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Measurement (part II) and geography

Functional specification

**Volume 1**

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## REPORT

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**Abstract**

This document is a detailed functionality description of the Measurements Module in the user requirements for ENSIS 3.0. The document is intended to give a cost and time estimate of the programming of the functionality it describes, and will be used for programming and testing of the final product.

The main objective of the specified functionality is to make the system more efficient and useful as a tool for planners and manager dealing with the management of water and in general and with monitoring activities such as ambient water quality, meteorology, hydrology, oceanography and biology in particular. The EU water framework directive (WFD) has in particular been a driving force.

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The ENSIS Group will forward future revisions of this specification to the users of this documentation. When requiring a revised version, a copy of this page should be enclosed.

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## Preface

This document is a detailed functionality description of chapter 6-Measurements in the user requirements for ENSIS 3.0 (June 1999). The document is intended to give a cost and time estimate of the programming of the functionality it describes, and will be used for programming. This specification shall also work as document during testing of the functionality.

The main objective of the specified functionality is to make the system more efficient and useful as a tool for planners and manager dealing with the management of water in general and with monitoring activities such as ambient water quality, meteorology, hydrology, oceanography and biology in particular. The new water frame work directive (WFD) has in particular been a driving force.

The improvements are in general for the:

- ◆ Measurement module (including biology additions in dealing with additions both for biota chemistry and taxonomic data )
- ◆ Geographic module (improvements of the user interface and functionality improvements).

The goal has been to implement a user friendly application for the complex nature of an integrated measurement database (handling different measurement types and mediums) which support the typical user of ENSIS. The focus has been put on the actual working procedures and structure of the different measurement types. At a first glance the data requirements for measurements may seem overwhelming, but the user will recognize the functionality through the whole application (across the different measurement types and medium). The user must also keep in mind that the extra properties to describe a measurement are not required by the system, but are mainly used for QA which will be a strict requirement for shared databases in the future (reliable data).

The suggested functionality may increase to some extent the burden of configuration of the different look up tables in the system. However, configuration is mainly a one time operation, and the suggested changes will enhance the daily use of ENSIS and ease the burden of exchange of data..

Since this document will be read by future users of the system (in order to comment on the specification) and that some of these users are not familiar with the current ENSIS application, the reader should be aware of that some of the basic concept is explained in detail even though some of the functionality is already implemented.

NIVA, March 2002

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<b>16</b>	<b>Biological Definitions .....</b>	<b>Error! Bookmark not defined.</b>
16.1	Species .....	Error! Bookmark not defined.
16.1.1	Species inventory.....	Error! Bookmark not defined.
16.1.2	Taxonomic structure (New/edit, delete).....	Error! Bookmark not defined.
16.1.3	Species .....	Error! Bookmark not defined.
16.1.4	Taxonomic Level .....	Error! Bookmark not defined.
16.2	Species Characteristics .....	Error! Bookmark not defined.
16.2.1	List of species characteristics.....	Error! Bookmark not defined.
	Definition of Species characteristics .....	Error! Bookmark not defined.
16.3	User defined species group .....	Error! Bookmark not defined.
16.3.1	List of user defined species groups.....	Error! Bookmark not defined.
16.3.2	User defined species group definition .....	Error! Bookmark not defined.
16.4	Semi Quantative Definitions .....	Error! Bookmark not defined.
16.4.1	List of semi quantative codes .....	Error! Bookmark not defined.
16.4.2	Definition of semi Quantative code.....	Error! Bookmark not defined.

16.5	BiotaChemistry_Fish Definitions.....	<b>Error! Bookmark not defined.</b>
<b>17</b>	<b>Geography.....</b>	<b>Error! Bookmark not defined.</b>
17.1	Changes to the menu .....	<b>Error! Bookmark not defined.</b>
17.2	General changes for geographical elements (not described in more detail)	<b>Error! Bookmark not defined.</b>
17.3	General changes for geographical elements (described in more detail)	<b>Error! Bookmark not defined.</b>
17.3.1	River links.....	<b>Error! Bookmark not defined.</b>
17.3.2	River node.....	<b>Error! Bookmark not defined.</b>
17.3.3	Lakes .....	<b>Error! Bookmark not defined.</b>
17.3.4	Coast and Marine objects .....	<b>Error! Bookmark not defined.</b>
17.3.5	Catchment.....	<b>Error! Bookmark not defined.</b>
17.4	River Cain .....	<b>Error! Bookmark not defined.</b>
17.5	Geography meta data .....	<b>Error! Bookmark not defined.</b>
17.6	Catchment level .....	<b>Error! Bookmark not defined.</b>
17.7	User Interests. ....	<b>Error! Bookmark not defined.</b>
17.8	Changes to the forms (GUI) .....	<b>Error! Bookmark not defined.</b>
17.8.1	Administrative Regions and user defined regions .....	<b>Error! Bookmark not defined.</b>
17.8.2	Region Dataset .....	<b>Error! Bookmark not defined.</b>
17.8.3	Grid .....	<b>Error! Bookmark not defined.</b>
17.8.4	River Link dataset .....	<b>Error! Bookmark not defined.</b>
17.8.5	River Type.....	<b>Error! Bookmark not defined.</b>
17.8.6	Lake dataset.....	<b>Error! Bookmark not defined.</b>
17.8.7	Lake Type .....	<b>Error! Bookmark not defined.</b>
17.8.8	Surrounding area .....	<b>Error! Bookmark not defined.</b>
17.8.9	Geology.....	<b>Error! Bookmark not defined.</b>
17.8.10	Coastal dataset.....	<b>Error! Bookmark not defined.</b>
17.8.11	Waterbody Type .....	<b>Error! Bookmark not defined.</b>
17.8.12	Freshwater Influence .....	<b>Error! Bookmark not defined.</b>
17.8.13	Substratum Composition.....	<b>Error! Bookmark not defined.</b>
17.8.14	Variable.....	<b>Error! Bookmark not defined.</b>

**Appendix 1: Registration depending on measurement type****Error! Bookmark not defined.**

## 1 Introduction

### 1.1 General

The improvements are in general specified for the:

- ◆ Measurement module (including biology add ins)
- ◆ Geographic module

#### Measurement module

The measurement module shall contain the necessary functionality to handle monitoring data (coast, rivers, and lakes) that are used to describe ambient water quality, sediment quality, hydrology, oceanography and biology (including biota chemistry and taxonomy). Also measurements taken in groundwater or other types of recipients may be entered to the database since this is only a question of medium. Meteorology, deposition and air quality data are also included as in the current ENSIS 2.05 version.

Physical and chemical data in water and sediments give a measure of the level of pollution, and give an indirect measure of impacts on human beings (guidelines for different type of use) and ecology. Chemical components measured in biota (fish, mussels, crabs etc) give a direct measure on how organisms respond to pollution. The inclusion of taxonomy offer the possibility to analyse the presence or abundance of different species (biodiversity), and be a helpful tool to determine the impacts of pollution.

As part of the measurement module further development concerned with the water quality classification system, the quality assurance procedures and other important functionality used for measurement data are introduced.

Special attention has been put on the possibilities for searching, presentation, export (through clipboard or reportgenerator) entering, editing and deleting of measurements.

The registration and presentation possibilities have been designed to reflect the working procedures and the structure of different measurement types.

#### Geographic Module

Improvements have been introduced for all geographic objects. The description is part of this document, but stored on a separate file.

## 1.2 References to other specifications

The functionality description has been written based on the need for the ENSIS/Water module. However, the objective has been to secure a best possible integration with other types of mediums in order to be able to use the measurement module as a general measurement database.

The result has been an application which apparently is very similar to the current interface (including the menu), but where the general GUI improvements shall be implemented and the logic connected to the measurement types guides the registration and presentation.

Which possibilities that will be available and also thereby the complexity of the measurement module depend on which submodules that are implemented. I.e. the different measurement types can be integrated as a submodules both to limit the application for some users and to increase the potential for sale and income (see explanation in this document).

<b>Database</b>	<p>An efficient database structure which will enhance the response time of the application both for retrieval and storage of data must be designed. This means that the description in this document might lead to a change in the existing data base structure even for those concepts which already exist in the current ENSIS 2.05 application i.e. Dataseries definitions.</p> <p>How the database structure should be implemented according to the functionality description in this document, and how this should be designed to enhance the efficiency shall be described in detail by the programmers in a separate document before the actual programming starts (for each separate module). NIVA shall be able to comment on the suggested database structure before the programming starts.</p>
<b>Modules</b>	<p>A separate document which suggest different sub modules of ENSIS has been made for ENSIS 2.05 (both technically and sales modules). This document shall still be used as the basis for what NIVA put in the definition of modularisation (december 2000).</p> <p>In addition to this document the programmer must keep in mind that each measurment type can be implemented as a sub module. When it comes to the new definitions these are in most cases common for each measurment type sub module. In the case the definitions are special for a measurment type it can be grouped together with the measurement type.</p>
<b>GUI</b>	<p>Forms have been designed as part of this specification, but the programmer must secure that the forms are user friendly and according to the Microsoft convention, and according to the general GUI improvement described in a separate document. .</p> <p>The GUI improvements have also been implemented by handwriting on all forms. See hardcopy of this specification. Also some specific references to GUI with special relevance for the measurement module are given in the next chapter.</p>

## Measurement (part II) and geography

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<b>GIS</b>	GIS functionality relevant for the measurement database is described in the GIS specification given as part of the modularization process. References are only made in this document.
<b>Graphics</b>	Graphics relevant for the measurement database is described in the Graphic specification given as part of the modularization process, and these user requirments are implemented in this specification.
<b>Dataflow between ENSIS Databases</b>	<p>A separate document describing how data can flow between databses (to make the flow of data effiicient and safe) has been made. Norgit has transferred these user requirments into functionality specification. NIVA has commented on the Norgit specification, and still 1 week of work by Norgit remind to finnish the requirements.</p> <p>The functionality is extremely important for many reason and in particular for adapting to the WRD annd implementing the national database in China.</p>
<b>Response time</b>	This document does not describe the response time for the measurement module, but a separate document describing response time has been made.

## **1.3 Gui**

### **1.3.1 General GUI improvements**

Forms has to the extent possible been prepared to better explain and illustrate the functionality described in this document.

The GUI shall always follow the ENSIS convention determined as part of the modularization of ENSIS, which among others determined that Microsoft standard shall be used.

Examples of functionality described in the general GUI document with especial importance for the measurement module are:

- ◆ Marking an area in the registration form for values(the flexigrid) and copy the selection to clipboard and paste it within the flexigrid or in external application such as excel. Other way around it shall be possible to copy a selection from excel and paste it within the flexigrid.
- ◆ Possibilities of edit in tables (several record at the time)
- ◆ Multiple selection in lists
- ◆ Sorting possibilities (based on typing characters and jump to selected record, and multiple column sort possibilities in lists)
- ◆ Multiple deletion
- ◆ Improved functionality of entering dates and time in the system
- ◆ Logic between search criteria and internal logic in the forms depending on measurement type and sampling method.
- ◆ Consistency to the extent possible (without affecting the user friendliness) between the different measurement types (see description below)

Changes to this document with respect to GUI shall be documented and approved by NIVA

### **1.3.2 Types of Measurements and sampling type will influence registration**

It has to the degree possible been a goal to keep the registration forms and the database structure similar for different types of measurements, without affecting the usefulness of the application. This is with respect both to the user and the programmer.

However, the different types of measurements requires to a certain degree different types of properties and registration. For some measurement types these are major changes compared to the current ENSIS 2.05 application, but for some others these are only minor compared to current application.

The registration of measurements is controlled by the user defined measurement type which is again linked to a hardcoded "Measurement type reference". The measurement type reference guides the user to adapted registration forms.

The measurement type is again linked to the sampling type (NB called sampling method in ENSIS 2.05) which allows the user to have different types of internal logic within a registration form (i.e. slightly differences between regular and irregular measurements/samples)

The forms are not designed based on the current structure of the database. A registration form will typical be based on the actual working procedure and might not reflect how data are organised in the database in data classes. This implies that there are many links between data classes to enhance the way data are entered in the system. The same form can be reached from several places, and data belonging to different data classes can be registered in the same form.

### **1.3.3 Search, Registration and presentation.**

#### Search

Search criteria for measurements have to the extent possible been kept the same for the measurement types, meaning that there is a set of common search criteria. Measurement type is for instance a main search criteria (given early in the search criteria forms) and will limit the other possible search criteria in the forms.

The specific search criteria for groups of measurement types are located on separate tabs together with the main search criteria.

As a general rule the search criteria are based on logic, meaning that a search criteria will limit the options in other search criteria (i.e. choice of medium limits the list of components as in the current application) Which search criteria which will be available will also depend on which sub module that are implemented.

The logic between the search criteria shall not slow down the application beyond the minimum requirements (see separate document)

#### Registration

Measurements for measurement types which have almost the same properties might also be opened in the same registration form. The possible combinations are described later in this document. However, even if measurements from different measurement types can be searched for from the same location in the application, it will not be convenient to open some of these in the same form. In those cases several forms will be opened at the same time (i.e one for the registration of biota and one for physical and chemical measurement in water)

In this case it is very important that even the user needs to open separate forms for measurements and common sampling information for different types of measurements it shall be possible to point at one date/timestep in one of the forms and the cursor will automatically go the records with the same time step in the other forms.

If it is practical convenient or not for the user to enter or view measurements of different measurement types in the same form even if this is technical possible, is up to the user to decide.

#### Presentation

In many cases the most important will be to graph different measurement types together, even if the measurements belongs to very different measurement types, and in some cases have these data in the same table view. Example of graphs for measurement types and



combination of measurement types are explained later in this document. In addition to measurement types the default graphs will also depend on the sampling type.

It must be pointed out that these graphs are default graphs and the user can select any other type of graph, when he/she is in the graph modus.

### Look up tables

Look up table has whenever possible been kept the same for the different measurement types, but in general there is functionality in the look up tables to check which measurement type the record in a list is valid for. Also the link to medium is very often given. This separation of look up tables based on measurement types will enhance the registration, because it will limit the available options in lists and combo boxes.

## 1.4 Import and Export

### 1.4.1 Import through the user interface

The import and export functionality is designed for the user including the administrator.

It is therefore very important that the data checks in the import routine are as strict as through the import interface. However, the checking slows down the response time, and special measures have to be taken to speed up the application (see separate document about response time)

In general all classes and properties described in this specification shall also be present in the export, import and report generator.

### 1.4.2 Import directly to the database

However, it is important to keep in mind that the import routine might not be convenient for all purposes, i.e. during big conversion jobs from other databases, the administrator might want to go directly in the database. Such types of import jobs requires a well documented and well structured database instead so that it is possible for a database administrator with programming knowledge to go directly to the database

### 1.4.3 Functionality improvements

#### Small and capital letters

In the current application there is a problem between use of small and capital letters. The system should handle this in a better way than today.

#### Importing regular timeseries

If dataseries with sampling methods with regular timesteps are imported the system should loop through the data and add missing data for the missing rows. The user shall get a warning before the import is completed, and the log file shall contain the date/time where missing values were added.

#### Metadata

Import of station metadata to Ensis is time-consuming. Metadata has to be imported one by one even though the metadata types are predefined. We would like to import all station metadata in one operation. We have one suggestion:

Property:	Station	Metadata	Metadata	Metadata
Reference:	Key/CODE	Key	Key	Key

It must be possible to use Property Metadata as many times as we want. Reference to property could be the ID of the specific metadata. Ex: Metadata Kommunenr has ID no 19 and Metadata Kartblad has ID no 12. Import of these two metadata types could be done like this:

Property	Station	Metadata	Metadata
Reference	Key	19	12
	1	Kommunenr	Kartblad

	2	Kommunenr	Kartblad
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### **Import of owners**

Import on the classes Owner(s) and WWTPInformation has the property refContactPerson. We don't think this shall be as a reference, I think it shall be a property directly on the classes Owner(s) and WWTPInformation. It shall also be two separate properties, one for the first name and one for the last name.

## **1.5 Basic Concepts and major changes**

### **1.5.1 Measurements for pollution sources**

The measurements for the pollution sources are in ENSIS 3.0 linked directly to the pollution sources and not the monitoring stations (ref. specification for pollution sources) .

### **1.5.2 Measurement Station**

A monitoring station is a geographical description of where the measurements are taken. Name, ID, code and location, given as a point with x- and y- co-ordinates relative to the project co-ordinate system and the altitude above sea level, describes the station.

The altitude above sea level describes the altitude of the water table. However, in addition there is need for a property to describe bottom depth.

A monitoring station can be made representative for a water object, and area a grid or a transect of a lake or coast.

Also the station has a link to medium and measurement type which can be set manually (if the station refers to other databases), but which is also updated automatically based on the measurements linked to the station (if any).

From the station form it is also possible to get to the filtered list of geographical objects the station is within.

The station definition is therefore as in the current ENSIS application with only a few modifications.

### **1.5.3 Measurement position**

A measurement position is linked to a monitoring station and is the point where the measurements are taken, described by x and y co-ordinate (usually the same as station, but can be different) a code which by default is "ST" and a z1 and z2 co-ordinate, relative to ground or water surface in meters.

For measurements in the medium air the z co-ordinates will describe the height above ground, while for water measurements the z co-ordinates will have a negative value and is describing the depth below the water surface. Normally only z1 will be given, and z2 will only be used for composite samples when the values is representative for a depth/height above ground interval.

The measurement position shall therefore be kept as in the current application, except for that not all measurement types use all properties of measurement position. This is described later in this document together with some minor improvements of the measurement position.

### 1.5.4 Measurement Type and consequences for the database structure

Measurement type is as explained a new property (partly implemented in the current application) to describe the type of measurements in order to achieve an efficient registration and search for data.

The measurement type is user defined, but is linked to a hardcoded **Measurement type references**. Several user defined measurement types can be linked to the same hardcoded reference.

The hardcoded measurement type references are:

1. Physcial/Chemical data for water, sediment/soil and air (including precipitation chemistry) ①

2. BiotaChemistry\_FISH ②
3. BiotaChemistry\_Benthic animal
4. BiotaChemistry\_Vegetation

Same structure for measurements, but common sampling information is different. Covered in this specification but Benthic Animal and Vegetation shall not be programmed before after approval of fish

5. Biological Data\_ (Taxonomy)\_Phytoplankton
6. Biological Data\_ (Taxonomy)\_Zooplankton
7. Biological Data\_ (Taxonomy)\_Benthic Animals
8. Biological Data\_ (Taxonomy)\_ Macrovegetation
9. Biological Data\_ (Taxonomy)\_Pheriphyton
10. Biological Data\_ (Taxonomy)\_Fish (Not covered in this specification) ③

Same structure for all biological groups, only minor differences . 5 and 6 almost identical, 7,8,9 almost identical

The measurement type references are modularized and which measurement type references which is implemented depends on the sub modules implemented. The programmer shall be aware of that there are only minor differences between the types in each main group (see figure above). Making one structure to work within each main group will therefore give the others.

Only 1 main group 1 will be of relevance for the air medium, however this group will typically cover a Varsity of other mediums including soil and groundwater .

How the hardcoded registration forms behave (the logic within the form) is also a function of sampling type (as in the current application). I.e the logic for an regular serie is different from an irregular. Instant value is different from partial duration values etc.

All measurements independent of measurement types have:

- ◆ Measurement time series definitions (or “home” of the measurement values and common sampling information)
- ◆ Common sampling information (new concept which is common for all measurements taken at the same time, place (x,y,z), for the same measurement type and in the same medium)
- ◆ Measurement values and corresponding attributes

If dataserries, common sampling information and measurement values should be grouped in three different classes in the database, or if some of the measurement types only have 1-2 classes is up to the programmer to decide based on the description in this document.

It is for instance most likely that some of the hardcoded measurement type references can refer to the same class with the consequence that some of the class properties will be inactive depending on the measurement type. However, it is unlikely that it is efficient to group all measurement types to the same classes since the properties varies. Especially between chemical/physical data and biota chemistry.

The measurement type references 2-4 can probably refer to the same dataserries definition class and the measurement values, but need different structure when it comes to the common sampling information.

When it comes to the last ones (biological data\_ taxonomy ) these may probably refer to the same tables, but which property to be inactive/active will depend on the measurement type references.

A previous version of a complete list of properties existing for each of the hardcoded measurement type can be seen in appendix 1 (however use this only as an indication the appendix is not updated, and to get an overview of allproperties the programmer must read chapter 4, 5 and 6 carefully).

### 1.5.5 Sampling Type (sampling method)

The property named **Sampling Method** in the current en ENSIS 2.05 which is renamed to **Sampling type** serves two purposes. First it describes the sampling technique used.(but not the equipment used see description below) Secondly, but more important, it defines the time series properties of the data series.

The user needs to describe:

- ◆ Step type (irregular, regular), as in the current application
- ◆ Value type (instant, full duration, partial duration), as in the current application
- ◆ Either “Measured at site” or “Sampled and Analysed at laboratory”, new property
- ◆ Either Composite Sample or Single Sample, new property, and
- ◆ Proportional factor, as in the current application.

Sampling type direct the use of graph defaults, and the internal logic in the registration forms.

### 1.5.6 Medium

A medium refers to the environment in which the measurements are taken and is not the same as measurement type.

However the medium has a link to measurement type list (this is new functionality)

The main mediums are typically air, water and soil. Mediums for water can be river, lake, coast, groundwater, etc. The medium and component definition are used to enhance registration and search for measurements (i.e. limit the options in the component and species list).

A level of sub mediums in addition to the examples given above, might also be relevant. Sub mediums describing different organs in biota might in particular be relevant for lakes, rivers and coastal area since measurement type only filter on biota and not on the different organs the samples are taken in.

Medium is a complete user defined property to enhance search and registration of data and does not influence on the design of the registration form (ref measurement type)

### 1.5.7 Component (exclusion of the parameter concept)

The component concept is meant to cover both chemical and physical measurements.

The component is global functionality in ENSIS and is linked to the majority of main modules. I.e. measurement module, geographic module, pollution sources module, dataset module etc.

Within each module the component may be linked to several other classes 'relevant for the module.

I.e.

For the measurement module the component shall be linked to:

Medium: Required

Measurement Type: Required

User defined component group: optional (to enhance search for data)

A full description of the new component is given later in this document.

It is important to notice that the possibilities of linking component to medium in the component form have made the parameter form unnecessary. The parameter concept shall therefore be removed from the application.

### 1.5.8 Species Inventroy

Species Inventory is a system defined in order to be able to register biological species and to link data to these.

The user (usually the admin) is given the possibility to construct a full user defined taxonomic list where all species are registered in a user defined taxonomic structure.

In addition to the structure there are some special properties defined for species and it is also possible to link picture of the species on the lowest level of registration.

Otherwise the species definition behave very similar to the component definition. The species are also linked to other tables in order to enhance registration:

Medium: Required

Measurement Type: Required

User defined biological group: optional (to enhance search for data in the application)

### 1.5.9 Measurement time series -Dataseries

A measurement time series is the “home=key” of the measurements in order for the measurements to be unique.

The definition of a dataseries depends on the measurement type and the sampling type.

### 1.5.10 Common sampling information (new concept)

Common sampling information is a set of information which is valid for a certain time, place and measurement type, and which is common for all measurements within this measurement type taken at the same time and place. The common sampling method can be regarded as meta data for some sort of batch.

### 1.5.11 Instrument

Instruments are described in the database by three sets of properties. First there are properties that describe the instrument type, which will be identical for all instruments of that particular type, for example measurement principle. Secondly there are properties that describe one specific instrument, like for example serial number and manufacturer. The last set of properties is related to the installation of the instrument at the station, like for example measurement position and installation date.

The functionality for instruments makes it possible to describe the measured values, but also to create an instrument inventory.

The instrument is already implemented in the application.

The availability of instrument or not in the registration forms is a function of the registration of sampling type. Only series with property “Measurement at site” will have the possibility to link instrument.

The link of instrument to the data shall be done on the measurement value level, and not on the dataseries definition level.

### 1.5.12 Analysis

There are several properties describing analyses. Analysis are used to describe the chemical analysis method. The most important are method name and description, in addition to laboratory.

Analysis information is already implemented in the application, but the most important change is that property shall be moved from the data series level to the measurement value level to describe each of the measurements and not the series.

Another important change is that analysis will only be available in registration forms where the data series definition are linked to sampling methods with property “Sampled and analysed at laboratory”

Some minor changes for analysis method have also been implemented.

### 1.5.13 Counting Method

Counting method is the equivalent to analysis method for chemical components, with the only difference that it is used to describe how species are counted.

Counting methods is a very simple look up table.

### 1.5.14 Sampling Equipment

Sampling equipment is used to describe the type of equipment used when sampling. It is not the same as sampling method.

Sampling equipment is part of the sampling handling procedure, but in many cases the user wants to have this field searchable.

The sampling equipment is either linked to the common sampling information or directly to each measurement value depending on the measurement type.

The rule is that it is linked to the measurement values.

### 1.5.15 Sampling Procedure

The sampling procedure is a look up table given by a code and a descriptive name. The code refers typically to a special procedure which describe sampling, preservation, transport, and other steps before the samples are analysed.



This is part of the QC system before the sampled is analysed.

Sampling handling is a new property, and is usually linked to the measurements.

### **1.5.16 Security Flag**

Security flag is a very similar to QA status flag. The security flag shall however give guidans on how the data may be used. Examples on flags are 1) Can not be published, 2) public, 2) for internal use etc.

Depending on the flag status the data may be excluded from calculations/graphics, included in calculatios/graphics with warning or for information purposes only.

### **1.5.17 Registration of Replicates and other changes on the measurement value level**

Registration of replicates is only valid for measurement types linked to chemical and physical components in water, sediment and biota.

It shall in ENSIS 3.0 be possible to register replicate samples for measurements taken at the same place and time and analysed for the same component. The measurement value class has been extended with this property.

The measurement value has also been extended with some other properties and some have been removed. The content and behaviour of the measurement value class depends on the measurement type.

## 2 Menu

The table below is a suggestion to new menu structure (all sub modules implemented)

Measurements	Measurement data		C	
	Extern database		C	
Station	Stations		C	
	Station Dataset		C	
	Surrounding Area		C	
	Site Classification Code		C	
	Station Metadata		C	
Calculations	Statistics	Descriptive Statistics	C	
		Regression	C	
	Calculated Timeseries	Aggregation	C	
		Time Series Calculator	C	
	Waterflux		W	
	Quality Classification	Quality Classification Routine	W	
		Quality Classification System	W	
	Meteorology	Rose	A	
		Stabfreq	A	
		Metfreq	A	
Quality Assurance	QA Flags	QA Status	C	
		QA Level	C	
	Routines	Component Limits Routine	C	
		Sum of Components Routine	C	
		Delta values Routine	C	
		Identical values Routines	C	
				C
Analysis and Sampling	Laboratory Analyses		C	
	Laboratory Adresses		C	
	Sampling Equipment		C	
	Sampling Handling Procedure		C	
	Counting Method		W	
Instruments	Instruments		C	
	Instrument Type		C	
	Measurement Principle		C	
	Asseccories		C	
Definitions	Biological Definitions	Species Inventory	W	
		Species Characteristics	W	
		User Defined Species Group	W	
		Taxonomic Level	W	
		Semi Quantative Definitions	W	
		Biotachemistry_Fish Definitiones	W	
	Measurement Type		C	
	Medium		C	
	Component		C	
	Sampling Type		C	
	User Defined Component Group		C	
	Storage Format		C	
	CSI_Userdefined Variable		C	
	Odour		W	
	Colour		W	
	Administrative Projects	Administrative Project Inventory		C
		Security Flags		C

The last column indicates if the entry is a common entry for air and water (C) and air module specific entry (A) or a Water Specific entry (W).

This indicates the commonalties on a high level. The sub modules behind the different menu entries may however vary (see the document "Ensis modules" as part of the modularization documents).

The definitions are as elsewhere in specification greyed out and located under the main entry where they are used. In the application definitions shall be separated from the main menu entries with a horizontal line.

NB graphics has been taken out as a separate menu item since the user has to always go through the search for measurement data in order to graph something. Graphing possibilities both exist for raw data, calculated time series and for other types of calculation. The access to graphic is therefore integrated in these functions.

### 3 Main entry to the measurement data-Overview

#### 3.1 Main Form

The user will go through the menu as today and select the menu entry Measurement Module|Measurement data|Measurements in ENSIS. The other main entry from the entry Measurement Module|Measurements| is the link to external datasources which contain a reference to measurements in external sources, but which are not stored in ENSIS. In this way ENSIS can be used as a Metadata system for measurements and as a true measurement database.

The form above is used to search for data and to work further with the measurements in graphs or tables, run QA checks, and to export to other applications. It is also from this location new series are created , deleted or appended (append is only valid for calculated). Also the user has a link to other relevant menu items from this location, including the calculation menu.

Depending on the measurement types searched for, one or several of these main form above will be filled in after applying search, however for some measurement type the registration

table will be opened directly i.e. for biological data). **Sjekke dette. Kan ikke alle selv biologiske komme opp her (ref dataserie def)**

The specifics for search criteria depending on measurement type are described under each measurement type. This chapter only describes some commonalities.

### 3.2 Search criteria

The user has access to several search criteria in order to find the measurements the user is searching for. The user may apply these search criteria or execute the search for measurements directly as in the current ENSIS 2.5 application.

Based on experience with the current application the user should in addition to advanced search criteria form, also have access to Quick Search criteria including :1) User defined search combinations for measurements, 2) Search for measurements at stations based a specific measurement type, and 3) search for measurements based on the station code or the station name.

#### 3.2.1 Search for measurements by using user defined search combination

Search combinations is a new concept and are user defined search combinations. User defined search combinations are specific for the user logged on a particular project. There is one hardcoded entry in this combobox which is "last search". The other entries are user defined combinations which the user has saved to the database. See explanation of the form "other search criteria" below.

If the user uses the "search combination" this will overrule the measurement type search and the code and station name search (Is used as an independent search criteria )

#### 3.2.2 Measurement Type

The userdefined measurement types will be available in the combobox. The user may select a particular measurement type to easily search for dataserie within this measurement type.

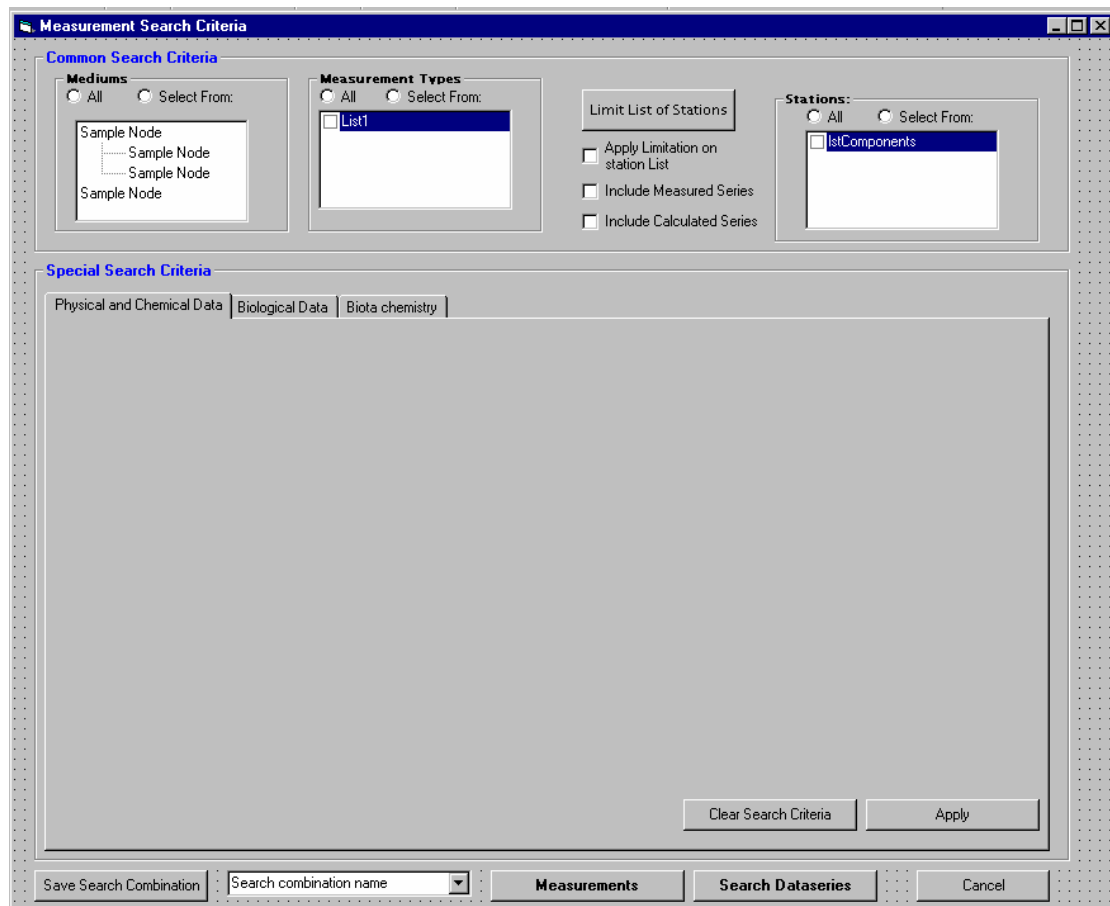
If the user does not select measurement type, all dataserie independent of measurement type will be found (as in the current application)

#### 3.2.3 Search for measurements at station

The user may search for measurements at some station by using the Code or the name. See existing functionality at the station search criteria form. The user uses the operator and write in the code or name field. If the user uses other operators that "equal to" both fields will be enabled and work together with AND. If the user selects equal to the code will give the name and vice a verca.

If the user in addition has undertaken a measurement type search, this search will work in combination with the Code/name search (AND statements) .

### 3.2.4 General and specific search criteria dependent on measurement types



The search criteria form (reached through “other search criteria”) will have some common search criteria and some special search criteria depending on measurement type. The special search criteria, on the “other search criteria” will be separated by tabs. This means that the number of tabs will depend on how many submodules (How many hardcoded measurement type references) the database is configured for. There will be three TABS in total if all hardcoded measurement types described in this document is implemented.

The figure below shows which measurement types which belongs to which Search criteria tab:

◆ Chemical and physical component in Air and waterresources, Chemical and physical component in soil and sediment, Water Chemistry in precipitation	} <b>Tab 1:</b> <b>Physical and Chemical Data</b>
◆ Biological data _Macrovegetation ◆ Biological data _Pheriphyton ◆ Biological data _Phytoplankton ◆ Biological data _Zooplankton ◆ Biological data _Fish ◆ Biological data _Benthic Animals	} <b>Tab 2</b> <b>Biological Data</b>
◆ Biota chemistry _Fish ◆ Biota chemistry _Benthic animals ◆ Biota chemistry _Vegetation	} <b>Tab 3</b> <b>Biota Chemistry</b>

If the database is only configured for one i.e. (Physical and chemical data in water and air), there will be no Tabs and the special search criteria “TAB” will be seamlessly integrated with the common search criteria (the current ENSIS 2.05 application).

