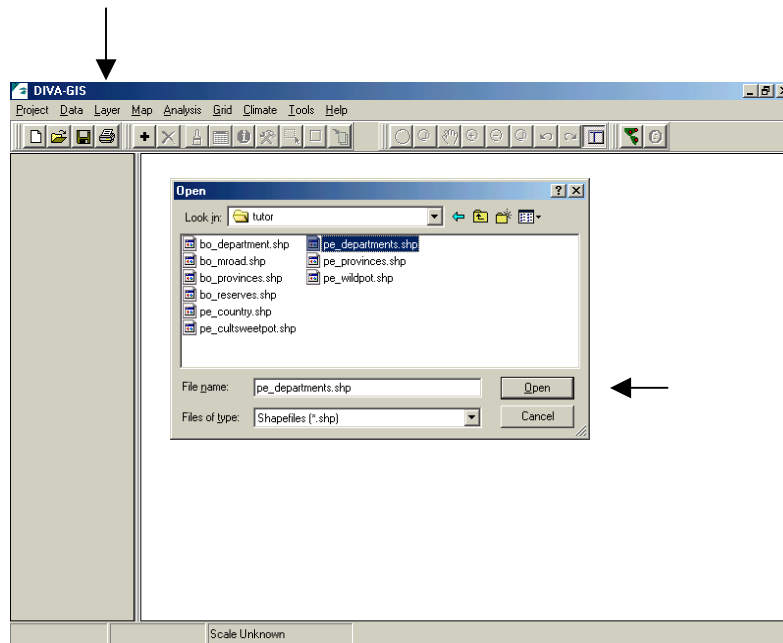# DIVA-GIS v3 - Tutorial

June 2003

This tutorial guides you through some commands in DIVA-GIS, in order to become familiar with the program. The data used in this tutorial can be downloaded from the Internet at http://www.diva-gis.org. They can be placed in any folder, but here we assume they are in the "C:\Program Files\DIVA\tutor" folder.

1. Shapefiles

⇒ Start DIVA-GIS
⇒ Click on *Layer - Add* in the menu bar

The "*Open*" window appears. In this window, go to the folder "<DIVA dir>\DIVA\tutor", and select the file pe_departments.shp and press the Open button. (<DIVA dir> refers to the folder where DIVA was installed, typically this in "C:\Program Files\DIVA").

Again do *Layer-Add* and select the file pe_wilpot.shp and press "Open".

Two "layers" should now be present in the legend (left hand side of the window) of DIVA. You can see these layers on the map, by clicking on the checkboxes next to their names in the legend. After that, your screen should show a map of Peru indicating areas where wild potatoes have been observed. This map was created by adding two "shapefiles" to the map. Shapefiles are files of points, (poly)lines, or polygons (areas) and associated data.
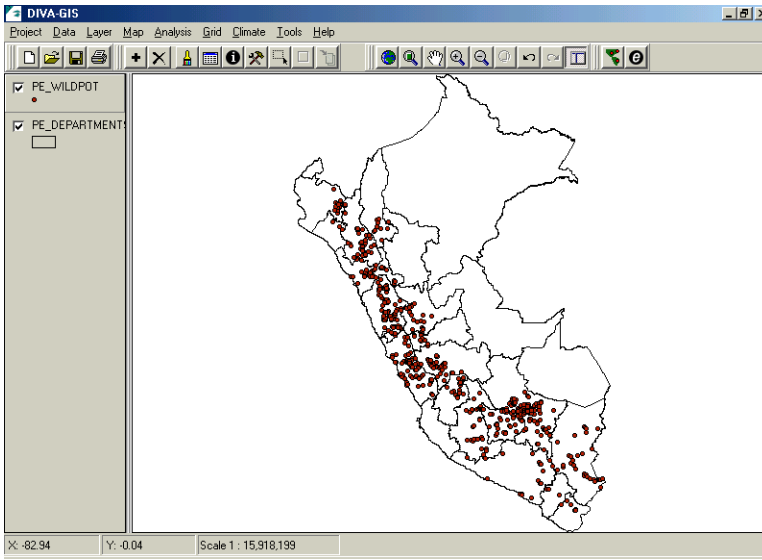
Now try out zooming in and out, and "pan" (moving the center of the map after zooming in), using the commands from the *Map* menu or from this toolbar:


To change the way this layer is displayed, click once on the pe_departments layer in the legend (not on the checkbox, but next to it). This makes that layer the "active Layer". Now click on *Layer/Properties* and the *Properties* window appears. (This window also appears after double clicking on the layer in the legend). Now you can change display properties such as the color and border size.
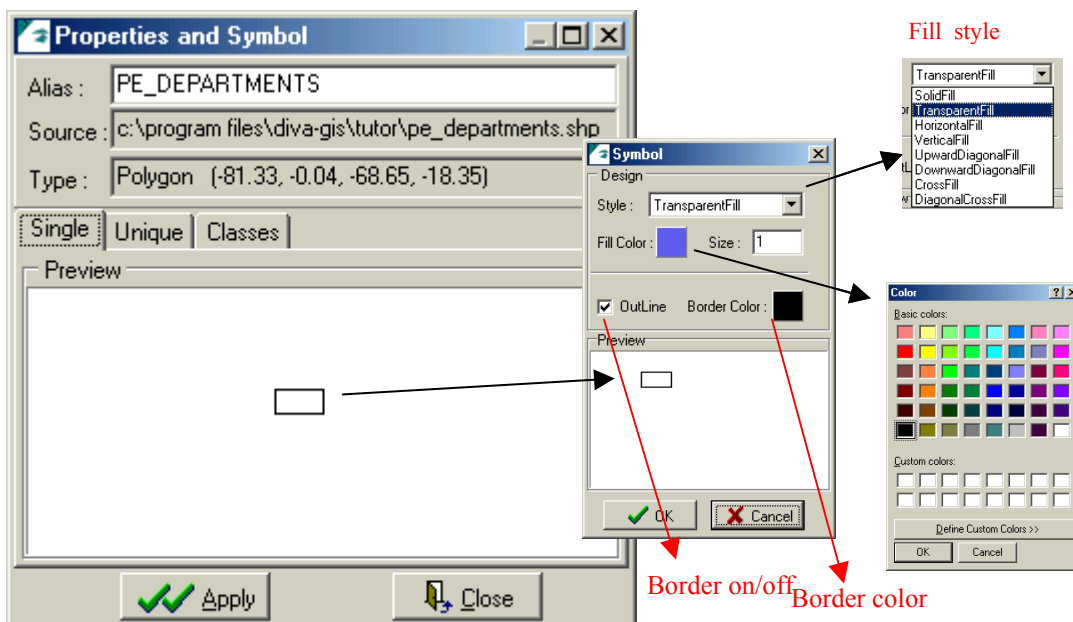
Change the *Style* to "SolidFill", and the *Fill Color* to green (double click on the rectangle in the Preview to show the color palette), and click on *Apply* and *Close*. The map of Peru should now be green. You can also try the ″Unique″ tab in the Properties window to make a map where each Department has a different color.

