DALMATINOVA BIBLIJA – STRUKTURA I KONZERVACIJA

THE DALMATIN BIBLE – STRUCTURE AND CONSERVATION

Jedert Vodopivec Tomašič, Blanka Avguštin Florjančič, Stanka Grkman, Meta Černič, Marjana Ljuba, Darja Haraurer, Mateja Kotar, Lucija Planinc, Nataša Petelin, Tatjana Rahovsky Šuligoj

Arhiv Republike Slovenije
Jedert.Vodopivec@gov.si

UDK / UDC 025.85:09
Izvorni znanstveni rad / Original scientific paper
Primljeno / Received: 11. 6. 2014.

Sažetak

Dalmatinova Biblija iz 1584. prvi je slovenski prijevod cjelokupne Biblije. Najveće je dostignuće razdoblja reformacije u Sloveniji. Knjiga je slovenski kulturni spomenik najviše kategorije i izvaredno je djelo s obzirom na sadržaj i s obzirom na materijal. Primjerak Dalmatinove Biblije kojim se bavi rad, dugo je vremena bio u aktivnoj uporabi, što su potvrdili brojni primjeri oštećenja uzorovanih čestom upotrebom i neodgovarajućom pohranom u prošlosti. Konzervatorsko-restauratorska intervencija bila je neophodna zbog znatnog oštećenja knjižnog bloka i uveza. Glavna svrha intervencije bila je ispitati stukturu i materijale, konzervirati i restaurirati listove knjižnog bloka, restaurirati uvez i konzervirati na što je dulje moguće izvornost knjige.

Ključne riječi: knjiga, Biblija, Dalmatinova Biblija, struktura, papir, uvez, konzervacija

Summary

Juraj Dalmatin's Bible from 1584 is the first Slovene translation of a complete Bible. It is the greatest achievement of the Reformation period in Slovenia. The book is a Slovene cultural monument of the highest category and is an extraordinary work, considering both the content and the material it was made of. The copy of the Dalmatin Bible presented and analyzed in this paper was in active use for a very long time, the proof of which are the severe signs of damage caused by frequent use and inappropriate storage in the past. The conservation-restoration intervention was necessary because both the text block and the binding were badly damaged. The main purpose of the intervention was to examine the structure and materials, conserve and restore the leaves of the text block, restore the binding and conserve as much as possible the originality of the book.

Keywords: book, Bible, Juraj Dalmatin, structure, paper, binding, conservation

1. Introduction

The translation of the Bible into national languages begin in earnest during the Protestant Reformation, when Martin Luther[1] demanded that at least in principle every Christian should read the Bible in his native tongue. According to Luther, translations should be done from the original and not from the Vulgate,[2] and there should be no comments or interpretations, so that the reader could be in direct contact with the Word of God and not influenced by human interpretation. It was on the basis of these principles, that Slovene Protestants approached the translation of the Bible. The first translations of biblical texts into Slovene were done by Primož Trubar,[3] who in 1555 published a translation of the Gospel according to St Matthew, which was gradually followed by the other parts of the New Testament on the basis of Luther's German translations, with the additional help of the clarifications of Erasmus of Rotterdam.[4]

[1] Martin Luther, German theologian, *Eisleben, 10 November 1483, †Eisleben, 18 February 1546.

[2] The Vulgate, St Jerome's Latin translation of the Bible based on early Latin translations, the Septuagint and Hebrew originals. His translation became the official text of the Bible in the Roman Catholic Church (*Enciklopedija Slovenije*, 260).

[3] Primož Trubar, Protestant clergyman, author of the first printed books in Slovene, * 8 or 9 June 1508, Rašca, Slovenia † 28 June 1586, Derendingen, Tübingen, Germany.

[4] Erasmus of Rotterdam (born Geert Geerts), Dutch Renaissance humanist, writer, philologist, philosopher and theologian, * 27 October 1466/1469, Rotterdam, Netherlands, † 12 July 1536, Basel, Switzerland.

Dalmatin's Translation in to Slovene

Trubar's work was continued by Jurij Dalmatin,[5] in whom Trubar took a fatherly interest during the latter's years as a student at the University of Tübingen, encouraging him in his study of his mother tongue. Even in this period Dalmatin was working on translations of biblical texts. Later, however, he would deliberately set about translating the whole of the Bible. Luther's translation served as the main basis for his translation of the Old Testament, although he did know Greek and Hebrew. For the New Testament he used Trubar's translation, adapting it slightly to bring it into line with Luther's translation. He finished his complete translation of Bible in 1578. Three years later, in 1581, a review board met in Ljubljana to review the translation. The members of the board included 11 Protestant theologians from Carniola, Styria and Carinthia. The Slovene text was given its final form by Juraj Dalmatin and his former teacher in Krško, Adam Bohorič.[6] The Bible was originally supposed to be printed by Mandelc's printing press in Ljubljana but following an intervention by the Bishop of Ljubljana, Archduke Charles prohibited its printing in Ljubljana or anywhere in Carniola, with the result that another solution had to be sought.[7]

Preparation for Printing

Dalmatin and Bohorič reported[8] in detail to the Provincial Estates on the preparations, printing, binding and other costs. Since 1997 their correspondence has also been available to read in Slovene, in the translations of the letters of Slovene Protestants.[9]

It is from these and other documents held in archives that the bulk of the information on the paper, printing and binding – studied and published by Avgust Dimitz in as early as 1875 – is taken.[10] This information was later recapitulated by other researchers into the history of the first Slovene translation of the Bible.

---

[5] Juraj Dalmatin, Slovene Protestant theologian , writer, * c. 1547, Krško, Slovenia † 31 August 1589, Ljubljana, Slovenia.

[6] Adam Bohorič, Slovene Protestant, grammarian and teacher, * c. 1520, near Brestanica, Slovenia† 20 November 1598, Germany.

[7] Berčič (1968), p. 47.

[8] SI AS2, I. reg., 88, 54/2.

[9] Rajhman (1997), 346 p.

[10] Dimitz (1875), pp. 202-203

We learn from the surviving archival documents[11] that printing such an extensive work was a technically and financially demanding undertaking. Even in those days, those commissioning such a work acted in an entirely commercial spirit. The rules that applied were similar to those that apply today.

On 22 May 1582 Dalmatin compiled a list of conditions "*about which the master printer must decide regarding the printing of the Slovene Bible, and provide a written explanation. First. At what price it is possible to buy a sheet of fine, white, good Median printing paper of middle quality (Mittlmedian drucker Papyr), of approximately the kind on which the Frankfurt German Bible is printed in folio format".* He then continues with conditions for the type of letters and the layout of the pages, the size of the print run, and the cost of borrowing Bible images. He also wants to know whether the printer would be able to work on two or three printing presses, so that the work could be completed as soon as possible and it would be known how many proofreaders would be necessary. He concludes with a request for the submission of test prints in the desired form and font.[12]

Printing & paper

In view of the prohibition of printing in Carniola, Trubar undertook to have the Bible printed by Gruppenbach in Tübingen, but despite the intervention of Duke Ludwig of Wittenberg, negotiations with Gruppenbach fell through, since the printer was apparently too expensive and too hesitant.[13]

The search continued and from among several candidates the publisher Samuel Seelfisch of Leipzig was chosen; on behalf of the Provincial Estates, Dalmatin and Bohorič signed a contract with him to print the Bible. [14] In the contract Seelfisch agreed to print 1,500 copies of the book, 50 of which were to be printed on Median paper and the others on Gross-kron paper. The paper would be purchased in Frankfurt, as was the custom.

The Bible was printed in the printworks of the heirs of Johann Krafft in Wittenberg. Under the supervision of Dalmatin and Bohorič, and with the exemplary cooperation of all involved, printing took less time than

[11] SI AS2, I.reg., 88, 54/2, sn 3, pp. 319-322.

[12] Rajhman (1997), p. 77-79.

[13] Rupel (1962), p. 218

[14] The contract signed by Dalmatin, Bohorič and the publisher Samuel Seelfisch (contemporary copy) in Wittenberg on 29 May 1583: AS, 2 I. Reg. Stan. arhiv, fasc. 54/2.

initially envisaged. Printing began on 28 May 1583 and was completed on the Saturday before St Martin's Day in the same year, i.e. 9 November 1583.[15] Although printing was completed in November 1583, the book bears the official date of 1584.