### Principle for search

The principle for search is that the user typically starts with common global search criteria (Such as station), thereafter the search criteria for the particular group of measurement types are listed on each TAB. These particular search criteria are designed to find the different dataseriees based on the properties of a dataseriees. Thereafter the user may want to only search for dataseriees which contain special types of measurements , this is the third level of search and are hidden behind buttons on each main TAB. It is important to keep in mind that if the User applies the search criteria which applies on the measurements within the seriees, the system will remeber this search when going to the measurment tabel and graphics. Hence, the user may change these special measurement search criteria from the measurement table and the graphs.

In this chapter only the common search criteria are explained, the special search criteria for the different TABs are explained in chapter 4,5, and 6.

### Common Search criteria

The selected measurement types limits the medium and the combination of the two limits the station list.

The user also needs as in the current ENSIS 2.05 application to decide if both measured and calculated series satisfying the search shall be found. By default only the measured series is checked.

If the user has selected a particular measurement type before entering the “other search criteria form” this measurement type and thereby also the medium will be checked. The special search criteria TAB relevant for the selected measurement type will be in focus.

If the user has used the station code /name combination search the relevant medium and measurement type references will already be checked. The limit list of station will disabled and the found stations will be listed. The user may set further search criteria.

If the user has entered a search combination this search combination will be filled in and the user may set further search criteria.

If the user has entered the main search form for dataserie from the station form. a filtration of stations as in the current ENSIS 2.05 application has already been performed. The limit list of stations will as in the current application be disabled, and the common search criteria and some of the specific search criteria will be filled in.

### **Clear Search Criteria and apply**

The clear search criteria applies to the Tab in focus. The clear search criteria will blank the form and the apply will secure that the search criteria are applied before moving to the next TAB.

### **Search Dataseries**

This will start the search for dataserie satisfying the search, meaning returning to the main entry form, but with the found dataserie listed. (After setting the search criteria it is not necessary to first return to the found dataserie form and then start the search as in the current application. It is obvious that after a user has set the search criteria. he wants to search )

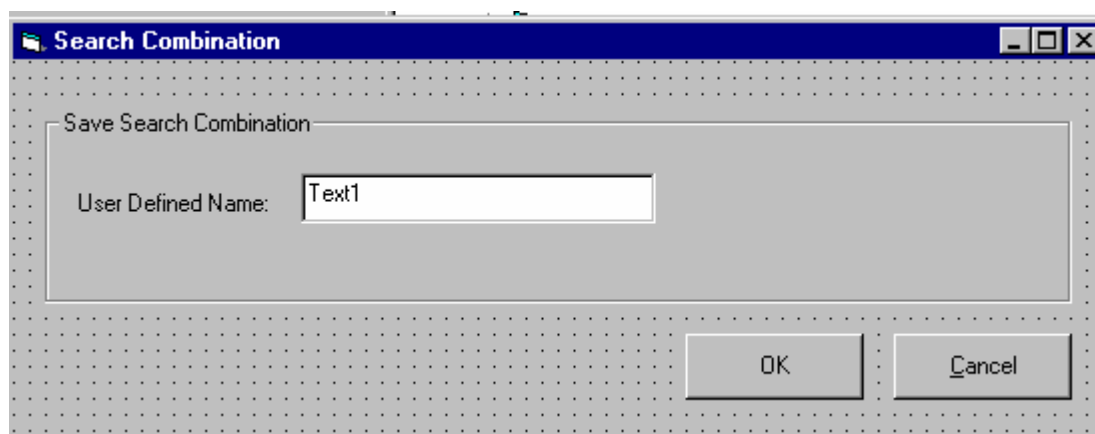
### **Measurements**

It shall not be necessary for the user to return to the main form in order to open the tables with the measurements. The user may directly enter the measurement tables after setting the search criteria One or several measurement registration forms will be opened. However, the user may with this operation start a search which takes a long time. A message saying that the system is searching for data shall therefore pop up, where the user must be able to stop the search. Another consequence of this direct access to the measurements might also be that there are to many measurements satisfying the search. In this case the user will get an error message saying that there are to many measurements satisfying the search, and that the user has to limit the search further.



### Save Search Combination

Finally the user may want to save a particular search combination (including those set on the TABs). In those cases the user needs to give a user defined name to the combination. These user defined search combinations will show up in the combobox, and will as explained above be available in the main form under “Quick Search for measurements”.



The combobox will always contain the hardcoded option "Last search" which is the last search criteria set independent of if the user has saved the combination or not.

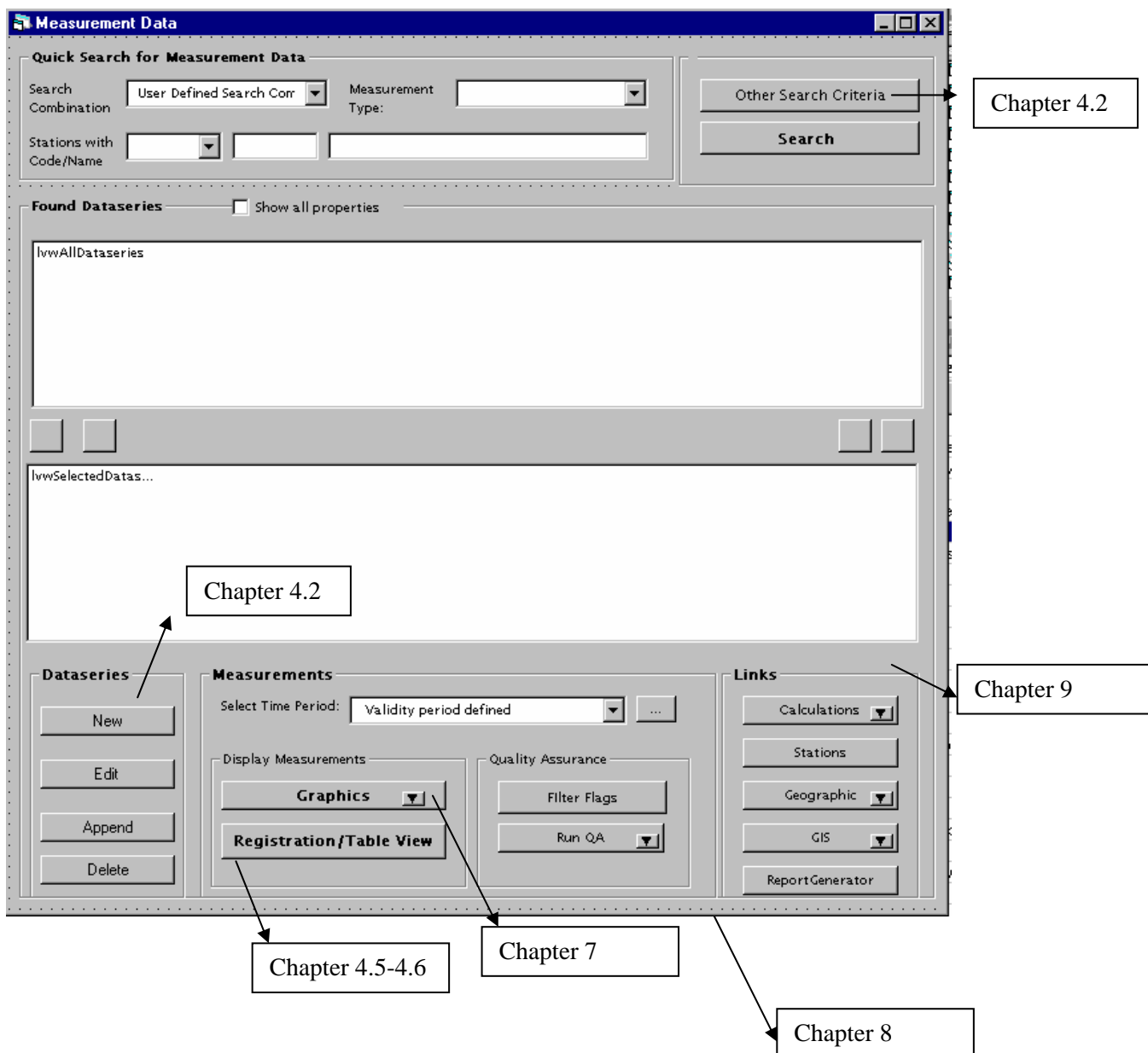
It is important to notice that the search profile (the set of search combinations) shall be specific for a particular user and project. If the user wants to delete a user defined search combination he she needs to select an entry in the combobox and choose delete.

## 4 Measurements-Physical and chemical data for water and air

This is the measurement type reference which will cover the ENSIS 2.05 functionality, with some special adaption in particular for precipitation chemistry

The form is described in the chapter as indicated on the figure

### 4.1 Main entry form to measurement data and specific search criteria



## 4.2 Search criteria

### 4.2.1 Search criteria form

The screenshot shows a software dialog box titled "Measurement Search Criteria: TAB : (Physical and chemical data)". It is organized into two main sections: "Common Search Criteria" and "Special Search Criteria".

**Common Search Criteria:**

- Measurement Types:** Radio buttons for "All" and "Select From:". A list box contains "IstComponents".
- Mediums:** Radio buttons for "All" and "Select From:". A list box contains "Sample Node" (three times).
- Limit List of Stations:** A button and a checkbox for "Apply Limitation on station List".
- Stations:** Radio buttons for "All" and "Select From:". A list box contains "IstComponents".
- Additional checkboxes: "Include Measured Series" and "Include Calculated Series".

**Special Search Criteria:**

- Three tabs: "Physical and Chemical Data" (selected), "Biological Data", and "Biota Chemistry".
- Sampling Type:** Radio buttons for "All" and "Select From:". List box: "IstComponents".
- Measurement Position Code:** Radio buttons for "All" and "Select From:". List box: "IstComponents".
- Z1 Position (meter):** Radio buttons for "All" and "Select From:". List box: "IstComponents".
- Z2 Position (meter):** Radio buttons for "All" and "Select From:". List box: "IstComponents".
- Limit to component group:** Radio buttons for "All" and "Select From:". List box: "IstComponents". Includes "Other limitations" and "Apply" checkboxes.
- Components:** Radio buttons for "All" and "Select From:". List box: "IstComponents".
- Search for dataserie based on measurements specifics:**
  - "Dataseries with measurements within timeperiod:" with a dropdown menu and a "Special Selection" button.
  - "Dataseries with number of measurement:" with a dropdown menu set to ">=", a text box with "1", and another empty text box.
  - "Other Search criteria" button and "Apply other search criteria" checkbox.

At the bottom of the dialog, there are buttons for "Clear Search Criteria" and "Apply". Below the dialog, there is a "Save Search Combination" section with a text box for "Search combination name" and a dropdown arrow. To the right are buttons for "Measurements", "Search Dataseries", and "Cancel".

### 4.2.2 Common Search criteria

The common search criteria are explained earlier in this document. The special search criteria are the same as in the current ENSIS 2.05 application. Some extra search criteria have been added and some of the existing are regarded as special and hidden behind buttons. Further almost all search criteria for dataserie based on the properties of the measurements contained in the series are hidden behind the Other Search criteria button.

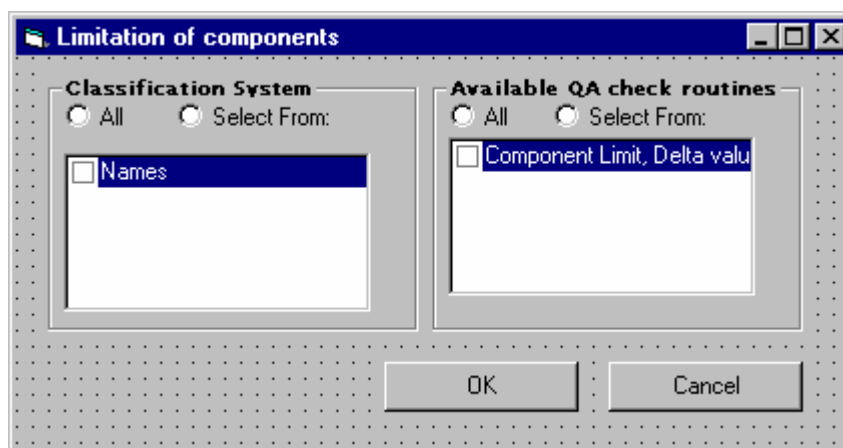
#### 4.2.3 Special Search Criteria-Section 1-search based on properties of dataseries

**Sampling Type:** As in the current ENSIS 2.05 application, but the list of available sampling types are limited based on previous selections.

**Measurement positions code and Z1 and z2 values:** These are split in three list boxes, but are otherwise as in the current ENSIS 2.05 application. Only positions relevant for the selected stations and sampling types will be listed. Further only, z1 and z2 values valid for the selected measurement position codes will be listed. If the user select z1 the actual combinations with z2 will be found if any.

**User defined component groups:**

This is a way to limit the list of components further. All user defined component groups will be listed. <Other component limitations>: The user also has access to other component limitations if he/she prefers to apply these. The user can limit the list of components based on a selected classification system or based on if a component is defined for one of the four QA routines defined (QA1=component limits, QA2= Sum of component, Q3= Ionic Balance and Q4= Delta values). The user can apply either 1) user defined component group, 2) classification system and 3) QA routines (AND statements between the search). The user must check the apply button in order to use the criteria hidden behind the button. This is a mean for the user to be aware of which search criteria that are in use.



**Components:** The components will be limited based on the already used criteria explained above as in the current ENSIS 2.05 application. In addition the user may apply the binoculars to find the actual components (the binoculars shall apply to all controls in the form)

#### 4.2.4 Special Search Criteria-Section 2-search based on properties of measurements

These search criteria are based on properties linked to the measurements in the dataserieis searched for.

**Search for dataserieis based on measurements specifics:**

Dataserieis with measurements within timeperiod:  
[Dropdown] [...] [Special Selection]

Dataserieis with number of measurement:  
[>=] [1] [ ]

[Other Search criteria]  Apply other search criteria

##### **With Measurements within period**

To limit the search for a special period the user uses the “Dataserieis with data within period” functionality as in the current ENSIS 2.05 application. The dataserieis period (with or without special selection) work as in the current application

The programmer should be reminded of that the period works with AND statement together with all criteria in the sub form (other search criteria) as well as the next criteria explained (with numbers of measurements)

##### **With numbers of measurement**

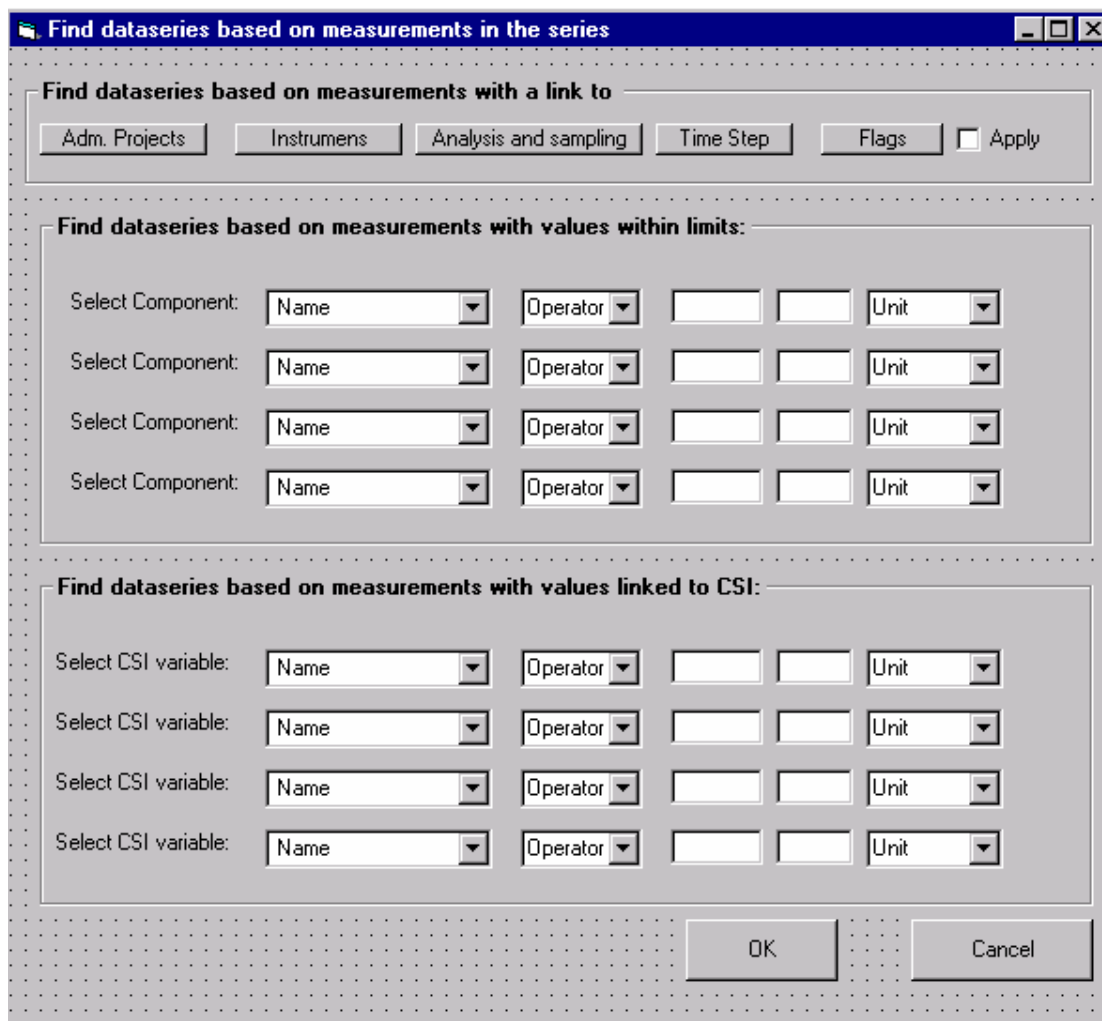
The user may as in the current ENSIS application search for dataserieis containing a specific number of samples within the given period.

The user may use the operator, =, >=, >, <=, <, between.

##### **Other search criteria**

Behind the button ”other search criteria” the user will find additional search criteria which limits the the found dataserieis based on properties of the measurements contained in the series. Some of these criteria are already implemented in the current ENSIS 2.05 application.

The search criteria form is explained below. If the user uses any of these search criteria, the apply check mark will be switch on as default. This is to secure that the user is aware of that additional criteria are set.

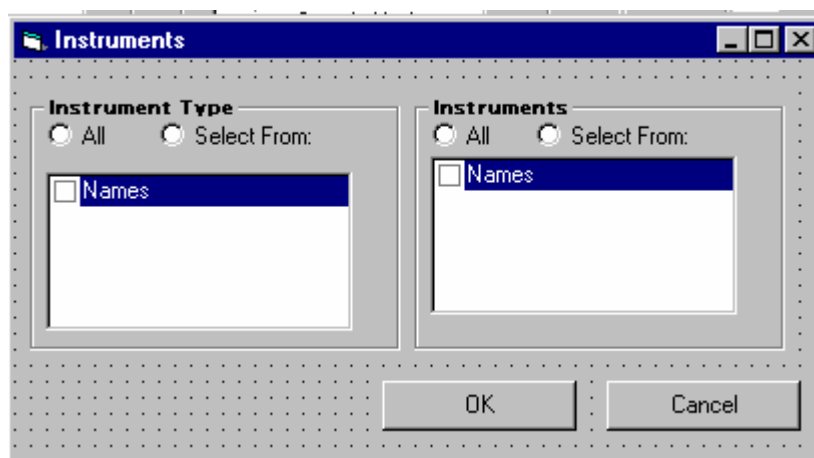


Find dataserie based on measurements with a link to

*Aministrative Projects*

As in the current application, but in a separate form as for instruments.,

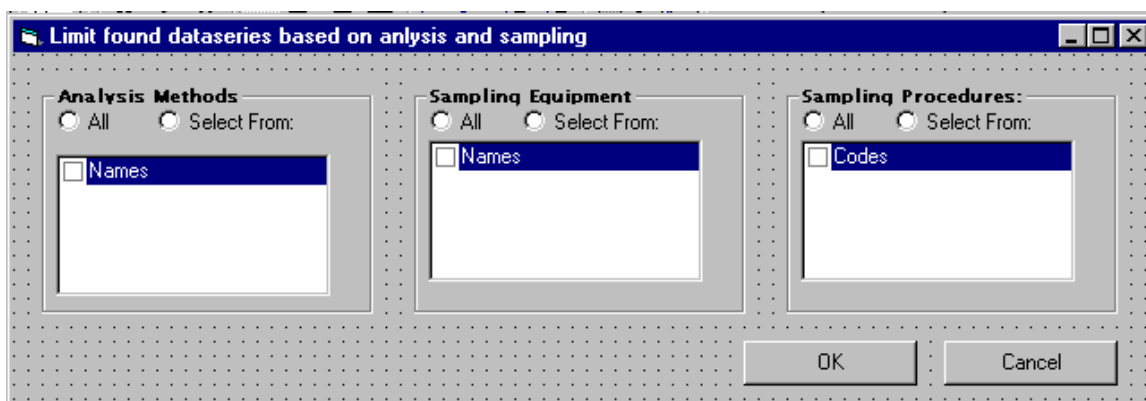
*Instruments*



As in the current application for instrument type, but instrument type limits instruments.

Also the user may limit the list to special equipment used.

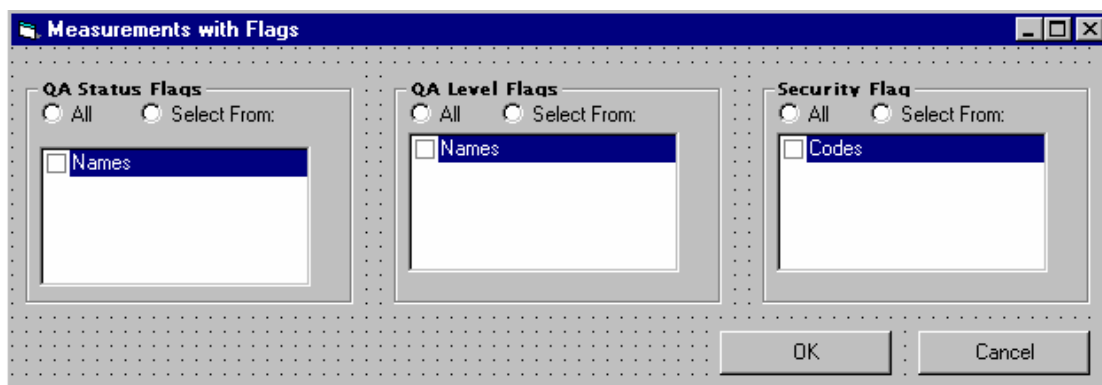
*Analysis and sampling:*



*Time Step*

As in current application

*Flags*



The user may search for all dataserie which have data with a particular QA status Flag, QA level flag or a security flag. The search criteria works together with the other search criteria.

### Find dataserie with measurement values within limits:

It is as in the current application possible to use a numerical criteria with respect to the measurements value as in the current application (I.e. all dataserie with PTOT >12 mg/l). The difference is that the user may define several conditions, with four as a maximum.

The available list of components will be limited to the selection already done.

### Find dataserie with measurements related to common sampling information (CSI):

It is possible to select one of the defined common sampling variables CSI which are defined for the selected measurement types (only the CSI defined for the measurement types will be available in the combobox). The CSI may be numeric or a text variable (same functionality as for Station meta data search). This means that if it is numeric the operators will be those linked to numeric variable, unit will be available and the possibilities to enter a range for

value of the variable. If it is a text variable, operators for text variable will be available, and the unit and range will be disabled.

If the user applies the CSI search all dataseriees which have one or several measurements at the same timesteps as the CSI variable satisfying the search will be found.

The user may define several conditions (maximum 4), where AND statement is used as elsewhere in the application.

### **Measurements and Search for Dataseries**

The user must as mentioned above choose if he/she wants to search for data series and go through the main entry form for found dataseries or if he/she wants to go directly to the measurement registration form/table view.

#### Search for dataseries

If the user pushes the Search Dataseries button, the search will begin and the user will be brought back to the main form (The user will not have to close/confirm the search criteria and then push the search button in the main form)

The found dataseries will be listed in the upper found dataseries window.

The main form with the found dataseries and the linked functionality in the main form are explained below.

#### Measurements

If the user pushes this button he/she will be brought to the table view/registration for the measurements. However, the user shall get a search operation window telling the user that this search might take some time. The user shall therefore have an access to stop the search for this intermediate form (and not only from the main form when searching for dataseries). If the registration table can not be opened because of limitation in rows the user shall also get an error message telling the user to limit the search further. If the user has searched for several measurement types which requires different registration forms, as many forms as necessary will be opened containing the dataseries and period satysfying the search.

NB it is important to notice that even the user has applied special search criteria for the measurements (“measurements with link to” and “measurements within time period and range” as explained above), these are only criteria to find the dataseries which have one or several measurements satisfying the search within this period. However, when the measurement table and the graphics are opened all measurements within the found dataseries are shown within the selected period. However the measurements that satisfy the search criteria are marked (see explanation given in the measurement registration form.)

It is only measurements (and not calculated values) which are opened in the measurement table/registration form.



### **4.3 Found data series**

The found data series after the user has searched for data may be measured time series or calculated time series. The different types of series shall as in the current ENSIS 2.05 application have different symbols.

If the “show all properties” is checked the data series shall be listed with all properties. Such as Station where the data are measured, the measurement type, the medium and component, the period which there exist data (validity period for the data series), measurement position, and sampling type and no of samples which exist for the data series, time step and duration. Sampling procedure, analysis method etc are properties of the data values and shall not be listed. Number of samples in each dataseries shall also be listed in a column. If the “show all properties” are unchecked, which it is by default only some properties shall be shown (see table below)

The properties for the data series will be listed in the columns of the table in a particular order, and with a particular heading. The order of the properties and the properties that shall be available in the list box are shown in the table below. The user can use the scrollbar to view all properties.

All properties will not be filled in for all data series. The table list possible properties for different types of series. The table will be opened with auto fit. This means that in the case of completely empty column, these will be present but very narrow.

As in Excel the user will at any time be able to double click on the edge of the coloumn heading cell in order to autofit the particular column.

The user can sort the series on the properties by clicking on the column heading . How each property will be displayed and the sorting criteria (numerical sensitive, alpha sensitive etc) are also explained in the table. This type of functionality is already implemented in the current ENSIS 2.05 application.

According to the general GUI requirement it shall also be possible to sort the table based on the content of several columns after priority (i.e. first on A , than on D than on F as in excel)

Properties (separated in columns from left to right)	Column Heading	Show	Sort by
Station	Station	1.3	2.3
Measurement position- Code	M.Pos. Code	1.4	2.3
Measurement position, Z1 value	Z1 (m)	Exact Value	Num. <sup>1</sup>
Measurement position, Z2 value	Z2(m)	Exact Value	Num.
Measurement type	M.Type	1.1	2.2
Medium	Medium	1.1	2.2
Component	Component	1.1	2.2
Sampling Type	Sampling Type	1.1	2.2
Validity Period	Validity Period	Range	Num
Number of samples	No of samples	Value	Num
Calculation method	Calc. method	1.1	2.2 <sup>2</sup>
Timestep(in second)	Timestep(Sec.)	Value	2.1
Duration (in second)	Duration (Sec.)	Value	2.1

Properties to be shown as default

Extra prop. If "show all prop" is checked

- 1.1 Name
- 1.2 Id and name
- 1.3 Code and Name (and sort by code)
- 1.4 Code
- 2.1 Numerical Sensitive, based on ID
- 2.2 Text sensitive based on Name
- 2.3 Sort by code

The user shall be able to mark one or several rows in the table (by standard Microsoft functionality, holding the ctrl button and selecting). The button on the right hand side (dashed triangular) moves only the highlighted data serie(s) in the upper box down to the box of selected data series. The user can also select a series by double clicking on it as in the current ENSIS 2.05 application and drag and drop highlighted items.

The arrow on the left-hand side (solid black) moves all found data series down to the box of selected data series (the look of the arrow buttons may be improved since experience has shown that the user automatically select the black arrow independently of if he/she wants to move a few series) .



It shall be possible to select any of the properties when selecting a serie (which means it must be possible to point in any of the cells in a row and get the row marked)

The selected series can from the lower box be further processed as in the current application

The arrows pointing in the opposite direction deselect data series from the selection box. The same rules shall be applied when deselecting dataserie(s).

<sup>1</sup> Negative numbers shall as an example be sorted in the following way 0, -1, -2, -10 etc

<sup>2</sup> The calculated time series will be marked with the type of calculation that have been used as in the current application, however this shall be a separate column with the name of the calculation method.

## 4.4 Dataseries Definition

The dataseries definition has been changed from the current ENSIS version, some properties has been moved to be a property of measurement. Measurement type has been introduced and the form has been reorganised.

**Dataseries Definition for Physical and Chemical Data**

**Basic Definitions**

Measurement Type:

Medium: 

- Sample Node
- Sample Node
- Sample Node
- Sample Node

Sampling Type:

Time Step:   ...

Duration:   ...

Prop. Factor:   ...

**Location**

Station:  ...

Measurement Position:  ...

**Link to component**

**User defined component group**

All  Select From:

- IstComponents

**Component**

All  Select From:

- IstComponents

### 4.4.1 Part 1–Basic definitions

Measurement Type: The measurement type must be selected. All user defined measurement types are listed by their names, the user can jump to the correct location by starting typing.

The medium is limited by the measurement type and is listed by the name (not ID and name) in the treeview.

Measurement type also limit the sampling type, which is listed by name (the user can jump to the correct location by starting typing. Otherwise the functionality is as in the current ENSIS 2.05 application.

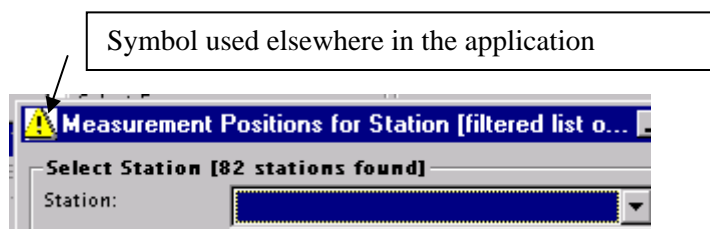
NB duration only needs to be filled in if the sampling type is defined as partial duration.

### 4.4.2 Part 2-Location

The dataserie's location is determined by the station and the measurement position as in the current ENSIS 2.05. The station shall show up with the code and the name (code, name) and be alphanumeric sensitive according to the code (the user can as elsewhere write the content of the cells directly and the system jumps to this location).

The user can also limit the list of stations to select from in the combobox. The limit list of stations, bring the user to the station search criteria and will limit the available options in the combobox.

If the user has chosen to do so there will be a symbol on the station combobox. I.e. the same symbol used to indicate filtered lists elsewhere in the application.



The chosen station will again filter the defined measurement positions for the station. The user might define new measurement positions as in the current application.

Instrument has nothing to do with the location, and is therefore removed from this form. The instrument could in theory still be part of the dataserie's definition form, but it shall be moved to the Time value level (an instrument may change over time as well as an analysis method).

### 4.4.3 Part 3 - Link to component

The components are listed by the component code. The dataserie definition described above (part 1:basic definition and 2 Location ) may be a one two many relation to the component (part 3 of the form). Meaning that several components are valid for the above mentioned description. However, when dataserie are listed and measurements are entered on the station the unique combination is Basic definition, location and one to one relation to component.

Only components linked to the selected medium and measurement type will be listed. However the user may also limit the available components further by selecting a user defined component group.

It is important to notice that the latter is only a mean to limit the list of components to select from. If a dataserie is already defined for a component and has measurements, these component will be listed and marked and can not be unchecked. Also these will be listed independently of if the user selects another component group.

The list of checked component may be extended automatically based on registration done by the user in the measurement registration form (ref. Chapter for registration of measurements).

NB from a storage point of view maybe part 3 of the form shall be separated from part 1.

It is up to the database designer and programmer to decide this based on the following requirements:

- 1) The functionality described in this document is implemented
- 2) The database is optimal in terms of responsetime, and
- 3) Efficient export/import is possible.

### **Unit shall be moved to value level.**

The unit which is part of the dataserie definition in the previous ENSIS version, should in ENSIS 3.0 be a property of the measurement value and not the time series. The only rule the system must follow is that within each unique combination of station, measurement position, medium, measurement type, sampling method and one component only values with units referring to the same unit type may be present.

This means that if the user starts to enter measurement values (manually or by import) these may be entered with whichever unit within a particular unittype as long as the dataserie is empty. If the dataserie has value the user must enter values with units belonging to the unit type already used for the dataserie. The unit is only a matter of conversion, and will allow the user to view or enter measurements in whichever unit within the unit type. This is however an issue to be taken care of in the registration and import of values.

The limitation of unit types and units for a particular measurement type are defined for each measurement type.