Double click on pe_wildpot (in the legend) and change the *Style* of the legend to "Square", the *Fill Color* to red, the *Size* to 4, and do not use an *Outline*.

To be able to see the points layer, drag (click on it and move it while keeping the mouse button down) it to the top in the legend.
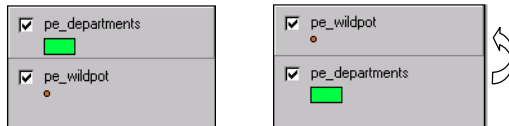

Save your work using the *Save* o *Save As* commands in the *File* menu and save the "Project" in a folder of your choice. Then use *File-Close* to close the project and *File-Open* to open it again. Note that the project file only stores the names of layers and some information about them, not the data. If you want to save the project with the data in a single file, you can use *File-Export*. This can be handy for sending a project to somebody else.

Make the pe_departments layer active by clicking on it in the legend.
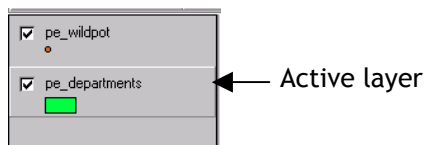
Choose the option *Layer – Identify Feature* from the Layer menu or from the toolbar:

After that, click on any part of the map of Peru. The *Identify* window will appear and show the data that are associated with the part of the map you clicked on (e.g., the name of the department).
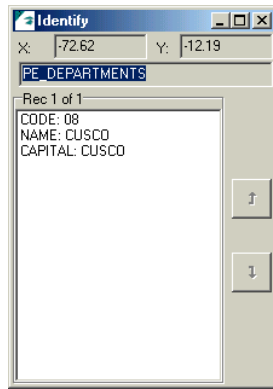
Note that after clicking on *Climate/Point*, you can click anywhere on the map (where there is land) to find out what the climate is like at that location.

Now make pe_wildpot the active layer and click on some points. If you click on a location with more than one overlapping or nearby points, these will all be shown in the *Identify* window. In the example below there were 8 records ("REC 1 of 8"). The records can be browsed using the arrows.
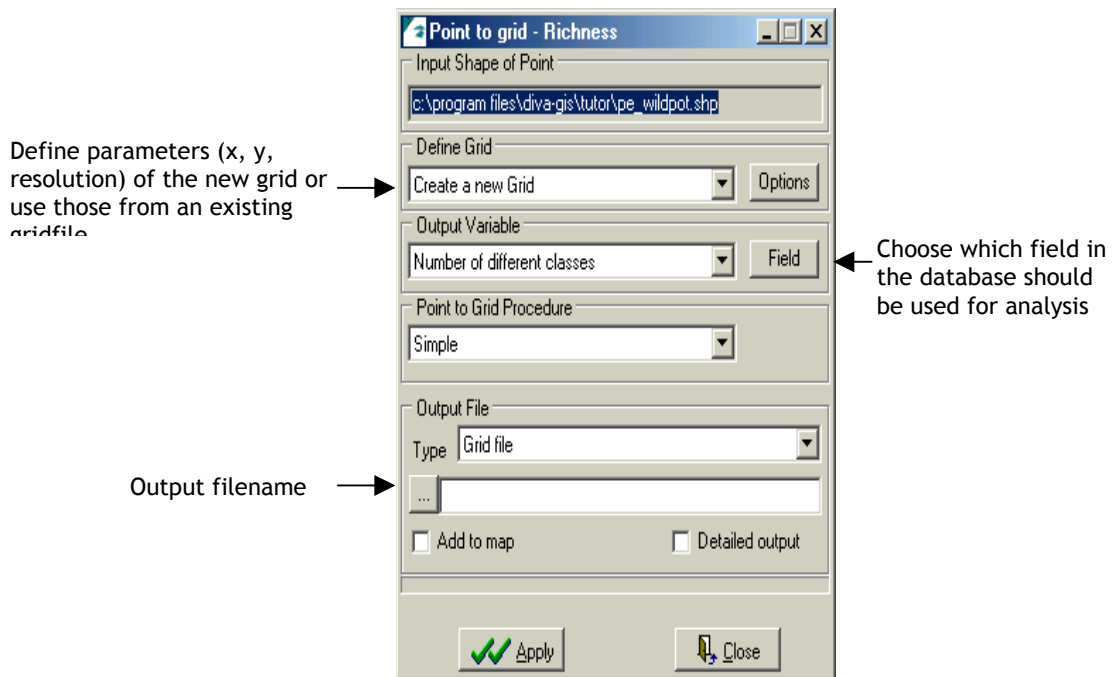
To see the whole table related to the active layer, click on *Layer-Table* or on this icon:

You can select a record in the database and then use *Highlight, Pan To* o, *Zoom To,* to see the location of the object related to this record on the map.

