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BIOTA Base

Short Manual

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Acknowledgement

We are greatly indebted to many friends, colleagues, and other persons who inspired the software development for BIOTA AFRICA and who helped and are still helping to create and improve it, especially (in alphabetical order):

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Notes and remarks regarding the BIOTABase software and this Short Manual are always very welcome and should be directed to gerhard.muche@botanik.uni-hamburg.de and/or mfinckh@botanik.uni-hamburg.de.

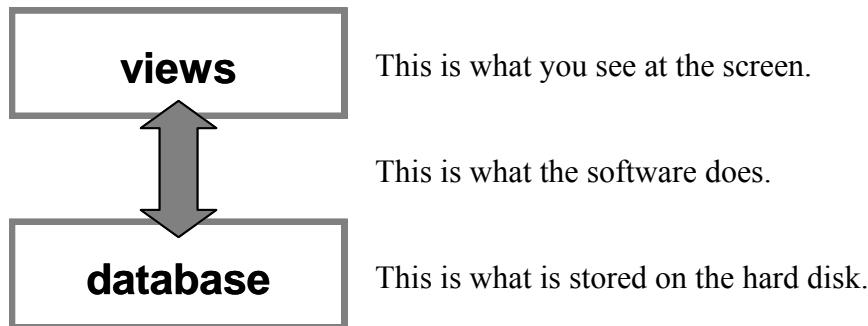
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BIOTABase short manual

1. Notes about the architecture of BIOTABase

As a general introduction, we would like to make some general remarks about how BIOTABase is built. Don't worry: It will not be too technical!

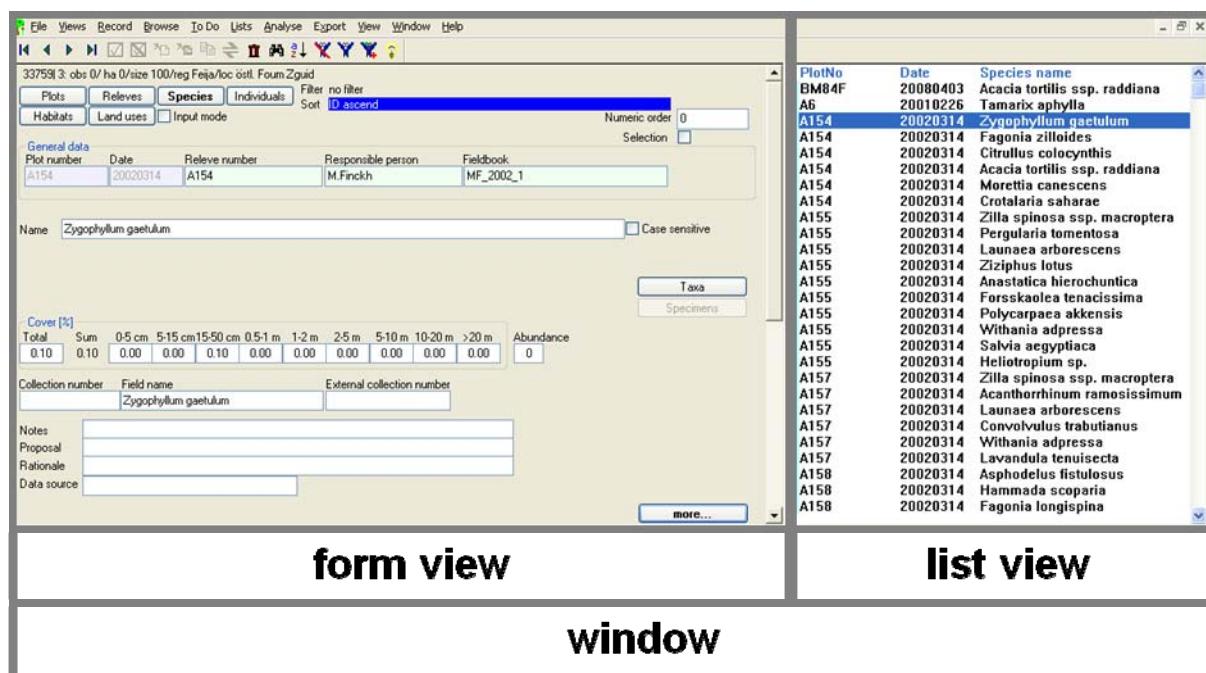


On your screen you see so-called views. They are necessary to interact with the data content. The data itself is stored in a database. BIOTABase is the software that manages the views and organises the connection to the database. The data are stored in the database. On your hard disk that is a file with the extension “mdb”.

The views

We distinguish two types of views: the form views and the list views. List views give you information about a set of records. You get at a glance an overview about the next or the previous records in the actual sequence of records. Form views show you a single record with all attributes. In the form you may edit the content.

Thus, the default layout of a BIOTABase window consists of two parts. On the left you see the form view. On the right you see the list view. One row in the list is marked to indicate that this is the record which is actually displayed in the form view.



BIOTABase is a MDI application. MDI is a shortcut for “multiple display interface”. This means that you can display more than one view at the screen. For instance it is possible to place the view with all information about the location of a vegetation record on the screen and simultaneously the view with all information about the observed species. The two views know about each other. For instance: If you switch the location record in the first view then automatically a respective record in the other view will be displayed.

In a MDI application only one view can be active. One says “it has the focus”. It is important to understand that the default window which consists of a form (left part) and a list (right part) in reality is composed by two views. Many functions of the program work only if the cursor is placed either in the left or in the right view. **If in a given moment the desired operation is not activated, a simple click in the other might help.** To toggle the focus between the form and the list you can also use the hot key “Ctrl Q”.

Sometimes you may not realise that more than one window is open, e.g. because the one you are working with fills the whole screen. With the menu command sequence <Windows><Tile horizontal> you can arrange all open windows simultaneously. Between these windows you can change the focus (i.e. the active window) with the hot key “Ctrl Tab” respectively “Ctrl Shift Tab”. The work with several open windows has the advantage that all context information is quickly available. But the huge amount of data placed on a little screen may be bothersome.

To browse through the data or to enter new data manually it is very comfortable to use two screens. This is possible if the graphic card of your computer provides this feature. In this case you can put e.g. the “plots view” on the left monitor and the “species view” on the right monitor.

The database

BIOTABase works with the MS Access® database. It is important to emphasize that MS Access® is on one side a software product to manage a database and on the other side a file format to store a set of data tables and relations. BIOTABase uses only the functions of the latter. The data is saved as a file in mdb-format. You don't need a license for MS Access®.

You can use MS Access® to have a look at the tables, its structures and contents. You may even edit the content. But please do not change the database structure. Otherwise BIOTABase will no longer be able to read the information. BIOTABase works with MS Access® 97-2003 formats because they are widespread and all newer releases can handle it.

2. Notes about notation

To describe how a software product works is not an easy matter. We have to explain many technical details. Unfortunately, not for all technical terms words of the common language are available. Therefore we have to define our own notation in several aspects we want to describe.

- The database is divided in different tables. They are marked with square brackets: [Plots], [Releves], [Species], [Individuals], [Habitats], [Land uses], [Specimens], [Taxa] , [Synonyms], [Photographs], [Worknames].
- We named the forms with the control units shown on the monitor with terms as short and precise as possible. To identify a term like “species” as a form, we put it in square brackets [Species]. In most cases the form view has the same name as the respective table in the database: Form [Plots] is based on table [Plots], form [Species] is based on table [Species] and so on. Generally, we use the plural variant for the form label: [Plots], [Releves], [Species], [Taxa].