### **Analysis method (laboratory) and instrument**

This is in ENSIS 3.0 regarded as properties of the measurement value, and shall not be a unique property of the series information as in ENSIS 2.05

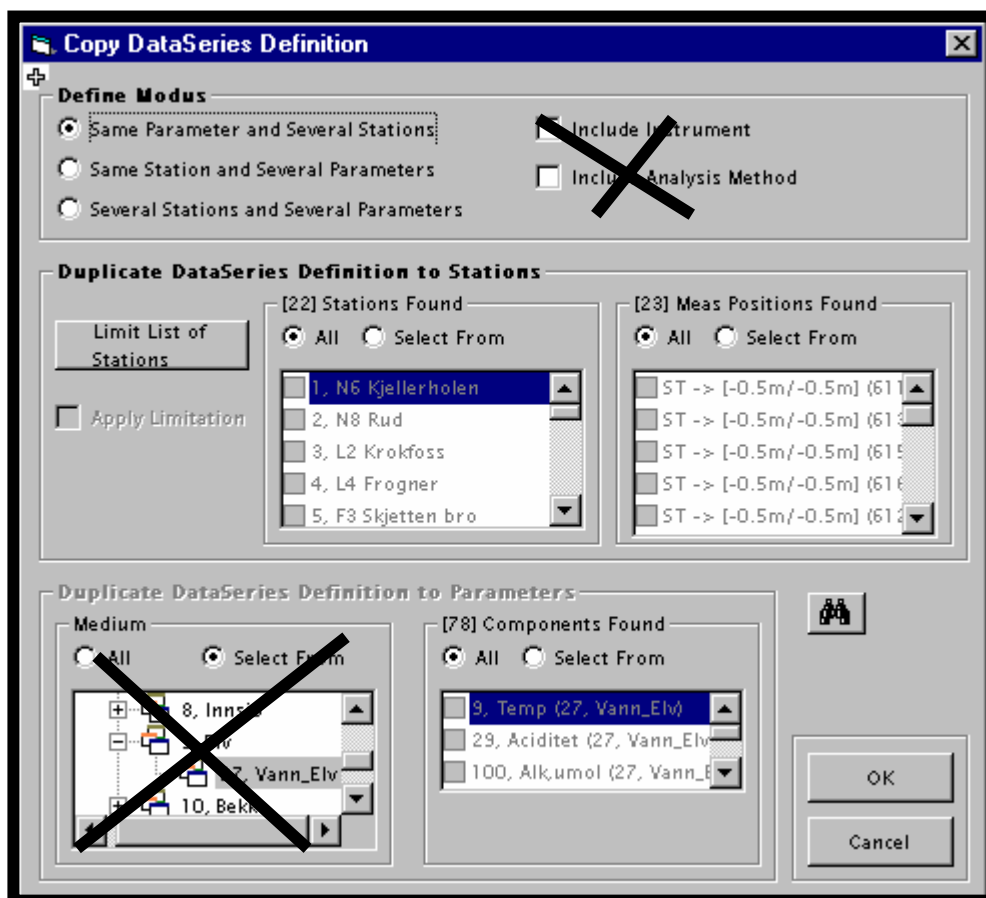
### Buttons to the right

The data button and the clear button shall be removed otherwise the functionality shall be as in the current ENSIS 2.05 application of October 2001, but be moved to the bottom of the form as elsewhere in the application.

The existing copy definition is shown below, and must be modified to reflect the changes in the dataserie definition.

The following shall be the new radiobutton options:

- ◆ Same Measurement type, medium and component, and several stations
- ◆ Same Measurementtype, medium and station and several components
- ◆ Same Measurement type and medium, but several staions and components









### 4.5.1 Measurement registration form/table view of measurements

When the user has applied the search criteria for data the user may go through the selection of found data series to this table view/registration form. The user might also reach the form above by going directly from the search criteria form for measurement as explained earlier.

This chapter describes the measurement registration for physical and chemical data and how to view the measurements with properties in the table.

The form above consist of three parts (see the numbers):

- 1) Registration modus (which can be viewed and which can be hidden for the user)
- 2) Functionality to enter one by one record to the table
- 3) Flexi grid/table with the selected period of data and with functionality to sort, copy, graph etc.

The main difference for the user when it comes to the registration of data compared to the current EMNSIS 2.05 application is that in addition to register the records directly in the table view (flexigrid), the user will have the possibilities to register one by one record.

Also there have been other improvements in terms of functionality to register the information and viewing the data.

As the user will notice the references to the dataseries has been removed from the registration form (ref. screen dump of existing ENSIS 2.05).

The screenshot shows the 'Measurements Data' window. At the top, there is a 'Modify Data within:' dropdown. Below it is the 'Dataseris' table:

Station	Compone...	Unit	QA1	QA2	Positi...	M.Pos...	M.Pos...	(x,y)	Sampling
279, Vannsjø	102, pH [4...	pH	3 ~ 10		ST	-24	-24	(264...	6, Manue
279, Vannsjø	82, NH4-N	mg/l	0 - 5		ST	24	24	(264...	6, Manue

Below the table is the 'Registration Modus' section with various dropdowns and checkboxes for 'Def. QA Level', 'Def. Quality', 'Status Flag', 'Def. Volume', 'Def. Adm. Project', 'QA1 check', and 'QA2 check'. There are also checkboxes for 'Hide Flags', 'Hide Unit', 'Hide Volume', 'Correction: none', and 'AdmProject'. To the right is the 'New / Edit' section with date and time pickers for 'From:' and 'To:', and buttons for 'Add Row', 'Delete Rows', and 'Set Date(s)'. At the bottom is the 'Measurements Data for selected Data series' table with columns for 'Start Time', 'End Time', 'Parameter', 'Value', and 'Unit'. The bottom of the window has 'Copy', 'Apply', 'OK', and 'Cancel' buttons.

The list of dataseries as in the existing version of ENSIS does not have to be part of the measurement registration form for several reasons:

- ◆ The main form is still opened where the user may see the definition of the dataseries. In addition these properties may be switched on in the flexigrid.
- ◆ Tooltip will be available as well as colour codes to help the user to know which series he/she is entering information for (if he/she select to enter the data directly in the table and not by one and one record).
- ◆ Part 2 of the form above will always be filled in with the data series definitions when the user moves around in the flexigrid. This is explained more in detail below (see section “content of table”).

4.5.2 Functionality in the form as a consequence of sampling type

The functionality in the registration form depends on which sampling type(s) the dataserie belong to. The table below shows the logic in the form depending on relevant properties for the sampling type. The logic is close to how this work in the current application.

At site/ In Lab	Step type	Value Type	Consequences
At site	Regu lar	Full dur.  Part Dur.  Instant	<p>The modify time period will be filled in with the period set in the main form or in the search criteria <sup>3</sup> (if the user has limited the view of data to a particular period) Otherwise the modify time period will be equal to the data exist period if no period has been set.</p> <p>The data series need to be parallel in time other wise several measurements registration forms will be opened. The number of maximum rows which can be opened for each form shall be as in excel. If the number of rows is larger than this maximum number, an error message will occur, and the user will be forced to set a limitation in the period before entering the measurement registration form. The data exist period will always be written under the data modify period. If the user extends the data modify period beyond the data exist period, new empty rows will be added as in the current application based on the time step.</p> <p>The user can also add one and one record by using the new button and the modify time period will automatically be updated when the record is saved. When the user uses the new button the date will be given automatically based on the last timestep of the data exist period and independent of the modify time period set (in the case where the user use the new button the modify time period will automatically be updated to “From time already set in the modify time period” to “To time of the last sample in the serie”)</p> <p>To time will be given by from time of the last previous sample+timestep.</p> <p>The properties sampling equipment/instrument will be enabled and the user may register sampling equipment or instrument which are available from the same combo box even though they refer to two look up tables. Sampling procedure will also be enabled, but analysis method will be disabled.</p>

<sup>3</sup> It is very important that limitation with respect to the period set in the search criteria or in the main form; Select Time Period is already filled in and that the user does not have to write this selection again (if any). This is a drawback of the existing version. Also it is a drawback in the existing version that if the user has not set any period the form is not opened with the data exist period as the modify data period.

At site/ In Lab	Step type	Value Type	Consequences
At site	Irregular	Instant	<p>The modify time period will be filled in with the period set in the main form or the data exist period if no period has been set. The dataseries do not need to be parallel in time (The cells with no data will be left blank as in the current application). The rules to maximum rows as above will apply.</p> <p>The user needs to enter new rows manually (by new) or use the copy/insert row functionality. To time will be equal to from time. The user may enter a date outside the modify data within period. This only means that the user wants to enter more data, and the modify data within period is updated (the user shall not have to as in the current application extend the “modify period within” in order to be able to write a date outside the modify period)</p> <p>The properties sampling equipment/instrument will be enabled and the user may register sampling equipment or instrument. Sampling procedure will also be enable, but analysis method will be disabled.</p>
At site	Irregular	Part duration /full duration	<p>As above, but when the user enters a new sample “From time” will by default be “To time” for the last measurement in the series. The user may change the default “from time”, but will not be able to save (using the apply) if the period set is overlapping with any of the other measurements.</p> <p>This will function similar for partial duration, but there will be an extra check when the user uses apply to secure that the period(from-to) is bigger or equal to the partial duration timestep.</p>
At lab	Irregular	Instant	Same as “At site” for this type of measurement (irregular and instant), but also analysis method are enabled.
At Lab	Irregular	Part duration /full dur.	Same as “At site” for this type of measurement, but also analysis method are enabled.

It is possible to open any of the irregular series in the same form, but some properties may be disabled for some of the series.

### 4.5.3 Part 1 of the measurement registration form- Show registration Modus

The options in the registration modus shall in addition to functionality described above facilitate the registration of data.

#### Show registration modus

The registration modus is by default hidden for the user when he/she enters the registration form, and the user must check the check box "Show registration modus" in order change the settings.

The screenshot shows a software dialog box titled "Registration Modus". At the top, there are two checkboxes: "Show registration modus" (which is checked) and "Saved Modus is currently applied". The dialog is organized into several sections:

- Default Settings:** This section contains several dropdown menus and buttons. On the left, there are "Date/Time Format" (set to "Default dd.mm.yyyy"), "Unit" (set to "Name"), "QA Status Flag" (set to "Name"), "QA Level Flag" (set to "Name"), and "Security Flag" (set to "Name"). On the right, there are "Adm. Project" (set to "Code"), "Equipment/Instrument" (set to "Combo1"), "Analysis" (set to "Name"), and "Sampling Procedure" (set to "Code").
- Replicates:** This section includes a "Default ID" dropdown menu (set to "1"), a checkbox "Hide Replicates with ID" followed by a dropdown menu (set to ">="), and a "Total Number of replicates" text input field.
- Hide Properties:** This section contains a list of checkboxes for various properties: Measurement Type, Medium, Sampling Type, Station, M. Position Code, Z1, Z2, End Time, Units, Equipment/Instrument, Analysis, Sampling, Flags, Adm. Project, and Hide Corrections.
- Run QA:** This section has checkboxes for "Component Limits" and "Delta Values", and a "Save Modus" button.

When the registration modus is activated (checked) only the registration modus shown above and part 2 of the registration form is available in addition to the checkboxes at the bottom of the form :

- ◆ Extend table with all properties
- ◆ View Table in separate window
- ◆ One row pr dataserie link
- ◆ Limit to search

In addition it shall be possible for the user to drag out the form (right corner) as far as his/her screen allow him/she to do so, and use the "full table view" functionality in order to have all records in a separate table, but of course with a link to the registration currently worked with.

A screen dump of the form with the registration modus activated is shown below.

As soon as the user uncheck the check box the registration modus will disappear and the registration form will be enlarged including both part 2 and part 3.

### Save Modus is currently applied

If the “save modus is currently applied” is checked this is to remind the user that the modus has been saved earlier by the same user profile (same user logged into the project), and the modus will already be filled in. The user save a modus by the save modus button.

### Default Modus

Even though the user has not used the save modus functionality, some of the settings are by default switched on in the registration modus. However, the save Modus functionality overrule the default settings.

Which settings that are default depend on the sampling method (this is explained in the table below)

At site/ In Lab	Step type	Value Type	Consequences for registration modus (already set properties when the user enters the form if the user do not apply a userdefined modus saved before)
At site	Regular	All	Def date format:.dd mm.yyyy HH:MM:SS Def replicate ID: =1 Def analysis are disabled. As well the check box for this  To be checked as hidden: All except for end time and units.
At site	Irregular	Part duratio n /full duratio n	As above except for that : Date format: dd.mm.yyyy HH, To be checked as hidden : All except unit and Run QA
At site	Irregular	Instant	As irregular above except for that : Hide End Time shall also be checked
At lab	Irregular	Instant Part duratio n /full dur.	As described above for at site/irregular/instant/ except for that Analysis combo box shall be enabled.

Which property of each default setting that shall show up in the comboboxes are shown in the form.

Several of these possibilities are already implemented in the ENSIS 2.05 application, and are self explaining. Some comments might be necessary for the default date format and QA assurance.

Default data and time format: In the database all time values are stored with the same properties in a particular manner with all properties from year to second. However, the date format is for registration and view purposes only. The user shall be able to choose any of the date or time formats available in ENSIS (see import routine)

Two of the 4 defined automatic quality assurance routines might be used in this form, the other two will only be assessable from the Dataseries main from.

If the user checks component limits and delta values this will imply that all values which do not satisfy the check will be marked with a special colour (the component limit check will be on as default for irregular samples). The table(colour) is updated when the user uses apply.

Suggestions:

Values not satisfying the limit check=red

Values not satisfying the delta value check=blue

### 4.5.4 Part 2-Registration of one by one record

#### Order of registration

The user shall be able to move in the form by the TABS in the order shown at the screendump.

**Registration of one record**

Period of Data currently worked with:

Modify/ add data within: Selected Period ...

Data Exist period:

**Link to Dataseries**

Basic Link To Dataseries

Measurement Type: Name ...

Medium: Name ...

Sampling Type: Name ...

Location

Station: Code Name ...

P.Code: Code ...

Depth/Height (Z1): m

Depth/Height (Z2): m

New Dataseries

**Register Observation**

Component

Component Code ...

Component Name ... Expand List

Date/Time (Format xxx)

Date From Time From

Date to Time to ...

Quantification

Replicate ID: 1

Value Unit

**Sampling and Analysis**

Equipment/Instrument: Code ...

Sampling Procedure: Code ...

Analysis Method: Code ...

**Admin project and Security Flag**

Project: Code ...

Security Flag: Code ...

**Quality Assurance**

QA Status Flag: Code ...

QA Level Flag: Code ...

Search Cancel Apply New

#### Period of data currently worked with

The date exist period is the total period which there exist data for with respect to the opened series. The user can at any time extend/modify the modify time period set (if any), and the table with the data (part 3 of the form) will be updated according to this.

**New/ Edit**

Year: Month: Day: Hour: Minute: Second:

From: 1995 7 28 0 0 0

To: 1995 7 28 0 0 0

The current validity form should be used for this purpose.

**NB** However, it is important to notice that the user shall be able to write directly in the date/time form and not select from the combo box. This means if the user writes 15 for the day it shall not jump to 1 or 5. This shall be valid for all places where this form is used. In the current ENSIS 2.05 version this is an annoying shortcoming.

As mentioned above the selection of modify period gives different results in the registration form depending on if it is regular or irregular samples.

Regular: If the user wants to add new rows for regular dataseries, he /she has to extend the modify time period beyond the data exist period (which is shown), and the system will add the number of rows according to the extended period and the time step. However the user may also add one by one record and the modify data within period will be extended.

It must be pointed out that it is very seldom a user wants to add measurements for regular timeseries manually (since these series usually origin from instruments which continuously register data and produces data in large amounts). These types of data are usually imported



and the measurement registration form for regular series is in practical use to edit data and export/copy data using copy to clipboard.

Irregular: The modify data within will be a consequence of limitation set in the main form/search criteria or if the user chooses to set another modify time period in this form by the “...” button. Also the modify time period will be updated according to the new values which are entered.

### Dataserie definition

The dataserie definition consists of the Basic Link to Dataserie and the Location.

The user must select the dataserie definition of relevance. Only combinations satisfying the dataserie searched for will be available in the comboboxes.

#### Basic Link to dataserie

Usually the user will register information for one measurement type and medium at the time, and has given this as a limitation (search) before entering the registration form. In the case of only one option in the combo box this option will be filled in automatically, and the user does not have to enter this information.

Only sampling types relevant for the dataserie which are opened will be available in the combo box).

Sampling type will as for the other measurement types direct the further registration as described earlier and below.

The user may view the measurement type definition, the medium, and the properties of sampling type through the “...” buttons.

#### Location

Where the sample is taken, the location, is also part of the data series definition.

The user needs to select station the registration is valid for. Only stations related to the selections of data series (satisfying the search ) will be listed in the options. The stations will be listed with their code (i.e.HORIBYR) and name (Byrkejedalsvannet). The user may type directly in the combobox and the system will go to the location. If the user selects the code the name will be given and vice versa.

The selection of station limits the available horizontal measurement positions. Usually there is only one horizontal position equal to the station. In case of only one horizontal position this will be given by default (NB if the horizontal position is equal to the station the code ST is given in ENSIS)

The user may view the station information, the measurement position and the properties of sampling method through the “...” buttons.

The selection of station and horizontal measurement position will again limit the available combinations of Z1 and Z2 (combinations already existing for this measurement type, medium, sampling method, station and measurement horizontal position).

If it is a single sample (given by the selected sampling type) Z2 will be disabled and given equal to Z1. If it is a composite sample the user needs to give “from” and “to” depth/Height. All depths must be given as negative numbers. I.e. a composite sample from depth 2-4 meters, is given by.

Z1=-2

Z2=-4

All Heights are given as positive values.

Z1 limits the option of Z2. If the user does not find the combination of dataserie he/she is looking for (i.e. a new depth must be given for the combination), the user enter the “New Dataseries definition”.

The dataserie definition will be opened with everything filled in (everything the user has already selected) except for the measurement position.

### **Defining a new dataserie**

Even though the most frequent need of the user is to define a new vertical position under the process of registration, the user should be aware of that he/she can at any time use the new dataserie definition in order to get a new- or already defined dataserie not part of the search (the limitation already done) into the registration form. This functionality is to avoid that the user has to close down the form and do a new search for dataserie.

When the user applies “New dataserie” the series definition will be opened with only the information which has been filled out in the registration form and which are described above. Hence, if the user wants to open a blank dataserie, the user blank all fields described above.

If the user defines a dataserie from this position in the application it might be that the series is already defined. The user will not know this before trying to save the definition. The user will if the dataserie already exist get a message: “The dataserie is already defined and existing data within the defined period for registration will be read into the form”

This means that the user is brought back to the registration form, and the table gets appended with extra column and data from the dataserie within the data modify period (if any) are read into the form. Also the definition of the dataserie is now a possible combination for the registration of one by one measurements.

The user must be aware of that it is as described below not necessary to enter the new dataserie definition form to define a new combination with respect to a component.

### **Register observation**

#### **Component**

The user can select the component by typing the code or the name. Only components valid for the selected measurement type will be available. Also by default the list will be limited to those valid for the dataserie searched for. However the user may expand the list to all components valid for the selected measurement type (by the expand list button)

It is important to notice that the user can select any component even though it is not yet linked to the selected dataserie definition (see the dataserie definition form). When the user save the record (apply) also this component will be related to the dataserie definition and the table will be appended with extra columns. If the series already exist (but is not part of the dataserie limitation already done) also data within the modify period will be read into the

table. Finally if also the measurement already exist (same time stamp) the user will get a warning : “You are about to edit an existing record. Do you want to edit?” with OK and cancel as the options.

### Date and time

Regular: For dataserries with regular time step the date and time entry will always be disabled. If the user wants to edit an observation he she select the row from the table, and the properties will be filled in. If the user wants to enter a new record he/she has already pushed new and a new blank row has been added to the table with the following timestamp:

From Date and time: =End of data exist period (independently of if the modify time period covers the data exist period)

To Date and Time = From Date and time + timestep.

The date and time will be shown in the format selected by the user. And for information purposes this format will be written in parenthesis in the frame heading.

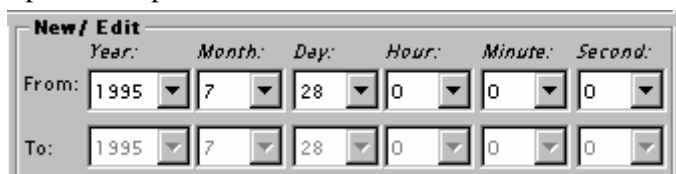
### Irregular:

For irregular samples the user gives both from and to time manually, one of the timestamp might be filled in automatically based on rules described in the beginning of this chapter

Date and time are given by writing directly in the fields according to the selected format or select from the date/time selection form by entering the “...” button (as in the current application)

The modify time period and dataexist period will be updated when the user saves (apply ) the registration.

Also the user has the possibility to enter a registration directly in the table, however this is explained as part 3 of the form below.



The screenshot shows a window titled "New / Edit" with a date and time selection interface. The interface is organized into two rows: "From:" and "To:". Each row contains six dropdown menus corresponding to the labels "Year:", "Month:", "Day:", "Hour:", "Minute:", and "Second:". In the "From:" row, the values are 1995, 7, 28, 0, 0, and 0. In the "To:" row, the values are also 1995, 7, 28, 0, 0, and 0. Each dropdown menu has a small downward-pointing arrow on its right side.

### Quantification

The user enters the value for the observation and the unit. The default for replicate is 1, but the user can change it to a higher number.

### Sampling and Analysis (optional)

Equipment/Instrument (Name): Equipment or instrument used in field.

Sampling procedure(code): Special sampling procedure used, i.e. a reference to a standard

Analysis Method: Only valid if analysed at Lab

The information is technically optional (from the application point of view), but might be administratively required within an organisation.

### Admin Project and Security Flag (optional)

The user might want to link the data to administrative project since this will say something about the owner of the data, and might be the key for not moving the data in to a common archive database (but only keep the data in a project database).

However, even if data are available in a database, there might be some restriction on use of the data. The security flag shall be a mean to flag the data based on restriction for use.

Example of Security Flags might be: Restricted, not to be published etc.

Entries for admin project and security flag can be set as default in the registration modus

The information is technically optional (from the application point of view), but might be administratively required within an organisation.

### Quality Assurance (optional) :

Quality assurance is of importance for use of the data in the future, and especially by other than the “owner” of the data.

An example of quality assurance flag might be suspect. Also signs like less than < or bigger than > are example of quality status flags.

The quality assurance level flag is on what level the quality assurance has been performed. I.e by Certified personnel.

Both entries can be set by default in the registration modus.

The information is technically optional (from the application point of view), but might be administratively required within an organisation.

### 4.5.5 Apply, cancel and new

The user may be done with registration after quantification( if the user does not want to give the other information or if he/she has set these as default values in the registration modus).

When the user use apply the record will “jump” down to the data table (NB if the record already exist (either within or without the modify time period) the user will not be able to save the changes before confirming = edit of an existing record).

The user can proceed with the next record without pushing new. This means that the next record is so similar to the record that the user just saved, that the user might want to change only some of the properties.

If the user wants to register a complete new record or edit an existing which has very different properties from the already registered record, the user select New. This will blank the form, except the entries which are given as default in the registration modus.

Cancel will blank the form without saving anything.

### 4.5.6 Search

The user may apply a search criteria to find rows in the table with values satisfying special criteria.

**Find Measurements in table**

**Measurements within period**

[Date Range] [Special Selection]

**Find measurements with a link to**

[Adm. Projects] [Instrumens] [Analysis and sampling] [Time Step] [Flags]  Apply

**Find measurements with values within limits:**

Select Component: [Name] [Operator] [ ] [ ] [Unit]

Select Component: [Name] [Operator] [ ] [ ] [Unit]

Select Component: [Name] [Operator] [ ] [ ] [Unit]

Select Component: [Name] [Operator] [ ] [ ] [Unit]

**Find measurements with values linked to CSI:**

Select CSI variable: [Name] [Operator] [ ] [ ] [Unit]

Select CSI variable: [Name] [Operator] [ ] [ ] [Unit]

Select CSI variable: [Name] [Operator] [ ] [ ] [Unit]

Select CSI variable: [Name] [Operator] [ ] [ ] [Unit]

[Cancel] [OK]

These are basically the same criteria which can be used by the user in the first place to find dataserries, but are focused to find and mark rows in the measurement table.

If these criteria has already been used as a basis for selection of dataserries the time value cells which satisfy these will already be marked in the table and the find measurement form will be opened with the information filled in.

However the user can change the selection or set new criteria after some specific rules which are explained below.

The user shall be aware of that this is only a method to view a special measurement selection in the table and distinguish these from the rest of the measurements, and a method to be able to copy only the selection to clipboard. This means that the table will contain all measurements values independently of these criteria as long as they are part of the dataserries satisfying the dataserries search given earlier, and as long as these are within the given modify time period.

### Find Measurements within period

This is basically the only difference from the similar form reached from the dataserie search form.

This will contain the modify time period already set. It is only when the user selects a sub period of the modify time period the actual rows satisfying the period will be marked. The user can not extend the modify time period from this location (equal or less). If the user has in addition set special selection criteria, it is only those rows with timestamps satisfying the special selection and the time period which will be marked.

### Find Measurements with link to:

The different lists of links (behind the buttons) are explained earlier. The lists will only contain entries that are valid for the already opened dataserie, meaning that the user has already used these search criteria when searching for dataserie.

The valid ones will be checked and the apply button will be checked. The user may want to uncheck some of the links in order to limit the selection further.

### Find measurements with values within defined limits

The user may mark those rows which have measurements which values satisfying special conditions: equal to a number, in an interval or less or bigger than a value. Only the components for the opened series will be listed.

The functionality is the same as described earlier

### Find measurements with values linked to CSI

The user may mark those rows which have measurements which values are linked to a special CSI variable with a special condition: equal to a number, in an interval or less or bigger than a value. Only the components for the opened series will be listed.

The functionality is the same as described earlier

## **4.5.7 Part 3 of the Measurement registration form-Enter data in the flexigrid directly**

### **Extend with all properties**

This will by default be unchecked. If the user check this possibility the table will be expanded and all properties for the time values will be shown. This will in other word overrule the hide check marks set for the registration modus. If the user uncheck the all properties the table will shrink to those properties the user has decided to show according to the registration modus.

### **Limit to search**

This will by default be unchecked and is only enabled when the user has undertaken a search which is valid for only some of the measurements(with properties) in the time series and not all. As explained above these will also be marked with a special color. If the user check this check box, the values (with properties) which do not satisfy the search will be hidden for the user.

### One row pr. Dataseries link

By default this will be unchecked and the user will only have one row pr timestamp. Only if several replicates are shown there will several rows with the same timestamp.

However, the user might want to organise the table based on the dataseries definition, meaning that there will be one row pr. Dataseries definition, replicate and timestamp. In this case there might exist several rows in the table with the same time stamp, also in the cases where only one replicate is shown.

### View Registration Table in Separate Window

The space for the registration table with all records available may be too small in order to be efficient to work with. The user can choose to view the registration in a separate window. However, the two forms will be open at the same time and linked. I.e. manual registration of one by one record in part 2 of the form will update the flexigrid. Vice a Versa marking a row in the registration table will always update part 2 of the form.

Also this separate measurement table will be in connection with the common sampling information table explained later.

### Registration Table (flexigrid) and functionality

#### Organisation of table

The user may enter new data/edit existing data directly in the table without working with one/by one observation as described in part 2.

The content of the table is of course dependent on the settings in the registration modus, and if the user has only chosen to show the limited search.

The organisation depends as explained above on if the table is organised based on timestamp or based on dataseries definition.

This description gives an overview of how the columns shall be organised and visualised in order for the user to enter data efficiently in these two modus.

Common for the two organisation “modus” is that there is a connection to part 2 as already mentioned. This means that if the user stands at one row in one cell the information available connected to this cell shall be displayed in part 2<sup>4</sup>. This means if the cell belongs to the dataseries definition, only the data series definition will be shown in part 2. However if the cell describe a property of time value, i.e. QA, Security flag, unit, the value etc. Information about the whole record/observations including the dataseries definition will be shown.

#### *Organisation based on timestamp*

All properties of interests (both from the dataseries and the time value) are listed in columns beginning from left to right. As in the current application the first two columns are the time stamp. The time stamp is shown with the default time/date format chosen by the user.

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<sup>4</sup> This functionality shall not slow down the application. A method to achieve this could be that one by one property is filled in hardly noticeable by the user



## Measurement (part II) and geography

When a new data series are entered the columns describing the dataseries and corresponding columns for the timevalue will be added to the table as new columns.

However if a new replicate is entered this will cause an extra row with the same date. Not all series will necessarily have all information filled in for all replicates and properties. Blanks shall therefore be treated as blanks and NOT be filled in with zero.

It is important for the user to get a visual overview of the registration table, and all the columns that might be included in the table.

A ToolTip containing all properties of the dataseries shall appear when the user point of any of the column headings in the table below. Also all properties for the time value linked to a dataseries shall have the same column heading colour. This means that when the user scroll to the right he/she will easily see the different dataseries.

NB if the selected dataseries have common properties i.e Station, Measurement position, z1 and Z2 these shall not be repeated to the right for eachtimeseries, but be located to the left next to the date stamp (This is also explained in the table below together with all properties in the column).

Column	Column Heading	Sort rows by properties in the column <sup>5</sup>	Required/Optional	
Start Time	Start Time	-		Timestamp
End Time	End Time	-	Required but can be hidden	
Measurement Type	M.type		Ref timeseries (but can be hidden)	Data series Link, may be several at one
Medium	Medium		Ref timeseries (but can be hidden)	
Sampling Type	Samp.Type		Ref timeseries (but can be hidden)	
Station	Station	Code, name	Ref time series (but can be hidden)	
Measurement Position Code	M.P. Code	Code(text)	Ref.timeseries (but can be hidden)	
Z1, value	Z1(m)	Number	Ref.timeseries (but can be hidden)	
Z2, value	Z2 (m)	Number	Ref.timeseries(but can be hidden )	
Replicate ID	Replicate ID	Number	Required but can be hidden	Component value With all properties Seperate Column with the Same colour
Quality status	Q. Status Flag	Name (or code)	Not required	
Component (value)	Component (value)  (Component code (text) shall be written in the heading with value in pharantesis i.e NTOT (value))	Number	Required	
Unit	Unit	Unit name	Required	
Quality Level Flag	Q. Level Flag	Name	Not required	
Quality Security Flag	Security Flag	Name	Not required	
Equipemntinstrument	Equip./Inst	Code for analysi, name for instrument	Not required	
Sampling Procedure	Samp. Proced.	Code	Not required, and not present if measured at site	
Analysis	Analysis	Name	Not required, and not present if measured at site	
Adm. Project	Adm. Project	Code	Not required	

Combina  
tion  
which  
make the  
row  
Unique

<sup>5</sup> This is also the properties that shall be available in the cell comboboxes. The user can write directly in the cell, and he will jump to the right space in the combobox.

	Properties which make the row unique
	<i>Organisation based on date:</i> Information to be repeated for each dataseries but which might be common for the opened dataseries and hence only organised to the left. There will be one row for each unique combination of date and replicate.
	Information for each value, but which must be repeated for each opened dataseries for the given timestamp.  <i>Organisation based on date:</i> Tooltip on the column heading showing the whole series definition and different colours for the group of properties linked to the time value for one component.
	Required class properties
	Optional class properties

*Organisation based on dataseries link*

The same functionality as described above will also apply to the table when this is organised based on the link to dataseries. The differences are that the dataseries definition (including the component) always are located to the left and there are one row for each unique combination of date, replicate and dataseries definition. Further the column which represent the value has “value” and not component name in the column heading.

Column	Column Heading	Sort rows by properties in the column <sup>6</sup>	Required/Optional
Start Time	Start Time	-	
End Time	End Time	-	Required but can be hidden
Measurement Type	M.type		Ref timeseries (but can be hidden)
Medium	Medium		Ref timeseries (but can be hidden)
Sampling Type	Samp.Type		Ref timeseries (but can be hidden)
Station	Station	Code, name	Ref timeseries (but can be hidden)
Measurement Position Code	M.P. Code	Code(text)	Ref time series (but can be hidden)
Z1, value	Z1(m)	Number	Ref.timeseries (but can be hidden)
Z2, value	Z2 (m)	Number	Ref.timeseries(but can be hidden )
Component	Component	Code	Ref.timeseries
Replicate ID	Replicate ID	Number	Required but can be hidden
Quality status	Q. Status Flag	Name (or code)	Not required
<b>Value</b>	Value	Number	Required
Unit	Unit	Unit name	Required
Quality Level Flag	Q. Level Flag	Name	Not required
Quality Security Flag	Security Flag	Name	Not required
Equipemntinstrument	Equip./Inst	Code for analysi, name for instrument	Not required
Sampling Procedure	Samp. Proced.	Code	Not required, and not present if measured at site
Analysis	Analysis	Name	Not required, and not present if measured at site
Adm. Project	Adm. Project	Code	Not required

Combina  
tion  
which  
make the  
row  
Unique

Timestamp

Data  
series  
Link

Component  
value  
With all  
properties  
In Seaparate  
Columns

<sup>6</sup> This is also the properties that shall be available in the cell comboboxes. The user can write directly in the cell, and he will jump to the right space in the combobox.

	<p><i>Properties which make the row unique</i></p> <p><i>Organisation based on dataserie definition</i> If the user has checked “one row pr dataserie link” the information will always be located to the left independently if these are common for the open dataserie or not. In this case there will be one row for each unique combination of dataserie definition, replicate and date. The same date may repeated as several rows even though only one replicate is shown</p>
	<p>Information for each value, but which must be repeated for each opened dataserie for the given timestamp.</p> <p><i>Organisation based on link to dataserie:</i> No tooltip, and not different colours for the group of properties linked to the time value for one component (since the headings refers to several components in this mode).</p>
	Required class properties
	Optional class properties

*Example*

The table below shows an illustration of organisation explained above (where some of the properties are hidden). The table is an example of “date organisation”. The dataserie definition in the example are common and hence organised to the left.

From Date	Station	Z1 (meter)	Replicate ID	NTOT (Value)	Unit	QA flag	PTOT (Value)	Unit	QA flag
1997.12.01 00	BS, Black Sea	-2	1	0.5	ug/l	>	3	Ug/l	Accepted
1997.12.01 00	BS, Black Sea	-2	2	0.6	ug/l	Accepted			

Be aware of that one of the data series do not have replicates and is left blank. Also the use of colour codes for values belonging to the same series is shown. In this example all properties referring to NTOT are yellow, and all properties referring to PTOT are grey

The panes shall be frozen on common functionality to the right and the column headings. In the example above this means that:

From date, station, replicate and z1 shall be frozen. Also the column headings shall be frozen. Hence Scrolling to the right or down will not move the 4 first columns and the headings.

### How to enter data directly in the table

- ◆ The user shall have the possibility to duplicate a row by the right mouse button and only change replicate ID or date in order for the new row to be unique(not possible for regular series).
- ◆ Insert new blank row. For regular series this operation is not possible in the middle of a series. Insert rows for regular series will only produce an extra new row with timestamp given by the end of Data exist period and the timestep . In order to apply insert new row for regular time series the organisation of the table must be in date modus.
- ◆ Mark several row(s) at the time and delete row(s). The delete functionality will differ from regular to irregular series. Regular series: Before the user delete the rows the system will ask for confirmation. If row(s) are deleted in the middle of a regular series the data will automatically be marked with missing values (the user will have the possibility to give a flag for missing data for these rows before confirming). If the last row(s) are marked for deletion the user will get two options (delete and do not leave any trace or replace with missing values). Also in the last case the user will have the possibility of flagging the data with the flag for missing data.

For irregular time series the user can delete a row any place in the time series, but will have the same rules for confirmation (delete and do not leave any trace or replace with missing values) and the possibility to chose the flag for missing data.