The entire text block of the Bible is richly illustrated with cliché prints, many of which had been used three decades early for the first edition of Luther's German translation. The text consists of five main parts. The first unpaginated section consists of the title page printed in two colours – black and red – followed by a blank page and then four leaves (eight pages) of German foreword, 26 leaves (52 pages) of Slovene foreword and 18 leaves (36 pages) of index. The second part contains the Old Testament and consists of 168 leaves (336 pages). Then come the Holy Prophets (108 leaves; 216 pages), the New Testament (76 leaves; 152 pages) and, the last or fifth section, an index (unpaginated) covering 8.5 leaves (17 pages).

Binding, Costs, Transport, Distribution

From the detailed reports sent by Dalmatin and Bohorič to the Carniolan estate board members we learn that Dalmatin and his colleagues left Wittenberg in January 1584 and set off for home in the depths of a harsh winter. On the way they settled the printing costs with Seelfisch in Leipzig (3,532 florins, 4 groschen and 9 pfennigs), before calling at the court of the Elector of Saxony, a sympathiser, where it is very likely that a few of the most beautiful copies remained, and then proceeding via Prague, Vienna and Klagenfurt to Ljubljana.

From the archival documents we are informed also that after printing was completed part of the print run was delivered to several Wittenberg bookbinders, who by December 1583 had bound 504 copies. The same report states how many bindings had been made by each bookbinder and in what form, along with the price for the binding of each copy. In many cases the type of paper is also given, for example: "Severin Rotter took 24 copies of Median and bound them in red leather with gold, a further 6 Median in white leather with boards and clasps, and 8 Gross-kron in red and black leather with boards and clasps". Among the first to receive from Dalmatin "a copy bound in white leather with boards and a clasp" was Trubar himself.[16]

[15] Rajhman (1997), p. 114.
[16] Rajhman (1997), p. 115-139.

Of the total 1,500 copies, Carniola received 870, Styria 330 and Carinthia 300. The total costs amounted to approximately 8,000 florins, of which the Carniolan Estates paid around 3,300, and the Styrian and Carinthian Estates around 1,300 florins. The remainder was paid by other supporters. The price of the Bible was set at 4 florins and 30 kreuzters for a bound copy, with an unbound copy selling for a florin less. According to some calculations, the book cost as much as a pair of good oxen. Distribution of bound and unbound copies took place in 1584 and 1585.[17]

Surviving Copies

The Dalmatin Bible escaped the book purges of the Counter-Reformation because Catholic priests were also allowed to use it (without the foreword, of course). Judging from the Protestant works that have survived to the present day, we can conclude that a number of other Slovene Protestant books also escaped the flames. According to information provided in the study accompanying the second facsimile reprinting of the Dalmatin Bible in 1994, 36 copies of the Bible were recorded as existing in Slovenia, with a further 42 copies outside Slovenia.[18],[19] During our examination of the condition of the surviving copies in Slovenia Dr Marijan Smolik[20] advised us that in past decades he had found additional copies during his study visits to German libraries. He noted where he found them on page 230 of his own copy of the so-called Trofenik Miscellany.[21] In January 2011 Mr Ivan Martelanc[22] informed us of another copy of the book with dedications by Dalmatin and Bohorič in the archives of the Pforta (protestant) school not far from Leipzig.[23] Before completion of the drafting of this paper, we were informed about the existence of two as yet

[17] Rajhman (1997), pp. 119-138.

[18] Trofenik (1968), pp. 230-231.

[19] Glavan (1994), accompaning text, no numeration.

[20] Dr. Marjan Smolik, director of the Seminary Library in Ljubljana, personal comunication September 2011.

[21] *Abhandlungen uber die Slowenische Reformation*, Rudolf Trofenik (ed.), I. Band, Munich 1968, page 230, property of Dr Smolik.

[22] Ivan Martelanc, retired official of the Ministry of Foreign Affairs and adviser to Slovenia's national Academy of Sciences and Arts, personal correspondence, 10 January 2011.

[23] In a personal communication dated 31 January 2011, Jože Martelanc writes: "just as happened in 1971 with the *Cerkovna ordninga*, when the theologian Jože Markuža discovered in the Vatican library that this work by Trubar had been mistakenly catalogued and shelved as Croatian literature written in the Glagolitic alphabet".

unrecorded but very well preserved copies by Dr Anton Kovač.[24] It is highly likely that further copies, unknown until now, will be found in the future.

2. Experimental and results

The copies of the Dalmatin Bible that survive in Slovenia include an incomplete and damaged copy from Kranj City Library. Conservation-restoration work on this copy is presented in detail below.[25]

This copy of the Bible was delivered to the Centre for Conservation and Restoration (CCR) of the Archives of the Republic of Slovenia (ARS) on 3 December 2009 by Viljem Leban, the director of Kranj City Library. This copy is entered in the CCR record book as No 09-84.

On receipt at CCR the copy was not complete: it was missing the back cover and a considerable number of leaves in the text block (Figure 1, 2 and 3).

2.1. Text Block Structure

Since the text block was incomplete, before beginning work we carried out foliation of all the surviving leaves of the text block, in the sequence followed by the leaves on receipt of the book. We marked the leaves using a soft (B2) pencil in the lower right-hand corner of the recto side of the leaf. Before the intervention we carried out written and photographic documentation and carefully stored all the historical items found inside the book.[26] Following examination and comparison with the reference to the (in Slovenia) best preserved complete copy[27], we found that 86 leaves were missing from our copy. The text block of our copy measured330 x 210 mm and was 98–110 mm thick. It contained 674 leaves gathered into 114 quires (of which one is a quaternion, while all the others are ternions[28] or incomplete ternions.[29]

---

[24] Kovač (2010) pp. 11-12 and personal correspondence, March 2012.

[25] *Dalmatinova Biblija*, Kranj City Library, IN=09120459, P STA 611.

[26] Among the pages of the text block we found more than 100 different historical items including various plants, e.g. touch-me-not, clover, straws of various types, blades of grass (probably used as bookmarks), and various seeds, feathers and so on. Creatures including a spider, a fly and various other insects were also found, and we even detected drops of several types of wax.

[27] *Dalmatins Bible*, National and University Library of Slovenia, NUK 10052.

[28] Ternion: 3 sheets or 3 double leaves, or 6 single leaves or 12 pages.

[29] Quaternion: 4 sheets or 4 double leaves, or 8 single leaves or 16 pages.

The arrangement of the quires is as follows: the block begins with two ternions, followed by a quaternion; quire 4–24 are ternions; quires 25 is an incomplete ternion, since the middle sheet has been torn out. Quire 26–62 are ternions (a leaf has been added between quires 47 and 48); quire 63 is a bifolium; this is followed by a ternion, which we count as quire 64. Between quire 64 and quire 65 (an incomplete bifolium), 26 leaves (presumably five quires) are missing. Quires 66–69 are ternions, after which the sequence is interrupted by a bifolium (quire 70), before continuing from quire 71 to quire 95. The middle leaf of quire 96 has been torn out. The sequence continues with ternions from quire 97 to the last quire, number 114, or a leaf with the original printed pagination St Paul I sheet 114–115; all other leaves of the text block were missing. (Table 1)

Table 1: Dalmatin Bible, 1584. No 09-84, condition before conservation-restoration intervention

Quire	**Original printed pagination (p)**	**Foliation pencil (f)**	**Damage: O: wear P: decay M: stains R: tears**	**Symbols: f – foliation** **Watermarks:** ♠ – spade-shaped ■ – hard to discern crown without A crown with A **SOS: only impression of sieve**	**Remarks**
TITLE PAGE, GERMAN AND SLOVENE FOREWORD					
1	none	1	O, P, M, R	SOS	The entire German foreword and the first leaf of the Slovene foreword are missing.
2	none	2–6	O, P, M, R	3, crown without A 5, crown with A 6, crown with A	
3	none	**7–20**	O, P, M, R	7, crown with A 8, crown without A 10, crown with A 13, 14, 17 and 18, crown without A	quaternion

