

BIONUMERICS Tutorial: Importing spoligo typing data

1 Introduction

Spacer oligonucleotide typing (spoligotyping) is widely used for differentation of *Mycobacterium tuberculosis* bacteria. With this method the DR region is investigated: this region consists of multiple copies of a conserved directly repeated 36 bp sequence (DR), separated by multiple non-repetitive (43) spacer sequences. Different *Mycobacterium tuberculosis* strains have various complements of these 43 spacers and form the basis of the spoligo typing assay.

Different systems are in use for the designation of spoligo type patterns. In this tutorial the import of following spoligo information is covered:

- Import of the spoligo type patterns as a 43-digit binary code stored in an external file (see 2).
- Import of the octal codes from an external file and conversion to the 43-digit binary code (see 3).

The data files used in this tutorial can be downloaded from https://www.applied-maths.com/
download/sample-data (click on "Spoligotyping data").

2 Import of 43 digit Spoligo codes

2.1 Preparing the database

1. Create a new database (see tutorial "Creating a new database") or open an existing database.

Since we will be importing the spoligo data as character data, we will first create a character type to hold this data. The steps below can be skipped if a suitable character type is already present in the database.

2. In the *Main* window, click on + in the toolbar of the *Experiment types* panel and select *Character type* from the list. Press <*OK*>.

The New character type wizard prompts you to enter a name for the new character type.

3. Enter a name, for example "Spoligo" and press < *Next*>.

In the next step of the wizard, the choice is offered between *Numerical values* and *Binary data*.

4. Choose Binary data.

After pressing <*Next*> again, the wizard asks if the character type has an open (*Yes*) or closed (*No*) character set.

5. Make sure *No* is selected and press the *<Finish>* button to complete the setup of the new character type.

The *Experiment types* panel now lists the new character type **Spoligo**.

2.2 Import wizard

In this section, we will import data from the text file SpoligoBinary.txt (see Figure 1). This text file contains a unique strain identifier in the first column (*Key*) and the binary spoligo data in the 43 other columns.

/ Sp	oligoBina	ary.txt - Note	pad																— C	X
<u>File</u>	Edit F <u>o</u> r	mat <u>V</u> iew	<u>H</u> elp																	
Key	Sp1	Sp2	Sp3	Sp4	Sp5	Sp6	Sp7	Sp8	Sp9	Sp10	Sp11	Sp12	Sp13	Sp14	Sp15	Sp16	Sp17	Sp18	Sp19	Sp20 🔥
MT001	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1
MT002	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
MT003	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MT004	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MT005	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MT006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MT007	1	1	1	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	1	1
MT008	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1
MT009	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
MT010	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
MT011	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MT012	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MT013	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MT014	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
MT015	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1
MT016	0	0	0	0	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1
MT017	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
MT018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MT019	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
MT020	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MT021	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MT022	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1
MT023	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MT024	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MT025	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MT026	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
																				~
<																				>

Figure 1: Text file containing binary spoligo data.

- 6. Select *File* > *Import...* (, Ctrl+I) to open the *Import* dialog box.
- 7. Choose the option *Import fields and characters (text file)* under the *Character type data* item in the tree and press <*Import*> (see Figure 2).
- 8. Press <**Browse**> and browse for the downloaded SpoligoBinary.txt file. Next, press <**Open**> and press <**Next**>.

As this is the first time we import character data from a text file into the database, we need to create a new import template by specifying *Import rules*.

 Select "Key" in the list and click < *Edit destination*> or simply double-click on "Key". Select "Key" as the BIONUMERICS destination field in the *Edit data destination* dialog box and press <*OK*> (see Figure 3).

The information in the grid is updated.

- Make a multiple selection for all 43 rows. Do this by selecting "Sp1" and while holding the Shift-key, click on "Sp43". Press < *Edit destination*>, select the character type Spoligo as destination under *Character value* and click < *OK*> (see Figure 4).
- 11. Press < OK > and then < Yes > to confirm the creation of new characters.

The grid panel is updated (see Figure 5).