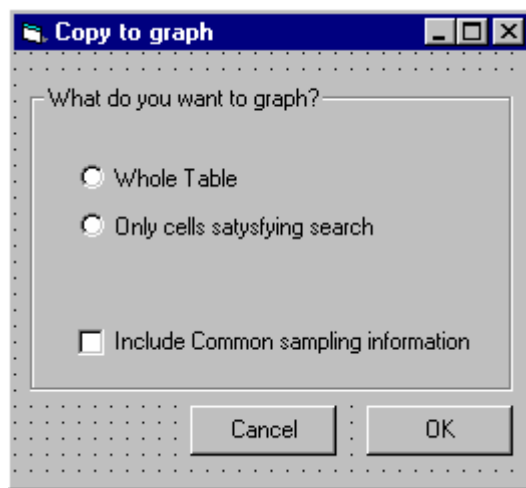
- ◆ Sort rows by any of the columns (se sort criteria in table above for the different properties) and use multiple column sort as in excel
- ◆ Write directly in cells even though some of the cells are comboboxes. Also possible to start to write in the cell, the system will jump to the approximate location in the combo box. The user then select from the combobox. What to be listed in the comboboxes ID, code or names of the look up tables are shown in the table. This is similar to how it works in the current application
- ◆ Copy and paste in each of the cells, delete content of a cell
- ◆ Move from cell to cell with the arrow buttons
- ◆ Mark several rows and graph the selection in a time series graph. The whole modify time period will be graphed for the selected series the measurement table is opened for, however the values for the selected rows will be highlighted in the graph. Also the user can only select to graph the selected rows (explained below)
- ◆ Mark several rows, copy to clipboard and paste in another OLE supported application. Only the properties the user has visible in the table (not the hidden ones will be copied). The selected rows will be marked with a special colour. Also the user can only select to copy the selected rows (explained below).

- ◆ The cell the user stands in will always be linked to the dataseries definition which is available by the right mouse button.
- ◆ Mark column and fill in empty cell.
- ◆ Mark column and Search and replace , a confirmation box shall be invoked
- ◆ The user shall have the possibility to drag out the registration form to cover as much of the screen as possible.

### 4.5.8 Graphics

The user may graph the measurement value.

The default graph is a timeseries graph (dependent on the sampling type as explained before), but where other options are available within the graph. In the graph also the standard graph functionality implemented in ENSIS is available, including the possibilities to change date and time format and to deselect series (The graph will be opened with several dataseries, but as part of the standard functionality in the graph there will be functionality to deselect data series).



However, and as explained above, the user might have marked some of the cells (either by direct selection in the table or by the "search" function). Also the user might want to include the numerical common sampling variables in the graph. The user will therefore always get the following intermediate form after choosing to graph:

If the user selects to graph the whole table the selected measurement values will be marked in the graph<sup>7</sup>.

---

<sup>7</sup> The whole table refer to columns that are defined in the registration modus. In order to copy properties which are hidden based on the registration modus, the user needs to check extend

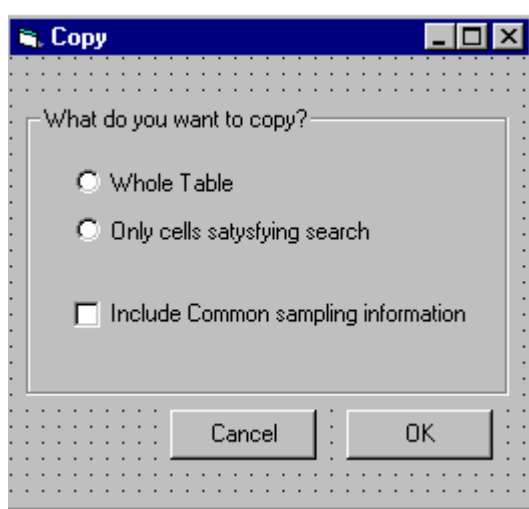
The whole table selection is default if the user has not checked the “show only search”. If the user has checked “show only search” the radiobutton “only cells satisfying search” will be default.

The include common sampling information will by default be unchecked.

### 4.5.9 Copy

It is important to notice that when the table is copied to clipboard the heading follows the table. Only the columns defined in the registration modus will be copied as long as the user has not checked the “extend table with all properties”.

Otherwise the functionality is as explained above.



The user might have marked some of the rows/cells (either by direct selection in the table or by the “search” function).

The default selection is “The whole table” if the user has not marked the “show only search” checkbox. If the user has checked “show only search” the radiobutton “only cells satisfying search” will be default.

If the user has selected some cells but still wants to copy the whole table, the selection will be kept when pasted in another application (special colour on the selected cells)

If the user has not selected any rows or cells the two radiobuttons will be disabled, and only the include common sampling information will be available.

The include common sampling information will by default be unchecked, and will if checked include only numerical and common CSI variable. If the user chooses to copy the common sampling information this will always be arranged after the dataseries definitions (not including component). The dataseries definition is the “key” for linking the CSI to the measurements. This implies that if the dataseries definition is common for the whole row, the

---

table with all properties. These hidden columns has nothing to do with the cells which might be empty or hidden due to the search which is undertaken.

common sampling information columns will only be listed ones, and to the left as for the dataserie definitions.

### 4.5.10 Common Sampling Information

There will be a link to common sampling information. This will open a form where the same dates are opened. The table is explained under common sampling information.

One important functionality however, is that if the user mark a row(s) in the measurement table the same row(s) (=the row(s) with the same timestamp) will be marked in the common sampling information form.

### 4.5.11 Calculate Deposits

This functionality will only be used for the user defined measurement type precipitation. The user must know when he/she is working with this measurement type or not, and will not use the option if he/she works for instance with measurements in Lakes.

The user may mark any area in the table and choose to calculate Flux and averages. Both arithmetic average and precipitation proportional averages will be given. The result table which is produced may be copied to clipboard, but will not be saved back to the database.

Precipitation will be hardcoded and the user can only use this function if this hardcoded component is available in the table and if it is defined within the unit type Length. The components which will be calculated together with precipitation must be of type mass/volume, if not only the average and the precipitation proportional average will be calculated for these components (i.e pH<sup>8</sup> )

---

<sup>8</sup> pH will also be a hardcoded component in the application since pH is logarithmic and needs to be handle special in calculations (see the chapter with calculations)

Example of result table:

From Time	To Time	Precipitation(mm)	Component 1 (value),	Component 1 (unit)	Component 1 (flux), mg/m2	Component2 (value),	Componen2 (unit)	Component 2 (flux), mg/m2
Data and time 1	Data and time 1	50.00	1.50	mg/l	0.08	4.00	mg/l	0.20
Data and time 2	Data and time 2	100.00	1.00	mg/l	0.10	3.00	mg/l	0.30
Data and time 3	Data and time 3	20.00	3.00	mg/l	0.06	6.00	mg/l	0.12
Data and time 4	Data and time4	1.00	14.00	mg/l	0.01	20.00	mg/l	0.02
<b>Average (Val Period)</b>		<b>42.75</b>	<b>4.88</b>		<b>0.06</b>	<b>8.25</b>		<b>0.16</b>
<b>Precipitation proportional (Val. Period)</b>			<b>1.46</b>			<b>3.74</b>		

The table shows 2 component. Each component will be added to the right.

Flux: The system will calculate flux for each component value as:

Flux (mass/area) = Component value (mass/volume)\*Precipitation (length)

The precipitation proportional average is calculated by the formula:

$$\frac{\sum_{i=1}^n (C_i * P_i)}{\sum_{i=1}^n P_i}$$

Where N is the number of timestep in the selection, Ci is the conctrction of one component at a given time, and precipitation Pi is the precipitation at a given time.

The validity period in this case (date and time 1 to end data and time 4) will be written in parenthesis.



### 4.5.12 GIS

The user will also for this type of measurements have two possibilities (drop down on button):

- ◆ Show stations on map
- ◆ Aggregated data

Show stations on map

**Show Stations on Map**

Select Map

If only one open this is automat. selected

Which stations do you want to show?

Stations valid for the whole table

Only stations linked to the data satisfying the search

Which components do you want to limit the selection by?

Select measurement type: Measurement type

Select medium: Medium

Select component:  All  Select From

List1

Cancel OK

The user will get an intermediate form. The user has to select a mapview, if there is only one opened this will be selected automatically. If none is opened the user needs to open a map. The user also has to define if all stations in the measurement table should be shown on the map or if only the stations linked to the data satisfying the search should be shown. Which of the two options to be default depends on the settings in the main form as described for "copy" above.

Also the user may want to only show stations for some of the components. The combobox and list will be limited by which table selection the user has selected to be shown on the

map(whole tabel, satation only satysfying search), and the controls will limit each other. If only one medium and measurement type is present this will be selected by default.

The selection will be created as a separate theme where the user can change the symbol an export the selection as an ordinary theme.

Aggregated Data

**Show aggregated data on map**

Select Map

If only one open this is automat. selected

**What do you want to show aggregated results from?**

Use the whole table as a basis       Use only cells satisfying the search

Select measurement type/medium: Measurement type Medium

Select components or CSIs variable: component/CSI variabl component/CSI variabl  
component/CSI variabl component/CSI variabl

Not selected dataserries: List1 Selected Dataseries: List1

**Aggregation Period**

Select whole data modify period       Select a specific date within the data modify period

**Aggregation Function**

Minimum       Time weighted average  
 Maximum       Time weighted interpolated average  
 Average  
 Percentile       Median

**Select dataset type**

Present as station dataset  
 Present dataset for objects linked to the station

**Select presentation type**

Graduated Color  
 Chart-proportional pie  
 Chart-pie

OK Cancel

The user may apply some statistical functions to the selected data and show the results on the map. In the statistical operation the system only uses data with replicate with ID=1. The system may use the whole table as basis for the calculation or only the data satisfying the search.

The user select a specific measurement type and medium (if only one is present in a combobox this will be selected automatically)

The user can select at maximum of combination of 4 component/CSI variables. Only the relevant Components/CSI variables (from the table view) will be available. By default all dataserie in the table/or selection which also satisfy the component /CSI variable will be selected to the right.

Before the user chooses to aggregate the user decide if the aggregation should be based on the whole modify time period for the selected data or a specific date. The whole period is default. However if the user select a special date the form below will be opened, The user may select a specific date within the period already selected. The form below will be opened with this period. After the user has pushed OK the selected period will be written in the form above, below the radiobutto.



The aggregation will function in the same manner as for classification of waterquality.

After the aggregation function is selected the user select the GIS presentation.

The user first needs to determine if the dataset should be shown as a station dataset or be represented by the objects linked to the station. The second optios requires that the stations have been made representative for an object (see station form where you can link a staion to a lake, part of lake, coastal area and riverlink). If the user selects that dataset should be created based on the objects linked to the station, only one component/CSI variable can be selected (if the user has selected severela he/she has to deselect some).

The last step is to select chart presentation.

The graduated color option will only be enabled if the user has selected only one component. The chart options will be enabled if the user wants to create station dataset. However, if the user has chosen to create datasets for the objects linked to the stations (option 2), the chart presentations will be disabled.

If the user has selected only one component, the only chart option will be chart- proportional pie, the chart –pie option will be disabled. The chart-proportional pie option means that the pies are proportional with the result.

However If the user has selected several components both chart options will be enabled, but the chart-pie will be default. The chart –pie will result in pie presentation with different color codes of the slices of the pie which reflects the values in the dataset. In order to create a chart\_pie and chart\_pie proportional the dataserie must belong to the same unit type.

Example Pies proportional presentation (only valid for station dataset):



Several components at one station (only interesting type of presentation if the values differ, in order to see the difference. If not graduate color is more interesting)



One Component at one station



0-100



100-200



>200

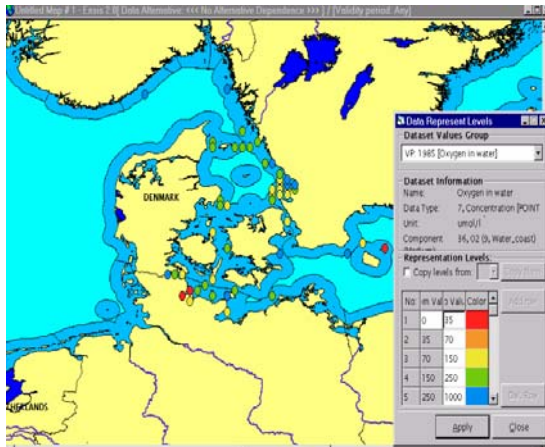
Example Chart Pie with color codes (several components and station dataset)



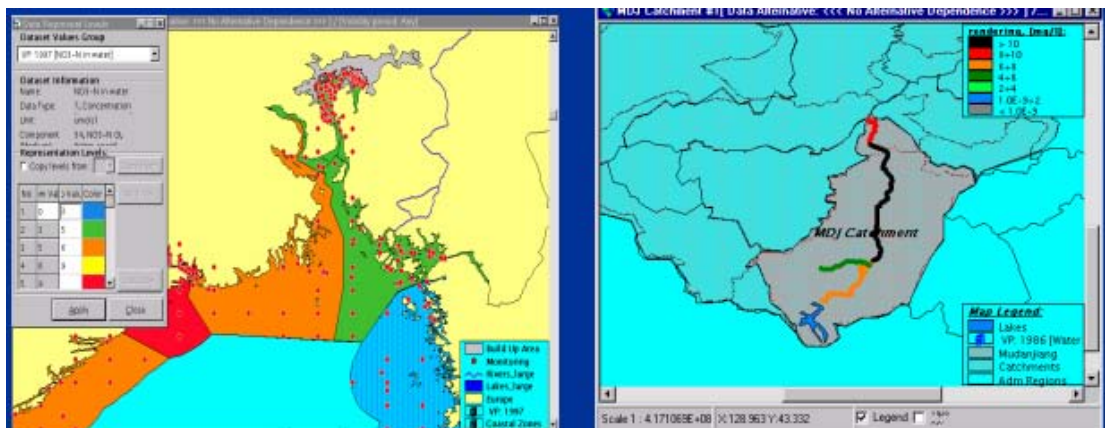
■	0-100 ug/l
■	100-200 ug/l
■	200-300 ug/l
■	>300 ug/l

## Measurement (part II) and geography

Example graduate color station dataset (only valid for one component)

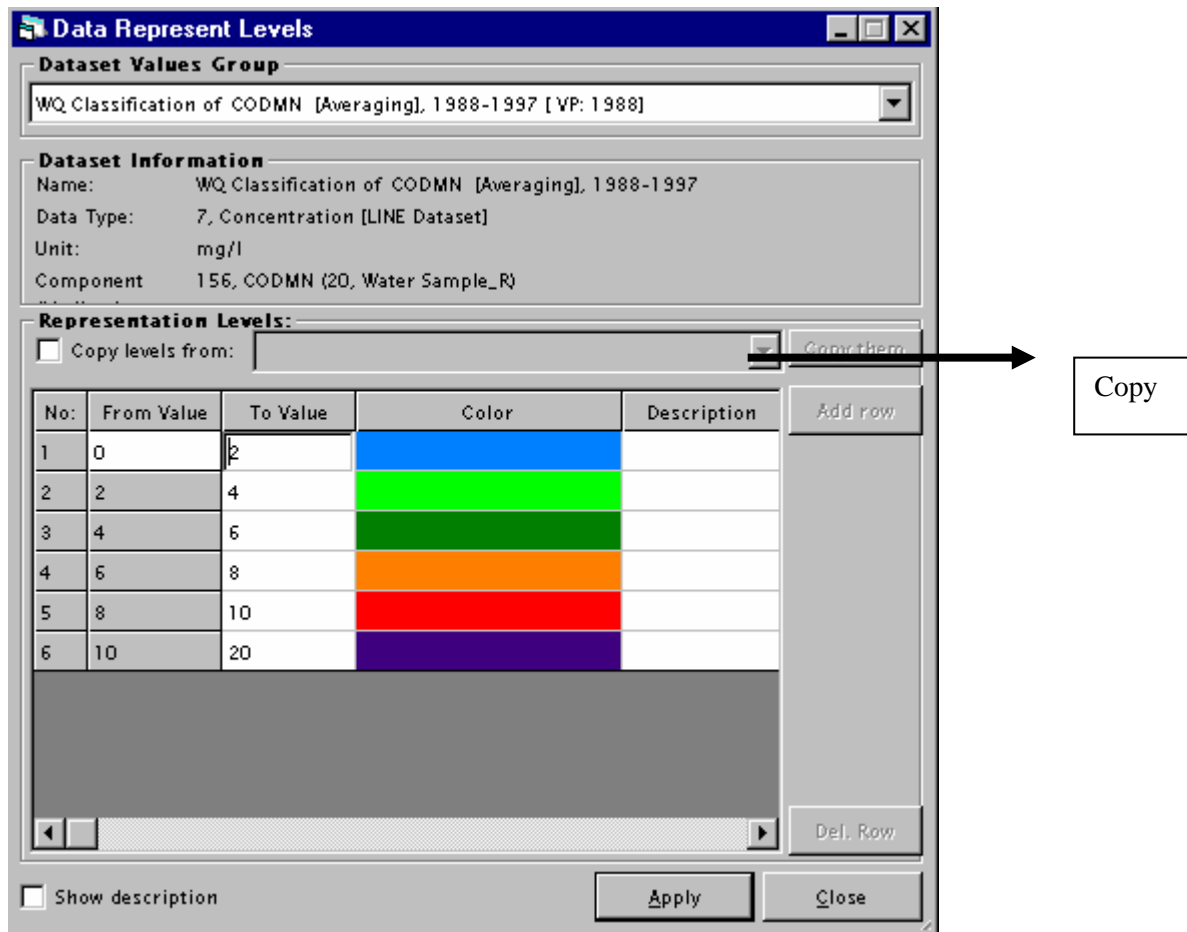


Example of graduate color with "object" dataset based on the link between objects and station (only possible for one component)



The property table to the datasets produced will contain; station name, station code, station ID, number of sampled used as basis for calculation, and the statistical results calculated. If several components/variables has been selected this will mean that several datasets are produced (but they are merged in the map). However if the user has chosen presentation based on the objects linked to the station several dataset might be produced (i.e, both river link dataset, lake dataset and coastal dataset) and these will be created as separated dataset (not merged) since they refer to different geographical themes.

It shall be possible to save all dataset which are created as in the current application, and the user may change the legend of the dataset by copying legend from a classification system (as in the current application).

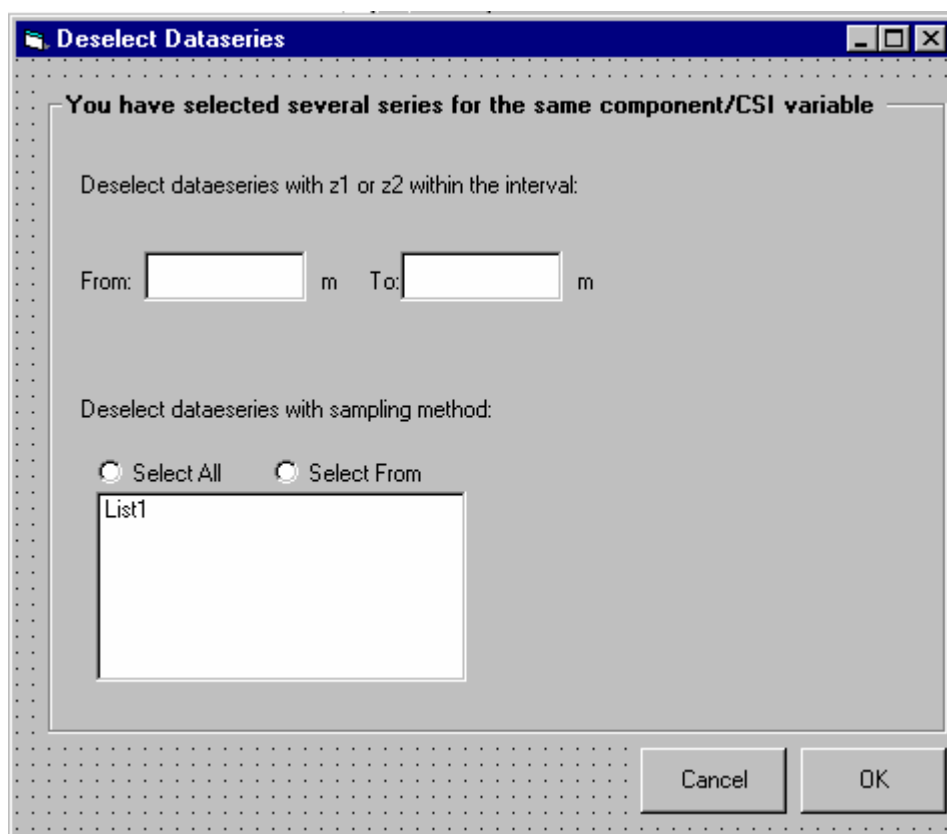


The user starts the calculation on the map by pushing OK. In order to calculate, only one dataset series per component/CSI variable can be selected at each station.

If several series are selected which do not satisfy this criteria it shall be easy to deselect the necessary series by marking several of the series and move to the left.

This issue could also be solved by an intermediate form asking the user to limit the search further based on the most commonly used selection criteria (for this type of operation).

Depth and sampling type will typically be such criteria.





## 4.6 Common Sampling Information

### 4.6.1 What is common sampling Information?

The common sampling information is used to connect common information to a set of measurements (from different dataserries), but which are taken at the same place (same station and measurement position), at the same time and belongs to the same measurement type, medium and sampling type.

The information can only be accessed through the measurement registration form through the common sampling information button, and can not be reached from the menu.

Further the common sampling information usually is information which are not regarded as physical and chemical measurements, but which is more or less descriptive data (text or numeric) to the measurements taken. This information is used as supportive information for the judgement of the measurements. The common sampling information is not issued with quality flags, security flags, sampling and analysis information .

The common sampling information is opened with the same period as the on set in the measurement form, but the number of timestamps might not be equal , meaning that observations do not exist for all timesteps.

### 4.6.2 Registration Modus (part 1 of the CSI registration form)

By default the form is as explained opened with the same modify/add data within period, and the default date format will be the same as for the measurement registration form.

Also the registration modus will be the same (for the properties that are common with the measurement registration form). The user may change the modus.

No default values for odour or colour will be given.

When the user uncheck the registration modus, there will be more space for the table (flexigrid) as explained for the measurement registration form.

Also the save modus functionality is available.

### 4.6.3 Registration of Common Sampling Information (CSI), Part 2

The registration of common sampling information function in the same manner as for registration of measurements. Only the differences are explained here.

The idea of common sampling parameters is that the values are only supportive information to the measurements taken. The necessary links to the dataserie containing the measurements, are therefore present. However the user may also from this location add “new” links or add “existing links as described in the measurement registration form. The rules for this is also the same, and the table will be expanded according to this operation.

There are to fixed components: Colour and odour. Colour can be selected from the combo box (descriptive name), and the user can in addition use the colour palette.

In addition the user has a possibility to give information about user defined CSI variable. The number of CSI variables the user may give information about (Available from the combobox) depends on how many variables that have been defined for the given measurement type.

Examples of user defined common sampling information variables defined might be “secchi depth”, “bottom depth” (for sediment samples) and weight/volume of sample.

Only those valid for the measurement type currently under registration will be available in combo box. If the variable is a text variable the unit will be disabled, and if it is a numeric variable the user must also define the unit. When the user has registered all CSI variables by using the apply button. The user uses apply in the main frame to register the whole record.

Also for CSI the user might register directly in the table, and if the user marks a row (data already registered) , the data will be read into part 2 of the form. Also the corresponding row in the measurement registration table will be marked. Vice a versa, when the user marks a row in the measurement registration table, the same row will be marked in the CSI registration form.

### Search

Search will function in the same manner as for the measurement table. If the user has already applied this as a search before entering the registration form this will already be filled in.

Only the text in the form will be somewhat different when reaching the form from this position.

**Find Common Sampling Information**

**CSI within period**

[Dropdown] [...] [Special Selection]

**Find CSI linked to measurements with a link to**

[Adm. Projects] [Instrumens] [Analysis and sampling] [Time Step] [Flags]  Apply

**Find CSI with link to measurements with values within limits:**

Select Component: [Name] [Operator] [ ] [ ] [Unit]

Select Component: [Name] [Operator] [ ] [ ] [Unit]

Select Component: [Name] [Operator] [ ] [ ] [Unit]

Select Component: [Name] [Operator] [ ] [ ] [Unit]

**Find CSI with values within limits:**

Select CSI variable: [Name] [Operator] [ ] [ ] [Unit]

Select CSI variable: [Name] [Operator] [ ] [ ] [Unit]

Select CSI variable: [Name] [Operator] [ ] [ ] [Unit]

Select CSI variable: [Name] [Operator] [ ] [ ] [Unit]

[Cancel] [OK]

#### 4.6.4 Registration of CSI in the table, part 3

The user have the same options for organizing the table as for the measurement table except for organising the common sampling information with one variable pr row. The common sampling information belonging to a date and a dataseries link will always be organised on one row, and if copied to clipboard with the measurements this information will always be organised in columns to the right of the measurments (except for the date and dataseries which are common with the measurments).

Since the measurment tabel and the CSI table are linked a change for the two checkboxes "limit to search" below will lead to the same same changes in the measurement form. .

CSI for selected Dataseries  Extend with all properties  Limit to search  View Table in Separate Window

Column	Column Heading	Sort rows by properties in the column <sup>9</sup>
Start Time	Start Time	-
End Time	End Time	-
Measurement Type	M.type	Name
Medium	Medium	Name
Sampling Type	Samp.Type	Name
Station	Station	Name
Measurement Position Code	M.P. Code	Code(text)
Z1, value	Z1(m)	Number
Z2, value	Z2 (m)	Number
Colour	Colour	Descriptive Name (Text) . The cell will also be filled with the colour
Odour	Odour	Descriptive Name (Text)
Samp.info., variable 1	Name of varaible (value)	Value or tekst depending if it is a numerical or text variable
Samp.info., variable 1	Unit	Unit (only for numerical variable)
Sampling information, variable (N) <sup>10</sup>	Name of varaible (value)	Value or tekst depending if it is a numerical or text variable
Sampling information, variable (N)	Unit	Unit (only for numerical variable)

Link to Measurements

CSI variable organised in columns with different colors at heading

The user has the same editing possibilities directly in the table as described for the measurements.

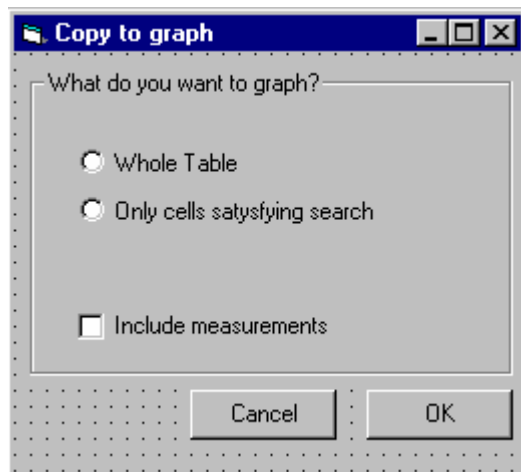
<sup>9</sup> This is also the properties that shall be available in the cell comboboxes. The user can write directly in the cell, and he will jump to the right space in the combobox.

<sup>10</sup> N indicates the total number of variables which exist for the selected measurement type

### 4.6.5 Graphics

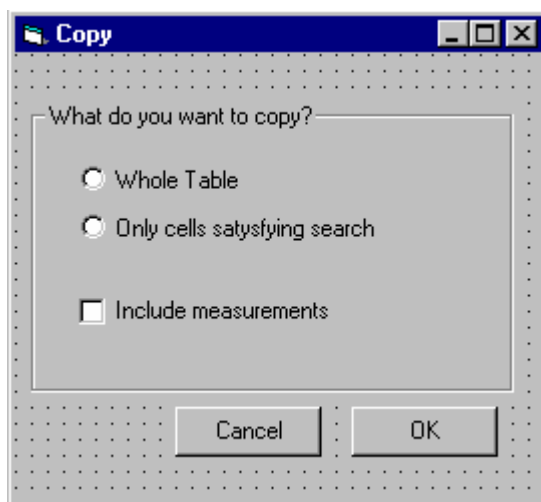
The numeric common sampling information variables may be graphed by marking the actual rows to be graphed or by graphing the whole table. The same functionality and rules as described for measurements will be available.

The user will get the question if he/she wants to also include the measurement values.



### 4.6.6 Copy

The user may copy the content of the table to clipboard. The same functionality as described when copying from the measurement table will be available. Both numeric and text variables may be copied and the user will get the same question if he/she also wants to include the measurements linked to the common sampling information.



## 5 Measurements-Biological Data

### 5.1 Main Entry form to the measurement data and the specific search criteria

**Measurement Data**

**Quick Search for Measurement Data**

Search Combination: User Defined Search Corr    Measurement Type: [ ]

Stations with Code/Name: [ ] [ ] [ ]

Other Search Criteria [ ]

Search [ ]

**Found Dataseries**     Show all properties

IvwAllDataseries

IvwSelectedDatas...

**Dataseries**

New [ ]

Edit [ ]

Append [ ]

Delete [ ]

**Measurements**

Select Time Period: Validity period defined [ ] ... [ ]

Display Measurements

Graphics [ ]

Registration/Table View [ ]

Quality Assurance

Filter Flags [ ]

Run QA [ ]

**Links**

Calculations [ ]

Stations [ ]

Geographic [ ]

GIS [ ]

ReportGenerator [ ]

This is the same form as for physical and chemical data

## 5.2 Search criteria

### 5.2.1 Search criteria form

### 5.2.2 Common Search Criteria

The first part of the form is as for physical and chemical data, and also the selection of sampling type. Measurement position code and z1 and z2. For some measurement types within this group the measurement position is not relevant. The criteria will only be used if relevant. Meaning that if the user has selected several measurement types and some have these properties (z1 and z2) and some not, the criteria will only be used on the measurement types where this is actual a property.

The difference from the physical and chemical search data form starts when the user wants to limit the species<sup>11</sup>.

<sup>11</sup> It is recommended that the reader, reads the definition chapter at the end of this document, especially the species chapter, before he/she reads this chapter.

### 5.2.3 Aggregation (taxonomic level)

The user may use an aggregated search approach by selecting taxonomic level. If the user selects a higher taxonomic level than species the names of the group will be listed instead, and the taxonomic tree will be limited to this level or higher. All search done after this limitation (selection of species/group of species, search for dataserie based on measurements etc) will relate to the selected aggregation level.

By default the lowest level (species) will be selected.

### 5.2.4 Limitation of list of species/group and selection of species

#### Selection of approach

The user selects either a taxonomic structure approach to limit the species/group of species or the "user defined Species" group approach.

#### Taxonomic Structure

If the user has selected a taxonomic structure approach, the taxonomic tree will show up and the tree will as mentioned be limited to the taxonomic level chosen (where the chosen level will be the lowest level in the tree). Also the tree will be limited to those measurement types of relevance.

The user can select any branch in the tree at the taxonomic level chosen or above this level and move all species/group of species linked to this branch to the species check box list. The species/group of species will be listed by their name. IF it is the species name or the group name on a taxonomic level which will be listed depends on the taxonomic level chosen.

I.e if the user has selected family as the taxonomic level and chooses the branch "annelida" which is the name of a group on the taxonomic level "class" which is above the taxonomic level "family", all group names on the family level will be listed which refers to "Annelida". Hirundiidae is an example of one group which will be listed. If the user has selected species as the taxonomic level and chosen the branch "Annelida", all species referring to Annelida would have been listed. I.e where Sanguisuga is one of them.

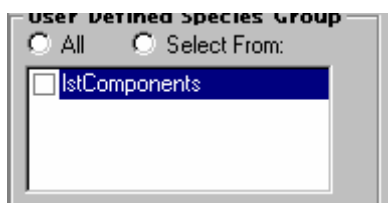
The user may use discrete selection and select another branch in the tree and add these species/group of species to the check box list (the functionality is equal to the functionality of advanced search on geographical objects i.e selecting a chain moving all links, selecting another chain moving all links).



User defined species group

If the user selects the user defined species group approach, all species/group of species which are members of the selected groups will be listed.

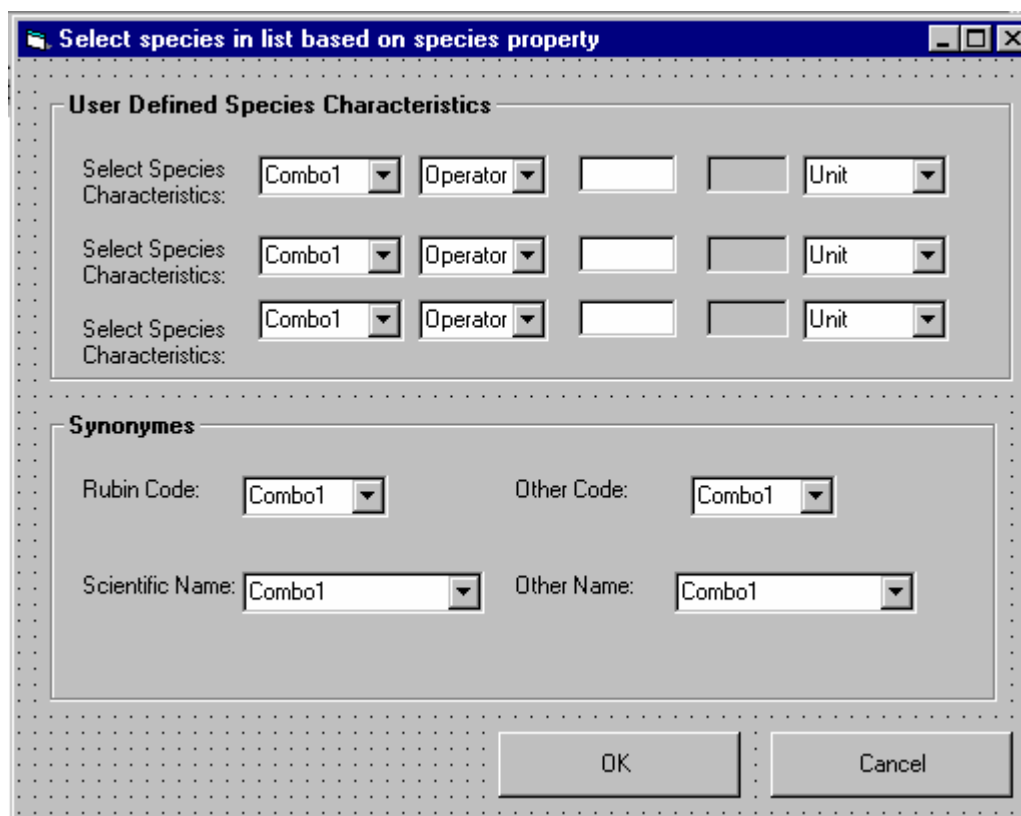
The figure shown below will in this case replace the taxonomic structure.