INDEX					
4	none	21–26	O, P, M, R	SOS	
5	none	27–32	P, M, R	SOS	
6	none	33–38	P, M, R	31, 34, 36 ♠	f. 34, clearly visible watermark
7	none	39–44	P, M, R	SOS	f. 44r full-page print of the Birth of Eve
PERVE MOSESSOVE BVQVE					
8	2–6	45–50	P, M, R	SOS	
9	7–12	51–56	P, M, R	51, ♠	
10	13–18	57–62	P, M, R	SOS	
11	19–24	63–68	P, M, R	SOS	
12	25–30	69–74	P, M, R	69, ♠	
13	31–36	75–80	P, M, R	SOS	
14	37–42	81–86	P, M, R	SOS	
15	43–48	97–92	P, M, R	SOS	
16	49–54	93–98	P, M, R	SOS	
17	55–60	99–104	P, M, R	SOS	
18	61–66	105–111	P, M, R	SOS	
19	67–72	112–117	P, M, R	SOS	
20	73–78	118–123	P, M, R	SOS	
21	79–84	124–129	P, M, R	129, ♠	
22	85–90	130–135	P, M, R	SOS	
23	91–96	136–141	P, M, R	SOS	
24	97–102	142–147	P, M, R	SOS	
25	103–108	148–151	P, M, R	SOS	central sheet 105–106 in the middle of the signature torn out
26	109–114	152–157	P, M, R	SOS	
27	115–120	158–163	P, M, R	SOS	
28	121–126	164–169	P, M, R	SOS	
29	127–132	170–175	P, M, R	SOS	
30	133–138	176–181	P, M, R	181, ■	
31	139–144	182–187	P, M, R	184, ■	
32	145–150	188–193	P, M, R	SOS	
33	151–156	194–199	P, M, R	194, 195, 197, ■	
34	157–162	200–205	P, M, R	SOS	wet-cleaning test
35	163–168	206–211	P, M, R	SOS	
36	169–174	212–217	P, M, R	215, 216, ■	

37	175–180	218–223	P, M, R	219, ■	
38	181–186	224–229	P, M, R	225, ■	
39	187–192	230–235	P, M, R	SOS	
40	193–198	236–241	P, M, R	SOS	
41	199–204	241–247	P, M, R	SOS	
42	205–210	248–253	P, M, R	SOS	
43	211–216	254–259	P, M, R	SOS	
44	(217 missing) 218–222	260–265	P, M, R	SOS	
45	223–228	266–271	P, M, R	SOS	
46	229–234	272–277	P, M, R	SOS	
47	235–240	278–283	P, M, R	SOS	
48	241–246	284–289	P, M, R	280, ■	small printed sheet added between pages 246 and 247
49	247–252	290–295	P, M, R	293, ■?	
50	253–258	296–301	P, M, R	SOS	
51	259–264	302–307	P, M, R	SOS	
52	265–270	308–313	P, M, R	307, ■?	
53	271–276	314–319	P, M, R	SOS	
54	278–281	320–325	P, M, R	SOS	
55	283–288	326–331	P, M, R	328, ■?	clearly visible watermark
56	289–294	332–337	P, M, R	332, ■, 334?, 336?	
57	295–300	338–343	P, M, R	SOS	
58	301–306	344–349		SOS	
59	307–312	350–355	P, M, R	353, 354, ♠	353, clearly visible watermark
60	313–318	356–361	P, M, R		
61	319–324	362–367	P, M, R	363, ■	
62	325–330	368–373	P, M, R	SOS	
63	331–334	374–377	P, M, R	SOS	
SVETI PREROKI V SLOVENSKI IESIK TOLMAZHENI SKUZI IVRIA DALMATINA					
64	none	378–383	P, M, R	SOS	scientific tests
IESAIAS PREROK					26 sheets in total are missing

65	27, 28, 30	384–386	P, M, R	SOS	incomplete signature, just 3 sheets, after rest. between f. 383 and 384 empty leaf added which is connected to f. 386
66	31–36	387–392	P, M, R	SOS	
67	37–42	393–398	P, M, R	SOS	
68	43–48	399–404	P, M, R	SOS	scientific tests
69	49–54	405–410	P, M, R	SOS	scientific tests
70	55–60	411–414	P, M, R	413, ♠	scientific tests leaf 56–57 missing
71	61–66	415–420		SOS	scientific tests
72	67–72	421–426	P, M, R	SOS	scientific tests
73	73–78	427–432	P, M, R	431, ♠	
74	79–84	433–438	P, M, R	SOS	
75	85–89	439–442	P, M, R	441, crown 442, fingerprint	mistake in original printed pagination: 2 x p. 88 and 2 x p. 89
76	2 x 92, 93, none, 95, 96	443–448	P, M, R	443, crown	mistake in original printed pagination: 2 x p. 92, p. 94 missing
77	97–101	449–454	P, M, R	SOS	
78	103–108	455–460	P, M, R	SOS	
79	109–114	461–466	P, M, R	464, 465, crown	
80	115–120	467–472	P, M, R		
81	121–126	473–478	P, M, R	474, crown?	
82	127–132	479–484	P, M, R	482, crown	
83	133–138	485–490	P, M, R	SOS	
84	139–144	491–496	P, M, R	SOS	
85	145–150	497–502	P, M, R	SOS	
86	151–156	503–508		504, crown	
87	157–162	509–514	P, M, R	SOS	
88	163–168	514–520	P, M, R	SOS	
89	168–174	521–526	P, M, R	SOS	
90	175–180	527–532	P, M, R	SOS	
91	181–186	533–538	P, M, R	535, crown	
92	187–192	539–544	P, M, R	541, 543, crown	

93	193–198	545–550	P, M, R	545, 546, 548, crown	
94	199–203, (204 none)	551–556	P, M, R	552, crown? 553, crown 556, crown	Leaf f. 556 is without original printed pagination. f. 556, very clearly visible watermark
95	205–210	557–562	P, M, R	560, crown without A 562, crown with A	f. 562, very clearly visible watermark
NOVI TESTAMENT					
96	none, 2, missing, 4, 5, 6	563–567	P, M, R	SOS	f. 563: scientific tests leaf between f. 564 and f. 565 is torn out
97	7–12	568–573	P, M, R	SOS	
98	13–18	574–579	P, M, R	SOS	
99	19–24	580–585	P, M, R	582?	
100	25–30	586–591	P, M, R	586, ♠	
101	31–36	592–596	P, M, R	SOS	
102	37–42	597–602	P, M, R	SOS	
103	43–48	603–608	P, M, R	SOS	
104	49–54	609–614	O, M, R	609, ♠	
105	55–60	615–620	O, M, R	SOS	
106	61–66	621–626	O, M, R	SOS	
107	67–72	627–632	O, M, R	SOS	
108	73–78	633–638	O, M, R	SOS	
109	79–84	639–644	O, M, R	SOS	
110	85–90	645–650	O, M, R	645, 648, crown without A	
111	91–96	651–656	O, M, R	654, 655, 656, crown without A	
112	97–102	657–662	O, M, R		
113	103–108	663–668	O, M, R	665, 667, 668, crown without A	
114	109–114	669–674	O, M, R	670, 672, crown without A	last surviving signature
At the end of the text block 45 leaves are missing, leaves 115 to 150 of the original printed pagination, and the whole of the unpaginated index.					


Figure 1


Figure 2


Figure 3

2.2. Paper

The leaves of the text block were trimmed to a **size** of 330 x 210 mm. The **weight** of all 674 leaves of the block before the conservation-restoration intervention was 3,027 g.[30]

On all the leaves of the text block, an impression of a screen pattern is visible to the naked eye, with relatively visible impressions of chain lines and less visible laid lines.[31] The traces of laid lines run parallel to the text on all leaves, while the traces of chain lines are always perpendicular to the printed text. The watermark is not always clearly recognisable. When viewed by transparent light, watermarks are visible on 87 leaves. (Table 1). All the watermarks are more or less in the central part of the leaf (Figure 4 and 5).

Four types of watermark appear:

1. a watermark in the shape of a crown with a capital A underneath,[32]
2. a crown without an A, (Figure 4 and 5)
3. a heart with an arrow, and
4. a square symbol that is hard to discern.