- Buttons on the surface of the software are marked with square brackets []. Between the square brackets the label is written, i.e. [Photographs]. As a rule, such a button is linked to the respective form and table.
- Menu items / commands are marked with angle brackets <>, i.e. <Open database>. To describe a command sequence of more than one item the single menu items are written one after another, i.e. <File><Defined terms><Responsible persons>.
- Hot keys are marked in apostrophes, i.e. “Ctrl S” means: press simultaneously the control key and the s key of the keyboard.
- Fields on a form or database table are embedded in curly brackets {}, i.e. in [Plots] the field {Country}. We use the singular variant: {Plot number}, {Date}, {Administration unit} and so on.

3. Legend of the menu items and toolbar icons

Important shortcuts:

Record	
First record	Home
Previous record	Arrow up
Next record	Arrow down
Last record	End
Jump x records forth or back	
Repeat last jump	Shift F3
Save record	Ctrl S
Undo actions	
Select / unselect and save record	Ctrl Space
New record	
Copy record (header only)	Ctrl B
Copy record	Ctrl D
Delete record	Ctrl Del
Delete all records in the current filter	

Arrow-keys to move in the database:



The four symbols serve quick moving in the database:

- <First record>: the marker moves on to the first record in the database.
 <Previous record>: the marker moves one record back.
 <Next record>: the marker moves a one record forward.
 <Last record>: the marker moves on to the last record in the database.

These actions are also accessible via keyboard with the cursor-keys “Arrow up/down”, “Home”, and “End” on the keyboard. Quick navigation up- and downwards can also be done with “Page↑” and “Page↓”. In a list view the page commands move so many records forth or back as the list view shows records simultaneously. In a form view the default for the page commands is 20 records. If besides a form view the respective list view is open then the form view takes the count of visible records within the list view for the move.

<Jump x records forth or back>: Sometimes you want to go to a record quite a distance from those of the current record. Then you can estimate the distance and make a jump in the direction.

You can repeat the jump by pressing the key combination “Shift F3”. You will be asked to set the number of records for the jump. A positive number moves ahead, a negative number moves back.

Store or reject database changes:

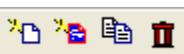


Changes on a program page demand either storage or rejection of these changes. The following symbols serve this purpose.

- <Save record>: the changes on this page are stored in the database.
<Undo>: the changes on this page are rejected. The previous state of the database is restored (this is possible only once!).

The symbols and menu points are only active if any changes were made.
The shortcut key for saving is "Ctrl S".

Adding and deleting records:



To manage the database, it is necessary to add or delete records. The following four symbols serve this purpose:

- <New record>: a new empty record is created.
<Copy record (only head infos)>: Blueprint. A new record is created. Its header data {Plot number}, {Date}, {Responsible person}, {Fieldbook} correspond to the current record. The remaining fields are empty.
<Copy record>: An exact copy of the current record, that you may modify further on. This command is especially reasonable if records are largely identical.
<Delete record>: this action deletes the current and all its dependent records.

The keyboard shortcuts for <Copy record> and <Delete record> are “Ctrl D” (D like duplicate) and “Ctrl Del”. <Copy Record (only header information)> is only available in the forms [Releves], [Species], and [Individuals]. Its shortcut is “Ctrl B“ (B like blueprint).

How to find your data in the database:

Larger databases are hard to view as a whole. It is often helpful to sort the database by different criteria, to downsize the visible data pool using a filter, or to search for specific records. This can be done with one of the following menu items, symbols in the toolbar or hot keys:

<Sort>: opens a dialog box to select criteria for data sorting.

<Set a standard filter>: opens a dialog box to build simple filter criteria.

<Set an extended filter>: opens a dialog box to build filter criteria, more capable than a standard filter but time-consuming.

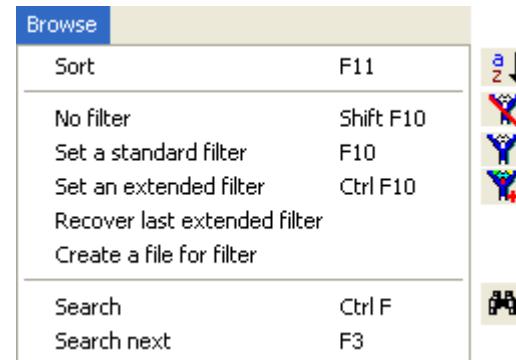
<Recover last extended filter>: recovers the last result of an extended filter command, this is faster than a new call.

<Create a file for filter>: stores record parameters in a file for filtering purposes.

Further explanations see chapter “Setting a filter”.

<Search>: opens a dialog box to search records for specific values.

<Search next>: repeats the last search command.



Manage windows

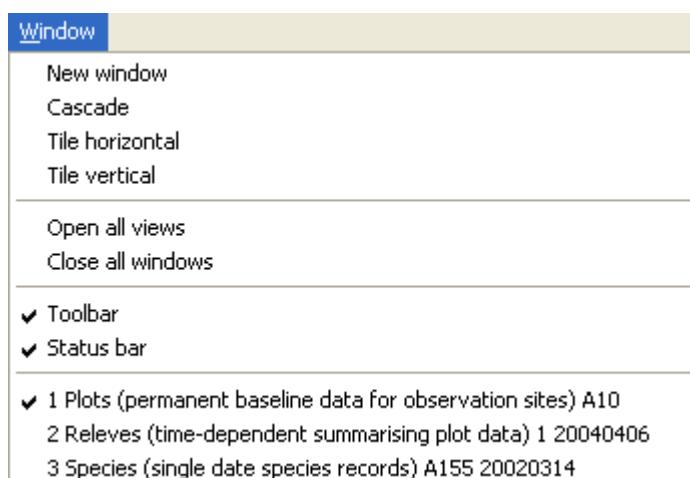
Switch between windows (toggle):

If several windows are open at the same time, you can switch between them with the shortcut “Ctrl Tab” or “Shift Ctrl Tab”.

Close windows:

You can close a single window quickly with the shortcut “Ctrl F4”. To close all windows in a single step, please use <Window> <Close all windows>.

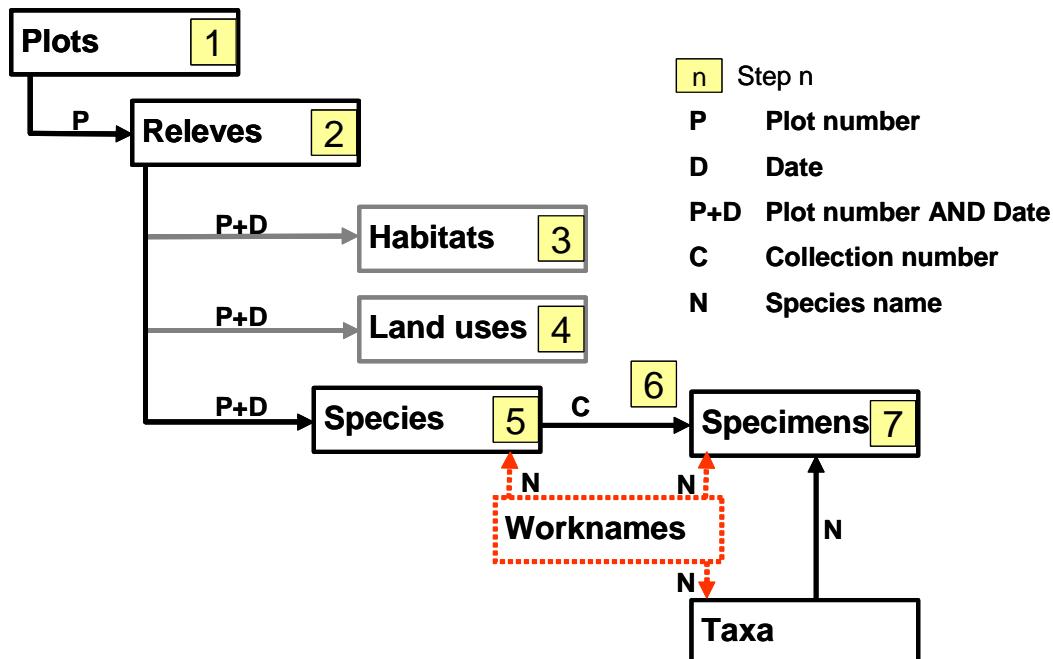
In the below part of the menu all open views are indicated with the momentary text of the window’s title bar. The window with the focus is marked.