ID	COLNR	LONGITUDE	LATITUDE	SPECIES	CODE	COUNTRY	ADM1	ADM2	LOC
250	OCH 13005	-77.58	-8.63	S. acaule Bitt	acl	PERU	Ancash	Sihuas	Puc.
251	OCH 12069a	-77.35	-9.67	S. acaule Bitt	acl	PERU	Ancash	Recuay	Betv
252	OCH 12069	-77.35	-9.667	S. acaule Bitt	acl	PERU	Ancash	Recuay	Rec
253	OCH 12092	-77.3	-9.82	S. acaule Bitt	acl	PERU	Ancash	Recuay	Carp
254	OCHS 12059	-77.25	-10.5	S. acaule Bitt	acl	PERU	Ancash	Bolognesi	Nea
255	OCHS 15725	-77.13	-10.18	S. acaule Bitt	acl	PERU	Ancash	Bolognesi	Shin
256	OCHS 15726	-77.13	-10.18	S. acaule Bitt	acl	PERU	Ancash	Bolognesi	Shin
257	OCHS 15731	-77.13	-10.18	S. acaule Bitt	acl	PERU	Ancash	Bolognesi	Pisg
258	OCHS 15727	-77.13	-10.18	S. acaule Bitt	acl	PERU	Ancash	Bolognesi	Shin
259	OCHS 15728	-77.13	-10.18	S. acaule Bitt	acl	PERU	Ancash	Bolognesi	Shin
260	OCHS 15729	-77.13	-10.18	S. acaule Bitt	acl	PERU	Ancash	Bolognesi	Mojc
261	OCHS 15730	-77.13	-10.18	S. acaule Bitt	acl	PERU	Ancash	Bolognesi	Mojc
262	OCH 12073	-77.033	-9.4	S. acaule Bitt	acl	PERU	Ancash	Huari	Hua
263	OCHS 13145	-76.87	-10.55	S. acaule Bitt	acl	PERU	Lima	Cajatambo	Nea
264	OCHS 13146	-76.75	-10.57	S. acaule Bitt	acl	PERU	Lima	Cajatambo	Quic
265	OCHS 13149	-76.75	-10.57	S. acaule Bitt	acl	PERU	Lima	Cajatambo	Quic
266	OCHS 13151	-76.72	-10.91	S. acaule Bitt	acl	PERU	Lima	Cajatambo`	Quir
267	OCH 5035	-76.6347	-11.5534	S. acaule Bitt	acl	PERU	Lima	Canta	Canl
268	OCH S-83	-76.583	-9.267	S. acaule Bitt	acl	PERU	Huanuco	Huamalies	Hua

Record: 1 of 1200

Statistic   Highlight   Pan To   Zoom To

2. Data analysis and grids

Let's make a grid with the number of observations of wild potatoes in Peru. Make pe_wildpot the active layer, and then click on *Analysis – Point to Grid - Richness* and click on *OK*. Choose a name for the output file and press *Apply*.

Define parameters (x, y, resolution) of the new grid or use those from an existing gridfile

Choose which field in the database should be used for analysis

Output filename

To show the new grid on the map, make sure that the "Add to map" checkbox is checked. Press Apply. When the program is finished, drag the pe_departments layer to the top and change (in the *Properties* window) its *Style* to *Transparent fill*.

The map shows a grid that consists of five colors, each indicating a range of number of observations per cell.

When the grid is the active layer, the row and column number, and the value of the cell is shown at the bottom of the screen, when moving the mouse over the map.

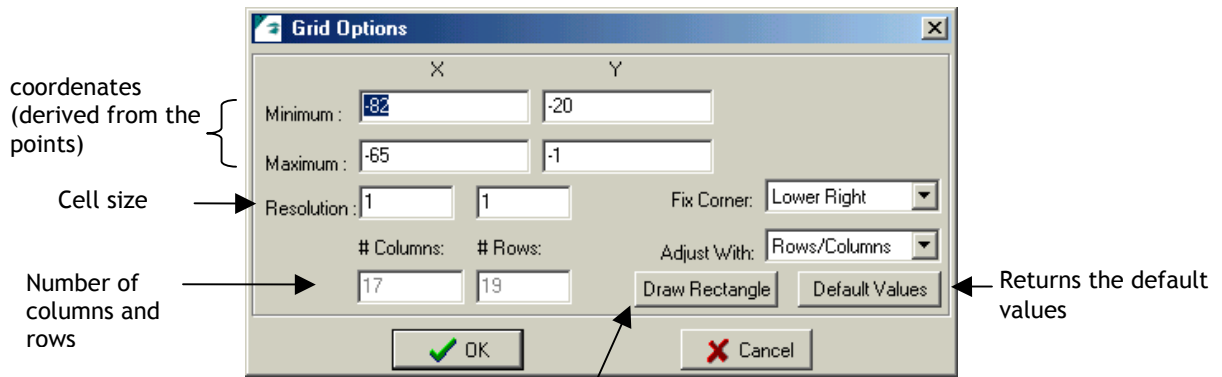Each color represents a range in the number of observations.
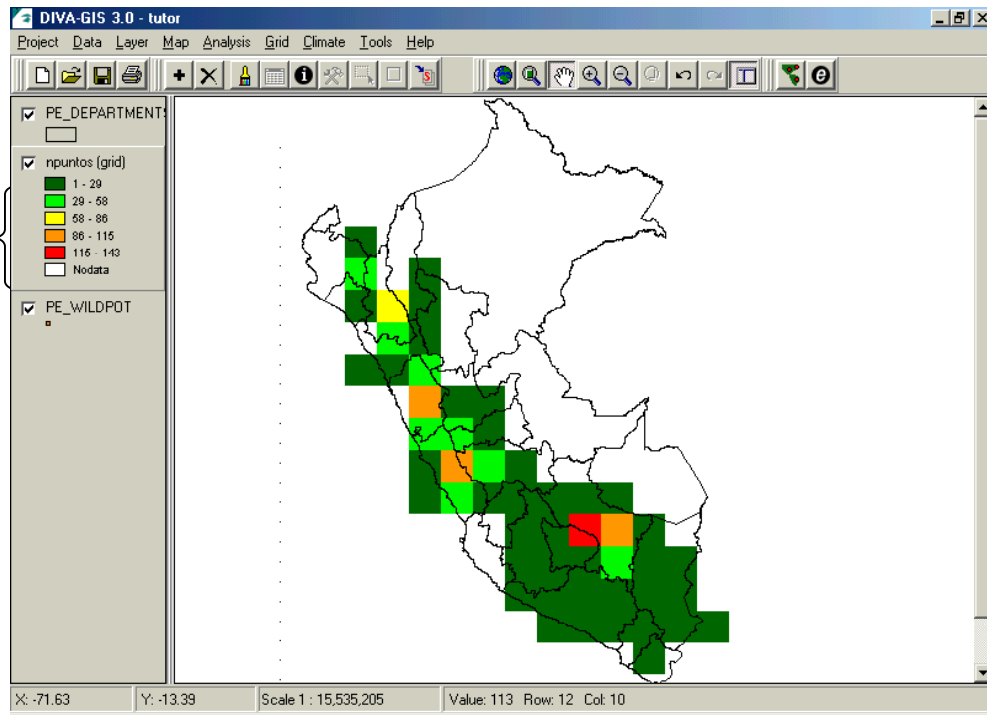
Row, Column, and value of the
cell where the mouse is.