The user defined species group allows the user for instance to define special groups of species like for instance "Red list Species". Since the user defined species group are assigned to one or several measurement types, only those relevant for the already selected measurements types will show up.

**5.2.5 Selection of species/group of species from the list**

The user has now done a limitation of the species/group of species list. The user may check some of the species/group of species based on some "other limitations" which refers to the property of the species in the list (in the groups). The criteria are shown below and refer to the species inventory registration (see definitions). In order to apply the se criteria the user needs to check the apply.



### 5.2.6 Search for dataseries based on measurements

#### Time period and number of measurement

After the user has determined which dataseries/group of dataseries to search for the user may start to limit the search based on the measurements contained in the series. These criteria will relate to the aggregation level (taxonomic level selected)

This is an equivalent search as described for physical and chemical data. The user determines the period which the search shall be based on and how many registration the dataseries must have. The user may select that in this count he/She will not include the absence registration.

The user may also set other more detailed search criteria equivalent to chemical and physical data. These are explained below.

The screenshot shows a dialog box titled "Search for dataseries based on measurements". It contains the following elements:

- A label: "Dataseries aggregated at the taxonomic level searched for have:"
- A "Data within period:" section with a dropdown menu, a "..." button, and a "Special Selection" button.
- A checkbox labeled "Number of registrations:" with a dropdown menu set to ">=" and a text input field containing "1".
- A checkbox labeled "Do not count Absence registration".
- A section titled "Details related to each registration" containing a button labeled "Other Search Criteria" and a checkbox labeled "Apply".

### Other search criteria

The other search criteria for biological data are similar to the additional search criteria which exist for physical and chemical search criteria.

The search criteria based on the link to administrative project, counting and sampling, and flags function in the same manner as explained earlier and are not repeated here,

The aggregation level selected is disabled and for information only. The user may as for physical and chemical data, search for dataserie containing measurements within certain limits. The comboboxes only contains information relevant to the search already undertaken.

After the user has applied a criteria, he/she will move this to the list of criteria.

**Special Search criteria**

Search for dataserie containing measurements with a link to :

Adm.projects Counting and sampling Flags  Apply

**Dataserie at the aggregated level satisfying:**

Aggregation (Taxonomic level)  
Already selected level/select another level

Select species/Group of species  
Combo1

Number/Coverage/Concentration  
Operator [ ] Unit

Biomass/Biovolume:  
Operator [ ] Unit

Semi Quantitative Measure:  
Operator [ ]

List1

**Special Search Criteria**

Zooplankton Macrovegetation  Apply

## Measurement (part II) and geography

The possible content of the numeric variables fields after the species/group of species is selected is shown below and depends on which measurement type the selected species/group of species belongs to, and which type of unit which are applied to the different measurement types (the units are therefore only examples).

Measurement type	Concentration	Coverage	Number	Biomass	Biovolume
Phytoplankton	Unit type : -count/vol				Unit type : -vol/vol
Zooplankton	Unit type: -count/vol			Unit type <sup>12</sup> : -Mass DW/volume -Mass C/volume	Unit type: -vol/vol
Benthic animals		Unit type : -Count/area -%/Area	Unit type : -Count	Unit type: -Mass DW/Area -Mass C/Area	
Macrovegetation		Unit type : -%/Area		Unit type: -Mass DW/Area -Mass C/Area	
Pheriphyton		Unit type : -%/Area		Unit type: -Mass DW/Area -Mass C/Area	
Fish			Unit type : -Count		

The special search criteria for zooplankton and Macrovegetation are listed below (and maybe not be part of the search form/disabled if the measurement types are not selected or themodules are not implemented )

Zooplankton

Average Length:  Operator   Unit

Number of Eggs:  Operator   Unit

Macrovegetation

Lower Vegetation Limit:  Operator   Unit

<sup>12</sup> Both MassC and Mass DW are base units

### 5.3 Found Dataseries

The listing and functionality after the user has applied the search and returned to the main form is exactly the same as described for physical and chemical data.

Properties (separated in columns from left to right)	Column Heading	Show	Sort by
Station	Station	1.3	2.3
Measurement position-Code	M.Pos. Code	1.4	2.3
Measurement position, Z1 value	Z1 (m)	Exact Value if relevant	Num. <sup>13</sup>
Measurement position, Z2 value	Z2(m)	Exact Value if relevant	Num.
Measurement type	M.Type	1.1	2.2
Medium	Medium	1.1	2.2
<b>Species/species group</b>	Species or species group (if species group the taxonomic level shall be listed in pharantesis)	1.1	2.2
Sampling Type	Sampling Type	1.1	2.2
Validity Period	Validity Period	Range	Num
Number of samples	No of samples	Value	Num
Calculation method	Calc. Method	1.1	2.2 <sup>14</sup>
Timestep(in second)	Timestep(Sec.)	Value if relevant	2.1
Duration (in second)	Duration (Sec.)	Value if relevant	2.1

Properties to be shown as default

Extra prop. If "show all prop" is checked

- 1.1 Name
- 1.2 Id and name
- 1.3 code and Name (and sort by code)
- 1.4 Code
- 2.1 Numerical Sensitive, based on ID
- 2.2 Text sensitive based on Name
- 2.3 Sort by code

It is important to notice that if the user has search for data by using an aggregated species approach (selecting a higher taxonomix level than species) the group name of the species shall be listed instead of the species name.

In this case it is important to know that the system in some cases can not only aggregate to a higher taxonomic level by aggregating observations on lower levels. This is due to the fact that observations can be registered on a higher level than species (i.e. on family), and do not originate from registrations on lower levels .

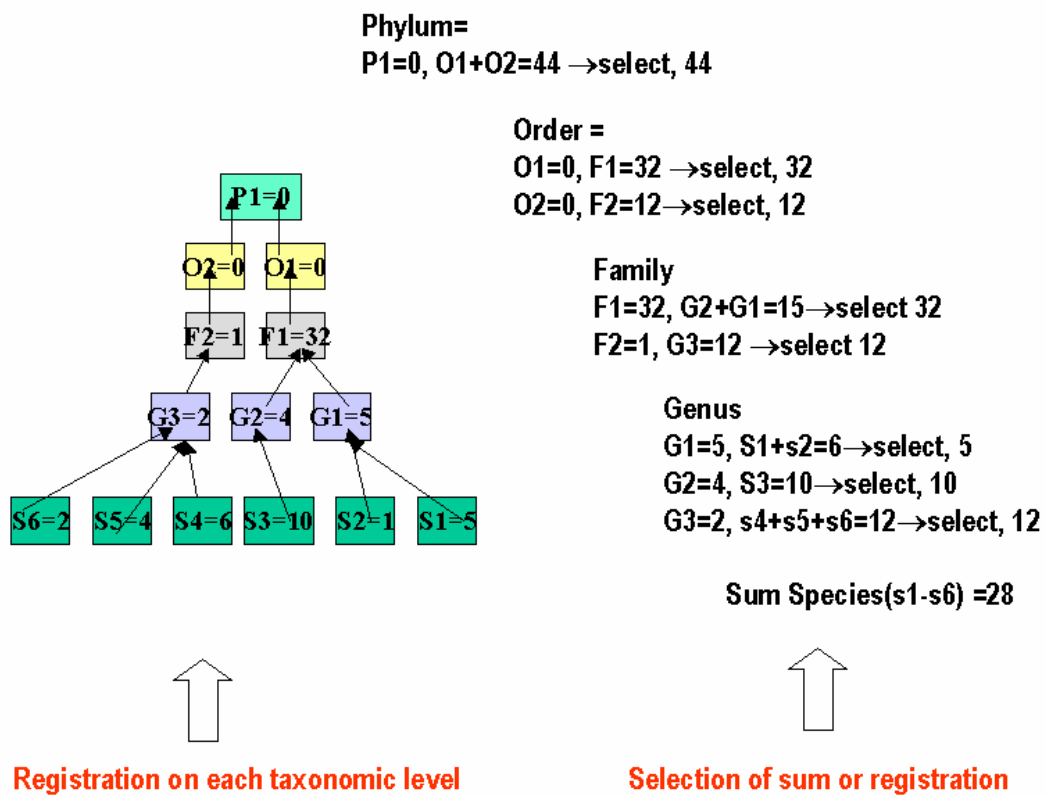
<sup>13</sup> Negative numbers shall as an example be sorted in the following way 0, -1, -2, -10 etc

<sup>14</sup> The calculated time series will be marked with the type of calculation that have been used as in the current application, however this shall be a separate column with the name of the calculation method.

So if the number of observation in the dataserie shall be listed, if graphs shall be made and if the datatables shall be aggregated, the system must operate with the following logic, starting from the lowest taxonomic level (species level):

- ◆ Is the sum of registrations on species level (for one group of species)  $\geq$  sum of registration on the next taxonomic level (i.e Genus). If yes: registration on Genus=sum of registration on species. If No: Registration on Genus=Registration on Genus. In the example below the answer was yes for all Genus groups.
  
- ◆ Is the sum of registration on genus level (for one family group)  $\geq$  sum of registrations on the next taxonomic level ( Family)? If yes: registration on Family=sum of registrations on Genus for this family. If No: Registration on Family=Registration on Family. In the example below the answer was NO for family F1 and the system choses the number which is registered and not the one which is aggregated from lower level For family F2 it was yes.
  
- ◆ Etc until reached the taxonomic level the user has searched for/or want to aggregate the data for. In the example below there are no registration on the taxonomic levels “order” and “phylum” and the number originates from the family level.

(the taxonomic level class is not shown in the example)



NB If the user has not registered values on a higher taxonomic level, dataseries have note been made and the system will only apply the sum rule

It is also important to notice that if the user has searched for several measurment types belonging to different main category (physical and chemical data, biological data, and Biota chemistry) the found table list shall be extended with coloumns which are not common for the three main groups. I.e. there might be an extra column for compoent and “Biota” species. There will only be an extra column for “Biota Species” if the user has selected to show and aggregated taxonomic level for the biological data (not on species level) This also means that some of the cells in the found dataseries list/matrix might be left blank.

## 5.4 Dataseries Definition

**Measurement Time Series Definition\_Biological Data**

**Basic Definitions**

Medium: [Tree view: Sample Node, Sample Node, Sample Node, Sample Node]

Measurement Type: [cboSamplingMethod]

Sampling Type: [cboSamplingMethod]

Time Step: [txtTimeStep] [cboTimeStepUnit] ...

Duration: [txtDuration] [cboDurationUnit] ...

Prop. Factor: [txtPropFactor] [cboPropFactorUnit] ...

**Location**

Station: [cboStation] ... [Limit Stations]

Measurement Position: [cboMeasPosition] ...

**Link to Species**

**Aggregation (Taxonomic level)**  
[Lowest level as default]

**Limit Species Selection:**  
 Taxonomic Structure  
 User defined groups

**Taxonomic Structure**  
 All  Select From:  
 [Tree view: Sample Node, Sample Node, Sample Node, Sample Node]

**Species/Group of species**  
 All  Select From:  
 [List box: List1]  
 Other limitations  Apply

[Get Prev. Definition] [Copy Definitions] [OK] [Cancel] [Apply]

### 5.4.1 Part 1-Basic Definitions

These are the same basic definitions explained for physical and chemical data.



### 5.4.2 Part 2-Location

This is the same functionality as described for physical and chemical measurements.

### 5.4.3 Part 3-Link to species

Link to species shall be based on the same principles as explained for link to component. The aggregation to taxonomic level, taxonomic tree and user defined component group (which will show up instead of taxonomic tree when the taxonomic structure approach is selected) are only search criteria to limit the list of species and group of species (see explanation in previous chapter-search criteria).

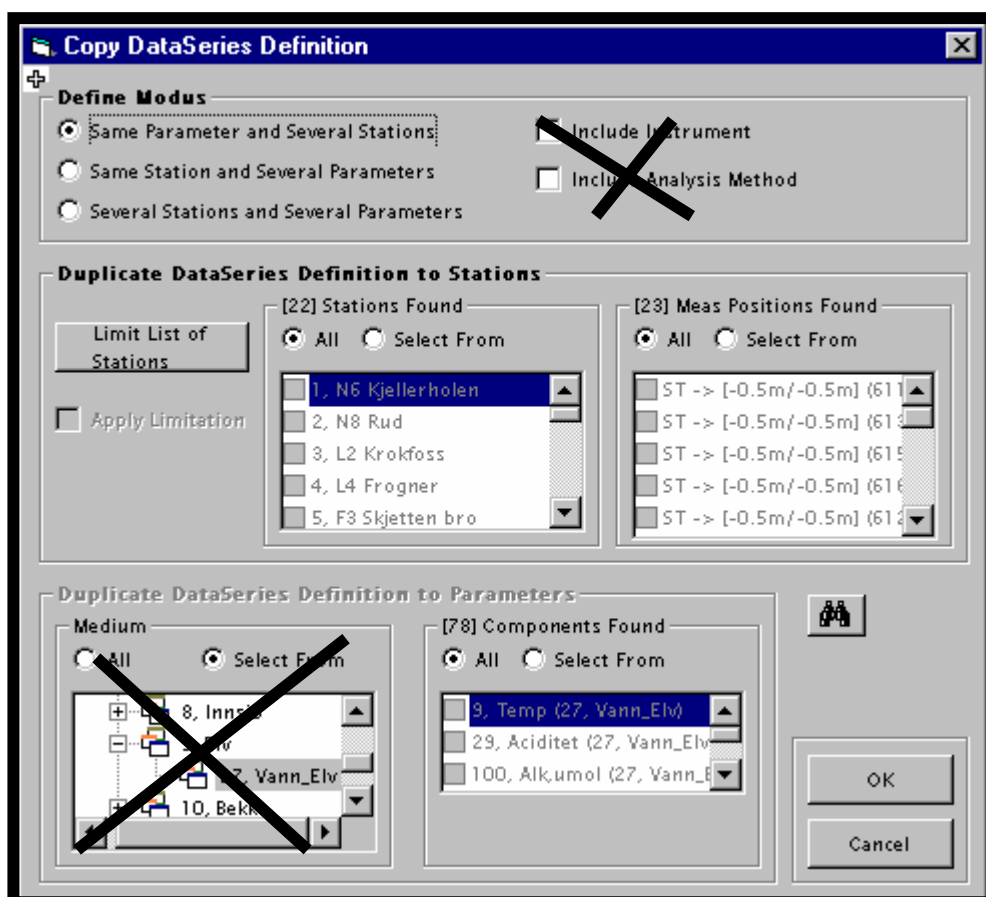
As soon as a species or group of species are selected and the user has used apply, the dataserie are created and the checkbox is disabled.

The programmer should be aware of that dataserie must be created if registration are supposed to be done on higher taxonomic levels. However, the link to species and group of species will usually occur the first time data are entered to the serie (see registration of measurements).

The user can also for this type of dataserie use the copy definition functionality.

The following shall be the new radiobutton options:

- ◆ Same Measurement type, medium and species/group of species, and several stations
- ◆ Same Measurementtype, medium and station and several species/group of species
- ◆ Same Measurement type and medium, but several stations and species/group of species



## 5.5 Measurement Registration\_ phytoplankton

### 5.5.1 Measurement registration form

The measurement registration form function in the same manner as described for physical and chemical manner.

Where there are three main parts:

- ◆ Registration modus
- ◆ Registration of one by one record
- ◆ Table view/registration directly in the table

In addition the user will also recognize the same links at the bottom of the form to graphics, GIS and copy to clipboard. Also the user will experience that the way and order of entering one and one record and is the same as for physical and chemical measurements with the first part as the link to dataseries definition, the second the registration itself of the measurement and the third part the registration of properties of the values (QA, Procedures etc) .

In this chapter it is focused on the differences. It is therefore important that the programmer keeps in mind what has been written in the equivalent chapter for physical and chemical

measurements.

*The main difference from physical and chemical data is that the user is able to register observations on a higher **taxonomic level** and not only on species level. Also a main difference (between biological data and physical/chemical data) is that several methods to quantify an observation/**several measures for one measurement** may be used.. In addition **semiquantitative measurmes** may be used. Even though one measurement may be quantified with several measurements, the same rules as for physical and chemical measurements apply to the units. **A dataseries will always have the same unit type for one measure**, meaning that if the unit type count/volume is used for concentration in a dataseries, all other measurements within this dataseries must have this unit type to describe concentration. However, the user may use other init types on other dataseries for concentration, but the user should stick to one type of unit type if he/she wants to compare data within an area.*

### 5.5.2 Functionality in the form as a consequence of sampling type

The logic depending on sampling type will be the same as described for physical and chemical measurements.

### 5.5.3 Part 1 of the measurement registration form –Show registartion modus

The registration modus has the same type of functionality and the same purpose as described for physical and chemical data. NB in the default setting, semiquantitative code must also be implemented (see benthic animals)

The form is opened with the registration modus hidden for the user, and the user will be aware of if it is a saved modus which is applied or not by the check box.

The user will only switch on the registration modus to set some default registration settings and to determine which of the columns which shall be hidden in the data table. The different properties which may be hidden or set as default are not explained in detail here. Some are explained for physical and chemical data and the other default settings are understandable for the programmer after reading the next chapter (registration of one by one record) .

However, two special comments are made. 1) Show taxonomic level list: The user determines the taxonomic levels which shall be displayed in the table and also be available for registration. By default only the species level is checked, and 2) Since this measurement type may be quantified with different measures, the user must may want to hide some of them in the table view (semiquantative code, phytoplankton counted, counting volume, concentration, specific volume and biovolume).

The idea about the registration modus is to enhance the registration of data. As soon as the user has determined these he/she will hide the registration modus again in order to have more free space in the form, among others to be able to see some of the table view.

In the registration modus there is a save registration modus option. This means that if the user opens the same measurement and medium combination again the registration modus will automatically be given.. This saved registration modus will be available even if the user has shut down the database and open up the database again.

### 5.5.4 Part 2 of the measurement registration form - Registration of one by one record

The screenshot displays a complex registration form with several sections:

- Period of Data currently worked with:** Includes a dropdown for 'Selected Period' and a 'Data Exist period' field.
- Link to Dataseries:** Contains dropdowns for 'Measurement Type', 'Medium', and 'Sampling Type', along with a 'Location' section for 'Station', 'P.Code', and two 'Depth/Height' fields.
- Register Observation:** Features a 'Taxonomic Level' dropdown, 'Species' section with 'Rubin Code', 'Other Code', and 'Scientific Name' dropdowns, and a 'Date/Time' section with 'Date From', 'Time From', 'Date to', and 'Time to' fields.
- Quantification:** Includes radio buttons for 'Presence' and 'Absence', and input fields for 'Sem-quantitative Code', 'Phytoplankton Counted', 'Counting Volume', 'Concentration', 'Specific Volume', and 'Biovolume', each with a 'Unit' dropdown.
- Sampling and Counting:** Contains dropdowns for 'Sampling Equipment', 'Sampling Procedure', and 'Counting Method', and a 'Sampling Volume' field with a 'Unit' dropdown.
- Quality Assurance:** Includes 'QA Status Flag' and 'QA Level Flag' dropdowns.
- Admin project and Security Flag:** Contains 'Project' and 'Security Flag' dropdowns.

At the bottom, there are buttons for 'Search', 'Duplicate Absence registration', 'Cancel', 'Apply', and 'New'. Hand-drawn black lines highlight the 'Species' and 'Date/Time' sections, and a large arrow points from the 'Apply' button towards the 'Quality Assurance' section.

### Order of registration

The order of registration is the same as for physical and chemical data, where the user moves by TAB functionality as shown on the figure.

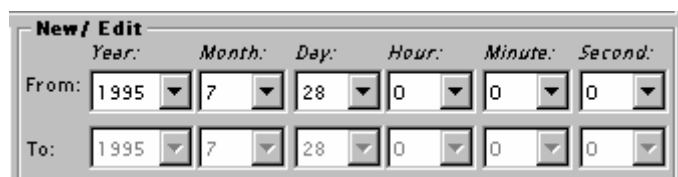
### Period of Data currently worked with

Before the user opens the form above he/she has probably limited the registration of data to some station (and also a period if the objective is to edit already saved data).

The user finds information about which period that are currently worked with, and the period there exist data for. The date exist period is the total period which there exist data for with respect to the opened series.

The period of data currently worked with is for information purposes only and does not limit the registration of data (except when the number of records exceed the limits of rows permitted in the table as in excel). In this case the user needs to limit the period he/she wants to work with in the table view. If the user add a new record the period will automatically be

extended. If the user wants to extend the period to edit already existing data the user might do so by opening the validity period form (... button)



	Year:	Month:	Day:	Hour:	Minute:	Second:
From:	1995	7	28	0	0	0
To:	1995	7	28	0	0	0

**NB** However, it is important to notice that the user shall be able to write directly in the date/time form and not select from the combo box. This means if the user writes 15 for the day it shall not jump to 1 or 5. This shall be valid for all places were this form is used. In the current ENSIS 2.05 version this is an annoying shortcoming.

As mentioned above the selection of modify period gives different results in the registration form depending on if it is regular or irregular samples.

**Regular:** If the user wants to add new rows for regular dataserie, he /she has to extend the modify time period beyond the data exist period (which is shown ), and the system will add the number of rows according to the extended period and the time step. However the user may also add one by one record and the modify data within period will be extended.

It must be pointed out that it is very seldom a user wants to add measurements for regular timeseries manually especially for this type of measurements (since these series usually origin from instruments which continuously register data and produces data in large amounts). These types of data are usually imported and the measurement registration form for regular series is in practical use to edit data and export/copy data using copy to clipboard.

**Irregular:** The modify data within will be a consequence of limitation set in the main form/search criteria or if the user chooses to set another modify time period in this form by the "...” button. Also the modify time period will be updated according to the new values which are entered.

### Dataserie definitions

The dataserie definitions consist of the basic link to dataserie and the Location.

#### Basic Link to Dataserie

Usually the user will register information for one measurement type (Phytoplankton) and medium at the time (i.e. marine), and has given this as a limitation before entering the registration. In the case of only one option in the combo box this option will be filled in automatically, and the user does not have to enter this information.

Sampling type functions as elsewhere in the application. For this type of data (phytoplankton) there will usually be one or two options (depending on which data that are currently worked with. Only sampling types relevant for the dataserie which are opened will be available in the combobox). The two most common sampling types for phytoplankton will have the following properties.

Analysed in Lab/site	Irregular/regular	Instant/Full duration/Part Dur.	Composite sample/Single sample
1) Analysed in Lab	Irregular	Instant	Single sample
2 Analysed in Lab	Irregular	Instant	Composite sample

Sampling type will as for the other measurement types direct the further registration.

The user may view the measurement type definition, the medium, and the properties of sampling method through the “...” buttons.

### Location

Where the sample is taken, the location, is also part of the data series definition.

The user needs to select station the registration is valid for. Only stations related to the selections of dataserie will be listed in the options. The stations will be listed with their code (i.e.HORIBYR) and name (Byrkejedalsvannet). The user may type directly in the combobox and the system will go to the location. If the user selects the code the name will be given and vice a versa.

The selection of station limits the available horizontal measurement positions. Usually there is only one horizontal position equal to the station. In case of only one horizontal position this will be given by default (NB if the horizontal position is equal to the station the code ST is given in ENSIS)

The user may view the station information, the measurement position and the properties of sampling method through the “...” buttons.

The selection of station and horizontal measurement position will again limit the available combinations of Z1 and Z2 (combinations already existing for this measurement type, medium, sampling method, station and measurement horizontal position).

If it is a single sample (given by the selected sampling method) Z2 will be disabled and given equal to Z1. If it is a composite sample the user needs to give “from” and “to” depth. All depths must be given as negative numbers. I.e. a composite sample from depth 2-4 meters, is given by.

Z1=-2

Z2=-4

Z1 limits the option of Z2.

### **Defining a new dataseries**

If the user does not find the combination of dataseries he/she is looking for (i.e. a new depth must be given for the combination), the user enter the “New Dataseries definition”.

Even though the most frequent need of the user is to define a new position under the process of registration, the user should be aware of that he/she can at any time use the new dataseries definition in order to get a new- or already defined dataseries not part of the search (the limitation already done) into the registration form . This functionality is to avoid that the user has to close down the form and do a new search for dataseries.

When the user applies “New dataseries” the series definition will be opened with only the information which has been filled out in the registration form and which are described above. Hence, if the user wants to open a blank dataseries, the user blank all fields described above.

If the user defines at dataseries from this position in the application it might be that the series is already defined. The user will not know this before trying to save the definition. The user will if the dataseries already exist get a message: The dataseries is already defined and existing data within the defined period for registartion will be read into the form”

This means that the user is brought back to the registration form, and the table gets appended with extra column and data from the dataseries within the data modify period (if any) are read into the form. Also the definition of the dataseries is now a possible combination for the registration of one by one measurements.

The user must be aware of that it is as described below not necessary to enter the new dataseries definition form to define a new combination with respect to a species.

The functionality is exactly the same as described for physical and chemical data.

### **Register observation**

#### **Species**

The user is now ready to start the registration of each species found.

Usually the user will enter observations on the species level. However, sometimes the user does not have detailed knowledge about the species found and does only know observations on a higher taxonomic level, i.e. the class the species belongs to. In this case the user will select a class instead of a species, before he/she continuos the registration.

How many options for selecting taxonomic level are set in the registration modus. If the user in the modus has only checked for one taxonomic level, i.e.species, this will be selected automatically.

The user may write the rubin code, other code or the scientific name of the species/group of species. One selection will give the others automatically. The Species/group of species and the taxonomic tree view will be limited to the selected medium, the measurement type and the selected dataseries. The user may expand the list and the list will be expanded to all species valid for the selected measurement type.

The user may also select from the Taxonomic Tree by entering the button. The one selected in the tree will be read into the form by its name. Vice a versa the user may view a particular

species/group that he/she has entered in the taxonomic tree. The numbers of branches in the treeview depends on how the taxonomic treeview has been build up (ref species inventory).

The different items in the tree-view are listed with their scientific name and with the two first character of Taxonomic Level in parentheses.

If the user enters a species name, he/she is also able to view the details of the species if such information has been given in the species inventory. If the user performs a registration on a higher taxonomic level (i.e. phylum), and hence enter a phylum record, the information of this record will show up instead of the species details.

### Date/time (timestamp)

The user must fill in the date (required) and time(optional) for the sample. If time is not set it will be given as 00. The user writes the dates and time directly into the cells in the time format he/she has decided to be default format, or select from the date /time selection form.



Usually the sampling method for this type of measurement is instant, meaning that the “to” time will be disabled and will be given equal to the “from” time.

If the user chooses to enter the data through the form above, it must as mentioned earlier be possible to write directly into the cells (treated as number and not as text).

### Quantification

Phytoplankton might be quantified with several measures, and for graphics only concentration and biovolume will be available.

Presence: The species is either present or absent. This is selected by radio buttons. By default presence is selected. If the user chooses absence, all other fields are disabled, except quality assurance and admin project information.

In order to give absent to several species at a time for the data series and data currently selected, the user may use the duplicate absence registration button.

The user will then be able to easily select the species he/she wants to duplicate the species for. The species already register for the data series and date will be unchecked (For this reason it is most efficient for the user to register all species present before starting with the species absent.

The selection of species for duplicate functions in the same manner as in the search criteria form (the tree will be limited to the measurement type, medium already selected). The branches will be limited to the taxonomic level or above.



The screenshot shows a software interface with two main panels. The left panel is titled "Aggregation (Taxonomic level)" and contains a dropdown menu labeled "Selected Level". Below it is a section "Limit Species Selection:" with two radio buttons: "Taxonomic Structure" (selected) and "User defined groups". Underneath is a section "Taxonomic Structure" with two radio buttons: "All" (selected) and "Select From:". Below these is a list of "Sample Node" entries with a tree structure, and two arrow buttons (left and right). The right panel is titled "Species /Group of species" and has two radio buttons: "All" (selected) and "Select From:". Below is a list box containing "1stComponents". At the bottom of the right panel are two buttons: "Other limitations" and "Apply".

### Semi -quantitative measures

If the user does not have any good quantitative measures of the species found, he/she might need to describe the measurement with semi quantitative measures. The semi quantitative measure is a look up table. The user select or type the semi quantitative code The code has a description.

If the user select semi quantitative measures, the rest of the options for the quantification will not be disabled even though that in most of the cases the user will either fill in semi quantitative measures or quantitative measures.

**Phyto plankton counted:** The user needs to give the number of cell counted. The unit will be given as default (defined in the modus) or selected automatically if ionly one type of unit exist for this entry. The unit is typically of type COUNT. I.e. Number (the user has determined the units for this measurement type and this entry when defining the measurement type, see definitions). ***A dataseries will always have the same unittype for one measure, meaning that if the unit type count is used , all other measurements within this dataseries must have this unit type to describe this field. However, the user may use other init types on other dataseries for this field, but the user should stick to one type of unit type if he/she wants to compare data within an area.***

**Counting Volume** is the volume counted The unit will be given as default (defined in the modus) or selected automatically if ionly one type of unit exist for this entry. The unit is of unit type VOLUME.. I.e. ml. (the user has determined the units for this measurement type and this entry when defining the measurement type, see definitions). ***A dataseries will always have the same unittype for one measure, meaning that if the unit type Volume is used , all other measurements within this dataseries must have this unit type to describe this field. However, the user may use other init types on other dataseries for this field, but the user should stick to one type of unit type if he/she wants to compare data within an area.***

**Concentration:** Phyto plankton counted and counting volume are optional, but if given the cell concentration will be calculated automatically (if the units are compatible with the possible units for this entry). The user can overwrite the number which is calculated automatically. The concentration is calculated by Phytoplankton Counted/Counting Volume and multiplied with the conversion factor between the selected units.

The unit is of unit type COUNT/VOLUME. I.e number/l (the user has determined the units for this measurement type and this entry when defining the measurement type, see definitions).

*A dataseries will always have the same unittype for one measure, meaning that if the unit type Count/volume is used, all other measurements within this dataseries must have this unit type to describe this field. However, the user may use other unit types on other dataseries for this field, but the user should stick to one type of unit type if he/she wants to compare data within an area.*

**Specific volume:** Specific volume is given by default and is a function of species (if available, ref. species inventory). The user can overwrite the default choice. The unit will be given as default if only one entry or defined in the modus. The unit is typically of unit type VOLUME/COUNT, i.e.  $\mu\text{m}^3/\text{number}$ . (the user has determined the units for this measurement type and this entry when defining the measurement type, see definitions).

*A dataseries will always have the same unittype for one measure, meaning that if the unit type volume/count is used, all other measurements within this dataseries must have this unit type to describe this field. However, the user may use other unit types on other dataseries for this field, but the user should stick to one type of unit type if he/she wants to compare data within an area.*

**Biovolume:** The biovolume is calculated by the concentration and specific volume (if the units are compatible with the possible units for this entry). The user can overwrite the result of the calculations. The biovolume is calculated by Concentration\*Specific Volume and multiplied with the conversion factor between the selected units. The unit will be given as default if determined in the modus or if only one entry available. The unit is of unit type Volume/volume. I.e.  $\text{mm}^3/\text{m}^3$ . (the user has determined the units for this measurement type and this entry when defining the measurement type, see definitions).

*A dataseries will always have the same unittype for one measure, meaning that if the unit type volume/volume is used, all other measurements within this dataseries must have this unit type to describe this field. However, the user may use other unit types on other dataseries for this field, but the user should stick to one type of unit type if he/she wants to compare data within an area.*

The example below shows the steps of calculation:

Cells Counted	<b>3</b>	Number
Counting Volume	<b>1</b>	dl
Concentration	$3/0.1=30$	Number/l
Specific Biovolume	<b>150</b>	ul/number
Concentration	$30*150=0.0045$	$\text{mm}^3/\text{m}^3$

**Sampling and counting:(optional)**

The user may enter information which will be supportive for the interpretation of the results. All information related to sampling and counting can be set as default values in the registration modus (except for value of sampling volume) . This means that the user does not have to select these for every record.

The information is technically optional (from the application point of view), but might be administratively required within an organisation.

Sampling Equipment given by the Name, Sampling procedure referring to a code which again refers to a complete sampling and sampling handling procedure (i.e where preservation is explained). Counting method is also of relevance and is the equivalent to analysis method for chemical components. Counting method is given by the name of the method. (The look up table for counting method is however more simple compared to the analysis method)

Sampling volume might also be of relevance and is the maximum volume which could have been counted (NB for phytoplankton samples sampling volume = sedimentation volume. It is not the amount of water sampled). The unit is given by the settings in the modus or selected if automatically if there exist only one option. It is of unit type VOLUME (the user has determined the units for this measurement type and this entry when defining the measurement type, see definitions).

### **Quality Assurance (optional) :**

Quality assurance is of importance for use of the data in the future, and especially by other than the “owner” of the data. The quantification of a species might be of different quality. I.e in some cases the user has a question mark to if the registration refers to the correct species. These data should be marked with suspect and be of type (include with warning or exclude), when used in graphics and statistics.

Also signs like less than < or bigger than > are example of quality status flags.

The quality assurance level flag is on what level the quality assurance has been performed. I.e by Certified personnel.

Both entries can be set by default in the registration modus.

The information is technically optional (from the application point of view), but might be administratively required within an organisation.

### **Admin Project and Security Flag (optional)**

The user might want to link the data to administrative project since this will say something about the owner of the data, and might be the key for not moving the data in to a common archive database (but only keep in a project database).

However, even if data are available in a database, there might be some restriction on use of the data. The security flag shall be a mean to flag the data based on restriction for use.

Example of Security Flags might be: Restricted, not to be published etc.

Entries for admin project and security flag can be set as default in the registration modus

The information is technically optional (from the application point of view), but might be administratively required within an organisation.

### 5.5.5 Apply, cancel new/edit

The user may be done with registration after quantification( if the user does not want to give the other information or if he/she has set these as default values in the registration modus).

When the user use apply the record will “jump” down to the data table (NB if the record already exist and is outside the period the user is currently modifying data for, the user will not be able to save the changes before confirming = edit of an existing record).

