SECOND REPORT ON THE MEDITERRANEAN ARTISANAL FISHERIES INVENTORY DATABASE AND GIS UTILITIES.

By

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1. INTRODUCTION

This report describe both the Database (ArtFiMed) and GIS applications developed to record and manage all data related with the COPEMED Artisanal Project.

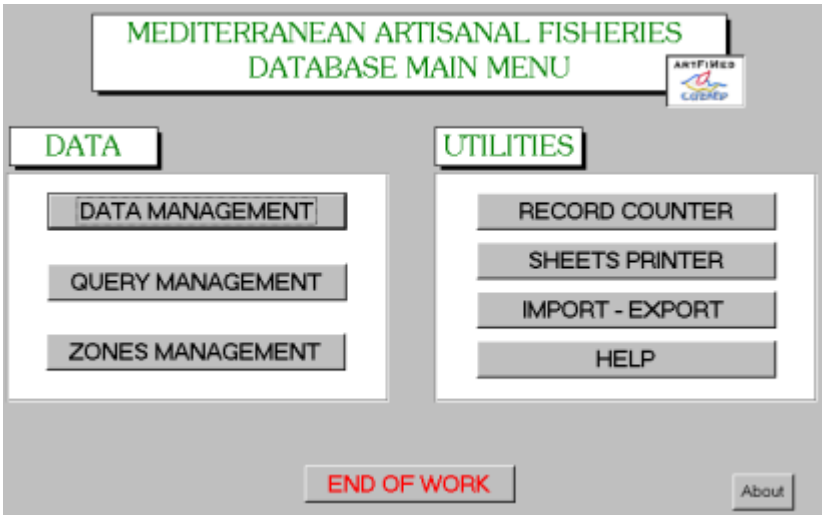
Respect to the Database is explained how to enter all type of data, the way to manage them and the way to get back different type of reports, data files and filtered results. An important section is how to link the database results with the GIS software (ArcView), in order to get maps and graphical results on specific cases.

Respect to the GIS are described the tools specifically programmed to manage and display the information about ports, metiers and species.

The present versions of both applications are not the final ones. So, some of the forms and utilities described can be modified in a short future. Moreover, additional utilities must be programmed to deal with new necessities.

2. DATABASE.

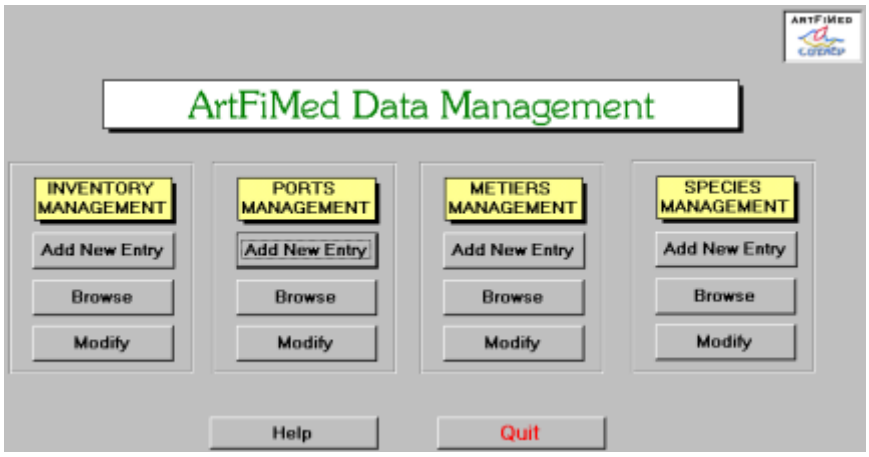
Data are recorded and managed using the ArtFimed application. The main menu is showed below. It has two main parts: the main one dealing with data managing and another to use some utilities.



2.1. DATA MANAGEMENT WINDOW

This window shows the menu to select wich type of data the user wants to manage, that is inventory, ports, metiers or species. The possibilities to manage data are always the same: "add" new records, and "modify" or "browse" existing records. In order to mantain the

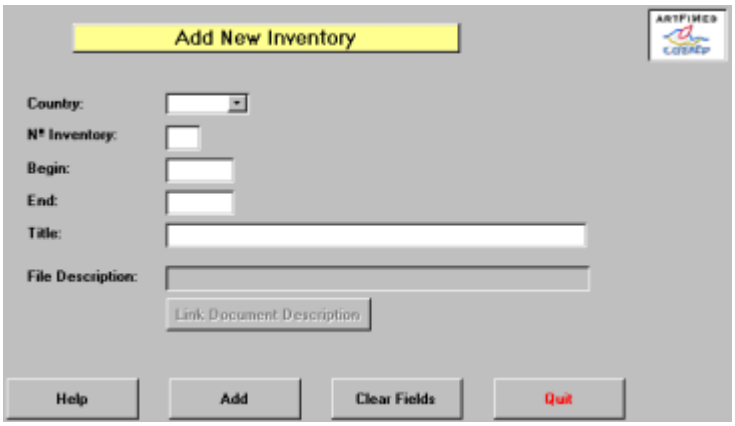
integrity of the species record set the user only can "browse" through the data, being "add" and "modify" records utilities available exclusively for the datamanager.



2.1.1. INVENTORY DATA MANAGEMENT

A) "Add new Inventory" window.

This window allows creating a new Inventory in the database. Taking into account the Inventory definition, it is obligatory to enter data for country, number of inventory and starting and ending dates. Complementary fields are "Title" (an inventory name) and "File description". The "File Description" field is filled after clicking the "Link Document Description" button, that open the window interface to find the desired document. The new Inventory is added to the database after clicking the "Add" button.

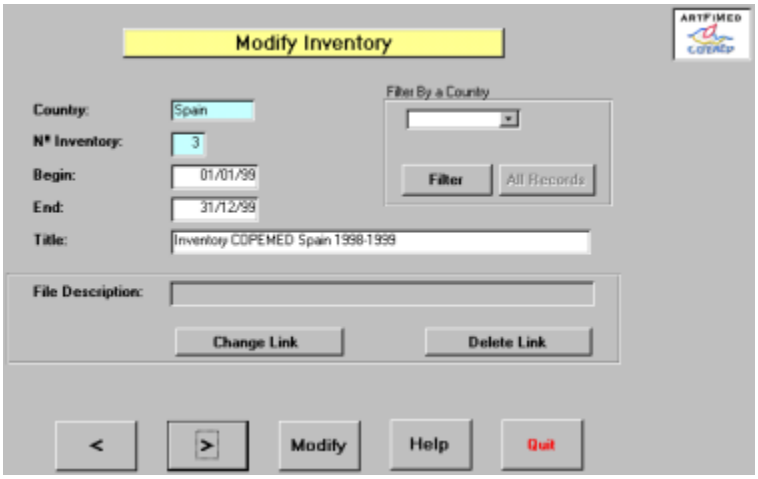


B) “Browse Inventories” window.

Using the next and the previous buttons it is possible to browse through all the inventories recorded in the Database. In this window it is not possible to enter or modify any data.

C) “Modify Inventory” window.

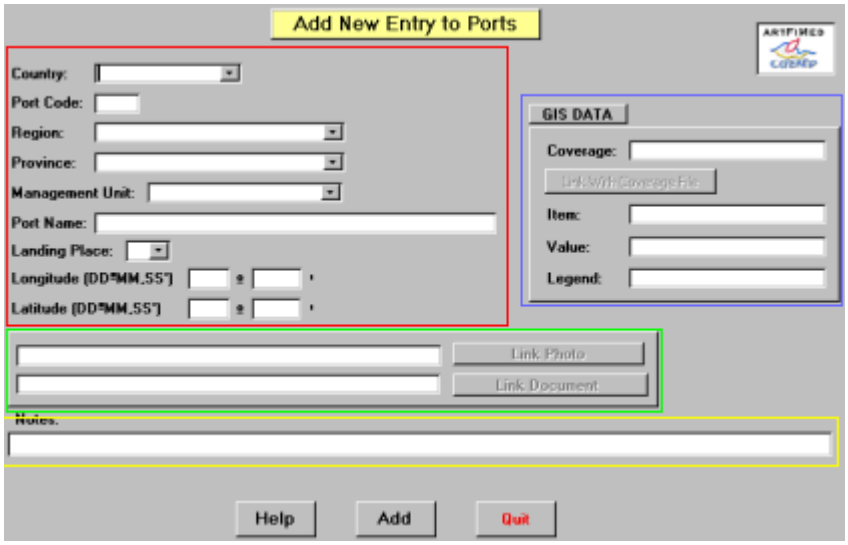
An existing Inventory can only be deleted by the datamanager. However the user can modify some of the Inventories data. These data are the followings: starting and ending dates, title and the description file linked. To facilitate the inventory searched a secondary window is included containing a filter utility by country. Once a country has been selected (in a pop-up menu) it must be clicked the "Filter" button, obtaining all the inventories related with the country requested. Clicking in the next or the previous buttons are showed the inventories filtered



2.1.2. PORTS DATA MANAGEMENT

A) Adding a new port

This window must to be used in the case to add a new artisanal fishing port or landing place to the Database. The window has four different parts.



The first part (red frame) contains nine fields, being obligatory to fill in seven of them, these are: Country, Region, Province, Management Unit, Port Code, Port Name and type of Landing Place. If any of the obligatories fields is not fill in, it appears a warning box. To facilitate the new entry for Country, Region, Province and Management Unit, there are pop -up menus containing the necessary information. The other two fields (Longitude and Latitude) make reference to the geographic coordinates for a Landing Place, and they are not strictly necessary. However, it is strongly recommended to fill in them since the Landing Place is the main geographical reference to use in GIS. The format to enter coordinates is, degrees, minutes (sexagesimal) and hundreds of seconds (two first digits), as usually is recorded by a GPS. In the case of a Landing Place lying to the west of the central meridian (Grenwich), the longitude must be enter with a negative sign.

The second part (green frame) is used to link a port photo and a document containing a general description. A click in the "Photo" button or in the "Document Description" button open the Windows Common Dialog, to look for and select the file to link.

The third part (yellow frame) is the "Notes" field to enter some commentaries about the port.

The fourth part (blue frame) is reserved to recorded GIS data. The "Link Coverage File" button open the Windows Common Dialog to search the name of the Arcinfo (or ArcView)

layer where are stored the geographical object(s) describing the Landing Place/Port, to be included in the field "Coverage". The field "Item" is the name of the attribut used to identify the port feature in the Coverage. The field "Value" is the value of the attribut used to identify the port feature in the Coverage and the field "Legend" is the attribut to be used in the geographical layer to make the legend.

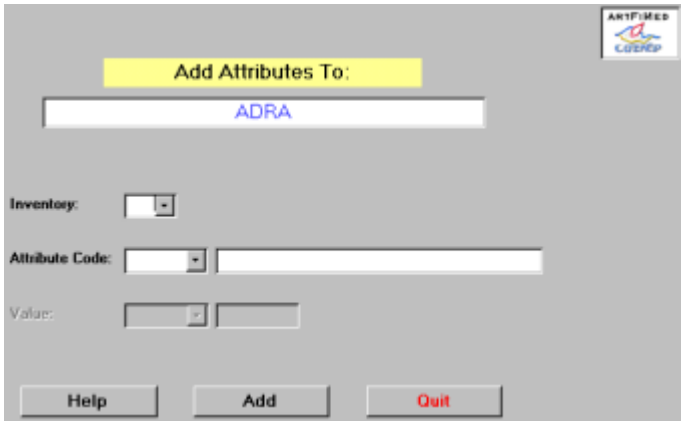
Data are not recorded in the Database until the "ADD Record" button is clicked. At the same time a message window is opened asking the user to add attributes for the new port. In affirmative case, is opened a new window containing the appropiates fields to fill in.

Previous window is displayed when clicking the "Quit" button.

A.1) Adding attributes to a port.