12. Press < *Preview* > to see what you are about to import (see Figure 6).

Import	? ×
Import data Select the kind of data to import:	Import character and optionally database information from text files and link to new or existing database entries. Each file should contain a well-defined table where a row corresponds to an entry and where columns correspond to characters (and database fields). The header of the table should contain the character names (and the database information field names).
	Import Close

Figure 2: The Import dialog box.



Figure 3: Edit data destination.

Edit data destination	?	\times
e <none> e Entry info field e Entry info field e Character value e Spoligo e Character mapping e Character set info field</none>	f	*
ок	Car	ncel

Figure 4: Link to Spoligo character experiment.

- 13. Press the *<Close>* button to close the preview and press *<Next>* to proceed to the *Import links* dialog box.
- 14. Make sure "Key" is checked in the *Import links* step and press <*Finish*>.

Source type	Source	Destination type	Destination	
File field	Кеу	Entry information	Кеу	
File field	Sp1	Character value : Spoligo	Sp1	
File field	Sp2	Character value : Spoligo	Sp2	
File field	Sp3	Character value : Spoligo	Sp3	
File field	Sp4	Character value : Spoligo	Sp4	
File field	Sp5	Character value : Spoligo	Sp5	
File field	Sp6	Character value : Spoligo	Sp6	
File field	Sp7	Character value : Spoligo	Sp7	
File field	Sp8	Character value : Spoligo	Sp8	
File field	Sp9	Character value : Spoligo	Sp9	
File field	Sp10	Character value : Spoligo	Sp10	
File field	Sp11	Character value : Spoligo	Sp11	
File field	Sp12	Character value : Spoligo	Sp12	
Cile field	Sn13	Character value : Spolico	Sp13	

Figure 5: Import rules.

revie	w								?	×	(
Nr.	Кеу	Sp1	Sp2	Sp3	Sp4	Sp5	Sp6	Sp7	Sp8	Sp9	1
1	MT001	1	0	1	1	1	1	1	1	1	
2	MT002	1	0	0	0	0	0	0	0	0	
3	MT003	1	0	1	1	1	1	1	1	1	
4	MT004	1	0	1	1	1	1	1	1	1	
5	MT005	1	1	1	1	1	1	1	1	1	
6	MT006	1	1	1	1	1	1	1	1	1	
7	MT007	1	1	1	1	1	1	0	0	0	
8	MT008	1	1	1	1	1	1	1	1	1	
9	MT009	1	1	1	1	1	1	1	1	1	
10	MT010	0	0	0	0	0	0	0	0	0	
11	MT011	1	1	1	1	1	1	1	1	1	
12	MT012	1	1	1	1	1	1	1	1	1	
13	MT013	1	1	1	1	1	1	1	1	1	
14	MT014	1	1	1	1	1	1	1	1	1	
15	MT015	1	1	0	1	1	1	1	1	0	
16	MT016	0	0	0	0	1	1	1	1	1	
17	MT017	1	1	1	1	1	1	0	1	1	
18 <	MT018	1	1	1	1	1	1	1	1	1	1

Figure 6: Preview.

The import template needs to be saved to be able to use it again later on.

- 15. Enter a *Name* for the import template (e.g. "Spoligo binary data") and optionally a *Description*. Next, press <*OK*>.
- In the *Import template* wizard page, the new template is added and is automatically selected (see Figure 7). Click < *Next*>.

In case there are no entries present with the same key as in the external file, the *Database links* wizard page will indicate that 35 new entries will be created during import (see Figure 8).

Import fields and characters		?	×
Import template Specify how to import data into	the database.		
Import templates:			
Spoligo binary data	Spoligo binary data	Create new	
		Edit	
		Preview	
		Сору	
		_	
	< Back Next >	Cance	el

Figure 7: Import template.

Import fields and characters	?	×
Database links Link the imported records to database entries. Double click on a cell to get an overview.		
Overview In 'All levels' Image: Constraint of the second sec		
< Back Finish	Can	ncel

Figure 8: Add 35 new entries.

17. Press < *Finish*> to start the actual import. The progress of the import is shown while database information is added to the BIONUMERICS database.

The entries are displayed in the *Database entries* panel and all entries are automatically selected. The character data is stored in the character type **Spoligo** (see Figure 9).