4. General input procedure for vegetation and collection data

We recommend to enter the data in the following order:

Sequence of data input



- 1st step:** If an appropriate plot does not already exist, compile a new plot in form [Plots].
- 2nd step:** If an appropriate relevé does not already exist, please add a new relevé record in [Relevés]. For a relevé record a plot specification is mandatory. A relevé is plot-related and time-dependent.
- 3rd step:** Enter appropriate habitat data (form [Habitats]). Habitat data is plot-related and time-dependent. A record in [Habitats] is optional.
- 4th step:** Enter appropriate land use data (form [Land uses]). Land use data is plot-related and time-dependent. A record in [Land uses] is optional.
- 5th step:** Enter species data (form [Species]). These data are plot-related and time-dependent.
- 6th step:** Enter a collection number in form [Species] for collected plant specimens. Each record in [Specimens] should have a collection number in [Species]. Not each record in [Species] must have a collection number. About the link between [Specimens] and [Species] on the one side, and the link between [Species] and [Relevés] on the other side it is documented where and when a specimen was collected.
- 7th step:** Click the button [Specimens] to create a corresponding entry in the collection data sheet [Specimens]. You can also add specimen records not one by one but with an action for a set of records at the end of your work in [Species] - see in form [Specimens] the menu command <To do><Take all records from [Species] with a non-empty collection number>.

8th step: Now you complete either the collection data set in the sheet [Specimens] or you close the [Specimens]-sheet and continue with [Species]. In this case, after accomplishing the data entry in [Species], one may return to the [Specimens]-sheet, to complete collection data.

Comment: The collection list in [Specimens] can also be compiled independently from plot data. To link the collection data with a certain collecting site, steps 1, 2, and 5 have then to be carried out. However, there is a certain risk that typing errors of collection number or species name cause failing links. Additionally, these data have to be entered twice (in form [Plots] and in form [Specimens]).

Entries in the taxa reference list:

The taxonomic [Taxa]-sheet is a stand-alone reference data set and can thus be handled independently from plot data. In this table, you can record the correct scientific names of species, together with additional species specific features.

You can generate this table directly from a species reference list of a certain area, or, accompanying the species identification, queried from the [Specimens] data sheet.

Species list in “[Worknames]”:

BIOTABase automatically generates the species list in form [Worknames]. It assembles all entries of current work names {Field name} or valid species names {Species name} in the [Species], [Specimens], [Individuals], [Synonyms], [Taxa], or [Photographs] sheets. Data in the [Worknames] sheet therefore depend on the entries in each of these tables. With the commands <Record><Delete all records without links to other tables> the workname list can be updated to the current state of these tables.

Compilation of picklists:

With the sequence <File><Defined terms> you can add terms in the pick lists like e.g. “Countries”, “Administration units” or “Fieldbooks”.

5. General comments to the nomenclature of vegetation records (relevé)

The relevé number:

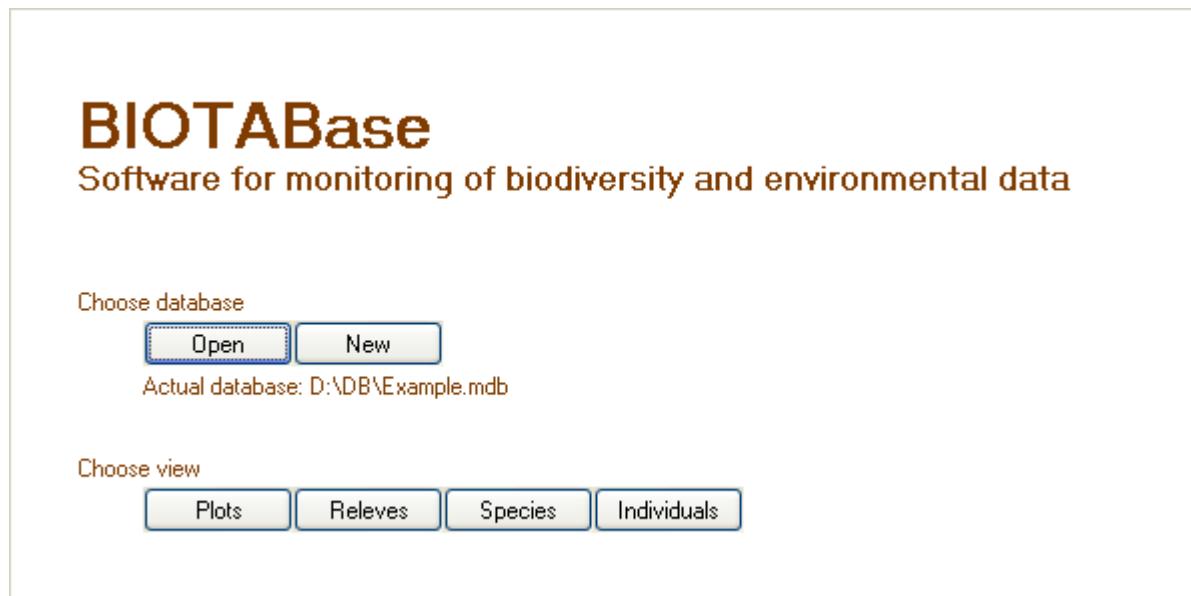
Traditionally, a relevé number relates to a vegetation record taken at a certain moment and a certain place. Hence this number includes two different types of information: (1) location and (2) time of the record. In this database though, these information are kept separately in order to link permanent plots in a logical way to the database (i.e. vegetation records from the same location but gathered at different dates).

Therefore, deviating from the traditional notation, we assign a plot number designating the observation place and a date specifying the moment of the observation or sampling.

A repeated record at a later date receives the same plot number, but a different date. So the combination of plot number and date corresponds to the relevé number in a classical phytosociological sense. In the form [Relevés] these combinations are administered. Here you also have the possibility to assign a special number to the plot-date-constellation in order to use a relevé number in the classical way. The [Relevés]-sheet records the “history” of a plot, each visit should be noted there.

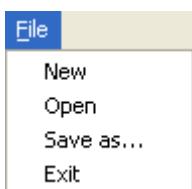
6. Open, select, save, create a database

Open the program. The button [Open] allows you to browse the directories of your computer to



find the database you look for.

If you need a new empty database, please press button [New].



The commands can also be called with the menu items within the menu <File>. There is furthermore a command <Save as...> with which one can save a copy of the actual database. After that action the copy will be the actual database.

Which database is momentarily in use you can see on the start panel (with full path information) or in the title bar (only file name) of each view.