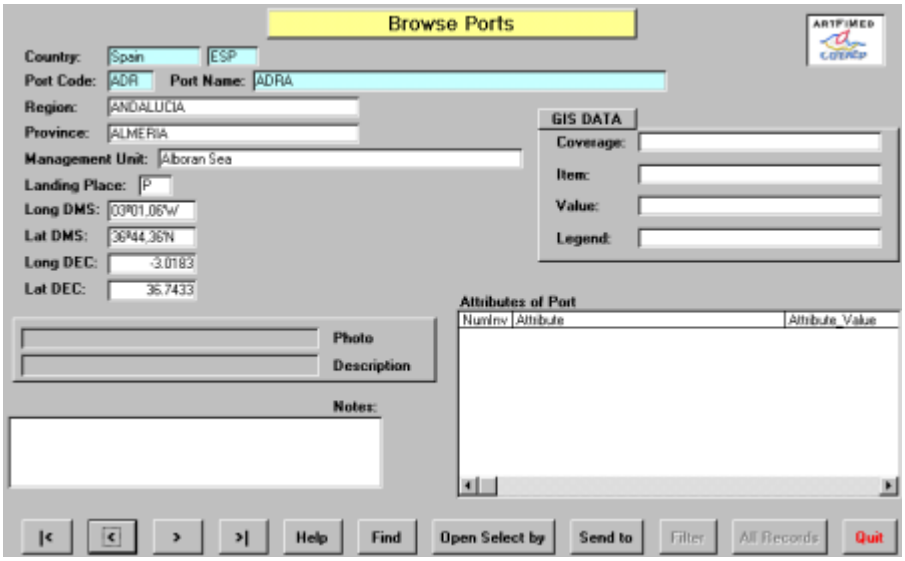
This window is used to add the attributes of a port.

It must be specified the inventory and the attribute code. In the case of numerical or boolean attributes also the value must be entered. To facilitate the addition of data there are pop-up menus containing the attributes codes and their meaning.



B) Browse ports.

This window shows all data related with ports or landing places, including an existing description document or a photograph. Since this window is just to browse through the data, the user cannot introduce or modify any field.



The user can look through the existing ports in the database using the next , previous , begin of file or end of file buttons.

To facilitate the search for a concrete port or a group of ports two buttons have been added: "Find" and "Open Select By" .

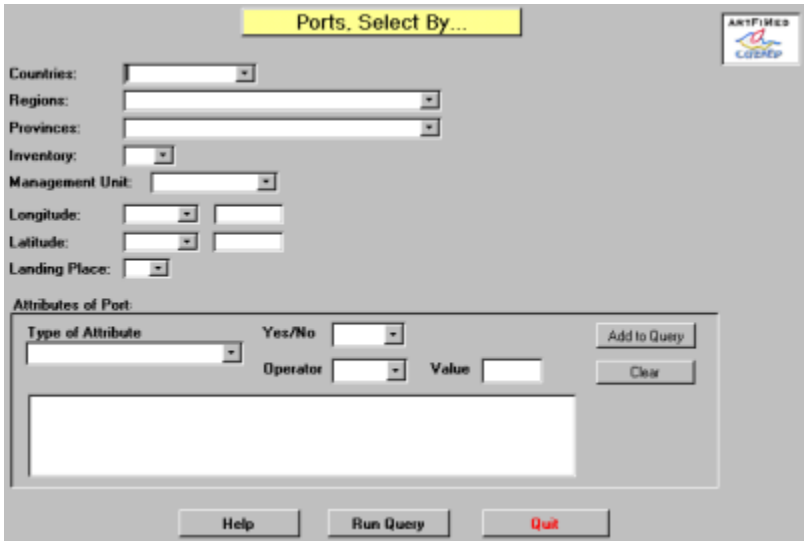
The Find button open a new windows in which it must be written the name of the port searched (or any part of the name). The Open Select By button opens a new window in which the user can limit the search of the desired metiers selecting by different criteria.

Once a group of ports have been selected, it must be clicked the "Filter" button in order to obtain the requested ports. The "All Records" button allows obtaining again all the ports.

Clicking the "Send to" button is opened a new window in which it is possible to view and/or print several type of reports, and to export the active data or the subset of data filtered to different formats (DOC, TXT, XLS, ...).

B.1) Select by ports.

In this window the user can specify the criteria which will be used to search the desired subset of ports. The searching can be established by any combination of fields appearing in the window, including the attributes for ports.



To make easier and quicker the query every field has a pop-up menu containing the necessary values. For countries, regions and provinces the values are nested in such a way that only appears the corresponding regions of a country, or the corresponding provinces of a region. Longitude and Latitude fields have pop-up menus containing different operators to limit them.

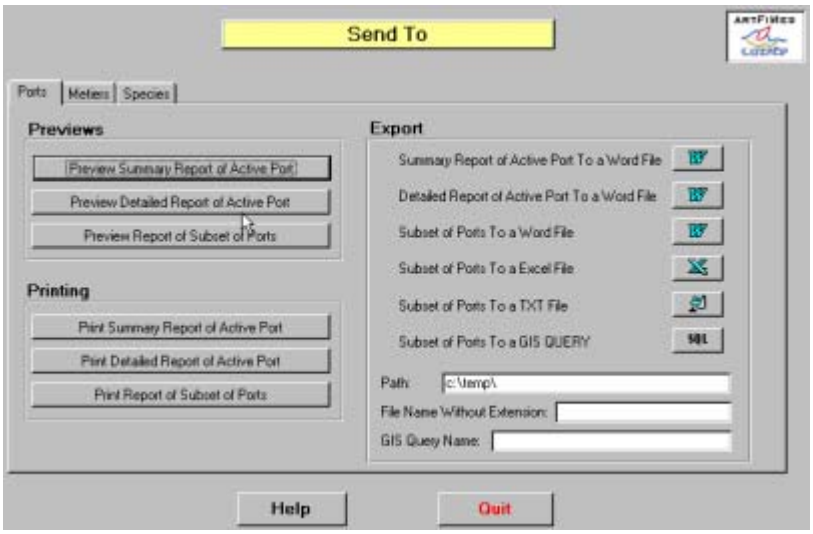
For the attributes of the ports only can be included in the query those containing numerical or boolean values. Once a "Type of Attribute" has been selected it must be choosen either "Yes/No", for boolean attributes, or an "Operator" and a "Value" for numerical attributes. To add the expresion to the query must be clicked the "Add to Query" button. Possible errors can be deleted with the "Clear" button. As a visual control, all the attributes and their selected values added to the query appears in the white box below the buttons.

When have been choosen all the criteria to search a subset of ports, it is necessary clicking the "Run query" button to perform the query. Then a message window shows how many records have been found with those criteria. Previous window is displayed when the accept button is clicked.

B.2) Ports: send to.

When a port or a goup of ports have been selected in the "

Select by Port", the information requested can be printed in standard reports or exported to files with different formats. These processes are carried out in the "Send To" window for ports, there were several possibilities to extract information from de Database.



For a single port (the active port in the browse window) can be viewed and/or printed two types of standard reports: summary and detailed. The summary report contains a limited information of the port requested, while the detailed report contains all the information recorded in the database related with the port.

A summary report for a port contains the following information: name of the port, country, country code, region, region code, province, province code, latitude (sexagesimal and decimal), longitude (sexagesimal and decimal), name of the coverage (ArcCov), name of the graphical element containing the information (ArcItem), value of the item (ArcValue), representation legend, path of the photo file, path of the description file, notes, management unit code and its name, type of landing place and all the port attributes.

A detailed report for a port contains the same information than in the case of a summary report, plus all the metiers and their related information (including the attributes)and all the information relative to the different geographical entities that are related with the port .

For a group of ports (subset of ports), obtained with the select by utility, can be viewed and/or printed only one type of report. Depending on the criteria chosen in the "Select By" window the number of ports selected is variable and can be very high, so the information contained in the report is limited making reference only to the name, the code, the geographical coordinates, the management unit and the type of landing place of each port.

The aforementioned reports also can be exported to different file formats: Word97, Excel97, Ascii (TXT). The reports for one port (summary and detailed) only can be exported to a Word file. A subset of ports can be exported as a Word file as an Excel or a TXT files, but in the two last cases the files contains more information for each port than in the first one.

Moreover, a subset of ports can be exported to a query ready to be used in GIS. In the case that one or more ports have not geographical coordinates, a message window shows the

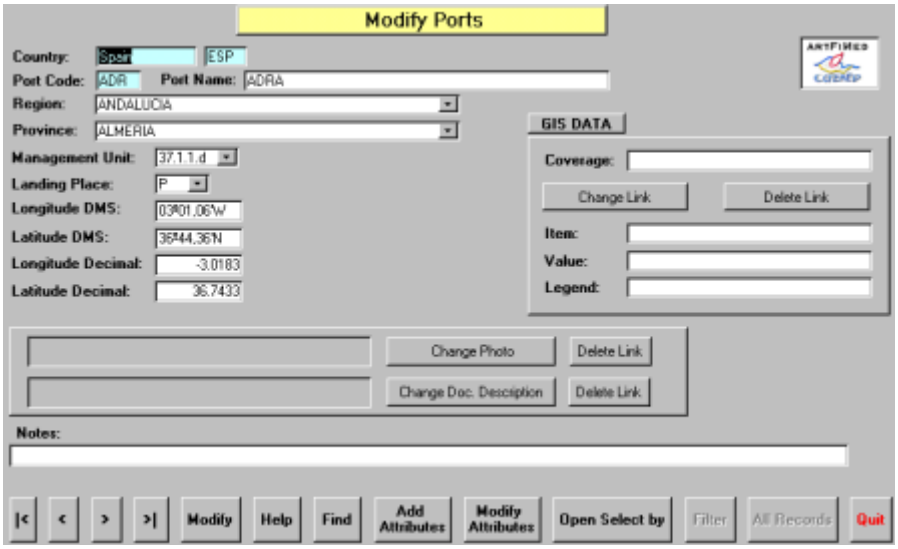
number o ports that are not possible to be used in GIS. Another message window will be displayed if the name used for the GIS query is the same than another one previously saved.

Before to export data to any format it is necessary to indicate a name for the file and where it will be saved.

C) Modify ports.

To modify any of the ports data must to be used the "Modify Ports" window. This window is quite similar to the "Add New Entry to Ports" and contains the same fields than it, but some more tools to change or add data.

Every data appearing in this window can be modified except those for Country and Port Code. There are two ways to change the information. For all the fields not related with any type of a file linked, the way to modify is just deleting the existing data and writing the new one. For those fields containing files linked, there are buttons either to change the file or to delete it.



The user can look through the existing ports in the database using the next, previous, begin of file or end of file buttons.

To facilitate the search for a concrete port or a group of ports two buttons have been added: "Find" and "Open Select By".

The Find button open a new window in which it must be written the name of the port searched (or any part of the name). The Open Select By button open the window in which the user can limit the search of the desired ports selecting by different criteria.

Once a group of ports have been selected, it must be clicked the "Filter" button in order to obtain the requested ports. The "All Records" button allows obtaining again all the ports.

The "Add Attributes" button allows to add new attributes to the active port in this window, and the "Modify Attributes" button open a window in which can be modified any of the existing attributes for the active port.

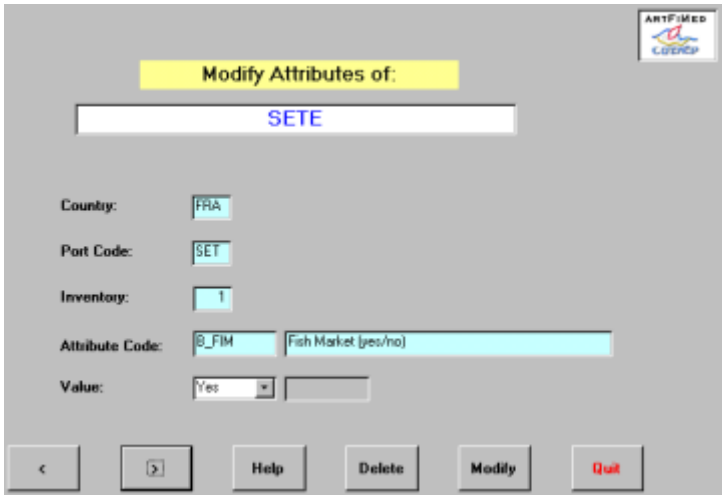
The modifications will not be recorded unless the "Modify Record" button is clicked.

