BDMER 2.0

BDMER Stock assessment database for bêche-de-mer and other invertebrates

BDMer Database User Guide

Version 2.0

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GOUVERNEMENT DE LA NOUVELLE CALÉDONIE

PROVINCE NORD

Preamble

The Vanuatu Fisheries Department, the Northern Province of New Caledonia and the Institut de Recherche pour le Développement (IRD) have been collaborating since 2011 to implement large-scale management plans for sea cucumber fisheries in Vanuatu and New Caledonia.

The common management strategy relies on species-based quotas (or TAC, Total Allowable Catch) that would be set in the main fishing sites using underwater observations and high-resolution habitat mapping. The methodological background of this approach was described in:
Léopold M., Cornuet N., Andréfouët S., Moenteapo Z., Duvauchelle C., Raubani, J., Ham J., Dumas P. (2013) Co-managing small-scale sea cucumber fisheries in New Caledonia and Vanuatu using stock biomass estimates to set spatial catch quotas. *Environmental Conservation* 40:367-379.

BDMer tool has been developed by Melanopus SA (Nouméa, New Caledonia) to allow for routine storage and statistical analysis of count data to assess sea cucumber stocks and provide relevant management guidelines for setting TAC levels.

BDMer 2.0 may also be used to estimate the stocks of other slow-moving, benthic invertebrate resources in coral reefs (e.g. trochus *Tectus niloticus*, giant clams *Tridacna sp*, green snail *Turbo marmolatus*) given that the same sampling method is used.

The version 2.0 of BDMer was released in October 2013.

Acknowledgements

The following people have contributed to BDMer 2.0 development :

- Northern Province of New Caledonia : Nathaniel CORNUET, Zacharie MOENTEAPO
- Vanuatu Fisheries Department : Jayven HAM, Rocky KAKU
- IRD : Marc LEOPOLD, Cécile DUVAUCHELLE
- MELANOPUS SA : Guénolé BOUVET

The BDMer project was funded by the Government of New Caledonia, the Northern Province of New Caledonia, the Vanuatu Fisheries Department, the IRD and the French Ministry for Environment.

Contents

Conventions

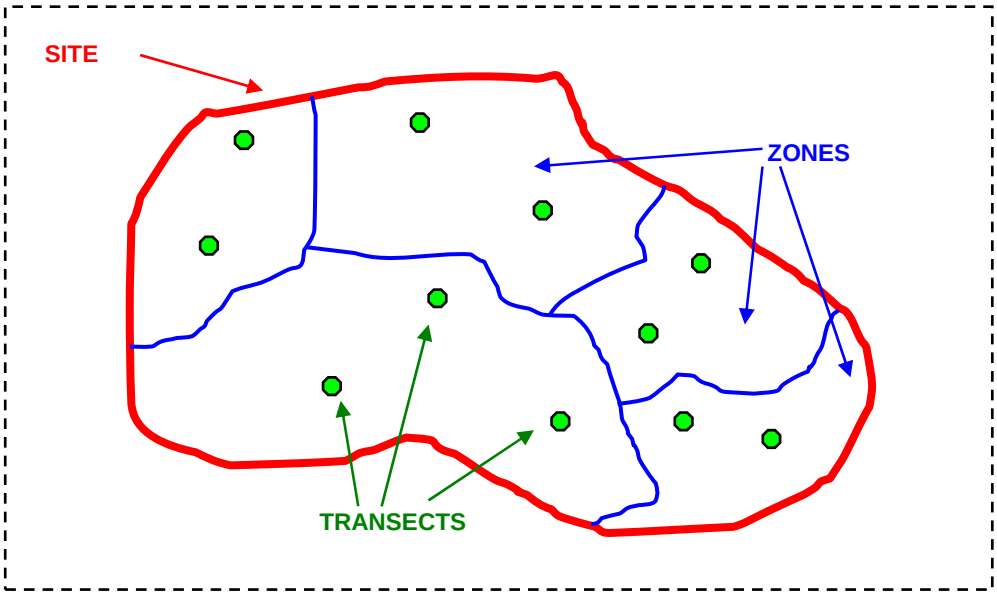
This section describes a collection of uniform spatial units throughout the manual. The conventions used in BDMer 2.0 are as follows:

Site : survey area. This would be the fisheries management unit. A **site** is composed of a mosaic of habitat **zones**

Zone : marine habitat area. A **zone** is defined as a polygon of a given surface. Zones are mapped by visual interpretation of high resolution aerial or satellite pictures through geographical information system (GIS) analysis.

Transect : invertebrates are counted and measured within specific areas named **transects**. Transects are randomly located in habitat **zones** using a stratified sampling design. Transects are characterized by area (length (e.g., 100 m) x width (e.g., 2 m)), latitude/longitude, and respective habitat zone.

These three spatial units are represented in the following figure :



Survey : Count data is collected in a **site** through a field **survey**.

Species habitat zone : Each invertebrate species is found in specific habitat zones depending on ecological factors. These zones are named **species habitat zones** (or **preference zones**) in BDMer 2.0 and used to perform stock estimates for each species. Preference zones are determined based on underwater observations during surveys. They are a subset of all the zones of the site.

1 INTRODUCTION to BDMer 2.0

This user guide presents all the functionalities of BDMer 2.0 in an easily understandable way.

BDMer 2.0 is a user-driven computer tool for managing and analysing underwater data on benthic invertebrate resources (e.g., sea cucumbers, trochus, green snail). It was designed to meet management needs for sea cucumber fisheries and the technical capacities of Fisheries Departments, in New Caledonia and Vanuatu (Southwest Pacific) in particular.

BDMer 2.0 incorporates a multi-species and multi-sites database for underwater observations of invertebrate abundance and size, and marine habitat maps. This tool also allows for performing pre-defined statistical routines to estimate invertebrate stock status (abundance, biomass, density, size structure by species). Estimate uncertainty is also calculated to provide appropriate recommendations for setting TAC level.

BDMer 2.0 automatically displays analysis results using visual support (tables, graphs…) and the most relevant management indicators. Data and results may be downloaded for further analysis or exported to PDF files to publish standardized survey reports.

BDMer 2.0 is available online for backup and data sharing, and on portable computers to provide on-time assessment results and management advice in survey sites.

2 Getting started

Access to BDMer 2.0 is available both online and through a local web application to fit different access restrictions.

2.1 BDMer 2.0 website

Validated data from Fisheries Departments of several Pacific countries is hosted and back-up on IRD Nouméa server and can be accessed online at http://bdmer.ird.nc/.
BDMer 2.0 website allows users from different countries to access a single database to share their data easily.
Access rights are restricted to :

- Fisheries Departments and other organizations that provide, use and manage data in BDMer 2.0 ;
- the IRD for administration purposes (maintenance and development of BDMer 2.0, user rights management).

The IRD also provides free access to a demo version of BDMer 2.0 at**:**
http://bdmer-test.ird.nc/. The demo version offers similar applications, however data is neither validated or saved.

2.2 BDMer 2.0 local application

BDMer 2.0 can be installed on individual (portable) computers in development mode. This option is very useful to access BDMer 2.0 in remote areas without internet connexion such as survey sites (e.g., in order to analyse data right after the field survey).
Applications are the same as on BDMer 2.0 website.
It is highly recommended to copy the data hosted in the local application onto BDMer 2.0 web server using download and upload procedures (p 47 and p 24) so as to allow for different users to access observation data and for back-up.

The installation and start procedures are presented here below.

2.2.1 Installation

1) **Download EASY-PHP software** *EasyPHP-12.1_with_PHP-5.4.6-setup.exe*
and **install** the software by clicking twice on this executable file.

2) **Copy-paste** the « *bdmer* » folder that was provided by BDMer 2.0 administrator into the following directory: *C:\Program Files\EasyPHP-12.1\mysql\data*

This folder hosts BDMer 2.0 database (tables, observation data, etc.).

3) **Copy-paste** the « *BDMERv2.0* » folder that was provided by BDMer 2.0 administrator into the following directory: *C:\Program Files\EasyPHP-12.1\www*

This folder hosts BDMer 2.0 web application that is used for accessing survey data and assessment results though an easy-to-use web interface.

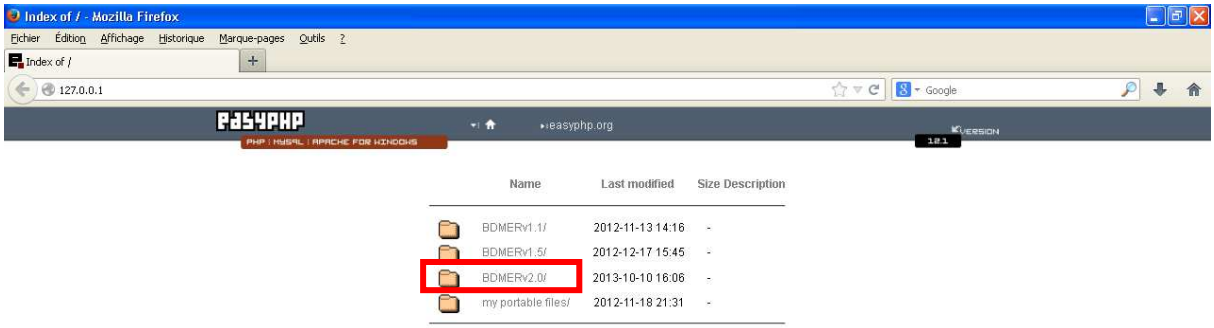
2.2.2 Running the local web application

1) **Start EASY-PHP**.

A small icon  is shown in the taskbar.

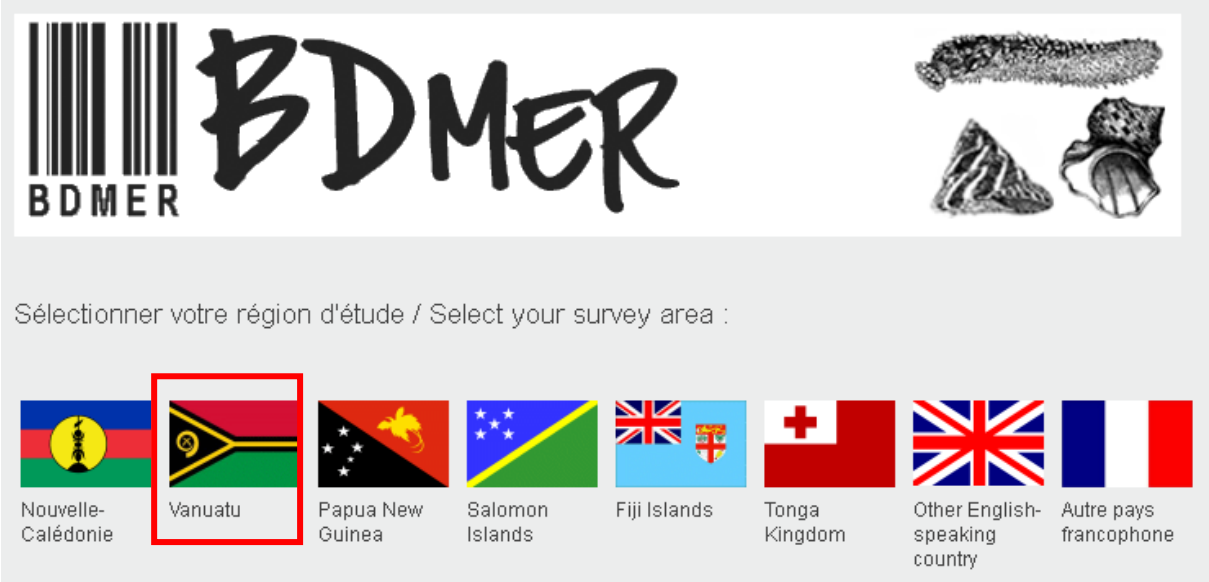
2) **Right click** the  icon and **click on** *local web* to start the application.

3) **Select** the latest available version of BDMer in your web browser : click the *BDMer v2.0/* folder.



2.3 BDMer 2.0 home page

1) **Click** your survey country site to access BDMer 2.0 home page.



Note : Your survey site selection sets BDMer 2.0 language (French/English) as well as the minimum harvest sizes enforced in the country.

If your survey site is not located in either of the available countries, click the *Other English-speaking country* flag (or *Autre pays francophone*). You will then be able to declare the minimum harvest sizes in your country site using the "*Species*" form (p 14).

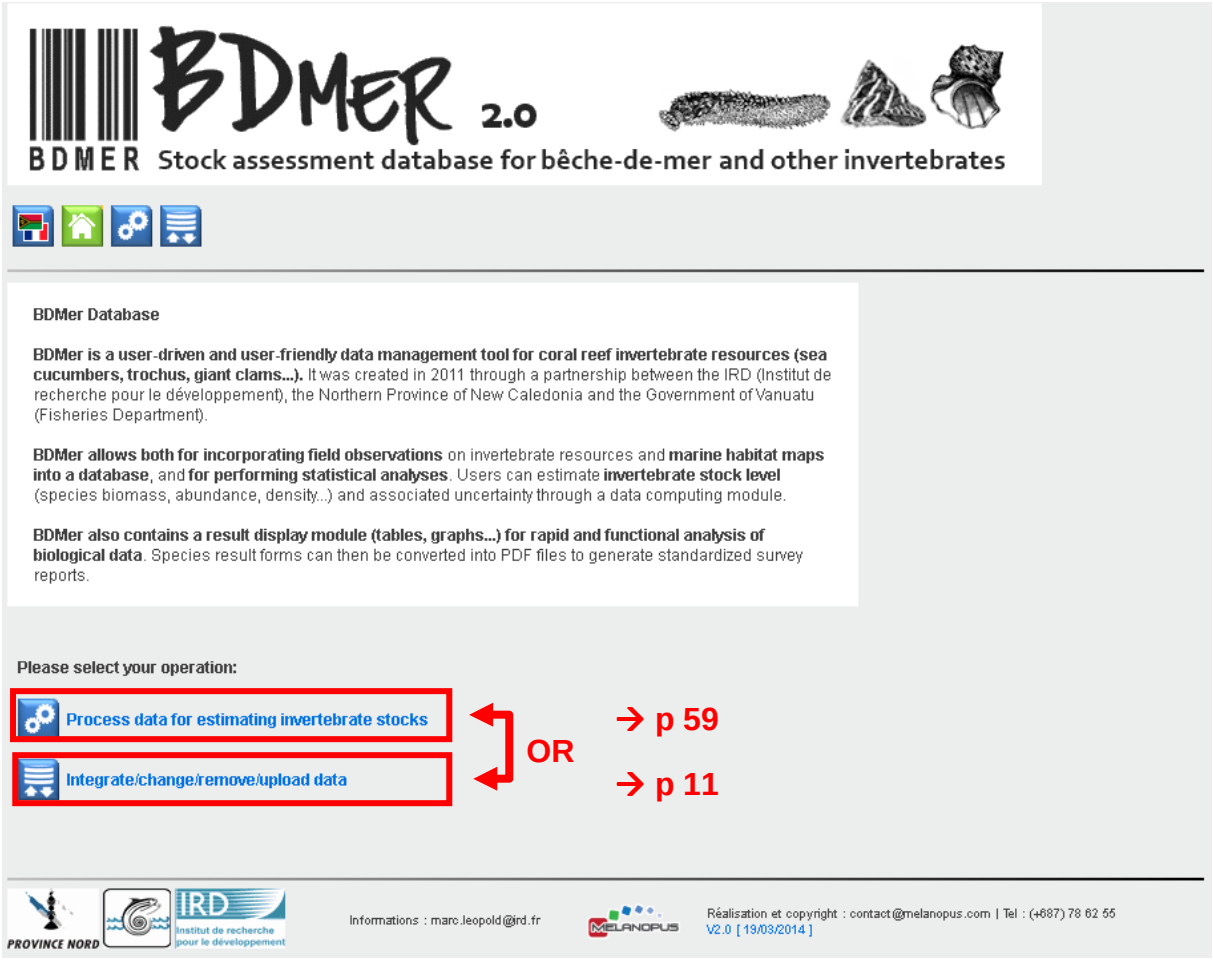
2) **Two options** are available on BDMer 2.0 home page :

- **Integrate, change, remove or upload data** (cf. § 3.)

Click this button to access BDMER 2.0 data (count data, zones, transects, species identification photos, …).

- **Process data for estimating invertebrate stocks** (cf. § 4.)

Click this button to access survey results (stock biomass and size structure, maps of survey sites, …).



Four short cuts appear in the main menu at the top of any web page :

: Direct access to site selection web page

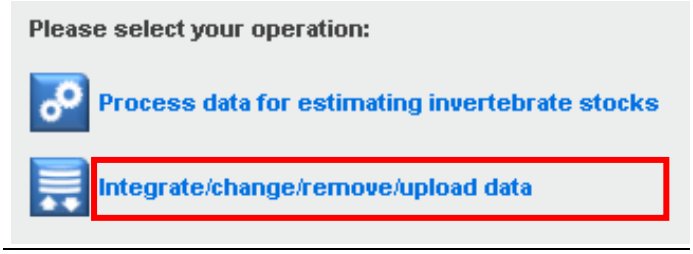
: Direct access to home page

: Direct access to data analysis and stock estimate procedures (cf. § 4. p 59)

: Direct access to data management procedures (cf. § 3. p 11)

3 DATA ENTRY, UPLOAD, MODIFICATION AND DOWNLOAD

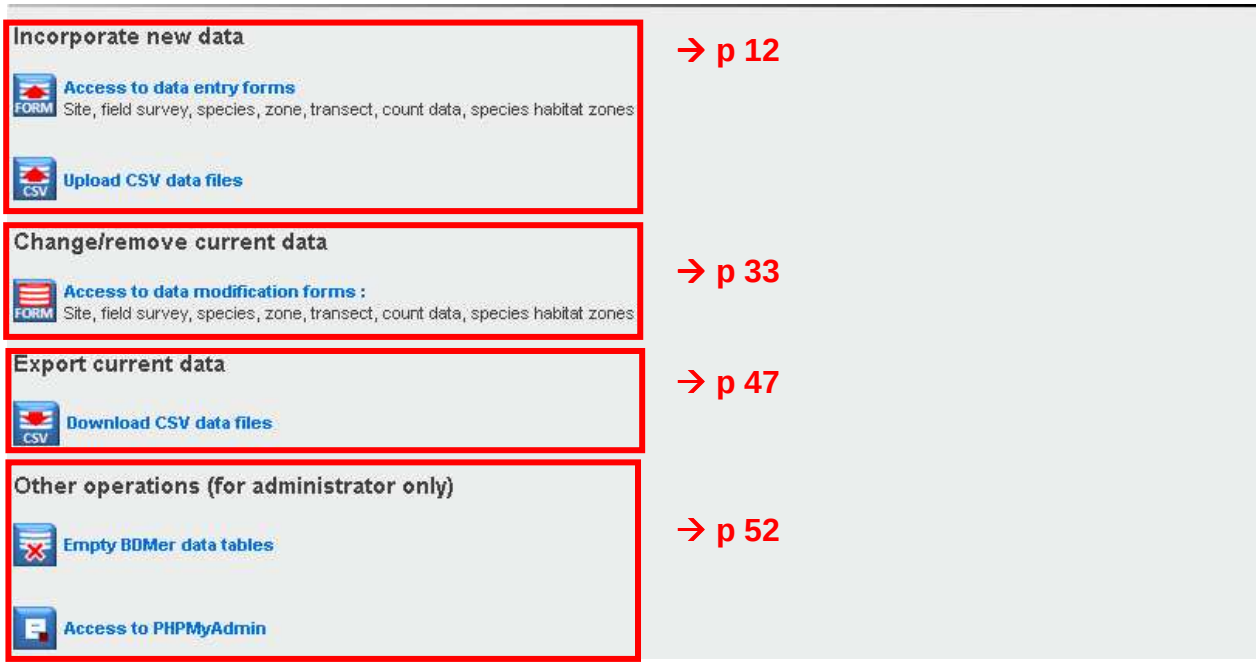
1) **Click** *Integrate/change/remove/upload data* on BDMer 2.0 home page.



OR

Click the *Integrate/change/remove/upload data* button in the main menu.

2) Six available commands are grouped in four operation types : *Incorporate new data*, *Change/remove current data*, *Export current data*, and *Other operation (for administrator)*



3.1 Input new data into BDMer 2.0

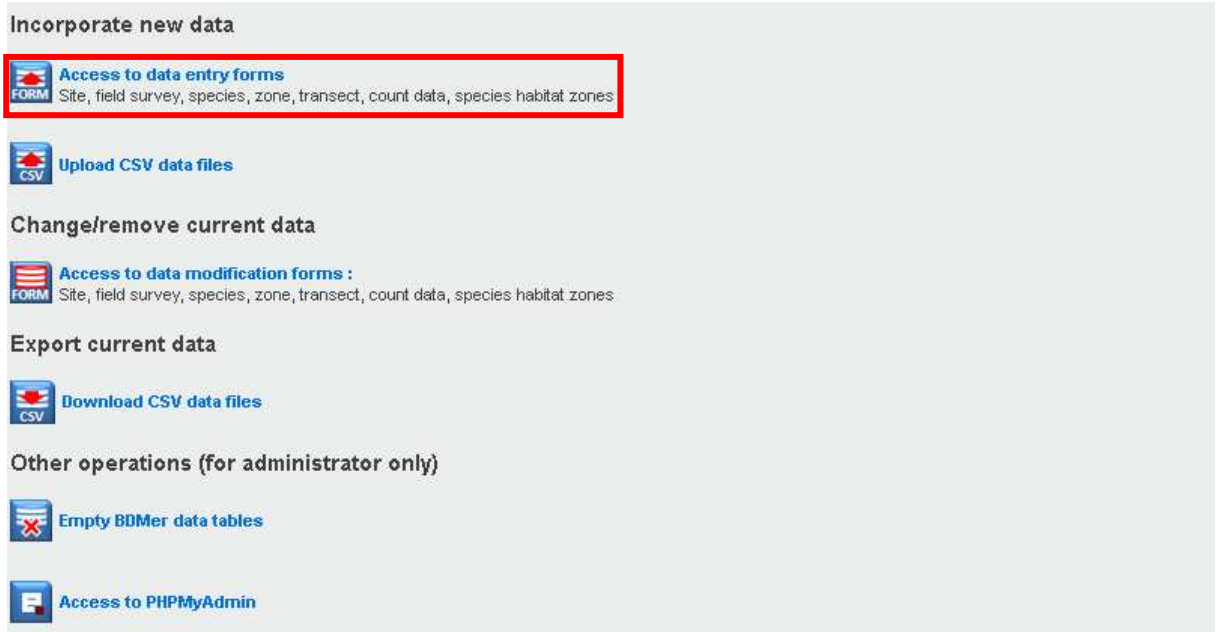
3.1.1 Input data using data entry forms

Data entry forms have been structured to facilitate and speed data entry into BDMer 2.0. Data validity tests are conducted to detect invalid data (typing errors, identification errors, outliers, unauthorized signs, etc.).

The procedure is as follows:

1) **Click** the *Integrate/change/remove/upload data* button in the main menu.

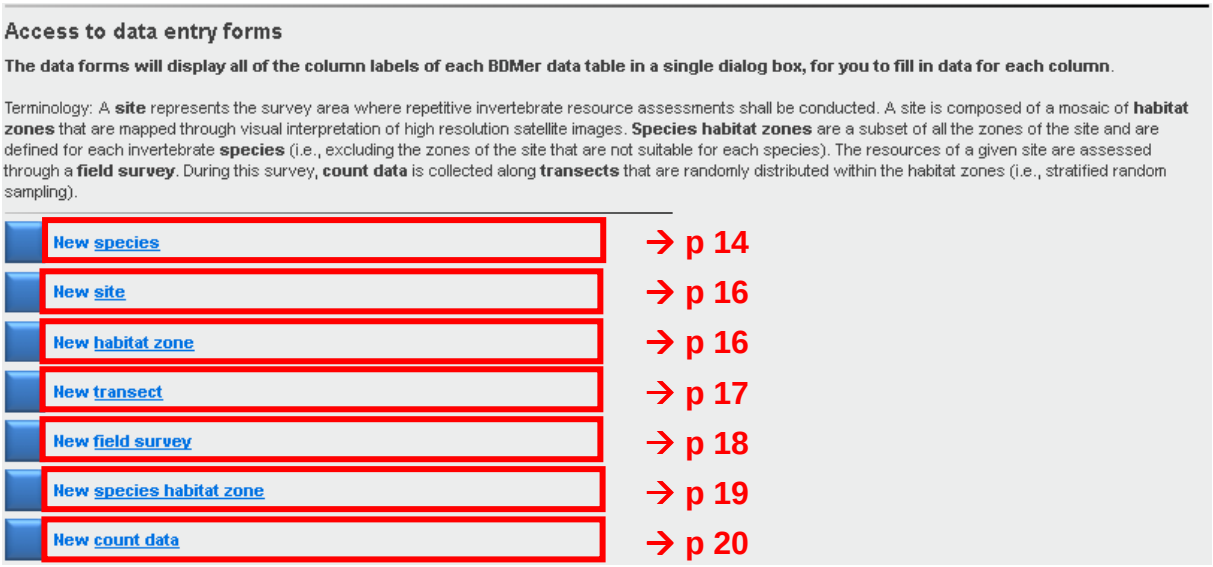
2) **Click** the *Access to data entry form* command



2) New data can be incorporated into BDMer 2.0 data tables using different entry forms according to the type of data:

- New invertebrate "Species"
- New survey "Site"
- New "Zone" within a survey site
- New "Transect" within habitat zones
- New "Field survey"
- New " Species habitat zones"
- New "Count data"

Click the type of data corresponding to your data to access the appropriate data entry form.