Type 1 and 2 are easy to recognise, type 3 is not very well visible and in the case of type 4 is difficult to recognise the datails.

[30] Weighed on a Mettler Toledo Exacta 1200 E3 scale at the CCR.

[31] Hand-made paper is made using a "paper mould", consisting of a wire screen on a wooden frame. The wire screen, made up of closely spaced horizontal "laid lines" and more widely spaced vertical "chain lines", usually featured a device made of slightly thicker wire in the form of a figure or monogram. The impression of this symbol is known as the watermark (Slovene: *vodni znak*, Italian: *filigrana*, French: *filigrane*, German: *Wasserzeichen*).

[32] Briquet, Les Filigranes, No 7934, 1581. Referenznummer: BR 7934, Abmessungen: a 29 w 46 h 44, Datierung(en): 1581, Verwendungsort(e): Luxeuil, Motiv: Lettres de l'alphabet | Lettre A | A majuscule latin 203 x 231 Pixel, 100 dpi = 52 x 59 mm.

Figure 4

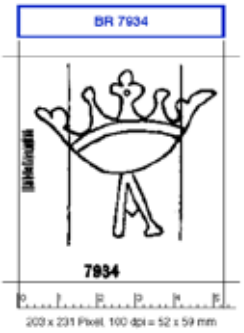

Figure 5

2.3. Positioning of the printing on the paper sheet

The printed single-sheet print space measures 270 x 170 mm. There is 21 mm of unprinted space from the top edge of the leaf (head margin), 20 mm from the outer edge (outer margin), 40 mm from the bottom edge of the leaf (foot margin) and 20 mm from the gutter.[33]

Judging from the impression of laid lines and chain lines, the position of the watermarks, the number of leaves in a section and a comparison with figures from literature. We find that the leaves of the text block were printed in folio size (2º), i.e. four pages to one sheet of paper.[34]

2.4. The binding

The text block was sewn with flax thread to four double bands made of hemp cord with an S-twist, which were badly deteriorated. The initial stitch (is) began in the gutter fold 17 mm from the head (top edge) of the section (T), the first band (1b) was attached 65 from the head, the second (2b) 130 mm from the head, the third (3b) 200 mm from the head, the fourth (4b) 265 from the head and the final stitch (fs) 315 mm from the head. The foot (bottom edge) of the section (B) ended 330 mm from the top edge of the text block.

T	is	1b	2b	3b	4b	fs	B
0	17	65	130	200	265	315	330

[33] Gutter: the middle of a folded sheet.
[34] Gaskel (1985), p. 80-109.

Later, because of frequent use, the sewing system was reinforced with strips of fabric. These strips, which surround the threads connecting the loose signatures, are pulled through to the upper wooden board, where they are simply secured with a double overhand knot.[35] The lower part of the bands was not reinforced in this manner and therefore the lower part of the board with its leather covering has been lost (Figure 3, 4 and 7).

Figure 6

Figure 7

Figure 8

The headbands have also been lost. All that remains of them are traces of impressions on the leather cover and, in part, on the outside edges of the damaged text block (Figure 6).

The hand-made pastedown on the front cover has survived but is badly damaged. The flyleaf that belongs to it has been lost, as has the entire back endpaper. As a result, we are unable to determine with precision the technique used to make it.

The spine of the text block has retained the roundness that was characteristic of the period and the type of binding. A strip of thick linen is pasted over the spine (and over the bands), serving to strengthen the spine and provide an additional connection with the wooden board (Figure 6).

The board in the surviving cover measures 351 x 240 mm and is 10–12 mm thick. It was made from radially cut beech. On the outside of the boards, the upper, lower and frontal central sections of the edges are cut conically to a width of 7 mm. On the inside the boards are cut conically to a width of 12 to 19 mm along the entire top, bottom and frontal edges, and to a width of 9 mm in the dorsal section. The round tunnels through which the bands are pulled are cut 7 mm from the dorsal edge. The bands run into channels on the inside and pass through the tunnels back to the outside of the cover. The frontal edge has two grooves for the fixed part of the brass clasps, positioned 85 mm from the top and bottom edges. The moving part of the clasps is missing. Their dimensions and shape can be concluded from similar surviving clasps from that period.

[35] Internet 1.

The leather covering is from alum-tawed pigskin of a thickness of 0.97 mm. Only the part covering the upper cover and spine survives. The part that covered the lower cover has been lost.

The leather is folded over the edges of the upper cover to the inner side of the boards, where it is trimmed in a straight line. The corner-pieces are damaged, making it impossible to determine their shape.

The decoration of the leather cover contains blind stamps with rolls, linear and flat metal tools.[36] The motif on the upper cover consists of a central image (it is slightly recessed and the impression of the plate is visible), around which various floral ornaments with straight lines are arranged. On the spine, all four main bands and the headbands are emphasised by straight lines. (Figure 6)

The well-conserved rigid brass parts of the clasps on the lateral edge of the front cover indicate that the clasps were of the German type. Modestly decorative straight and circular lines are still clearly visible on the brass. The lower, moving part of the clasps has been entirely lost. (Figure 6)

3. Damages

Judging from the damage to it, the book was used a great deal. Damage is clearly evident both in the binding and on the leaves of the text block. Most of the damage was of a mechanical nature (tears, missing sections, wear). The leaves of the text block also indicate damage due to long exposure to damp (Figure 1, 2, 3 and 6).

3.1. Binding Damages

The lower part of the **cover** (the leather covering and wooden board) is missing. The alum-tawed skin of the binding only survives on the spine and the upper board. The surviving part of the alum-tawed leather covering of the upper board is peeling, cut through in several places, dried-up, darkened and dirty from centuries of accumulated dirt. Its surface structure and decoration are hard to see. In the head and tail sections the turn-ins are damaged or missing. The corner-pieces of the front section are also missing (Figure 3 and 6).

The leather covering has come away along the entire length of the spine and in part across the surface of the wooden board.

[36] The decorations were made with the help of brass fillets, flat and round, on which various decorations were engraved. When these were heated and pressed onto the leather cover.

The skin covering the spine section of the book is cracked across the middle and its surface structure and decoration are hard to see.

The wooden board only survives in the upper part of the cover. It was made from radially cut beech. The board has worn down in the corner sections but the shape of the edges, typical of the sixteenth century, has survived. Although the wooden part of the cover was cut correctly, it was placed on the text block with the tension outwards,[37] which caused great tension in the wood every time the book was closed with the clasps. As well as the above, fluctuations of climate have weakened the structure of the wood and contributed to cracking along the height of the board. Over the centuries, contraction of the wood by 3–4 mm along its width has also occurred.

3.2. Text Block Damages

The damaged text block, which does not show traces of headbands, is sewn with flax thread to four double hemp bands. As a result of external factors (use, fluctuations of climate, etc.), the flax has lost its strength, with the result that in several places the bands are badly damaged or even broken. In order to extend the life of the Bible or allow it to be used further, the upper part of the bands was strengthened in the past with woven strips of linen. (Figure 1, 2 and 3)

Of the system of endpapers, which includes pastedowns and flyleaves, only the two sheets that were pasted to the inside of the upper cover have survived, although they have lost their connection to the text block. The damage follows the damage to the wooden board. The endpaper follows the damage to the wooden board, which is cracked along its entire height. As well as cracks, the endpaper has tears of different sizes and missing sections. All the other parts of the endpapers are missing.

The paper in the text block was damaged as a result of long use and storage in damp premises. The title page and the leaves in the first five and last ten signatures had been most exposed to mechanical damage. In the upper section of the book, practically all the leaves of the text block had suffered decay. Decay was most evident in the leaves of signatures 1–23 and in the last ten signatures. It extended from the upper edge to approximately one quarter of the surface of the leaves (Table 1 and Figure 2 and 3).

[37] The assembly of radial-cut wooden boards must follow the curve of the wood – which indicates its natural growth. The tension must be oriented towards the text block.

In view of such clear damage to the paper of the text block, we decided to carry out a more thorough examination of the paper. This included scientific tests of the state before and after the conservation-restoration intervention.

4. Natural Science Analyses

In the case in question we decided to carry out only the non-destructive and micro-destructive analysis of the text block paper. Regarding the other materials – wood, leather, cords – we obtained sufficient data from an accurate visual examination, and therefore additional scientific tests were not urgently necessary.

