**ADRIAMED**
**SCIENTIFIC COOPERATION TO SUPPORT RESPONSIBLE FISHERIES IN THE ADRIATIC SEA**
**GCP/RER/010/ITA**
**GCP/RER/021/EC**

# AdriaMed Trawl Survey Information System: the Biological indicators module user manual (ver. 2.1)

GCP/RER/010/ITA/OP-26 Rome (Italy), September 2007

# AdriaMed Trawl Survey Information System: the Biological indicators module user manual (ver. 2.1)*


## Abstract

Through the FAO AdriaMed Project the Trawl Surveys Information System (ATrIS) has been developed for the AdriaMed Adriatic countries (Albania, Croatia, Italy, Montenegro and Slovenia), providing a flexible common environment to standardize the trawl survey data collected in the AdriaMed demersal trawl surveys. ATrIS was conceived as a simple tool to store and perform basic processing of the data collected, to facilitate and to standardize the data entry and retrieval of data. The ATrIS system offers some basic utilities to interface data with the Geographical Information System (GIS). The ver. 2.1 includes updates as well a module for the estimation of biological indicators (identified by the Adriatic area researchers). This paper provides some guidelines for the use of the new module.


## 1. Introduction

The AdriaMed Trawl Survey Information System (ATrIS) is a computerized system developed to organize storage and undertake the preliminary analysis of the dataset available after the AdriaMed trawl surveys started in 2001. It was conceived and designed as a simple and common tool to store and perform basic processing of the data collected by the countries participating in the AdriaMed demersal trawl surveys. It has been distributed among all the AdriaMed Institutes and external requests to use the application have been made to the Project. At the moment ten Adriatic research institutions use ATrIS thus making it the common and standard database used among the Adriatic countries. The first version of ATrIS was circulated in 2004 (Milone *et al.*, 2003) and the Project, in cooperation with the Adriatic area experts, continues to update and improve the application (Gramolini *et al.,* 2005a, b).

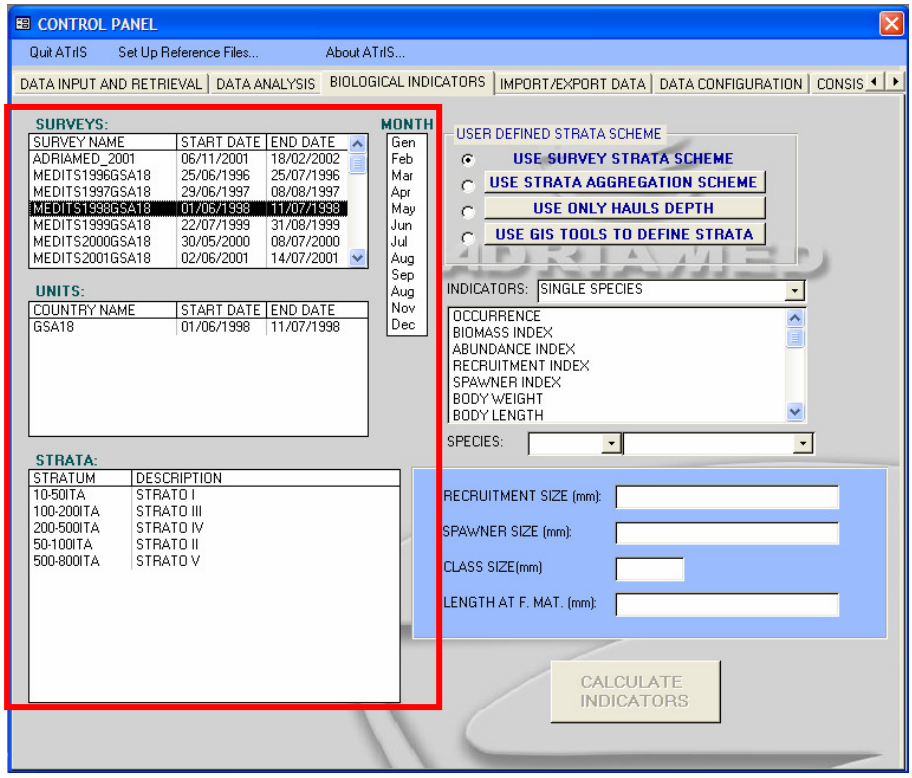
In 2005, on the basis of the indications of the GFCM SAC and as a result of the need to define new tools to support fisheries management and decision-making processes, the use of indicators was discussed in depth during the FAO AdriaMed Working Group meeting on the Identification of Biological and Economical Indicators for Adriatic Sea Demersal Fisheries, held in Fano, Italy, 2005. One of the tasks of the AdriaMed Working Group was the establishment of a first suite of simple indicators and their respective statistical estimators, based on fishery-dependent and independent data to be applied in the Operational Units identified in the Adriatic Sea GSA 17 and 18. An appropriate methodological approach comprising both the use of indicators and the Traffic Light system was developed in the framework of the AdriaMed Project and applied to the trawl fishery in the Southern Adriatic Sea by the Adriatic area experts. Accordingly the analysis of the state of demersal fisheries in the GFCM GSA 18 (FAO-GFCM, 2001) from a biological, economic and sociological point of view was carried out (Accadia *et al.,* 2006).


* This paper should be cited as follows: Zeuli, V., Gramolini, R., Milone, N. (2007) AdriaMed Trawl Survey Information System: the Biological indicators module user manual (ver. 2.1). FAO-MiPAAF Scientific Cooperation to Support Responsible Fisheries in the Adriatic Sea. GCP/RER/010/ITA/OP-26. AdriaMed Occasional Papers, 26: 13 pp.

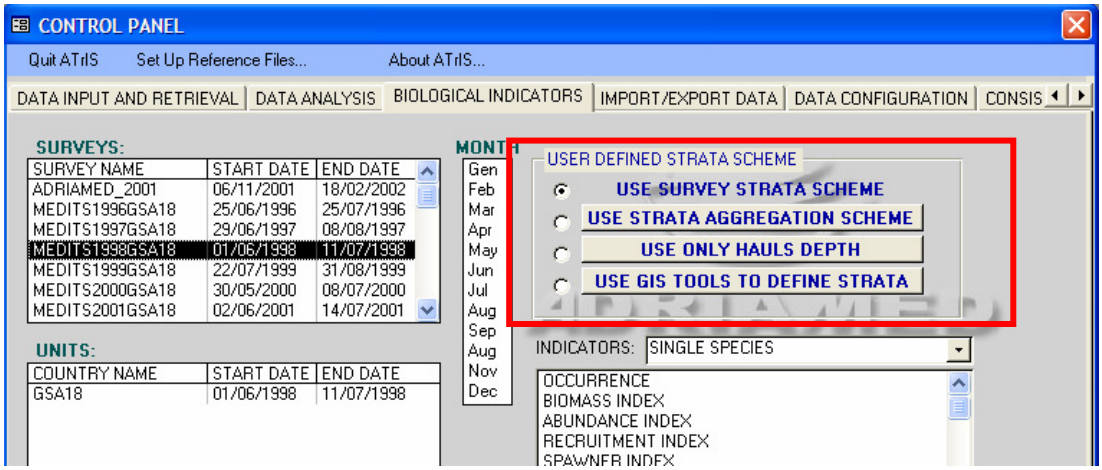
After this exercise the Project was asked to include an automatic procedure in ATrIS, which could help to calculate the indexes mentioned. The routine was created and the ver. 2.1 (complete with updates and the routine for indicators) was distributed among the AdriaMed participating countries. The following paragraphs provide some guidelines on the use of this new procedure. For the discussion on the list and use of indicators and more details please refer to the AdriaMed Occasional Paper N.19 (Accadia *et al*., 2006).