C.1.) Modify attributes of a port.

This window allows to modify or delete any of the attributes associated to the active port in the "Modify Ports" window.

The user can look through the existing attributes using the next or previous buttons, in order to delete or modify them. Only it is possible to modify the value for the active attribute when the "Modify" button is clicked. A click in the "Delete" button will delete the active attribute in the window.

"Modify Ports" window will be displayed when clicking the "Quit" button.

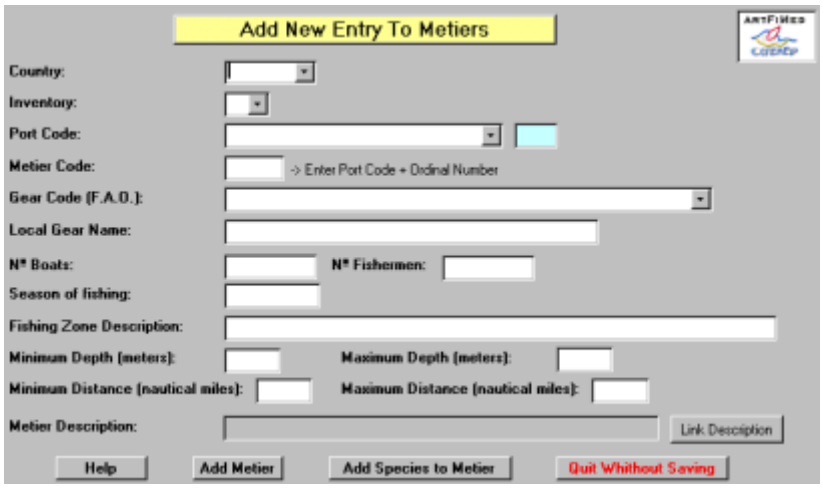


2.1.3. METIERS DATA MANAGEMENT.

A) Adding a new metier.

This window helps to the user adding new metiers and all the related information in the Database.

To add a new metier it is essential to enter data for the following fields: Country, Inventory, Metier Code, Port Code, Gear Code, Season and one species at least. For Metier Code is possible to enter any code, but it is recommended to use the Port Code plus a number. Note that it is not possible to enter the same Metier Code for two differents metiers in the same Country and Inventory.



The rest of fields are not strictly necessary to be filled up to add a new metier. However, in order to fully exploit the potential of the application it is most desirable that all fields were filled up.

To facilitate the entry of new data there are popup menus in those fields in which is possible to get them.

Before adding a metier is essential to define a target or an accessory species This process is carried out in a new window showed when the "Add Species to Metier" button is clicked.

Only when one or more species have been added, it can be added the new metier. As a reminder to the user a warning indicating that it is necessary to click on the "Add Metier" button it appears.

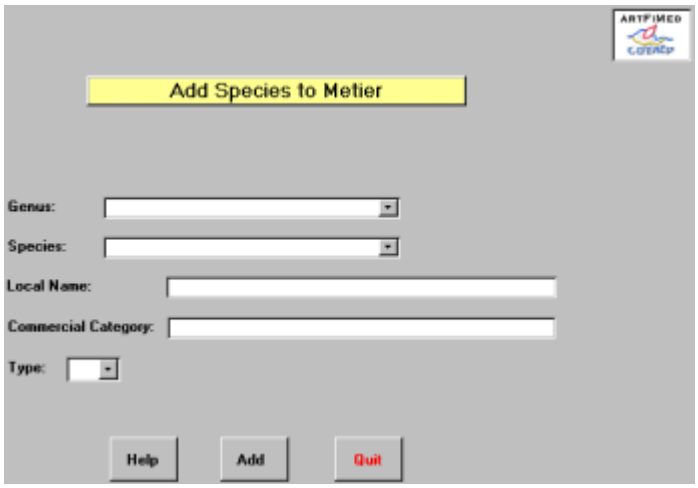
Once the "Add Metier" button is clicked a warning box shows a message asking the user if wants to enter attributes for the metier.

If the "Accept" button is clicked it shows a new window in which can be added attributes to the metier, otherwise if the "Cancel" button is clicked the "Data Management" window is displayed.

A.1) Add species to a Metier.

By definition a metier always must to be referred to one species at least. This species can be either a target species or an accessory one.

To make easier the new entry the window contains popup menus for Group, Family, Genus and Species. It is not possible to enter a species that is not recorded in the Database. In this case, first it is necessary to enter the new species in the "Add new entry" of the "Species Management" menu.



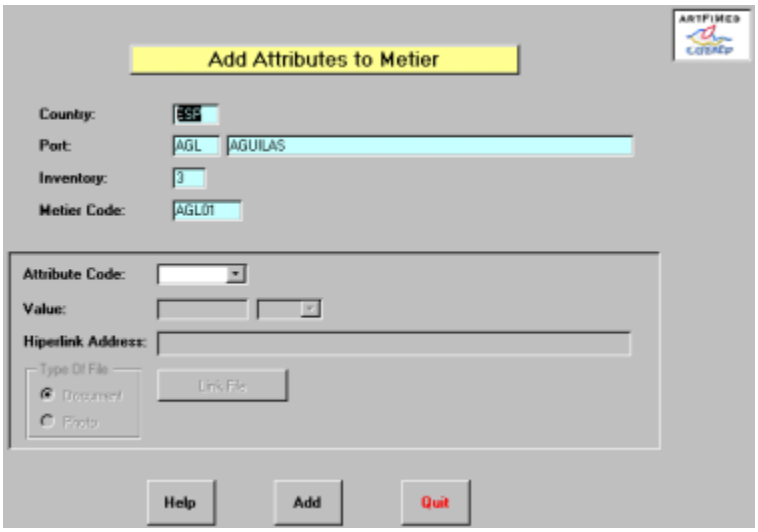
In the field "Local name" must be entered the common name that the species receive in the area in which is catched. If there are commercial categories for the species, such as juveniles, adults, or specific names designating a range of sizes, these must be entered in the "Commercial Category" as a text.

A.2) Adding attributes to a metier.

This windows allows to add attributes to the active metier in the "Add New Entry to Metier" or in the "Modify Metier" window.

Data for Country, Port, Inventory and Metier Code are showed as information and can not be modified.

The user can add so many attributes as he wishs. A popup menu shows the diffrent type of attributes recorded in the database and their codes. The attributes to be entered can be of three types: numerical, boolean or hyperlink. For each case must be entered a different "Value" or a path for the file containig the hyperlink ("Hyperlink Address" field). Each time it will be added an attribute must to be clicked the "Add" button.



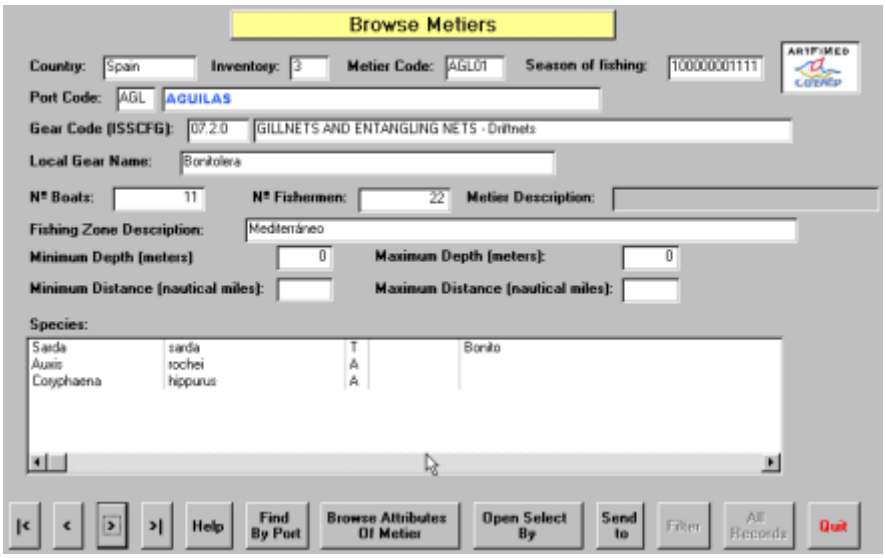
Hyperlinks attributes for metier can be either photos or description documents. With the aim to be sure that all the basic information is recorded in the Database and can be conveniently exported, the application makes a copy of the photo and/or the text document to be linked. These copies are saved in different folders, so it is necessary to indicate which type of file it is linked in each case.

The "Quit" button displays a different previous window, depending if the access went through "Modify metier" or through "Add New Entry to Metier" (in this case the "Data Management" window).

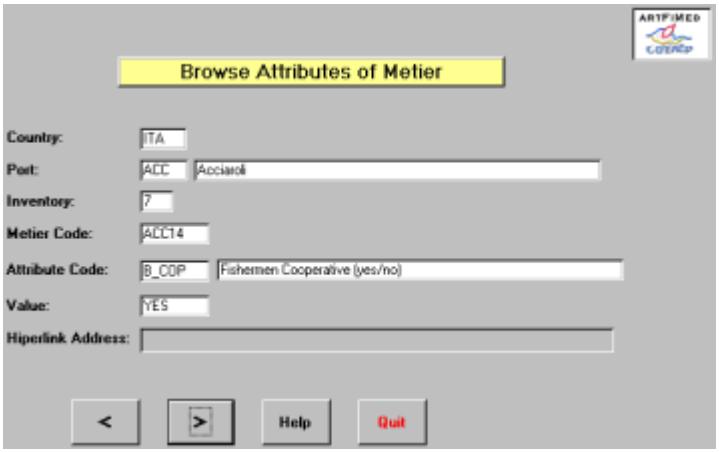
B) Browse through the metiers.

This window allows to see all the information related with the metiers recorded in the database. In this window it is not possible to modify any data, offering only the complete dataset for each metier.

The user can look through the existing metiers in the database using the next , previous , begin of file or end of file buttons.



To see the attributes of the active metier in the screen it must be clicked the "Browse Attributes Of Metier" button , opening a new window in which is possible to look through all the attributes belonging to a metier.



To facilitate the search for the metiers that belong to a port or a group of metiers with the same characteristiscs two buttons have been added: "Find By Port" and "Open Select By"

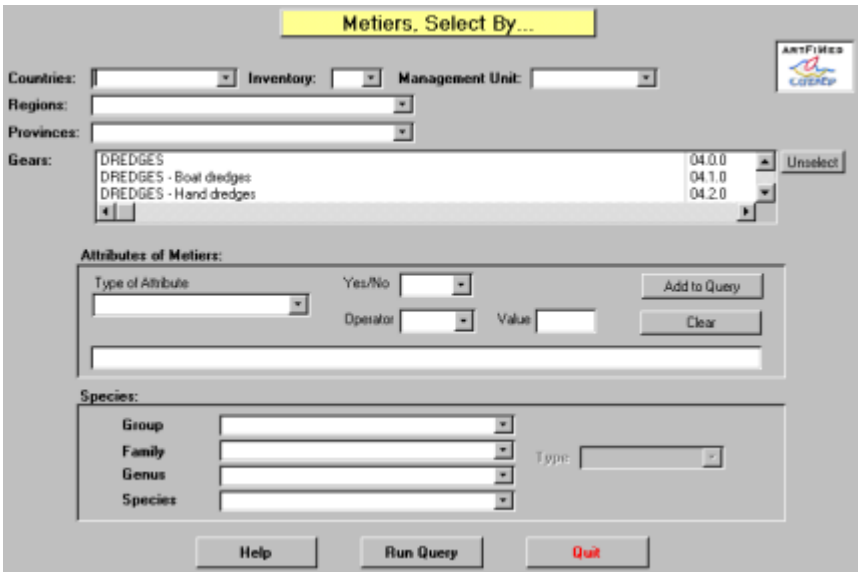
The "Find By Port" button open new window in which it must be written the name of the port (or any part of the name) searched. The Open Select By button open a new window in which the user can limit the search of the desired metiers selecting by different criteria.