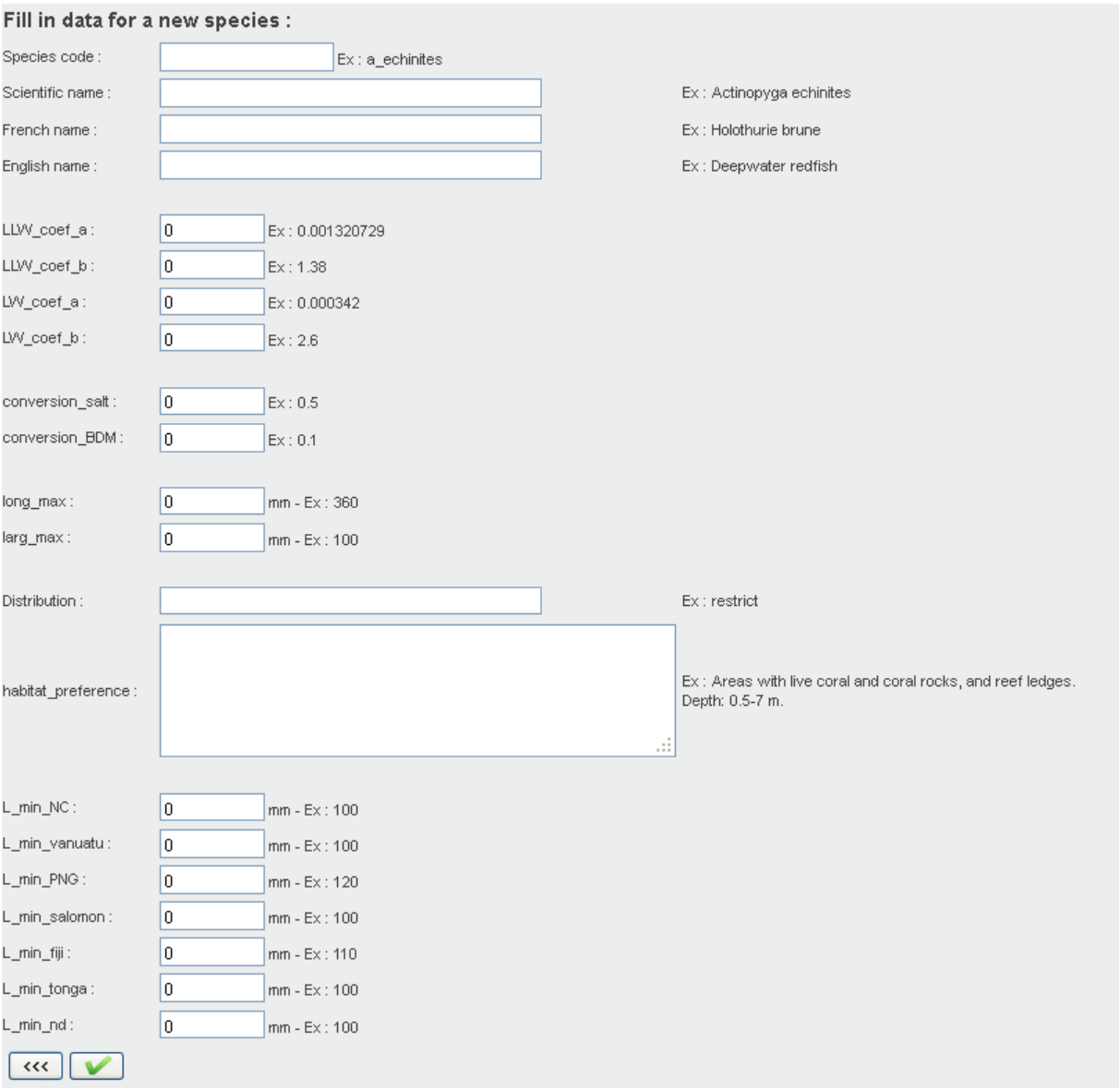


3.1.1.1 Input a new species

One must inform the following data fields while incorporating a new invertebrate species into BDMer 2.0 (see screen preview p 15):

Field name	Description
Species code	Species reference in the database. Use the following code : first letter of genus name followed by "_" and full species name in lowercase letters. Exemple : Actinopyga echinites → a_echinites
Scientific name	Latin name (genus an dspecies)
French name	French common name
English name	English common name
LLW_coef_a	"a" coefficient in the length&width – weight conversion formula. For sea cucumbers, this relationship is as follows: Weigth (W) = a*[PI*(Length/2)*(Width/2)]^b. Use "." as decimal separator (rather than ","). Eg : 2.456 and not 2,456. This relationship lacks for some species (set LLW_coef_a = 0).
LLW_coef_b	"b" coefficient in the above length & width – weight conversion formula. Use "." as decimal separator. This relationship lacks for some species (set LLW_coef_b = 0).
LW_coef_a	"a" coefficient in the length – weight conversion formula. For sea cucumbers, this relationship is as follows: Weight (W)= a*[Length^b]. Use "." as decimal separator (rather than ","). Eg : 2.456 and not 2,456. This relationship lacks for some species (set LW_coef_a = 0).
LW_coef_b	"b" coefficient in the above length – weight conversion formula. Use "." as decimal separator. This relationship lacks for some species (set LW_coef_b = 0).
conversion_salt	Conversion rate from whole weight to salted and gutted products for sea cucumbers, or to raw shells (eg, trochus, green snail). Use "." as decimal separator. Eg : conversion_salt = 0.42 if 1kg of whole weight animals gives 0.42 kg of salted and gutted products (42 %).
conversion_BDM	Conversion rate from whole weight sea cucumbers to dried products (bêche-de-mer). Use "." as decimal separator. Eg : conversion_BDM = 0.07 if 1kg of whole weight animals gives 0.07 kg of bêche-de-mer (7 %).
long_max	Maximal length (in mm)
larg_max	Maximal width (in mm)
distribution	Inidicates here if the species in found in a very large range of marine habitats (distribution = ubiquist) or in restricted habitats (distribution = restrict)
habitat_preference	Describes species preference habitats (exposition, substrate, depth, reef geomorphology…)
L_min_NC	Minimum harvest length in New Caledonia (in mm).
L_min_vanuatu	Minimum harvest length in Vanuatu (in mm).
L_min_PNG	Minimum harvest length in Papua New Guinea (in mm).
L_min_salomon	Minimum harvest length in the Solomon Islands (in mm).
L_min_fiji	Minimum harvest length in Fiji Islands (in mm).
L_min_tonga	Minimum harvest length in Tonga (in mm).
L_min_nd	Indicate here the minimum harvest length (in mm) in your study site if your country site is not listed above.

Note : If the species "*LLW_coef_a*" and "*LLW_coef_b*" coefficients (OR the "*LW_coef_a*" and "*LW_coef_b*" coefficients) are not informed in BDMer 2.0, the estimated stock biomass (in kg) will be 0. However, the stock abundance (in number of individuals) would be correctly estimated (cf. p 59).



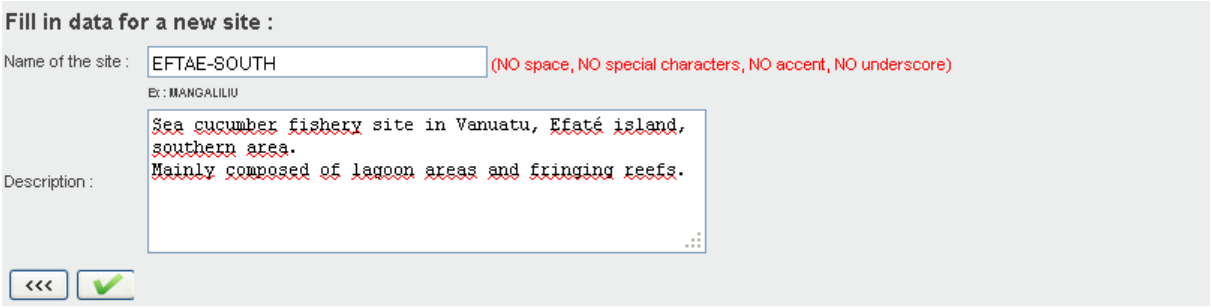
Click the ✔ button to validate the creation of the new species or the <<< button to cancel and go back to the previous page.

Note : "*Species code*" and "*scientific name*" are the only compulsory fields.

3.1.1.2 Input a new survey site

One must inform two data fields while incorporating a new survey site into BDMer 2.0 :

Field name	Description
Site name	The site name must be written in uppercase letters (ex : EMAE). If the site name is composed of 2 or 3 words, each word must be separated by "-" (don't use "_", space, special characters, accent). Eg : EFATE-SOUTH Try not to exceed 15 characters.
Description	This is a free text field that describes the site location (country, island, province…), target resources, etc.



Click the ✔ button to validate the creation of the new survey site or <<< to cancel.

3.1.1.3 Input a new zone

One must inform three data fields while incorporating a new zone into BDMer 2.0 :

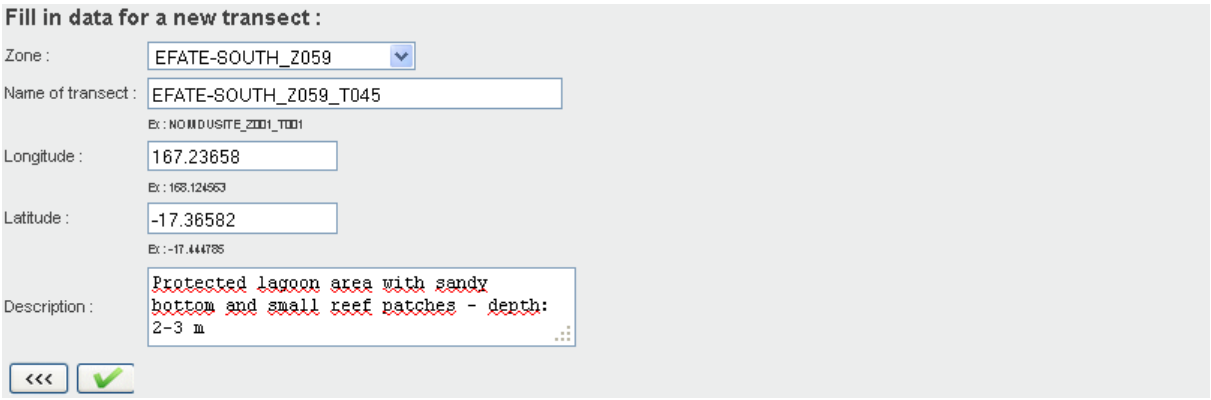
Field name	Description
Site	Scroll the sites list to select the appropriate survey site
Name of the zone	The name of each zone is composed of two parts : - The exact name of the site followed by "_" (eg. EFATE-SOUTH_) These characters are automatically generated and must not be changed. - The code of the zone (3 digits), preceded by "Z" (eg. Z089) Eg. EFATE-SOUTH_Z089
Surface of the zone	Surface area of the zone (in m²) calculated through GIS. This field is compulsory. Note : 1 km² = 100 ha = 1,000,000 m² 1 ha = 10,000 m²

Click the ✔ button to validate the creation of the new zone or <<< to cancel.

3.1.1.4 Input a new transect

One must inform five data fields while incorporating a new transect into BDMer 2.0 :

Nom du champ	Description
Zone	Scroll the zones list to select the appropriate zone
Name of transect	The name of each transect is composed of two parts : - The exact name of the zone followed by "_" (eg. EFATE-SOUTH_Z059_) These characters are automatically generated and must not be changed. - The code of the transect (3 digits), preceded by "T" (eg. T045) Ex. EFATE-SOUTH_Z059_T045
Longitude	Longitude (in decimal degrees) using WGS84 coordinates. Use "." as decimal separator. Eg. 168.23568
Latitude	Latitude (in decimal degrees) using WGS84 coordinates. Use "." as decimal separator and "-" for South latitudes. Eg. -17.23651
Description	This is a free text field that describes the marine habitat (rocky/sandy bottom, live/dead coral, seagrass, etc.) and depth within the transect area. Remark : this information is complementary to count data to set the preference habitat zones of the target species.

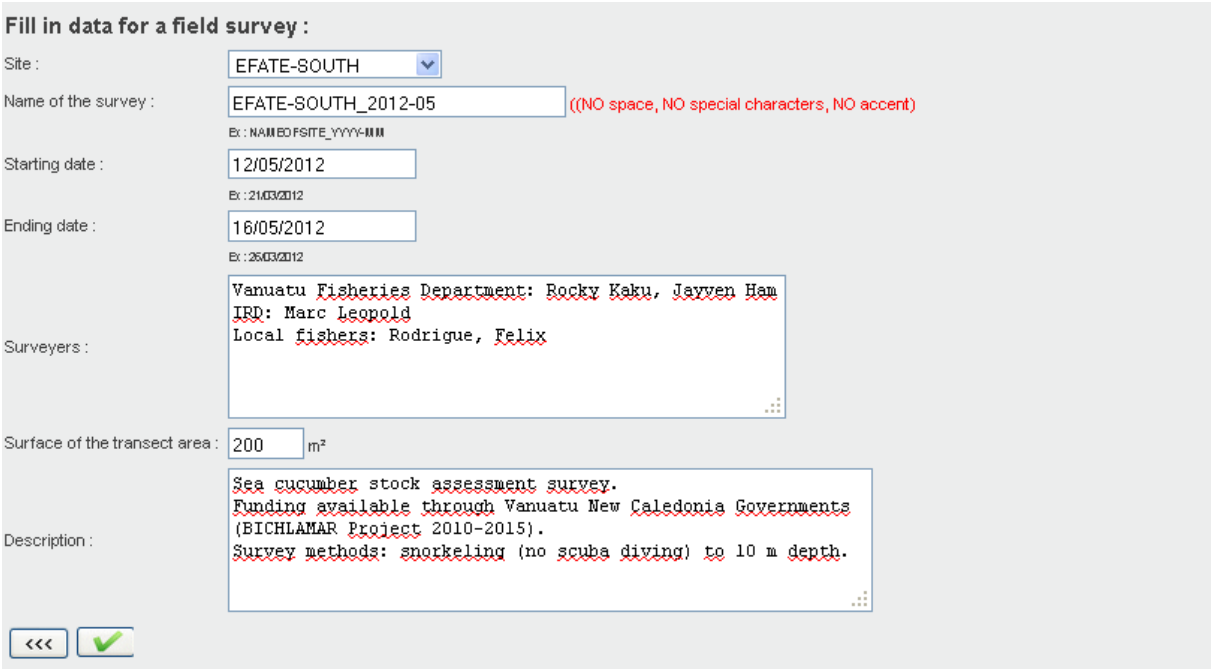


Click the  button to validate the creation of the new zone or  to cancel.

3.1.1.5 Input a new field survey

One must inform five data fields while incorporating a new transect into BDMer 2.0 :

Field name	Description
Site	Scroll the sites list to select the appropriate survey site
Name of the survey	The name of each survey is composed of two parts : - The exact name of the site followed by "_" (eg. EFATE-SOUTH_) These characters are automatically generated and must not be changed. - The year and the month of the survey, separated by "-" (don't use "_", space, special characters, accent) Eg. EFATE-SOUTH_2012-05
Starting date	Date of the first survey day (DD/MM/YYYY)
Ending date	Date of the last survey day (DD/MM/YYYY)
Surveyers	Free text field that presents the names of the participants to the survey (including their organization, contact, etc.)
Surface of the transect area	Surface area (in m²). Eg : 100-m long and 2-m wide transects extend over 200 m² (default value).
Description	Free text field that describes all relevant information related to the survey: target invertebrate resources, count method, funding agencies, project name, etc.



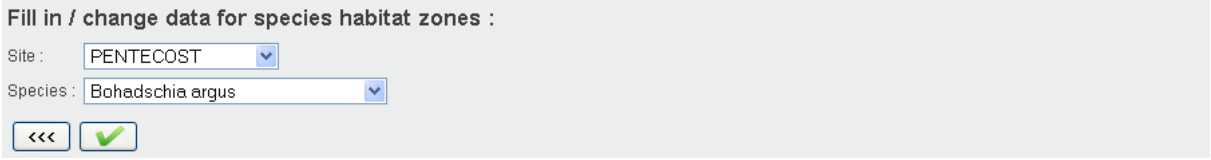
Click the ✔ button to validate the creation of the new field survey or <<< to cancel.

3.1.1.6 Input a new species habitat zone

Note : Each invertebrate species is found in specific habitat zones depending on ecological factors. These zones are named **species habitat zones** (or **preference zones**) in BDMer 2.0 (cf. p 5) and used to perform stock estimates for each species (cf. p 62).

1) **Scroll** the sites and species lists to select the appropriate survey site and invertebrate species**,** then **validate**  .

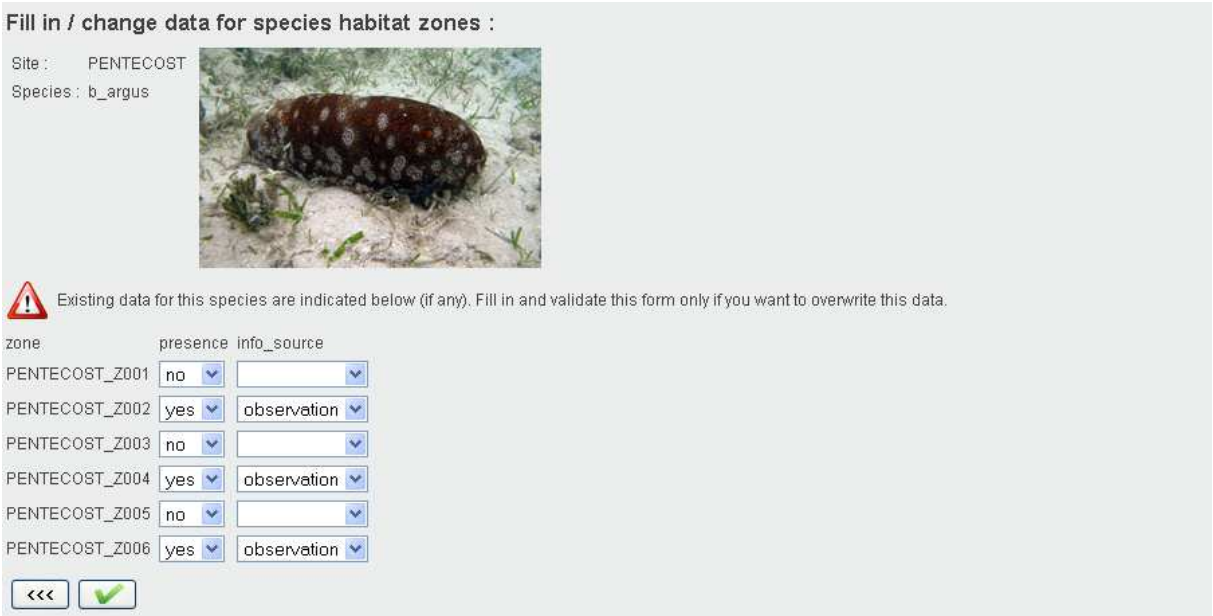
Note : You can not input a new preference zone in BDMer 2.0 prior to input the corresponding survey site and species.



2) **Inform** the following data fields for each zone in the survey site :

- "*presence*" : select "*presence*" = *yes* if the zone is suitable for this species and "*presence*" = *no* otherwise (default value).
- "*info_source*" : if "*presence*" = *yes*, select "*info_source*" = *observation* if the species was observed within this zone (within or outside sample transects) during the survey, or "*info_source*" = *literature* if your choice is based on available ecological knowledge from reports, publications, etc.

Note: It is not recommended to generalize ecological knowledge from literature to avoid misestimating resource stocks.

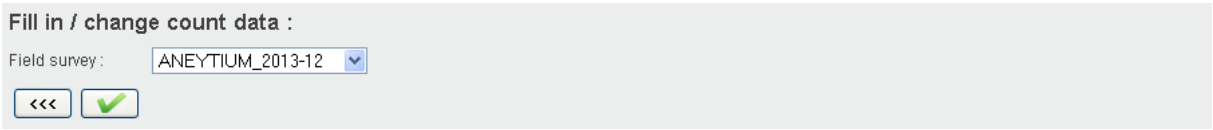


3) **Click** the  button to validate the creation of the new field survey or  to cancel.

3.1.1.7 Input new count data

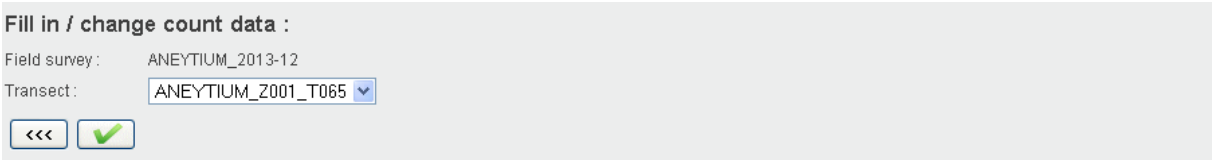
1) **Scroll** the surveys list to select the appropriate field survey**,** then **validate**  .

Note : You can not input new count data in BDMer 2.0 prior to input the corresponding field survey.

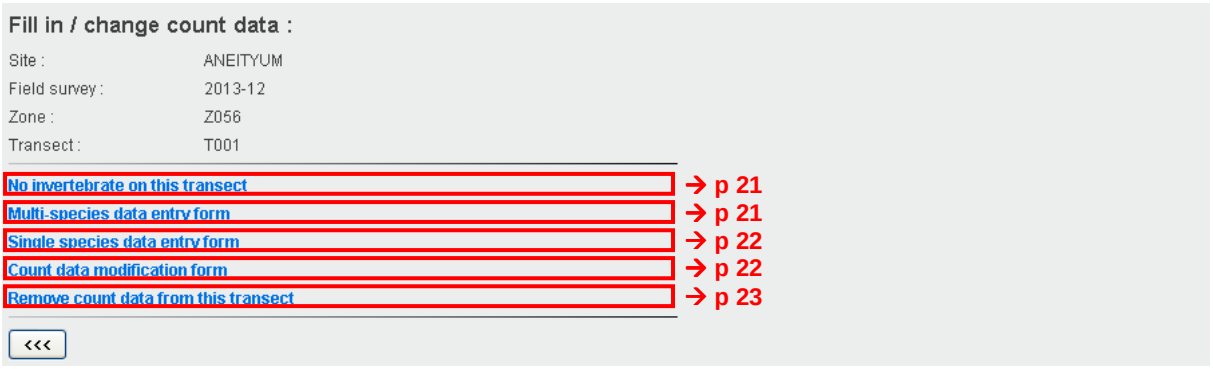


2) **Scroll** the surveys list to select the appropriate field survey**,** then **validate**  .

Note : You can not input new count data in BDMer 2.0 prior to input the corresponding survey site, zones, and transects.



3) **Select** the appropriate entry mode among the five available options according to the invertebrate abundance within the selected transect to facilitate and speed data entry.

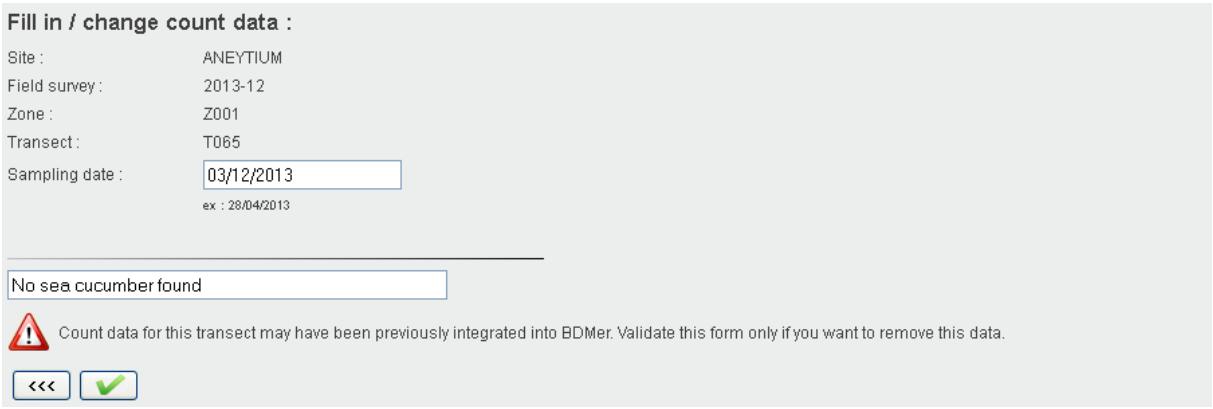


OPTION #1 : No invertebrate was found within the transect :

- Click the *No invertebrate in this transect* command

- Inform survey date (DD/MM/YYYY) and validate 

 Count data that would have been previously incorporated in BDMer 2.0 for this transect and this field survey will be removed (cf. OPTION #5).