## 2. Biological Indicators

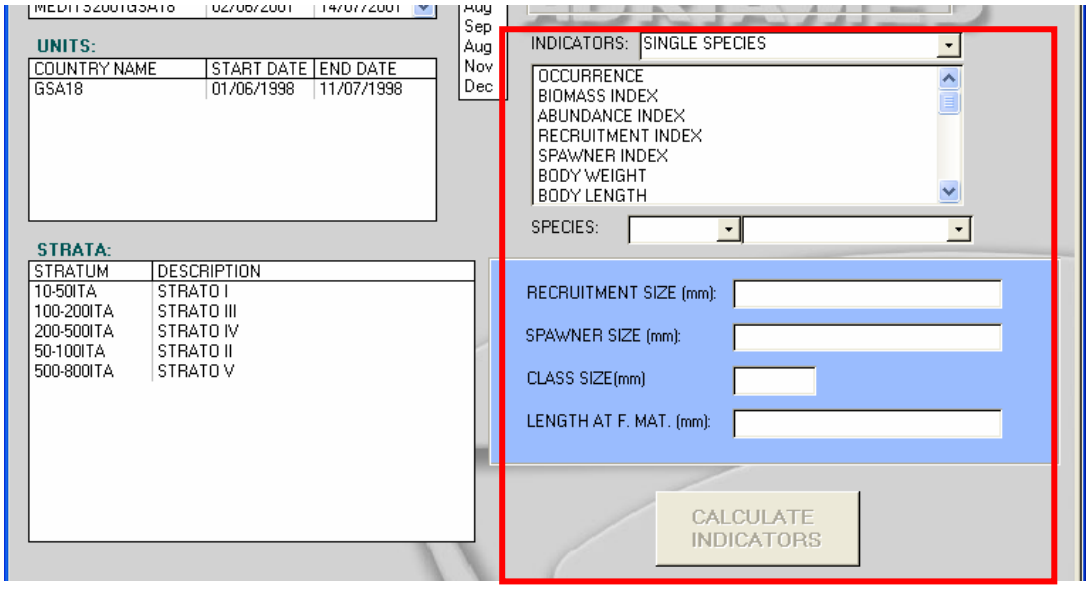
The panel Biological indicators allows the user to calculate a series of biological indicators relative to a single species or to a whole community, characterised by the data stored in the data base. As for the panel Data analysis, the left hand side of the panel is used to select the geographical area which is to be referred to in the calculation of the indices (see paragraph 7).




In the same way, on the top right-hand side of the screen it is possible to define the stratification level to use in the calculation (see paragraph 7.1)

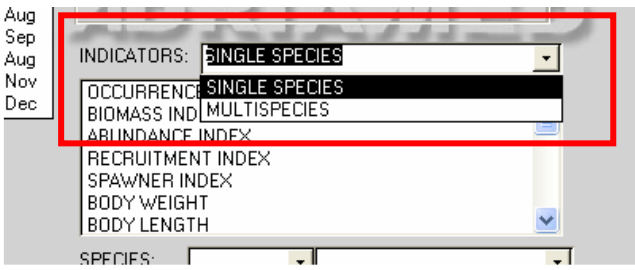



At the bottom-right of the panel the user can choose the indicators that he or she wishes to calculate and enter the values of any known parameters, on the basis of which the calculation will be made.



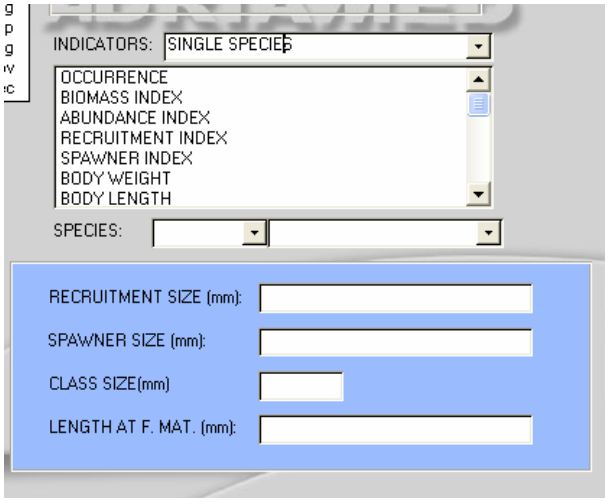

## 3. Choosing the type of indicator

The first step is the choice of the type of indicator(s) to be calculated of the two possibilities, i.e. the indicators relative to a single species or the indicators relative to a whole community. The drop down menu allows the user to make this choice.

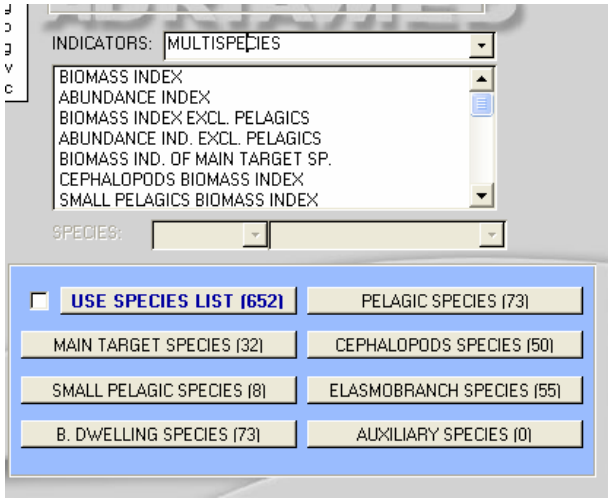


After having chosen the type of indicator, the list of available indicators is updated, as is the list of the parameters to insert for the calculation of these indicators. These parameters are different for the two types of indicators available.