Introduction

4.1. Selection of paper samples and testing method

We carried out testing of paper on five quires of the central part text block, containing representative examples of damage to the paper in the book in question. The selected quires and sheets were:

quire 68: sheet 399–404, sheet 400–403, sheet 401–402;
quire 69: sheet 405–410, sheet 406–409, sheet 407–408;
quire 70: sheet 411–414, sheet 412–413;
quire 71: sheet 415–420, sheet 416–419, sheet 417–418;
quire 72: sheet 421–426, sheet 422–425, sheet 423–424;
and
leaf 378 in quire 64 and leaf 563 in quire 96.

We conditioned samples of paper in a standard atmosphere on the basis of SIST ISO 187, at 23°C and 50% relative humidity. We then carried out the following analysis on the selected samples.

4.2. Selected Analysis

1. basic structural characteristics of the paper: grammage (ISO 536), thickness and specific volume (ISO 534),
2. air permeance of the paper: Gurley method (ISO 5636/2),
3. optical characteristics of the paper: whiteness (ISO 2470), yellowing (DIN 6167), opacity and transparency (ISO 2471), light scattering and absorption (ISO 9416),

4. colorimetric characteristics of the paper: brightness and colour properties CIE L*a*b* (ISO 5631),
5. pH value of the paper surface (TAPPI 529; Archives RS, InoLAB pH 720),
6. qualitative microscopic analysis of paper fibres (in detached fragments) – measurement in polarised light at 100x magnification with an optical microscope (ICP – Wild stereo microscope).

4.3. Results & Discussion

The results obtained from the measurements carried out on the selected sheets of paper were compared against each other, both before and after the process of wet-cleaning and consolidation of the paper with starch solution (see chapter 5). Detailed results of the measurements of the physical properties of the paper are presented elsewhere.[38] The main findings are summarised below.

The basic structural and surface properties of paper are defined by grammage, thickness and bulk. We measured all these properties according to the standard procedure on the selected papers.

Before the intervention, the values for the grammage of an individual sheet of paper ranged from 58 to 81 g/m^2. There were considerable fluctuations between sheets – up to 20 g/m^2 – which can be attributed to irregularities in the manufacture of the hand-made sheets of paper. The grammage values for individual sheets after the intervention were slightly lower (by 1 to 2 g/m^2) in all samples. This is probably the consequence of the washing away of dirt and fillers during wet-cleaning.

Before the intervention, values for the thickness of the paper ranged from 120 to 190 μm. Following the intervention the measurements showed no deviations from the values measured before the intervention.

Specific volume shows values of between 1.8 and 2.7 cm^3/g, with considerable differences between sheets. All the papers achieve the desired values in the range 1.5 to 2.5 cm^3/g, indicating a bulky paper type.

Measurement of air permeance using the Gurley method shows that before the intervention all the papers achieve a value of between 3 and 10 seconds, which means that the structure and surface of the paper are permeable to air and sensitive to the action of external factors. After the intervention, the

[38] Černič, Vodopivec (2011), p. 38-42.

values remain unchanged for the majority of sheets, with just two exceptions (sheets 400–403 and 401–402), where permeance falls (8 to 10 s).

Before the intervention all the leaves achieve very low values for paper **smoothness** – from 1 to 2.5 seconds – which means that the surface is very rough; this is characteristic of older hand-made paper. Following the intervention the smoothness increases slightly but the values remain in the low smoothness range.

We measured the whiteness[39] of the paper using a DataColor spectrophotometer. Whiteness values ranged from 40 to 46% for all leaves before the intervention. The lowest values were recorded for leaves with more visible stains, indicating more frequent use. Following the intervention, whiteness increased by 0 to 5%.

Opacity[40] values of the paper varied greatly before the intervention, from 91 to 99%, while transparency values ranged from 5 to 23%, depending on grammage, bulk and the amount of damage to the individual leaf.

Following the intervention the opacity values for the majority of leaves remained unchanged or fell slightly. In the case of individual sheets, the removal of dirt on the surface and in the structure of the leaf resulted in an increase in opacity of up to 5 %, while transparency fell by up to 10% (e.g. in sheet 412–413).

Values for the light scattering coefficient point to considerable differences between papers – those with poorer opacity achieve lower light scattering values, which gives printed paper a poorer appearance. Light scattering coefficient values before the intervention ranged from 30 to 55 m^2/g. Leaves that achieved values lower than 40 m^2/g indicate considerable damage to the paper fibres. Measurements of light scattering and absorption are a very good measure for evaluating the degree of damage to paper.

Since the visual differences between better and worse conserved parts of the paper leaves are considerable, we decided to examine their properties through measurements of colorimetric properties. We measured colour in the CIE L*a*b* colour space in accordance with standards ISO 13655 and ISO 12647-2.

[39] Whiteness is a measure of the reflectance of blue light at a wavelength of 457 nm and is used in determining the optical properties of paper.

[40] Opacity is a measure of the non-transparency of paper, which in today's printed products must be greater than 90%. Higher opacity is a consequence of higher light scattering values, measured using the Kubelka-Munk method, which is favourable for a better quality impression. It depends on the quality of the fibres and fillers used in the paper.

Brightness values (CIE L*) are confirmed by whiteness values. Brightness was around 80% in the worse conserved sections of the paper, and up to 84% in the better conserved sections. Following the intervention the brightness of damaged sections of the paper increased or remained unchanged.

Qualitative microscopic examination of the fibrous structure of the paper in the samples taken from detached fragments of damaged leaves was carried out in the CCR, using a Zeiss Axioskop 40 optical microscope at 100x magnification, Graph C colouring. Comparative analysis of the type of fibres showed that only flax and hemp fibres were used as a raw material to make the paper.[41] Since detached fragments from damaged sections were used for the analysis, damage to the fibres is also visible in the samples (Figure 9).

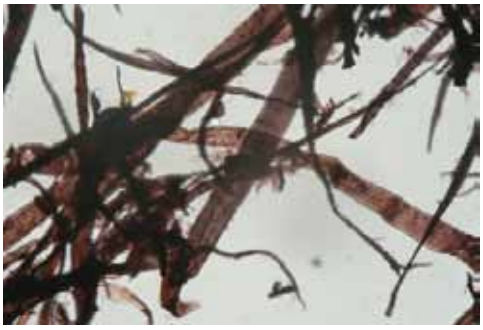

Figure 9

The pH values of the paper surface were measured at the CCR using a SEN TIX SUR flat-head electrode and an InoLAB pH 720 precision pH meter. Measurements were carried out on several leaves and in several places on the same leaf.[42]

The pH values measured on leaf 399 ranged from 4.4 to 4.7 before the intervention, and from 5.9 to 6.2 after the intervention.

On leaf 202 they ranged from 5.0 to 5.3 before the intervention, and from 6.5 to 6.7 after the intervention.

[41] The microscopic image of flax and hemp is similar and therefore we cannot differentiate between them in this way. We can, however, ascertain the presence of other fibres which are structurally different from flax and hemp.

[42] Stanka Grkman, records of measurements, 2010.

5. Conservation Treatment

Before unbinding, we examined the copy of the Bible in detail, catalogued the arrangement of sheets and quires, and created photographic documentation. The original printed pagination did not run uninterruptedly or was missing in some sections. Before beginning the intervention, we therefore numbered (paginated) all the leaves of the text block.

All historical items found in the book were labelled and removed from the text block. Each one was given a serial number and an indication of the page where it was found.

5.1. Separation of the covers from the text block

As a result of loss of adhesiveness of the starch adhesive, the alum-tawed skin had mostly come away from the spine and board. (Figure 7) We reached the bands with just a minor intervention of dry lifting of the leather covering. Untying the overhand knots and carefully pulling the bands from the channels and tunnels separated the text block and the wooden board. We did not separate the still well-conserved alum-tawed covering and solidly fixed immovable parts of the clasps from the front of the wooden board.