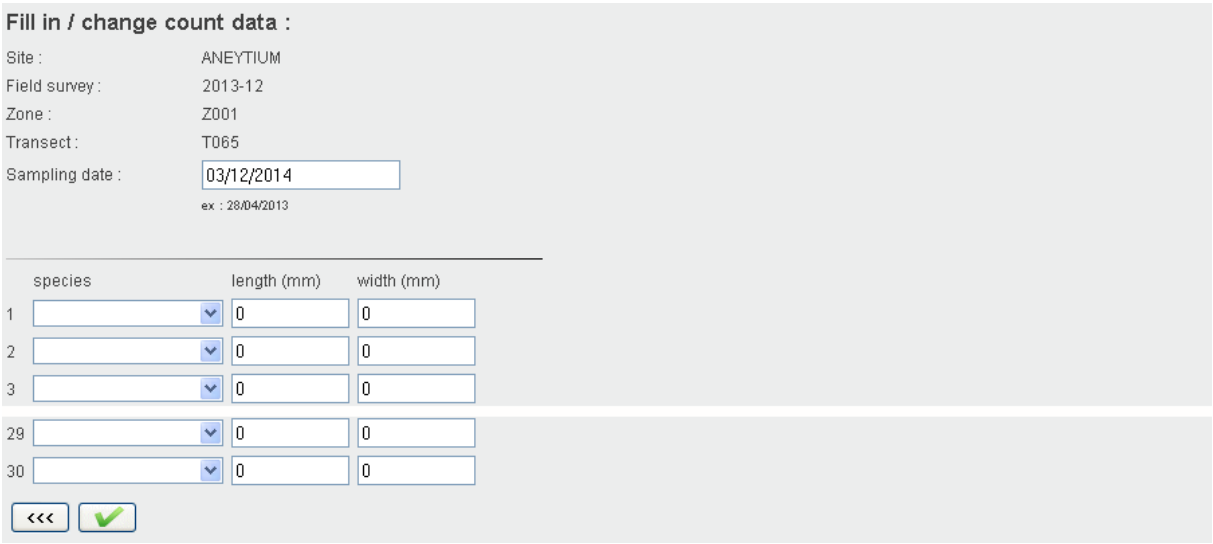


OPTION #2 : Several species were observed within the transect :

- Click the *Multi-species data entry form* command

- Inform survey date (DD/MM/YYYY), and fill in the data table: scroll the species list to select the appropriate species and inform corresponding length (mm) and width (mm)

- Validate 



 Individual length and width can not excess "*long_max*" et "*larg_max*" parameters as set in the corresponding "*Species*" table (cf p 14).

 Length must be informed, but width is optional. However, if one does not inform invertebrate width (i.e, "*width*"=0), the length&width–weight conversion relationship must not be used when estimating the stock of this species (p 64).

In the case of typing errors, replace the species name by a blank line (first line in the scrolling list) and input "*length*" = 0 and "*width*" = 0.

Note: if more than 30 individuals were observed, validate and repeat from step 1.

OPTION #3 : A single invertebrate species was observed within the transect :

- Click the *Single species data entry form* command

- Inform survey date (DD/MM/YYYY), and scroll the species list to select the appropriate species

- Fill in the data table: inform length (mm) and width (mm) of each individual

- Validate

Note: if more than 30 individuals were observed, validate and repeat previous steps.

OPTION #4 : You want to change existing count data:

You may use this option in the case of typing error or for completing transect records for instance.

- Click the *Count data modification form* command

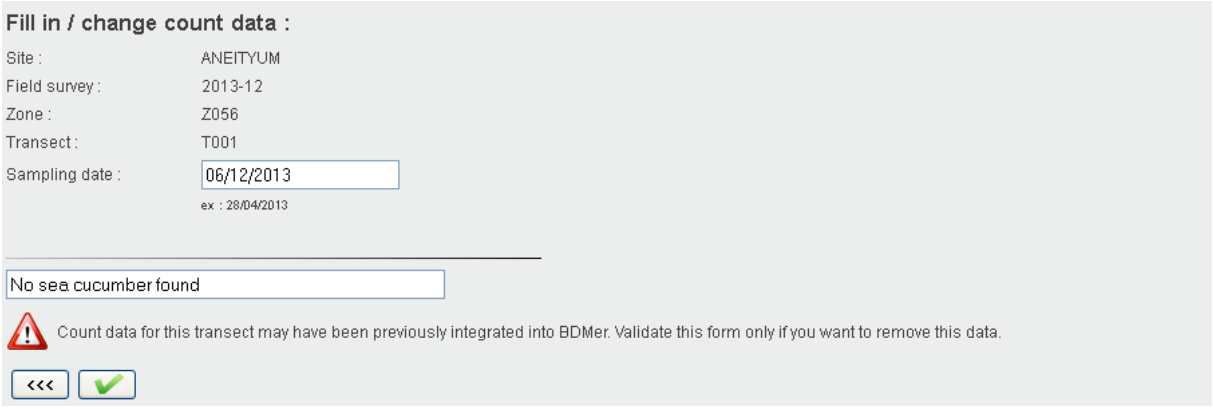
- Scroll the species list to select the appropriate species and inform corresponding length (mm) and width (mm). To remove an individual from the data table, replace the species name by a blank field (first row in the scrolling list) and input "*length*" = 0 and "*width*" = 0.

- Validate data modification .

OPTION #5 : You want to remove ALL existing for this transect and this field survey in BDMer 2.0:

- Click *Remove count data from this transect*

- Confirm your choice  or cancel data removal  .



TIPS TO FACILITATE DATA ENTRY

- Press TAB to switch from one data field to another for single species and multi-species data entry forms.

- Press the first letter of species name (eg. press « *h* » for *Holothuria sp.*) instead of scrolling species list to move to the species row whose name starts with that letter (eg. press "h" → *Holothuria atra*).

  Press the same letter again to move down the list rows (eg. press "*h*" twice → *Holothuria edulis*), or use ↑ or ↓ to move up or down the list rows.

- If several species were observed in high numbers within the transect (eg. *Holothuria scabra*, n=150 and *Actinopyga miliaris*, n=50), one may use the single species data entry form for each species.

3.1.2 Upload data from CSV files

BDMer 2.0 user interface allows for uploading blocks of data (eg. zones, transects, count data…) from CSV files (using semi-column separator).

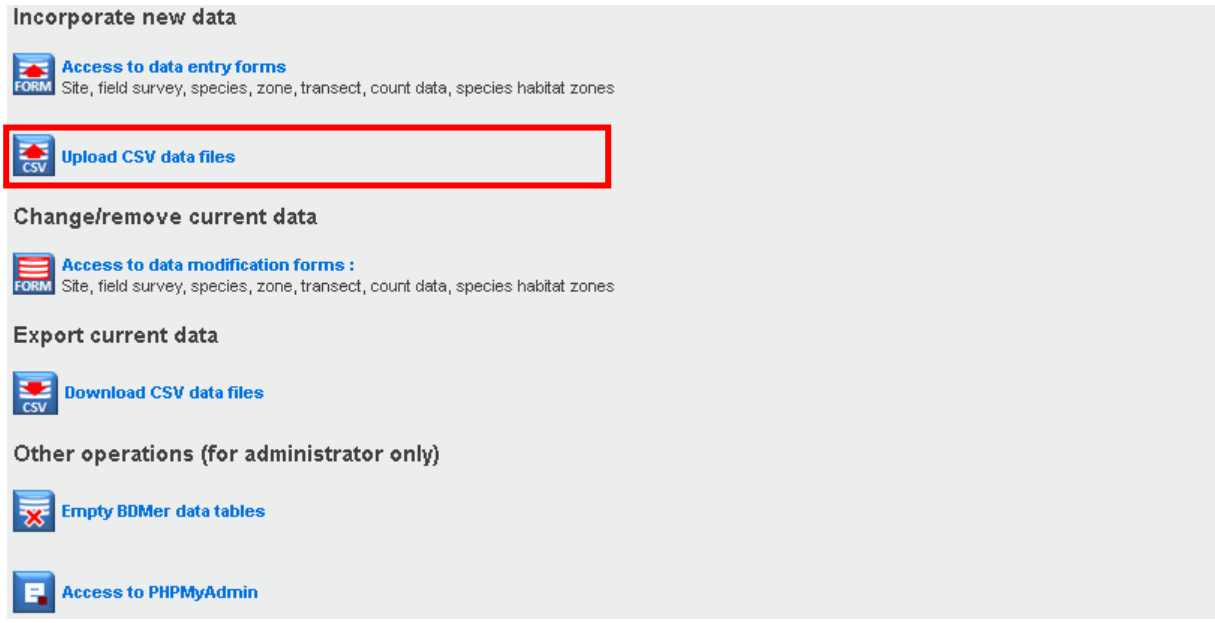
This tool is very useful to avoid typing errors and to facilitate data entry in BDMer 2.0 in the following cases :

- To upload blocks of geographical data from GIS attribute tables (eg. surface area of marine zones, GPS transect coordinates).
- To upload blocks of data (eg. count data) available from other computers or softwares (eg. Microsoft Excel files).
- To copy BDMer 2.0 data to another computer or server (eg. for duplicating of the database).

The upload procedure is as follows :

1) **Click** the *Integrate/change/remove/upload data* button in the main menu.

2) **Click** the *Access to data entry form* command

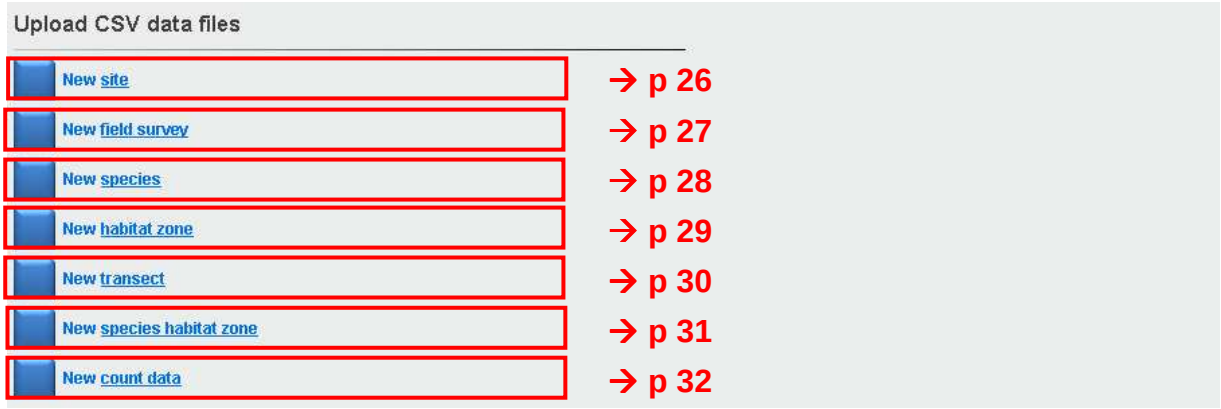


Note : CSV files can easily be created from Microsoft Excel files using the « save as » function and CSV file extension. Use the semi-column separator rather than the comma separator (check your settings *Control panel>Region and language>Formats>Additional settings*).

2) Data can be incorporated into BDMer 2.0 data tables using different entry forms according to the type of data :

- New survey "Site"
- New "Field survey"
- New invertebrate "Species"
- New "Zone" within a survey site
- New "Transect" within habitat zones
- New " Species habitat zones"
- New "Count data"

Click the type of data corresponding to your data to access the appropriate data entry form.



Note : CSV files must contain the same data fields as those of the corresponding data table in BDMer 2.0. It is recommended to refer to previous section *Integrate/change/remove/upload data* > *Access to data entry form* (from p 14) to check for data consistency.

Note: The first row of CSV files must contain field names.

3.1.2.1 Upload new survey sites

Data in CSV files must strictly respect the order of columns and the type of data of the following table. Changing the column order of a table may indeed affect codes and applications that depend on the specific order of columns. Only the spelling of column names can be changed.

Code	Description
EFATE-NORTH	Sea cucumber fishery site in Vanuatu, Efaté island, northern area
PENTECOST	Trochus fishery site in Vanuatu, Pentecost island, east coast

Refer to *Input a new survey site* (p 16) to learn about table content and unauthorized characters. The "*Description*" field must not contain ";" sign.

Once the data table has been properly formatted, the upload procedure is as follows :

1) **Click** the *Browse…* button to select your CSV file.

2) **Click** the *Upload* button.

Error messages may be displayed if data does not meet the required format.

Note : This upload procedure does not overwrite existing data.

3.1.2.2 Upload new field surveys

Data in CSV files must strictly respect the order of columns and the type of data of the following table. Changing the column order of a table may indeed affect codes and applications that depend on the specific order of columns. Only the spelling of column names can be changed.

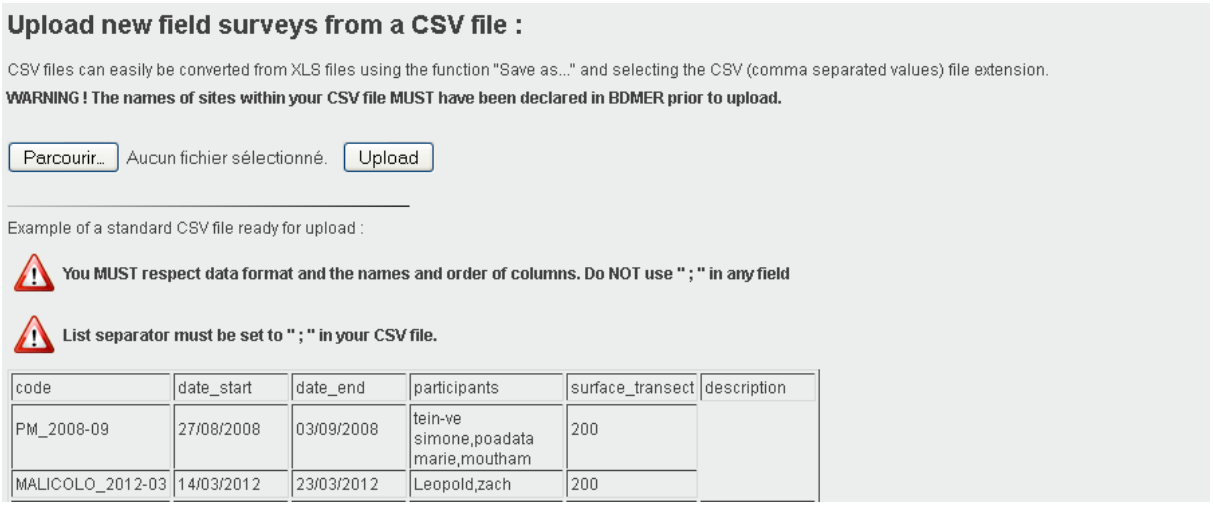
code	Date_start	Date_end	Participants	Surface_transect	Description
EFATE_2012-09	12/09/2012	19/09/2012	Sam Roham	200	Trochus stock assessment

Refer to *Input a new field survey* (p 18) to learn about table content and unauthorized characters. The "*Description*" field must not contain "*;*" sign.

Once the data table has been properly formatted, the upload procedure is as follows :

1) **Click** the *Browse…* button to select your CSV file.

2) **Click** the *Upload* button.



Error messages may be displayed if data do not meet the required format.

Note : This upload procedure does not overwrite existing data.

3.1.2.3 Upload new species

Data in CSV files must strictly respect the order of columns and the type of data of the following table. Changing the column order of a table may indeed affect codes and applications that depend on the specific order of columns. Only the spelling of column names can be changed.

Species code	Scientific name	French name	English name	LLW_coef_a	LLW_coef_b	LW_coef_a	LW_coef_b
a_mauritiana	Actinopyga mauritiana	Holothurie des brisants	Surf redfish	0.01964344	1.11	0.000647	2.456

Wet --> gutted&salted conversion rate	Wet --> dried conversion rate	Max length (mm)	Max width (mm)	Distribution	Species habitat
0.5	0.06	380	150	restrict	Oceanic-influenced reefs in wave-exposed zones. Depth: 0-10 m.

…

Minimum harvest size New Cal.	Minimum harvest size Vanuatu	Minimum harvest size PNG	Minimum harvest size Salomon Is.	Minimum harvest size Fiji Is.	Minimum harvest size Tonga	Minimum harvest size Other country
20	25	0	0	0	0	0

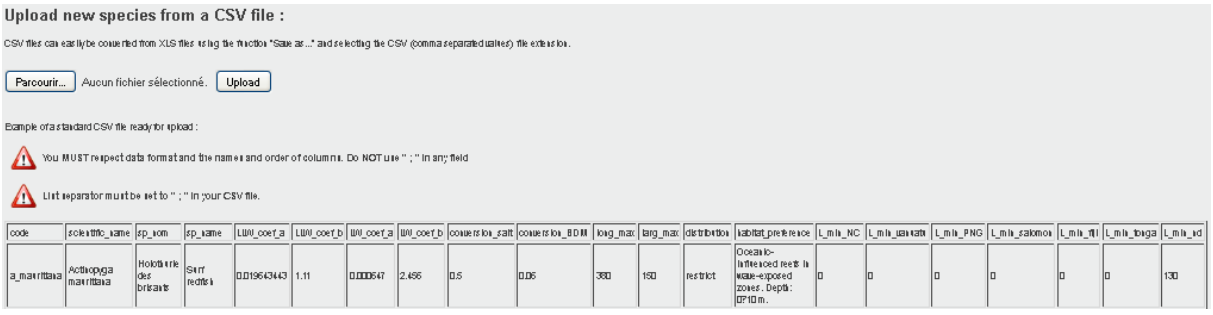
…

Refer to *Input a new species* (p 14) to learn about table content and unauthorized characters. The "*Species habitat*" (or "*Habitat_preference*") field must not contain ";" sign.

Once the data table has been properly formatted, the upload procedure is as follows :

1) **Click** the *Browse…* button to select your CSV files.

2) **Click** the *Upload* button.



Error messages may be displayed if data do not meet the required format.

Note : This upload procedure does not overwrite existing data.

3.1.2.4 Upload new habitat zones

Data in CSV files must strictly respect the order of columns and the type of data of the following table. Changing the column order of a table may indeed affect codes and applications that depend on the specific order of columns. Only the spelling of column names can be changed.

code	Surface area
EFATE_Z001	325659
EFATE_Z002	1235698

Refer to *Input a new habitat zone* (p 16) to learn about table content and unauthorized characters. Surface area should be indicated in m².

Once the data table has been properly formatted, the upload procedure is as follows :

1) **Click** the *Browse…* button to select your CSV files.

2) **Click** the *Upload* button.

Error messages may be displayed if data do not meet the required format.

Note : This upload procedure does not overwrite existing data.

3.1.2.5 Upload new transects

Data in CSV files must strictly respect the order of columns and the type of data of the following table. Changing the column order of a table may indeed affect codes and applications that depend on the specific order of columns. Only the spelling of column names can be changed.

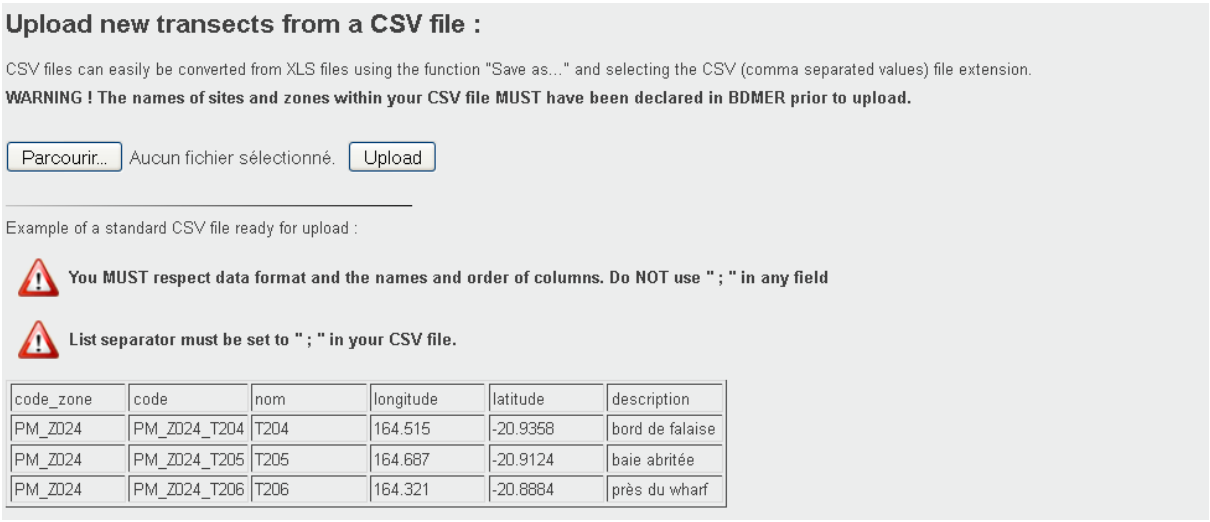
Zone code	Transect code	Name	longitude	latitude	description
EFATE_Z001	EFATE_Z001_T001	T001	168.1235	-17.5236	Reef flat with rubble, depth 1-2 m.
EFATE_Z001	EFATE_Z001_T002	T002	168.3658	-17.6528	Dense seagrass bed, sandy bottom with reef patches, depth 2-4 m.

Refer to *Input a new transect* (p 17) to learn about table content and unauthorized characters. The "*Description*" field must not contain ";" sign.

Once the data table has been properly formatted, the upload procedure is as follows :

1) **Click** the *Browse…* button to select your CSV files.

2) **Click** the *Upload* button.



Error messages may be displayed if data do not meet the required format.

Note : This upload procedure does not overwrite existing data.

3.1.2.6 Upload new species habitat zones

Data in CSV files must strictly respect the order of columns and the type of data of the following table. Changing the column order of a table may indeed affect codes and applications that depend on the specific order of columns. Only the spelling of column names can be changed.

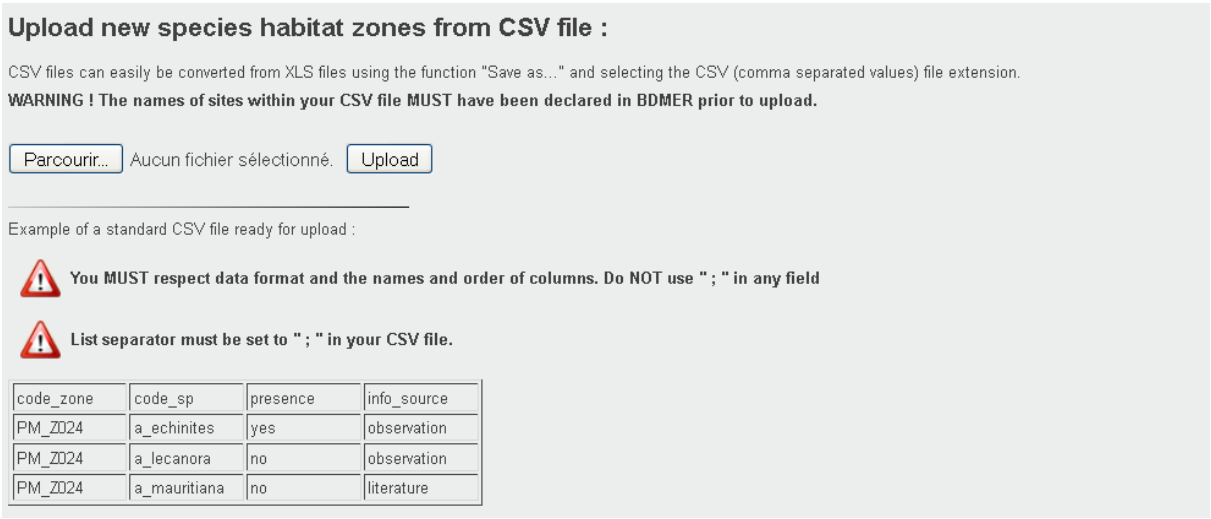
Zone code	**Species code**	**Presence** (yes/no)	**Info_source** (NA/literature/observation)
EFATE_Z001	h_atra	yes	observation
EFATE_Z002	h_atra	no	
EFATE_Z003	H_atra	yes	literature

Refer to *Input a species habitat zone* (p 19) to learn about table content and unauthorized characters.

Once the data table has been properly formatted, the upload procedure is as follows :

1) **Click** the *Browse…* button to select your CSV files.

2) **Click** the *Upload* button.



Error messages may be displayed if data do not meet the required format.

Note : This upload procedure does not overwrite existing data.

3.1.2.7 Upload new count data

Data in CSV files must strictly respect the order of columns and the type of data of the following table. Changing the column order of a table may indeed affect codes and applications that depend on the specific order of columns. Only the spelling of column names can be changed.

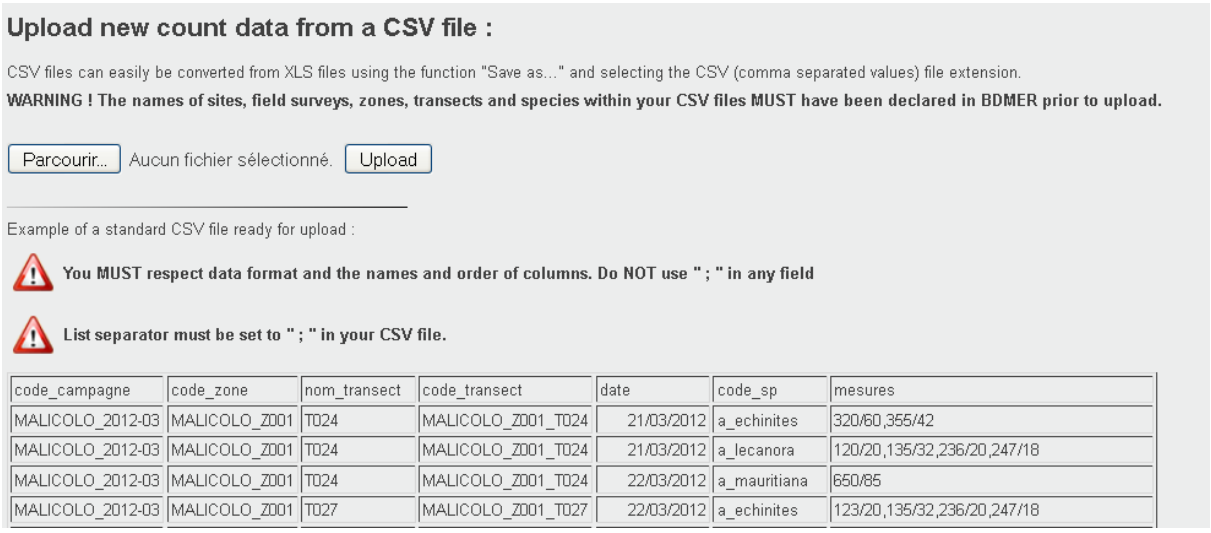
Survey code	Zone code	Transect name	Transect code	Sampling date	Species code	Size (mm) Length/width
MALICOLO_2012-03	MALICOLO_Z001	T024	MALICOLO_Z001_T024	21/03/2012	a_echinites	320/60,355/42
MALICOLO_2012-03	MALICOLO_Z001	T024	MALICOLO_Z001_T024	21/03/2012	a_lecanora	120/20,135/32,236/20, 247/18
MALICOLO_2012-03	MALICOLO_Z001	T024	MALICOLO_Z001_T024	22/03/2012	a_mauritiana	650/85
MALICOLO_2012-03	MALICOLO_Z001	T027	MALICOLO_Z001_T027	22/03/2012	a_echinites	123/20,135/32,236/20, 247/18

Refer to *To input new count data* (p 20) to learn about table content and unauthorized characters.