SINGLE SPECIES

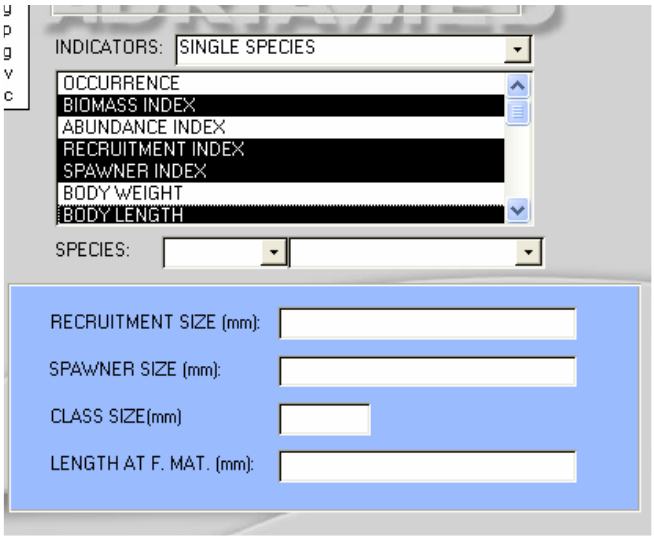



MULTISPECIES




## 4. Single species Biological Indicators

On choosing the "single species" indicators, the list shows the nine indicators that ATrIS can currently calculate. It is possible to choose one or more indicator(s) from this list for which the user wishes to calculate the value; should no single indicator be chosen, all the indicators will be calculated simultaneously. Multiple selection of indicators can be carried out using the "Shift" and "Ctrl" keys, as they are commonly used to select multiple lines or cells in Excel.



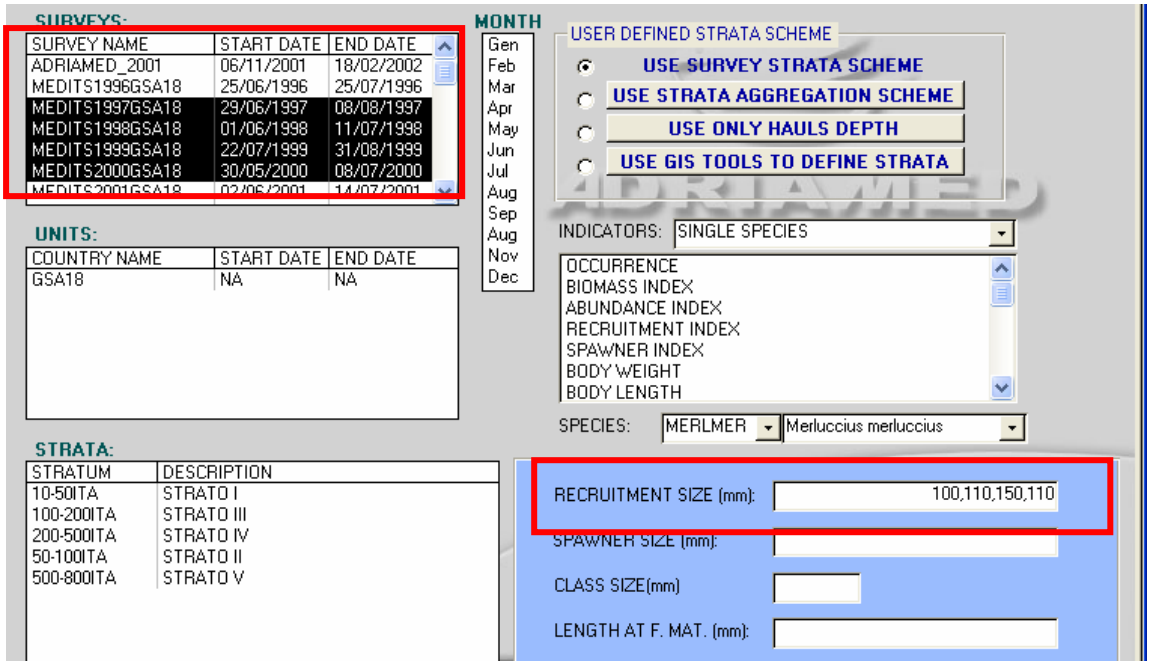

A double left-button click on the mouse on this same list will cause the selection to be cancelled and will take the list back to the initial point at which no indicator is selected.
For this type of indicator the user must choose the species to which the indicators refer. Some of the indicators (Recruitment Index, Spawner Index, Body Length, mean body len. excl. recruits, Mean body len./First mat. Len) require the presence of biological data (length, sex and maturity) in

the archive. Such data are usually gathered for the target species however ATrIS also allows for the storage of the same data for species that have not been identified as target species. It is therefore necessary first to check that the required data have been stored for the chosen species, before carrying out the calculation, otherwise the indices that require these data will not be calculated.

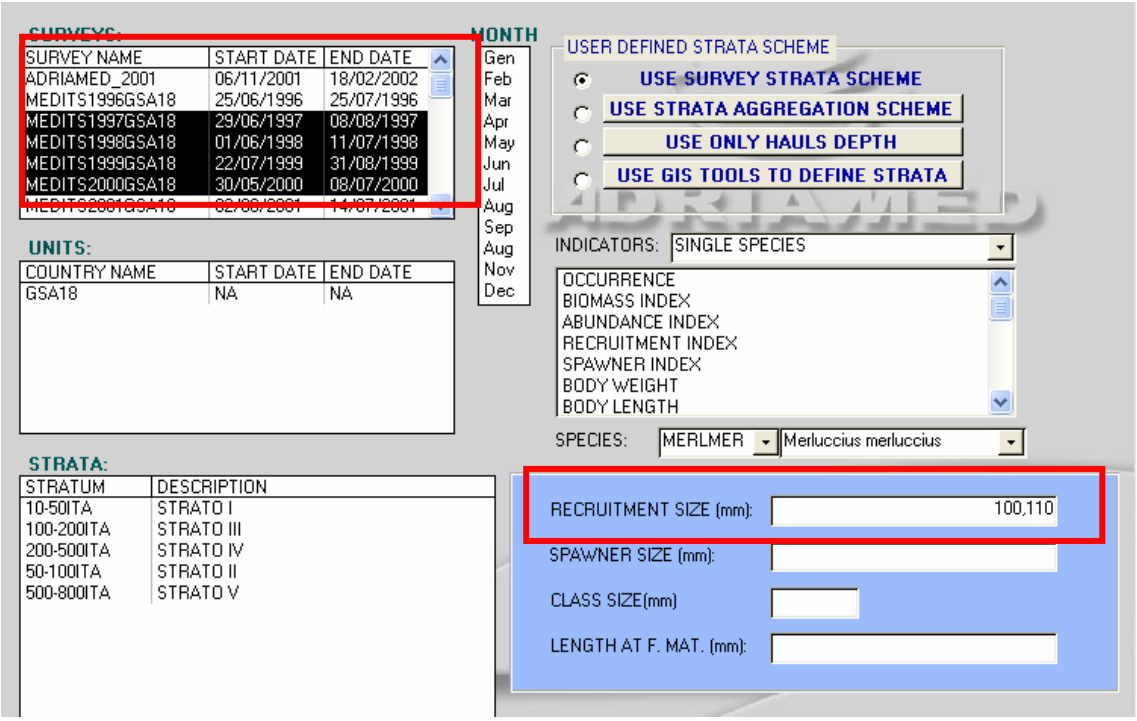
## 5. Parameters necessary for the calculation of the indices

The user has to indicate the following parameters:

RECRUITMENT SIZE (mm)
This is the recruitment size for the chosen species expressed in mm. This parameter is necessary for the calculation of the abundance index relative to the part of the population that represents recruitment (to the fishing gear) (Recruitment Index), that is for all the individuals that are smaller than the size indicated in the parameter. Should the user select more than one survey, it is possible to indicate different recruitment sizes, listing the values relative to the different sizes separated by a comma.