Once a group of metiers have been selected, it must be clicked the "Filter" button in order to obtain the requested ports. The "All Records" button allows obtaining again all the metiers.

Clicking the "Send to" button is opened a new window in which it is possible to view and/or print several type of reports, and to export the active data or the subset of data filtered to different formats (DOC, TXT, XLS, ...).

B.1.) Select by metier.

In this window the user can specify the criteria which will be used to search the desired subset of metiers. The searching can be established by any combination of fields appearing in the window, including the attributes for metiers.



To make easier and quicker the query every field has a pop-up menu containing the necessary values. For countries, regions and provinces the values are nested in such a way that only appear the corresponding regions of a country, or the corresponding provinces of a region.

For "Gears" a general type will include all kind of gear belonging to that type. For example, if DREDGES is added to the query, all kind of DREDGES (Boat dredges and Hand dredges) will be selected.

For the attributes only can be included in the query those containing numerical or boolean values. Once a "Type of Attribute" has been selected it must be chosen either "Yes/No", for boolean attributes, or an "Operator" and a "Value" for numerical attributes. To add the

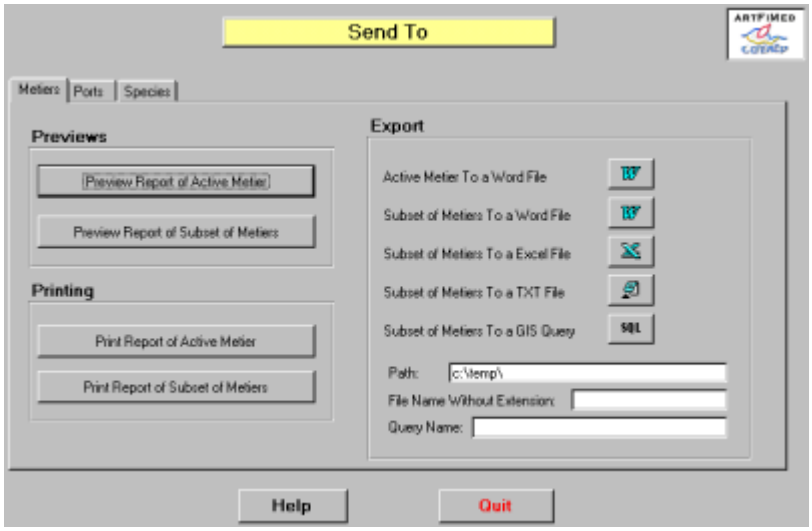
expression to the query must be clicked the "Add to Query" button. Possible errors can be deleted with the "Clear" button. As a visual control, all the attributes and their selected values added to the query appears in the white box below the buttons.

The species are nested in the same way than countries, regions and provinces, i. e., only appear the species belonging to a genus, a family and a group selected. Moreover, it is possible to select only a group, a family or a genus as well.

When have been chosen all the criteria to search a subset of metiers, it is necessary clicking in the "Run query" button to perform the query. Then a message window shows how many records have been found with those criteria. Previous window is displayed when the "Accept" button is clicked.

B.2) Metier: send to.

When a metier or a group of metiers have been selected in the "Select by Metier", the information requested can be printed in standard reports or exported to files with different formats. These processes are carried out in the "Send To" window for metiers, there were several possibilities to extract information from de Database.



There are only two types of reports to be previewed and printed: a report for the active metier in the "Metier Browse" window or a report for a group of metiers (a "subset") selected with the "Select By" utility.

For an active metier it can be previewed and/or printed a standard report containing all the data relative to the metier: country, metier code, port, inventory, fishing season, ISSCFG code, type of gear, number of boats, number of fishermen, minimum and maximum depth,

minimum and maximum distance from the coastline, fishing zone description, path of the description file, target and accesories species, commercial categories and attributes of the metier. This standard report can be exported to a Word file as well.

For a subset of metiers, obtained with the select by utility, can be viewed and/or printed only one type of report. Depending on the criteria chosen in the "Select By" window the number of metiers selected is variable and can be very high. So the information contained in the report is limited, making reference only to the country, inventory, port name (and its geographical coordinates) in which is located the metier, the metier code, the fishing season, the ISSCFG code, the type of gear, the fishing zone description and the target and accessories species catched.

The aforementioned report also can be exported to different file formats: Word97, Excel97, ASCII (TXT). In order to obtain a complete data matrix, both Excel97 and Ascii files contains a complete information for each metier.

Moreover, a subset of metiers can be exported to a query ready to be used in GIS. In the case that some metier belongs to a port that have not geographical coordinates, a message window shows the number o ports that are not possible to be used in GIS. Another message window will be displayed if the name used for the GIS query is the same than another one previously saved.

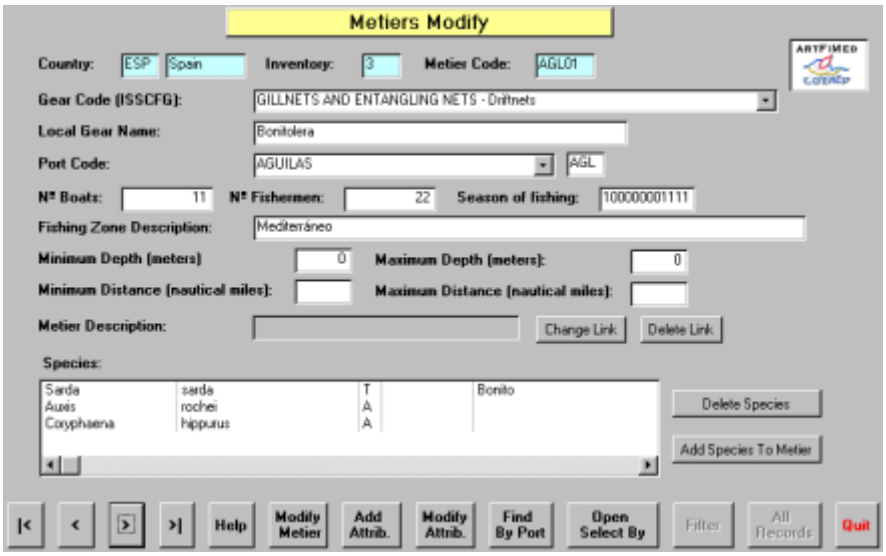
Before to export data to any format it is necessary to indicate a name for the file and in which folder it will be saved.

C) Modify metiers.

This window alows to change or delete any data or link relative to a metier, except those related with its identification (country, inventory, and metier code). There are three ways to change the information. For all the fields not related with any type of file linked (except species), the way to modify is just deleting the existing data and writing the new one. For those fields containing files linked, there are buttons either to change the file or to delete it. For species can be added a new one or deleted any of the existing. Clicking in the "Add Species To Metier" button it will be displayed the appropiate window to entry a new species. To delete a species it is necessary to place the cursor on the species to be deleted and then clicking in the "Delete Species" button.

The user can look through the existing metiers in the database using the next , previous , begin of file or end of file buttons.

To facilitate the search for the metiers that belong to a port or a group of metiers with the same characteristiscs two buttons have been added: "Find By Port" and "Open Select By".



The "Find By Port" button open a new windows in which it must be written the name of the port (or any part of the name) searched. The Open Select By button open a new window in which the user can limit the search of the desired metiers selecting by different criteria.

Once a group of metiers have been selected, it must be clicked the "Filter" button in order to obtain the requested ports. The "All Records" button allows obtaining again all the metiers in the database.

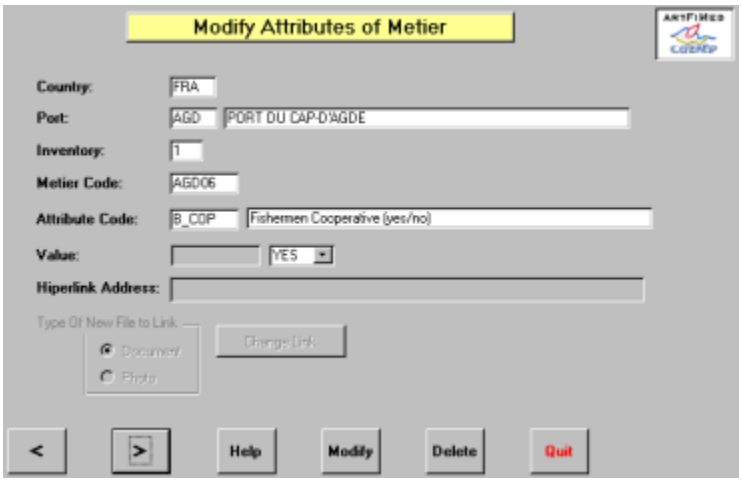
All the changes will not be recorded until the "Modify Metier" button is clicked.

In this window also it is possible to add new attributes to a metier, using for it the "Add Attrib." button. A click in the "Modify Attrib." button opens a new windows in which is possible to modify any of the existing attributes of a metier. In both cases the attributes will be changed in the correspondent windows, not being necessary to use the "Modify Metier" button.

C.1) Modify metier attributes.

This window allows to modify or delete any of the attributes associated to the active metier in the "Metiers Modify" window.

The user can look through the existing attributes using the next or previous buttons, in order to delete or modify them. Only it is possible to modify the value for the active attribute when the "Modify" button is clicked. A click in the "Delete" button will delete the active attribute in the window.



Those attributes that are Hyperlinks (photos or documents) can be modified or deleted as well. With the aim to be sure that all the basic information is recorded in the Database and can be conveniently exported, the application makes a copy of the photo and/or the text document to be linked. These copies are saved in different folders, so it is necessary to indicate which type of file it is linked in each case before to click in the "Change Link" button.

The " Metiers Modify" window will be displayed when clicking in the "Quit" button.

2.1.4. SPECIES DATA MANAGEMENT

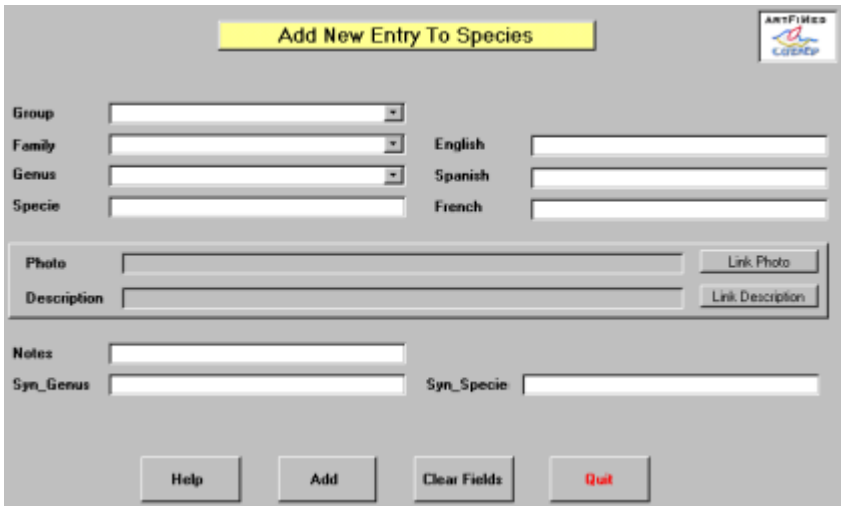
A) Adding a new species to the database.

To add a new species to the database it is essential to fill up the group, family, genus a species fields at least. To facilitate the new entry group, family and genus have hierarchical popup menus, in the way that only appear the families of a the group selected, and the genus of that family. If the species is not known this field can be filled up with the "sp" abbreviation.

If a photo (or a drawing) and/or a description document for the species are available, these can be added to the database linked them from their original location.

If the new species added is entered with a synonymous name, the fields "Syn_Genus" and "Syn_Species" must be filled up with the current name in use.