Once the data table has been properly formatted, the upload procedure is as follows :

1) **Click** the *Browse…* button to select your CSV files.

2) **Click** the *Upload* button.



Error messages may be displayed if data do not meet the required format.

Note : This upload procedure does not overwrite existing data.

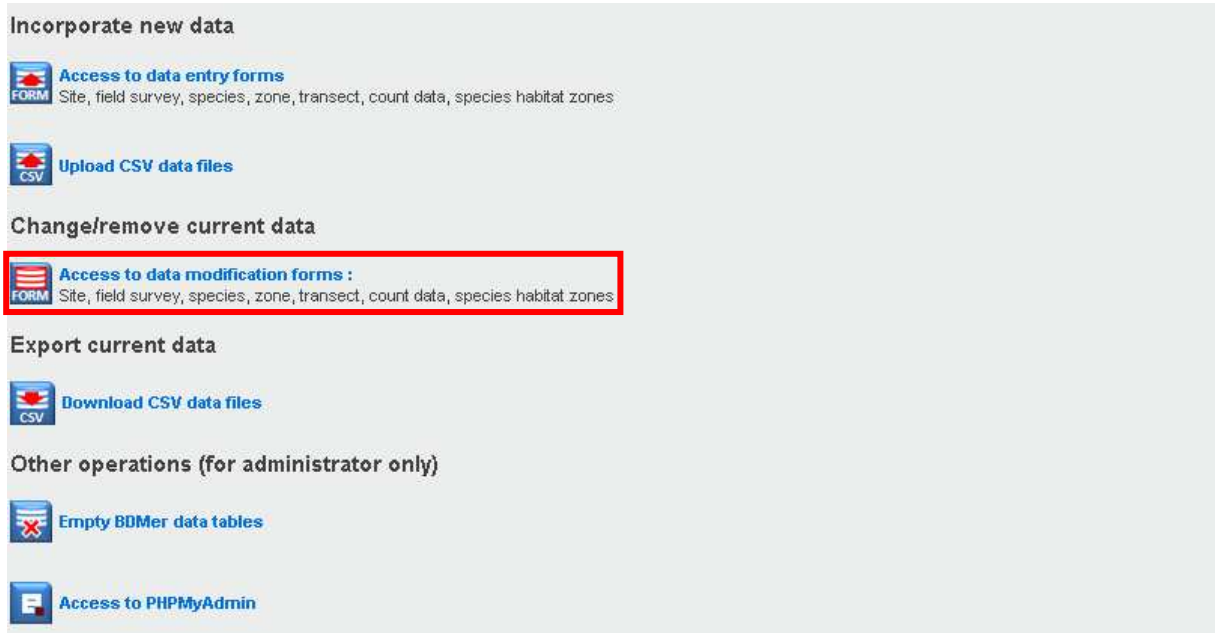
3.2 Change/remove existing data

BDMer 2.0 allows for changing or removing data through data modification forms.

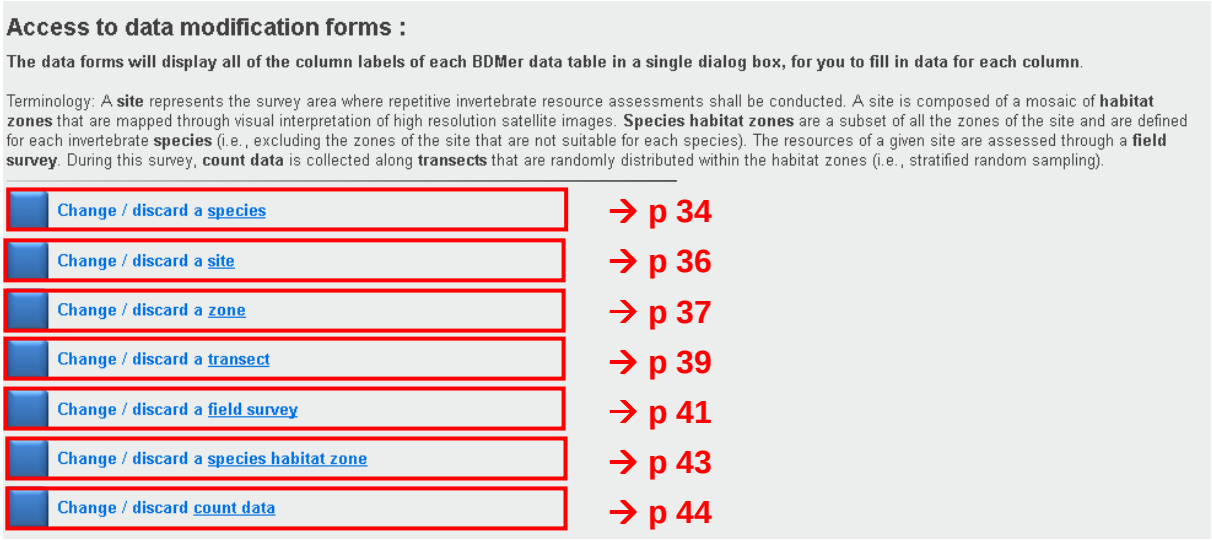
Note : These procedures can only change/remove one transect at a time. They cannot process data blocks.

1) **Click** the *Integrate/change/remove/upload data* button in the main menu.

2) **Click** the *Access to data modification forms* command.



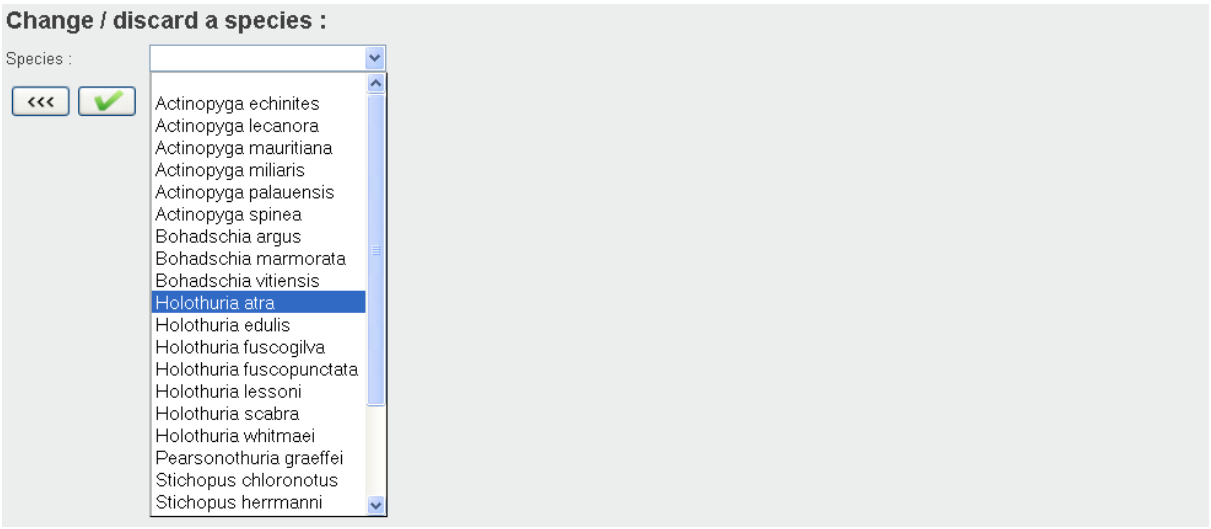
3) Data can be changed/removed from BDMer 2.0 data tables using different modification forms according to the type of data.
Click the type of data corresponding to your data to access the appropriate data modification form.



Data modification forms and data entry forms are the same whatever the type of data. It is recommended to refer to previous section *Integrate/change/remove/upload data* > *Access to data entry form* (from p 14) to check for data consistency.

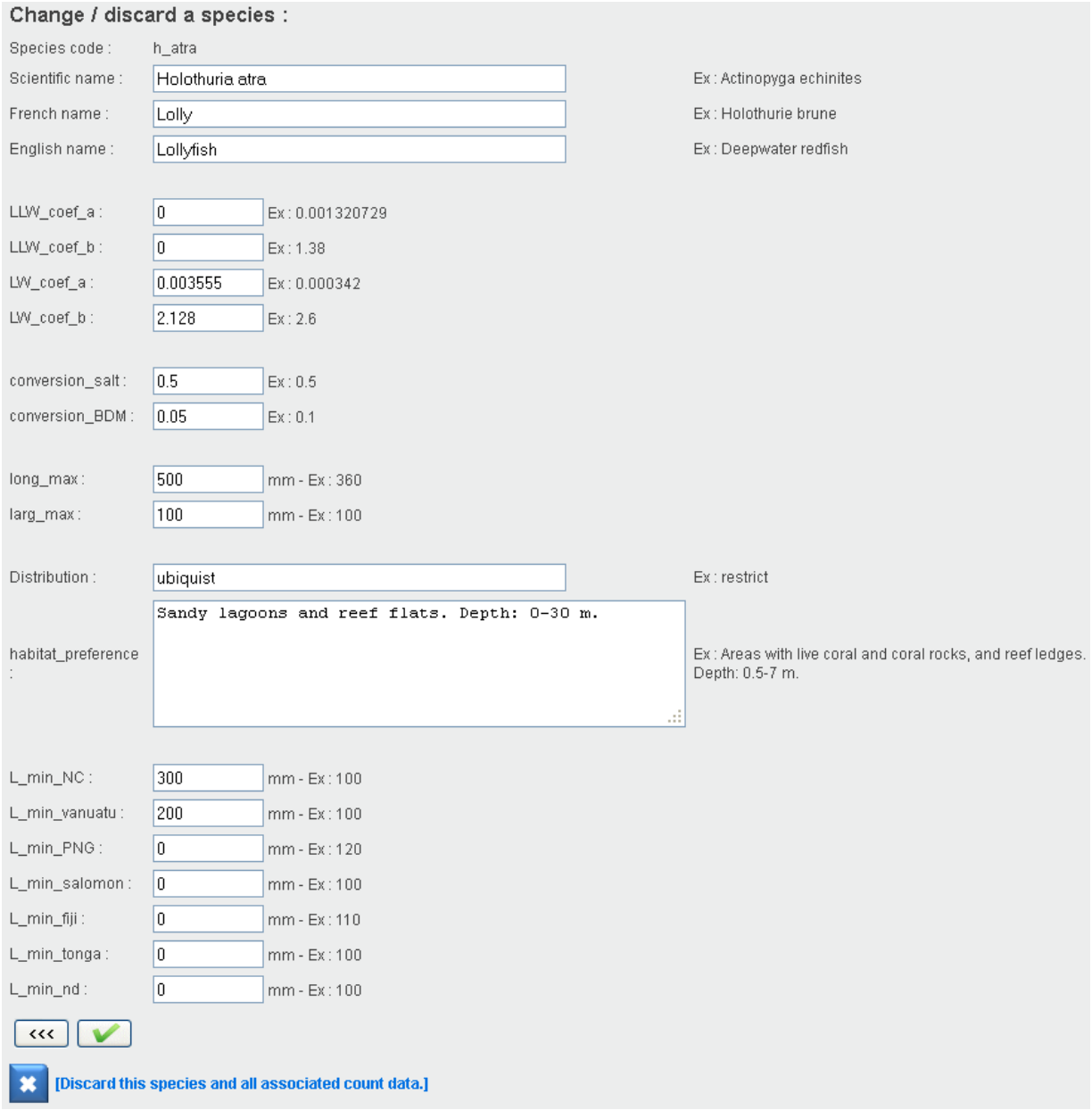
3.2.1 Change/remove a species

1) **Scroll** the species list to select the appropriate species**.**



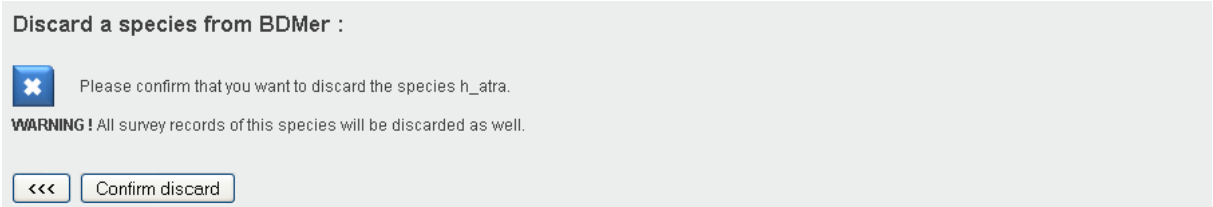
Validate .

2) **Change** the appropriate data field(s) using the required data format, then validate .



3) To remove the selected species from BDMer 2.0, **click** the *Discard this species and all associated count data* command (at the bottom of the page).
Note : Existing count data for all field surveys will be discarded as well.

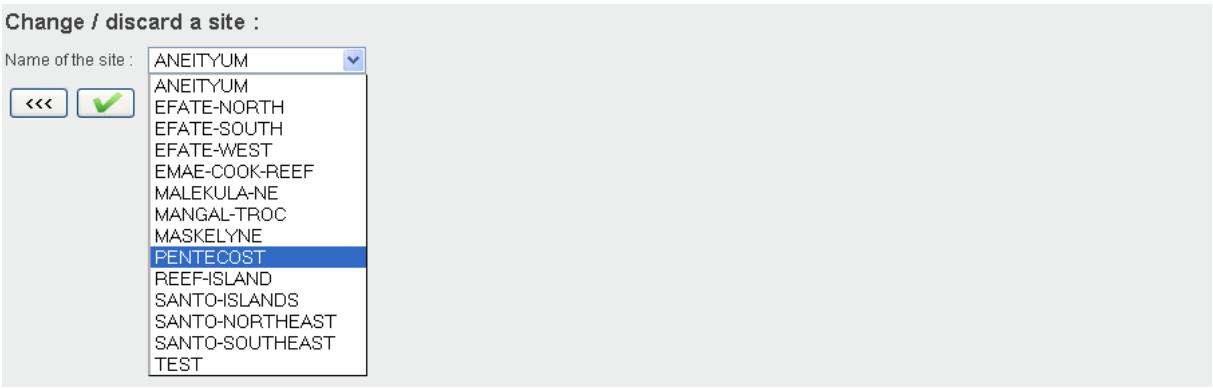
A warning message is displayed to confirm your choice.



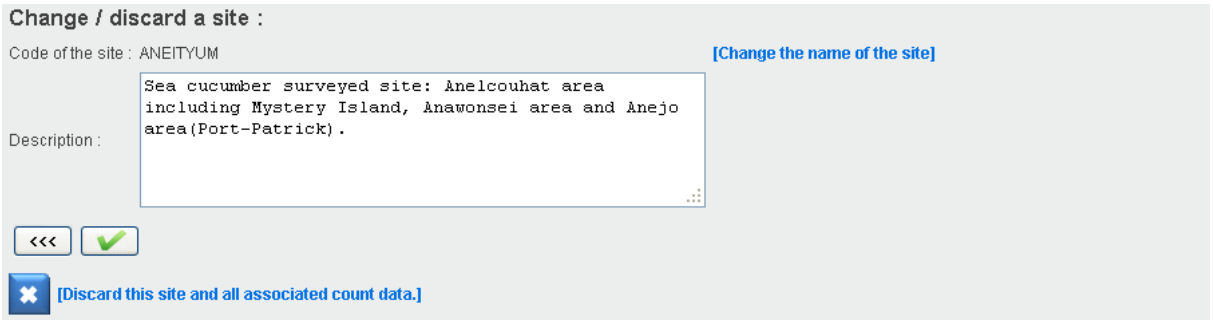
Click the *Confirm discard* button or <<< to cancel.

3.2.2 Change/remove a survey site

1) **Scroll** the species list to select the appropriate species, then **validate**  .



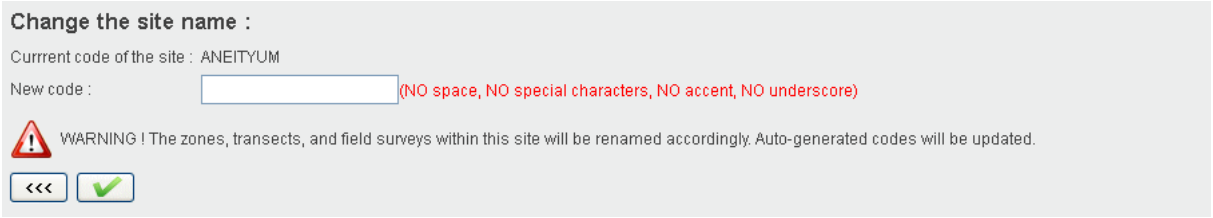
2) You can **change the site description** in the "*Description*" field, then validate  .



3) You can **change the name of the survey site** by clicking *Change the name of the site*.

Note : Write the new site name in UPPERCASE LETTERS. If the site name is composed of 2 or 3 words, each word must be separated by "-" (don't use "_", space, special characters, accent).

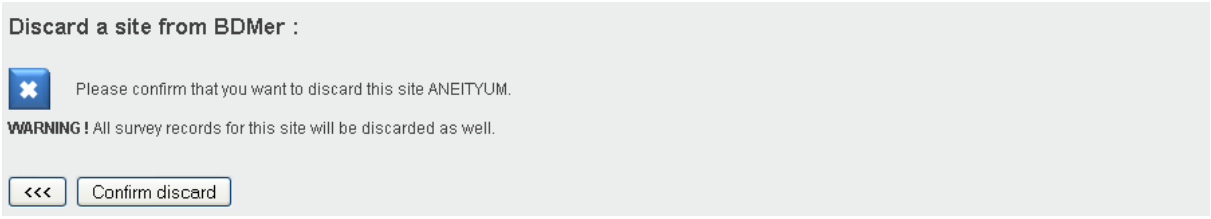
The corresponding survey, zone and transect codes will be automatically updated.



Validate the new name  or cancel  .

4) To **remove the selected site** from BDMer 2.0, click *Discard this site and all associated count data* (at the bottom of the page).
Note : Existing zones, transects, and surveys (including count data) within this site will be discarded as well.

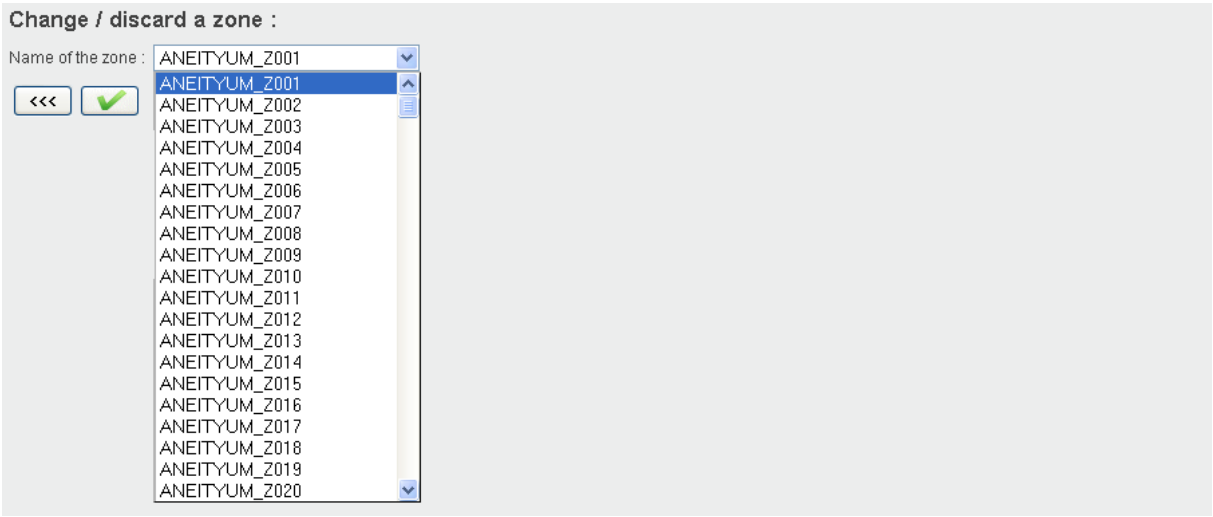
A warning message is displayed to confirm your choice.



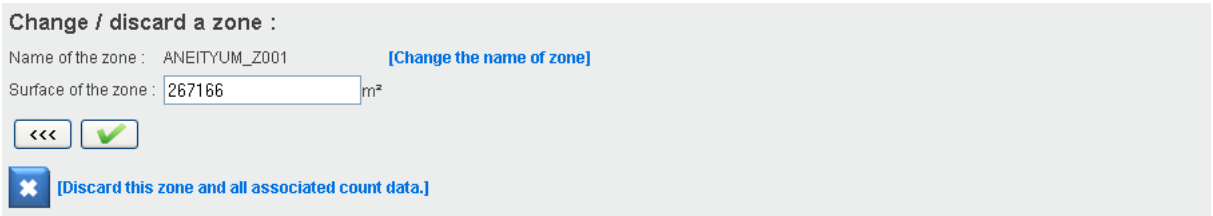
Click the *Confirm discard* button or <<< to cancel.

3.2.3 Change/remove a habitat zone

1) **Scroll** the zones list to select the appropriate zone, then **validate** ✔.



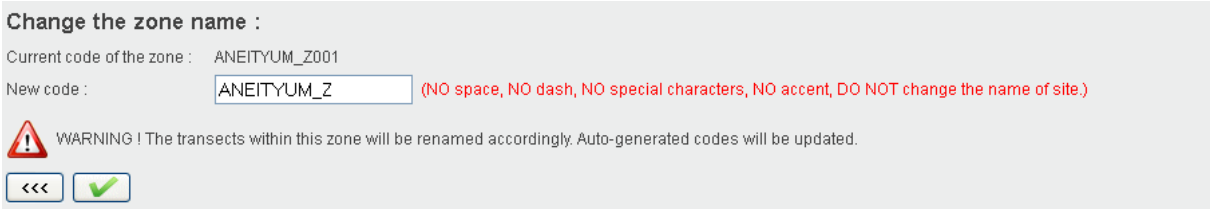
2) You can **change the surface area**, then validate ✔.



3) You can **change the zone name** by clicking *Change the name of the zone*.

Note : The first part of the new zone name is automatically generated (ie, name of the site followed by "_Z") and must not be changed. You must just inform the 3 new digits of the zone code (cf. p16).

The corresponding transect codes will be automatically updated.

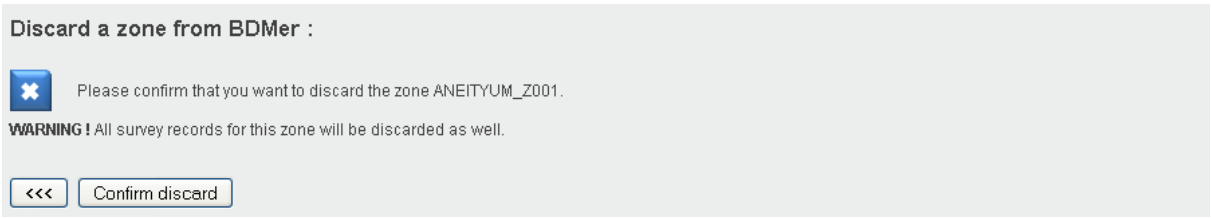


Validate the new name or cancel <<<.

4) To **remove the selected zone** from BDMer 2.0, click *Discard this zone and all associated count data* (at the bottom of the page).

Note : Existing transects and count data within this zone will be discarded as well.

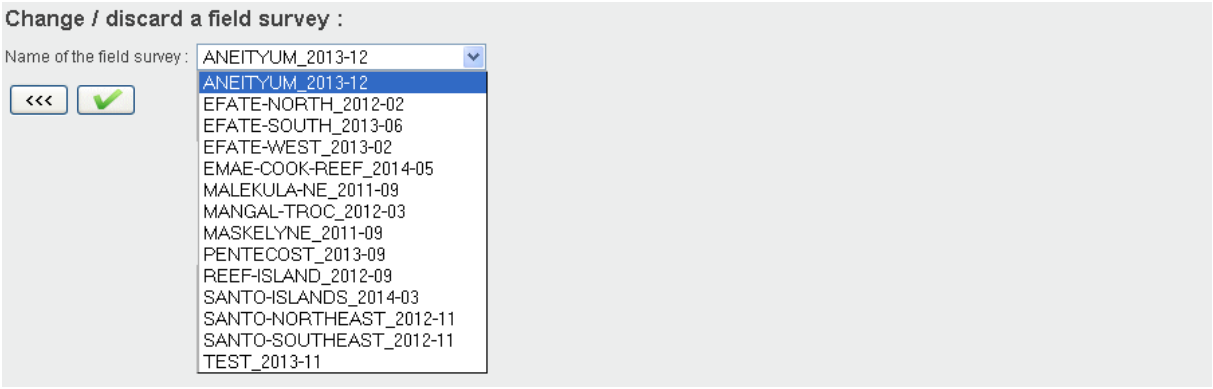
A warning message is displayed to confirm your choice.