To change the legend and show other ranges (e.g.,: 1-10, 10-20, etc) o individual values, double click on the grid. The grid *Properties* window appears. Click on a value in the "To" column and change it. You can also insert more rows (ranges) using "Insert row" (+).
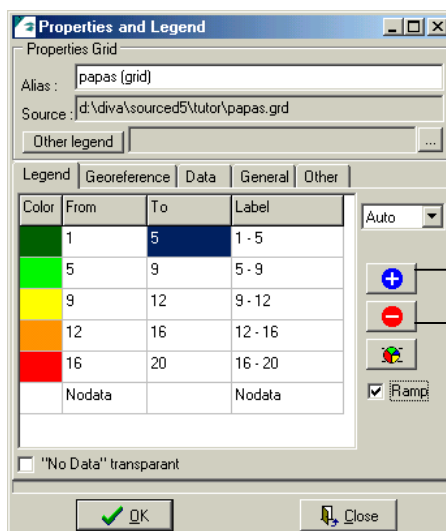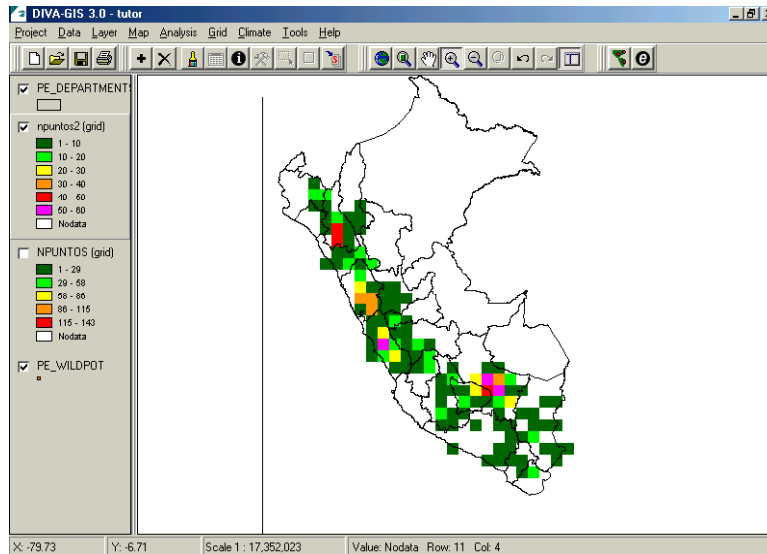

Insert rows

Delete rows

Make some more grids. Frist activate the Pe_wildpot layer. Then select *Analysis/Grid*. Select *Define Grid-Options*. In the *Adjusting With* use Rows/Columns. Change the resolution (size) of the cells to 0.5 degrees and click OK. Then click Apply in the *Create Grid* window. The result is a grid with smaller cells than the previous grid (and hence with different values).

coordenates
(derived from the
points)

Cell size

Number of
columns and
rows

Returns the default
values

Define the output area by drawing it on the
screen.

Make another grid using pe_wildpot (*Analysis-Grid-Richness*), now of the number of different classes (species in this case) per grid cell. In *Output Variable* select *Number of Distinct Values,* click on *Options* and select the variable **Species** from the database. Click *OK* and then *Apply*.
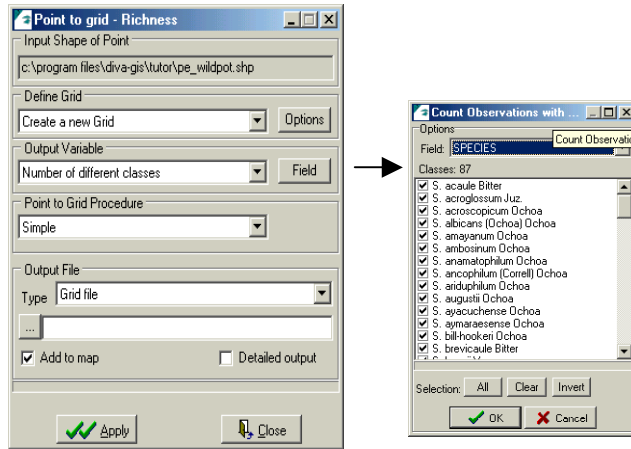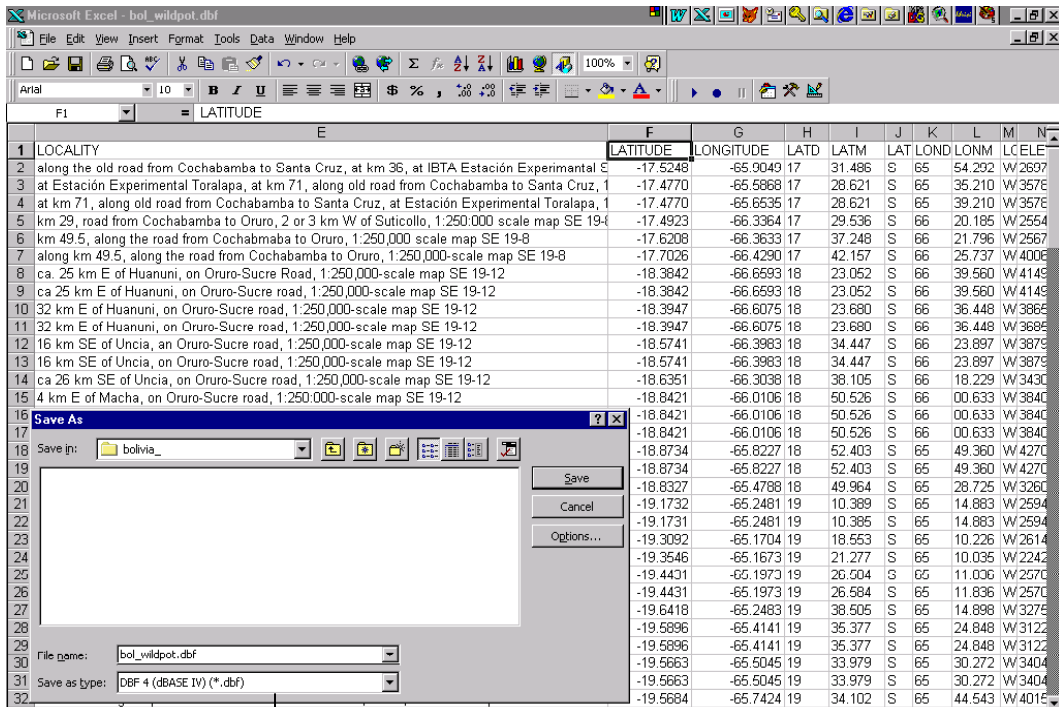

Save your project.