18. Click on a green colored dot in the *Experiment presence* panel to open the experiment card for an entry.

The values are displayed as a "plate" with one column. The "0" values have a white color, the "1" values are colored in black.

19. Hover over the experiment card with the mouse.

The key of the entry is shown and the name and value of the character being pointed at.

- 20. Click in the upper left corner of the card to close the card.
- 21. To view the values in a list, double-click on the experiment **Spoligo** in the *Experiment types* panel, select **Settings** > **General settings...** (1), select the *Experiment card* tab and change the representation to **List**. Close the two windows.
- 22. Click on a green colored dot in the *Experiment presence* panel to open the experiment card for an entry.

Import spoligotyping data - BioNumerics					– 🗆 ×
File Edit Database Analysis Scripts Window Help					
Experiment types	Database entries		Con	nparisons	
	∄ + 👌 ⊗ 🔩 😫	All Entries>	ן ט 	⊢ᄚ⊗ឩ៲ឩ ∝	<all comparisons=""></all>
# Name Type 🗸	Key Level	Modified date 🚽 1		Name Modified date	Level 🔻
1 Spoing Character types	MT001	2020-04-14 13:16:49	^		^
	MT002	2020-04-14 13:16:49			
(MT003	2020-04-14 13:16:49		1	Ň
````	MT004	2020-04-14 13:16:49 •			<i>,</i>
Entry fields Database design	MT005	2020-04-14 13:16:49	Ident	tification projects Decision networks	
	MT006	2020-04-14 13:16:49	5		
	MT007	2020-04-14 13:16:49	7=		S SAI Menuno
Name Field type	MT008	2020-04-14 13:16:49		Name Modified date	•
	мтоо9	2020-04-14 13:16:49 •			
	MT010	2020-04-14 13:16:49			
	MT011	2020-04-14 13:16:49 •			
	MT012	2020-04-14 13:16:49 •			
Fingerprint files Power assemblies Annotations	MT013	2020-04-14 13:16:49 •	Align	nments BLAST projects Chromosome comp	arisons
□ + PA ⊗ B   Ch マ. <all fingeron<="" td=""><td>MT014</td><td>2020-04-14 13:16:49</td><td>-</td><td></td><td><all alignments=""></all></td></all>	MT014	2020-04-14 13:16:49	-		<all alignments=""></all>
	MT015	2020-04-14 13:16:49			
File name Experiment type Link 🔻	MT016	2020-04-14 13:16:49 •		Name Modified date	•
^	MT017	2020-04-14 13:16:49			
×	MT018	2020-04-14 13:16:49			
< >>	≤ <	> *	~		
Database: Import spoligotyping data (_DefaultUser_) Entries: Loaded=3	5, View=35, Selected=35 1 experiments	C:\Users\Public\Documents\BioNumerics\Data BN8\l	mport spoligotyping data Th	is is a time limited package valid until 2020-12-3	

Figure 9: The Main window after import of the data.

The imported values are now displayed in a list (see Figure 10).

Character	Value	Mapping	•
Sp1	1	<+>	^
Sp2	0	<->	
Sp3	1	<+>	
Sp4	1	<+>	
Sp5	1	<+>	
Sp6	1	<+>	
Sp7	1	<+>	
Sp8	1	<+>	
Sp9	1	<+>	
Sp10	1	<+>	
Sp11	1	<+>	
Sp12	1	<+>	~

Figure 10: Character experiment card.

23. Close the experiment card by clicking in the left upper corner of the card.

Information about the follow-up analysis of binary data sets in BIONUMERICS can be found in the tutorial "Clustering a binary data set", available on the Applied Maths website.

### 3 Import and conversion of octal Spoligo codes

### 3.1 Preparing the database

1. Create a new database (see tutorial "Creating a new database") or open an existing database.

Octal spoligo codes will be imported and stored in an information field (see 3.2), and a conversion script will convert the octal spoligo codes to the original binary patterns and store these patterns in a character type experiment (see 3.3).

We will first create a character type to hold this data. The steps below can be skipped if a suitable character type is already present in the database.

2. In the *Main* window, click on + in the toolbar of the *Experiment types* panel and select *Character type* from the list. Press <*OK*>.

The New character type wizard prompts you to enter a name for the new character type.

3. Enter a name, for example "Spoligo" and press < *Next*>.