In the example given above, four surveys have been selected and for each one the recruitment sizes of 100mm, 110mm, 150mm, 110mm have been indicated respectively as 100,110,150 and110 in the text box.
If fewer values are indicated in the text box than the number of surveys selected, then the last value given will be used for the last surveys for which no value has been specified.




In the example given four surveys have been selected however only two length values have been given for the recruitment size, in this case the values used for the four surveys chosen will be respectively: 100, 110, 110, 110, the last value given (the second) is also used for surveys three and four.

SPAWNER SIZE (mm)

This is the (minimum) size after which the chosen species could potentially reproduce, expressed in mm. This parameter is necessary for the calculation of the abundance index for the part of the population with a length greater than that of first reproduction (Spawner Index). If the user chooses more than one survey, then it will be possible to indicate different recruitment sizes, listing the values relative to the different sizes separated by a comma, as illustrated for the parameter concerning recruitment.

CLASS SIZE (mm)

Class size is the interval in mm used to estimate the frequency distribution per size class. This distribution is used to estimate the indicators that use the length of individuals, mean length and the median of the lengths. The interval can only be a multiple of the precision used in storing the data in the database (see page 98 of the manual in the section data analysis).

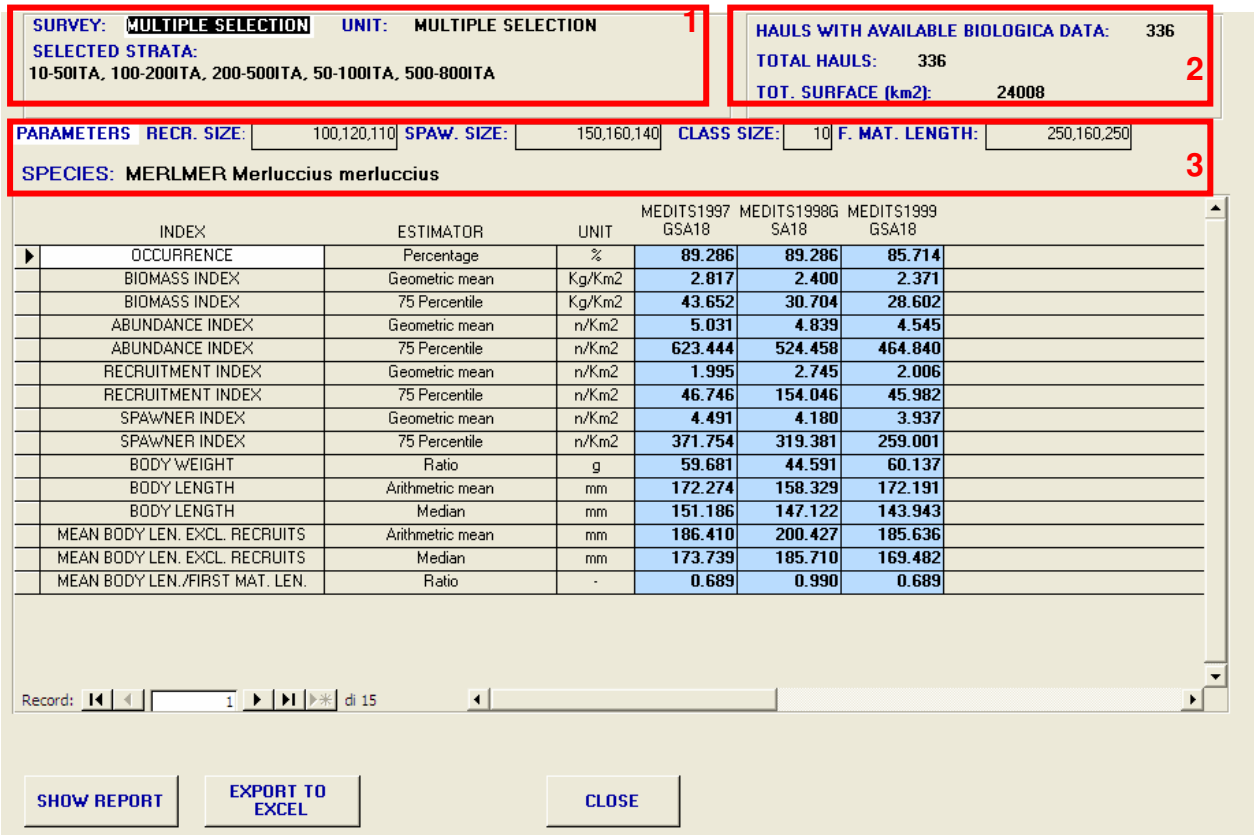
LENGTH AT FIRST MATURITY (mm)

This is the minimum size at which individuals reach sexual maturity, expressed in mm. This parameter is necessary to calculate the abundance index expressed as the ratio between mean length and length at first maturity. If the user chooses more than one survey then it is possible to indicate

different recruitment sizes, listing the values relative to the different sizes separated by a comma, as illustrated for the parameter concerning recruitment.

## 6. Results of the calculation

The following figure shows the way in which the results of the calculations are visualised, when carried out for the indices relative to a single species.




| INDEX | ESTIMATOR | UNIT | MEDITS1997 GSA18 | MEDITS1998G SA18 | MEDITS1999 GSA18 |
|---|---|---|---|---|---|
| OCCURRENCE | Percentage | % | 89.286 | 89.286 | 85.714 |
| BIOMASS INDEX | Geometric mean | Kg/Km2 | 2.817 | 2.400 | 2.371 |
| BIOMASS INDEX | 75 Percentile | Kg/Km2 | 43.652 | 30.704 | 28.602 |
| ABUNDANCE INDEX | Geometric mean | n/Km2 | 5.031 | 4.839 | 4.545 |
| ABUNDANCE INDEX | 75 Percentile | n/Km2 | 623.444 | 524.458 | 464.840 |
| RECRUITMENT INDEX | Geometric mean | n/Km2 | 1.995 | 2.745 | 2.006 |
| RECRUITMENT INDEX | 75 Percentile | n/Km2 | 46.746 | 154.046 | 45.982 |
| SPAWNER INDEX | Geometric mean | n/Km2 | 4.491 | 4.180 | 3.937 |
| SPAWNER INDEX | 75 Percentile | n/Km2 | 371.754 | 319.381 | 259.001 |
| BODY WEIGHT | Ratio | g | 59.681 | 44.591 | 60.137 |
| BODY LENGTH | Arithmetic mean | mm | 172.274 | 158.329 | 172.191 |
| BODY LENGTH | Median | mm | 151.186 | 147.122 | 143.943 |
| MEAN BODY LEN. EXCL. RECRUITS | Arithmetic mean | mm | 186.410 | 200.427 | 185.636 |
| MEAN BODY LEN. EXCL. RECRUITS | Median | mm | 173.739 | 185.710 | 169.482 |
| MEAN BODY LEN./FIRST MAT. LEN. | Ratio | - | 0.689 | 0.990 | 0.689 |