7. Plots

DBExample.....BIOTABase, BIOTA AFRICA 2009 - [Plots (permanent baseline data for observation sites) BM11]

General data

Plot number	Date (first visit)	Releve number	Responsible person	Fieldbook
BM11	20020508	BM11.2	M.Staudinger	unknown

Plot-No.(interim) Country Administration unit Locality

01-BM-11 Maroc El_Miyit_BO

Latitude	Longitude	N/S	Deg	Min	Sec,Dec	E/W	Deg	Min	Sec,Dec	Point accuracy	GPS Map	Map	
centre	30.3660208	5.6308489	N	30	21	57	67	W	5	37	51	05	Merchich
corner	0.0000000	0.0000000		0	0	0.00		0	0	0.00		additional points	

Type of releve/plot Marked Observ. ID Hectare ID Rank ID Size

VEG magn 101 11 19 100 [m²] = 10 [m] x 10 [m]

Photographs

Notes (general data) Hang; Beckenlandschaft; Hangfläche

SOTER data - Global and National Soils and Terrain Digital Databases (FAO)

Soter unit 0 Major landform ... Min. elevation ... [m] Max. elevation ... [m] Relief intensity ... [m/km] other SOTER data

Landscape description

Landscape	unknown	Short description
Topic	All	Short description
Landscape element	unknown	Height Width Depth Diameter Notes (landscape)
	0 0 0 0 [m]	

Local topography

Altitude	Exposition	Inclination	Slope complexity	Slope shape	Slope position	Notes (local topography)
754 [m]	336 [°]	20.1 [°]	36.5 [%]	unknown	unknown	unknown

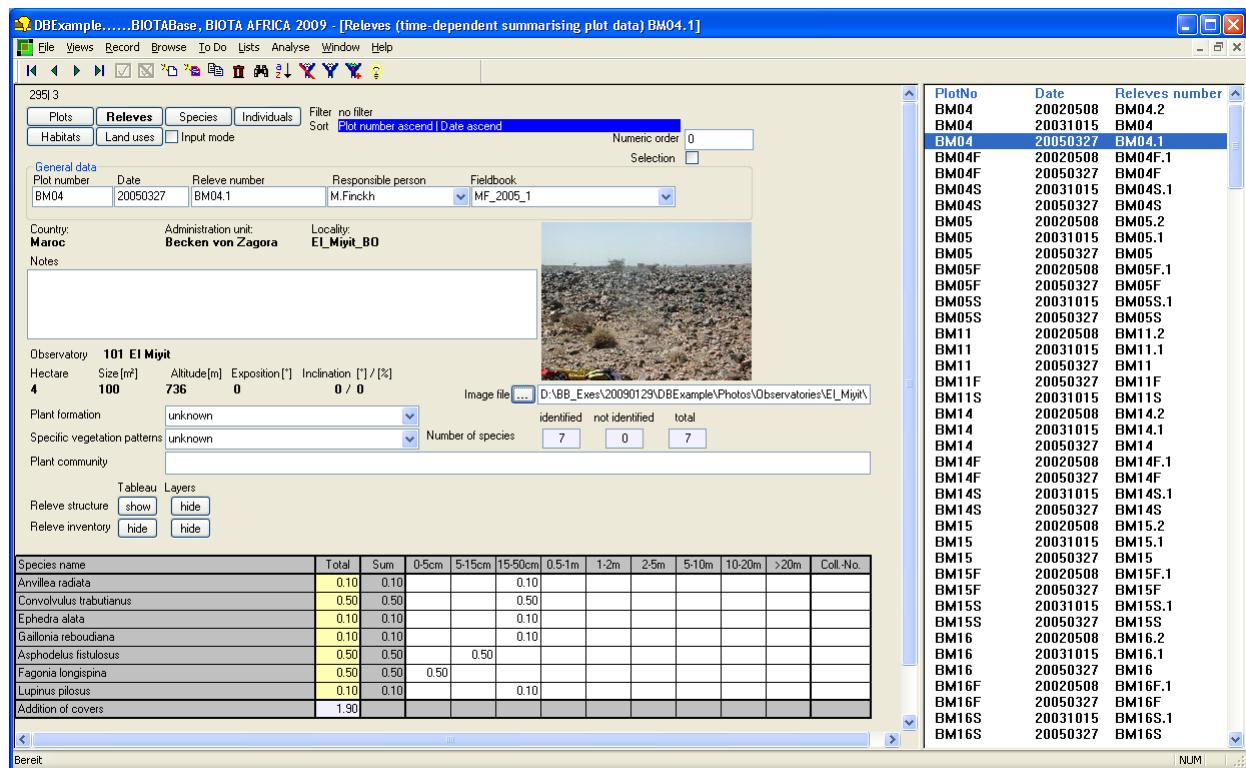
Bereit

Data entry for a new plot:

With a click at the menu item <Record><New record> an empty data sheet appears. Assign a plot number and a date (both fields are accessible with double-click). Save (for security reasons) with the save button or “Ctrl S” and your new plot is compiled. Now you can enter all further data in this sheet. The plot sheet comprises data defining and characterising the plot which are not variable in time (e.g. geographical coordinates, elevation, etc.). If the entries you need are not in the pick list then you have first to add them in the defined terms. You may invoke the input forms for the meaningful defined terms with <View><Countries>, <View><Administration units> and so on. The defined terms {Marked} don't need an input form because they are predefined within BIOTABase.

Alternative: If there are already similar plots in the database, with <Records><Copy record> (or “Ctrl D”) the data set of an existing plot can be copied. Nevertheless, a new plot number has to be assigned and all incorrect entries have to be deleted or missing entries completed respectively. Be cautious, this procedure may cause errors, but is time-saving if you enter similar plots.

8. Relevés



Data entry: Create a first relevé record

If you are in the view [Plots], please make sure that the check box “Input mode” has a tick and call the button [Relevés]. An input mask appears where the field entries {Plot number} and {Date} are already adopted from [Plots]. You also see the entries of {Country}, {Administration unit}, {Locality} and several more fields that are filled in the form [Plots]. Please, edit the fields {Responsible person} and {Fieldbook}.

Alternative: If there are already similar relevés in the database, with <Records><Copy record (header only)> or <Records><Copy record> the data set of an existing relevés can be copied. Nevertheless, a new date has to be assigned and all incorrect entries have to be deleted or missing entries completed respectively.

The relevé form shows tableaus with contents about structural elements and/or an inventory of species of this plot at this date. The species in the relevé inventory can be added or removed not here in the relevé form but in the species form, see next chapter.

You may print a compilation of information in a data sheet with the command <To do><Print data sheet>. All records in the current filter will be prepared to be printed and shown in a preview.

[Drucken...](#) [Nächste](#) [Vorherige](#) [Zwei Seiten](#) [Vergrößern](#) [Verkleinern](#) [Schließen](#)

Data sheet																						
Plot number BM04	Date 20050327	Releve number BM04.1	Responsible person M.Finckh	Fieldbook MF_2005_1																		
Country Maroc	Administration unit Becken von Zagora			Locality El_Miyit_BO																		
Latitude 30.366841	Longitude -5.6276966	Point accuracy	GPSMad WGS84	Map																		
Type of releve VEG	Marked magn	Obs.ID 101	Observatory name El Miyit	Hectare 4	Size (sam) 100 = 10 [m]x10 [m]																	
Altitude [m] 736	Exposition [°] 0	Inclination [°/M%] 0/0	Slope complexity unknown	Slope shape unknown	Slope position unknown																	
Notes general Wadiboden; Beckenlandschaft; kleines Wadi																						
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Species name</th> <th>Total cover</th> </tr> </thead> <tbody> <tr> <td>Asphodelus fistulosus</td> <td>0.50</td> </tr> <tr> <td>Convolvulus trabutianus</td> <td>0.50</td> </tr> <tr> <td>Fagonia longispina</td> <td>0.50</td> </tr> <tr> <td>Anvillea radiata</td> <td>0.10</td> </tr> <tr> <td>Ephedra alata</td> <td>0.10</td> </tr> <tr> <td>Gaillonia reboudiana</td> <td>0.10</td> </tr> <tr> <td>Lupinus pilosus</td> <td>0.10</td> </tr> </tbody> </table>							Species name	Total cover	Asphodelus fistulosus	0.50	Convolvulus trabutianus	0.50	Fagonia longispina	0.50	Anvillea radiata	0.10	Ephedra alata	0.10	Gaillonia reboudiana	0.10	Lupinus pilosus	0.10
Species name	Total cover																					
Asphodelus fistulosus	0.50																					
Convolvulus trabutianus	0.50																					
Fagonia longispina	0.50																					
Anvillea radiata	0.10																					
Ephedra alata	0.10																					
Gaillonia reboudiana	0.10																					
Lupinus pilosus	0.10																					

9. Species

DBExample.....BIOTABase, BIOTA AFRICA 2009 - [Species (single date species records) BM22 20020508]