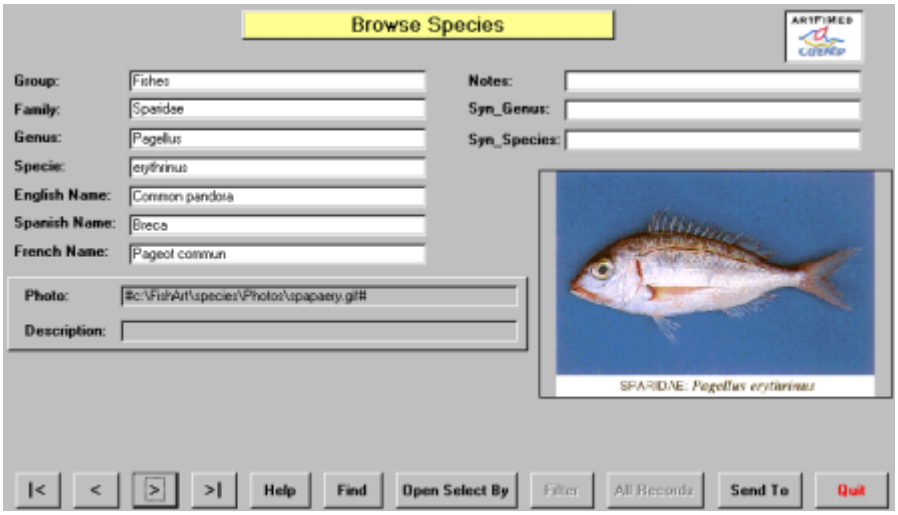
Once all the fields have been filled in, the new species will be added to the database clicking in the "Add" button.



B) Browse through the species.

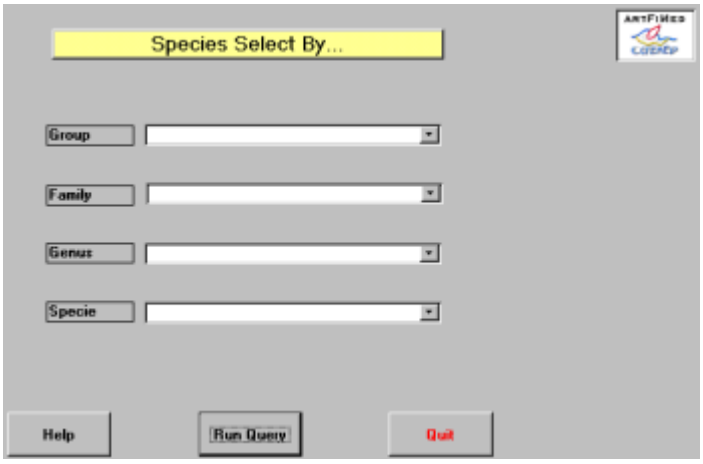
In this window the user can look through all the species recorded in the database. The window not only shows the complete information of the species searched but also a photo or a drawing (if it exits).

To find a species the user can use the "Find" button, asking for the scientific name of the species, the genus or the family or the common name of the group.



It can be searched a species with the "Open Select By" button as well, but the major utility in this case is to select a group of species to obtain a report through the "Send To" button.

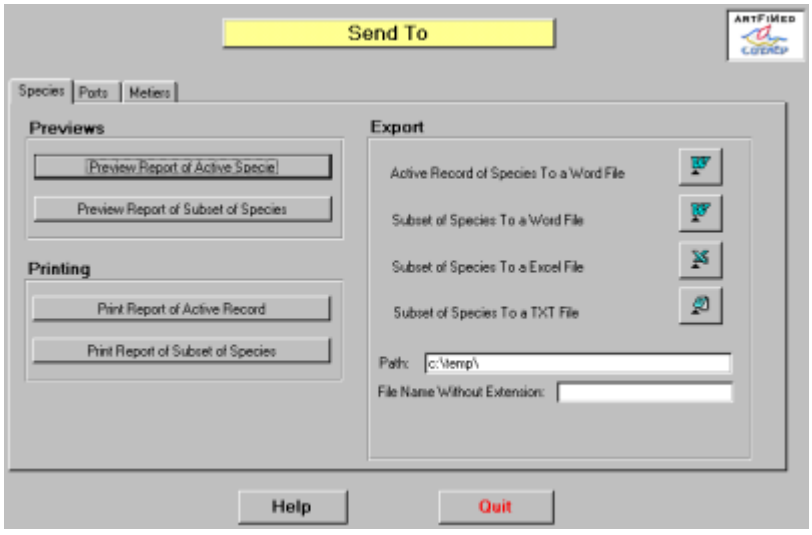
In the "Select By" window the user can get a set of species using any combination of their fields: group, family, genus and species.



The "Quit" button come back the previous window. Then it is necessary to "Filter" the data selected, clicking in the correspondent button.

B.1) Species: send to.

The species displayed in the "Browse Species" window, or a set of species selected with the criteria defined in the "Select By" window, can be viewed and/or printed in standard reports.



The report for the active species (in the "Browse Species" window), contains all the information recorded about the species, including the photograph or the drawing. This report can be printed directly or exported to a Word97 file.

The report for a group of species ("Subset") only contains a list with the species chosen according to the criteria of searching. As additional information in this report also appears the common name of each species in Spanish, English and French.

The "Subset of Species" can be exported to a Word97, Excel97 or ASCII (TXT) file. The word file obtained contains the same information than the standard report, however both Excel and ASCII contains all the related information with the species selected.

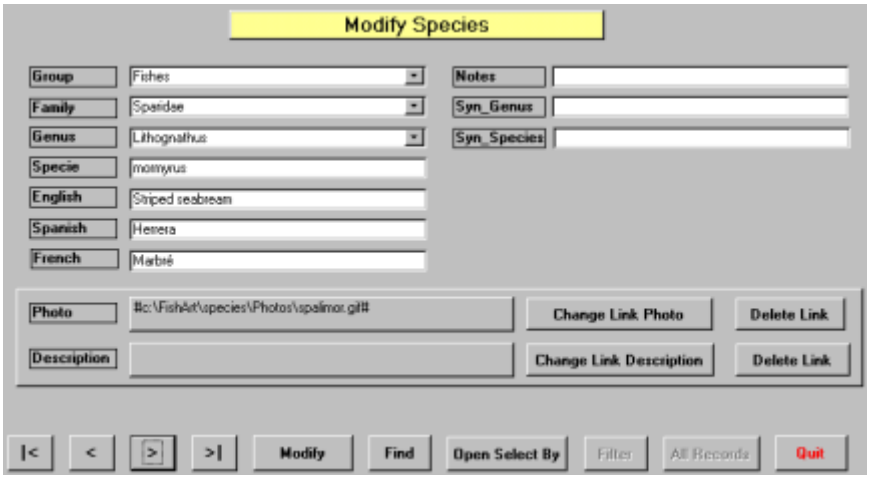
C) Modify species.

There are two ways to change the information. For all the fields not related with any type of file linked, the way to modify is just deleting the existing data and writing the new one. For those fields containing files linked, there are buttons either to change the file or to delete it.

The user can look through the existing species in the database using the next , previous , begin of file or end of file buttons.

To facilitate the search for a concrete species or a group of species two buttons have been added: "Find" and "Open Select By".

The Find button open a new windows in which it must be written the name of the species, genus or family searched (or any part of the name). The Open Select By button open a new window in which the user can limit the search of the desired species selecting by different criteria.



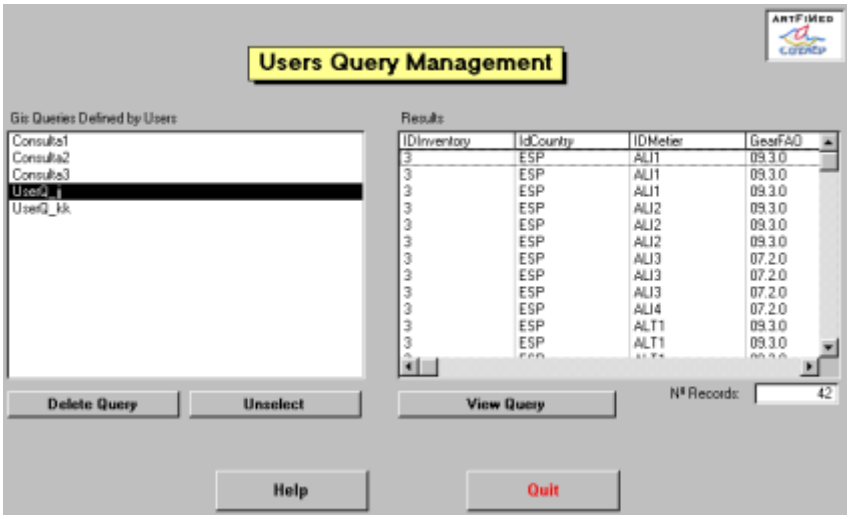
Once a group of species has been selected, it must be clicked the "Filter" button in order to obtain the requested species. The "All Records" button allows obtaining again all the species.

The modifications will not be recorded unless the "Modify" button is clicked.

2.3. QUERIES MANAGEMENT.

The Ports "Send To" and the Metiers "Send To" utilities allow the user to create queries ready to be used in GIS (ArcView). Since these queries are recorded in the database and the number of them created can be high, it has been added to the application this window that, firstly shows the queries results and secondly allows to "Delete" an unnecessary query.

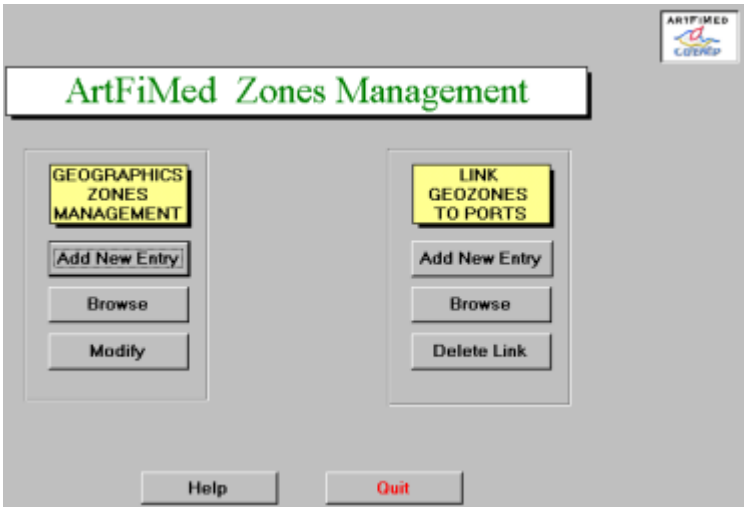
To see the query results in the "Results box", simply it must be selected one of the queries showed in the "Gis Queries Defined by users box". The number of records contained in the query appears in the "Nº Records box". Clicking the "Delete Query" button it will be eliminated in the database.



2.4. ZONES MANAGEMENT.

This menu allows managing all data relative to geographical zones (called GEOZONES in the application) that are used in GIS. Data from GIS coverages (a layer of information) created by the user in ArcView can be recorded and manage in this part of the application. A special "Script" in ArcView uses this information to obtain new "Views" which displayed all the geographical areas related with a concrete port.

The menu has two main parts: "GEOGRAPHICS ZONES MANAGEMENT" and "LINK GEOZONES TO PORTS".



2.4.1. GEOGRAPHIC ZONES MANAGEMENT.

Geographical zones (Geozones) are every graphical element representing a spatial item which have a direct or indirect relationship with an artisanal port. So, a Geozone can be a fishing zone for a metier, a fishing ground for a species, a mariculture zone, a marine park, a terrestrial reference used to find a fishing ground, closed areas to fish or any other spatial component that can be used to understand better an artisanal activity and its management.

The menu contains three options: "Add New entry", "Browse" and "Modify"

A) Adding a new geozone.

This window allows to enter a new Geozone to the Database. It contains the following fields: "Geozone Country", "Geozone Code", "Geozone Title", "Coverage", "ArcItem", "ArcValue", "Legend" and "Notes".

"Geozone Country" store the country in which is located the Geozone. A "Geozone Code" is the identificator of the geographical entity, i. e., the Geozone identificator, and can be made by any combination of letters and numbers. "Geozone Tiltle" store the name of the Geozone. "Coverage" is the name of the GIS layer where is stored the Geozone (for example an ArcView Shapefile). "ArcItem" is the name of the field value used in the attributes table of the "Coverage", identifying the graphical feature that represents the Geozone and "ArcValue" is the value of the attribute. Legend represents the attribute to be

used in the geographical layer to make the legend. If different Geozones are included in the same coverage, all of them must to be referred to the same attribute in the legend.