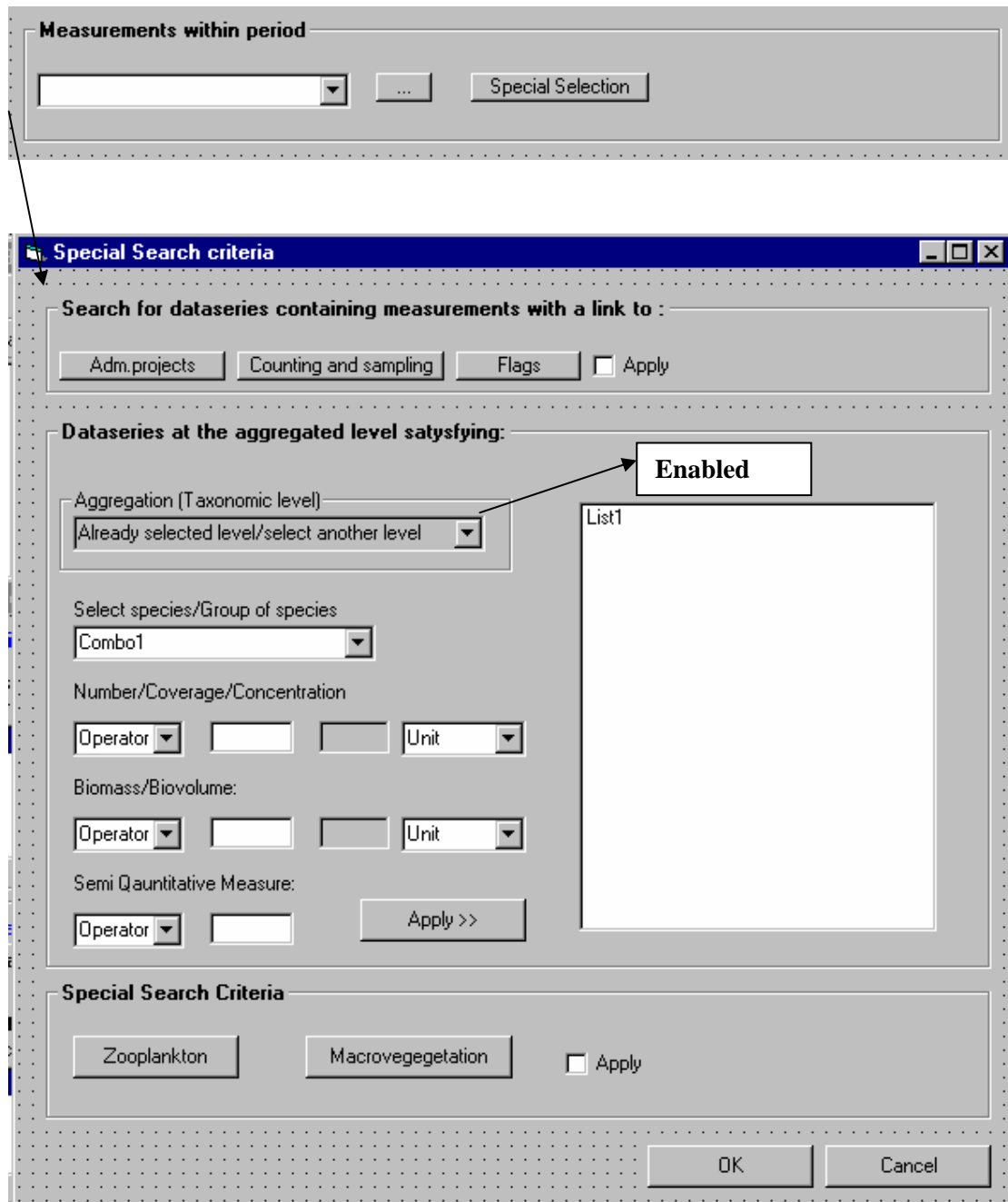
The user can proceed with the next record without pushing new/edit. This means that the next record is so similar to the record that the user just saved, that the user might want to change only some of the properties.

If the user wants to register a complete new record or edit an existing (which is within the period currently worked with), and which has very different properties from the already registered record, the user select New/edit. This will blank the form, except the entries which are given as default in the registration modus.

Cancel will blank the form without saving anything.

### 5.5.6 Search

The user may apply a search criteria to find rows in the table with values satisfying special search criteria. This shall function in the same manner as described for physical and chemical measurements. Meaning that the measurement time period within period shall be inserted at the top of the form. The criteria already set (if any) when searching for the dataserries in the first place shall be filled in etc. The aggregation (Taxonomic level shall be enabled)



### 5.5.7 Part 3 of the measurement registration form – Measurement table

#### Checkboxes

The measurement table is build with the same type of functionality as described for physical and chemical data, and the user has the same check boxes in connection to the table:

- ◆ Extend with all properties
- ◆ Limit to search
- ◆ One row pr. Dataseries link
- ◆ View registration table in separate window.

The user can view all records for the selected stations and period in a table. Which columns that are visible and which that are hidden depends on the registration modus. The user may want to overrule the registration modus and show all properties of a record, by checking the check box.

Most likely the user will in order to to work more efficiently with the table, check the view registration table in a separate window.

Also the programmer shall be aware of that this type of measurments shall be opened with the “One row pr dataseries link” checked.

The other functionality of the checkboxes are explained in detail for physical and chemical measurements and are not repeated here.

#### **Registration table and functionality**

The user has the possibility to edit, select, copy (i.e to excel), paste, delete in the table as described for chemical measurements.

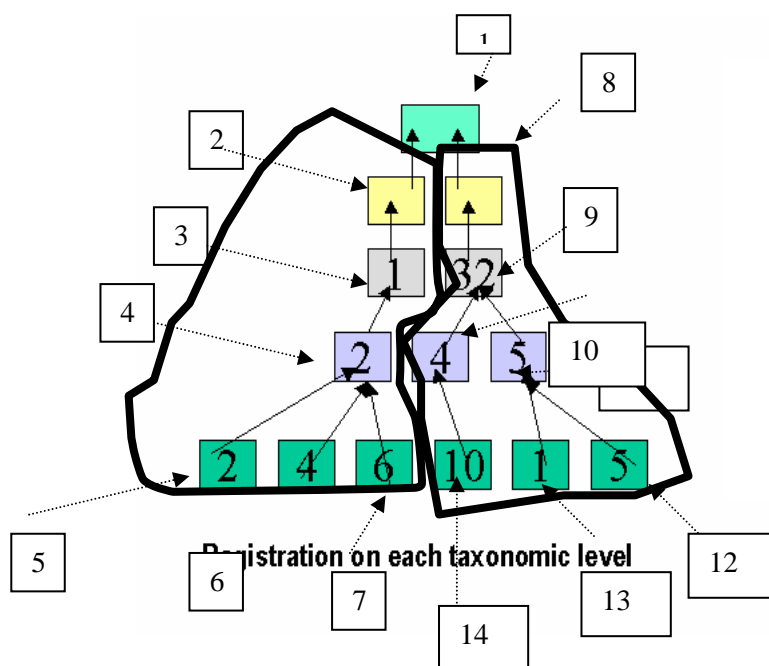
The user may have opened several tables (in the case where he has selected several measurement types which have different properties, i.e. physical and chemical data, phytoplankton and zooplankton). In this case the user may point on one date in one of the windows (i.e the chemical data table), and the system will automatically run to the same record (same station and date) in the phytoplankton data table (if it exist). The user shall also have the possibility to merge the data tables that are open, if these have a structure which allows this. NB the merge options has not been described in detail and not implemented on the forms.

Some special remarks (compared to what has been specified for physical and chemical) has to done with the respect to organisation of the table in the two modus 1) Organisation based on timestamp and 2) organisation based on dataseries link.

### Organisation based on timestamp

The main difference from the physical and chemical data is the fact that the biological data belonging to the same branch will be grouped together, before another will be listed. How many taxonomic levels that will be shown in the table depend on the settings in the registration modus. If the data on higher taxonomic levels will be summed or if it will be based on real registration (and the logic for this) are described in the chapter for found dataseries (ref figure below). Since the registration might only be summed on some registration levels and not be a result of registration, these might miss information in the properties column (i.e. QA, security flag, project etc). If so these fields will only be left blank. Another thing to keep in mind is that the measurements from phytoplankton might be represented by several quantitative and semiquantitative measures, where some might be hidden in the table view (i.e. concentration, biovolume..., ref quantification).

The figure also below show an example of how (in which order) the species and group of species will be listed in columns to the right. In the example there will be 14 different species references (group of species) with one or several measurement with corresponding properties for a particular date and dataseries reference).



## Measurement (part II) and geography

It is important to keep in mind that the functionality with tooltips on column heading (showing the data series reference), and pointing on cells in the table etc. shall be the same as for physical and chemical measurements.

Column	Column Heading	Sort rows by properties in the column <sup>15</sup>	Required/Optional
Start Time	Start Time	-	
End Time	End Time	-	Required but can be hidden
Measurement Type	M.type		Ref timeseries (but can be hidden)
Medium	Medium		Ref timeseries (but can be hidden)
Sampling Type	Samp.Type		Ref timeseries (but can be hidden)
Station	Station	Code, name	Ref timeseries (but can be hidden)
Measurement Position Code	M.P. Code	Code(text)	Ref time series (but can be hidden)
Z1, value	Z1(m)	Number	Ref.timeseries (but can be hidden)
Z2, value	Z2 (m)	Number	Ref.timeseries(but can be hidden )
Quality status	Q. Status Flag	Name (or code)	Not required
Present/absent		Text	
Semi quantitative code	Speciesname(semi quantitative code)	Text	Not required
Number of Cells	Speciesname(number of cells)	Number	Not required
Unit	Unit	Text	Not required
Counting volume	Species Name(counting volume)	Number	Not required
Unit			
Species (value of concentration)	Species/species ( Concentraion )  (Species latin name/species group (text) shall be written in the heading with concentration in pharanthesis)	Number	Required if not biovolume is given and there are no semi quantitative measures, and no absent registration
Unit	Unit	Unit name	Required
Specific Volume		Number	Not required
Unit		Text	
Species (value of biovolume)	Species/species ( Biovolume )  (Species latin name/species group (text) shall be written in the heading with cincentration in pharanthesis)	Number	Required if not concentration is given and there are no semi quantitative measures, and no absent registration
Unit	Unit	Unit name	Required
Quality Level Flag	Q. Level Flag	Name	Not required
Quality Security Flag	Security Flag	Name	Not required
Equipemntinstrument	Equip./Inst	Code for analysi, name for instrument	Not required
Sampling Procedure	Samp. Proced.	Code	Not required, and not present if measured at site
Analysis	Analysis	Name	Not required, and not present if measured at site
Adm. Project	Adm. Project	Code	Not required

Combination which make the row Unique

Several quantitative/semi quantitative measures for one record

Timestamp

Data series Link, may be several at one row

Species values With all properties

Separate Column with the Same colour in the heading for each species reference/group of species with properties.

In the example these columns must be repeated 14 times (14 colour codes) in the heading)

<sup>15</sup> This is also the properties that shall be available in the cell comboboxes. The user can write directly in the cell, and he will jump to the right space in the combobox.



	Properties which make the row unique
	<i>Organisation based on date:</i> Information to be repeated for each dataserie but which might be common for the opened dataserie and hence only organised to the left.
	Information for each measurements, but which must be repeated for each species/group of species the given timestamp and dataserie reference. In the example above these columns will be repeated 14 times before starting on another main branch  <i>Organisation based on date:</i> Tooltip on the column heading showing the whole series definition and different colours for the group of properties linked to the time value for one species/group of species and taxonomic level..
	Required class properties
	Optional class properties

Organisation based on dataserie link

The same functionality as described above will also apply to the table when this is organised based on the link to dataserie. As mentioned above this type of organisation shall be the default choice for this type of measurements.

The differences are that the dataserie definition (including the species/group of species ) always are located to the left and there are one row for each unique combination of date, and dataserie definition. Further the column which represent the quantative or semiquantative measure has the variable name in the heading such as “concentration”, biovolume” etc, Also there is an extra column showing the taxonomic level.

If the user has chosen to show different taxonomic levels the order of the listing (vertical) will be the same as described above (horizontal). For the example shown in the figure this means: 1, 2,3,4,5,6,7,8,9,10 .....

Also the taxonomic level shall be a separate column allowing the user to effectively sort based on this and i.e date( remember that in the table it is possible to search based on several columns at the time (ref physical and chemical measurements)

## Measurement (part II) and geography

Column	Column Heading	Sort rows by properties in the column <sup>16</sup>	Required/Optional
Start Time	Start Time	-	
End Time	End Time	-	Required but can be hidden
Measurement Type	M.type		Ref timeseries (but can be hidden)
Medium	Medium		Ref timeseries (but can be hidden)
Sampling Type	Samp.Type		Ref timeseries (but can be hidden)
Station	Station	Code, name	Ref timeseries (but can be hidden)
Measurement Position Code	M.P. Code	Code(text)	Ref time series (but can be hidden)
Z1, value	Z1(m)	Number	Ref.timeseries (but can be hidden)
Z2, value	Z2 (m)	Number	Ref.timeseries(but can be hidden )
Species/group of species	Species/group of species	Text	Ref.timeseries
Taxonomic Level	Taxonomic Lecl	Text	Ref time series
Present/absent		Text	
Semiquantative code	Speciesname(semiquantative code)	Text	Not required
Number of Cells	Speciesname(number of cells)	Number	Not required
Unit	Unit	Text	Not required
Counting volume	Species Name(counting volume)	Text	Not required
Unit		Text	
Species (value of concentration)	Concentration	Number	Required if not biovolume is given and there are no semiquantative measures, and no absent registration
Unit	Unit	Unit name	Required
Specific Volume	Specific Volume	Number	Not required
Unit	Unit	Text	
Species (value of biovolume)	Biovolume	Number	Required if not concentration is given and there are no semiquantative measures, and no absent registration
Unit	Unit	Unit name	Required
Quality Level Flag	Q. Level Flag	Name	Not required
Quality Security Flag	Security Flag	Name	Not required
Equipemntinstrument	Equip./Inst	Code for analysi, name for instrument	Not required
Sampling Procedure	Samp. Proced.	Code	Not required, and not present if measured at site
Analysis	Analysis	Name	Not required, and not present if measured at site
Adm. Project	Adm. Project	Code	Not required

Combination which make the row Unique

Timestamp

Data series Link

Species values With all properties In Seperate Columns Listed onnce

<sup>16</sup> This is also the properties that shall be available in the cell comboboxes. The user can write directly in the cell, and he will jump to the right space in the combobox.

	<p><i>Properties which make the row unique</i></p> <p><i>Organisation based on dataserie definition</i> If the user has checked “one row pr dataserie link” the information will always be located to the left independently if these are common for the open dataserie or not. In this case there will be one row for each unique combination of dataserie definition, and date. The same date may repeated as several rows even though only one replicate is shown</p>
	<p>Information for each value, but which must be repeated for each opened dataserie for the given timestamp.</p> <p><i>Organisation based on link to dataserie:</i> No tooltip, and not different colours for the group of properties linked to the time value for one species/group of species (since the headings refers to several components in this mode).</p>
	Required class properties
	Optional class properties

*Example*

The table below shows an illustration of organisation explained above (where some of the properties are hidden). The table is an example of “date organisation”. The dataserie definition in the example are common (except for species) and hence organised to the left. The table shows in this case three taxonomic level 1) Family, 2) Genus, and 3) Species, where there are three different species at the species level<sup>17</sup>. Also it must be pointed out that only the concentration values are shown and not the biovolume or other type of quantification.

---

The species used as an example does not belong to the phytoplankton.

**Measurement (part II) and geography**

From Date	Station	Z1 (meter)	Replicate ID	QA flag	Hirundinidae (concentration)	Unit	QA flag	Haemopsis (concentration)	Unit	QA flag	Sanguisuga (concentration)	Unit
1997.12.01 00	BS, Black Sea	-2	1	>	6	Nbr/cm3	A	6	Nbr/cm3	A	2	Nbr/cm3
1997.14.01 00	BS, Black Sea	-2	2	A	12	Nbr/cm3r	A	10	Nbr/cm3	A	1	Nbr/cm3

Freeze Panes (points to the first four columns)

Family level (points to the 'Hirundinidae' column)

Genus level (points to the 'Haemopsis' column)

Species level: Species 1 (points to the 'Sanguisuga' column)

(Table in the horizontal direction continuous)

QA flag	xxxxx(concentration)	Unit	QA flag	xxxxx(concentration)	Unit
A		2 Nbr/cm3	A		2 Nbr/cm3
	A	8 Nbr/cm3		A	1 Nbr/cm3

Species level: Species 2 (points to the first two columns)

Species level: Species 3 (points to the last two columns)

The panes shall be frozen on common functionality to the right and the column headings. In the example above this means that:

From date, station, and z1 shall be frozen. Also the column headings shall be frozen. Hence Scrolling to the right or down will not move the 4 first columns and the headings.

How to enter data directly in the table

This will function in the same manner as for physical and chemical data and the functionality is not repeated here.

### 5.5.8 Graphics

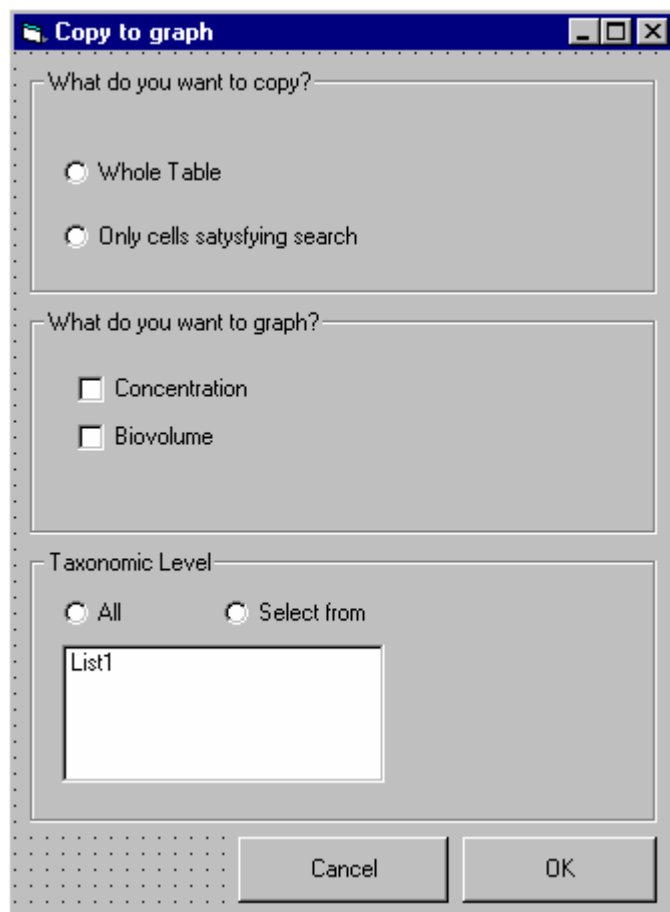
The user may graph the measurement values. This will function in the same manner as described for physical and chemical data.

The default graph is a timeseries graph, with column as a standard timeplot. The user must decide, (in addition to to what to copy) which figures that shall be plotted.

This is due to the fact that phytoplankton may be represented by two measures. These are concentration and Biovolume.

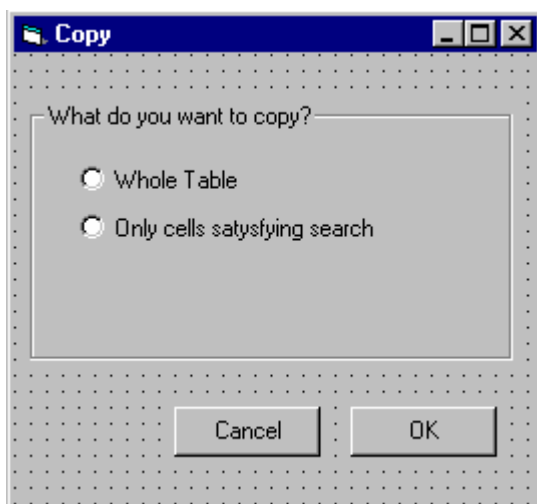
All taxonomic level which are shown in the user interface (not hidden) will be plotted by default, However, the user may deselct some or select other taxonomic level before entering the graph.

If the user select to copy only cells satysfying the search, the search criteria will be available in the graph (options), and the user may change the selection from the graph position.



### 5.5.9 Copy to clipboard

The functionality of the copy to clipboard will be the same as described for physical and chemical measures.



### 5.5.10 Gis

The user will also for this type of measurements have two possibilities (drop down on button):

- ◆ Show stations on map
- ◆ Aggregated data

Show stations on map

This will function in a similar manner as for physical and chemical data.

The screenshot shows a dialog box with a blue title bar and standard window controls. It is divided into three main sections by dotted lines:

- Select Map:** Contains a dropdown menu with the text "If only one open this is automat. selected" and an empty text input field.
- Which stations do you want to show?:** Contains two radio button options:
  - Stations valid for the whole table
  - Only stations linked to the data satisfying the search
- Which species do you want to limit the selection by?:** Contains several controls:
  - "Select measurement type:" with a dropdown menu showing "Measurement type".
  - "Select medium:" with a dropdown menu showing "Medium".
  - "Select Taxonomic Level:" with a dropdown menu showing "Taxonomic level".
  - "Select species/group of species:" with two radio buttons: "All" (selected) and "Select From". Below "Select From" is a text input field containing "List2".
  - A checkbox labeled "Show Picture of Species/group of species on station" which is currently unchecked.

At the bottom of the dialog box are two buttons: "Cancel" and "OK".

The user will get an intermediate form. The user has to select a mapview, if there is only one opened this will be selected automatically. If none is opened the user needs to open a map. The user also has to define if all stations in the measurement table should be shown on the

map or if only the stations linked to the data satisfying the search should be shown. Which of the two options to be default depends on the settings in the main form as described for "copy" above.

Also the user may want to only show stations for some of the species/group of species. The combobox and the listing of species will be limited by which table selection the user has selected to be shown on the map (whole table, station only satisfying search), and the controls will limit each other. If only one medium and measurement type is present this will be selected by default.

By aware that the user also select the taxonomic level and the content of the species list will hence be limited both by the names of the species/groups belonging to that particular taxonomic level, and if the representation should be based on the whole table view or only to those station satisfying the search.

The selection will be created as a separate theme where the user can change the symbol and export the selection as an ordinary theme.

Be also aware of that the user may be able to show the picture of the species on the map (ref also GIS document). The station theme (point theme) will be behind the picture. Meaning that if the picture is not available only the station symbol will be shown.



Aggregated Data

**Show aggregated data on map**

**Select Map**

If only one open this is automat. selected

---

**What do you want to show aggregated results from?**

Use the whole table as a basis     
  Use only cells satisfying the search

Select measurement type/medium:   
 Measurement type    
 Medium

Select components or CSIs variable:   
 component/CSI variabl    
 component/CSI variabl

component/CSI variabl    
 component/CSI variabl

Not selected dataserries:                     
 Selected Dataseries

List1                      
 List1

---

**Aggregation Period**

Select whole data modify period     
  Select a specific date within the data modify period

---

**Aggregation Function**

Minimum                     
  Time weighted average

Maximum                     
  Time weighted interpolated average

Average                     
  Median

Percentile                     

---

**Select dataset type**

Present as station dataset

Present dataset for objects linked to the station

**Select presentation type**

Graduated Color

Chart-proportional pie

Chart-pie

**What do you want to show aggregated results from?**

Use the whole table as a basis       Use only cells satisfying the search

Select measurement type/medium:    Measurement type [v]    Medium [v]

Select Taxonomic Level:    Taxonomic level [v]

Select species/group of species:    Species [v]    Species [v]

   Species [v]    Species [v]

Not selected dataseries:    Selected Dataseries

List2 [ ]    List2 [ ]

Concentration       Biovolume

This function in the same manner as described for physical and chemical data. However the middle part of the form should be replaced with the one above in order to limit to taxonomic level.

The user may apply some statistical functions to the selected data and show the results on the map. The system may use the whole table as basis for the calculation or only the data satisfying the search.

The user select a specific measurement type and medium (if only one is present in a combobox this will be selected automatically)

The user can select at maximum of combination of 4 species or group of species (all within the same taxonomic level) . Only the relevant species/group of species (from the table view with or without search) will be available. By default all dataseries in the table/or selection which also satisfy the species selection will be selected to the right.

Before the user chooses to aggregate the user needs to select the quantitative measure he/she wants to represent. For phytoplankton the two possible choices are 1) concentration and 2) Biovolume.

Also the user needs to decide if the aggregation should be based on the whole modify time period for the selected data or a specific date. The whole period is default. However if the user select a special date the form below will be opened, The user may select a specific date within the period already selected. The form below will be opened with this period. After the user has pushed OK the selected period will be written in the form above, below the radiobutton.

**New/ Edit**

Year: [v]    Month: [v]    Day: [v]    Hour: [v]    Minute: [v]    Second: [v]

From: [v] [v] [v] [v] [v] [v]

To: [v] [v] [v] [v] [v] [v]

The aggregation will function in the same manner as for classification of waterquality.

After the aggregation function is selected the user select the GIS presentation.

The user first needs to determine if the dataset should be shown as a station dataset or be represented by the objects linked to the station. The second option requires that the stations have been made representative for an object (see station form where you can link a station to a lake, part of lake, coastal area and riverlink). If the user selects that dataset should be created based on the objects linked to the station, only one component/CSI variable can be selected (if the user has selected several he/she has to deselect some).

The last step is to select chart presentation.

The graduated color option will only be enabled if the user has selected only one component. The chart options will be enabled if the user wants to create station dataset. However, if the user has chosen to create datasets for the objects linked to the stations (option 2), the chart presentations will be disabled.

If the user has selected only one component, the only chart option will be chart- proportional pie, the chart -pie option will be disabled. The chart-proportional pie option means that the pies are proportional with the result.

However If the user has selected several components both chart options will be enabled, but the chart-pie will be default. The chart -pie will result in pie presentation with different color codes of the slices of the pie which reflects the values in the dataset. In order to create a chart\_pie and chart\_pie proportional the dataserie must belong to the same unit type.

Example Pies proportional presentation (only valid for station dataset):



Several components at one station (only interesting type of presentation if the values differ, in order to see the difference. If not graduate color is more interesting)



One Component at one station



0-100



100-200



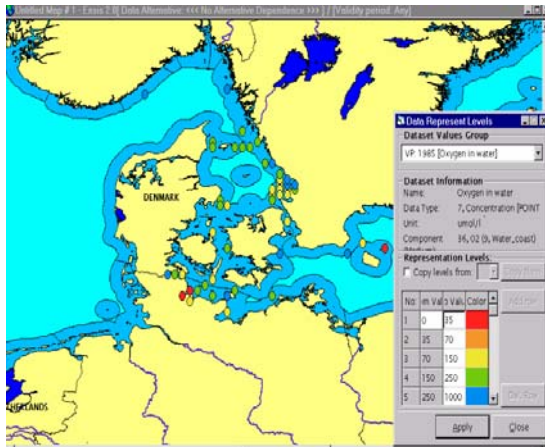
>200

Example Chart Pie with color codes (several components and station dataset)

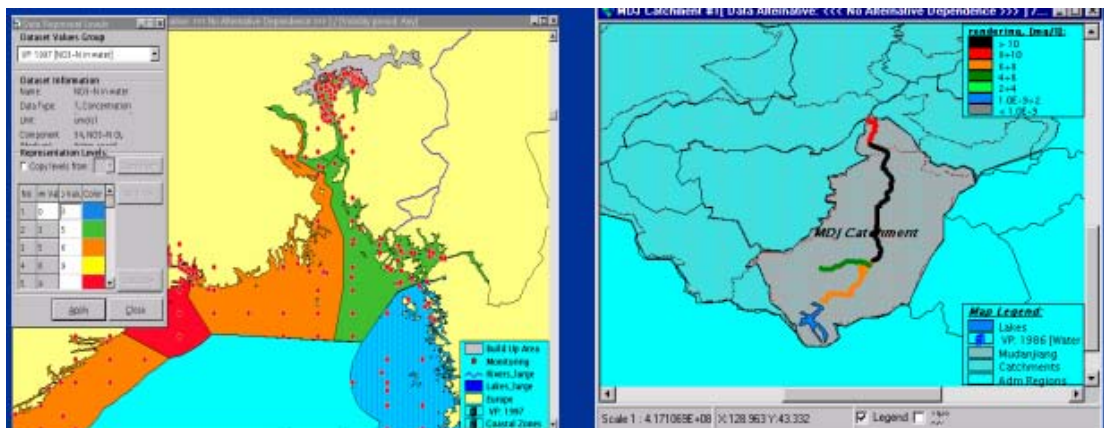


## Measurement (part II) and geography

Example graduate color station dataset (only valid for one component)

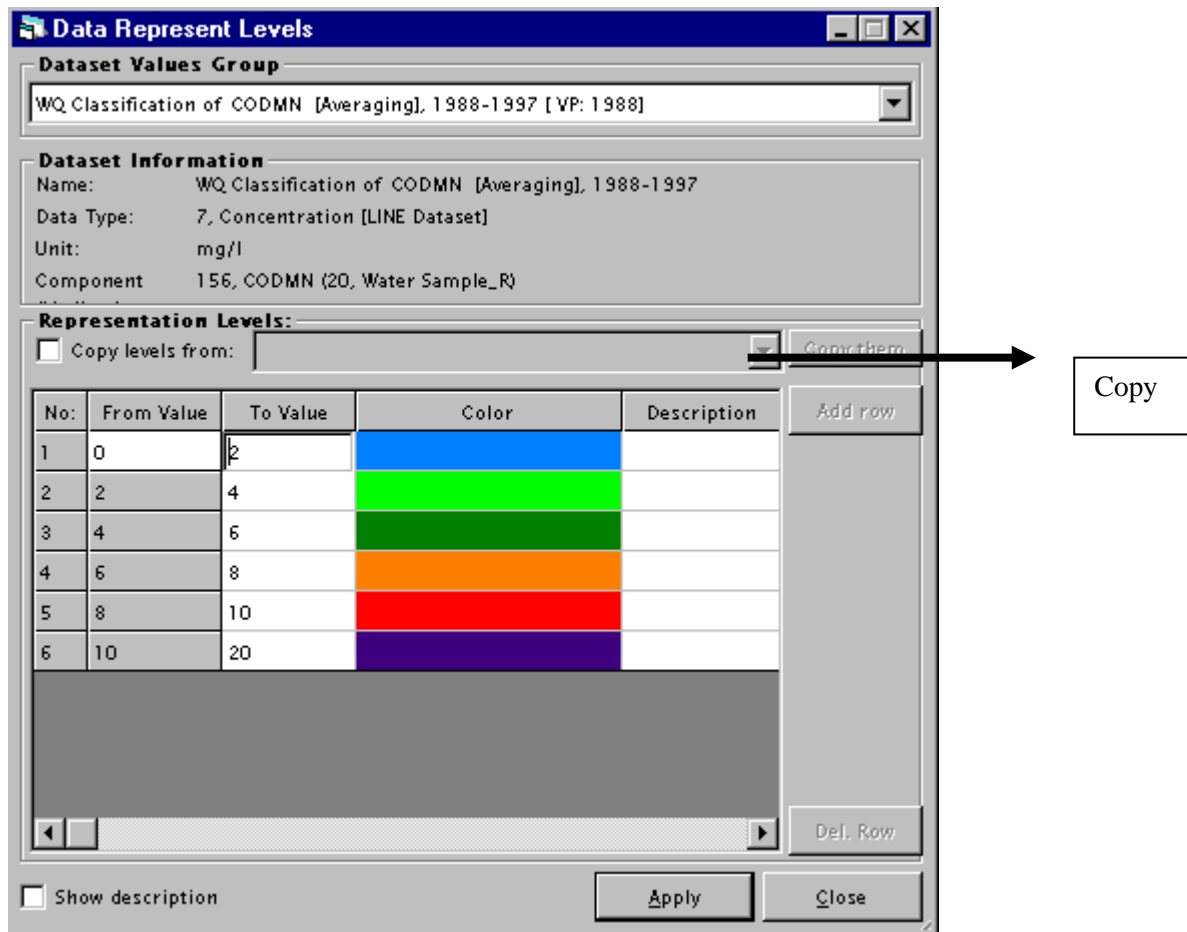


Example of graduate color with "object" dataset based on the link between objects and station (only possible for one component)



The property table to the datasets produced will contain; station name, station code, station ID, number of sampled used as basis for calculation, and the statistical results calculated. If several components/variables has been selected this will mean that several datasets are produced (but they are merged in the map). However if the user has chosen presentation based on the objects linked to the station several dataset might be produced (i.e, both river link dataset, lake dataset and coastal dataset) and these will be created as separated dataset (not merged) since they refer to different geographical themes.

It shall be possible to save all dataset which are created as in the current application, and the user may change the legend of the dataset by copying legend from a classification system (as in the current application).



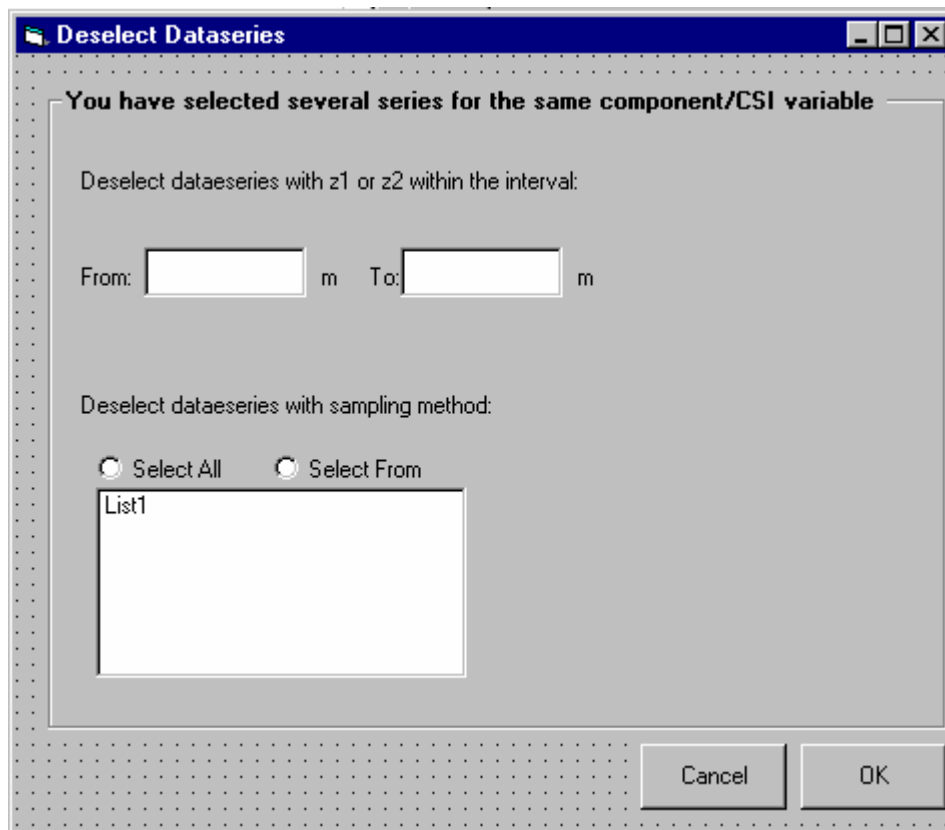
The user starts the calculation on the map by pushing OK. In order to calculate, only one dataset or species/group of species can be selected at each station (not several depths).