File View Record Browse To Do Lists Analyse Export View Window Help

1556|14: obs 101 / ha 22/size 100/leg Becken von Zagora/loc El_Miyit_BO

Plots Releves Species Individuals Filter no filter Sort ID ascende

Habitats Land uses Input mode

Numeric order: 0 Selection:

General data	Plot number	Date	Releve number	Responsible person	Fieldbook							
Fumana ericoides	BM22	20020508	BM22.2	M.Staudinger	unknown							
Name	Gallonia reboudiana <input type="checkbox"/> Case sensitive											
Cover [%]	Total	Sum	0-5 cm	5-15 cm	15-50 cm	0.5-1 m	1-2 m	2-5 m	5-10 m	10-20 m	>20 m	Abundance
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Collection number	Field name	External collection number										
	Gallonia reboudiana											
Notes	<input type="checkbox"/> more...											
Proposal												
Rationale												
Data source												

Bereit

PlotNo	Date	Species name
BM11	20020508	Fagonia longispina
BM21	20020508	Sclerocephalus arabicus
BM21	20020508	Hammada scoparia
BM21	20020508	Fagonia longispina
BM22	20020508	Ziziphus lotus
BM22	20020508	Anvillea radiata
BM22	20020508	Acacia tortilis ssp. raddiana
BM22	20020508	Acanthorrhinum ramosissimum
BM22	20020508	Sclerocephalus arabicus
BM22	20020508	Lotus glinoides
BM22	20020508	Fagonia longispina
BM22	20020508	Asphodelus fistulosus
BM22	20020508	Morettia canescens
BM22	20020508	Gallonia reboudiana
BM22	20020508	Diplotaxis harra
BM22	20020508	Heliotropium europaeum
BM22	20020508	Convolvulus trabutianus
BM22	20020508	Launaea arborescens
BM22	20020508	Salvia aegyptiaca
BM22	20020508	Paronychia arabica
BM22	20020508	Lupinus pilosus
BM22	20020508	Urginea nyctiflora
BM22	20020508	Forsskaolea tenacissima
BM22	20020508	Panicum turgidum
BM22	20020508	Aristida adscensionis
BM22	20020508	Asteriscus hierochunticus
BM22	20020508	Aristida coerulescens
BM33F	20020508	Convolvulus trabutianus
BM33F	20020508	Hammada scoparia

Data entry: Create a first species record

If you are in the view [Releves], please call the button [Species]. An input mask appears where the field entries {Plot number} and {Date} are already adopted from [Releves].

Now enter the first species in the field {Name}, with the currently assigned name (which may be a scientific or a work name). The species name can be typed character by character in the edit field. BIOTABase immediately completes the name by looking in the database if there is a name beginning with exactly such sequence of characters. In the positive case the name will be proposed. In the negative case you can write the name you want. After saving the record BIOTABase knows also this name as from now. Below the edit field there are shown five names. If there is the one you want then you may double click it. It will be put in the field. You may also scroll through the list. For this, please press the arrow keys in combination with the control key “Ctrl ↓” or “Ctrl ↑”.

Enter in {Cover} the cover value according to the corresponding layer(s). If you did not record the vegetation structure, just enter total cover (%) or under {Abundance} the number of individuals. Please, save the entry clicking the save button or using “Ctrl S”.

Important: As long as a species occurs exclusively in a single layer, it is not necessary to register the value again under {Total}. This field can be completed later with the command <To do><Fill total cover automatically>.

Data entry: Compile further species records

The entry of further species that are part of this relevé can be done with the blueprint icon in the toolbar or short key “Ctrl B”. This action automatically creates a new species record, with the entries {Plot number} and {Date} of the prior record. All further entries are carried out as described above.

Data entry: Collection of plant material

If you collected a plant, a collection number has to be entered in the field {Collection number}. Push the button [Specimens] after saving the entry. Thereby the collection number, the collection date, and the work name are copied to the herbarium database form [Specimens], which is opened at the same time. To carry on with entries in form [Species] just close this window (“Ctrl F4”). To complete the entries in the collection database, see “Data entry” in “Herbarium database [Specimens]” below.

Further information in [Species]:

In addition to the name, abundance and cover of a species, many further ecological and morphological observations can be entered in this sheet. This should **only** be done if the observed attributes are variable within this species. **If the attributes are species specific, it makes more sense** to enter the characteristic attributes of a species in the [Taxa] sheet, from where they can be assigned to all (empty) records of this species in the whole database on command.

Transfer of species specific ecological information from [Taxa] to [Species]:

Carry out the sequence <To do><Take attributes from [Taxa]>. Depending on the chosen option, the information from the herbarium database is assigned to the actual record or to all records in the actual filter.

10. Relevé inventory

The species composition as a whole represents a vegetation relevé (a plot at a certain date). A dynamic table of such a “species composition” or “inventory” is shown in the form [Relevés]. The information about the occurrence of species at this location and date is stored in the data sheet [Species] and BIOTABase is using this information here to give a condensed overview about what is going on at this plot.

identified	not identified	total
13	0	13

Species name	Total	Sum	0-5cm	5-15cm	15-50cm	0.5-1m	1-2m	2-5m	5-10m	10-20m	>20m	Coll-No.
Anvillea radiata	5.00	5.00			5.00							
Launaea arborescens	2.00	2.00		2.00								
Ephedra alata	1.00	1.00				1.00						
Lotus glinoides	1.00	1.00		1.00								
Fagonia longispina	0.10	0.10		0.10								
Hippocratea constricta	0.10	0.10			0.10							
Launaea nudicaulis	0.10	0.10			0.10							
Lupinus pilosus	0.10	0.10				0.10						
Morettia canescens	0.10	0.10		0.10								
Reseda villosa	0.10	0.10		0.10								
Sclerocephalus arabicus	0.10	0.10		0.10								
Urginea nyctiflora	0.10	0.10			0.10							
Medicago laciniata	0.01	0.01		0.01								
Addition of covers	9.81											

Browse	
Sort relevé records	
Sort inventory tableau by species names	←
Sort inventory tableau by total cover	←
No sort criterion (inventory tableau)	
<hr/>	
No filter	
Set a standard filter	
Set an extended filter	
Recover last extended filter	
Create a file for filter	
<hr/>	
Search	Ctrl F
Search next	F3

[Relevés] gives an overview but should not serve as an input mask. Species can be assorted according to name or cover value to get an idea of the species composition or the importance of certain species.

Data entry:

Anyhow, there are several functions for data entry which can facilitate work:

With <To do><Fill total cover (bird's eye view) automatically> you assign the cover values of the different layers for a whole record to the field {Total cover}. Merely for the species occurring in several layers, the total cover values have to be entered by hand (here or in form [Species]).

Furthermore, with the sequence <Record><Copy record> the whole species list of this table can be taken over for a new date. Especially for permanent plots with a high number of reoccurring species the data entry is much quicker. Only the cover values of the species known from the plot have to be entered manually. In [Species], the species without cover data (which disappeared) can then be selected by filtering and deleted while new species are added. You can delete all cover values in an inventory tableau by using the menu command <To do><Empty cover values of inventory>.

You can define hotkeys for frequent cover values. This may be useful if certain values, e.g. 0.5, are very frequent. For details see menu item <To do>.

11. Relevé structure

This table should file summary and descriptive characteristics of a relevé, e.g. total cover and cover of different layers, maximum and average plant height and the coverage of certain groups (woody species, annual and perennial herbs, grasses, lianas etc.). These data should particularly provide tools for a structural comparison of the vegetation within different floras, e.g. savannas of Africa and Southern America.