In area 1 (top left) the information relative to the surveys and geographical areas selected is summarised. In area 2 (top right) information is given relative to the total number of stations used in the calculation as well as the km$^2$ covered in the geographical area considered. Area 3 provides the information relative to the parameters specified for the calculation of the indicators. The table with the results can be exported in Excel format, alternatively it is possible to obtain a report that can be printed.

**ADRIAMED**
*SCIENTIFIC COOPERATION TO SUPPORT*
*RESPONSIBLE FISHERIES IN THE ADRIATIC SEA*

SURVEY: MULTIPLE SELECTION UNIT: MULTIPLE SELECTION
SELECTED STRATA:
10-50ITA, 100-200ITA, 200-500ITA, 50-100ITA, 500-800ITA

HAULS WITH AVAILABLE BIOLOGICA DATA: 336
TOTAL HAULS: 336
TOT. SURFACE (km2): 24000

PARAMETERS RECR. SIZE: 100,120,110 SPAW. SIZE: 150,160,140 CLASS SIZE: 10 F. MAT. LENGTH: 250,160,250

SPECIES: MERLMER Merluccius merluccius

| INDEX | ESTIMATOR | UNIT | MEDITS1997G SA18 | MEDITS1998G SA18 | MEDITS1999G SA18 |
|---|---|---|---|---|---|
| OCCURRENCE | Percentage | % | 89.286 | 89.286 | 85.714 |
| BIOMASS INDEX | Geometric mean | Kg/Km 2 | 2.817 | 2.400 | 2.371 |
| BIOMASS INDEX | 75 Percentile | Kg/Km 2 | 43.652 | 30.704 | 28.602 |
| ABUNDANCE INDEX | Geometric mean | n/Km 2 | 5.031 | 4.839 | 4.545 |
| ABUNDANCE INDEX | 75 Percentile | n/Km 2 | 623.444 | 524.458 | 464.840 |
| RECRUITMENT INDEX | Geometric mean | n/Km 2 | 1.995 | 2.745 | 2.006 |
| RECRUITMENT INDEX | 75 Percentile | n/Km 2 | 46.746 | 154.046 | 45.982 |
| SPAWNER INDEX | Geometric mean | n/Km 2 | 4.451 | 4.180 | 3.937 |
| SPAWNER INDEX | 75 Percentile | n/Km 2 | 371.754 | 315.381 | 259.001 |
| BODY WEIGHT | Ratio | g | 59.681 | 44.591 | 60.137 |
| BODY LENGTH | Arithmetric mean | mm | 172.274 | 158.329 | 172.191 |
| BODY LENGTH | Median | mm | 151.186 | 147.122 | 143.943 |
| MEAN BODY LEN. EXCL. RECRUITS | Arithmetric mean | mm | 186.410 | 200.427 | 185.636 |
| MEAN BODY LEN. EXCL. RECRUITS | Median | mm | 173.759 | 185.710 | 169.482 |
| MEAN BODY LEN./FIRST MAT. LEN. | Ratio | - | 0.689 | 0.990 | 0.689 |

02/05/2007 11.07.17 ADMIN Pagina 1 di 2

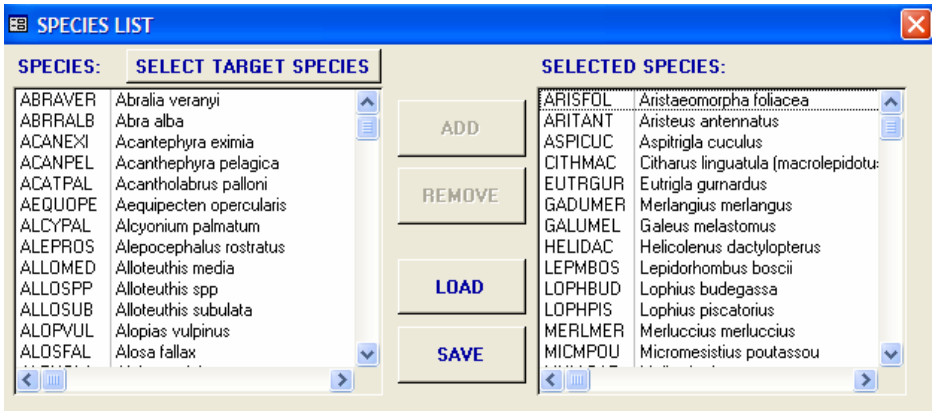
## 7. Multispecies Biological Indicators

If the option "multispecies indicators" is chosen, the list shows the ten indicators that ATrIS can currently calculate. As for the single species indicators, it is possible to choose one or more indicator from the list for which the user wishes to calculate the value; if no choice is made all the indicators are calculated simultaneously. Multiple selection of indicators can be carried out using the "Shift" and "Ctrl" keys, as they are commonly used to select multiple lines or cells in Excel. A double left-button click on the mouse on this same list will cause the selection to be cancelled and will take the list back to the initial point at which no indicator is selected

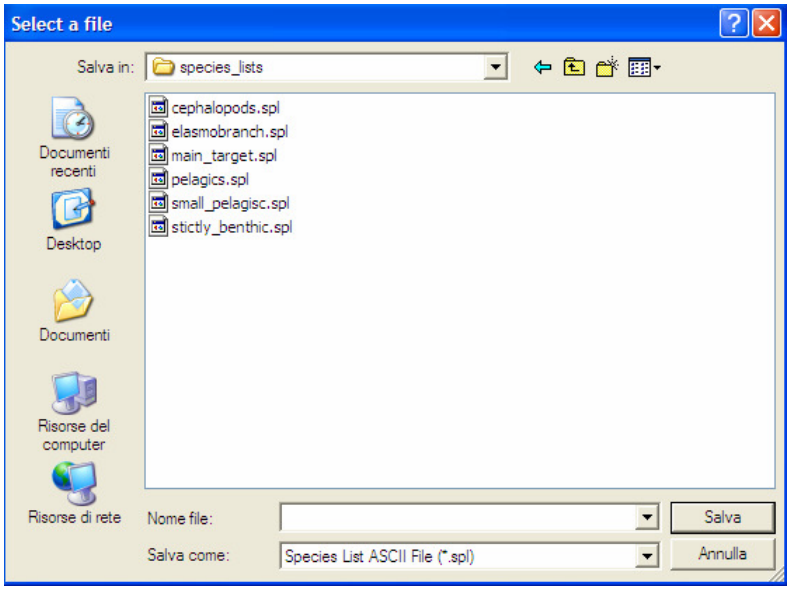
In the same was as in the case of the singe-species indicators, here too some indicators require the user to indicate a series of parameters. In this case however the user essentially has to define a series of lists of species on the basis of which the abundance and/or biomass indicators will be calculated. The following paragraphs provide a detailed description of the indicators and the lists of species that are necessary for the calculation. Before this, however, there is a brief illustration of how to select a list of species using the mask provided.