Once all the fields have been filled in pressing the "Add" button saves the new Geozone in the Database.

B) Browse through geozones.

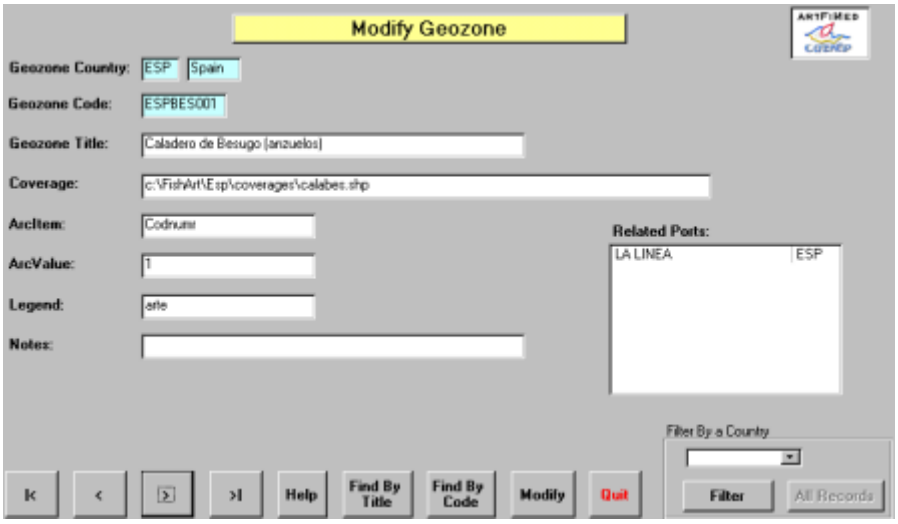
All the Geozones recorded in the Database can be find and browse in this window. The window is quite similar to the "Add New Entry" but containing more helpful buttons to look for the Geozones, and a box where are listed all the ports related with the active Geozone in the window.

The user can look through the existing Geozones in the database using the next , previous , begin of file or end of file buttons.

A specific Geozone can be found using as the "Find By Title" as the "Find By Code" buttons. Also it is possible to obtain the complete Geozones of a country, using the "Filter By a Country" utility.

C) Modify geozones.

This window contains the same fields and buttoms as the “Browse Zone”, but in this case is possible to modify all the values in the fields except those for "Geozone Country" and "Geozone Code".



It is not possible to delete a Geozone in order to maintain the Database integrity. Only it is possible to delete the existing links between a Geozone and a Port in the “Modify Links Geozones to Ports” window.

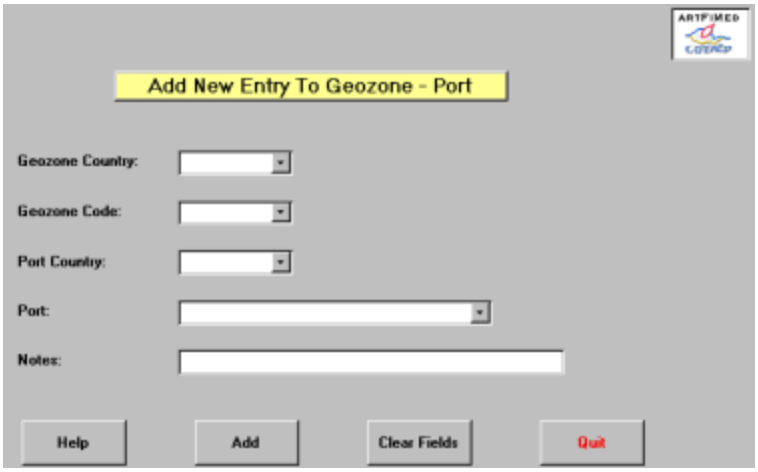
2.4.2. LINKING GEOZONES TO A PORT

The Geozones can be linked to the ports which are relationed with. The procedures to link the existing Geozones ("Add...") to a port, browse through the different Geozones and the ports linked to them, or delete the existing links, can be accessed in this window. A Geozone must have been added in the correspondent menu (Adding a new Geozone), before it is linked to a port.

A special "Script" in ArcView uses the Geozones linked to ports to obtain new "Views" which displayed all the geographical features related with a concrete port.

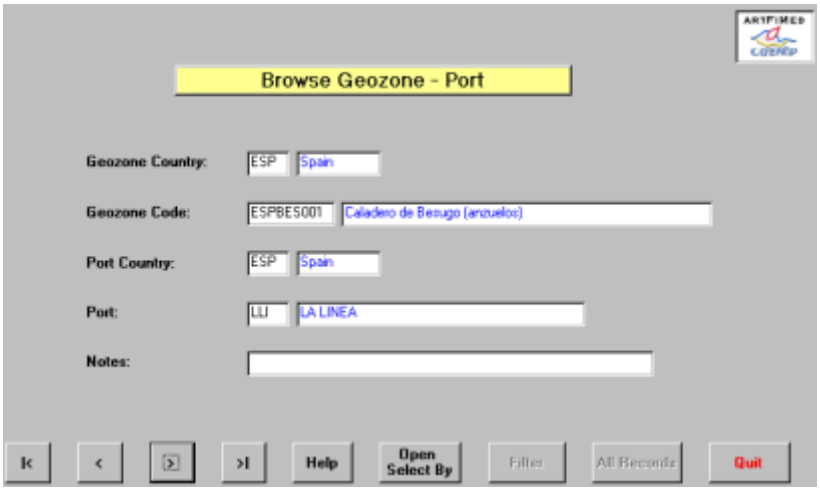
A) Creating a new link between a geozone an a port.

This window allows linking an existing Geozone to a concrete port. Except the notes field, the rest of them must be filled up. The "Geozone Country" field makes reference to the country in which it is located the feature represented by the Geozone. This can be the same than the "Port Country" related or a different one. The "Geozone Code" field has a pop up menu containing all the existing Geozones that can be linked to the selected "Port". The geozone is linked to the port once the "Add" button is clicked.



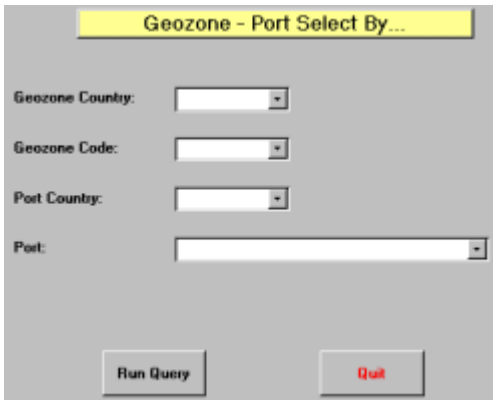
B) Browse through the links between ports and geozones.

It can be browse through all the Geozones and the Ports linked using the different utilities of this window. The information requested is showed in blue and it is not possible to modify any field.



The user can look through the existing links in the database using the next, previous, begin of file or end of file buttons.

The "Open Select By" button allows to find a concrete Port or Geozone, opening a new window in which the user can limit the search of the desired links selecting by different criteria.



Once a group of ports or Geozones have been selected, it must be clicked the "Filter" button in order to make them active in the window. The "All Records" button allows obtaining again all the links.

C) Deleting a link between a port and a geozone.

This window is practically the same than the "Browse Geozone-Port", showing the information about a Geozone and the Port linked, but including a "Delete" button to eliminate the displayed link.

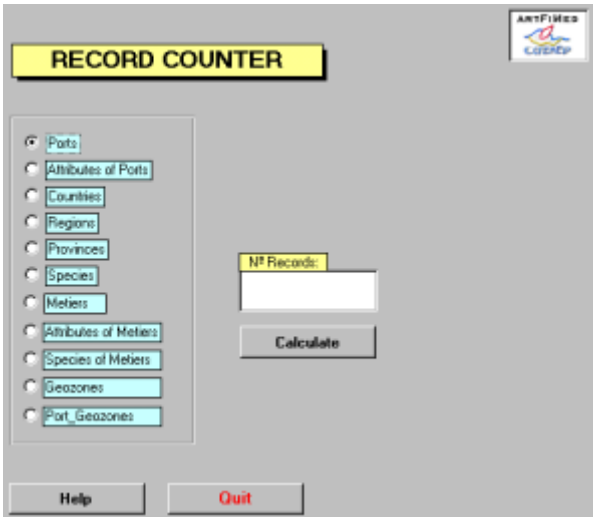
The user can look through the existing links in the database using the next, previous, begin of file or end of file buttons.

The "Open Select By" button allows to find a concrete Port or Geozone, opening a new window in which the user can limit the search of the desired links selecting by different criteria.

3. UTILITIES.

3.1. RECORDS COUNTER

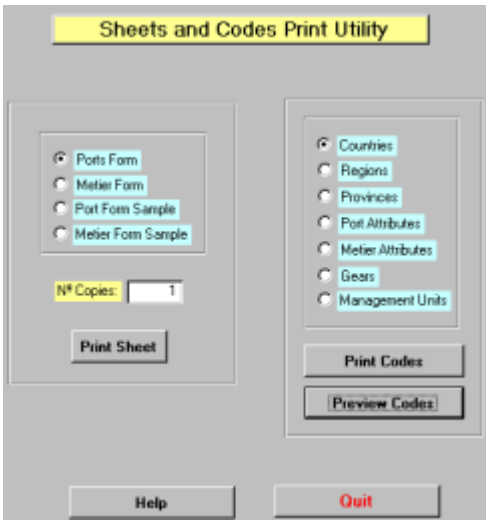
This utility allows knowing how many records there are in any of the tables that make up the Database. Simply selecting one of the items in the list and clicking the "Calculate" button are showed the number of records existing in the Database.



3.2. PRINT SHEETS AND CODES.

This utility has been included to print sheets containing the information that can be collected in the database and all the codes used in the program.

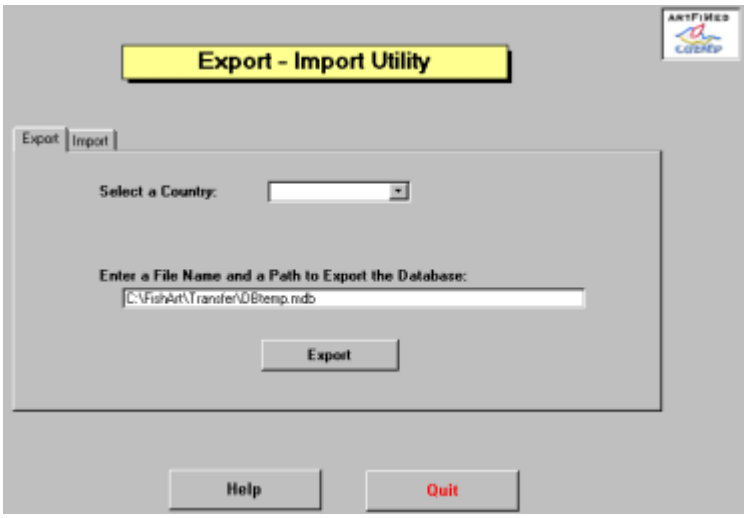
It has been also included examples for Ports and Metiers sheets that explain how to fill up the sheets.



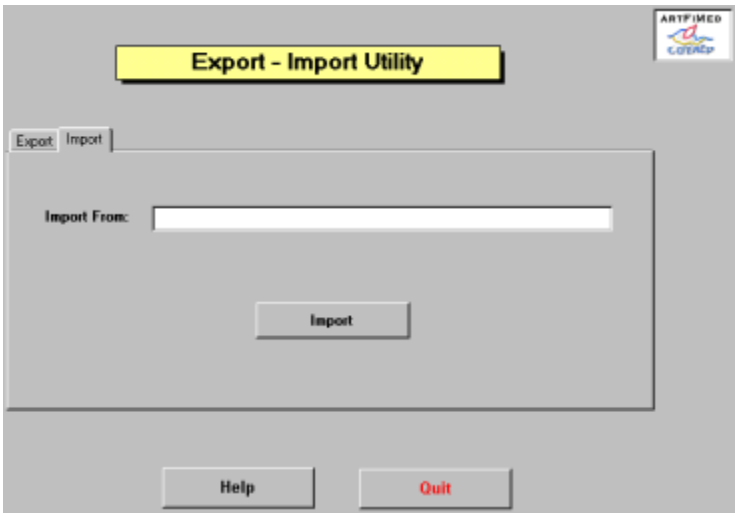
3.3. IMPORT/EXPORT DATA.