If several series are selected which do not satisfy this criteria, it shall be easy to deselect the necessary series by marking several of the series and moving to the left.

This issue could also be solved by an intermediate form asking the user to limit the search further based on the most commonly used selection criteria (for this type of operation).

Depth and sampling type will typically be such criteria.

The form is the same as for physical and chemical sample. However, the frame heading shall be changed to reflect that these are species/group of species and not component.



## 5.6 Measurement Registration \_zooplankton

### 5.6.1 Measurement registration form

The registration of zooplankton functions exactly in the same manner as for the phytoplankton both with respect to the:

- ◆ Registration modus
- ◆ Registration one by one record
- ◆ Table view.



### 5.6.2 Functionality in the form as a consequence of sampling type

The logic will be the same as described for physical and chemical measurements

### 5.6.3 Part 1 of the measurement registration form-show registration modus

The show registration modus will function in the same manner as described for phytoplankton. With an extra property which the user can uncheck (meta data)

The screenshot shows a software interface for measurement registration. It is divided into several sections:

- Default Settings:** A grid of dropdown menus for various parameters: Date/Time Format (dd.mm.yyyy), QA Status Flag, QA Level Flag, Security Flag, Adm. Project, Sampling Equipment, Sampling Procedure, Counting Method, Cells Counted, Counting Volume, Concentration, Specific Volume, Bio Volume, and Sampling volume.
- Show Tax. Level:** A section with a list box containing 'List1'.
- Hide Properties:** A list of checkboxes for properties to be hidden: Measurement Type, Medium, Sampling Type, Station, M. Position Code, Z1, Z2, End Time, Sampling, Counting, Flags, Adm. Project, Hide Corrections, Units, Presence/Absence, Semiquantative code, Cells counted, Counting volume, Spec. Vol./Spec. Biom., Biovolume/Biomass, and Metadata. A 'Save Modus' button is located at the bottom right of this section.

NB in the form the default setting for semiquantative code must also be implemented (see benthic animals)

### 5.6.4 Part 2 of the measurement registration for registration of one by one record

#### Order of registration

The same as for phytoplankton where the user moves in the form by TABS.

The screenshot shows the 'Modify /add Record' form, which is a complex interface for registering observations. It is organized into several main sections:

- Period of Data currently worked with:** Includes a dropdown for 'Modify/ add data within' and a text field for 'Data Exist period'.
- Link to Dataseries:** A section for linking to existing data series, with fields for Measurement Type, Medium, and Sampling Type.
- Location:** Fields for Station, P. Code, and Depth/Height (Z1 and Z2).
- Register Observation:** The central section for entering observation details, including Species (with Rubin and Other codes), Scientific Name, Date/Time (Date From, Time From, Date to, Time to), and Quantification (Sem-quantitative Code, Zooplankton Counted, Counting Volume, Concentration, Specific Volume/Biomass, and Biovolume/Biomass).
- Sampling and Counting:** Fields for Sampling Equipment, Sampling Procedure, Counting Method, and Sampling Volume.
- Quality Assurance:** QA Status Flag and QA Level Flag.
- Admin project and Security Flag:** Project and Security Flag.

Hand-drawn black lines and arrows highlight the flow of the registration process, starting from the 'Species' field and moving through the 'Date/Time' and 'Quantification' sections, then to 'Sampling and Counting', and finally to 'Quality Assurance' and 'Admin project and Security Flag'.

**Period of data currently worked with**

As for phytoplankton

**Dataserries definition**

As for phytoplankton

**Defining a new dataserries**

As for phytoplankton

**Register observation**

Species

As for phytoplankton

Date /timestamp

As for phytoplankton

Quantification

Precense/Absence

As for phytoplankton

Semi-quantative measures

As for phytoplankton

Zooplankton counted

As for phytoplankton

Counting volume

As for phytoplankton

Concentration

As for phytoplankton

Specific Biovolume/Specific Biomass

It is of relevance to either give the specific biovolume or the specific biomass (depends on the species). For this reason it is also relevant to calculate or enter manually Biovolume and Biomass.

Specific Biomass is given as Mass DW/volume or Mass C /volume<sup>18</sup>.

The specific biomass and biovolume is only given as default for some species. Usually the specific biomass/biovolume is calculated based on the Weighthed average length of a relevant subset of zooplankton in the sample. There exist factors for specific biomass depending on length in the litterature (Each zooplankton is measured and the biomass is calculated and scaled based on the length/Sum length. Thereafter all sub samples are summed and the weighted specific biomass/biovolume is calculated) . The database described here is not

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<sup>18</sup> Mass DW and Mass C will be defined as base units

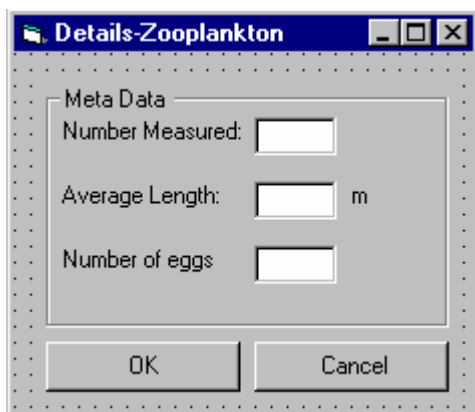
designed to undertake this type of calculations. This is part of the counting procedure and the user gives only the final result as one "weighted specific biovolume/biomass"

### Biovolume/Biomass

The biovolume and biomass are calculated automatically based on the specific biomass or biovolume and the concentration. However, the user may as for phytoplankton overwrite the calculation.

### Details

Even though it is not relevant to save all sub calculations as described above, it is of relevance to give information about the arithmetic average length of the zooplankton that were measured and the number which were measured. Also the number of eggs may be entered. The weighted average may be calculated based on the specific biomass and the factor given in literature.



The image shows a software dialog box titled "Details-Zooplankton". It contains a "Meta Data" section with three input fields: "Number Measured:", "Average Length:" (with a unit "m" to its right), and "Number of eggs". At the bottom of the dialog are two buttons: "OK" and "Cancel".

### **Sampling and counting (optional)**

As for phytoplankton

### **Quality Assurance (optional)**

As for phytoplankton

### **Admin project and security flag**

As for phytoplankton

#### **5.6.5 Apply, cancel and new/edit**

As described for phytoplankton

**5.6.6 Search**

As described for phytoplankton

**5.6.7 Part 3 of the measurement registration \_Measurement table**

**Checkboxes**

As for phytoplankton

**Registration table and functionality**

Organisation based on timestamp

This will function in the same manner as for phytoplankton. However, there must be three extra columns after biovolume/biomass (Number measured, Length, Number of eggs). These properties may be hidden as well as the other properties (through the registration modus)

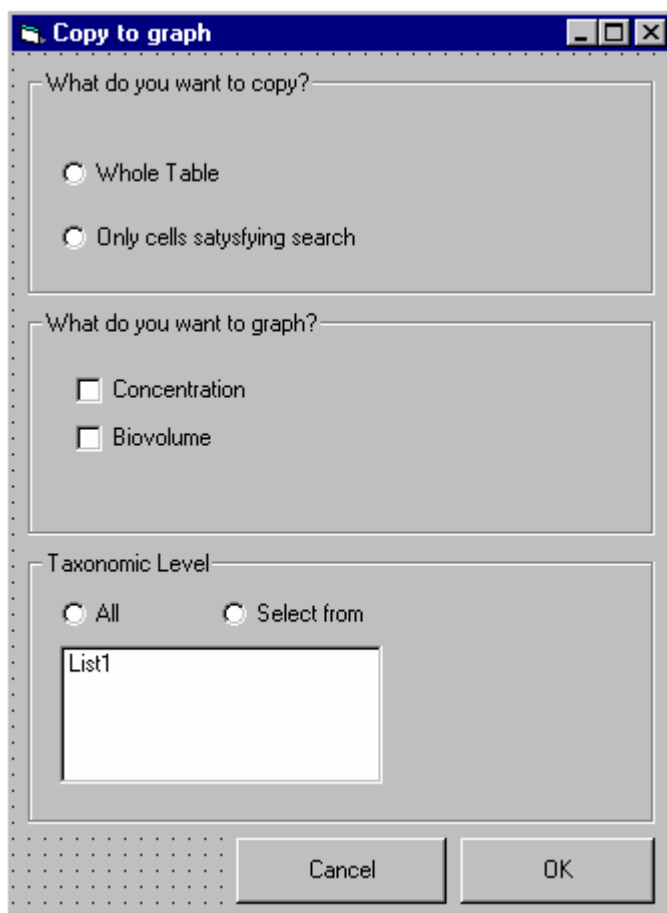
Organisation based on timeseries link

Same as for phytoplankton, but three extra columns for after biovolume/biomass (Number measured, Length, Number of eggs).

### 5.6.8 Graphics

The same as for phytoplankton, but the user select among :

- ◆ Concentration
- ◆ Biovolume/Biomass



**5.6.9 Copy to clipboard**

Same as for phytoplankton

**5.6.10 Gis**

Show Stations on map

Same as for phytoplankton

Aggregated Data

Same as for phytoplankton except that the user chooses between:

- ◆ Concentration
- ◆ Biovolume/Biomass

When he/she is aggregating data

## 5.7 Measurement Registration \_Benthic Animals

### 5.7.1 Measurement registration form

The registration of Benthic animals functions exactly in the same manner as for the phytoplankton both with respect to the:

- ◆ Registration modus
- ◆ Registration one by one record
- ◆ Table view.

### 5.7.2 Functionality in the form as a consequence of sampling type

The logic will be the same as described for physical and chemical measurements

### 5.7.3 Part 1 of the measurement registration form-show registration modus

Default Settings:  
Date/Time Format: dd.mm.yyyy | HH ... Counting Method: Code ...  
QA Status Flag: Code ... Semi Quantitative Code: Code ...  
QA Level Flag: Code ...  
Security Flag: Code ... Number Counted: Unit ...  
Adm. Project: Code ... Sampled Area: Unit ...  
Sampling Equipment: Code ... Coverage: Unit ...  
Sampling Procedure: Code ... Biomass: Unit ...

Show Tax. Level  
List2

Hide Properties  
 Measurement Type  
 Medium  
 Sampling Type  
 Station  
 M. Position Code  
 Z1  
 Z2  
 End Time  
 Sampling  
 Counting  
 Flags  
 Adm. Project  
 Hide Corrections  
 Units  
 Presence/Absence  
 Semiquantitative code  
 Number counted  
 Sampled area  
 Coverage  
 Biomass

Save Modus

The show registration modus will function in the same manner as described earlier for phytoplankton, but with the relevant properties for benthic animals.

### 5.7.4 Part 2 of the measurement registration for\_registration of one by one record

#### Order of registration

Modify /add Record

Period of Data currently worked with:  
Modify/ add data within: Selected Period ...  
Data Exist period:

Basic Link To Dataseries  
Medium: Name ...  
Measurement Type: Name ...  
Sampling Method: Name ...

Location  
Station: Code | Name ...  
P.Code: Code ...  
Depth (Z1): | m

New Dataseries

Register Observation  
Species:  Expand list  
Rubin Code | Other Code ... Details  
Scientific Name ... Tax. Tree  
New

Date/Time (Format xx/xx/xx)  
Date From: | Time From: |  
Date to: | Time to: |

Quantification  
 Precise  Absence  
Sem-quantitative Code: Code ...  
Number Counted: | Unit ...  
Sampled Area: | Unit ...  
Coverage: | Unit ...  
Biomass: | Unit ...

Sampling and Counting  
Sampling Equipment: Code ...  
Sampling Procedure: Code ...  
Counting Method: Code ...

Quality Assurance  
QA Status Flag: Code ...  
QA Level Flag: Code ...

Admin project and Security Flag  
Project: Code ...  
Security Flag: Code ...

Search Duplicate Absence registration Cancel Apply New

The order of registration is the same as for phytoplankton where the user moves from field to field by the TAB.



### **Period of data currently worked with**

As for phytoplankton

### **Dataserries definition**

As for phytoplankton, except that the depth reference will only refer to one depth (z1) and not a depth interval (the sampling type will never be composite and hence the field for Z2 is not relevant)

### **Defining a new dataserries**

As for phytoplankton

### **Register obserrvation**

#### Species

As for phytoplankton

#### Date /timestamp

As for phytoplankton

#### Quantification

#### Precence/Absence

As for phytoplankton

#### Semi Quantative measures

As for phytoplankton

#### Number counted and Counted area

The same principle with respect to what units that will be available are as explained for phytoplankton (configured to each field and measurement type)

The number counted refers to the whole sample, and the counted area (if register) is equal to the sampled area. For this type of biological data it is not of relevance to register the counted area versus the sampled area. This type of field is therefore removed from the form compared to phytoplankton (see figure). Number counted may be given relatively (% versus other species) or absolute number. The unit type is determined by the user, but the user need to keep in mind taht to get comparable results the user should stick to one unittype (ref phytoplankton).

#### Coverage

The coverage is typically number or % of species pr area unit. The system tries to calculate this based on number counted and counted area (only possible if the units correspond to the units selected for the coverage. The user may overwrite the calculation (if any).

#### Biomass

The user may also give Specific biomass or biovolume is not relevant for this measurment type, but the user may give the biomass directly. Unit types used may be Mass C/Area og Mass DW/Area (depending on the configuration).

**Sampling and counting (optional)**

As for phytoplankton

**Quality Assurance (optional)**

As for phytoplankton

**Admin project and security flag**

As for phytoplankton

**5.7.5 Apply, cancel and new/edit**

As for phytoplankton

**5.7.6 Search**

As for phytoplankton

**5.7.7 Part 3 of the measurement registration for registration of one by one record**

**Checkboxes**

As for phytoplankton

**Registration table and functionality**

Organisation based on timestamp

This will function in the same manner as for phytoplankton. However, the quantification columns will be less and have different headings: Presence/ absence, Semi Quantative code, number counted, sampled area, and biomass.

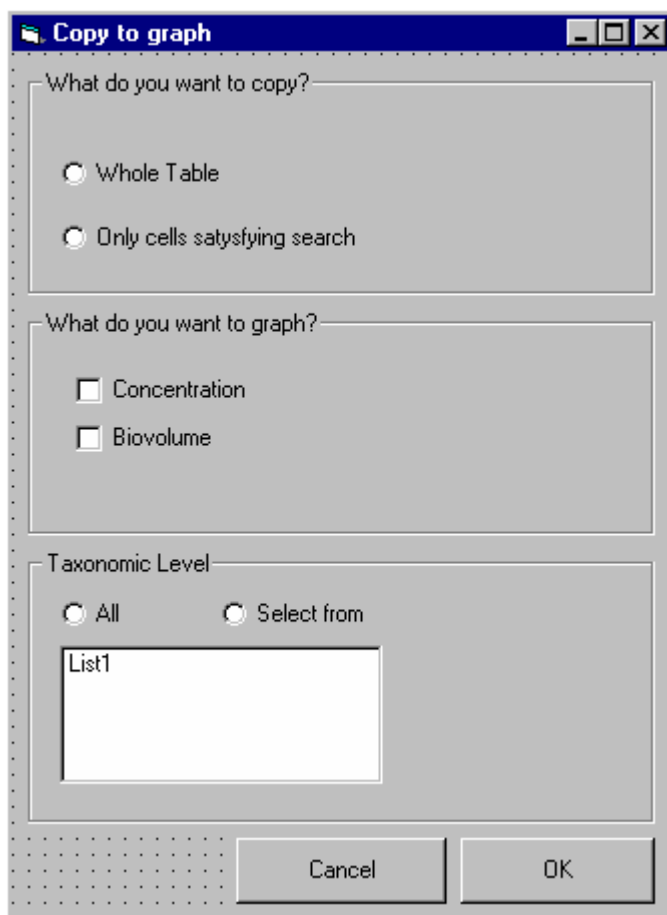
Organisation based on timeseries link

Same as for phytoplankton, but with other quantification columns (as described above)

**5.7.8 Graphics**

The same as for phytoplankton, but when the user is asked what he/she wants to graph he/she select from (check boxes) :

- ◆ Number counted
- ◆ Coverage
- ◆ Biomass



### 5.7.9 Copy to clipboard

Same as for phytoplankton

### 5.7.10 Gis

#### Show Stations on map

Same as for phytoplankton

#### Aggregated Data

Same as for phytoplankton except that the user chooses between the following options (radiobuttons) when he/she is aggregating data

- ◆ Number counted
- ◆ Coverage
- ◆ Biomass



## 5.8 Measurement Values \_Macrovegetation

### 5.8.1 Measurement registration form

The registration of Macrovegetation functions exactly in the same manner as for the benthic animals both with respect to the:

- ◆ Registration modus
- ◆ Registration one by one record
- ◆ Table view.

The only difference is that the the meta data /lower Vegetation limit may be registered.

### 5.8.2 Functionality in the form as a consequence of sampling type

The logic will be the same as described for physical and chemical measurements

### 5.8.3 Part 1 of the measurement registration form-show registration modus

The screenshot shows a software interface for measurement registration. It is divided into three main sections:

- Default Settings:** A grid of dropdown menus for various parameters: Date/Time Format (dd.mm.yyyy, HH), QA Status Flag, QA Level Flag, Security Flag, Adm. Project, Sampling Equipment, Sampling Procedure, Counting Method, Semi Quantitative Code, Counted, Sampled Area, Coverage, and Biomass. Each dropdown has a 'Code' or 'Unit' selection.
- Show Tax. Level:** A text box containing 'List2'.
- Hide Properties:** A list of checkboxes for properties to be hidden: Measurement Type, Medium, Sampling Type, Station, M. Position Code, Z1, Z2, End Time, Sampling, Counting, Flags, Adm. Project, Hide Corrections, Units, Presence/Absence, Semiquantitative code, Counted, Sampled area, Coverage, and Biomass. A 'Save Modus' button is located at the bottom right.

The functionality will be the same as described for benthic animals

### 5.8.4 Part 2 of the measurement registration for registration of one by one record

#### Order of registration

Same as for benthic animals

#### Period of data currently worked with

Same as for benthic animals

#### Dataserries definition

Z2 is not relevant for this type of measurements, and the z2 is therefore removed from the form (as for benthic animals).

For marine macrovegetation the measurements are assigned to a depth (z1). However, for some measurements i.e. taken in river or lake this is lacking or not relevant. In these cases the user may assign an approximate value or i.e. -9900 to indicate that the depth is missing (if there exist only one possibility in the combobox this will be selected automatically). It must be decided later if there should be made an additional form to cover these differences, but for the time being there shall be no difference depending on the medium (coast, river, lake)

#### Defining a new dataserries

As described for phytoplankton

#### Register observation

##### Species

As described for phytoplankton

##### Date /timestamp

As described for phytoplankton

### Quantification

#### Precense/absence

As described for phytoplankton

#### Semi-quantative measures

As described for phytoplankton

#### Counted

The quantification is usually given in %, but as mentioned earlier this only depends on the unit types (and units) the user has assigned to the different measurement types.

#### Sampled Area

This is the sampled area that the % counted refers to.

#### Coverage

Coverage is calculated or manually overwritten as described for benthic animals.

#### Biomass

The biomass might be given equivalent as for Benthic animals (Usually with unit types Mass C/Area, or Mass DW/area)

(Comment: Biomass is not frequently in use in river and lakes. However, for the time being the form shall be kept the same).

#### **Sampling and counting (optional)**

As described for phytoplankton

#### **Quality Assurance (optional)**

As described for phytoplankton

#### **Admin project and security flag**

As described for phytoplankton

#### **5.8.5 Apply, cancel and new/edit**

As described for phytoplankton

#### **5.8.6 Search**

As described for phytoplankton

### **5.8.7 Part 3 of the measurement registration for registration of one by one record**

#### **Checkboxes**

As for phytoplankton

#### **Registration table and functionality**

##### Organisation based on timestamp

This will function in the same manner as for phytoplankton. However, the quantification columns will be less and have different headings: Presence/ absence, Semi Quantative code, counted, sampled area, and biomass (= the same as for benthic animals)

##### Organisation based on timeseries link

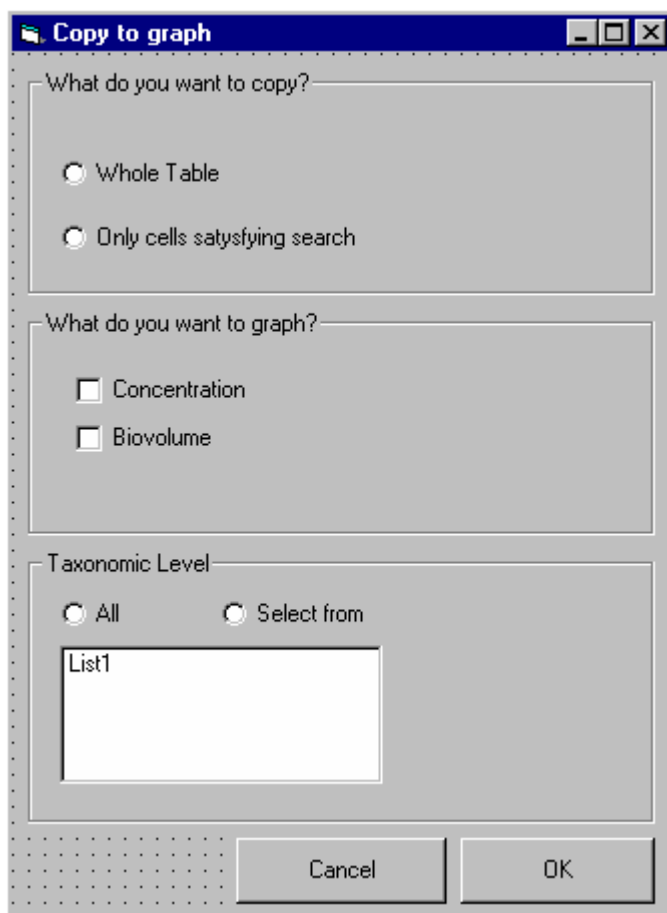
Same as for phytoplankton, but with other quantification columns (as described above)

### **5.8.8 Graphics**

The same as for phytoplankton, but when the user is asked what he/she wants to graph he/she select from (check boxes) :

- ◆ Counted
- ◆ Coverage
- ◆ Biomass





### 5.8.9 Copy to clipboard

Same as for phytoplankton

### 5.8.10 Gis

#### Show Stations on map

Same as for phytoplankton

#### Aggregated Data

Same as for phytoplankton except that the user chooses between the following options (radiobuttons) when he/she is aggregating data

- ◆ Counted
- ◆ Coverage
- ◆ Biomass

## 5.9 Measurement Registration \_Pheriphyton

### 5.9.1 Measurement registration form

The registration of periphyton functions exactly in the same manner as for the macrovegetation, both with respect to the:

- ◆ Registration modulus
- ◆ Registration one by one record
- ◆ Table view.

### 5.9.2 Functionality in the form as a consequence of sampling type

The logic will be the same as described for physical and chemical measurements

### 5.9.3 Part 1 of the measurement registration form-show registration modus

The screenshot shows a software interface for measurement registration. It is divided into three main sections:

- Default Settings:** A grid of dropdown menus and buttons for configuring various parameters. Fields include Date/Time Format (dd.mm.yyyy, HH), QA Status Flag, QA Level Flag, Security Flag, Adm. Project, Sampling Equipment, Sampling Procedure, Counting Method, Semi Quantitative Code, Counted, Sampled Area, Coverage, and Biomass. Each field has a 'Code' or 'Unit' dropdown and a '...' button.
- Show Tax. Level:** A text box containing the value 'List2'.
- Hide Properties:** A list of checkboxes for toggling the visibility of different data fields. The list includes: Measurement Type, Medium, Sampling Type, Station, M. Position Code, Z1, Z2, End Time, Sampling, Counting, Flags, Adm. Project, Hide Corrections, Units, Presence/Absence, Semiquantitative code, Counted, Sampled area, Coverage, and Biomass. A 'save Modus' button is located at the bottom right of this section.

The functionality will be the same as described for benthic animals

### 5.9.4 Part 2 of the measurement registration for registration of one by one record

#### Order of registration

Same as for benthic animals

#### Period of data currently worked with

Same as for benthic animals

#### Dataserries definition

Z2 is not relevant for this type of measurements, and the z2 is therefore removed from the form (as for benthic animals and macrovegetation).

For marine macrovegetation the measurements are assigned to a depth (z1). However, for some measurements i.e. taken in river or lake this is lacking or not relevant. In these cases the user may assign an approximate value or i.e. -9900 to indicate that the depth is missing (if there exist only one possibility in the combobox this will be selected automatically). It must be decided later if there should be made an additional form to cover these differences, but for the time being there shall be no difference depending on the medium (coast, river, lake)

This is exactly the same comment made for macrovegetation.

#### Defining a new dataserries

As described for phytoplankton

#### Register observation

##### Species

As described for phytoplankton

##### Date /timestamp

As described for phytoplankton

### Quantification

#### Precense/absence

As described for phytoplankton

#### Semi-quantative measures

As described for phytoplankton

#### Counted

The quantification is usually given in % relatively to the total counted number which is given in the sampling frame (See below).

But as mentioned earlier this only depends on the unit types(and units) the user has assigned to the different measurement types, and the user might give this as an absolute number as well.

#### Sampled Area

This is the sampled area that usually the % counted refers to.

#### Coverage

Coverage is calculated or manually overwritten as described for benthic animals.

#### Biomass

The biomass might be given equivalent as for Benthic animals (Usually with unit types Mass C/Area, or Mass DW/area)

(Comment: Biomass is not frequently in use in river and lakes. However, for the time being the form shall be kept the same).

#### **Sampling and counting (optional)**

As described for phytoplankton except that sampling volume shall be replaced by Total counted. Total counted refers to a total number periphyton counted (several species)

#### **Quality Assurance (optional)**

As described for phytoplankton

#### **Admin project and security flag**

As described for phytoplankton

#### **5.9.5 Apply, cancel and new/edit**

As described for phytoplankton

#### **5.9.6 Search**

As described for phytoplankton

### **5.9.7 Part 3 of the measurement registration for registration of one by one record**

#### **Checkboxes**

As for phytoplankton

#### **Registration table and functionality**

##### Organisation based on timestamp

This will function in the same manner as for phytoplankton. However, the quantification columns will be less and have different headings: Presence/ absence, Semi Quantative code, counted, sampled area, and biomass (= the same as for benthic animals)

Also the sampling properties will have an extra column (as for phytoplankton) called Total counted. In this column the user will typically registrate the total number counted (independent of species)

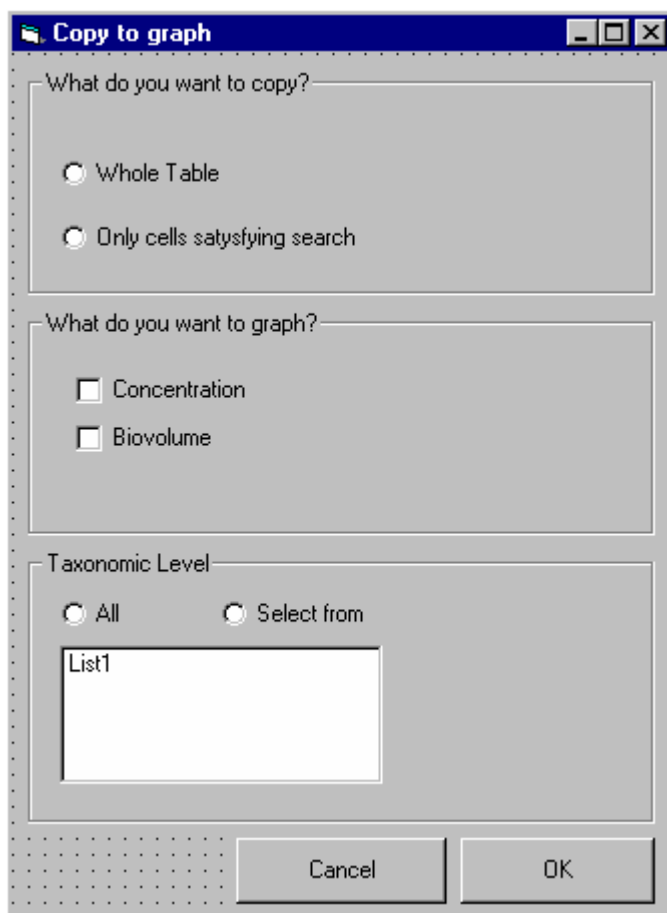
##### Organisation based on timeseries link

Same as for phytoplankton, but with other quantification columns (as described above)

### **5.9.8 Graphics**

The same as for phytoplankton, but when the user is asked what he/she wants to graph he/she select from (check boxes) :

- ◆ Counted
- ◆ Coverage
- ◆ Biomass



### 5.9.9 Copy to clipboard

Same as for phytoplankton

### 5.9.10 Gis

#### Show Stations on map

Same as for phytoplankton

#### Aggregated Data

Same as for phytoplankton except that the user chooses between the following options (radiobuttons) when he/she is aggregating data

- ◆ Counted
- ◆ Coverage
- ◆ Biomass



## ***5.10 Measurement Registration \_Fish***

This will probably be designed approximately with the same structure as described for the other biological groups. However this is not part of this specification, but can easily be written as an additional specification after testing the already specified functionality

## ***5.11 Common Sampling Information***

Not relevant



## 6 Measurements-BiotaChemistry

### 6.1 Main entry form to measurement data and specific search criteria

**Measurement Data**

**Quick Search for Measurement Data**

Search Combination: User Defined Search Corr    Measurement Type: [ ]

Stations with Code/Name: [ ] [ ] [ ]

Other Search Criteria

Search

**Found Dataseries**     Show all properties

IvwAllDataseries

IvwSelectedDatas...

**Dataseries**

New

Edit

Append

Delete

**Measurements**

Select Time Period: Validity period defined [ ]

Display Measurements

Graphics [ ]

Registration/Table View

Quality Assurance

Filter Flags

Run QA [ ]

**Links**

Calculations [ ]

Stations

Geographic [ ]

GIS [ ]

ReportGenerator

The main entry form to the biota-chemistry data is the same as for physical and chemical measurements.

## 6.2 Search Criteria

### 6.2.1 Search criteria form

The screenshot shows a software dialog box titled "Measurement Search Criteria Biota Chemistry". It is organized into two main sections: "Common Search Criteria" and "Special Search Criteria".

**Common Search Criteria:**

- Measurement Types:** Radio buttons for "All" and "Select From:" with a list box containing "IstComponents".
- Mediums:** Radio buttons for "All" and "Select From:" with a list box containing "Sample Node" (repeated three times).
- Limit List of Stations:** A checkbox for "Apply Limitation on station List", and checkboxes for "Include Measured Series" and "Include Calculated Series".
- Stations:** Radio buttons for "All" and "Select From:" with a list box containing "IstComponents".

**Special Search Criteria:** This section has three tabs: "Physical and Chemical Data", "Biological Data", and "Biota Chemistry" (which is selected).

**Biota Chemistry Tab:**

- Sampling Type:** Radio buttons for "All" and "Select From:" with a list box containing "IstComponents".
- Measurement Position Code:** Radio buttons for "All" and "Select From:" with a list box containing "IstComponents".
- User Defined Species Group:** Radio buttons for "All" and "Select From:" with a list box containing "IstComponents".
- Limit to component group:** Radio buttons for "All" and "Select From:" with a list box containing "IstComponents", and checkboxes for "Other limitations" and "Apply".
- Species:** Radio buttons for "All" and "Select From:" with a list box containing "IstComponents".
- Components:** Radio buttons for "All" and "Select From:" with a list box containing "IstComponents".
- Search for Dataseries based on measurement specifics:**
  - Dataseries with measurements within timeperiod:** A dropdown menu, a "..." button, and a "Special Selection" button.
  - Dataseries with number of observations:** A ">=" dropdown, a "1" input field, and a "..." button.
  - Buttons for "Other Search criteria-Fish", "Other Search criteria-Macrovegetation", and "Other Search criteria-Benthic Animals", each with an "Apply other search criteria" checkbox.

At the bottom of the dialog, there are buttons for "Clear Search Criteria" and "Apply". Below the dialog box, there is a "Save Search Combination" section with a "Search combination name" dropdown, and a row of buttons: "Measurements", "Search Dataseries", and "Cancel".

### 6.2.2 Common search criteria

The common search criteria are as explained earlier

### 6.2.3 Special search criteria

The selection of sampling type and measurement position code function in the same manner as for physical and chemical data. However, the depth references (z1 and z2) are removed since these are not relevant for this type of measurements.

### Limit list of species to defined species group

The user may limit the list of species by selecting one or several predefined groups of species. In the case of biotachemistry this is regarded as sufficient to limit the species list since the number of species measured usually are limited. Therefore it is not necessary to have more advanced search criteria to limit the list, i.e. as for biological samples where you in addition have the possibility to select from a species hierarchy.

### Limit to component group

This will limit the list of components to select from.

### Species

The user may select one or several of the listed species.

### Components

The user may select one or several of the listed components.

### Search for dataserries based on measurement specifics.

This function exactly the same as described for physical and chemical data.

6.2.4 Other search criteria-Fish

**Find Dataseries based on measurement details**

Find dataseries based on measurements with a link to

Adm. Projects Analysis and sampling Time Step Flags  Apply

Find dataseries based on measurements with values within limits:

Select Medium: Name Select Species: Name

Select component: Name Operator Unit

Select component: Name Operator Unit

Select component: Name Operator Unit

Find Dataseries based on measurements with values linked to catch information:

Name of fisherman: Name Vessel: Name

Scientist in charge: Name Catch Depth: Operator Unit m

CPUE: Operator Unit

Find Dataseries based on information about the fishes in the samples/catch:

Based on individuals  Based on average No of individuals: Operator Unit

Weigh, Length and age

Length: Operator Unit cm

Weight: Operator Unit g

Gonade Weight: Operator Unit g

Liver Weighth: Operator Unit g

Conditional Factor: Operator Unit

Age: Operator Unit Year

Other physical characteristics

Sex: Male/Female

Maturation Index: Unit

Color of meat: Unit

Disease: Unit

Piscivore: Yes/no

Stomach Fullness: Unit

Find Dataseries based on measurements with values linked to other CSI:

Select CSI variables: Name Operator Unit

Select CSI variables: Name Operator Unit

OK Cancel

The other search criteria are other relevant search criteria of interest to biotachemistry. These special search criteria depends on type of biotachemistry. The form above shows the search criteria which are relevant for fish.