In the next step of the wizard, the choice is offered between *Numerical values* and *Binary data*.

#### 4. Choose *Binary data*.

After pressing < *Next*> again, the wizard asks if the character type has an open (*Yes*) or closed (*No*) character set.

5. Make sure *No* is selected and press the *<Finish>* button to complete the setup of the new character type.

The *Experiment types* panel now lists the new character type **Spoligo**.

- 6. Double-click on the **Spoligo** experiment in the *Experiment types* panel to call the *Character type* window.
- 7. Select *Characters* > *Add array of characters...* and specify **43** as the number of rows and **1** as the number of columns.

43 characters are now listed in the Character type window (see Figure 11).

ڪ آ	paracter type 'Spoligo'				_	П	×
	anderer type opoligo						~
File S	Settings Characters	Fields Mapping V	Vindow Help				
Ē	]   부부 부댢 부╦						
Char	acters						
+	⊗ 🛃 🗠	⊠×   ↑ ↓	All Characters>	ບ			
	Character	Enabled	Min.	Max.	Color scale		•
	1-1	×	0	100			^
	2-1	×	0	100			
	3-1	×	0	100			
	4-1	×	0	100			
	5-1	×	0	100			
	6-1	×	0	100			
	7-1	×	0	100			
	8-1	×	0	100			
	9-1	×	0	100			~
Chara	acters Mapping						
Com	parison settings						
Sp	oligo settings						
Sp	oligo: binary values, cl	osed data set (43 cha	aracters)				
							$\sim$
	sempanoon						
Comp	arison settings Crossli	inks Attachments					
Character type Spoligo Characters in view=0							

Figure 11: The Character type window.

8. Close the *Character type* window.

#### 3.2 Import wizard

In this section, we will import data from the text file SpoligoOctal.txt (see Figure 12). This text file contains a unique strain identifier in the first column (*Key*) and the octal spoligo code in the second column (*Octal*).

9. Select *File* > *Import...* (, Ctrl+I) to open the *Import* dialog box.

🧾 Spo	ligoOctal.txt - Notepad	_	×
<u>F</u> ile <u>E</u> o	dit F <u>o</u> rmat <u>V</u> iew <u>H</u> elp		
Кеу	Octal		
MT036	577767777760600		
MTØ37	200010003760371		
MT038	73777777770171		
MT039	577777777700771		
MT040	77777777770371		
MT041	77777777770171		
MT042	770020777760771		
MT043	777757777770371		
MT044	777777677774160		
MT045	000020007760771		
MT046	77777777770371		
MT047	77777777764171		
<			>

Figure 12: Text file containing octal spoligo codes.

10. Choose the option *Import fields (text file)* under the *Entry information data* item in the tree and press <*Import*> (see Figure 13).

Import	? ×
Import data Select the kind of data to import: 	Import information fields from text files and link to new or existing database entries. Each file should contain a well-defined table where a row corresponds to an entry and where columns correspond to information fields. The header of the table should contain the information field names. Manage import templates
	Import Close

Figure 13: The Import dialog box.

11. Press < *Browse* > and browse for the downloaded SpoligoOctal.txt file. Next, press < *Open* > and press < *Next* >.

As this is the first time we import entry information from a text file into the database, we need to create a new import template by specifying *Import rules*.

 Select "Key" in the list and click < *Edit destination*> or simply double-click on "Key". Select "Key" as the BIONUMERICS destination field in the *Edit data destination* dialog box and press <*OK*> (see Figure 14).

The information in the grid is updated.

- Select "Octal" from the list, press < *Edit destination*>, select "Create new" as destination under *Entry info field* and click < *OK*>.
- 14. Press *<OK>* and then *<Yes>* to confirm the creation of the new information field.

The grid panel is updated (see Figure 15).

15. Press < *Preview* > to see what you are about to import (see Figure 16).



Figure 14: Edit data destination.

File field File field	Key Octal	Entry information Entry information : Entry info field	Key Octal	