In order to conserve as many original elements as possible, we untied the double overhand knot in the final stitch and separated the thread from the interior of the gutter fold of the first quire. We lifted the quires and removed the connecting threads from them. As far as possible, we conserved the threads. The removed threads and bands were labelled and stored. The last part of the Bible was visibly damaged and is therefore particularly sensitive. We attached individual parts of fragments to the quires they belonged to and protected them and stored them temporarily until cleaning of individual leaves of the text block. (Figure 8)

5.2. Dry-cleaning of the leaves of the text block

We dry-cleaned every leaf of the text block with a soft brush, a Magic Rub® eraser, a Wishab® cleaning sponge and a soft eraser (Milan® Oval 1012). To clean cracks we used a Faber-Castell® Perfection 7058B eraser pencil. (Figure 10)


Figure 10


Figure 11


Figure 12

5.3. Wet-cleaning of the leaves of the text block

We were able to remove a lot of dirt and stains through simple wet-cleaning in a water bath. (Figure 11) Before the wet-cleaning process we carried out a test wet-cleaning and measurement of changes in the dimensions of the paper. For the testing of changes of dimensions we selected quire which consists of three sheets (200–205, 201–204 and 202–203).

Changes of size before and after wet-cleaning were measured horizontally along the top edge, middle and bottom edge of the sheet, and vertically on the left edge, middle and right edge of the sheet. We found that the change in size in the vertical and horizontal directions were similar and very small, practically negligible – less than a millimetre.[43]

The dry leaves, backed with Hollytex®,[44] were first moistened with a water spray (Dalia® spray). Wet-cleaning of the leaves was carried out in stainless steel 780 x 650 mm trays in a water bath, to which we added a few drops of NH_4OH.[45] The leaves, placed between two sheets of Hollytex®, were soaked for 15 minutes and then rinsed in running water for 2 minutes. Very damaged leaves were backed with Hollytex® and placed onto moistened thick polyester felt and soaked for 15 minutes and then rinsed in running water for 2 minutes. (Figure 12) After wet-cleaning we coated the drained leaves with a 0.5% solution of a mixture of methylcellulose (MC)[46] and wheat starch,[47] to which we added a buffer in the form of a calcium carbonate ($CaCO_3$) suspension (2

[43] Internal report of the CCR on the intervention on the Dalmatin Bible, 2010–2011.
[44] Hollytex®: non-woven polyester fabric.
[45] For wet-cleaning, tap water at a temperature of approximately 40 ºC was used.
[46] Methylcellulose: Culminal 2000, Hercules.
[47] Wheat starch: Domofix W, Helios.

g/l).[48] The leaves, placed between sheets of Hollytex®, were dried and aligned between cotton cloths and weighted wooden boards (6 kg per pile of 730 x 610 mm boards).

5.4. Tears and Missing Parts

Restoration interventions on the leaves of the text block were carried out using the classic procedure of manual supplementing of missing parts and consolidation of tears. In order to supplement missing parts were used two types of Japanese paper: thicker Japico® Kozo 632-461 (34 g/m²) and thinner Paper Nao® RK 00 (3.6 g/m²).We pasted the tears with thin Paper Nao® RK 1 (8 g/m²), using a mixture of wheat starch and methylcellulose in a ratio of 2 : 1.[49]

All the restored leaves were placed between sheets of Hollytex® and weighted with wooden boards and 6 kg weights. The use of moderate weighting meant that we avoided wrinkling during the drying process and excessive smoothness of the paper and the impression.

5.5. Assembling sheets into quires, preparation of endpapers and bands, sewing

We arranged the restored sheets into their original quires and carefully aligned them along the top edge (head). During preparation of the endpapers and the sewing frame, the stacked quires rested under boards with 6 kg weights. New hand-made paper was selected for the endpapers.[50] The endpaper is a folded bifolium reinforced with aero-linen® and sewn[51] at the gutter fold using No 18 flax thread.

[48] Coating mixture: 500 g water + 2.5 g wheat starch. Prepared as follows: 500 g water + 2.5 g MC are mixed 10 minutes then left to stand overnight so the MC can swell to its full extent. Swelling for 20 minutes at a temperature of approximately 20°C, simmering for 20 minutes at a temperature of approximately 90°C, cooling for 20 minutes at room temperature.

[49] Mixture for pasting: 9% (10 g/100 ml) solution of wheat starch and 2% (2 g/100 ml) solution of MC.

[50] Ruscombe paper mill: Handgeschöpftes restaurier papier, No 2088, approx. 90 g/m², 510 x 695 mm, pH approx. 7.5.

[51] We sewed the endpaper along the entire length of the gutter fold – stitches alternate from inside to outside and from outside to inside at intervals of 1 cm.

The text block was sewn onto four double bands, which owing to deterioration could not be reused. We prepared new bands modelled on the originals. We made them from 18 flax S-twisted warp threads (Figure 13). All four double bands prepared in this way were drawn onto the sewing frame.

Sewing was precisely and entirely modelled on the original sewing, which means that we followed the model both in the choice of threads and the thickness and type of bands, and in the tying technique. Integral[52] sewing begins at the initial stitch from the back of the endpaper, passes to the inside of the binding and continues to the first double band (1v). Here, in the middle of the band, it passes to the outside, where it goes round its right-hand half, and then left and returns to the same stitch. On the inside it repeats its journey to the second (2v), third (3v) and forth (4v) bands and ends at the final stitch (k), where it passes to the next quire. This method of sewing is then repeated for all 114 quires. At the spine, the sewn text block is glued with starch adhesive, but only between the bands. We additionally close-stitched the bands, closely alternating the threads of integral and additional sewing.

5.6. Conservation-restoration of the original board

Before beginning the intervention on the original wooden board, we protected the alum-tawed leather covering against possible damage. Residues of adhesive were cleaned from both wooden parts of the beech board. On the inside of the board we determined the position of the four pegs[53] that will once again unite the two parts of the board into a single whole. Because of the fear of causing new cracks, we arranged pegs of different lengths alternately along the height of the board. The fibres in the wood of the pegs ran diametrically to the fibres in the wood of the board and were only glued into the original beech board up to half of its thickness.

The natural movement of the wood dictates the direction of working of each board, which requires planning, exact angles of cut, boring of holes, cutting of grooves, scraping, sealing, etc. To make the lower board we cut a new well-dried, radially cut piece of beech using the dimensions of the original cover. In the upright position the wood indicated the direction of natural growth and curve, which we took into account when fixing the wooden board to the text block

[52] Integral sewing includes an uninterrupted connection of signatures and bands from the initial stitch (z) to the final stitch (k).

[53] Wooden pegs for fastening wooden parts.

5.7. Attaching the boards to the text block

After preparing the boards in this way, we positioned them on the text block. The connection of the bands to the boards begins on the outside of the rounded spine, then extends through a round hole (tunnel) to the inside of the boards, runs into short hollowed channels on the inside of the board and then passes through another round tunnel to the outside of the board (Figure 13 and 14).

13

14

We anchored the bands in the desired position with the help of starch adhesive and wedge-shaped pieces of alum-tawed pigskin. We adjusted the tension between the text block and the positioned boards to the extent that at the same time as closing the boards we shaped the spine curve of the text block.

We strengthened the spine of the text block with aero-linen®, which also extended below the boards in the upper and lower parts of the text block.

5.8. Headbands

The original headband system was entirely torn off. We inspected the headband systems of a number of other surviving copies of the Bible in libraries in Ljubljana (the National and University Library, the National Museum, the Seminary Library) and found that headbands are not identical among themselves. We therefore decided to make a primary headband with a linen warp and a standard primary trimming. For the trimming we used washed, uncoloured No 18 flax thread.[54] The headband is attached to the text block at

[54] The threads are usually impregnated, but this is not desirable in headbands because of slipping and the closer stitching.

every seventh quire. The basic bands are parted at the ends and glued at an angle of 45° to the outside of the wooden boards.

5.9. Leather covering

For the new covering we chose alum-tawed pigskin, which in terms of the type of animal and method of working is as similar as possible to the skin used in the original. Since new alum-tawed leather is always white in colour, we dyed it a shade lighter than the original shade.[55]

The new skin was cut in such a way that the spine of the animal was parallel to the spine of the book, so that the forces between the skin, the wood, the canvas and the paper were not incompatible. Assembly took place gradually: first the spine with its raised bands, then the covering of the lower board, with intermediate drying at each stage. On the upper board, which still had remnants of the original skin, we shaped a new alum-tawed covering according to the missing part of the original covering and thinned it appropriately.[56] In this way we joined the added and original coverings harmoniously across the surface.