## 8. How to choose and save a list of species

The lists of species can be selected using the mask in the following image:




The choice of species is carried out as described in paragraph 7.2.3. In this case, however, the list chosen can be saved as a text file and reinserted later. To save the chosen list in a file press the save button and a window will open to allow the user to indicate the name of the file in which the list will be saved.



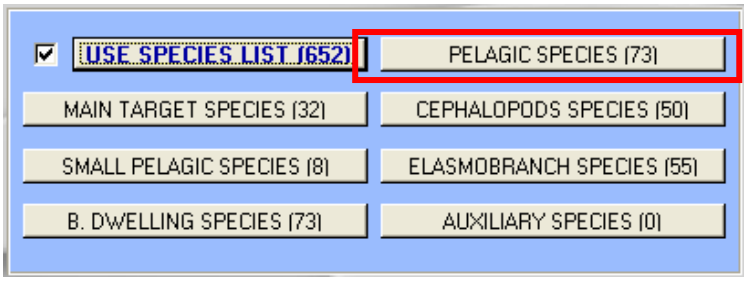

This is an ASCII file and the extension is .spl (species list). In the same way, press the Load button and it is possible to insert the species saved previously in a .spl file in the list in which the user is working.

## 9. Required parameters for the calculation of indices

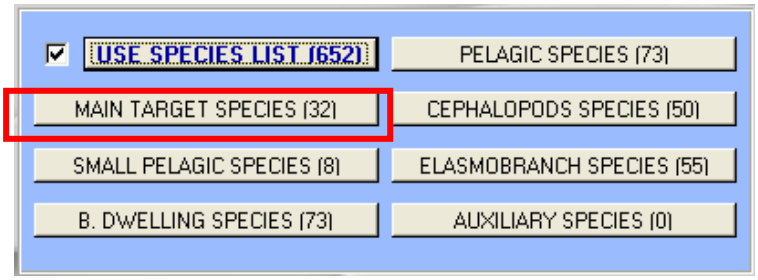
*Total Biomass index and Total Abundance index.*

The calculation is made considering all the species captured at least once during the chosen survey. For the calculation of these indices it is not strictly necessary to indicate a list of species in the basis of which the calculation will be made, this is because all the species will be considered. However the user can indicate a set of species that define the whole community, thus excluding the species that have been stored in the database but which can be considered secondary in the calculation of the total biomass index. In order to use a specific list in the calculation of the total abundance and biomass indices it is necessary to check the box next to the button for the definition of the list of species.

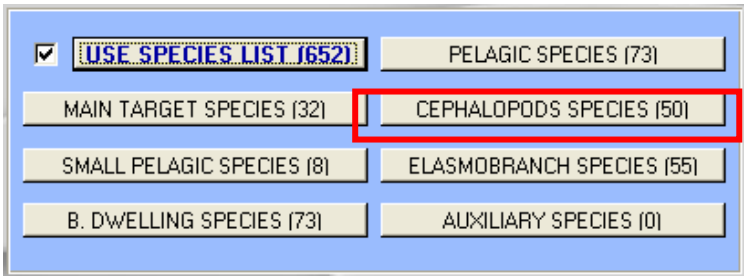
*Total Biomass index and Total abundance index excluding pelagic species*
The calculation is made considering all the species captured at least once during the chosen survey excluding the pelagic species. The list of the species to exclude has to be defined using the dedicated button. If the user has explicitly defined the list of species that make up the community (see the previous point) then the pelagic species will be excluded.



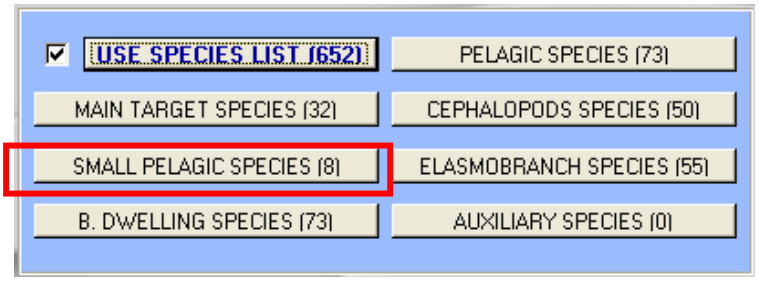

*Biomass index of main target species*
The calculation is made considering just the main target species. The list of these species has to be defined using the dedicated button.



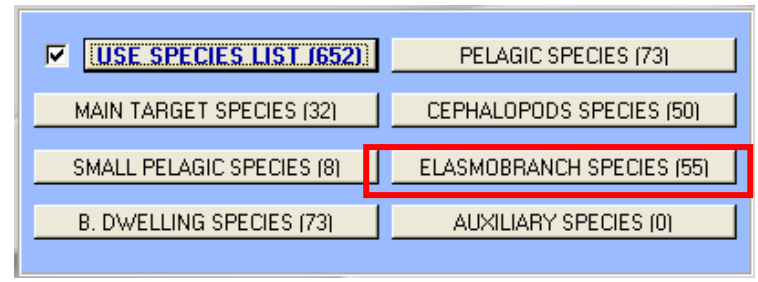

*Cephalopods Biomass index*
The calculation is made considering just the cephalopods. The list of these species has to be defined using the dedicated button.



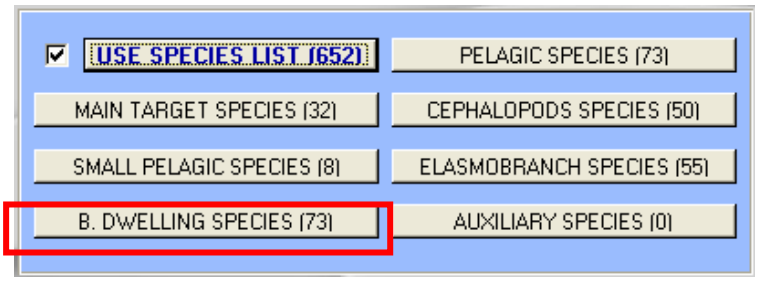
*Small pelagics Biomass index*
The calculation is made considering just the small pelagic species. The list of these species has to be defined using the dedicated button.