File field	Octal	Entry information : Entry info field	Octal	
Edit destination				
Preview				
Preview Show advanced	options			
Preview Show advanced	options			
Preview Show advanced	options			
Preview Show advanced	options			
Preview Show advanced	options			
Preview Show advanced	options			
Preview Show advanced	options			



- 16. Press the *<Close>* button to close the preview and press *<Next>* to proceed to the *Import links* dialog box.
- 17. Make sure "Key" is checked in the *Import links* step and press <*Finish*>.

The import template needs to be saved to be able to use it again later on.

- Enter a *Name* for the import template (e.g. "Spoligo octal code") and optionally a *Description*. Next, press < *OK* >.
- In the *Import template* wizard page, the new template is added and is automatically selected (see Figure 17). Click < *Next*>.

In case there are no entries present with the same key as in the external file, the *Database links* wizard page will indicate that 35 new entries will be created during import (see Figure 18).

20. Press < *Finish*> to start the actual import. The progress of the import is shown while database information is added to the BIONUMERICS database.

evie	w		?
Nr.	Кеу	Octal	
1	MT036	577767777760600	
2	MT037	200010003760371	
3	MT038	73777777770171	
4	MT039	57777777700771	
5	MT040	777777777770371	
6	MT041	777777777770171	
7	MT042	770020777760771	
8	MT043	777757777770371	
9	MT044	77777677774160	
10	MT045	000020007760771	
11	MT046	777777777770371	
12	MT047	77777777764171	
13	MT048	77777777760771	
14	MT049	777777637770371	
15	MT050	75757677777740	
16	MT051	037637777760771	
17	MT052	775777702770371	
18	MT053	77777777774171	
19	MT054	77377774760771	



Import fields		? ×
Import template Specify how to import data into	the database.	
Import templates:		
Spoligo octal code	Spoligo octal code	Create new
		Edit
		Preview
		Сору
	< Back	Next > Cancel

Figure 17: Import template.

Import fields	?	×
Database links Link the imported records to database entries. Double click on a cell to get an overview.		
Overview       In 'All levels'       Image: Create 35 entries       and image: Update 0 entries         Image: Select modified entries       Select modified entries		
< Back Finish	Can	cel

Figure 18: Add 35 new entries.

The entries are displayed in the *Database entries* panel and all entries are automatically selected. The octal codes are stored in the *Octal* entry information field (see Figure 19).

Import spoligotyping data 2 - BioNumerics		- 🗆 ×
File Edit Database Analysis Scripts Window Help		
ki ⊙ 12, III (C) 12,		
Experiment types	Database entries	Comparisons
	£] + [Å ⊗ €,   € ▽ <all entries=""></all>	+ 🗗 🛛 🗟 । 🔓 🗵
# Name Type 🗨	Key Modified date Octal 🗨 1	Name Modified 🗸 🗸
1 Spoligo Character types	MT036 2020-04-14 14:29:57 577767777760600	A
	MT037 2020-04-14 14:29:57 200010003760371	
	MT038 2020-04-14 14:29:57 7377777770171	×
Ŷ	MT039 2020-04-14 14:29:57 57777777700771	< >
Entry fields Database design	MT040 2020-04-14 14:29:57 7777777770371	Identification projects Decision networks
	MT041 2020-04-14 14:29:57 7777777770171	
+ 🗁 ⊗ 🔩 👘 🖾 ↑ ↓ <all entry="" fields=""></all>	MT042 2020-04-14 14:29:57 770020777760771	
Name Field type 🗨	MT043 2020-04-14 14:29:57 77775777770371	Name Modified 🗸 🔻
Victal Fixed	MT044 2020-04-14 14:29:57 77777677774160	^
	MT045 2020-04-14 14:29:57 000020007760771	
	MT046 2020-04-14 14:29:57 7777777770371	· · · ·
	MT047 2020-04-14 14:29:57 7777777764171	
Fingerprint files Power assemblies Annotations	MT048 2020-04-14 14:29:57 7777777760771	Alignments BLAST projects Chrom. Comp.
	MT049 2020-04-14 14:29:57 77777637770371	
All Fingerprint files>	MT050 2020-04-14 14:29:57 75757677777740	
File name Experiment type Link 💌	MT051 2020-04-14 14:29:57 037637777760771	Name Modified 🖝
^	MT052 2020-04-14 14:29:57 775777702770371	^
	MT053 2020-04-14 14:29:57 7777777774171	