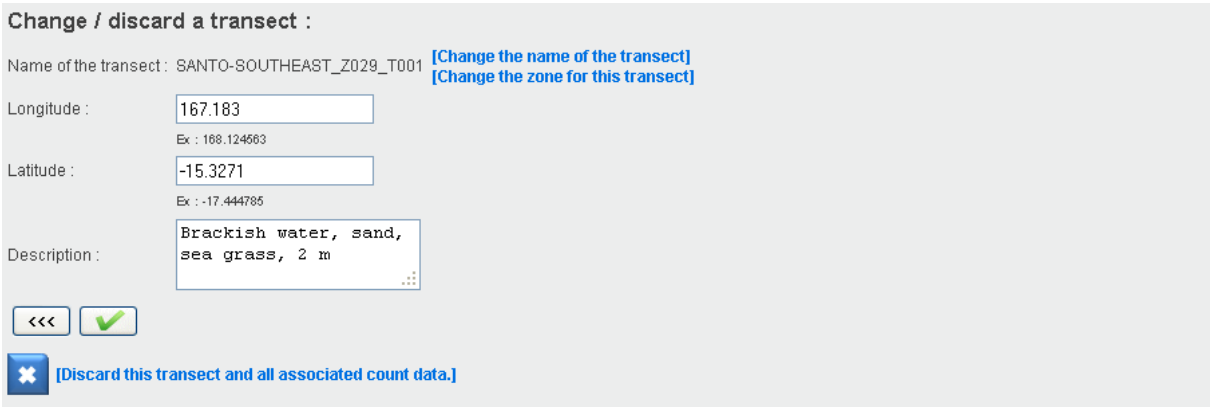
Click the *Confirm discard* button or <<< to cancel.

3.2.4 Change/remove a transect

1) **Scroll** the transects list to select the appropriate transect, then **validate**  .

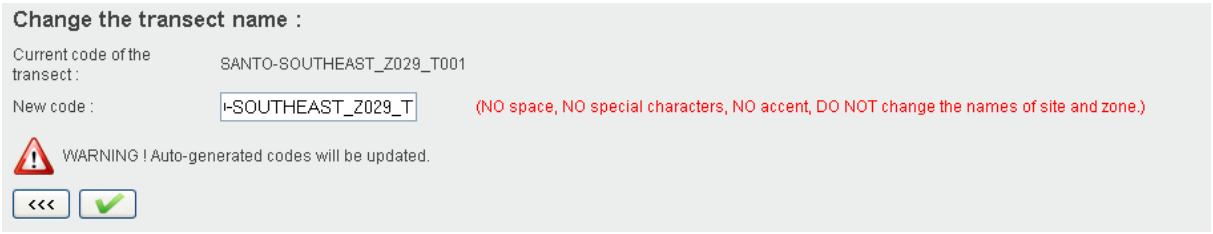


2) You can **change the GPS coordinates and the description of the transect area**, then validate  .



3) You can **change the transect name** by clicking *Change the name of the transect*.

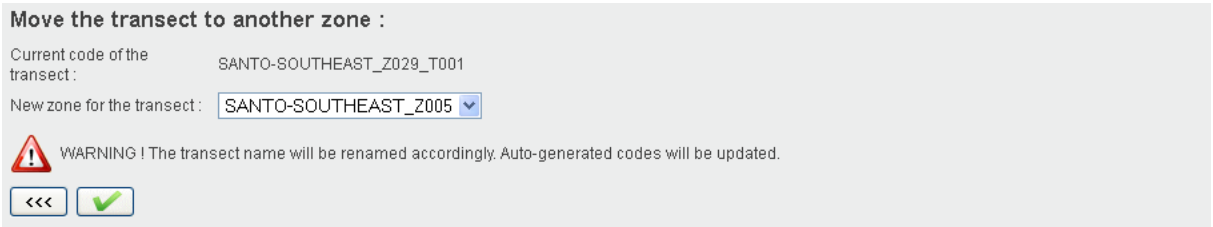
Note : The first part of the new transect name is automatically generated (ie, name of the zone followed by "_T") and must not be changed. You must just inform the 3 new digits of the transect code (cf. p17).



Validate the new name  or cancel  .

4) You can **change the corresponding habitat zone** by clicking on *Change the zone for this transect*.

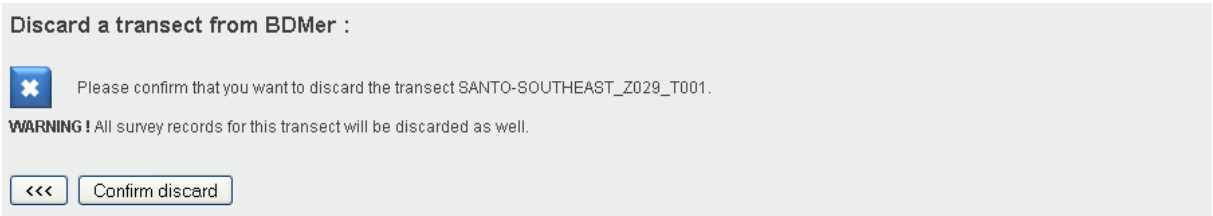
Scroll the zones list to select the new appropriate zone. The transect code will be automatically updated.



Validate your choice  or cancel  .

5) To **remove the selected transect** from BDMer 2.0, click *Discard this transect and all associated count data* (at the bottom of the page).
Note : Existing count data within this transect will be discarded as well.

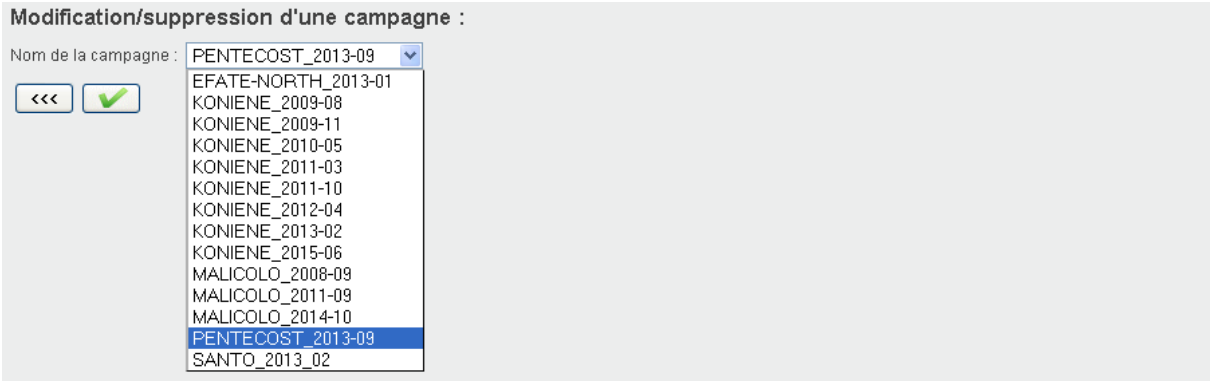
A warning message is displayed to confirm your choice.



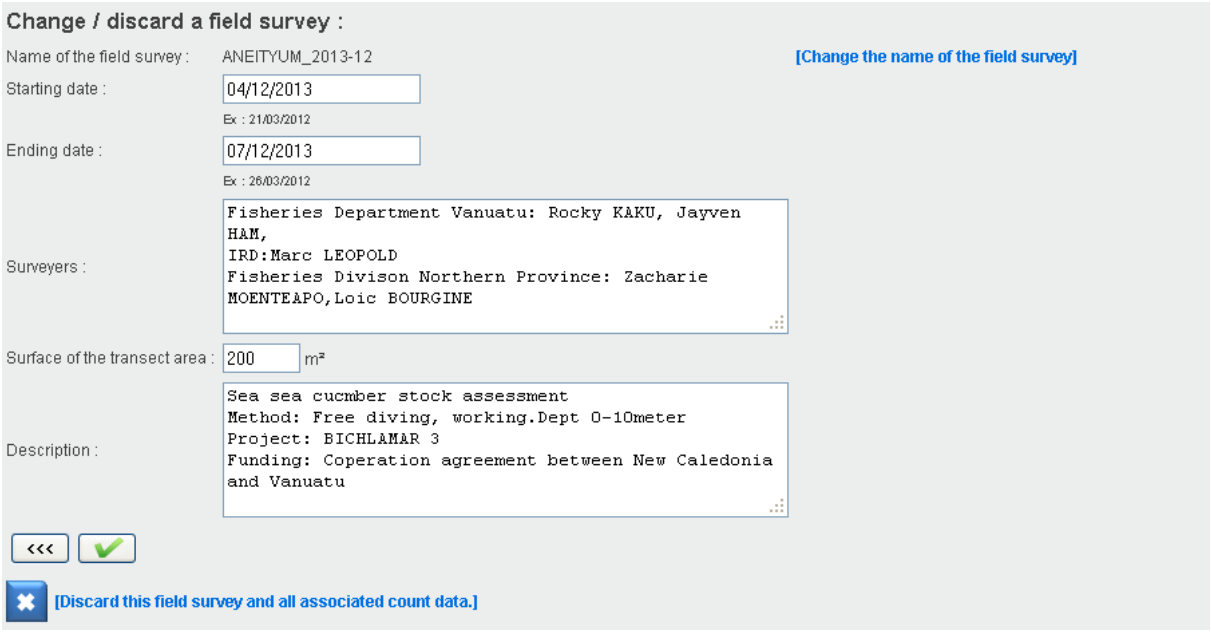
Click the *Confirm discard* button or  to cancel.

3.2.5 Change/remove a field survey

1) **Scroll** the surveys list to select the appropriate field surveys, then **validate**  .

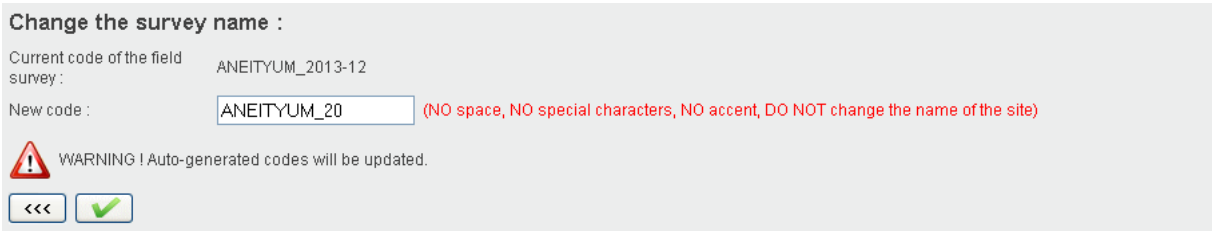


2) You can **change** existing information concerning the survey in appropriate data fields, then validate  .



3) You can **change the survey name** by clicking *Change the name of the field survey*.

Note : The first part of the new survey name is automatically generated (ie, name of the site followed by "_20") and must not be changed. You must just inform the year and the month of the survey, separated by "-" (don't use "_", space, special characters, accent in survey name) (cf. p18).

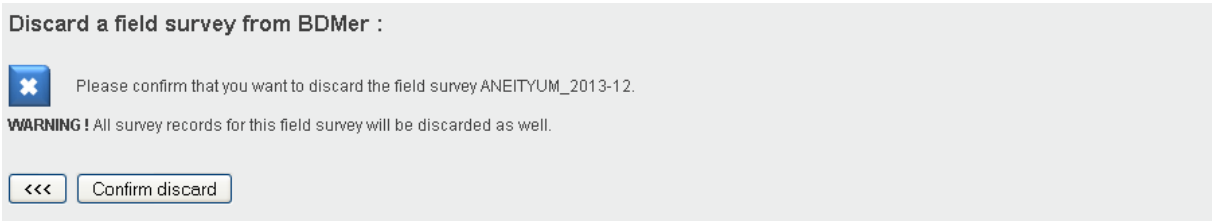


Validate the new survey name  or cancel  .

5) To **remove the selected field survey** from BDMer 2.0, click *Discard this field survey and all associated count data* (at the bottom of the page).

Note : Existing count data related to this field survey will be discarded as well.

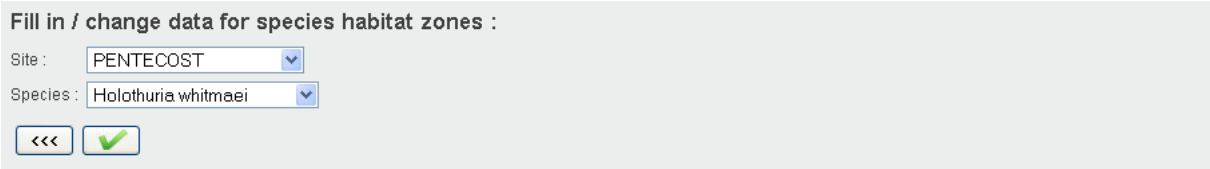
A warning message is displayed to confirm your choice.



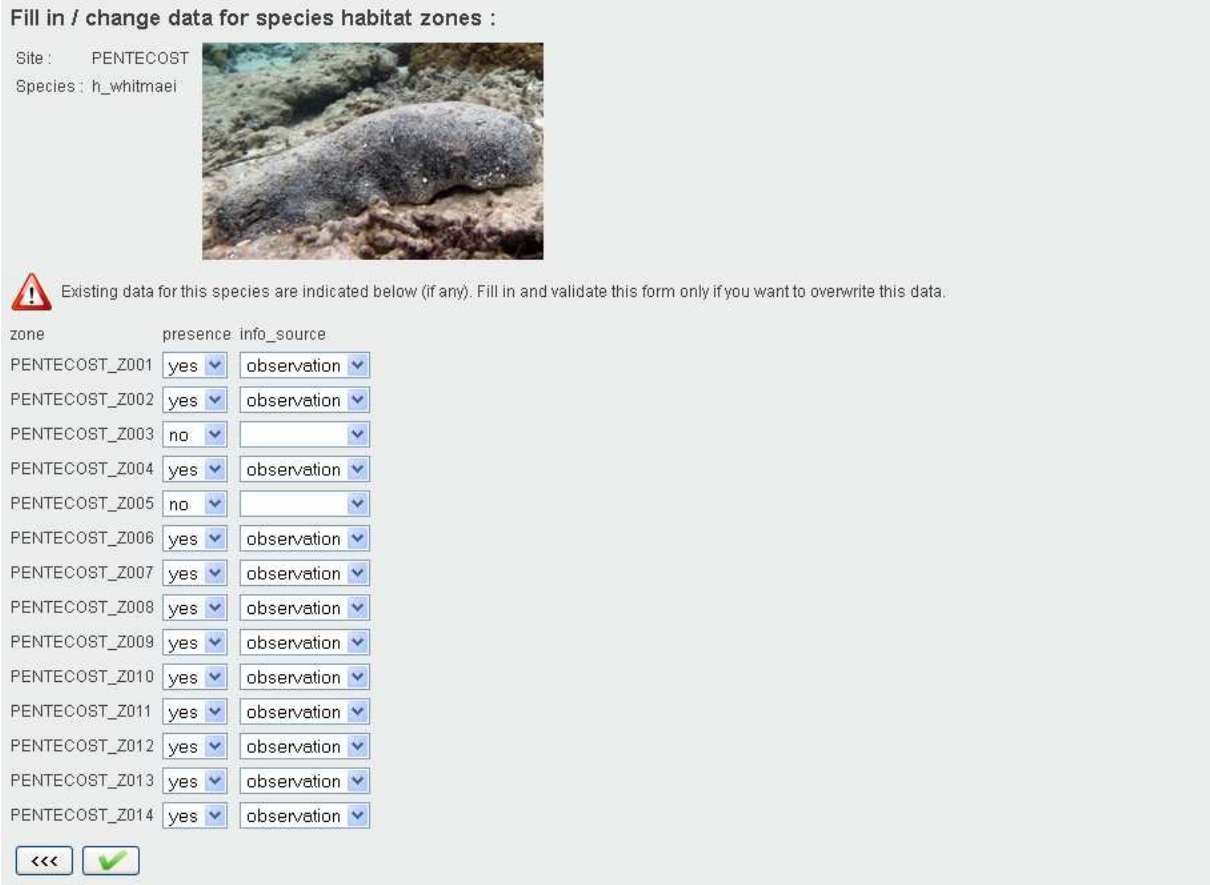
Click the *Confirm discard* button or  to cancel.

3.2.6 Change/remove a species habitat zone

1) **Scroll** the sites and species lists to select the appropriate site and species, then **validate** .



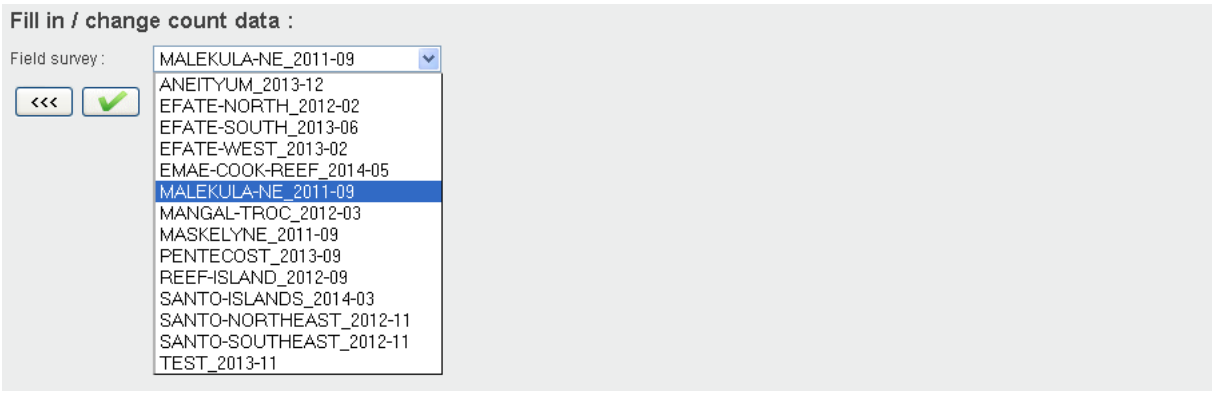
2) You can **change** existing information concerning each zone within the survey site.
Note: Refer to *To input a new species habitat zone* (p 19) to learn about the table content.



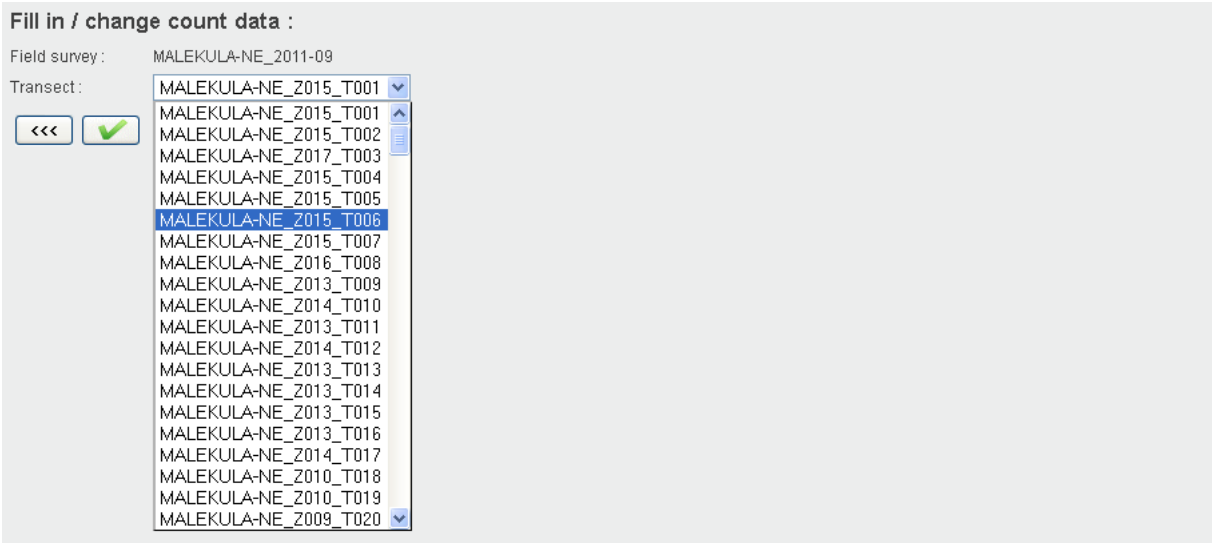
3) **Validate** your change(s) or **cancel** <<<.

3.2.7 Change/remove count data

1) **Scroll** the surveys lists to select the appropriate field survey, then **validate**  .

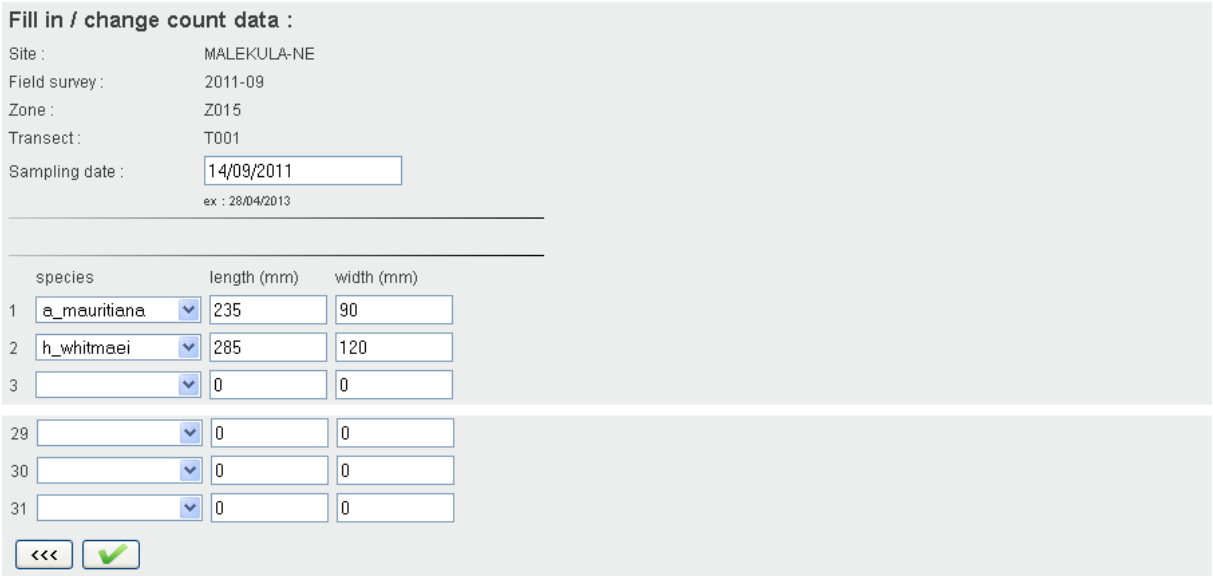


2) **Scroll** the transects lists to select the appropriate transect, then **validate**  .



3) To change existing data concerning survey date, species and size measurements in the case of typing error for instance, **click** *Count data modification form* (as described p 22).

Then **scroll** the species list to select the appropriate species and **inform** corresponding length (mm) and width (mm). To remove an individual from the data table, replace the species name by a blank field (first row in the scrolling list) and input "*length*" = 0 and "*width*" = 0.



Individual length and width can not excess "*long_max*" et "*larg_max*" parameters as set in the corresponding "*Species*" table (cf p 14).

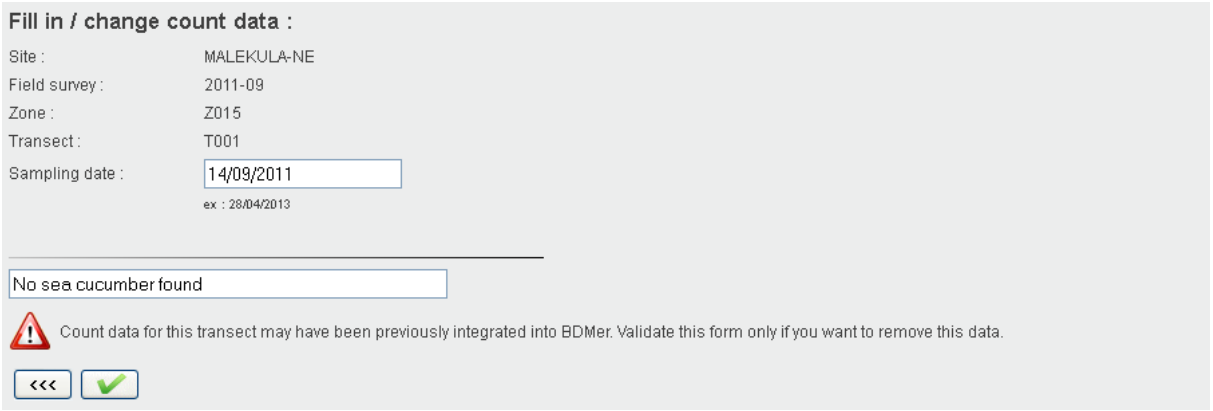
Length must be informed, but width is optional. However, if one does not inform invertebrate width (i.e, "*width*" = 0) of a species, the length&width – weight conversion relationship must not be used when estimating the stock of this species (cf p 64).

In the case of typing error, replace the species name by a blank line (first line in the scrolling list) and input "*length*" = 0 and "*width*" = 0.

Validate data modification or cancel <<<.

4) To erase existing count data for the selected transect and survey, **click** *Remove count data from this transect* (cf p 23).

Confirm your choice  or cancel data removal  .