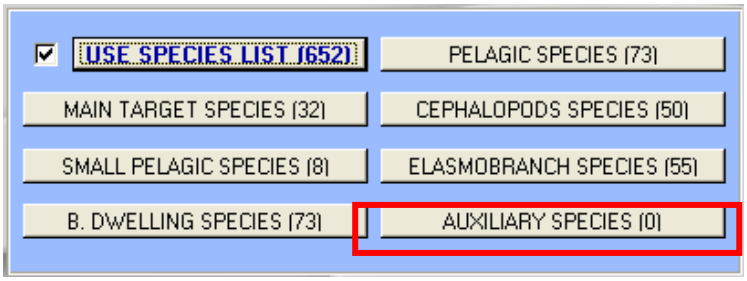

*Elasmobranch Biomass index*
The calculation is made considering just the species belonging to the elasmobranch group. The list of these species has to be defined using the dedicated button.




*BOI index*
The calculation is made considering the ratio between the biomass of the strictly benthic fin-fishes and the total biomass. The list of the strictly benthic fin-fishes has to be defined using the dedicated button. Furthermore if the user has explicitly defined the list of species that make up the community then the total biomass will be calculated using this list.

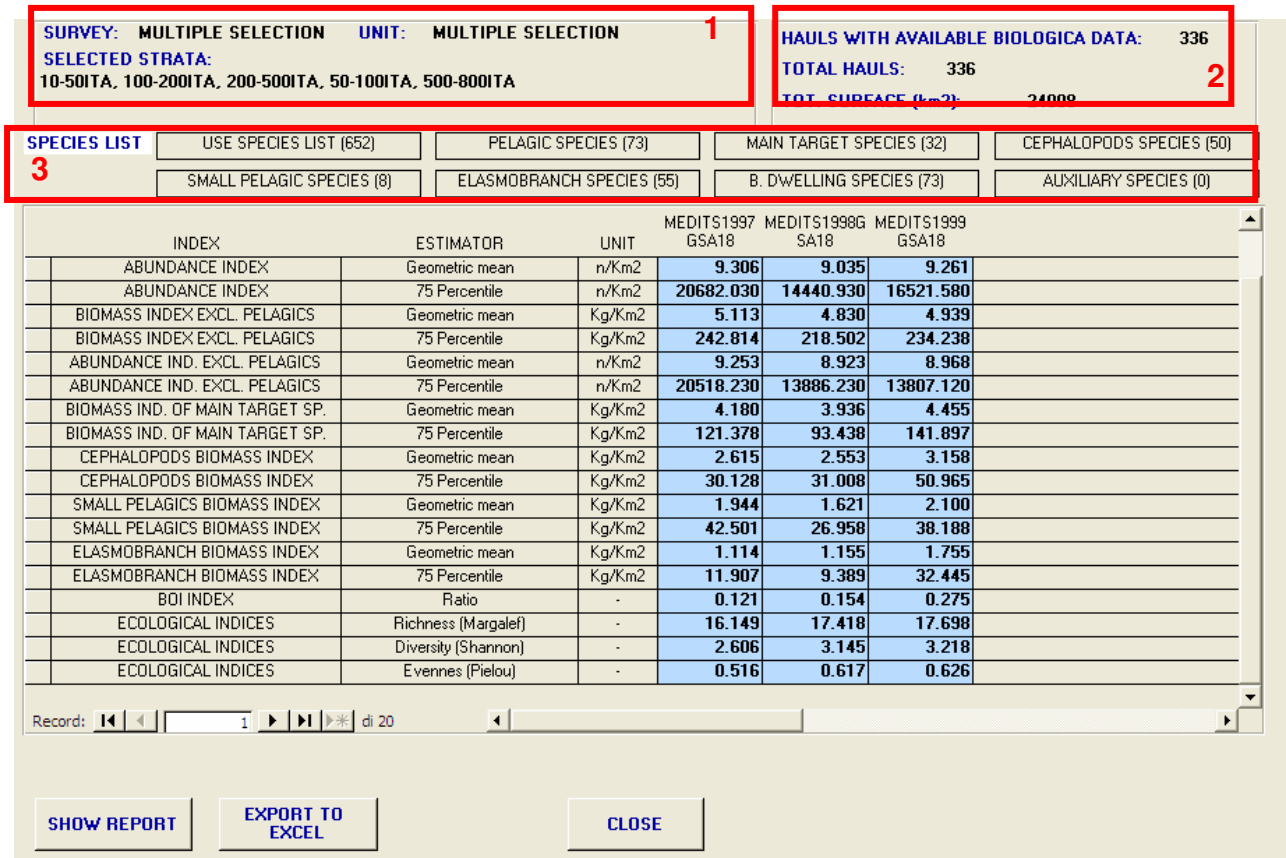



The biomass of some auxiliary species, species that are considered sporadic for the fishery activities considered, can be excluded from the calculation of total biomass. These sporadic species must be specified using the dedicated button.




## 10. Result of the calculation

The mask that gives the results of the calculation made for the indices relative to the community is shown below:




| INDEX | ESTIMATOR | UNIT | MEDITS1997 GSA18 | MEDITS1998G SA18 | MEDITS1999 GSA18 |
|---|---|---|---|---|---|
| ABUNDANCE INDEX | Geometric mean | n/Km2 | 9.306 | 9.035 | 9.261 |
| ABUNDANCE INDEX | 75 Percentile | n/Km2 | 20682.030 | 14440.930 | 16521.580 |
| BIOMASS INDEX EXCL. PELAGICS | Geometric mean | Kg/Km2 | 5.113 | 4.830 | 4.939 |
| BIOMASS INDEX EXCL. PELAGICS | 75 Percentile | Kg/Km2 | 242.814 | 218.502 | 234.238 |
| ABUNDANCE IND. EXCL. PELAGICS | Geometric mean | n/Km2 | 9.253 | 8.923 | 8.968 |
| ABUNDANCE IND. EXCL. PELAGICS | 75 Percentile | n/Km2 | 20518.230 | 13886.230 | 13807.120 |
| BIOMASS IND. OF MAIN TARGET SP. | Geometric mean | Kg/Km2 | 4.180 | 3.936 | 4.455 |
| BIOMASS IND. OF MAIN TARGET SP. | 75 Percentile | Kg/Km2 | 121.378 | 93.438 | 141.897 |
| CEPHALOPODS BIOMASS INDEX | Geometric mean | Kg/Km2 | 2.615 | 2.553 | 3.158 |
| CEPHALOPODS BIOMASS INDEX | 75 Percentile | Kg/Km2 | 30.128 | 31.008 | 50.965 |
| SMALL PELAGICS BIOMASS INDEX | Geometric mean | Kg/Km2 | 1.944 | 1.621 | 2.100 |
| SMALL PELAGICS BIOMASS INDEX | 75 Percentile | Kg/Km2 | 42.501 | 26.958 | 38.188 |
| ELASMOBRANCH BIOMASS INDEX | Geometric mean | Kg/Km2 | 1.114 | 1.155 | 1.755 |
| ELASMOBRANCH BIOMASS INDEX | 75 Percentile | Kg/Km2 | 11.907 | 9.389 | 32.445 |
| BOI INDEX | Ratio | - | 0.121 | 0.154 | 0.275 |
| ECOLOGICAL INDICES | Richness (Margalef) | - | 16.149 | 17.418 | 17.698 |
| ECOLOGICAL INDICES | Diversity (Shannon) | - | 2.606 | 3.145 | 3.218 |
| ECOLOGICAL INDICES | Evennes (Pielou) | - | 0.516 | 0.617 | 0.626 |

