Płock			x	1				x			3
32	Poznań	1		10	11			4	7		x	34
33	Proszowice			x								1
34	Przemyśl			10	2							12
35	Przeworsk			3	1							4
36	Pułtusk			x								1
37	Pyzdry			1	x	2						4
38	Radom				1							1
39	Rawa Mazowiecka			1	1							2
40	Sambor				1							1
41	Sandomierz			1	1				1			3
42	Sieradz			2	1							3
43	Sochaczew				1							1
44	Stradom				2	1	4	1				8
45	Szadek			1								1
46	Tyczyn								1			1
47	Uniejów								1			1
48	Urzędów			x								1
49	Warsaw			8	9						x	18
50	Warta			x								1
51	Wągrowiec							1				1
52	Widawa			2								2
53	Wieliczka			1								1
54	Wieluń			1								1
55	Wojnicz				1							1
	Total	9	1	157	158	13	15	57	76	12	7	505

x – presence of a given specialization in town; counted as 1 specialist.

The possibilities of arms production in Poland in the 14th–15th centuries  
(Hypothetic data)

The data concerning arms production	Swords			Cross bows			Mail-armours			Coats of plates		
	1390	1450	1500	1390	1450	1500	1390	1450	1500	1390	1450	1500
Year production of the single workshop	50	60	70	25	27	30	30	40	45	40	45	50
Total production in the country	5300	6500	9600	2100	3700	4000	2400	2500	2700	1200	2300	4600

The quantity of products delivered to the market was to a great extent affected by the number of craftsmen, the organization of production and the technical possibilities (table 4). According to our estimates the home craft could secure the full replacement of side-arms in 9 years, of ballistic weapons in 17 years, of mail-armours in 19 years, and of all the elements of coat of plates – in 25 years.<sup>57</sup> These are rough estimates as the above considerations are of a purely theoretical character. It is obvious that when preparing to a military campaign warriors did not buy complete equipment but only replaced old and used arms by new or improved items. An overall replacement took place every 70th year on the average (as an effect of the experience from the major campaigns: 1290, 1360, 1430). Thus, the above estimates are the result of the durability of particular elements of the arms and of the demand for them, which accounted for the uneven development of various specializations.

The arms were purchased by the gentry, by the village administrators obliged to military service, and occasionally by peasants. Towns bought arms for city arsenals and guilds as well as for the guards, the royal

court – for the solidiers and courtiers, and as gifts for the visitors. The court accounts of the times of Władysław Jagiełło and Kazimierz Jagiellończyk<sup>58</sup> include the monarch's private orders for considerable quantities of arms. Similarly, the great lords were interested in purchasing arms for the troops protecting their estates, as well as for the sake of prestige. Finally, the arms crafts worked for the needs of professional soldiers who in the middle of the 15th century were forming a separate category. Certain quantities of the arms were exported, mainly to Lithuania; there were instances of manufacturing arms according to models suggested by the buyers.<sup>59</sup>

Translated by Ewa Książek

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<sup>58</sup> *Rachunki dworu króla Władysława Jagielly...*, passim; *Liber quitantiarum regis Casimiri ab a. 1484 ad 1488*, [in:] *Teki A. Pawińskiego*, vol. II, Warszawa 1897; *Rachunki królewskie z lat 1471–1472 i 1476–1478*, ed. S. Gawęda, Z. Perzanowski, A. Strzelecka, Wrocław–Kraków 1960.

<sup>59</sup> A. Nowakowski, J. Szymczak, *Rodzaje uzbrojenia ochronnego w Polsce w okresie monarchii stanowej w świetle źródeł pisanych*, „Kwartalnik Historii Kultury Materialnej”, 1985, XXXIII, pp. 35–36.

<sup>57</sup> J. Szymczak, *Produkcja i koszty uzbrojenia...*, p. 239.