3.3 Export data to CSV files

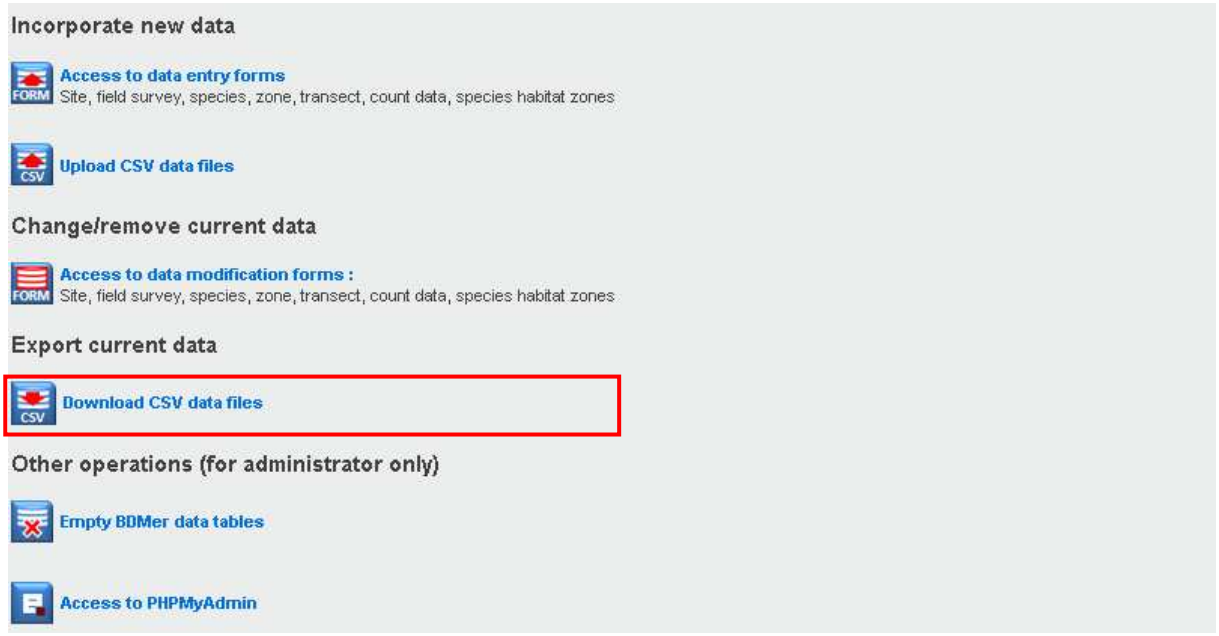
BDMer 2.0 user interface allows for exporting data (eg. zones, transects, count data…) to CSV files. This tool is very useful in the following cases :

- To quickly check the records of BDMer 2.0 data tables.
- To convert BDMer 2.0 data into standard CSV files that would be readable by any other computer (eg. using Microsoft Excel) for further analysis, back-up, or printing.
- To copy BDMer 2.0 data to another computer or server (eg. duplication of the database) through upload procedures (cf. *Upload CSV data files* p 24) using export CSV files. Indeed export CSV files are directly readable by BDMer 2.0 upload procedures.

The export procedure is as follows :

1) **Click** the *Integrate/change/remove/upload data* button in the main menu.

2) **Click** *Download CSV data files*



Two download options appear :

- *Download the data of a specific field survey* (p 49)

- *Download all BDMer data* (p 51)

3.3.1 Download the data of a field survey

Each of the 8 data tables of BDMer 2.0 can be exported to specific CSV files (cf. below table). To export all the survey data, one may therefore download the 8 files one file at a time.

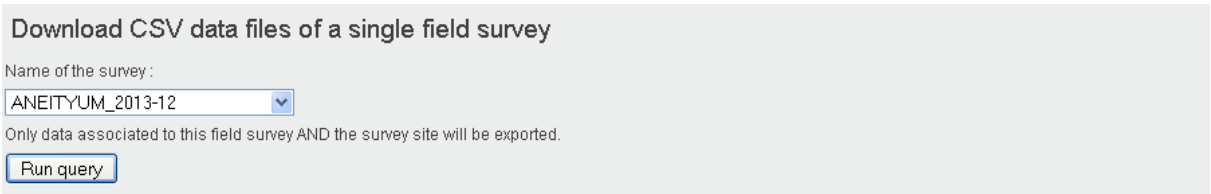
File names	Data tables	CSV file columns	Main content	Size (ko)	Last update
campagne_requested.csv	Field survey	All fields of the "Survey" table (including ID codes)	Dates, description, participants… of the selected field survey	Size of CSV files	Date and time of the last update of each data table in BDMer 2.0
data_requested.csv	Count data (1)	All fields of the "Count data" table (including ID codes)	Size of each individual observed during the selected survey (1 row = 1 individual)		
data_export_requested.csv	Count data (2)	All fields of the "Count data" table (including ID codes)	Size of each individual observed during the selected survey (1 row = 1 species)		
espece_requested.csv	Species	All fields of the "Species" table (including ID codes)	Characteristics of the species observed during the selected survey		
site_requested.csv	Site	All fields of the "Site" table (including ID codes)	Survey site characteristics		
transect__requested.csv	Transect	All fields of the "Transect" table (including ID codes)	Name and GPS coordinates of the surveyed transects		
zone_requested.csv	Zone	All fields of the "Zone" table (including ID codes)	Habitat zones within the survey site		
zone_preference_requested.csv	Species habitat zone (or preference zone)	All fields of the "Species habitat zone" table (including ID codes)	Preference habitat zones of each species observed duting the survey		

Note : Export CSV files are directly readable by BDMer 2.0 upload procedures (cf. *Upload CSV data files* from p 24) since data fields in the export CSV files are consistent with those of the corresponding data tables in the database, except *data_requested.csv* count data file. You may rather use the *data_export_requested.csv* file (i.e., one row contains the size measurement(s) of all individuals per species and per transect) to upload the survey count data into another BDMer 2.0 database.

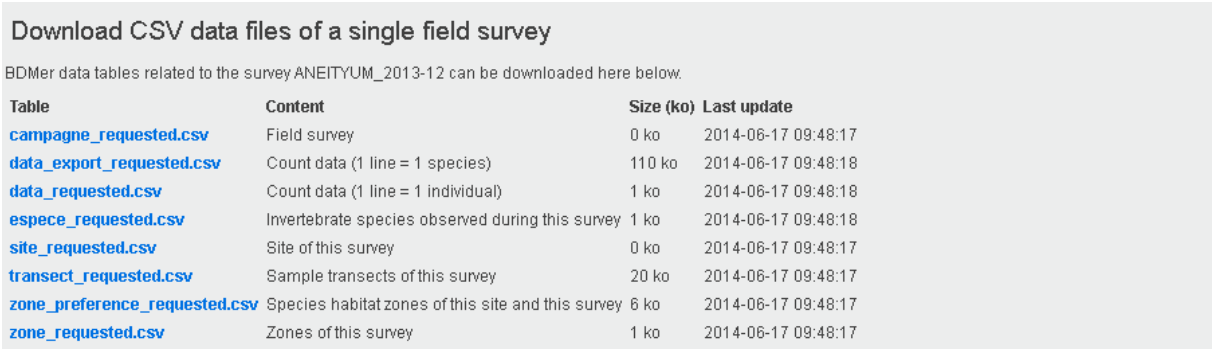
The download procedure is as follows:

1) **Click** *Download the data of one field survey*

2) **Scroll** the surveys lists to select the appropriate field survey, and **click** the *Run query* button.



3) **Click** the file name (in blue) to start download.



Download CSV data files of a single field survey

BDMer data tables related to the survey ANEITYUM_2013-12 can be downloaded here below.

Table	Content	Size (ko)	Last update
campagne_requested.csv	Field survey	0 ko	2014-06-17 09:48:17
data_export_requested.csv	Count data (1 line = 1 species)	110 ko	2014-06-17 09:48:18
data_requested.csv	Count data (1 line = 1 individual)	1 ko	2014-06-17 09:48:18
espece_requested.csv	Invertebrate species observed during this survey	1 ko	2014-06-17 09:48:18
site_requested.csv	Site of this survey	0 ko	2014-06-17 09:48:17
transect_requested.csv	Sample transects of this survey	20 ko	2014-06-17 09:48:17
zone_preference_requested.csv	Species habitat zones of this site and this survey	6 ko	2014-06-17 09:48:17
zone_requested.csv	Zones of this survey	1 ko	2014-06-17 09:48:17

3.3.2 Download all BDMer 2.0 data

Each of the 8 data tables of BDMer 2.0 can be exported to specific CSV files (cf below table). To export all BDM 2.0 data, one may therefore download the 8 files one file at a time.

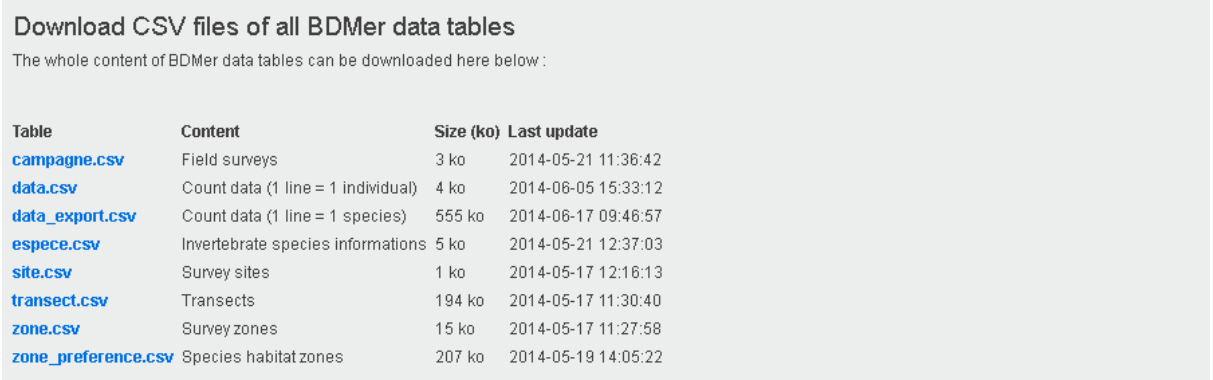
File names	Data tables	CSV file columns	Main content	Size (ko)	Last update
campagne_requested.csv	Field survey	All fields of the "Survey" table (including ID codes)	Dates, description, participants… of all field surveys	Size of CSV files	Date and time of the last update of each data table in BDMer 2.0
data_requested.csv	Count data (1)	All fields of the "Data" table (including ID codes)	Size of each individual observed during each field survey (1 row = 1 individual)		
data_export_requested.csv	Count data (2)	All fields of the "Data" table (including ID codes)	Size of each individual observed during each field survey (1 row = 1 species)		
espece_requested.csv	Species	All fields of the "Species" table (including ID codes)	Characteristics of all the species observed during any of the field surveys		
site_requested.csv	Site	All fields of the "Site" table (including ID codes)	Characteristics of all survey sites		
transect__requested.csv	Transect	All fields of the "Transect" table (including ID codes)	Transect names and GPS coordinates of all survey sites		
zone_requested.csv	Zone	All fields of the "Zone" table (including ID codes)	Zone characteristics of all survey sites		
zone_preference_requested.csv	Species habitat zone (or preference zone)	All fields of the "Species habitat zone" table (including ID codes)	Preference habitat zones of each species observed during field surveys		

Note : Export CSV files are directly readable by BDMer 2.0 upload procedures (cf. *Upload CSV data files* from p 24) since data fields in the export CSV files are consistent with those of the corresponding data tables in the database, except *data_requested.csv* count data file. You may rather use the *data_export_requested.csv* file (i.e., one row contains the size measurements of all individuals per species and per transect) to upload the survey count data into another BDMer 2.0 database.

The download procedure is as follows:

1) **Click** *Download all BDMer data*

2) **Click** the file name (in blue) to start download.



3.4 Other operations (for BDMer 2.0 administrator)

3.4.1 Empty BMDer 2.0 data tables

This tool is useful in the following cases :

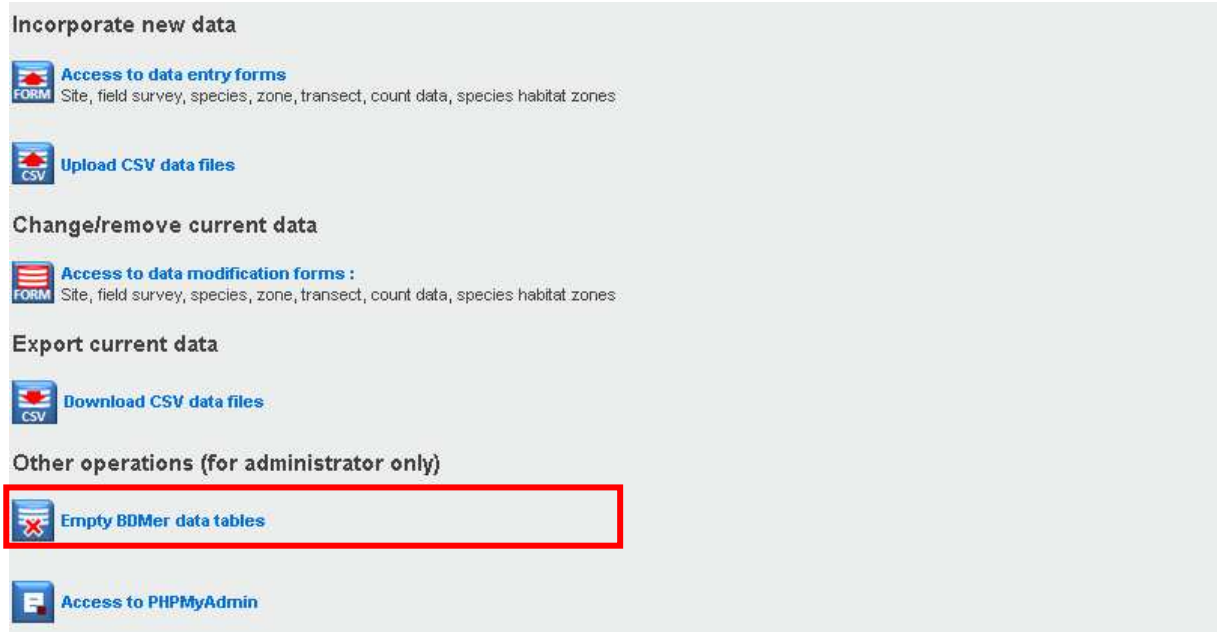
- If you would like to use BDMer 2.0 on another personal computer: once a copy of the database has been installed on this computer (cf. *Getting start* p 7), you may empty all data tables to only keep the structure and the applications of BDMer 2.0.

- If a large number of errors has been detected in the database: it is recommended to empty the erroneous data table(s), and to upload the validated data from corresponding CSV file(s) (cf *Upload data form CSV files* p 24).

The procedure is as follows :

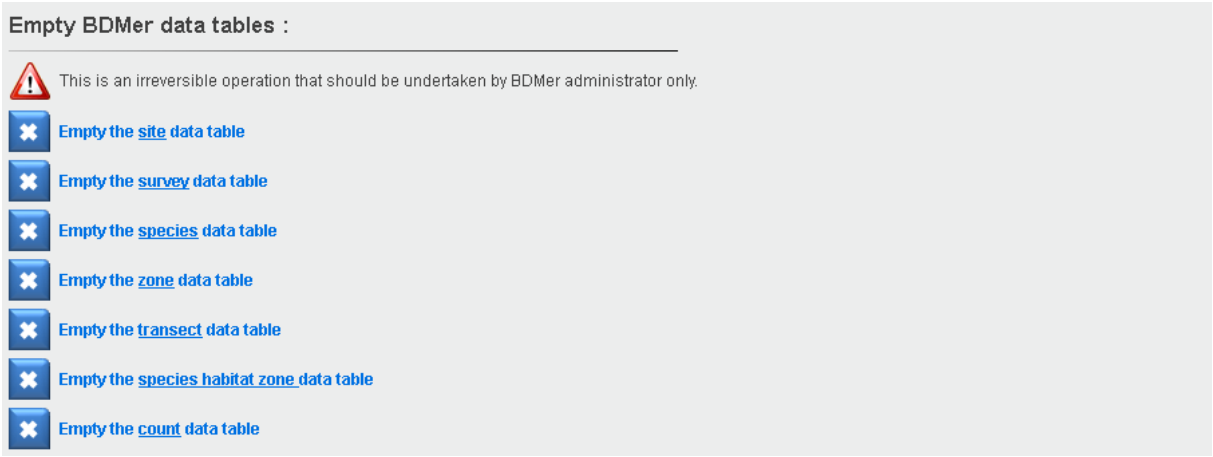
1) **Click** the *Integrate/change/remove/upload data* button in the main menu.

2) **Click** *Empty BDMer data tables*



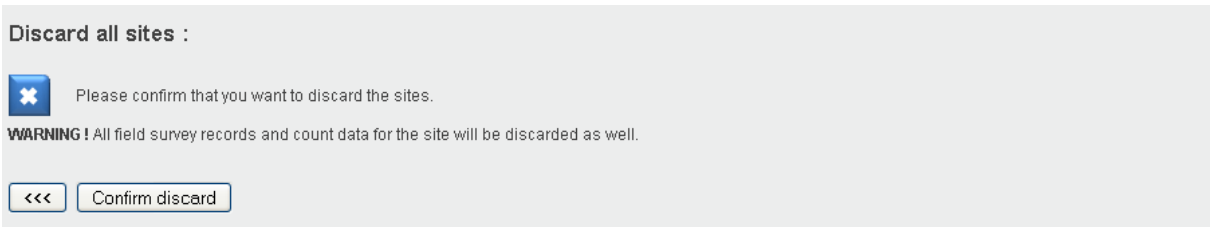
3) The full content of the 7 data tables of BDMer 2.0 can be removed : sites, field surveys, species, zones, transects, species habitat zones, and count data.
To empty all BDM 2.0 data, one may empty the 7 data tables one table at a time.

Click the appropriate table to remove its content.



4) A warning message is displayed to confirm your choice.

Click the *Confirm discard* button or  to cancel.



Note: Removing data from BDmer 2.0 tables is an irreversible operation and may result in cascade effects in the following cases:

- if the content of the "*site*" data table is removed, all other data (eg, data related to field surveys, zones, transects, and underwater census) would be removed as well - except the "species" data table;

- if the content of the "*species*" data table is removed, count data would be removed as well – except the rows corresponding to the transects where no invertebrate was observed during survey.

- if the content of the "*field survey*" data table is removed, count data would be removed as well.

- if the content of the "*zone*" data table is removed, transects and count data would be removed as well.

- if the content of the "*transect*" data table is removed, count data would be removed as well.

3.4.2 Using PHPMyAdmin for managing data

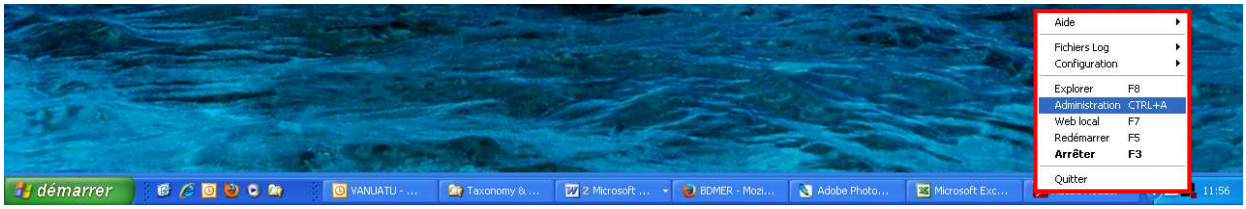
The local BDMer 2.0 administrator can access to the EasyPHP administration mode (*PHPMyAdmin*) for a larger range of operations. Indeed some data management tools are not available in BDMer 2.0.

This user guide does not provide details on *PHPMyAdmin*. However the procedures to access the administration mode and to upload count data using *PHPMyAdmin* are described below.

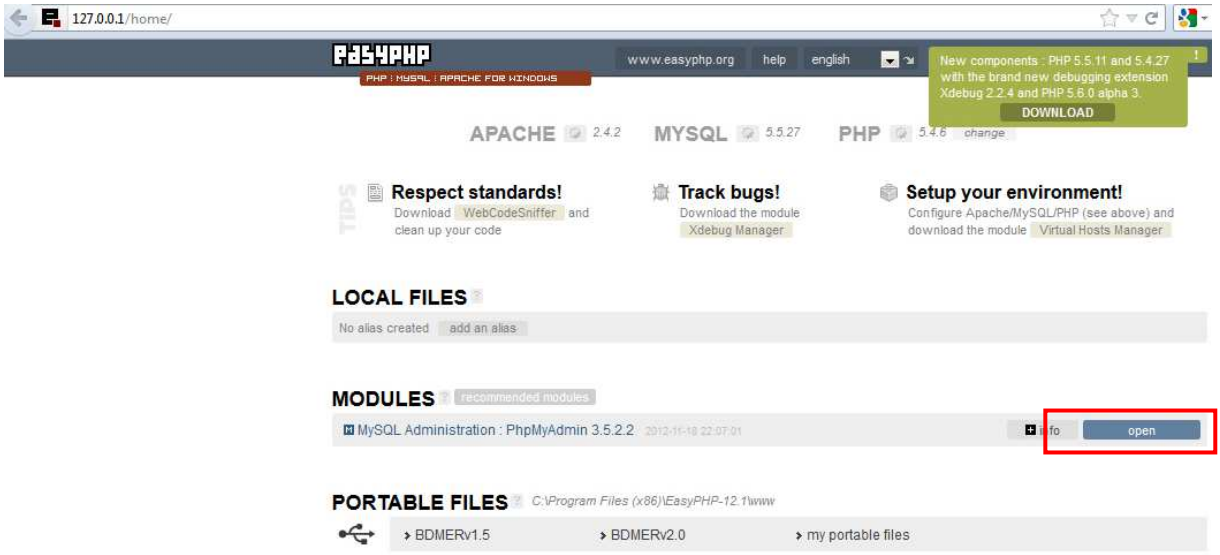
3.4.2.1 Access to BDMer 2.0 Administration mode

1) **Right click** the  icon in the taskbar and **select** *Administration* to start the application.

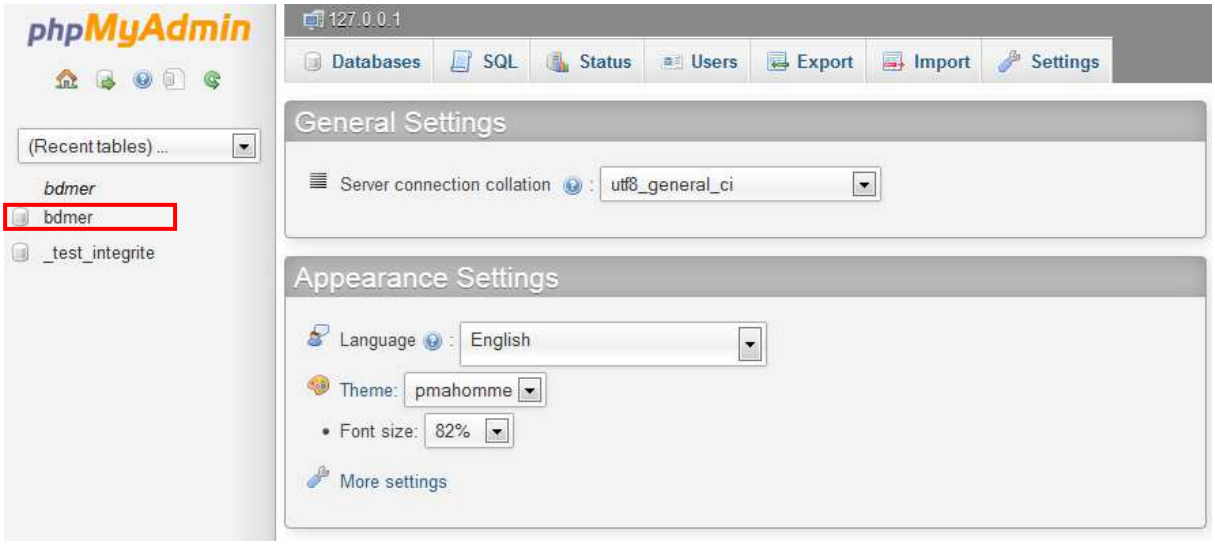
Note : No Internet connexion is required.



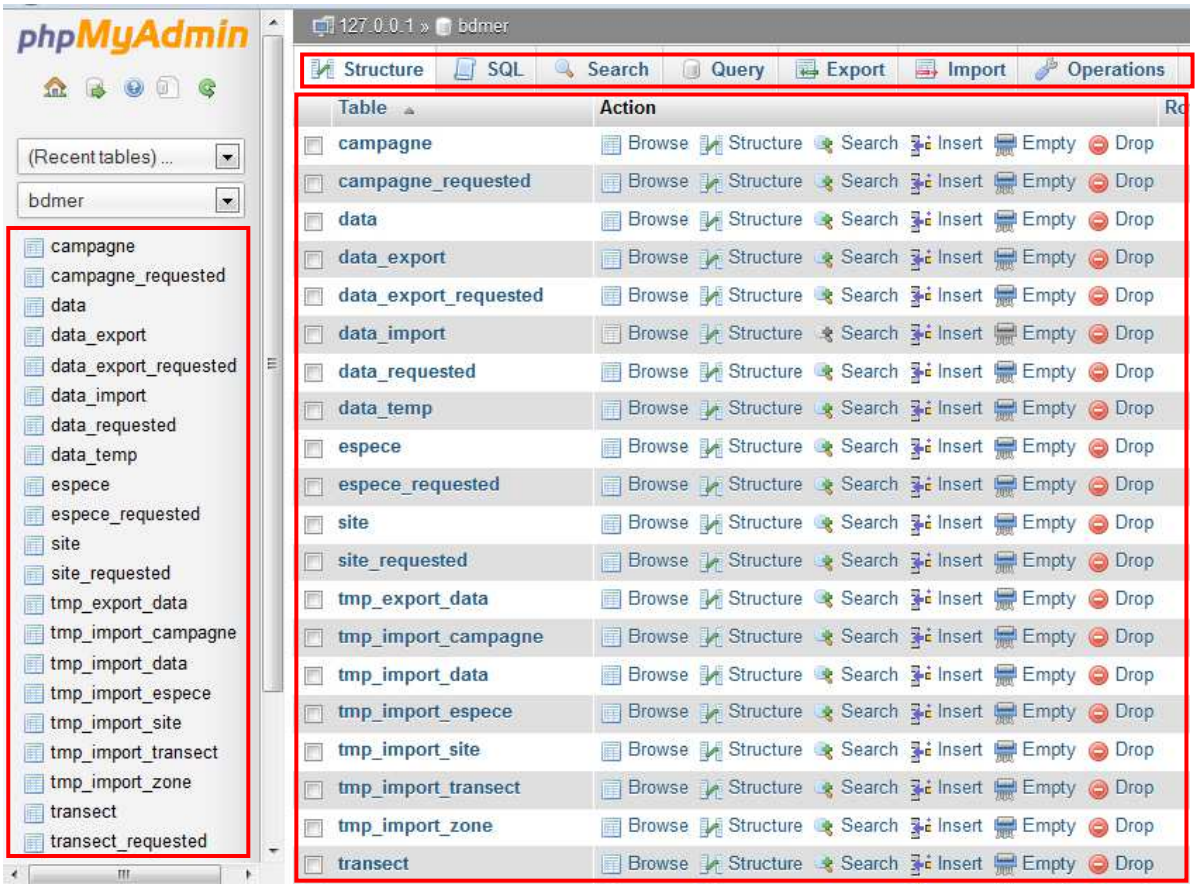
2) **Click** the *open* button on the *Administration* homepage.