We then made the turn-ins, corner-pieces and headband pieces. Following the traces on the original covering, we inserted a flax cord beneath the skin by the headband pieces and emphasised it. We glued the remains of the leather spine covering to the back of the new leather in the same way as on the cover on the upper board.

5.10. Making the brass clasps

The moving parts of the two brass clasps are based on a contemporary type of clasp with a long narrow brass section and a shorter insert of leather bands. The brass has a similarly modest decoration to the original fixed part.[57] The leather bands are inserted into wooden groves below the covering and fixed by a brass plate which is fastened by little brass nails.

---

[55] The shade was selected from a composed colour spectrum by Lucija Planinc. Dyeing the alum-tawed skin was carried out by Darja Harauer and Lucija Planinc using Enkrasol Ltd colours.

[56] Thinning and adaptation is only ever done to additional materials, never to the originals.

[57] The brass clasps were made by Christoph Stiedl Porenta – Zlato Runo.

After assembling the moving part of the clasps, we pasted the sections of the endpapers with reinforcements to the inside of the wooden board. We also freshened the alum-tawed skin with a conservation coating for leather.[58]

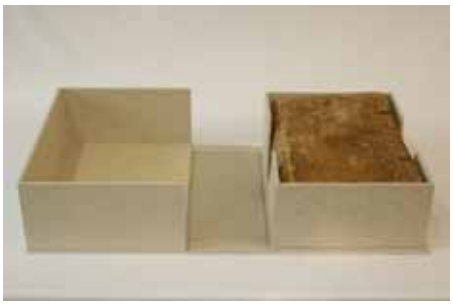

Figure 15

Figure 16

5.11. Protection of the item following the conservation-restoration intervention

We equipped the conserved and restored book with a tailor made box made from archival quality materials. A protective box is essential for every restored book since it keeps it safe during transport and protects it from other external harmful factors**. (**Figure 16) If the book is opened for inspection and reading, or even exhibited open, the covers need to be supported by wage-shaped supports. (Figure 17)

6. Discussion

In view of the importance of the book, the conservation intervention was undoubtedly a major logistical and technical challenge. Before beginning the conservation intervention with which we were faced, we asked ourselves the ethical question of whether it is actually necessary to intervene with such an important book, since every conservation intervention reduces the originality of the original substance.

The book in question is a printed work, not a unique manuscript. According to figures published to date, there are 36 known copies of the book in Slovenia, and at least a further 42 copies outside Slovenia. Half of these are

[58] Lederfett "Russische rezeptur" Best. – No 42 400.

in a relatively good condition. Additionally, copies of two facsimile editions – from 1968 and 1994 – are also available for use. These are faithful copies of the original, at least as regards the content.

After examining our copy of the Dalmatin Bible and consulting with colleagues, we established that in its present condition the book was vulnerable, and that every use of it, no matter how small, would only increase the damage. We therefore decided that we would unbind the book, wet-clean the leaves of the text block, conserve and restore the damaged leaves and reconstruct the original binding.

In view of the importance of the item, we also decided to carry out structural and natural science analyses. The majority of the scientific test methods used to analyse written and graphic heritage come from the graphic industry. In the case of industrial analysis, the quantity of the sample is not usually problematic. We, on the other hand, are rather limited when it comes to taking and selecting samples from items of cultural heritage, and therefore when using these methods it is difficult to follow standards, above all with regard to the quantity and dimensions of samples. The lack of homogeneity of the material is another problem. Even in the case of hand-made paper from the same paper-maker, the differences in properties are considerable. The state of conservation of individual parts of a book can also differ. Thus in the same book some of the paper can be badly damaged, decayed and fragile, while other parts are well conserved and almost undamaged. Because of difficulties of this kind, it is sometimes hard to identify a sample that represents the properties of the paper of the entire text block, and therefore the results given only apply to concretely specified leaves. Comparative analysis of the basic physical properties of the structure and surface, and of the optical and colorimetric properties of the selected sheets of paper from the Dalmatin Bible in question, showed that between individual sheets of paper there are differences in grammage, thickness, bulk, optical and colorimetric properties and damage.

Following the conservation-restoration intervention, the optical and colorimetric properties were improved, as were the properties of the surface of the paper. On the basis of research carried out on a representative sample, we are also able to generalise the results to the text block as a whole.

Given the abundance of stains of various kinds, wet-cleaning was the only effective solution. Wetting the paper during wet-cleaning can cause a sheet of paper to change size. The change depends on the type of paper and the method of drying. We have to be particularly attentive to changes in size when we have to rebind the sheets into the text block and fit the text block back into

the covers. In the case in question the measurements showed that the changes in size following wet-cleaning were negligible, and therefore this procedure was a possible choice.

A review of archive sources and literature revealed that the only information on the paper on which the Bible was printed is contained in the contract with the printer, Seelfisch, where the print run and figures for the paper are given. Unfortunately the research undertaken to date has failed to establish whether the figures given in the contract applied to the quality or the size of the paper. The paper used in our copy of the Bible had various watermarks. More than half of the sheets have no watermark, and we therefore conclude that the figure stated in the contract is more likely to refer to the size of the paper than to the quality. In order to confirm this assumption, however, additional research and examination of the paper in other surviving copies will be necessary.

Thanks to information in the literature on the positioning of the watermarks and the impression of the screen pattern, we are able to state with certainty that the leaves were printed in folio size. After unbinding the text block, we found that the quires were assembled in ternions. This is also confirmed by findings from the literature. The text blocks of the facsimile editions from 1968 and 1994 are assembled in a different way. They contain quaternions gathered into 95 quires.

Although our copy of the Dalmatin Bible is incomplete, we decided not to add reconstructions or copies of the missing leaves. The main reason for this is the fact that it is impossible today to approximate the quality and characteristics of the paper of that time. We decided to conserve the text block in its present extent. Partial reconstruction of missing parts was only carried out on the title page, for aesthetic reasons.

7. Conclusions

A conservation intervention is an opportunity to study in detail the structure and technique of manufacture of an item, and to examine the materials that comprise it. In the case of the copy of the Dalmatin Bible presented here, we find that the existing (incomplete) text block, measuring 330 x 210 mm, consists of 114 quires (113 ternions and one quaternion), sewn on to four double hemp bands fixed to wooden boards via tunnels and channels.

The original headband system was entirely torn off. The cover was dressed in alum-tawed pigskin decorated with blind stamps of rolles, linear and flat metal tools. The rigid parts of two brass clasps of the German type survive on the upper cover. In text block paper the impression of the screen pattern is visible on each sheet of paper, while more than a fifth also have a watermark. We found four different shapes of watermark. The details on the composition of the text block given in the text accompanying the two facsimile editions cannot be connected with the existing condition of the Bible. From the positioning of the impression of the screen pattern and the watermarks, we can establish that the book was printed in folio format, in other words four pages per sheet. Three sheets of paper printed in this way (6 leaves or 12 pages) were gathered to form the individual quire of the text block. The damage to the paper and other materials of the book is the consequence of use and, later, long exposure to damp. For this reason the conservation intervention was necessary, extensive and technically demanding. Comparative analysis of the structure, surface and optical and colorimetric properties of the text block paper showed that these properties have improved following the conservation-restoration intervention. The information on the paper provided in archive sources and literature cannot be connected with the condition ascertained during examination of the structure of the paper and the text block of the Bible in question. Here additional research of other surviving copies of the Dalmatin Bible is undoubtedly necessary.

8. Acknowledgements

First of all we would like to thank Dr Christopher Clarkson for all his knowledge on book conservation transmitted to us during our long cooperation. For help in researching archive sources and literature from the field of Protestantism we would like to thank Dr Lilijana Žnidaršič Golec and Dr Andrej Nared of the Archives of the Republic of Slovenia. We would also like to thank Dr Klementina Možina of the Faculty of Natural Sciences and Technology at the University of Ljubljana for her help in resolving some problems connected with the book printing.

LITERAUTRA

Archives of the Republic of Slovenia (ARS): SI AS 2, Deželni stanovi za Kranjsko, I. reg., šk. 88. 54/2), sn. 3, str. 319–322.