In area 1 (top left) the information relative to the surveys and geographical areas selected is summarised. In area 2 (top right) information is given relative to the total number of stations used in the calculation as well as the km$^2$ covered in the geographical area considered. Area 3 provides the information relative to the lists of species defined for the calculation of the indicators. The table with the results can be exported in Excel format, alternatively it is possible to obtain a report that can be printed.

**ADRIAMED**

*SCIENTIFIC COOPERATION TO SUPPORT RESPONSIBLE FISHERIES IN THE ADRIATIC SEA*

SURVEY: MULTIPLE SELECTION UNIT: MULTIPLE SELECTION

SELECTED STRATA:

10-50ITA, 100-200ITA, 200-500ITA, 50-100ITA, 500-800ITA

HAULS WITH AVAILABLE BIOLOGICA DATA: 336

TOTAL HAULS: 336

TOT. SURFACE (km2): 24008

SPECIES LIST

| USE SPECIES LIST (652) | PELAGIC SPECIES (73) | MAIN TARGET SPECIES (32) | CEPHALOPODS SPECIES (50) |
|---|---|---|---|
| SMALL PELAGIC SPECIES (8) | ELASMOBRANCH SPECIES (55) | B. DWELLING SPECIES (73) | AUXILIARY SPECIES (0) |

| INDEX | ESTIMATOR | UNIT | MEDITS1997G SA18 | MEDITS1998G SA18 | MEDITS1999G SA18 |
|---|---|---|---|---|---|
| BIOMASS INDEX | Geometric mean | Kg/Km2 | 5.250 | 5.026 | 5.346 |
| BIOMASS INDEX | 75 Percentile | Kg/Km2 | 259.050 | 239.627 | 339.790 |
| ABUNDANCE INDEX | Geometric mean | n/Km2 | 9.306 | 9.035 | 9.261 |
| ABUNDANCE INDEX | 75 Percentile | n/Km2 | 20682.030 | 14440.930 | 16521.590 |
| BIOMASS INDEX EXCL. PELAGICS | Geometric mean | Kg/Km2 | 5.113 | 4.830 | 4.939 |
| BIOMASS INDEX EXCL. PELAGICS | 75 Percentile | Kg/Km2 | 242.814 | 218.502 | 234.238 |
| ABUNDANCE IND. EXCL. PELAGICS | Geometric mean | n/Km2 | 9.253 | 8.923 | 8.968 |
| ABUNDANCE IND. EXCL. PELAGICS | 75 Percentile | n/Km2 | 20518.230 | 13886.230 | 13807.120 |
| BIOMASS IND. OF MAIN TARGET SP. | Geometric mean | Kg/Km2 | 4.180 | 3.936 | 4.455 |
| BIOMASS IND. OF MAIN TARGET SP. | 75 Percentile | Kg/Km2 | 121.378 | 93.438 | 141.897 |
| CEPHALOPODS BIOMASS INDEX | Geometric mean | Kg/Km2 | 2.615 | 2.553 | 3.158 |
| CEPHALOPODS BIOMASS INDEX | 75 Percentile | Kg/Km2 | 30.128 | 31.008 | 50.965 |
| SMALL PELAGICS BIOMASS INDEX | Geometric mean | Kg/Km2 | 1.944 | 1.621 | 2.100 |
| SMALL PELAGICS BIOMASS INDEX | 75 Percentile | Kg/Km2 | 42.501 | 26.958 | 38.188 |
| ELASMOBRANCH BIOMASS INDEX | Geometric mean | Kg/Km2 | 1.114 | 1.155 | 1.755 |
| ELASMOBRANCH BIOMASS INDEX | 75 Percentile | Kg/Km2 | 11.507 | 9.389 | 32.445 |
| BOI INDEX | Ratio | - | 0.121 | 0.154 | 0.275 |
| ECOLOGICAL INDICES | Richness (Margalef) | - | 16.149 | 17.418 | 17.698 |
| ECOLOGICAL INDICES | Diversity (Shannon) | - | 2.606 | 3.145 | 3.218 |
| ECOLOGICAL INDICES | Evennes (Pielou) | - | 0.516 | 0.617 | 0.626 |

02/05/2007 11.18.46 ADMIN Pagina 1 di 2

## 11. References


Accadia, P., Ceriola, L., Mannini, P., Massa, F., Milone,N., Ungaro, N. 2006. Applicability and performance of some biological and economic indicators for the Adriatic Sea trawl fisheries in the western GFCM GSA 18. FAO Scientific Cooperation to Support Responsible Fisheries in the Adriatic Sea. GCP/RER/010/ITA/OP-19. *AdriaMed Occasional Papers* 19: 24 pp.

FAO - General Fisheries Commission for the Mediterranean. 2001. Report of the twenty-sixth session. Lacco Ameno, Ischia, 10-13 September 2001. *GFCM Report*. No.26. Rome, FAO. 2001. 27p.

Gramolini, R., Mannini, P., Milone, N., Zeuli, V. 2005a. AdriaMed Trawl Survey Information System (ATrIS): User Manual. FAO-MiPAF Scientific Cooperation to Support Responsible Fisheries in the Adriatic Sea. GCP/RER/010/ITA/TD17. *AdriaMed Technical Documents*, 17: 141 pp.

Gramolini, R., Mannini, P., Milone, N., Zeuli, V. 2005b. Developing a Regional Trawl Surveys Information System: AtrIS. Paper presented at the GFCM-SAC Sub-Committee on Statistics and Information Transversal workshop on GFCM Statistical Framework and Databases (including IUU white list) (Rome, 26th October 2005). GCP/RER/010/ITA/OP-17. *AdriaMed Occasional Papers*, 17: 10 pp.

Milone, N., Zeuli, V., Mannini, P. 2003. AdriaMed Trawl Survey Databank: User Manual. FAO-MiPAF Scientific Cooperation to Support Responsible Fisheries in the Adriatic Sea. GCP/RER/010/ITA/OP-12. *AdriaMed Occasional Papers,* 12: 18 pp.