3) **Click** the *bdmer* database in the left *PHPMyAdmin* menu to access *bdmer* homepage.



4) You can then access to BDMer 2.0 data tables and to *PHPMyAdmin* data management tools (eg, data import, export, modification, etc.).

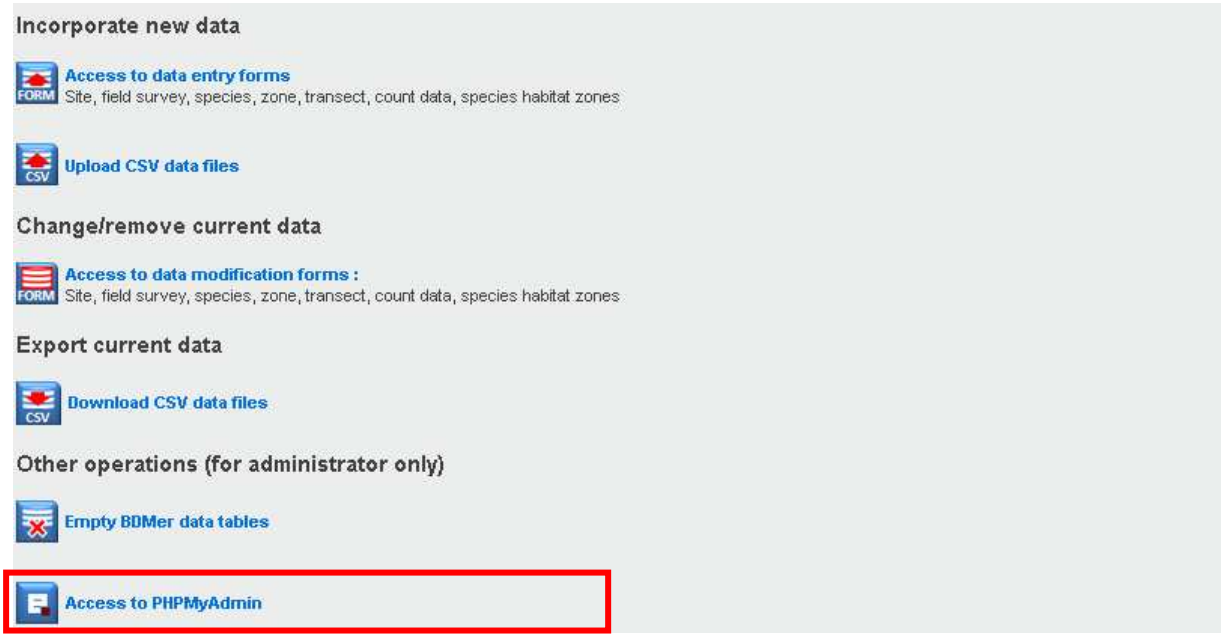


3.4.2.2 Upload field survey data using PHPMyAdmin

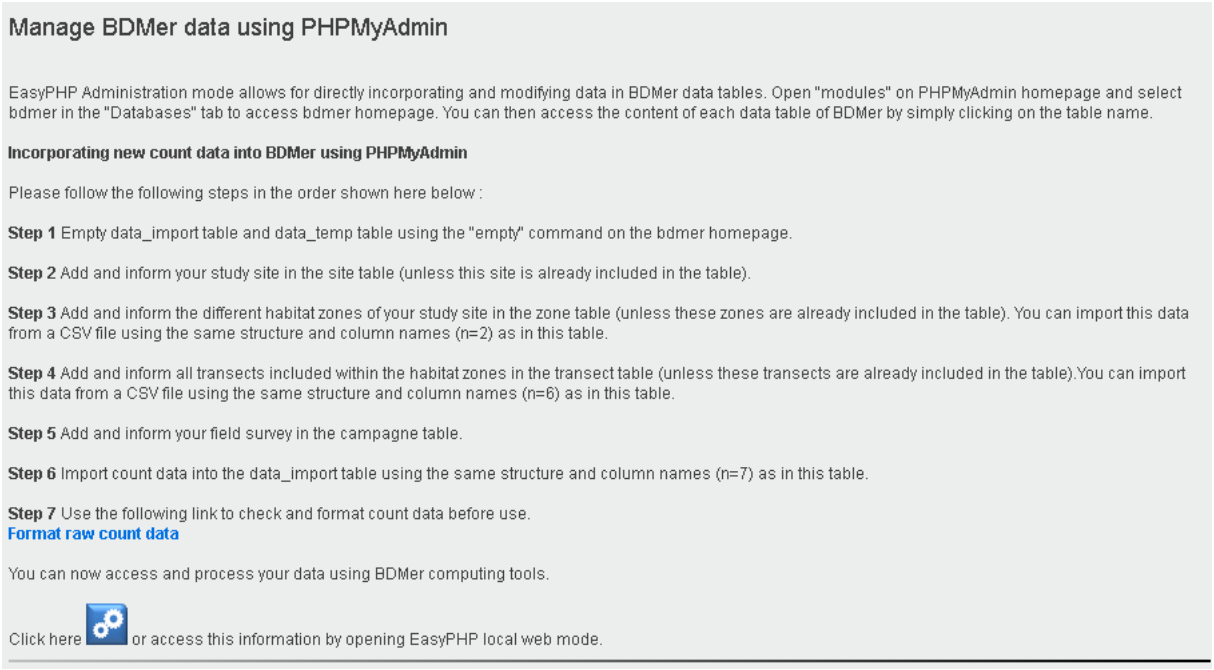
The step-by-step procedure for uploading field survey data into BDMer 2.0 using PHPMyAdmin is described in the web application.

1) **Click** the *Integrate/change/remove/upload data* button in the main menu.

2) **Click** *Access to PHPMyAdmin*



3) **Follow** the instructions for each of the 7 steps.

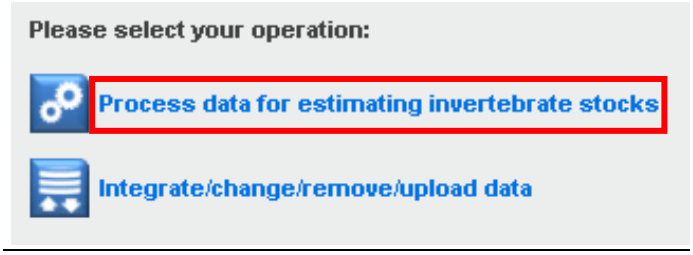


Note : Do never click "*Format raw count data*" if you have not terminated each of the 6 previous steps, and step 1 in particular. **Irreversible data loss** may result from inappropriate use of the this procedure.

4 DATA ANALYSIS AND STOCK ESTIMATES

4.1 Getting started

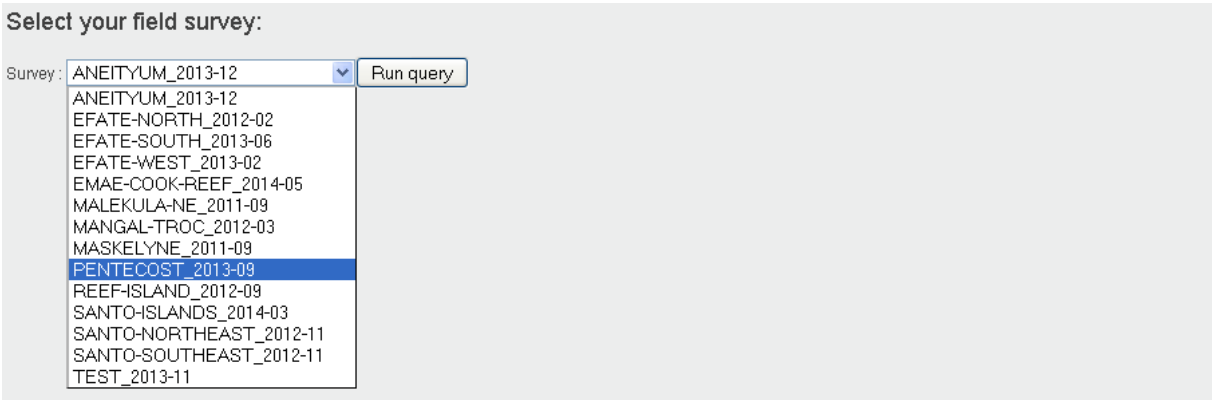
1) **Click** *Process data for estimating invertebrate stocks* in BDMer 2.0 home page (p 10).



or

Click the *Process data for estimating invertebrate stocks* button in the main menu.

2) **Scroll** the surveys list to select the appropriate field survey, then **click** the *Run query* button.



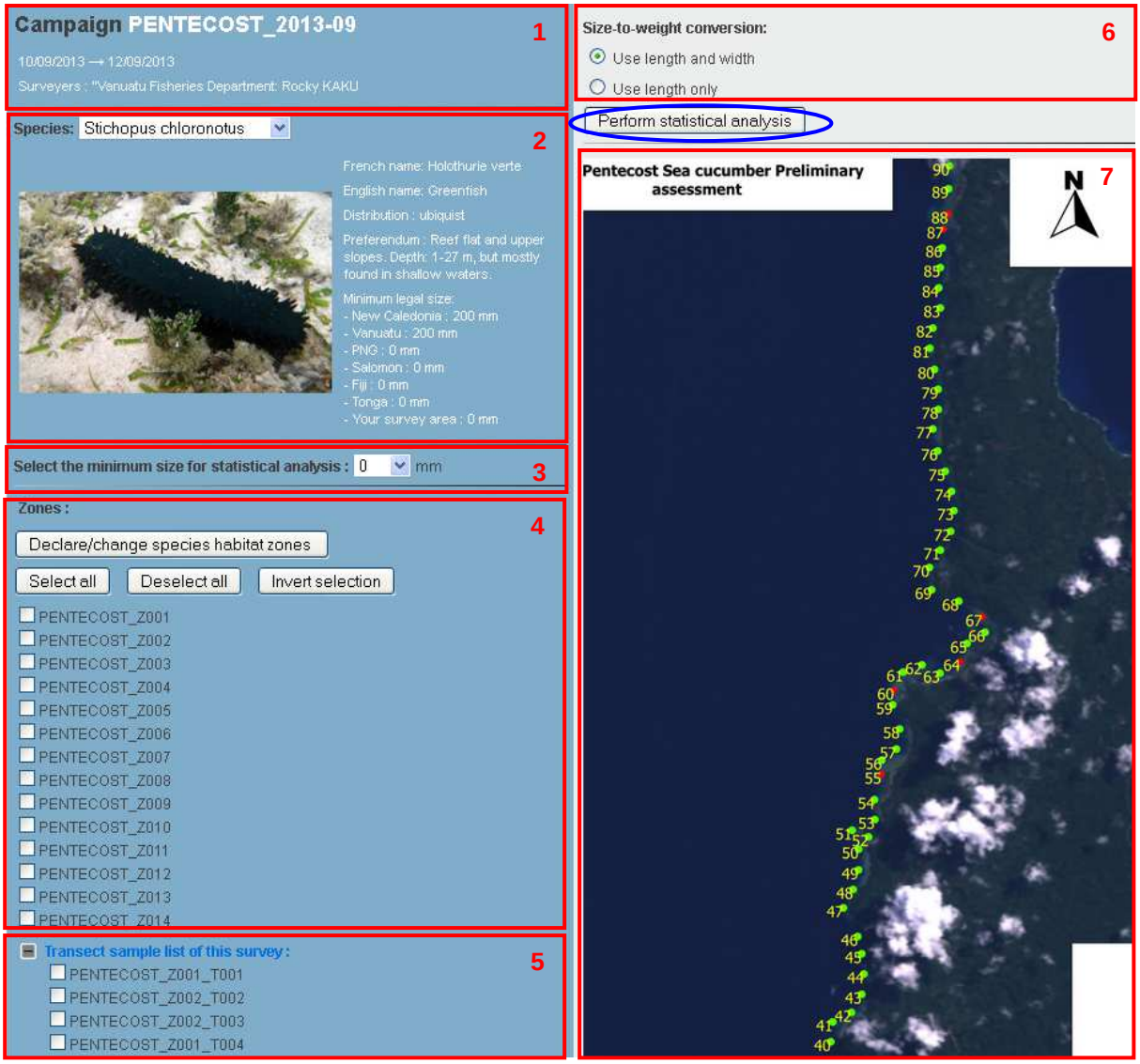
Note: One may process survey data one survey at a time. Indeed BMDer 2.0 does not allow for estimating the stocks of different surveys simultaneously. To compare stocks among surveys, you may download the CSV files that contain the assessments results of each survey (cf. p 72).

4.2 Analysis parameters

Once the field survey has been selected, the following analysis parameters need to be defined:

[1] Survey characteristics
[2] **Select** invertebrate species
[3] **Select** individuals according to size (optional)
[4] **Select** habitat zones
[5] **Select** survey transects
[6] **Select** size-to-weight conversion relationship
[7] Map of survey site

Once all required parameters have been specified, **click** the *Perform statistical analysis* button.



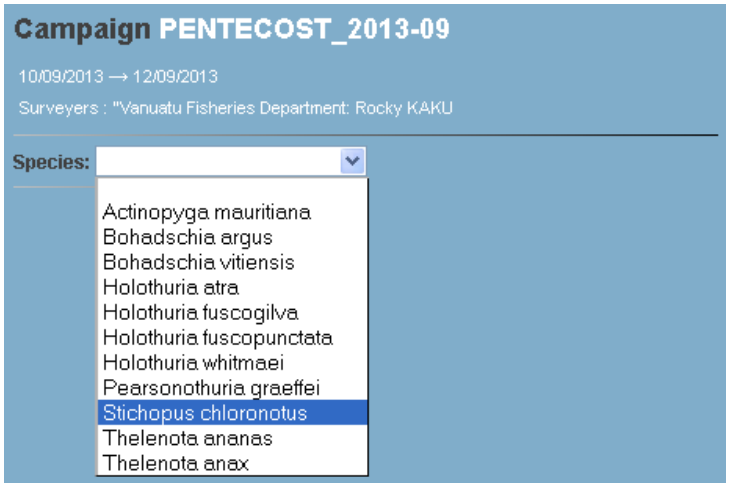
4.2.1 Survey characteristics

The survey name, dates and participants are briefly presented at the top of the web page (cf. p 18).

4.2.2 Species selection

Survey data can be processed one species at a time. BMDer 2.0 does not allow for estimating the stocks of different species simultaneously.

Scroll the species list to select the appropriate invertebrate species. Only the species that were observed during the selected survey are displayed in the scrolling list.



The species identification picture appears including species characteristics (cf. p 14):

- Species French and English names
- Species distribution
- Species marine habitat
- Minimum harvest size in each country

You may click the picture to enlarge and then outside the picture to close the window.

Note : If you are using the local web application, two files corresponding to the species identification picture are located in the *EasyPHP-12.1\www\BDMERv2.0\images\photos* directory :

- a 72 dpi JPEG file (9 x 6 cm) named “species name.jpg” (eg. *h_scabra.jpg*) ;
- a 300 dpi JPEG file (9 x 6 cm) named “species name**_big**.jpg” (ex. *h_scabra_big.jpg*).

Note : To compare stocks among species, you may download the CSV files that contain the assessments results for each species (cf. p 72).

4.2.3 Individual selection according to size (optional)

The default value (0 mm) of the *minimum size for statistical analysis* field suits most survey analysis. Indeed, whatever this parameter value, BDMer 2.0 systematically estimates the biomass and the abundance of the whole stock, the legal-sized stock (ie, composed of all individuals larger than the minimum harvest size), and each size class (cf. p 65 and following pages). These results usually allow for determining the authorized catch in the survey site.

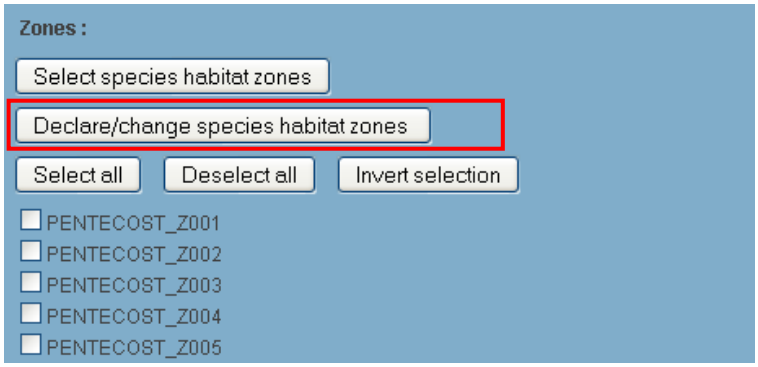
However one may need to estimate these indicators for a specific size range that is not predefined in BDMer 2.0. The *minimum size for statistical analysis* may be set accordingly by scrolling the sizes list. Corresponding estimates will be presented in the result report (cf. p 66) and downloadable through CSV files (cf. p 72).

4.2.4 Zone selection

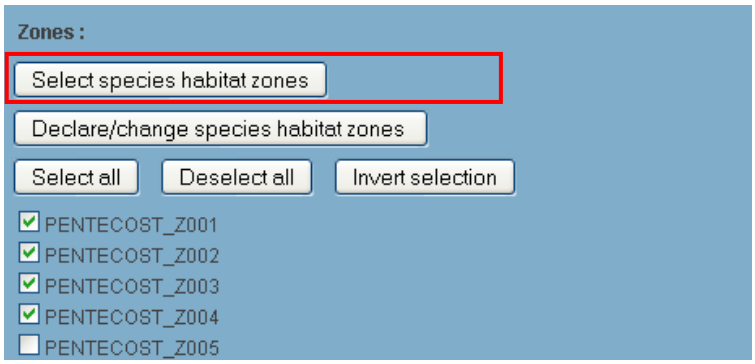
BDMer 2.0 only displays the habitat zones that were visited during the selected survey. Indeed count data must not be generalized to areas that have not been surveyed to avoid misestimating stock indicators.

More specifically the stock must be estimated within the species habitat zones only. Some invertebrate species may be widely distributed over a large range of marine habitats (eg., *Holothuria atra*, *Stichopus chloronotus*) whereas other species show more restricted habitat distribution (eg, *Actinopyga mauritiana* alongside reef crests, *Bohadschia marmorata* in seagrass beds).

It is therefore recommended to specify the preference habitat zones of the species prior to estimating stock indicators. **Click** the *Declare/change species habitat zones* button to access the corresponding form (cf. p 19).



Once the species habitat zones have been specified, **click** the *Select species habitat zones* button to tick all these zones in the list.



Alternatively you may tick zones directly in the list. **Click** the *Select all*, *Deselect all* or *Invert selection* buttons as needed.

Note : The *Select species habitat zones* button is not available if species habitat zones have not been previously defined.

4.2.5 Transect selection

Click *Transect sample list of this survey* to display the survey transects. All transects that are located within the selected habitat zones (see above) are ticked (default option). This list is usually appropriate for most survey statistical analysis.

Note: Invertebrate abundance in some transects may be distant from other observations in the rest of the sample set, and higher than what is deemed reasonable compared to the sample mean. Such transect are called *outliers*.
Naive interpretation of stock estimates derived from data sets that include such outliers may be misleading. It is recommended to remove outliers from statistical analysis and to compare stock estimates.

To remove transects from statistical analysis, **uncheck** these transects in the list.

Click again *Transect sample list of this survey* to hide the transect list.

4.2.6 Size-weight parameters

Invertebrate weight may be estimated using either length and width measurements or length only depending on available formulas and data (cf. p 14). If both formulas are available in BDmer 2.0, the length-width/weight conversion relationship should be preferred as it allows for more reliable weight estimates.

Length-width/weight conversion coefficients are available in BDMer 2.0 for the following species :

Scientific name	Common name	Length-width / weight coefficient
Stichopus chloronotus	Greenfish	√
Actinopyga echinites	Deepwater redfish	√
Actinopyga spinea	New Caledonia blackfish (Burying blackfish)	√
Holothuria scabra	Sandfish	√
Holothuria lessoni	Golden sandfish	√
Thelenota ananas	Prickly redfish	√
Actinopyga mauritiana	Surf redfish	√
Actinopyga palauensis	Deepwater blackfish	√
Stichopus herrmanni	Curryfish	√
Actinopyga miliaris	Hairy blackfish	√
Holothuria whitmaei	Black teatfish	√
Holothuria fuscogilva	White teatfish	√

Note : If the length-width/weight conversion coefficients are not informed in BDMer 2.0, the *Use length and width* button is not available.

Note: If animal width has not been recorded during survey, tick the *Use length only* button despite length-width/weight conversion coefficients are informed for this species.

4.2.7 Survey site map

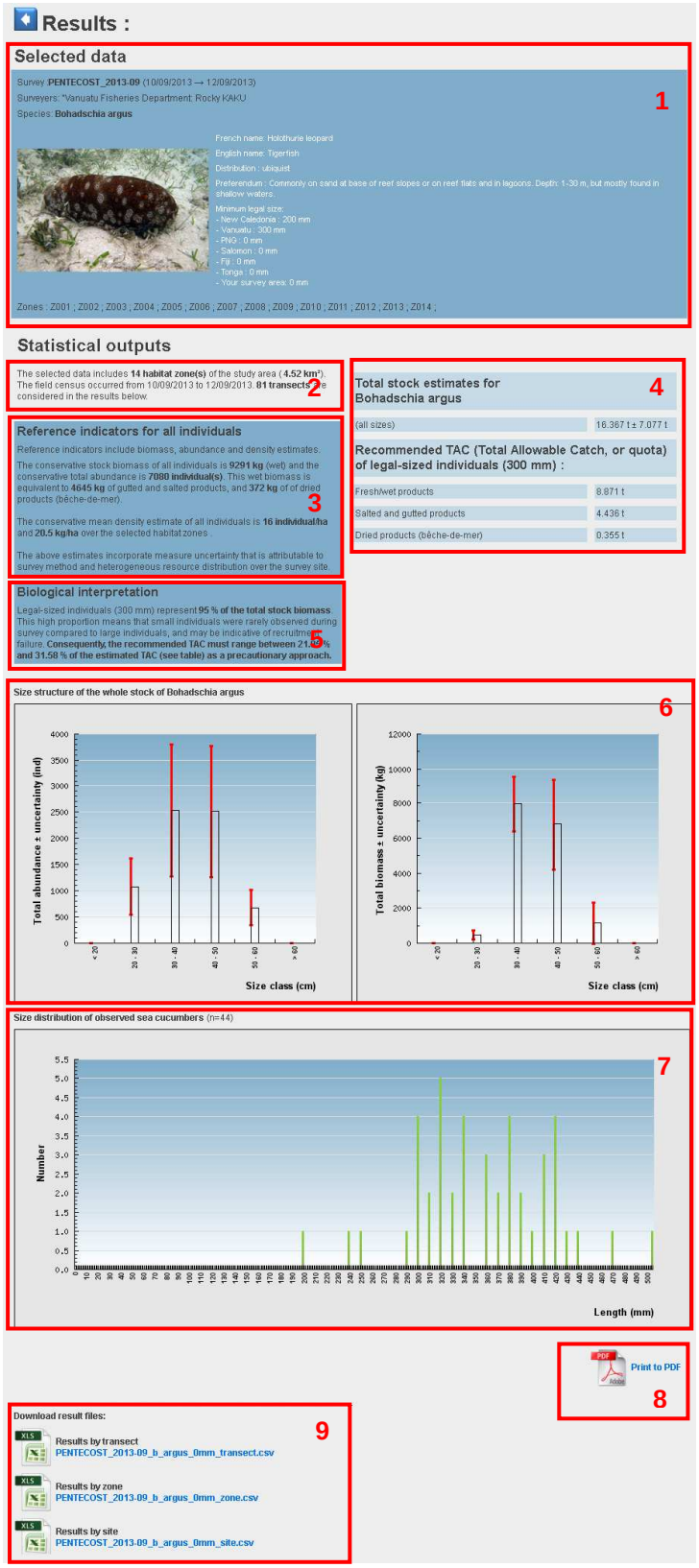
A map of the survey site is displayed on the screen's right side. This map is usually derived from aerial or satellite imagery and presents habitat zones and sample transects.

Right click the map and *Save image as…* to download.