3. Data management

3.1 Importing and verifying data

Open the file bol_wildpot.xls with Excel (or other spreadsheet program). Insert two new columns: LATITUDE and LONGITUDE.

Now fill these columns with coordinate data in decimal degrees using the columns LATD, LATM, LATH, LOND, LONM, LONGH. LATD y LOND have degrees data, LATM y LOGM have decimal minutes (not minutes and seconds)), LATH and LONGH indicate the hemisphere (N/S and E/W). To calculate Latitude use a formula like "=-1*(LATD+LATM/60)"

When you are done save the file under a different name. After that, save it as a DBF (version 4) file. Close and open the DBF file and verify that the data have been saved. It is important that in Excel you set the format of the cells to a number with 5 decimals. Otherwise, all the decimal numbers may be cut off.

Microsoft Excel - bol_wildpot.dbf

File Edit View Insert Format Tools Data Window Help

Arial 10 | F1 = LATITUDE

LOCALITY	LATITUDE	LONGITUDE	LATD	LATM	LAT	LOND	LONM	LC ELE
1 LOCALITY	LATITUDE	LONGITUDE	LATD	LATM		LOND	LONM	LC ELE
2 along the old road from Cochabamba to Santa Cruz, at km 36, at IBTA Estación Experimantal E	-17.5248	-65.9049	17	31.486	S	65	54.292	W 2697
3 at Estación Experimental Toralapa, at km 71, along old road from Cochabamba to Santa Cruz, 1	-17.4770	-65.5868	17	28.621	S	65	35.210	W 3578
4 at km 71, along old road from Cochabamba to Santa Cruz, at Estación Experimental Toralapa, 1	-17.4770	-65.6535	17	28.621	S	65	39.210	W 3578
5 km 29, road from Cochabamba to Oruro, 2 or 3 km W of Suticollo, 1:250:000 scale map SE 19-8	-17.4923	-66.3364	17	29.536	S	66	20.185	W 2554
6 km 49.5, along the road from Cochabmaba to Oruro, 1:250,000 scale map SE 19-8	-17.6208	-66.3633	17	37.248	S	66	21.796	W 2567
7 along km 49.5, along the road from Cochabamba to Oruro, 1:250,000-scale map SE 19-8	-17.7026	-66.4290	17	42.157	S	66	25.737	W 4006
8 ca. 25 km E of Huanuni, on Oruro-Sucre Road, 1:250,000-scale map SE 19-12	-18.3842	-66.6593	18	23.052	S	66	39.560	W 4149
9 ca 25 km E of Huanuni, on Oruro-Sucre road, 1:250,000-scale map SE 19-12	-18.3842	-66.6593	18	23.052	S	66	39.560	W 4149
10 32 km E of Huanuni, on Oruro-Sucre road, 1:250,000-scale map SE 19-12	-18.3947	-66.6075	18	23.680	S	66	36.448	W 3865
11 32 km E of Huanuni, on Oruro-Sucre road, 1:250,000-scale map SE 19-12	-18.3947	-66.6075	18	23.680	S	66	36.448	W 3685
12 16 km SE of Uncia, an Oruro-Sucre road, 1:250,000-scale map SE 19-12	-18.5741	-66.3983	18	34.447	S	66	23.897	W 3879
13 16 km SE of Uncia, on Oruro-Sucre road, 1:250,000-scale map SE 19-12	-18.5741	-66.3983	18	34.447	S	66	23.897	W 3879
14 ca 26 km SE of Uncia, on Oruro-Sucre road, 1:250,000-scale map SE 19-12	-18.6351	-66.3038	18	38.105	S	66	18.229	W 3430
15 4 km E of Macha, on Oruro-Sucre road, 1:250:000 scale map SE 19-12	-18.8421	-66.0106	18	50.526	S	66	00.633	W 3840
16	-18.8421	-66.0106	18	50.526	S	66	00.633	W 3840
17	-18.8421	-66.0106	18	50.526	S	66	00.633	W 3840
18	-18.8734	-65.8227	18	52.403	S	65	49.360	W 4270
19	-18.8734	-65.8227	18	52.403	S	65	49.360	W 4270
20	-18.8327	-65.4788	18	49.964	S	65	28.725	W 3260
21	-19.1732	-65.2481	19	10.389	S	65	14.883	W 2594
22	-19.1731	-65.2481	19	10.385	S	65	14.883	W 2594
23	-19.3092	-65.1704	19	18.553	S	65	10.226	W 2614
24	-19.3546	-65.1673	19	21.277	S	65	10.035	W 2242
25	-19.4431	-65.1973	19	26.504	S	65	11.036	W 2570
26	-19.4431	-65.1973	19	26.584	S	65	11.836	W 2570
27	-19.6418	-65.2483	19	38.505	S	65	14.898	W 3275
28	-19.5896	-65.4141	19	35.377	S	65	24.848	W 3122
29	-19.5896	-65.4141	19	35.377	S	65	24.848	W 3122
30	-19.5663	-65.5045	19	33.979	S	65	30.272	W 3404
31	-19.5663	-65.5045	19	33.979	S	65	30.272	W 3404
32	-19.5684	-65.7424	19	34.102	S	65	44.543	W 4015