To update the database has been included one utility to import or export a set of data. This menu has two folders one to export data by country and another one to import them.

To export data first it must be selected a country and secondly to write a file name and the path in which it will be saved the data. All type of data related with the selected country will be exported, even those dealing with text and image files.



To import data only must be specified the file name and the path form which will be imported. Since only can be exported the whole information for a country and the updating only can be made for the datamanager, it is not necessary to indicate the name of the country from which the data are imported. Once the Import button is pressed all the coincident information is removed from the database and replaced for the new one.



3.4. HELP.

An interactive windows help file is being made with access from any of the different windows that make up the application.

4. GIS APPLICATIONS.

4.1. BASIC SOFTWARE AND SPECIFIC TOOLS.

4.1.1. ArcView.

The basic software to use in GIS all the specific tools created for the ArtFiMed application is ArcView, which is software for desktop GIS and mapping from Environmental System Research Institute (ESRI). ArcView offers the power to visualize, explore, query and analyze data spatially.

As was previously reported, the main reasons to choose this software have been the following:

- It is easy to use.
- It is enough powerful for the established purposes.
- It has good connectivity with ACCESS Database.
- It has a language program (Avenue) that allows automating reiterative cases.
- It can be customized for the final user.

ArcView comes with a useful set of ready-to-use data. Additional geographic data sets are available from ESRI and from various third parties to suit almost any requirement the user might have. Plus, if an organization uses ARC/INFO data, it will immediately be able to use ArcView to access all these resources, including vector coverages, map libraries, grids, images and event data.

ArcView can be used to work spatially. A key feature of ArcView is that it's easy to load tabular data and data from database servers, into ArcView so that it can be displayed, queried, summarized, and organized this data geographically.

The user works with geographic data in interactive maps called views. Every view features ArcView's unique geographic 'Table of Contents', making it easy to understand and control what's displayed.

Clicks on features on a view make their records highlight in a table showing their attributes. Select records in the table and the features they represent highlight on the view. ArcView's tables also have a full range of features for obtaining summary statistics, sorting and querying.

ArcView's charts offer a powerful business graphics and data visualization capability that is fully integrated into ArcView's geographic environment. ArcView lets to work simultaneously with geographic, tabular and chart representations of the data.

ArcView's layouts let to create high quality, full colour maps by first arranging the various graphic elements on-screen the way the user wants them. Layouts are smart because they have a live link to the data they represent. When a layout is printed, any changes to the data are automatically included.

ArcView scripts are macros written in Avenue, ArcView's programming language and development environment. With Avenue it can be customized almost every aspect of ArcView, from adding a new button to run a programmed script, to create an entire custom application. Specific tools for the ArtFiMed application have been developed using Avenue.

All the components of an ArcView session: views, tables, charts, layouts, and scripts are conveniently stored in one file called a project. ArcView's Project window shows the contents of a project and makes it easy to manage all the work.

4.1.2. ArcExplorer.

Most of the results obtained with ArcView can be viewed and queried using ArcExplorer, a free distributed browser for ArcView files developed by ESRI. Then, ArcExplorer is the basic software for all the users that have not got ArcView.

With ArcExplorer the user can do:

- View and query ESRI shapefiles and ARC/INFO coverages.

- Display a wide variety of image formats
- Measure distances on a map
- Find features
- Identify and query geographic and attribute data
- Display data using classifications, symbols, and labeling
- Pan and zoom through multiple map layers
- View and download data published on Web sites which use ESRI IMS (Internet Map Server) technology.

ArcExplorer also features legends, overview maps, saving and retrieving projects, and map printing.

The main difference between this and the previous software is that with ArcExplorer is not possible to create coverages. Moreover, the specific scripts made for the ArFiMed application can not be run in ArcExplorer.

4.1.3.Others

To solve problems dealing in topological aspects additional software from ESRI, named DAK (Data Automation Kit), has been used.

4.2. BASIC MAPS

4.2.1.Used in ArcView

The Western Mediterranean Base Map contains three main coverages: a political map (*Mapabase.shp*) a bathimetric map (*Batimetria.shp*) and a ports map (*Portsmed.shp*). These coverages are saved in the ArtFiMed application in the following path: *C:\FishArt\GIS\BasicCoverages*.shp*. The shapefiles have been constructed using cartographic data from several information sources:

- IBCM (GEBCO): IBCM digital chart is the main source for the western Mediterranean basic map, including the coastline and bathimetry (contour lines for 50, 100, 200 and 400 m depth). The main problem of this source is that particular small areas are not too accuracy, also the 50 m depth contour line is lack for some zones (part of Morocco, for example). Therefore, it is necessary to improve in the future this basic cartography acquiring new digital information. At present, only for Spain's coastline has been possible to improve the result. In short future will be also incorporated a more detailed map for Malta.

- ESRI Data & Maps (1988): a collection of CD-ROMs containing data and maps in a shapefile formats. These have been used to obtain data relative to political and

administrative boundaries for all the countries in the region. Additional information on names of administrative division does not contained in ESRI maps have been acquiring via Internet. Also in this case it is necessary to check the data contained in the Database to avoid errors.

- Ports: the geographical coordinates of the fishing ports, and other fishing places, are included in the database and have been provided for the different participants in the COPEMED artisanal project.

Since different cartographic sources have been used, some problems have arisen in certain aspects relative to the overlapping of the maps:

- Coastlines from IBCM and ESRI maps are not coincident. In this case, the solution adopted has been to consider the IBCM coastline as the better one. In the other hand, administrative boundaries contents in the ESRI maps have been modified (using DAK) in a suitable way to connect with the IBCM coastline.

- ESRI maps containing administrative boundaries for African countries were designed for display at scales to about 1:10.000.000, so the largest display scale suggested is 1:5.000.000. For European countries, maps were originally digitized from 1:300.000 scale source maps, so in this case the largest display scale recommended is 1:100.000. Larger scales than theses not offer a good resolution. In the cases that were desirable to zoom in a particular area over the recommended display scales, not coincident borders between countries can appear. To solve this problem borders have been modified (using DAK) to avoid gaps between polygons, although these modifications not strictly correspond with real boundaries.

- Location of the ports is displayed very accuracy since come from precise geographical coordinates. However, most of points representing ports do not match exactly with the coastline.

4.2.2. Used in ArcExplorer.

Same shapefiles as used in ArcView can be viewed and queried with ArcExplorer.

4.3. CONNECTION WITH THE DATABASE

It is possible to get visual information choosing an appropriate set of data from ACCESS, connecting directly from ArcView through SQL connection performed through ODBC.

4.3.1. Creation of queries

The main objective is to get in an easy way graphical results (maps) useful to understand particular problems having a spatial dimension.

At the moment, all data are referred to ports. The graphical views of the different attributes are directly related with the feature that representing ports (points). In this way, the data

selection that is represented appears as a group of points, with the same location than the ports in which the data chosen are present.

To select the subset of data we want to represent, we must to use the "Select By" utilities for Ports and Metiers (see sections 2.1.2.B.1 and 2.1.3.B.1). After the selection is made, the utilities "Send to a GIS query" for ports and metiers create specific files to be used in ArcView (see sections 2.1.2.B.2 and 2.1.3.B.2).

4.3.2. To connect to the database to create a table

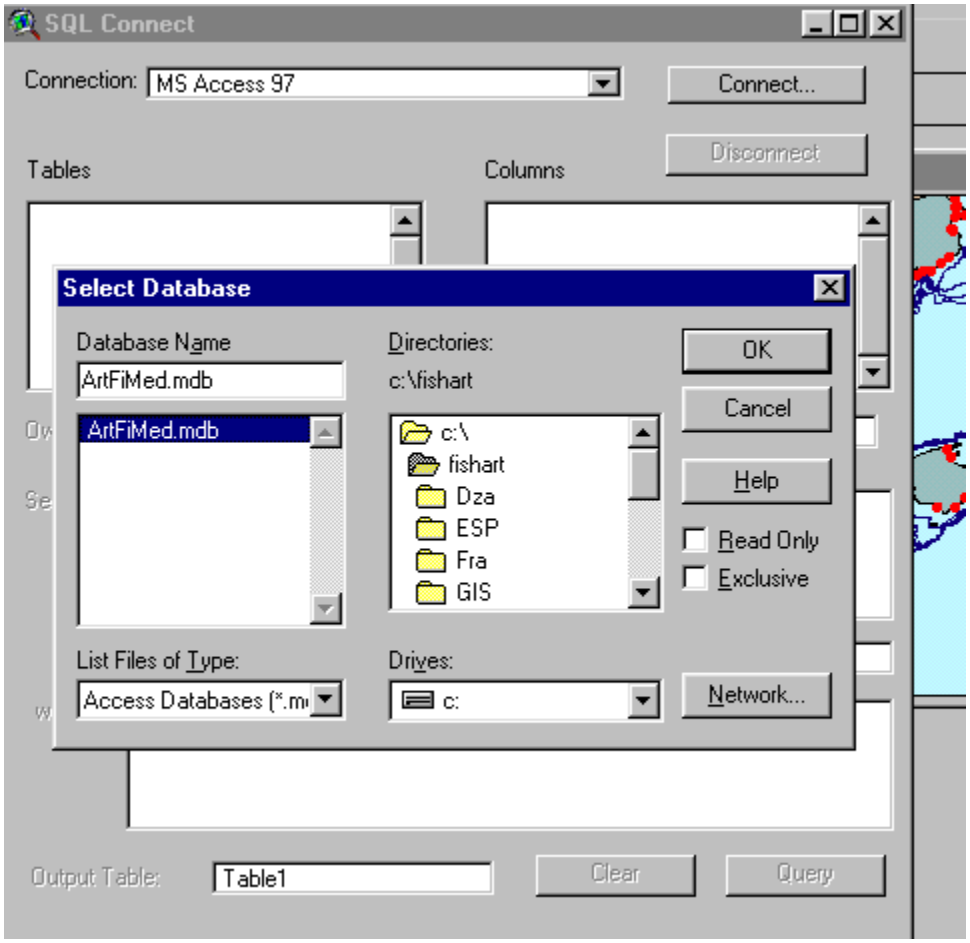
Once the "GIS queries" files have been created they can be directly included in ArcView using the "SQL connect" tool. The procedure to do it is described in the following steps:

1 Make the Project window active in ArcView.

2 From the Project menu, choose SQL Connect. The SQL Connect dialog appears.

3 The databases that are available are listed in the Connection box. Then, it must selected the desired database that in our case is MS Access 97.