Portion of different vegetation layers											
	Layer	Total	Summe	0-0.5 m	0.5-1 m	1-2 m	2-5 m	5-10 m	10-20 m	>20 m	Main Height
		[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[cm] (95%)[cm]
Vegetation											
Total Cover		1.50	1.60	1.50	0.10						45.00
Woody species											
- shrubs											
- trees											
Herbaceous											
- annual		1.50	1.50	1.50							
- perennial											
Graminoid											
- annual		0.10	0.10	0.10							
- perennial		0.10	0.10	0.10							
Geophytes											
Climbers											
Epiphytes											
Succulents											
- stem succ.											
- root succ.											
Free text											

Data entry:

Call the menu button [Releves] from the [Plots]-sheet. An input mask appears where the field entries {Plot number} and {Date} are taken from [Plots].

12. Herbarium database [Specimens]

The “Specimens” database provides the management of your herbarium and the link between collection and observation data. The main task is to ensure smooth and continuous taxonomic updating of vegetation data during the classification process. Besides, herbarium labels can be printed.

Coll. number	Date	Species name
500010	20001031	Hammada scoparia
500011	20001031	Carthamus fruticosus
500012	20001031	Lavandula mairei
500013	20001105	Hammada scoparia
500014	20001105	Hammada scoparia
500015	20001105	Hammada scoparia
500016	20001105	Ononis antiquorum
500017	20001105	Ribes uva-crispa
500018	20001106	Quercus rotundifolia
500019	20001106	Salsola vermiculata
500020	20001106	Fraxinus angustifolia
500021	20001108	Rhus tripartita
500022	20001108	Anabasis oropedium
500023	20020704	Plantago subulata ssp. atlantis
500024	20020704	Rhodanthemum sp.
500025	20010212	Genista scorpius ssp. myriantha
500026	20010212	Lavandula mairei
500027	20010218	Cuscuta epithymum
500028	20010218	Pergularia tomentosa
500029	20010218	Hammada scoparia
500030	20010218	Zilla spinosa ssp. macroptera
500031	20010218	Morettia canescens
500032	20010218	Withania adpressa
500033	20010218	Ononis natrix
500034	20010218	Lavandula mairei
500035	20010218	Farsetia aegyptiaca
500036	20010218	Convolvulus trabutianus
500037	20010218	Rhus tripartita
500038	20010218	Forskaolea tenacissima
500039	20010218	Carthamus fruticosus
500040	20010221	Adenocarpus anagyrifolius
500041	20010221	Juniperus thurifera
500042	20010221	Juniperus oxycedrus
500043	20010221	Astragalus armatus
500044	20010225	Ephedra altissima
500045	20010226	Maerua crassifolia
500046	20010226	Maerua crassifolia
500047	20010226	Anvillea radiata
500048	20010226	Morettia canescens
500049	20010226	Ephedra alata
500050	20010226	Polycarphae akkensis
500051	20010226	Ononis natrix
500052	20010226	Convolvulus trabutianus
500053	20010226	Gaillonia reboudiana
500054	20010226	Retama raetam
500055	20010226	Gaillonia reboudiana
500056	20010226	Lavandula tenuisecta
500057	20010226	Eryngium f. tenue
500058	20010226	Ephedra alata
500059	20010226	Rhus tripartita
500060	20010226	Hammada scoparia

Data entry:

If a plant was collected at a certain location, a respective plot has to be recorded in form [Plots]. In form [Species] a collection number has to be entered into {Collection number}. After saving, touch the [Specimens]-button. Thereby the collection date and number as well as the work name are assigned to the herbarium database, which is opened at the same time.

The fields which have to be filled in during the classification process are largely self-explanatory.

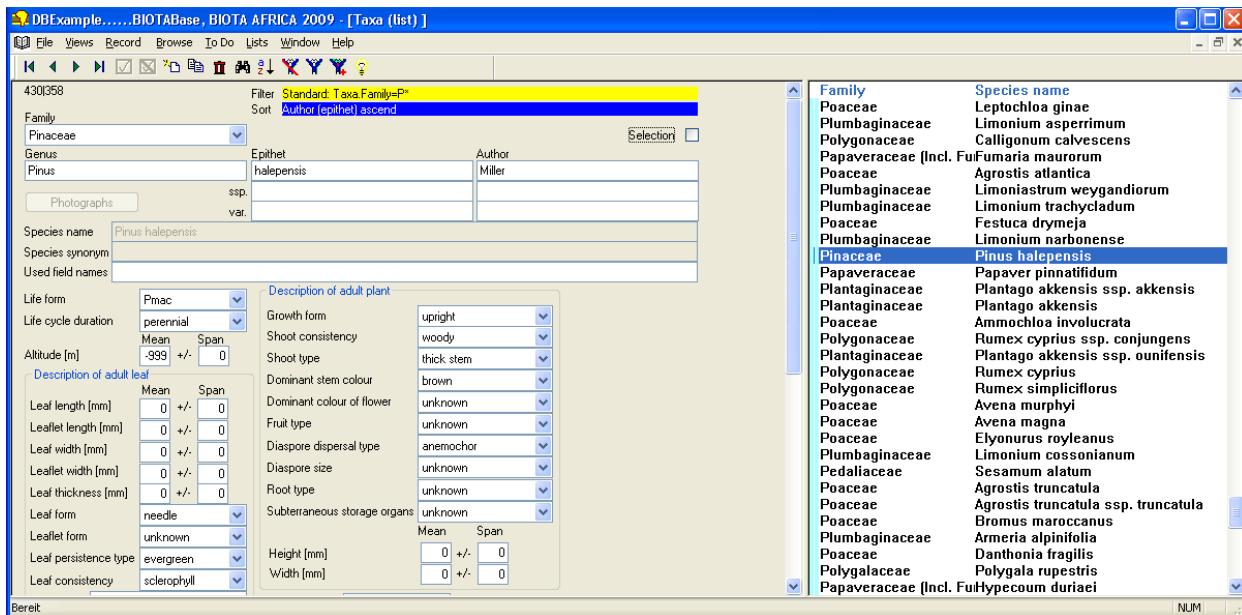
Updating of names:

Updating of plant names is an important task in vegetation science and database management:

As soon as a collected plant has been identified, you should enter the scientific plant name in the field {Scientific name}. The software looks automatically for similar entries in the [Taxa] reference list, which can be taken over (like in [Species]) by double clicking or with “Ctrl cursor↑↓”. Save the entry with “Ctrl S”.

With <To do><Substitute> or the double-arrow symbol, the “Species” database can be updated subsequently. There is the option to either (conservatively) update only the record of the corresponding collection or, via the work name {Field name}, to update some or all other records containing the same work name.

13. Species reference list [Taxa]



The stand-alone database “Taxa” serves several purposes. On the one hand it provides “encyclopedic” floristic data, i.e. should comprise complete records of the flora at a study site, with their accurate scientific names, authors and the associated synonyms. On the other hand, “encyclopedic” ecological information should be provided, e.g. species specific information about life form, morphological characteristics, dissemination biology and other traits. Such information should therefore be gathered in this database and not in the form [Species]. It can easily be assigned to the species database afterwards (see below).

Data entry:

The data entry is largely self-explanatory.

14. Worknames

The species list in [Worknames] is automatically generated from the entries which are currently in use as work names {Field name} or valid species names {Species name} in the [Species], [Individuals], [Specimens], [Taxa], [Synonyms], or [Photographs] tables.

Database cleansing:

The data in [Worknames] **depend** on the entries in one of the aforementioned tables. With the sequence <Records><Delete all records without links to other tables> the work names can be updated to the current status of these tables.

Changes of species names:

Furthermore, [Worknames] can be used to change names, e.g. in case of typing errors or if species have to be pooled. Typing errors can be corrected directly in the window of the selected species. The change only affects the [Species], [Individuals] and [Photographs] database, not [Specimens], [Taxa] or [Synonyms]. This difference is important because the latter three forms administer the relation between the name, the components of the name (e.g. genus and epithet), and additional information like family and authors.