Save As

Save in: bolivia_

File name: bol_wildpot.dbf

Save as type: DBF 4 (dBASE IV) (*.dbf)
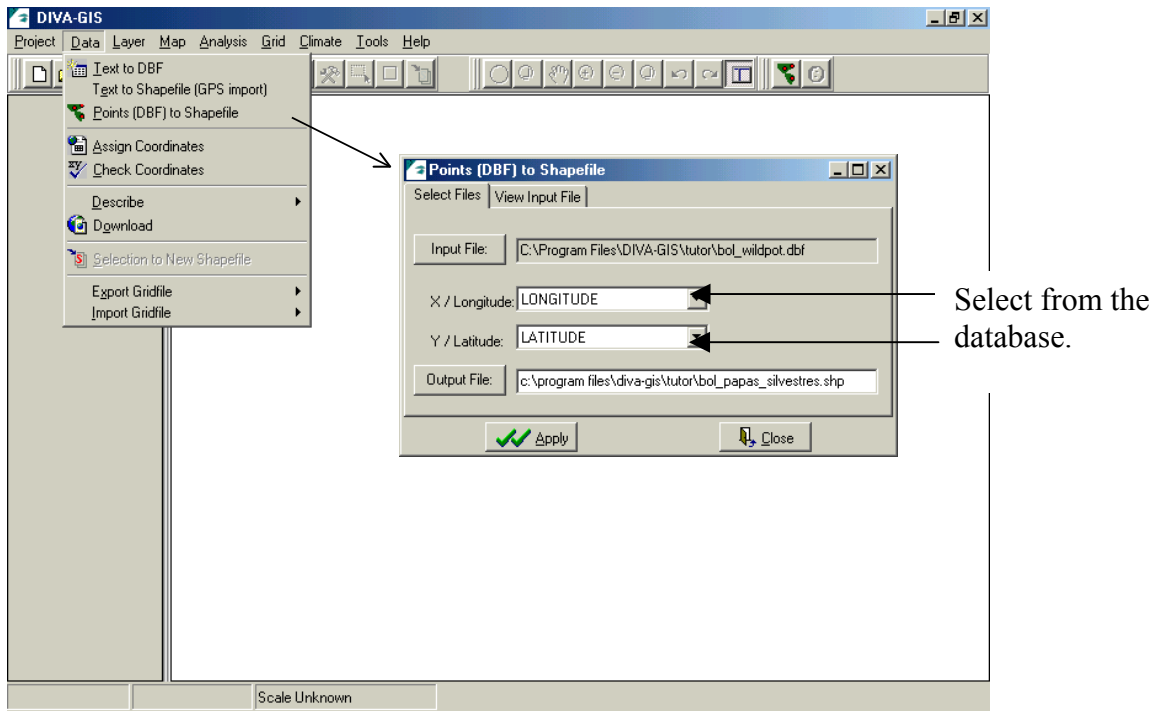
Save
Cancel
Options...

Save as DBF4

Create a shapefile

Start with a new project (*File/New*).

Use *Data/Create Shape* to create a shapefile from the DBF file you just made with Excel. Select the DBF file as *Input File*, and for Longitude and Latitude select the columns LONGITUD and LATITUD. Choose a name for the output shapefile and click Apply.

Select from the database.

When the program finishes it will ask you whether you want the shapefile added to the map. Choose *Yes* and click on *Close*.

Add the shapefiles bo_departments.shp and bo_depatment.shp from the <DIVA dir>\tutor\ folder. Your screen should look like this:
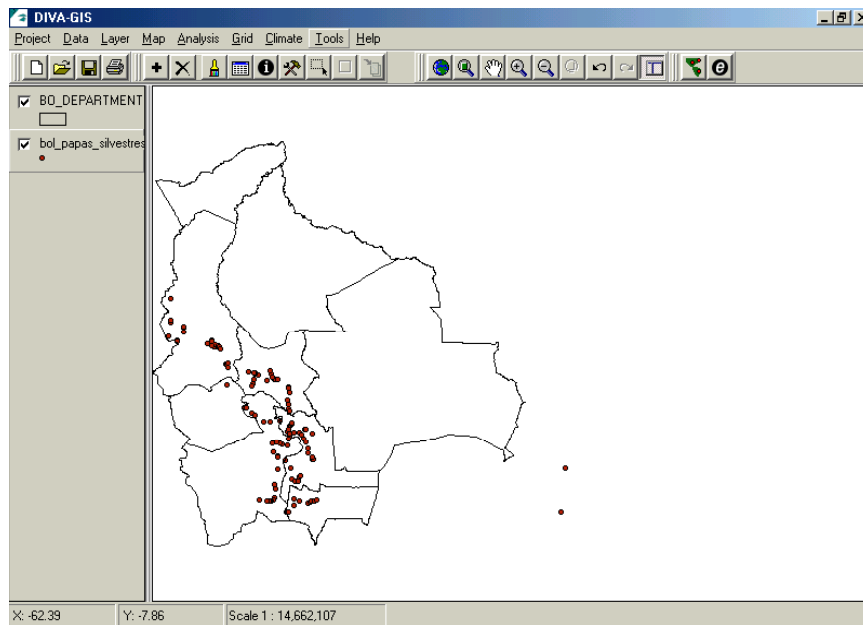
To verify the locations of the points, these can be queried against the data in bo_provinces. Use *Data/Check Coordinates*. The input file should be the points file. The "Shape of Polygon" should be the file bo_provinces.

For the "Relation Fields" use the following:

Relations Fields	Shape of Point	Shape of Polygon
Relation 1	STATE	DEPARTMENT
Relation 2	PROVINCE	PROVINCE
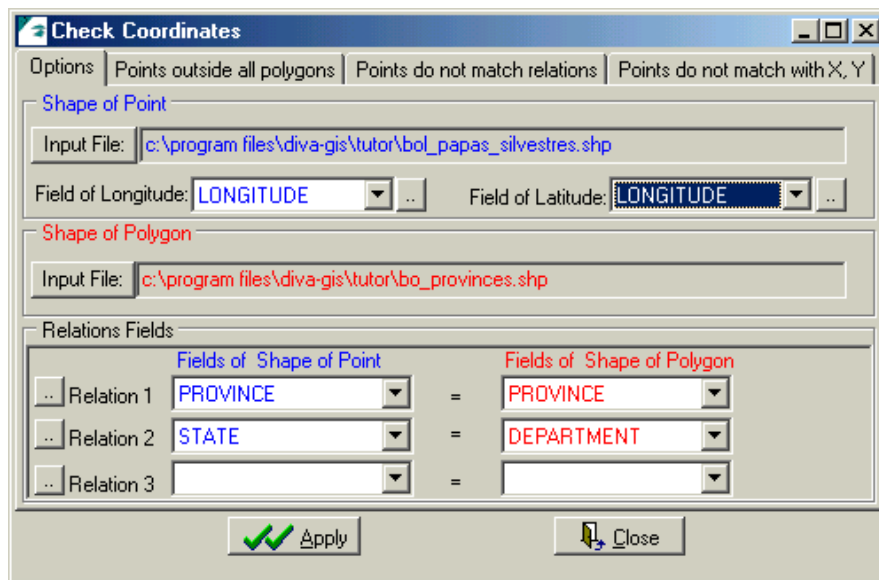
Now click on Apply, and when the program is finished look in the three result tabs to find the points outside all polygons (in this case outside of Bolivia); the points that do not mach relations (the name of the Department or Province is not the same in the database of the pointfile and that of the relevant polygon.