Berčič, Branko. Tiskarstvo na Slovenskem – Zgodovinski oris = Printing in Slovenia – A Historical Review. Ljubljana : Odbor za proslavo 100-letnice grafične organizacije na Slovenskem, 1969, pp. 34–53.

Berčič, Branko (ur.). O nastajanju Dalmatinove Biblije, Biblia, tu ie, vse Svetu pismu, Stariga inu Noviga testamenta = Bibel, das ist, die gantze heilige Schrifft : windisch (Monumenta litterarum Slovenicarum). Special edition. In Ljubljana : Mladinska knjiga; from Munich: R. Trofenik, 1968, pp. 152-262.

Briquet, Les Filigranes, No 7934, http://www.ksbm.oeaw.ac.at/scripts/php/BR.php (accessed 12 December 2011).

Clarkson, Christopher. The Conservation of Early Books in Codex Form:

A personalApproach: Part 1. The Paper Conservator 1978, Vol. 3 pp. 33-50.

Clarkson, Christopher. The Safe Handling and Display of Medieval Manuscripts and Early Printed Books. Conference (Slovenia), July 1996. Ed. Jedert Vodopivec & Natasa Golob, The Archives of the Republic of Slovenia. 1996, pp141-188.

Clarkson, Christopher. Minimum intervention in treatment of books, Pre-prints, 9th.

IADA-Congress, Copenhagen, August 16-21, 1999.

Černič, Meta; Vodopivec Tomažič, Jedert: Dalmatinova Biblija – Karakterizacija fizikalnih lastnosti papirja in tiska = Dalmatin's bible - characterization of paper and print on the book block. Papir, XXXIX, 6, (2011), pp. 38–42.

Dimitz, August: Geschichte Krains von der *ältestenZeit* bis auf das Jahr 1813, Dritter Theil: Vom Regierungsantritte Erzherzog Karls in Innerösterreich bis auf Leopold I. (1564–1657), Ljubljana, Kleinmayr & Bamberg.(1875) pp. 184-211.

Gaskel, Philip: A New Introduction to Bibliography – The Hand-Press Period 1500–1800, Oxford University Press 1972, Oxford, (1985), pp. 1–185.

Glavan, Michael (ed.) (1994): Biblia, tu je, vse Svetu pismu, Stariga inu Noviga testamenta = Bibel, das ist, die gantze heilige Schrifft : windisch. Facsimile. Ljubljana, Mladinska knjiga, (1994), accompanying text, no numeration.

Glavan, Michael: Slovenski faksimile v 19. in v prvi polovici 20. stoletja: predmoderni faksimile. Knjižnica, 48, 4, (2004), pp. 7–36, http://revija-knjiznica.zbds-zveza.si/Izvodi/K0404/glavan.pdf.

Internet 1: http://veja-iv.skavt.net/modules/Skavtski%20vozli/skavtski%20vozli.htm (accessed: 6 March 2012).

Kovač, Anton: Valuable Books, Incunabula & Manuscripts, Slavica Verlag, Munich, (2010), p. 11–12.

Licul, Miljenko: Computer print with reproduction of the title page of the copy kept in the Pforta library, with dedications by Dalmatin and Bohorič, Embassy of the Republic of Slovenia in the Federal Republic of Germany, 8 February 2006.

Rajhman, Jože: Pisma slovenskih protestantov = Briefe der slowenischen Protestanten (Korespondence pomembnih Slovencev, 11). Ljubljana: Slovenska akademija znanosti in umetnosti: Znanstvenoraziskovalni center SAZU, Inštitut za slovensko literaturo in literarne vede, Ljubljana, (1997), 346 p.

Rajhman, Jože; Rigler, Jakob: Enciklopedija Slovenije. Ljubljana, s.v. "Dalmatin, Jurij", (1988). p. 170.

Rozman, France: Enciklopedija Slovenije. Ljubljana, s.v. "Biblija". Ljubljana, (1987) p. 261.

Rupel, Mirko: Primož Trubar – *Življenje* in delo = Primož Trubar – Life and Work, Ljubljana, Mladinska knjiga, (1962) 204 p.

Šulek, Nina: Vodni znaki zgodnjega 15. stoletja v testamentih, hranjenih v Pokrajinskem arhivu Koper – Enota Piran, Arhivi, 26/1, (2004), pp. 37-46.

Tóth, Zsuzsanna; Koppán Orsolya; Papp. Jjudith; Érdi, Marianne: Restoration of a Unique Hungarian Medieval Codex Based on Results of Recent International Research and on a New Restoration Technique. New approaches to book and paper conservation-restoration. Horn; Vienna: Berger, (2011), pp. 331-356.

Trofenik, Rudolf (ed.): Abhandlung über die Slowenische Reformation, Band I, Munich, Rudolf Drofenik (1968) 266 p.

Vodopivec, Jedert: Vezave srednjeveških rokopisov: Strukturne prvine in njihov razvoj = Medieval bindings in Slovenia : binding structures on stiff-board manuscripts. Ljubljana, Arhiv Republike Slovenije, 1999. 562 p.

Umek, Ema (ed.): Odsevi reformacijskega gibanja v dokumentih Arhiva SR Slovenije 0 reflection of the reformation in ducument of Archives SR of Slovenia, Katalogi, zvezek 5, Arhiv SRS, Ljubljana, (1987), 100 p.

Vodopivec, Jeder et al: Dalmatinova Biblija 1584: Analiza strukture in papirja ter konserviratorsko-restavratorski poseg = The Dalmatin Bible of 1584: analysis of structure and paper and conservation-restoration. Vars. spomenikov, 2012 (in print)

Vuk, Vili: Dalmatinovo in Bohoričevo posvetilo – novo odkritje: izvirnik Dalmatinove Biblije na deželni šoli Pforta v Nemčiji, Večer, Friday 20 May 2005, p. 14, Kultura in šolstvo.

Zadnikar, Andrej: Vodni znaki na papirju do leta 1800 = Water marks in paper until 1800, Arhivi, XXI, (1998), pp. 59–62.

Figure captions

1. The Dalmatin Bible with title page, condition on receipt (Photo Archive of the CCR; photo: Lucija Planinc)
2. The Dalmatin Bible open (leaves 252 verso and 253 recto), condition on receipt (Photo Archive of the CCR; photo: Lucija Planinc)
3. Back of the closed Dalmatin Bible with damage to text block and binding, condition on receipt (Photo Archive of the CCR; photo: Lucija Planinc)
4. Front and spine of the closed Dalmatin Bible with damage to binding, condition on receipt (Photo Archive of the CCR; photo: Lucija Planinc)
5. Separation of the covers from the text block during the unbinding process (Photo Archive of the CCR; photo: Lucija Planinc)
6. Separation of individual signatures from the text block during the unbinding process (Photo Archive of the CCR; photo: Lucija Planinc)
7. Microscopic image of paper fibres in the Dalmatin Bible (100x enlargement), (Photo Archive of the CCR; photo: Marjana Cjuha)
8. Screen pattern impression and position of watermark (detail), (Photo Archive of the CCR; photo: Lucija Planinc)
9. A watermark in the form of a crown resting on a capital letter A is one of the four identified watermarks in the paper of the text block of this copy of the Dalmatin Bible (Briquet, Les Filigranes, No 7934, 1581).
10. Dry-cleaning of paper sheets with typical stains on the upper edge of the leaves (Photo Archive of the CCR; photo Lucija Planinc)
11. Wet-cleaning of paper sheets in a water bath (Photo Archive of the CCR; photo Lucija Planinc)
12. Rinsing paper sheets during wet-cleaning (Photo Archive of the CCR; photo Lucija Planinc)
13. Attaching the boards to the text block (Photo Archive of the CCR; photo Mateja Kotar)
14. Fixing the alum-tawed bands to the board (Photo Archive of the CCR; photo Mateja Kotar)
15. The Dalmatin Bible in a made-to-measure protective box, which is essential for every restored book since it keeps it safe during transport and protects it from external harmful factors (Photo Archive of the CCR; photo: Lucija Planinc)
16. The Dalmatin Bible with title page, condition after completion of the intervention (Photo Archive of the CCR; photo: Lucija Planinc)