Pooling of species:

With the sequence <To do><Replace name> a current name can be chosen and the respective records merged into another name. This command only affects the [Species], [Individuals] and [Photographs] database, not [Specimens], [Taxa] or [Synonyms].

Abbreviations of species names:

Often in the field books the scientists use abbreviations of the species names. These abbreviations can be stored in the mask [Substitutes] which can be found under the menu item <File><Defined terms><Substitutes>. Here you enter the abbreviation and the meant species name.

In the forms [Species], [Individuals] and [Photographs] you may enter your abbreviations. When you have finished your work, you can call in the form [Worknames] the menu command <To do><Replace substitutes by original>. This command works like a macro with which all deposited abbreviations will be substituted by the associated species name, not only in [Worknames] but also in [Species], [Individuals] and [Photographs]. This function will speed up your manual data input.

15. Photographs

You can manage your photographs of plots or plants using the form [Photographs]. The photographs should be available as jpg-files. These jpg-files can be located in different directories on the hard disk. The database retains only a photograph's file name and path, not the jpg-file itself. If the path specification points at a subdirectory below the location of the database (that is the mdb-file), then the path can be set relative. This has advantages because a copy in another directory tree will work in the same manner as the original.

To Do
Select records
Deselect records
Set field entries
Copy contents
Arrange records in a numeric order
Print photographs collection
Print next n records of the photographs collection
Insert date like the date in [Plots]
Check duplicates
Check all records without a corresponding photograph file
Insert all files of a given directory
Make path of file relative (records in the current filter)
Replace path
Remove all files which are not registered in the database
Replace all species names with unspecified if not linked to other tables
Assign image files to plots
Trim field entries
Random select

To access a photographs collection:

- Copy the jpg-files in a directory on your hard disk, e.g. in a folder “photographs”. You can create further subdirectories according to your own preferences.
- Run the menu item <To do><Insert all files of a given directory>. You will get a file select dialog.
- Select the folder you want. Choose a jpg-file (any file will do it, you only need it to get the correct folder; if there is none jpg-file then copy a dummy.jpg in the directory). The absolute path specifications of all jpg-files in this directory and all subdirectories will be inserted in the database.
- The path expression can be made relative with the menu item <To do><Make path relative (records in current filter)>. “Relative” means in this context “relative to the location of the database”, for example if the mdb-file is stored in ”D:\BIOTAData\” and a photograph is stored in “D:\BIOTAData\Photographs\Plots” then the relative path is “Photographs\Plots”.

Most jpg-files are big and often you handle many photographs, so you might need much space on the disk. Therefore it is good if the big files are stored only once. In the working versions of the database it is recommendable to handle the photographs with “thumbnails”. The software IrfanView allows you to create thumbnails (see in the menu of IrfanView <File><Batch Conversion/Rename>, use width 400 Pixels and 72 DPI).

12599 125 Plot-No.	Date	Species name	Selection <input type="checkbox"/>
14867	20010824	<i>Zygophyllum spinosum</i>	
Field number	Photographer	Source	
116607	C.Mayer	▼ BIOTA Southern Africa	
Notes			
URL Photographs\CarolinMayer\plants 24_25\Feldherbar\Zygophyllum spinosum 116607.jpg ... D:\DB\Work\DBBiota\Photographs\CarolinMayer\plants 24_25\Feldherbar\Zygophyllum spinosum 116607.jpg			
<p>Zygophyllaceae <i>Zygophyllum spinosum</i> 116607</p>			

If a photograph shows a place, you should fill the **field {Plot number}** with a plot number. This plot number points to a record in the form view [Plots], so you can describe this place with specifications in the form [Plots]. In the field **{Plot number}** you can enter only plot numbers that are valid (already existing). You can scroll through a sorted list of all existing plot numbers if you press “**Ctrl ↑**” or “**Ctrl ↓**”. If the photograph is not related to a certain plot, please type “unspecified” in the plot number field. In form [Plots] a record with this special plot number must exist. The link between the form views [Plots] and [Photographs] is usefull, e.g.:

- If you work in the form [Plots] you can press the button [Photographs] and you will get all records in the form [Photographs] with the same plot number.
 - If you want to describe the place where the photograph has been taken you can record it in [Plots] and use all the fields you need.

If appropriate, the **field {Species name}** should contain the name of a plant shown on the photograph. In this field all valid work names are possible. You can scroll through a sorted list of all valid work names if you press “**Ctrl↓**” or “**Ctrl↑**”. If your photograph is not related to a species, please type “**unspecified**”. You can type also a new name. In this case the new name will be added automatically to the [Worknames] table. If your photograph shows more than one species, then you should use one record for each species. You should not duplicate the image-files, only the records are needed which can point all to the same image-file. The use of the field **{Species name}** may be:

- If you work in the form view [Species] you can press the button [Photographs] and you will get all records in the form view [Photographs] with the same species name.
 - If you want to describe the species shown on the photograph you can record it in [Taxa] and there you can enter information like {Family} and {Author}, {Life form} and {Life cycle duration}.

To find **duplicates of photographs** use the menu item <To do><Check duplicates>. This function separates the photograph's name (that is the xyz.jpg part of the "path and name string"), inserts it into the field {Filename}, looks for all file names with more than one record, sets a filter on all these records, orders the set by the file name, and shows all these records on the screen. The user can now compare the versions of the photograph and can decide which one to prefer or to delete.



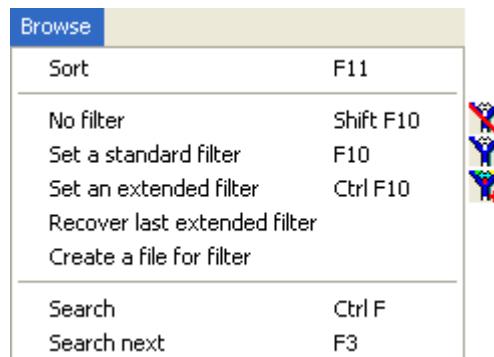
To print your photographs choose the menu item <To do><Print photographs collection>. The collection is defined by all records where the field {Selection} is marked with a tick. To get exactly the set of records you want you have to:

- Remove all marks in the field {Selection} (use <To do><Remove selection item for all records in the database>).
 - Set a filter with <Browse><Set a filter>.
 - Set a selection mark for all records in the filter (use <To do><Set selection item for all records in the current filter>).
 - Choose the menu item <To do><Print photographs collection>.

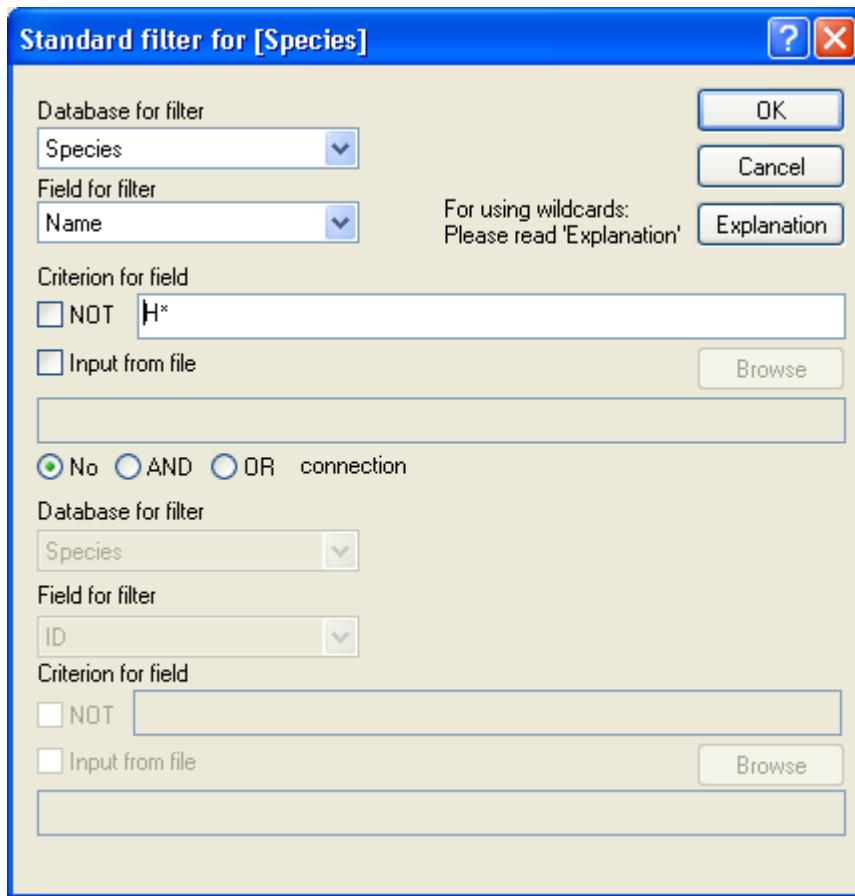
If there are links to plot number, species name or photographer, than this information will be printed. Printing includes information contained in the form [Photographs], [Plots] and [Taxa].