Points outside of Bolivia:

Check Coordinates _ □ X

| Options | Points outside all polygons | Points do not match relations | Points do not match with X, Y |

No Req	X	Y	PLANTID	COUNTRY	STATE	PROVINCE	LOC
52	-46.0907	-21.4427	SFVU 6572	Bolivia	Potosí	Sud Chichas	abou
53	-46.0907	-21.4427	SFVU 6573	Bolivia	Potosí	Sud Chichas	abou
55	-56.2642	-21.8035	SFVU 6575	Bolivia	Tarija	Aviles	47.5
70	-56.1238	-20.3673	SFVU 6614	Bolivia	Chuquisaca	Nor Cinti	45.3

Row:0 of 0   Highlight   Pan To   Zoom To   Export

Mismatch of Department and/or Province data

Check Coordinates _ □ X

| Options | Points outside all polygons | Points do not match relations | Points do not match with X, Y |

No Req	X	Y	Point:PROVI	Polyg:PROVI	Point:STATE	Polyg:DEPAI	F
1	-65.9049	-17.5248	Punata	Jordan	Cochabamba	COCHABAMI	S
2	-65.5868	-17.477	Tiraque	Arani	Cochabamba	COCHABAMI	S
3	-65.6535	-17.477	Tiraque	Arani	Cochabamba	COCHABAMI	S
6	-66.429	-17.7026	Quillacollo	Arque	Cochabamba	COCHABAMI	S
7	-66.6593	-18.3842	Dalence	Bustillos	Oruro	POTOSI	S
8	-66.6593	-18.3842	Dalence	Bustillos	Oruro	POTOSI	S
9	-66.6075	-18.3947	Dalence	Bustillos	Oruro	POTOSI	S
10	-66.6075	-18.3947	Dalence	Bustillos	Oruro	POTOSI	S
11	-66.3983	-18.5741	Bustillos	Bustillos	Oruro	POTOSI	S
12	-66.3983	-18.5741	Bustillos	Bustillos	Potosí	POTOSI	S
13	-66.3038	-18.6351	Bustillos	Bustillos	Potosí	POTOSI	S
14	-66.0106	-18.8421	Chayanta	Chayanta	Potosí	POTOSI	S

Row:0 of 0   Highlight   Pan To   Zoom To   Export

To investigate the causes of these inconsistencies, use the options Highlight, and Pan y Zoom To. You can also use Export to make a textfile with a list with all points with inconsistencies.

3.2 Asignar Coordenadas

In case you do not have coordinates for a group of observations, you can use DIVA to try to assign coordinates to these points, using the locality description. Use the file "accessions without coordinates.dbf" and the function *Data/Assign Coordinates* to try this.

The file "accessions without coordinates.dbf" has locality descrioptions such as "growing at a local place called Millnihuaya, 1 Km E of Pacomanta". This information has bee systematized in the following way:

NAME1 : Millnihuana (name of the most specific place in the description)
DIST1   (distance from that place, in km)
DIR1   (heading from that place)
NAME2 : Pacomanta   (name of an alternative, less specific, place)
DIST2   : 1   (distance from that place, in km)
DIR2   : E   (heading from that place)

SPECIES	COUNTRY	DEPARTMENT	PROVINCE	ALTITUDE	NAME1	DIST1	DIR1	NAME2	DIST2	DIR2	LOCALITY
S. medians Bitter	PERU	Lima	Huarochiri	0	Matucana	5	N		0		growing in valley of Río Rimac, 5.0
S. multiinterruptum Bitt	PERU	Lima	Huarochiri	0	Millnihua			Pacomanta	1	E	growing at a local place called Millr
S. alandiae Cárdenas	BOLIVIA	Cochabamba	Mizque	2800	Tortora	4	S				4 km S of Tortora on rd to Sucre, 1:
S. marinasense Vargas	PERU	Cuzco	Quispicanchis	3550	Cusco	8	S				Prov. Cusco: from the Universidad
S. dolichocremastrum I	PERU	Ancash	Carhuaz	3985	Ulta			Chilla	25	E	growing at a local place called Ulta
S. lignicaule Vargas	PERU	Cuzco	Calca	0	Piscac	8	NW				Prov. Calca: Ruins of Pisac, locatec
S. megistacrolonum Bit	BOLIVIA	Potosi	Sud Chichas	3686	Tupiza	15	W				14.5 West of Tupiza
S. xdoddsii Correll (aln	BOLIVIA	Cochabamba	Mizque	0	Chuquilla	42	N				10 km N of Chuquillas, 42 km N of
S. yungasense Hawkes	BOLIVIA	La Paz	Nor Yungas	1700	Yolosa	8	S				8 km south of Yolosa on road to Sa
S. sandemanii Hawkes	PERU	Arequipa	Arequipa	0	Cabreria						Cabreria
S. bukasovii Juz.	PERU	Lima	Yauyos	0	Alis						Alis
S. sparsipilum (Bitter) J	BOLIVIA	Cochabamba	Punata	2697	San Benit						along the old road from Cochabam
S. arnezii	BOLIVIA	Chuquisaca	Tomina	0	Padilla	8	W				7.9 km west of town square of Padi
S. megistacrolonum Bit	BOLIVIA	Potosi	Sud Chichas	4006	Tupiza	20	W				20.2 km West of Tupiza
S. acaule Bitter	BOLIVIA	Potosi	Tomas Frias	0	Rio Cerda	4	S	Chaqui	1	N	3.9 km S of Potosi-Sucre road, nea
S. albicans (Ochoa) Oc	PERU	Ancash	Corongo	0	Cabuacona						Cabuacona

Above you can see a part of this database. Note that there is the field COUNTRY with two values: BOLIVIA and PERU (in this case). DIVA has databases with place names and coordinates (gazetteers) that are used to assign coordinates. In the folder <DIVA dir>\gazet\, se encuentran dos archivos gazetters BOL.dbf y PER.dbf. Los nombres de éstos archivos deben ser igual a los nombres que contiene el campo COUNTRY de "accessions

without coordinates.dbf" (BOLIVIA, PERU) para que proceda la búsqueda de datos.