· · · · · · · · · · · · · · · · · · ·	MT054 2020-04-14 14:29:57 773777774760771	× ×
>	✓ < > <	> < >
Database: Import spoligotyping data 2 ( DefaultUser ) Entries: Loaded=35 View=	5. Selected=35 1 experiments C:\Users\Public\Documents\BioNumerics\Data BN8\	mport spolicotyping data 2 This is a time limited packar

Figure 19: The Main window after import of the data.

### 3.3 Conversion

- 21. In the Database entries panel of the Main window select all entries containing an octal code that you wish to convert to the 43 digit spoligo code. To select all entries at once, make sure the Database entries panel is the active panel and select Edit > Select all (Ctrl+A).
- 22. Select **Scripts** > **Run script from file...**, navigate to the downloaded and unzipped Spoligotyping data folder and select the script ConvertSPOLIGOcode.BNS.

SPOLIGO-code convertor	?	$\times$
Save character file as (optional):		
Select SPOLIGO character type:		
Spoligo	$\sim$	
Select the Information field that contains the SPOLIGO code:		
OCTAL	$\sim$	
Use selected entries only	ОК	
	Cance	el 🛛

Figure 20: Conversion dialog.

- 23. Select the *Character type* that will hold the 43 digit code after conversion of the data. In our example, make sure *Spoligo* is selected.
- 24. Select the *Information field* that contains the octal code. In our example, make sure *Octal* is selected.
- 25. Check the option **Use selected entries only** to apply the script only on the selected entries in the database. When this option is unchecked, all entries in the database will be included in the conversion action.

26. Press < OK > to run the script.

The 43 digit codes are stored in the character type **Spoligo** (see Figure 21).

Import spoligotyping data 2 - BioNumerics		- 🗆 ×
File Edit Database Analysis Scripts Window Help		
Experiment types	Database entries	Comparisons
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Entry fields Database design	MT040 2020-04-14 14:29:57 7777777770371 •	Identification projects Decision networks
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+ 🖄 ⊗ 🔩 I 🛍 🖾 ↑ ↓ <all entry="" fields=""></all>	MT042 2020-04-14 14:29:57 770020777760771 •	29 + 12 ⊗ 6, 1 61
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Database: Import spoligotyping data 2 (_DefaultUser_) Entries: Loaded=35, View=	, Selected=35 1 experiments C:\Users\Public\Documents\BioNumerics\Data BN8\In	port spoligotyping data 2 This is a time limited packar

Figure 21: The Main window after import of the data.

27. Click on a green colored dot in the *Experiment presence* panel to open the experiment card for an entry.

The values are displayed as a "plate" with one column. The "0" values have a white color, the "1" values are colored in black.

28. Hover over the experiment card with the mouse.

The entry Key is shown and the name and value of the character being pointed at.

- 29. Click in the upper left corner of the card to close the card.
- 30. To view the values in a list, double-click on the experiment **Spoligo** in the *Experiment types* panel, select **Settings** > **General settings...** (11), select the *Experiment card* tab and change the representation to **List**. Close the two windows.
- 31. Click on a green colored dot in the *Experiment presence* panel to open the experiment card for an entry.

The imported values are now displayed in a list (see Figure 22).

32. Close the experiment card by clicking in the left upper corner of the card.

Information about the follow-up analysis of binary data sets in BIONUMERICS can be found in the tutorial "Clustering a binary data set", available on the Applied Maths website.

Character	Value	Mapping	•
1-1	1	<+>	^
2-1	0	<->	
3-1	1	<+>	
4-1	1	<+>	
5-1	1	<+>	
6-1	1	<+>	
7-1	1	<+>	
8-1	1	<+>	
9-1	1	<+>	
10-1	1	<+>	
11-1	1	<+>	
12-1	1	<+>	~

Figure 22: The character experiment card.