4 Select the Connect button. The Login box will appear.

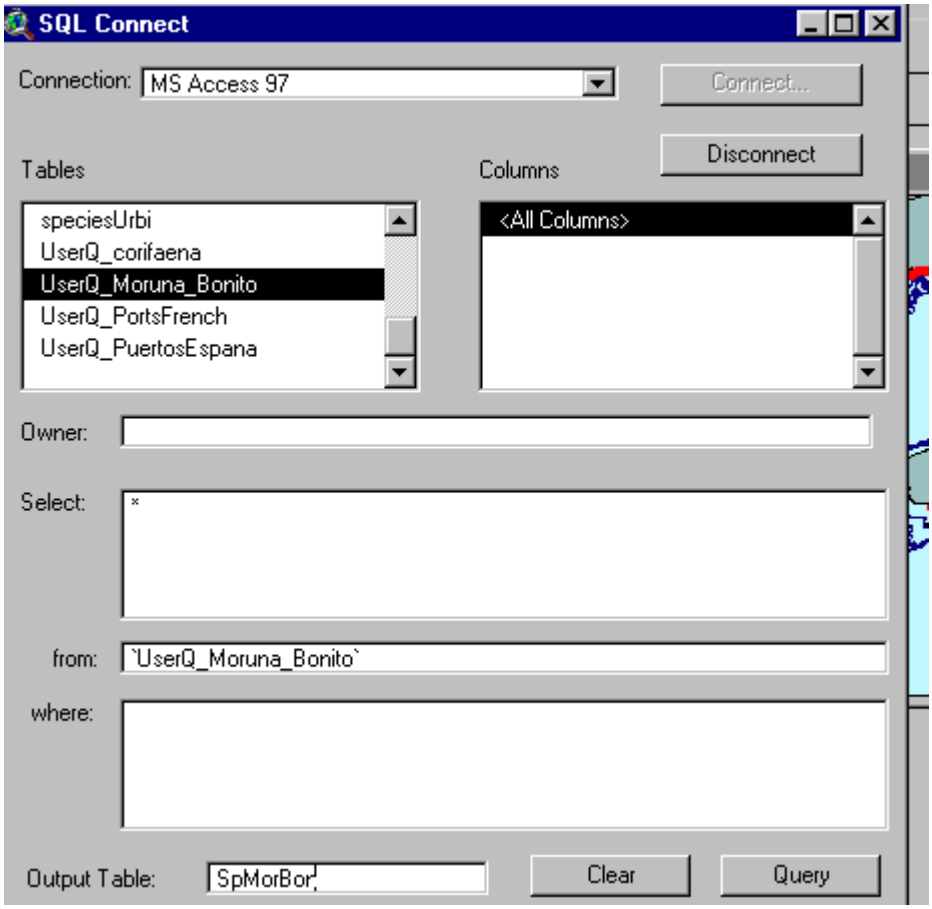


5 Type in the appropriate connection information in the new dialog box, in our case ArtFiMed.mdb file. When the Connect button is gray out and the Disconnect button is activating, the database is connected. A list of all tables and queries associated with that database will appear in the Tables box.

6 Select an user query (named "UserQ_") from the Tables box. Double click on a query to fill the From box.

7 Double click on "All columns" to select them. All the columns from the selected query will be included in the new database table. The "*" will appear in the Selct box.

8 If you are satisfied with the query, press the Query button. ArcView will create a table containing the records from the database.



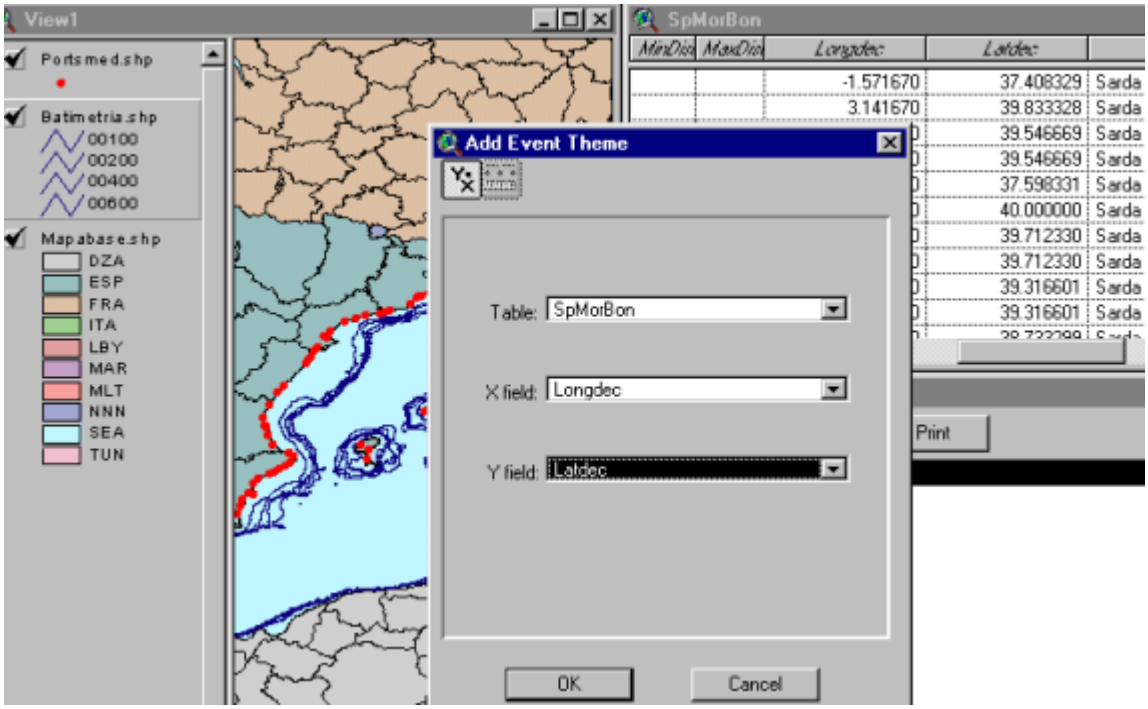
4.3.3.To add the results of a query to ArcView

Once a table containing the records from a query has been added to the Project in ArcView, next step is to represent graphically the set of data. So, it is necessary to add the table and its coordinates in ArcView. The procedure is described in the following points:

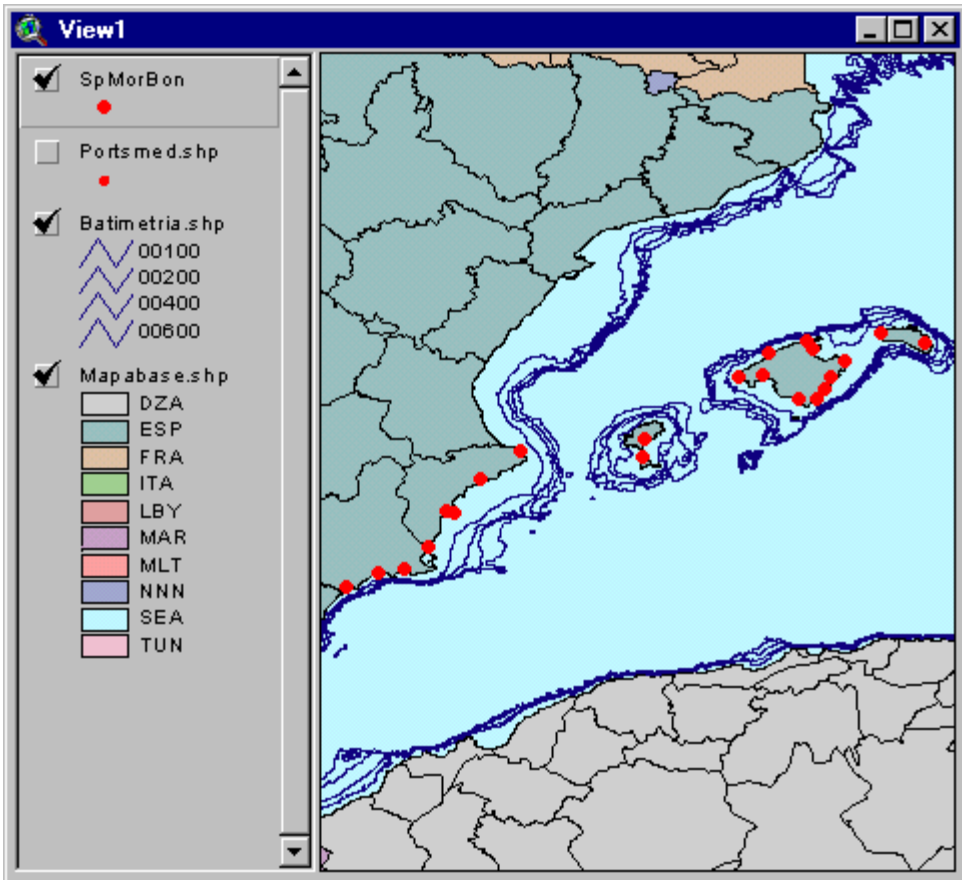
1 From the View menu choose Add Event Theme.

2 Choose the XY button.

3 In the Table list select the table containing the data from the query. Each record in the table represents a point feature located at a X, Y coordinate point (ports location). Choose the appropriate fields containing the coordinate information, that is in our case “Longdec” in the X field and “Latdec” in the Y field.



4 Press OK. ArcView adds a theme where each of the new points has the attributes selected in the Database.



4.4. INCORPORATION OF EXISTING COVERAGES (GEOZONES) IN THE DATABASE.

There are also other graphical features (lines, polygons) representing spatial covers that can not be seen directly as data in the ArtFiMed database, but in ArcView shapefiles. The information associated to these shapefiles have been also recorded in the Database, and connected to the adequate ports (see section 2.4.2). To achieve on a view the information of a concrete port, a special "script" has been programmed in such a way that allows obtaining only the features related with the port requested, even if the original shapefile also contains values for other ports. These features have been named as "Geozones" (see section 2.4).

Geozones corresponds to graphical features interesting for the artisanal fishery. So, information such as fishing zones by metiers, marine parks, untrawlable areas, mariculture zones, detailed bathimetry, will improve the global knowledge of the area and can be used to evaluate what will be the impact to the artisanal fisheries, if different measures than existing are introduced.

With the programmed script, the user can obtain easily in a new view all the Geozones that are affecting or can be affected for the fisheries in a port. The features appears as separated

shapefiles containing only the information directly associated with the requested port, even if the original files also contains data for other ports.

4.5. OTHER TOOLS DEVELOPED IN ARCVIEW.

To obtain the spatial distribution (referred to ports) of the main species and fishing gears two sample scripts that connect and query the database have been made.

- Species. To know in which ports are usually landed both the target and the accessory species an Avenue script has been programmed. The script allows to the user to choose the country, or countries, to analize and the species of interest. Also it is possible to choose all the species belonging to a Genus or all the species belonging to a Family.

  To do the selection a window showing the necessary information is displayed. In this window there are boxes containing the information relative to the countries the genus and the species. Once the boxes have been completed, simply clicking in a button a new theme with the information requested is added to the view. The script also zoom to the area in which the data processed must to appear.

- Gears. In the same way than above script, another one allows to the user to see the spatial distribution of a particular gear (referred to the ports) in the area. A gear must be chosen through FAO code for gears. In this way it is also possible to get the spatial distribution of a group of gears (gillnets and entangling nets, for example). The information requested is added to the view as a new theme and also zooms to the area that has the requested information.

4.6. FUTURE DEVELOPMENT.

The GIS application will be finished in the short future adding new basic maps and utilities able to achieve representing graphical features not directly related with ports, but with species and metiers. The specific case to develop will consist in the possibility to incorporate to ArcView the fishing grounds for different combination of metier/species in a direct way from the database. For this, will be necessary to create a new basic map (grid) and a new script to display the results in ArcView.

4.6.1. The "Grid" map as the fishing grounds reference.

As a basic coverage to locate the fishing grounds in a map will be created a specific grid map covering the whole COPEMED area, from the coastline until the isobath of 200 m depth. Each cell of the grid will have a dimension of 2x2 minutes, enough to locate specific artisanal fishing grounds. Each of the cells will have a code to identify them. The coding is not sequential, but it is made up with the coordinates of the lower left corner of each cell. In this way the user can identify easily in a map a concrete cell and its code. For example, if a cell has in the lower left corner the coordinates *2º 26' W 37º 12' N*, the code is

W0226_3712. The east (E) or west (W) directions must be specified in the code, since there are COPEMED areas that are located on both sides of the Greenwich meridian.

The grid has an only reference point from which will be originated. This point has the following coordinates: *6º00' E 36º20' N*. Since the coding is not sequential, it will be possible to extend or to modify the cell surface in a new grid, starting from the same reference point, without to modify the coding type.

A set of cells will make up a fishing ground for a concrete metier-species. This set will be considered as special Geozone in the database, in this case not related with ports as the aforementioned case, but with metiers. For it, the database application will be modify making new tables and forms to add the ancillary information and manage the new data.

4.6.2. Creation of new coverages.

To incorporate the fishing grounds in the ArcView project will be developed a new script, which will create new views and shapefiles containing the requested items allowing to mapping as the fishing grounds by metiers and/or species.