With the Windows Explorer 🔍 , go to the <DIVA dir>\gazet\ folder and rename the files BOL.dbf and PER.dbf to BOLIVIA.dbf and PERU.dbf. (Or first download these files from www.diva-gis.org

In the "Assing Coordinates" window (first tab; Select Files) select as Input File "accessions without coordinates.dbf" and as Output file put the any name; include all or some fields of your choice.
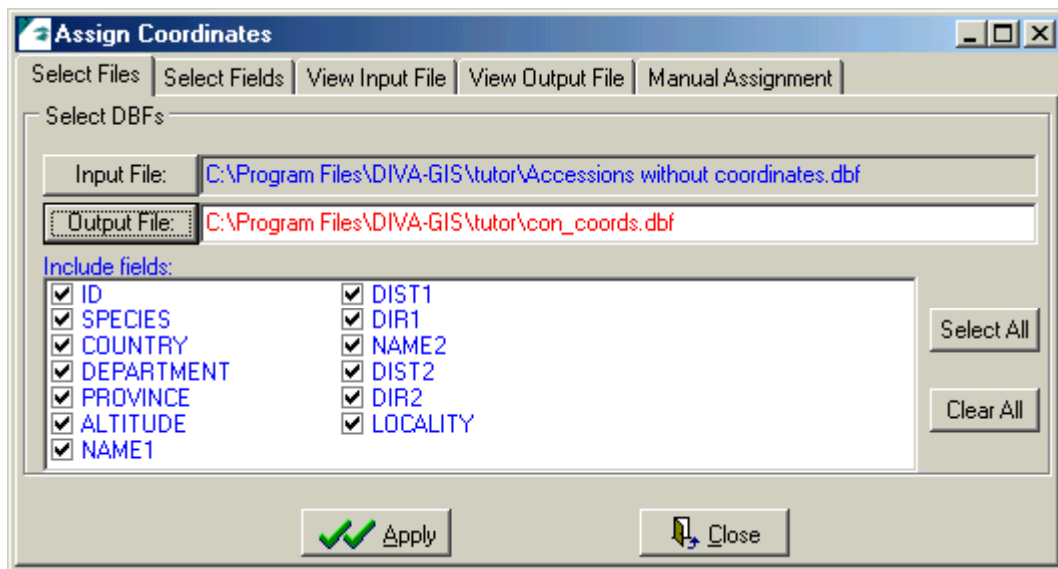
Then, on the second tab, Select Fields, click on Refresh, and select the fields as indicated in the image below. Then return to the first tab and press Apply.
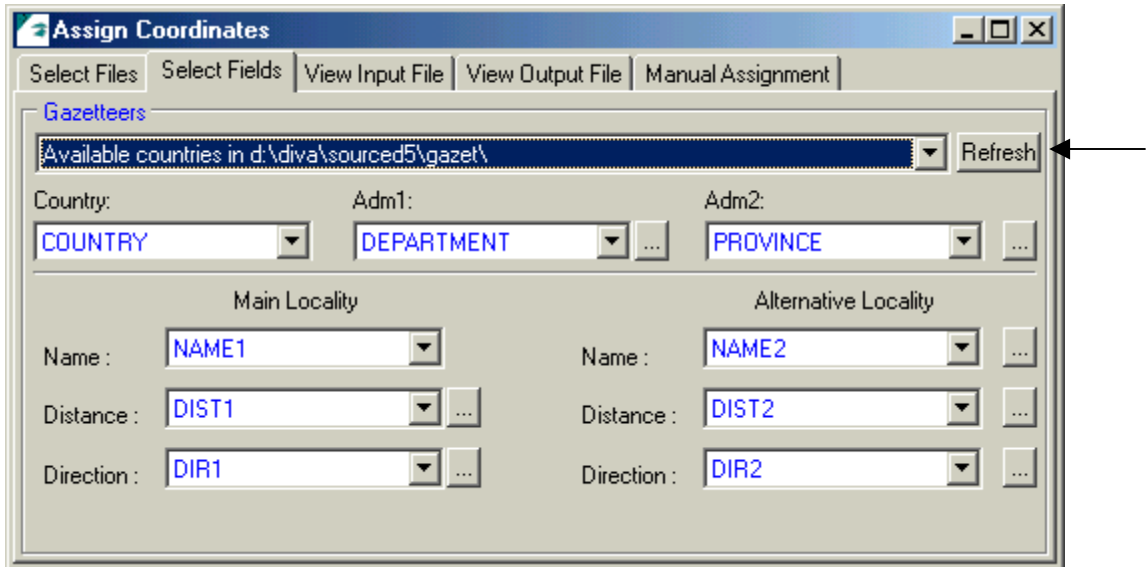
When the program has finished, go to the View Output File tab, to see the results:
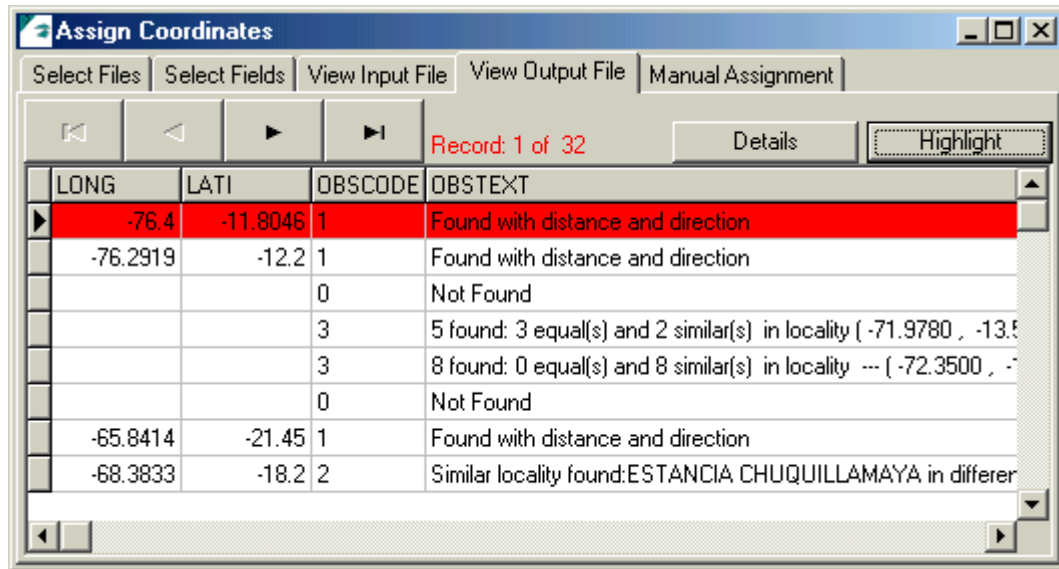
The program has created two new fields, LONG and LATI, in which the coordiantes that were found have been put. The new field OBSTEXT indicates how these have been determined. In case there was more than one match, there is a text like "found 4 equal(s), and 1 similar(s) in locality …". In those cases you can look at these (as a list and on the map), by selecting the record (click on it) and pressing the *Details* button.