Double-click the map to enlarge in a new window, and then click outside to close the window.

Note : The image file is located in the *EasyPHP-12.1\www\BDMERv2.0\cartes* folder. The file name must be the exact name of the site (eg. EFATE-NORTH.jpg). There is no size or resolution specification for this image.

4.3 Data analysis results



Results are structured based on the following sections :

[1] Selected data

[2] Analysis criteria (zones and transects)

[3] Reference indicators (abundance, biomass, density)

[4] Total stock biomass and Total allowable catch (TAC)

[5] Biological interpretation

[6] Size structure of the whole stock

[7] Size structure of the observed invertebrates

[8] Download PDF report

[9] Export data to CSV files

4.3.1 Selected data

This section describes the survey name and characteristics, the species name and characteristics, the selected habitat zones and any outlier transect.

4.3.2 Analysis criteria

This paragraph indicates the number of habitat zones, their corresponding surface area within the survey site, and the number of transects included in the statistical analysis. The survey period is also indicated.

Eg. "The selected data includes 13 habitat zone(s) of the study area (4.3 km²). The field survey occurred from 10/09/2013 to 12/09/2013. 78 transects are considered in the results below."

4.3.3 Reference indicators

This paragraph summarizes the statistical estimates of the following reference indicators:

- Biomass (in kg) of whole, gutted/salted and dried products
- Abundance (in number of individuals)
- Density (in individual/ha and kg/ha)

Specifically BDMer 2.0 estimates the 95% confidence interval of each above indicator and returns the lower endpoint of this interval (rather than the total estimate). This is a conservative approach to data uncertainty resulting from methodological factors and heterogeneous resource distribution over the survey site.

Note: Biomass, abundance and density estimates refer here to the animals larger than the minimum size threshold that was specified when defining the analysis parameters (cf. p 62). The minimum size threshold is indicated in the paragraph title (eg. "*Reference indicators for individuals larger than 200 mm*" if the threshold was set at 200 mm, or "*Reference indicators for all individuals*" if the threshold was set at 0 mm).

Eg. "Reference indicators for individuals larger than 200 mm:

Reference indicators include biomass, abundance and density estimates.
The conservative stock biomass of individuals larger than 200 mm is 9278 kg (wet) and the conservative total abundance is 7073 individual(s). This wet biomass is equivalent to 4639 kg of gutted and salted products, and 371 kg of of dried products (bêche-de-mer).
The conservative mean density estimate of individuals larger than 200 mm is 17 individual/ha and 21.6 kg/ha over the selected habitat zones.
The above estimates incorporate measure uncertainty that is attributable to survey method and heterogeneous resource distribution over the survey site."

Note: The following warning message is displayed if fewer than 30 transects have been surveyed given that small sample size may lead to misleading results:

"There are too few transects in the selected zones to accurately calculate estimate uncertainty due to the heterogeneous spatial distribution of the resources over the study site. It is therefore suggested to perform the statistical analysis using a larger sample size, i.e., including more habitat zones.
Assessment results are available in the CSV files. Great care should be taken to avoid misinterpretation given the above statistical issue."

4.3.4 Total stock biomass and Total allowable catch (TAC)

Biomass stock estimates and recommended TACs are displayed in a table for better clarity:

1) Total stock biomass (in tons) and the associated 95 % confidence interval

2) Recommended TAC (or quota) corresponding to the conservative estimate of the legal-sized stock biomass (i.e., composed of individuals larger than the minimum harvest size).
The conservative estimate of the legal-sized stock biomass is the lower endpoint of the 95% confidence interval of the legal-sized stock biomass.
The TAC is estimated for live invertebrates and then converted into gutted/salted and dried products using predefined conversion ratio (cf. p 14).

Example :

Total stock estimate for Stichopus chloronotus	
(all sizes)	*8.574 t ± 6.329 t*
Recommended TAC (Total Allowable Catch, or quota) of legal-sized individuals (200 mm)	
Fresh/wet products	*0.905 t*
Salted and gutted products	*0.453 t*
Dried products (bêche-de-mer)	*0.027 t*

Result interpretation:

The total stock estimate is 8.574 t ± 6.329 t : this means that the stock ranges between 2.245 tons et 14.903 tons. The conservative total stock estimate would be 2.245 tons.

The recommended TAC is 0.905 ton (wet weight). This value is indeed derived from the legal-sized stock biomass which ranges between 0.905 ton and 8.398 tons. The conservative value of this stock is therefore 0.905 ton.

This TAC (live weight) is equivalent to 0.453 ton of salted and gutted products given that the conversion rate from live Greenfish to gutted/slated products is 0.5 (50 %).

The TAC (live weight) is equivalent to 0.027 ton of dried products given that the conversion rate from live Greenfish to bêche-de-mer is 0.03 (3 %).

4.3.5 Biological interpretation of stock estimates

This paragraph indicates the proportion of the stock (%) that is composed of legal-sized animals. The TAC is then derived from this rate and from the biomass of the legal-sized stock indicated in the above table (cf. p 67). Two situations may be observed :

1) Legal-sized animals represent less than 30 % of the total stock biomass : the TAC may then represent the full legal-sized stock indicated in the table.

   The following recommendation is displayed :

   > "*Biological interpretation*
   > *Legal-sized individuals (300 mm) represent 12 % of the total stock biomass. This low proportion is attributable to the common observation of small individuals in the survey compared to adults (see charts below) and is indicative of local recruitment. Resources may be harvested following the recommended TAC (see table)."*

2) Legal-sized animals represent more than 30 % of the total stock biomass : the TAC may then represent only a part of the legal-sized stock indicated in the table corresponding to 20 % to 30 % of the total stock.

   The following warning and recommendation is displayed :

   > *"Biological interpretation*
   > *Legal-sized individuals (300 mm) represent 95 % of the total stock biomass. This high proportion means that small individuals were rarely observed during survey compared to large individuals, and may be indicative of recruitment failure. Consequently, the recommended TAC must range between 21.05 % and 31.58 % of the estimated TAC (see table) as a precautionary approach."*

Note: These recommendations aim at limiting catches to a maximum of 30 % of the total resource biomass as a precautionary approach to fisheries management. It is suggested to decrease this rate to 20 % in depleted and/or recovering fisheries.

4.3.6 Stock size structure

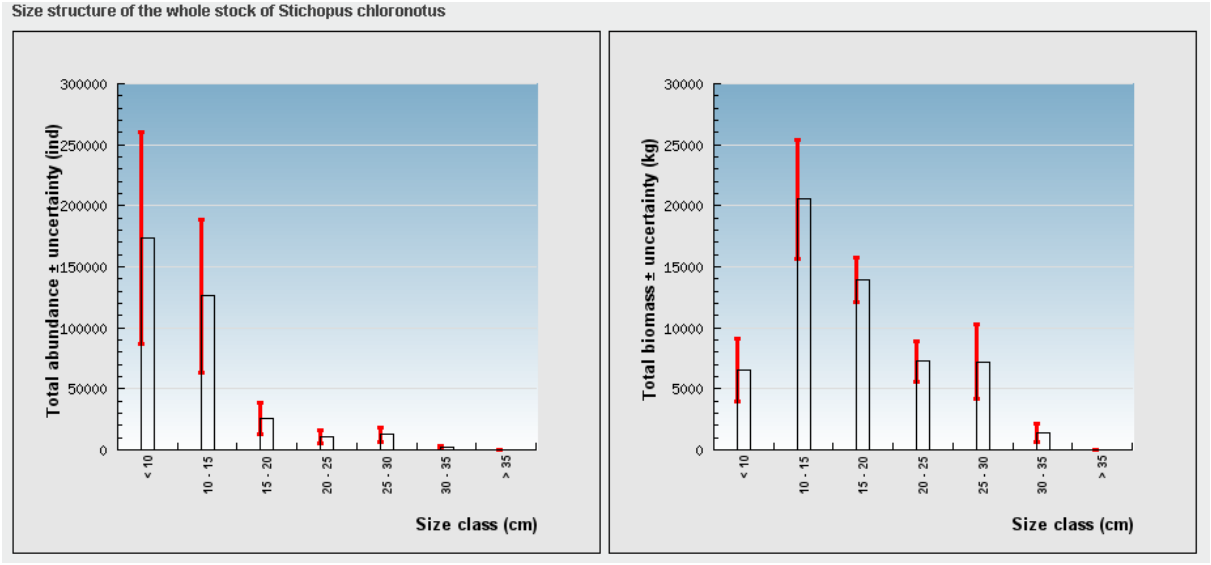
Two graphs show the length distribution of the total stock abundance (in number of animals) and biomass (in kg).

The estimated stock of each length class is shown by a histogram. The vertical red bar shows the corresponding 95% confidence interval of this estimate.

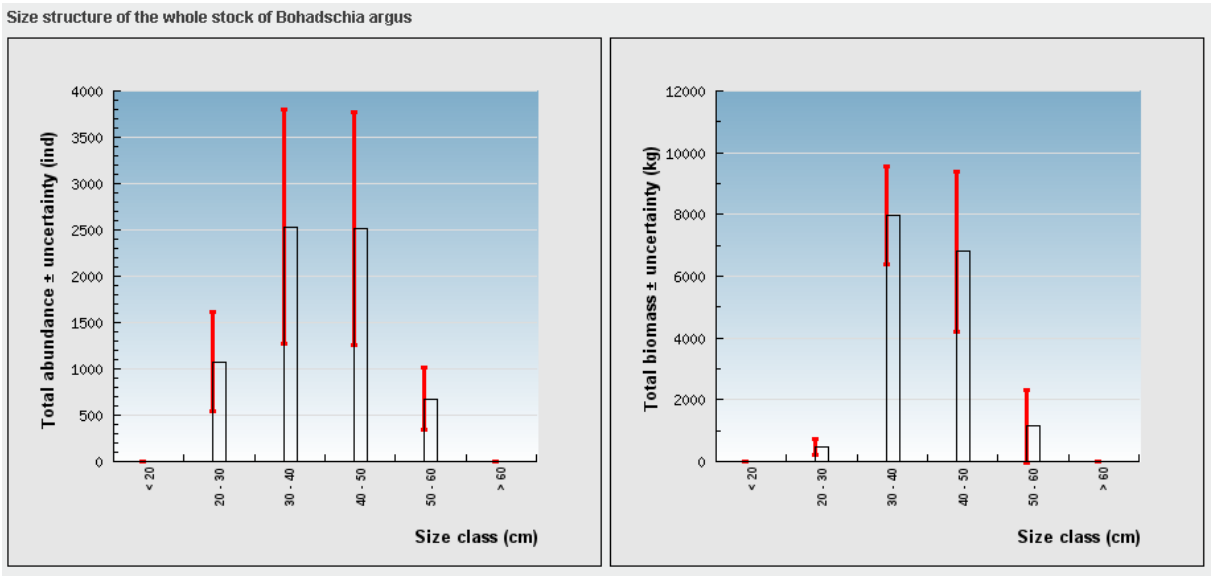
Predefined size classes are used depending on species maximum length (cf. p 14) :

- 5 cm size classes if species maximum length is 50 cm or less,
- 10 cm size classes if species maximum length is above 50 cm.

Eg. Stichopus chloronotus, maximum length = 47 cm



Eg. Bohadschia argus, maximum length = 60 cm

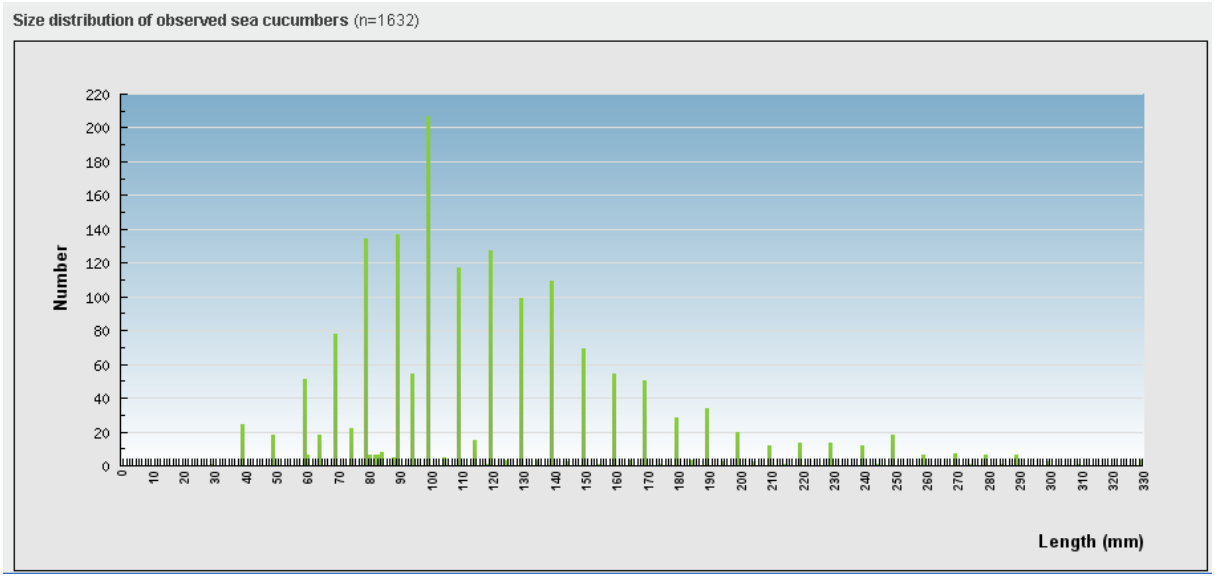


4.3.7 Size distribution of observed invertebrates

A diagram displayed the size distribution of the observed invertebrates during survey. Each green bar represents the number of animals of the corresponding length found within the whole transect set.

The total number of observed individuals is indicated in the diagram title (eg. n=1632 individuals in the example below).

Note : This diagram does not show extrapolated abundance values at the site scale (cf. p 69). Only observed invertebrates are included.

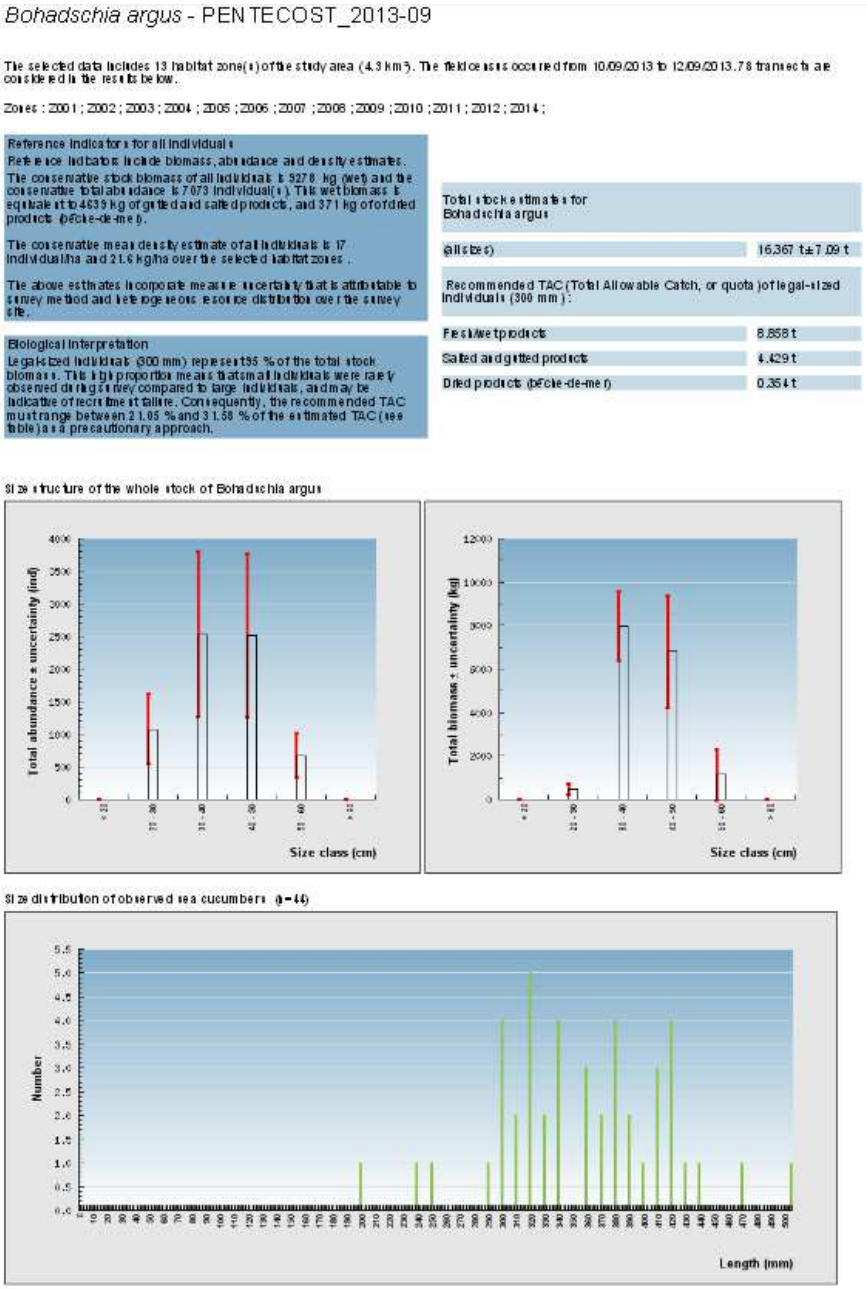


4.3.8 Create a PDF result report by species

Click the *Print to PDF* button (cf. p 65) to create a standard result report. A PDF document will be displayed in your Internet browser and may be download to your computer.

The DPF file shows all previous statistical assessment results. It has been designed to produce standard reports for each species including all relevant biological information based on survey observations.

Example of a survey PDF report for Bohadschia argus:



Bohadschia argus - PENTECOST_2013-09

The selected data includes 13 habitat zone(s) of the study area (4.3 km²). The fieldcensus occurred from 10/09/2013 to 12/09/2013. 78 transects are considered in the results below.

Zones : Z001 ; Z002 ; Z003 ; Z004 ; Z005 ; Z006 ; Z007 ; Z008 ; Z009 ; Z010 ; Z011 ; Z012 ; Z014 ;

Reference Indicators for all individuals

Reference Indicators include biomass, abundance and density estimates.

The conservative stock biomass of all individuals is 5278 kg (wet) and the conservative total abundance is 7073 individual(s). This wet biomass is equivalent to 4639 kg of gutted and salted products, and 371 kg of of dried products (bêche-de-mer).

The conservative mean density estimate of all individuals is 17 individuals/ha and 21.6 kg/ha over the selected habitat zones.

The above estimates incorporate measure uncertainty that is attributable to survey method and heterogeneous resource distribution over the survey site.

Biological Interpretation

Legal-sized individuals (300 mm) represent 55 % of the total stock biomass. This high proportion means that small individuals were rarely observed during survey compared to large individuals, and may be indicative of recruitment failure. Consequently, the recommended TAC must range between 2 1.05 % and 3 1.58 % of the estimated TAC (see table) as a precautionary approach.

Total stock estimates for *Bohadschia argus*

(all sites)	16,367 t±7.09 t

Recommended TAC (Total Allowable Catch, or quota) of legal-sized individuals (300 mm):

Fresh/wet products	8.858 t
Salted and gutted products	4.429 t
Dried products (bêche-de-mer)	0.354 t

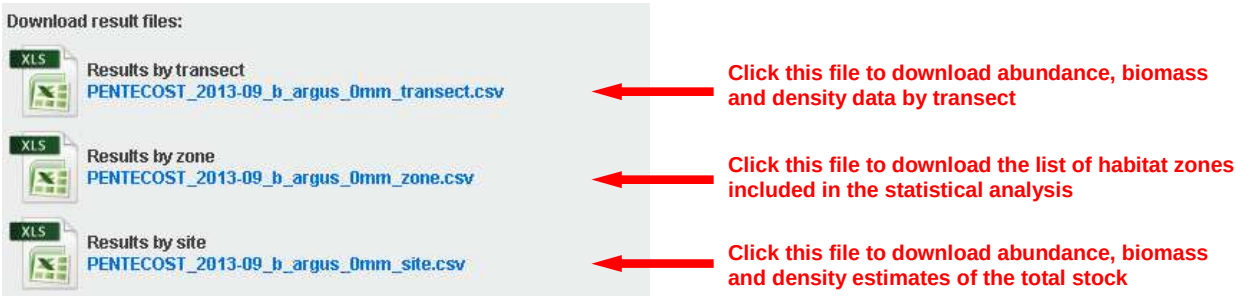
Size structure of the whole stock of Bohadschia argus

Size distribution of observed sea cucumbers (n = 44)

4.3.9 Export statistical results to CSV files

Raw statistical results may be downloaded as CSV files. Three CSV files are automatically generated by BDMer 2.0 concerning transect, zone and site data respectively:

Click the appropriate CSV file to open or download.



Note : If you are using the local web application, the three CSV files will be automatically saved in the *EasyPHP-12.1\www\BDMERv2.0\EXPORT_FICHIERS_CSV* folder on your computer.

4.3.9.1 Download count data by transect

The *###_transect.csv* file contains count data by transect including the selected survey, species, and transects only (cf. p 61-64).
The following data fields are included:

Field name	Description
code_campagne	Survey code
code_zone	Zone code
transect	Transect name
code_transect	Transect code
code_sp	Species code
total_nb	Observed number of individuals
densit_nb/ha	Density (individuals per ha) *densit_nb/ha = total_nb x 10000 / transect surface area in m²*
biomass_kg	Estimated biomass (kg) – live animals
biomass_kg/ha	Biomass density (kg per ha) *biomass_kg/ha = biomass_kg x 10000 / transect surface area in m²*

Note : GIS may be used to map species abundance by transect (*total_nb*, *densit_nb/ha*, *biomass_kg*, *biomass_kg/ha*) using transect names as identifiers to join count data to transect location.

4.3.9.2 Download the zone list

The *###_zone.csv* file includes data concerning the selected habitat zones and transects only (cf. p 62-63). The following data fields are included:

Field name	Description
code_campagne	Survey code
code_zone	Zone code
surface_km2	Surface area of the zone (in km²)
nb_transects	Number of sample transects within the zone

Note : BDMer 2.0 does not estimate species abundance and biomass in each habitat zone due to statistical reasons. Indeed little accurate estimate uncertainty would be expected given the common small sample size within each zone potentially leading to misinterpretation of results.
To estimate the species abundance and biomass in a single habitat zone, check only this zone in the zone list when defining analysis parameters (cf. p 62) and download the *###_site.csv* file (cf. below).

4.3.9.3 Download stock assessement results for the whole site

The *###_site.csv* file includes all statistical assessment results concerning the selected field survey, species, habitat zones and transects (cf. p 59-64). This information is particularly useful to compare stocks between sites, surveys and/or species.

The following data fields are included in the *###_site.csv* file:

	Data fields	Description
ANALYSIS CRITERIA	**code_campagne**	Survey code
	nb_zones	Number of sample habitat zones
	surface	Total surface area of habitat zones
	nb_transects	Number of sample transects
	code_sp	Species code
	Lmin	Minimum length (mm) of selected invertebrates (cf. p 62)
TOTAL ABUNDANCE	**total_nb**	Total stock abundance (number of individuals)
	total_nb_95%IC	95 % confidence interval (CI) width
	total_nb_precaution	Lower endpoint of the 95 % CI (=conservative value) *total_nb_precaution = total_nb - total_nb_95%IC*
TOTAL BIOMASS (live animals)	**total_biomass**	Total stock biomass (kg) - whole live animals
	total_biomass_95%IC	95 % confidence interval (CI) width
	total_biomass_precaution	Lower endpoint of the 95 % CI (=conservative value) *total_biomass_precaution = total_biomass - total_biomass_95%IC*
TOTAL BIOMASS (gutted/salted products)	**total_biomass_salt**	Total stock biomass (kg) - gutted/salted products
	total_biomass_95%IC	95 % confidence interval (CI) width
	total_biomass_salt_precaution	Lower endpoint of the 95 % CI (=conservative value) *total_biomass_salt_precaution = total_biomass_salt - total_biomass_salt_95%IC*
TOTAL BIOMASS (dried products)	**total_biomass_beche-de-mer**	Total stock biomass (kg) - dried products
	total_biomass_beche-de-mer_95%IC	95 % confidence interval (CI) width
	total_biomass_beche-de-mer_precaution	Lower endpoint of the 95 % CI (=conservative value) *total_biomass_beche-de-mer_precaution = total_biomass_beche-de-mer - total_biomass_beche-de-mer_95%IC*
AVERAGE DENSITY	**densit_ha**	Average density (number of individuals per ha)
	densit_ha_95%IC	95 % confidence interval (CI) width
	densit_ha_precaution	Lower endpoint of the 95 % CI (=conservative value) *densit_ha_precaution = densit_ha - densit_ha_95%IC*
AVERAGE BIOMASS DENSITY	**biomass_ha**	Average biomass density (kg per ha)
	biomass_ha_95%IC	95 % confidence interval (CI) width
	biomass_ha_precaution	Lower endpoint of the 95 % CI (=conservative value) *biomass_ha_precaution =biomass_ha - biomass_ha_95%IC*

Note : The conservative values of abundance, biomass, and density estimates in the above table would be overestimated if fewer than 20 transects ("*nb_transect*"<20) have been sampled. Indeed the 95 % confidence interval width would be larger than that calculated by default (see correction factors below). For instance, this may occur is a subset of habitat zones has been selected (cf. p 62).

It would then be recommended to use the following corrections factors to re-estimate the conservative stock values:

Number of sample transects (nb_transects)	Multiply 95% confidence interval width by this correction factor:
Close to 15	1.05
Close to 10	1.1
Close to 5	1.25
Close to 3	1.5