## ANNEX 2

## First records of arms production specializations in Poland in 13th–15th centuries

## OFFENSIVE ARMS

## Blade makers:

1. Cracow 1407 2. Poznań 1429 3. Nowy Sącz 1. 15th c.

## Sword polishers:

1. Cracow 1315

## Sword makers:

[1. Wrocław 1290 2. Legnica 1317] 3. Cracow 1317 4. Sandomierz 1339 5. Kazimierz 1361 6. Szadek 1375 7. Warsaw 1381 8. Biecz 1388 9. Lvov 1388 10. Lublin 1396 11. Łęczyca 1397 12. Poznań 1403 13. Przemyśl 1407 14. Przeworsk 1408 15. Pilzno 1425 16. Kalisz 1426 17. Gorlice 1428 18. Krzywiń 1429 19. Sieradz 1430 20. Kleparz 1450 21. Kościan 1453 22. Pyzdry 1453 23. Opatów 1457 24. Pułtusk 1462 25. Wieliczka 1463 26. Pilica 1464 27. Kamieniec Podolski 1473 28. Mrzygłód 1481 29. Rawa Mazowiecka 1485 30. Ciechanów 1486 31. Płock 1486 32. Uniejów 1490 33. Busk 1493 34. Brześć Kujawski 1494 35. Bochnia 1495 36. Krosno 1497 37. Widawa 1497 38. Proszowice 1. 15th c. 39. Nowy Sącz 1. 15th c. 40. Warta 1505 41. Wieluń 1505.

## Cross bow makers:

1. Cracow 1308 2. Sandomierz 1372 3. Kazimierz 1373 4. Poznań 1380 5. Łęczyca 1393 6. Nowy Sącz 1396 7. Biecz 1397 8. Nowy Targ 1402 9. Lvov 1404 10. Kalisz 1404 11. Sambor 1409 12. Sieradz 1415 13. Przemyśl 1416 14. Radom 1418 15. Gniezno 1433 16. Płock the 1430's 17. Warsaw 1443 18. Halicz 1447 19. Rawa Mazowiecka 1447 20. Pyzdry 1453 21. Sochaczew 1467 22. Kościan 1475 23. Stradom 1485 24. Ciechanów 1486 25. Czernsk 1486 26. Kołomyja 1487 27. Wojnicz 1492 28. Przeworsk 1493 29. Gąbin 1495.

## Arrow makers:

1. Cracow 1394 2. Lvov 1407 3. Łęczyca 1430 4. Pyzdry 1453 5. Stradom 1455 6. Kościan 1475.

## Bow case makers:

1. Cracow 1411 2. Stradom 1426 3. Kazimierz 1437.

## DEFENSIVE ARMS

## Mail-armour makers:

[1. Wrocław 1254] 2. Cracow 1339 3. Poznań 1386 4. Lvov 1353 5. Wągrowiec 1419 6. Stradom 1491

## Coat of plates makers:

[1. Wrocław 1254] 2. Cracow 1339 3. Poznań 1386 4. Lvov 1393 5. Wągrowiec 1419 6. Stradom 1491.

## Coat of plates makers:

[1. Wrocław 1300 2. Brzeg 1318] 3. Cracow 1340 4. Lvov 1353 5.

Nowy Sącz 1371 6. Kazimierz 1372 7. Tyczyn 1375 8. Sandomierz 1395 9. Inowrocław ca 1400 10. Poznań 1410 11. Kalisz 1440 12. Ciechanów 1486 13. Płock 1486 14. Uniejów 1487 15. Busk 1499.

## Helmet makers:

1. Cracow 1362 2. Lvov 1382 3. Kazimierz 1387.

## Shield makers:

[1. Wrocław 1267] 2. Cracow 1329 3. Gródek 1488 4. Poznań 1489 5. Lvov 1. 15th c. 6. Warsaw 1. 15th c.

ANNEX 1

Final records of the production specialization in Poland in 1990-1991

Year	Production specialization	Value
1990	...	...
1991	...	...
1992	...	...
1993	...	...
1994	...	...
1995	...	...
1996	...	...
1997	...	...
1998	...	...
1999	...	...
2000	...	...
2001	...	...
2002	...	...
2003	...	...
2004	...	...
2005	...	...
2006	...	...
2007	...	...
2008	...	...
2009	...	...
2010	...	...
2011	...	...
2012	...	...
2013	...	...
2014	...	...
2015	...	...
2016	...	...
2017	...	...
2018	...	...
2019	...	...
2020	...	...