16. Setting a filter

Previous to data analysis and export, it might be necessary to define a sub-set of data of your interest. This selection is conducted using filters. You can access the filter tools with the sequence <Browse><Set a standard filter> from almost all pages. You may use hot keys or press the icon in the toolbar (see figure). Besides the standard filter there is an extended filter with an enhanced scope.



If you invoke a filter a dialog box for the filter opens up: First, you have to appoint the database table which contains the selected parameter “Database for filter”. Then you choose the parameter for the selection “Field for filter”. Under “Criterion for field” you define the selection criterion.



Selection syntax: alpha-numerically ascending „from – to” selections are defined by a colon (“:”), lists are defined by a semi-colon (“;”). The criterion on a numerical field ‘100:300;500:700’ would display all data sets with values between 100 and 300, and between 500 and 700 respectively for the chosen parameter. The selection criterion [not] 100:300;500:700 would display all records with values neither between 100 and 300, nor between 500 and 700 for the chosen parameter.

Caution with negative values:

-100:-300 would display nothing, the query sequence has to be inverted to -300:-100.

-300 -100 0 100 300

Use wildcard-characters (*) or (?) to specify a part in an alpha-numeric field that can be contained in the specific field of more than one record:

‘*’ is a replacement character for one or more characters.

Example: The expression ‘Namib*’ matches ‘Namib Desert’, ‘Namibia’, ‘Namibian’, etc.

‘?’ is a replacement character for exactly one character.

Example: The expression ‘German?’ matches ‘Germany’, ‘Germans’, etc. but not ‘Germanicus’.

What can you do if you are searching for a question mark or an asterisk? Then you have to mask the ‘?’ or ‘*’ with square brackets.

Example: ‘Acacia[?]’ matches only ‘Acacia?’ and ‘Explanation[*]’ matches only ‘Explanation*’.

You are allowed to combine the wildcards with the ‘:’ and ‘;’.

Example: Species.Date=??.?03*;???.?05* delivers all records with a Date in March or May.

Example: Species.Name=A*:C*:M*:N*:R*:T* shows all records with species names beginning with A,B,C,M,N,R,S,T.

Within numeric or logical fields wildcards don't work.

In the forms a set filter and also for the sort criterion a short info gives a hint that and what criteria are set.

Filter Standard: Species.Name=A*:C*:M*:N*:R*:T*
Sort Name ascend

If you want to delete a filter you can invoke the menu item <No filter>. Then all records in the view will be displayed.

You can combine two selection criteria in the filter dialog box using an "AND" or "OR" linkage. To combine more criteria, the first filter has to be set, from which a data file has to be created (with <Browse><Create a file for filter>). This filter has to be called in the first "Criterion for field" with "Input from file", and another filter has to be set for the already reduced data set.

What is the difference between a standard and an extended filter? To answer this, one has to know a little bit about the technological background of the filtering procedure. Databases use the SQL-Standard (Structured Query Language). If it is possible to use this feature the query will be fast, in generally. Because of the flexible selection syntax of BIOTABase we are able to produce very complex expressions so that it can reach the limits of SQL. Such a query gives a message 'Perhaps the filter criterion is too complex. Please use the extended filter.' The extended filter does some work before the database is queried. First it marks all records which fulfil the criterion. This will be done with an internal field 'SelectionTemp' in the database table and after this the filtering will be done with a SQL criterion 'SeletecionTemp=true'. This procedure is time consuming, but it always works. So a general rule is: Work with the standard filter. If BIOTABase refuses this command then try the same with the extended filter. With two types of queries it is of advantage to use the extended filter:

- (1) If you want to find records in one table and the field of interest is in another table.
- (2) If you are working with 'files for filtering'.

An example for the first is a question like this: Find all records in [Species] which belongs to the phanerophytes. The information about the Life form is in the table [Taxa]. So the filter criterion within [Species] has to be: 'Taxa.Lifeform=P*'.

17. Analysis of vegetation data

The analysis tools of the database rather allow a first exploration of potential species-environment relationships than exact statistical analysis of vegetation data. For a sound data analysis we recommended to set a filter for the required data set and export it in an adequate file format for the aimed analysis software (see: Data export).

Quick visual data exploration:

There are two commands for explorative data analysis. In [Plots] the command sequences <Analyse><Species names versus two fields> and <Analyse><Plots versus two fields> respectively allow to plot species or plots against two environmental parameters of your choice. Examples are diagrams of plots against longitude/ latitude to obtain an idea of spatial coverage of the plots, or diagrams of a species against altitude and latitude to obtain a north-south altitudinal profile of this species. You can save the results of such explorative queries in separate data files in *.txt-format for external analysis.

Features of vegetation records:

In [Plots] you can query quickly several features of vegetation records, e.g. the species number per plot. With the sequence <Analyse><Records in [Species] per plot> you analyse for example the species number per plot. Once again, the results of these queries can be saved as separate data files in *.txt-format.

18. Data export to other software

It is generally reasonable to set a filter before data export, to define the desired data-subset (see “Setting a filter”).

Data export to Cornell Condensed Format (e.g. for JUICE, CANOCO):

You export data in the current filter to a CND-file using the command sequence <Export><Cornell condensed format variant (Plot number, date)>. The Cornell Condensed Format requires a “relevé number”, which is generated by a combination of plot number and date. You can adjust the maximum number of digits (6 for JUICE, 8 for CANOCO) and the composition of the “relevé number” (how many digits are derived from the plot number) according to the requirements of your analysis software (Attention: different analysis software demands different dialects of CND-Files!!!). The export file is automatically stored in the same subdirectory as your BIOTABase-files.

You export the environmental data with <Export><Canoco environment data>. You can select the desired environmental parameters using a selection mask. This file is also stored in the same subdirectory as the BIOTABase-files. To retrieve the files in your analysis software, you should rename them with an adequate ending: in CANOCO xx.dat and xx.env, in JUICE xx.cc!.

Data export to GIS (e.g. Arc View, ArcGIS®):

For spatial analyses it might be useful to export selected habitat data of species or plots to a Geographical Information System (GIS). With the sequence <Lists><List select fields> you activate a selection mask where you can choose the desired parameters from a database table. For GIS-applications it is essential to include geographical coordinates to the selection (from [Plots]). You export the selected parameters to a freely nameable text-file, stored within the same subdirectory as the BIOTABase -files.

You can as well use a copy of the whole BIOTABase *.mdb-file directly as a geodatabase in ArcGIS and use the query tools of ArcGIS for data selection.

Data export to MS Excel® or other spreadsheet formats:

MS Excel® can import files with a csv-format (comma separated values). BIOTABase can create such files. The general procedure is to ask for a list (menu item <Lists><...>) or cross table (menu item <Analyse><Cross table>), get a preview and then call <Export>. The separator is the semi-colon ‘;’.