### Find Dataseries based on measurements with a link to

This function in the same manner as described for physical and chemical data.

### Find dataseries based on measurements with values within limits

The user may limit the search even further to one of the available mediums and species and link this to one or several (maximum 3) of the already limited components (only medium, species and component which match the other search criteria already set will be available in the combo boxes).

This search criteria is created in order to be able to search for dataseries with usually very or low measurement values. If the user does not select any medium and species, the component limitation will apply to any of the already selected mediums and species.

If the comboboxes only has one entry (based on limitation done elsewhere) this shall be selected as default.

### Find dataseries based on measurements with values linked to catch information

The user may search for dataseries which have a link to the following CSI information: Name of fisherman (free-text), scientist in charge (free-text), CPU (a number where logical operators may be used, where between is one logical operator and default is >), vessel (free text) and catch depth (a number with logical operators, default shall be >)

### Find Dataseries based on information about the fishes in the sample/catch

The user must decide if the search should be based on the information of each individual in a catch/sample or average information about the individuals. The default choice is individual and the number of individuals are disabled. If average is chosen no of individuals is by default  $\geq 2$ . The user should be aware of that the average refers to the average of the composite sample if the sampling type is "composite" and the average for the whole catch if the sampling type of the dataseries is of type "individual"

The weight, length, conditional factor and age variables are numerical where the user has the possibility to use numerical search criteria.

Other physical characteristics may be used to find any dataseries which have measurements with a link to fish individuals with specific properties: Sex, maturation index, color of meat, disease, Piscivore and stomach fullness.

In the case the user selects based on average, the frame other physical characteristics is disabled.

### Find dataseries based on measurements with values linked to other CSI

Finally the user may select any other CSI variable (maximum 2) in order to search for dataseries with measurements linked to this property.

### 6.3 Found Dataseries

The listing of found data series will function in the same manner as described in chapter 4.3. Except for the fact that in addition to the component column one extra column will be needed to list the species reference. The species shall be listed with the latin name (In the case where the user has searched for both water chemistry and biota chemistry, the water chemistry data series will not have reference to species =left blank)

Properties (separated in columns from left to right)	Column Heading	Show	Sort by
Station	Station	1.3	2.3
Measurement position- Code	M.Pos. Code	1.4	2.3
Measurement position, Z1 value	Z1 (m)	Exact Value	Num. <sup>19</sup>
Measurement position, Z2 value	Z2(m)	Exact Value	Num.
Measurement type	M.Type	1.1	2.2
Medium	Medium	1.1	2.2
Component	Component	1.1	2.2
Species	Species	1.1.	2.2
Sampling Type	Sampling Type	1.1	2.2
Validity Period	Validity Period	Range	Num
Number of samples	No of samples	Value	Num
Calculation method	Calc. method	1.1	2.2 <sup>20</sup>
Timestep(in second)	Timestep(Sec.)	Value	2.1
Duration (in second)	Duration (Sec.)	Value	2.1

Properties to be shown as default

Extra prop. If "show all prop" is checked

- 1.1 Name
- 1.2 Id and name
- 1.3 Code and Name (and sort by code)
- 1.4 Code
- 2.1 Numerical Sensitive, based on ID
- 2.2 Text sensitive based on Name
- 2.3 Sort by code

<sup>19</sup> Negative numbers shall as an example be sorted in the following way 0, -1, -2, -10 etc

<sup>20</sup> The calculated time series will be marked with the type of calculation that have been used as in the current application, however this shall be a separate column with the name of the calculation method.

## 6.4 Dataseries Definition

**Dataseries Definition for Biota Chemistry**

**Basic Definition**

Measurement Type: Combo2

Medium: Sample Node

Sampling Type: cboSamplingMethod

Time Step: txtTimeStep    cboTimeStepUnit

Duration: txtDuration    cboDurationUnit

Prop. Factor: txtPropFactor    cboPropFactorUnit

**Location**

Station: cboStation    Limit Stations

Measurement Position: cboMeasPosition

**Link to Species and Component**

**Taxonomic Structure**

All     Select From:

Sample Node

**User Defined Species Group**

All     Select From:

IstComponents

**User defined component Group**

All     Select From:

IstComponents

**Species**

All     Select From:

IstComponents

**Component links to species**

Species

All     Select From:

IstComponents

Apply species/component link

Get Prev. Definition    Copy Definitions    OK    Cancel    Apply

The dataseries definition function in the same manner as described for physical and chemical measurements, except for the following:

Measurement Position: The measurement position z values are not relevant, only the code and the x and y position.

### Linking species and component

The dataserries need to be linked both to species and component.

One species can have many components, but all species are not necessarily linked to the same components.

This means that after the user has checked a species, this will be available in the combobox in order for the user to link component to the species.

In order to apply a link from species to components the user must use the apply the button “Apply Species/Component link”

Which species and components to be available to select from will in the first place be a consequence of the measurement type . However, the user can use the criteria to the left to limit the list further.

The species component combinations which already have measurements will be checked and disabled.

### Sampling type

It must also be mentioned that the sampling type definition will in most cases(if not all) have the following combination:

- ◆ Sampled and analysed in laboratory
- ◆ Step type= irregular
- ◆ Value type= instant
- ◆ Sample type= composite or individual

This means that time step, duration and proportional unit are in most cases not relevant for this measurement type



## 6.5 Measurement values-Fish

The registration form (including the table) for measurement will function in the same manner as for chemical and physical measurements in water and air. It is important for the programmer to have this in mind since only the differences are elaborated on in this chapter.

### 6.5.1 Part 1 of the measurement registration form-Show registration modus

The registration modus will be the same as for physical and chemical samples, except for the fact that the z1 and z2 settings shall be removed.

### 6.5.2 Part 2-Registration one by one record

#### Location:

It is not necessary to give the depths ( $z_1$  and  $z_2$ ) for any of the measurements and hence these have been removed from the form.

#### Select species and component

The user selects both species and components, only species and components linked to the opened dataserie will be available. However, if the user expands the list all components and species valid for the selected measurement types will be available.

After the user is finished with the registration an push apply/new the following will happen:

If the dataserie exist with the combination which the user selects this means that the measurements will be saved in this serie, if it does not exist with this species/component combination this means that the dataserie will automatically be created.

In both cases and as explained earlier the table will be updated with the new dataserie/or the existing dataserie which are fetched from the database

#### Quantification

In addition to give a replicate reference to the value, the user must for this type of measurements, also refer to the fish ID or the composite ID. If it is a composite sample (determined by the sampling type) the fish ID field will be disabled, and if it is defined as an individual sample the composite sample ID will be enabled.

Which units to show up depends on the definition of measurement type.

### 6.5.3 Apply, cancel and new

As described for physical an chemical samples

### 6.5.4 Search

This will refer to the search criteria which are explained above and shown below.

**Find Dataseries based on measurement details**

Find dataseries based on measurements with a link to:      Apply

Find dataseries based on measurements with values within limits:

Select Medium:  Select Species:

Select component:

Select component:

Select component:

Find Dataseries based on measurements with values linked to catch information:

Name of fisherman:  Vessel:

Scientist in charge:  Catch Depth:    m

CPUE:

Find Dataseries based on information about the fishes in the samples/catch:

Based on individuals  Based on average No of individuals:

Weight, Length and age

Length:    cm

Weight:    g

Gonade Weight:    g

Liver Weigth:    g

Conditional Factor:

Age:    Year

Other physical characteristics

Sex:

Maturation Index:

Color of meat:

Disease:

Piscivore:

Stomach Fullness:

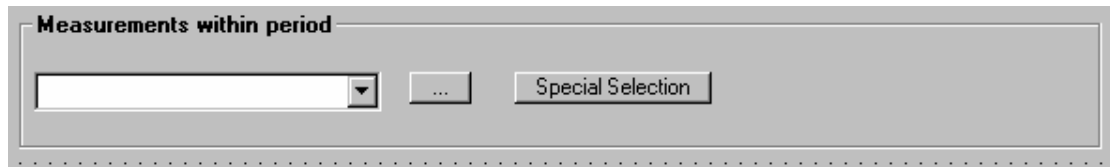
Find Dataseries based on measurements with values linked to other CSI:

Select CSI variables:

Select CSI variables:

With some differences:

The frame shown below shall be inserted at top of the form:



The image shows a rectangular frame with a light gray background and a dashed border. At the top left, the text "Measurements within period" is displayed. Below this, there is a white text input field with a small downward-pointing arrow on its right side. To the right of the input field is a button with three dots "...". Further to the right is a button labeled "Special Selection".

This will contain the modify time period already set. It is only when the user selects a sub period of the modify time period the actual rows satisfying the period will be marked. The user can not extend the modify time period from this location (it must be equal or less). If the user has in addition set special selection criteria, it is only those rows with timestamps satisfying the special selection and the time period which will be marked.

Also the frames shall change name when reached from the measurement table:

- ◆ Find measurements with a link to
- ◆ Find measurements with values within limits
- ◆ Find measurements with values linked to catch information
- ◆ Find measurements linked to information about the fishes in the samples
- ◆ Find measurements with values linked to CSI

The idea behind this search is exactly the same as described for the physical and chemical data (chapter 4). Which we can sum up to:

- ◆ These are basically the same criteria which can be used by the user in the first place to find dataserries, but are focused to find and mark rows in the measurement table.
- ◆ If these criteria has already been used as a basis for selection of dataserries the time value cells which satisfy these will already be marked in the table and the find measurement form will be opened with the information filled in.
- ◆ The user can change the selection or set new criteria after some specific rules which are explained below.

The user shall be aware of that this is only a method to view a special measurement selection in the table and distinguish these from the rest of the measurements, and also a method to be able to copy only the selection to clipboard. This means that the table will contain all measurements values independently of these criteria as long as they are part of the dataserries satisfying the dataserries search given earlier, and as long as these are within the given modify time period. The measurements satisfying the criteria will be marked, and the user can also decide that he/she will only limit the table to those satisfying the search (Limit to search).

### 6.5.5 Part 3 of the measurements registration form. Enter data directly in the table

The user has the same possibilities as described for physical and chemical data.

- ◆ Extend table with all properties.
- ◆ Limit to search.
- ◆ One row pr dataserie link.
- ◆ View registration table in separate window.

The data will be organized similar (but not exactly ) as for physical and chemical data, and there will be the same possibilities to enter data directly in the table, sorting, copying, access to tooltip on headings and color codes etc, .

#### Organisation based on timestamp

As illustrated below the main difference compared to physical/chemical data are that:

- ◆ Fish ID/Composite ID is a property,
- ◆ medium is not a separate coloumn (but part of the value heading) and therefore the column which contain the value of the measurment has the following heading: Componentcode (medium name), i.e.Hg (fish liver).
- ◆ the species reference is an extra property and even this is part of the dataserie definition there shall always be one row pr unique combination of time, species, replicate ID and Fish ID/Composite ID (the sampling type will guide if the actual reference is a fish ID or a composite ID)
- ◆ The depth properties of dataserie are not relevant
- ◆ If analysis has been taken in several medium for one unique combination, all components with values are listed for one medium, and thereafter the next medium (see example)

Column	Column Heading	Sort rows by properties in the column <sup>21</sup>	Required/Optional
Start Time	Start Time	-	
End Time	End Time	-	Required but can be hidden
Measurement Type	M.type		Ref timeseries (but can be hidden)
Sampling Type	Samp.Type		Ref timeseries (but can be hidden)
Station	Station	Code, name	Ref timeseries (but can be hidden)
Measurement Position Code	M.P. Code	Code(text)	Ref time series (but can be hidden)
Species	Species	Latin Name(text)	Required
Replicate ID	Replicate ID	Number	Required but can be hidden
Fish ID/Composite ID	Fish ID/Composite ID	Number	Required
Quality status	Q. Status Flag	Name	Not required
Component (value)	Component code(medium)  (Component code (text) shall be written in the heading with the medium reference in pharanthesis)	Number	Required
Unit	Unit	Unit name	Required
Quality Level Flag	Q. Level Flag	Name	Not required
Quality Security Flag	Security Flag	Name	Not required
Equipemntinstrument	Equip./Inst	Code for analysi, name for instrument	Not required
Sampling Procedure	Samp. Proced.	Code	Not required, and not present if measured at site
Analysis	Analysis	Name	Not required, and not present if measured at site
Adm. Project	Adm. Project	Code	Not required

Combina  
tion  
which  
make the  
row  
Unique

Timestamp

Data series Link, may be several at one row

Component value With all properties Seaparate Column with the Same colour

	Properties which make the row unique
	<i>Organisation based on date:</i> Information to be repeated for each dataseries but which might be common for the opened dataseries and hence only organised to the left..
	Information for each value, but which must be repeated as coluns for each opened dataseries for the given timestamp, replicate ID, Fish ID/Composite ID and species.  <i>Organisation based on date:</i> Tooltip on the column heading showing the whole series definition and different colours for the group of properties linked to the time value for one component.
	Required class properties
	Optional class properties

### Organisation based on dataseries link

The same functionality as described above will also apply to the table when this is organised based on the link to dataseries. The differences are that the dataseries definition (including the component) always are located to the left and there are one row for each unique combination of date, replicate, Fish ID/Composite

<sup>21</sup> This is also the properties that shall be available in the cell comboboxes. The user can write directly in the cell, and he/she will jump to the right space in the combobox.

## Measurement (part II) and geography

ID and dataseries definition. Further the column which represent the value has “value” and not component code and medium in the column heading.

Column	Column Heading	Sort rows by properties in the column <sup>22</sup>	Required/Optional
Start Time	Start Time	-	
End Time	End Time	-	Required but can be hidden
Measurement Type	M.type		Ref timeseries (but can be hidden)
Medium	Medium		Ref timeseries (but can be hidden)
Sampling Type	Samp.Type		Ref timeseries (but can be hidden)
Station	Station	Code, name	Ref timeseries (but can be hidden)
Measurement Position Code	M.P. Code	Code(text)	Ref time series (but can be hidden)
Species	Species	Species Lathin Name (text)	Ref.timeseries
Component	Component	Code	Ref.timeseries
Replicate ID	Replicate ID	Number	Required but can be hidden
Fish ID/Composite ID	Fish ID/Composite ID	Number	Required
Quality status	Q. Status Flag	Name (or code)	Not required
<b>Value</b>	Value (medium)	Number	Required
Unit	Unit	Unit name	Required
Quality Level Flag	Q. Level Flag	Name	Not required
Quality Security Flag	Security Flag	Name	Not required
Equipemntinstrument	Equip./Inst	Code for analysi, name for instrument	Not required
Sampling Procedure	Samp. Proced.	Code	Not required, and not present if measured at site
Analysis	Analysis	Name	Not required, and not present if measured at site
Adm. Project	Adm. Project	Code	Not required

Combina  
tion  
which  
make the  
row  
Unique

Timestamp

Data  
series  
Link

Component  
value  
With all  
properties  
In Seperate  
Columns

<sup>22</sup> This is also the properties that shall be available in the cell comboboxes. The user can write directly in the cell, and he will jump to the right space in the combobox.

	<p>Properties which make the row unique</p> <p><i>Organisation based on dataserie definition</i> If the user has checked “one row pr dataserie link” the information will always be located to the left independently if these are common for the open dataserie or not. In this case there will be one row for each unique combination of dataserie definition, replicate and date. The same date may repeated as several rows even though only one replicate is shown</p>
	<p>Information for each value, but which must be repeated for each opened dataserie for the given timestamp.</p> <p><i>Organisation based on link to dataserie:</i> No tooltip, and not different colours for the group of properties linked to the time value for one component (since the headings refers to several components in this mode).</p>
	Required class properties
	Optional class properties

*Example*

The table below shows an illustration of organisation explained above (where some of the properties are hidden). The table is an example of “date organisation”. The dataserie definition in the example are common and hence organised to the left.

From Date	Sampling Type	Station	Species	Repl icate ID	Fish ID/ Compos ite	QA flag	Hg (liver)	unit	QA flag	Zn (live r)	Unit	QA flag	Hg (gills)	Unit
1997.12.01	Individual	BS, Black Sea	Cod	1	1	>	0.5	ug/l	A	3	Ug/l	A	3	Ug/l
1998.12.01	Individual	BS, Black Sea	Cod	1	1	A	0.6	ug/l	A	4	Ug/l	A	4	Ug/l

Freeze Panes

The same fish has been analysed for several components in several mediums.

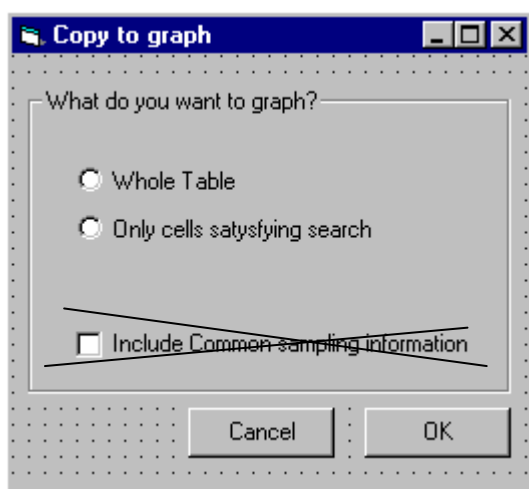
The use of colour codes for values belonging to the same series is shown. In this example all properties referring to hg in liver are yellow, all properties referring to zn (liver) are grey and all properties referring to Hg in gills are blue.

The panes shall be frozen on common functionality to the right and the column headings. In the example above this means that:

From date, station, replicate and Fish ID shall be frozen. Also the column headings shall be frozen. Hence Scrolling to the right or down will not move the 4 first columns and the headings.



### 6.5.6 Graphics



When the user enters the graph from the measurement registration form, the user will get the same form as explained for physical and chemical measurements. The options and functionality are the same:

- ◆ the user might have marked some of the cells (either by direct selection in the table or by the “search ” function).
- ◆ Also the user might want to include the numerical common sampling variables in the graph.

If the user selects to graph the whole table the selected measurement values will be marked in the graph<sup>23</sup>.

The whole table selection is default if the user has not checked the “show only search”. If the user has checked “show only search” the radiobutton “only cells satisfying search” will be default.

The include common sampling information shall not be included.<sup>24</sup>

---

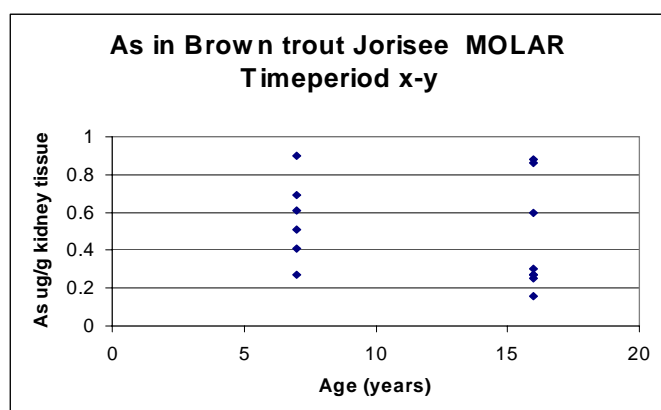
<sup>23</sup> The whole table refer to columns that are defined in the registration modus. In order to copy properties which are hidden based on the registration modus, the user needs to check extend table with all properties. These hidden columns has nothing to do with the cells which might be empty or hidden due to the search which is undertaken.

<sup>24</sup> The common sampling information may be included within the graph see the graphics and the TAB “Source Data” tab. The only reason for not including the common sampling information when the user opens the graph is due to the fact that there are a lot of CSI for this type of measurements and it is better if the user add these data within the graph.

The default graph for this type of measurements from this location shall not be a timeplot but a component/CSI\*component/CSI plot where the user have:

- ◆ One graph for each station
- ◆ One sub graph for each unique combination of component/medium /species (sub graph is defined in the graphics chapter see chapter 7)
- ◆ Station name in each sub graph graph heading together with the timeperiod and species reference)
- ◆ Value on the y axis (with legend component(medium) and Age on the x axis (with legend Age(year)
- ◆ Plot type (point/markers).

An example is given below for one sub graph for a station:



Since one graph can only have 6 sub graph (see graphics) these mean in order to get plot like described maybe several graph windows must be opened (there might be more than six combinations). The six sub graph for each graph will be merged/tiled in one "picture", but the user can also separate the sub graph in separate windows (see graph description)

When the user has entered the graph several other possibilities will also be available, including switching to another graph type i.e timeplot and arrange the data in sub timeperiods. See separate graphic chapter.

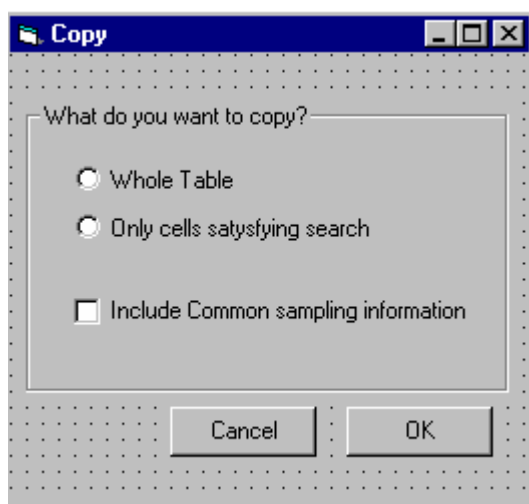
When the measurements are graphed or when calculations are performed only measurements with replicate 1 will be used. In ENSIS 3.0 it shall only be possible to register replicates and copy this to clipboard, but not graph them (Also it is seldom to have several replicates for the same fish or composite sample)



### 6.5.7 Copy

It is important to notice that when the table is copied to clipboard the heading follows the table. Only the columns defined in the registration modus will be copied as long as the user has not checked the “extend table with all properties”.

Otherwise the functionality is as explained for physical and chemical data.



The user might have marked some of the rows/cells (either by direct selection in the table or by the “search” function).

The default selection is “The whole table” if the user has not marked the “show only search” checkbox. If the user has checked “show only search” the radiobutton “only cells satisfying search” will be default.

If the user has selected some cells but still wants to copy the whole table, the selection will be kept when pasted in another application (special colour on the selected cells)

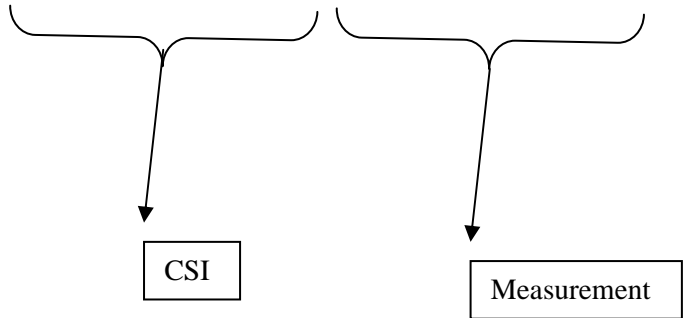
If the user has not selected any rows or cells the two radiobuttons will be disabled, and only the include common sampling information will be available.

The include common sampling information will by default be unchecked, and will if checked include only numerical and common CSI variable. If the user chooses to copy the common sampling information this will always be arranged before the thecolumns describing the measurements. The definitions which make a row unique (except the replicate) is the “key” for linking the CSI to the measurements (see figure below)

Measurement (part II) and geography

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From Date	Sampling Type	Station	Species	Replicate ID	Fish ID/ ComplID	Age (year)	Weight (g)	Gonade Weight (g)	Liver Weight (g)	QA flag	Hg (liver)	unit	QA flag	Hg (gills)	Unit
1997.12.01	composite	BS, Black Sea	Cod	1	1					>	0.5	ug/l	A	3	Ug/l
1998.12.01	composite	BS, Black Sea	Cod	1	1					A	0.6	ug/l	A	4	Ug/l



### 6.5.8 GIS

The user will also for this type of measurements have two possibilities (drop down on button):

- ◆ Show stations on map
- ◆ Aggregated data

Show stations on map

**Show Stations on Map**

Select Map

If only one open this is automat. selected

Which stations do you want to show?

Stations valid for the whole table

Only stations linked to the data satisfying the search

Which components do you want to limit the selection by?

Select measurement type: Measurement type

Select medium: Medium

Select component:  All  Select From

List1

Cancel OK

I

This will function in the same manner as for physical and chemical measurements. The user will get an intermediate form. The user has to select a mapview, if there is only one opened this will be selected automatically. If none is opened the user needs to open a map. The user also has to define if all stations in the measurement table should be shown on the map or if only the stations linked to the data satisfying the search should be shown. Which of

the two options to be default depends on the settings in the main form as described for "copy" above.

Also the user may want to only show stations for some of the components. The combobox and list will be limited by which table selection the user has selected to be shown on the map(whole tabel, satation only satysfying search), and the controls will limit each other. If only one medium and measurement type is present this will be selected by default.

The selection will be created as a separate theme where the user can change the symbol an export the selection as an ordinary theme.

Aggregated Data

**Show aggregated data on map**

Select Map

If only one open this is automat. selected

**What do you want to show aggregated results from?**

Use the whole table as a basis       Use only cells satisfying the search

Select measurement type/medium: Measurement type Medium

Select components or CSIs variable: component/CSI variabl component/CSI variabl  
component/CSI variabl component/CSI variabl

Not selected dataserries: List1 Selected Dataseries: List1

**Aggregation Period**

Select whole data modify period       Select a specific date within the data modify period

**Aggregation Function**

Minimum       Time weighted average  
 Maximum       Time weighted interpolated average  
 Average  
 Percentile       Median

**Select dataset type**

Present as station dataset  
 Present dataset for objects linked to the station

**Select presentation type**

Graduated Color  
 Chart-proportional pie  
 Chart-pie

OK Cancel

This will function in the same manner as for physical and chemical measurements.

The user may apply some statistical functions to the selected data and show the results on the map. In the statistical operation the system only uses data with replicate with ID=1. The system may use the whole table as basis for the calculation or only the data satisfying the search.

The user select a specific measurement type and medium (if only one is present in a combobox this will be selected automatically). For this type of measurements however it is



most likely that there will exist one measurement type and several mediums linked to the selected measurements (gills, liver etc).

The user can select at maximum of combination of 4 component/CSI variables. Only the relevant Components/CSI variables (from the table view) will be available. By default all dataserie in the table/or selection which also satisfy the component /CSI variable will be selected to the right. (The user can not select several mediums and one component)

Before the user chooses to aggregate the user decide if the aggregation should be based on the whole modify time period for the selected data or a specific date. The whole period is default. However if the user select a special date the form below will be opened, The user may select a specific date within the period already selected. The form below will be opened with this period. After the user has pushed OK the selected period will be written in the form above, below the radiobutto.



The aggregation will function in the same manner as for classification of waterquality. The aggregation is performed on all sampless (independently of Fish ID/Composite ID)

After the aggregation function is selected the user select the GIS presentation.

The user first needs to determine if the dataset should be shown as a station dataset or be represented by the objects linked to the station. The second optios requires that the stations have been made representative for an object (see station form where you can link a staion to a lake, part of lake, coastal area and riverlink). If the user selects that dataset should be created based on the objects linked to the station, only one component/CSI variable can be selected (if the user has selected several he/she has to deselect some).

The last step is to select chart presentation.

The graduated color option will only be enabled if the user has selected only one component. The chart options will be enabled if the user wants to create station dataset. However, if the user has chosen to create datasets for the objects linked to the stations (option 2), the chart presentations will be disabled.

If the user has selected only one component, the only chart option will be chart- proportional pie, the chart –pie option will be disabled. The chart-proportional pie option means that the pies are proportional with the result.

However If the user has selected several components both chart options will be enabled, but the chart-pie will be default. The chart –pie will result in pie presentation with different color codes of the slices of the pie which reflects the values in the dataset. In order to create a chart\_pie and chart\_pie proportional the dataserie must belong to the same unit type.

Example Pies proportional presentation (only valid for station dataset):

Example Pies proportional presentation (only valid for station dataset):



Several components at one station (only interesting type of presentation if the values differ, in order to see the difference. If not graduate color is more interesting)



One Component at one station



0-100



100-200



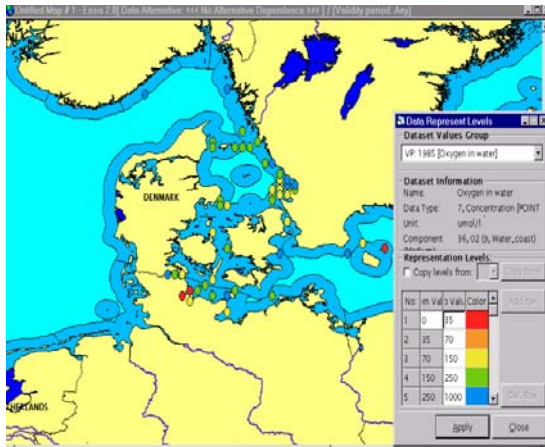
>200

Example Chart Pie with color codes (several components and station dataset)

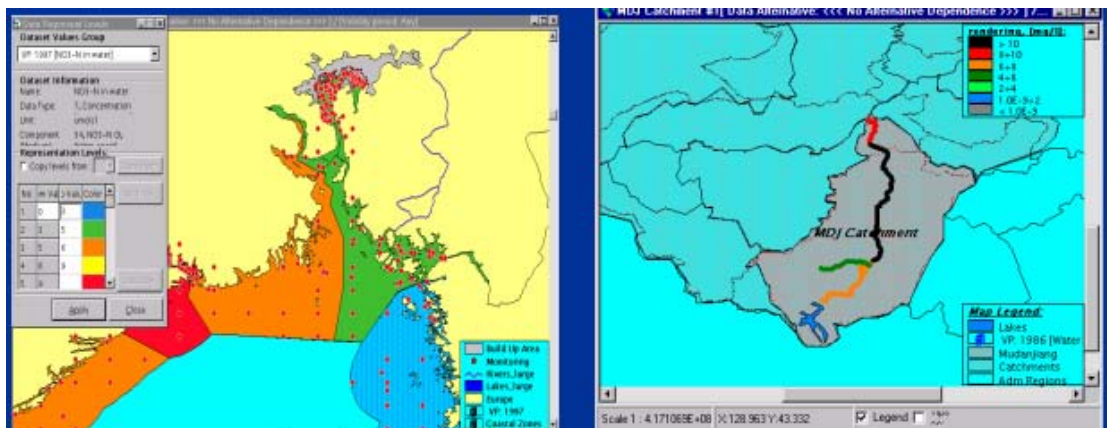


## Measurement (part II) and geography

Example graduate color station dataset (only valid for one component)

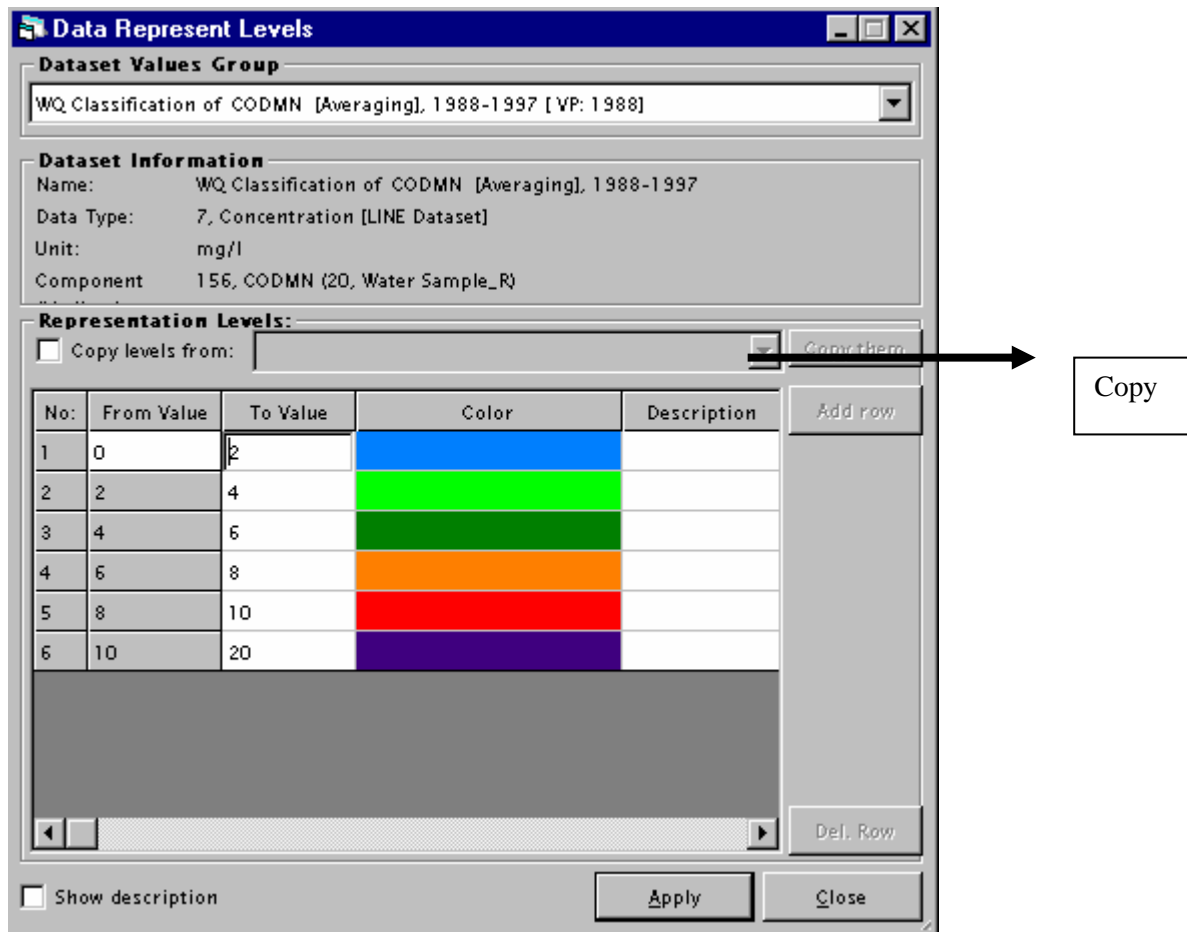


Example of graduate color with "object" dataset based on the link between objects and station (only possible for one component)



The property table to the datasets produced will contain; station name, station code, station ID, number of sampled used as basis for calculation, and the statistical results calculated. If several components/variables has been selected this will mean that several datasets are produced (but they are merged in the map). However if the user has chosen presentation based on the objects linked to the station several dataset might be produced (i.e, both river link dataset, lake dataset and coastal dataset) and these will be created as separated dataset (not merged) since they refer to different geographical themes.

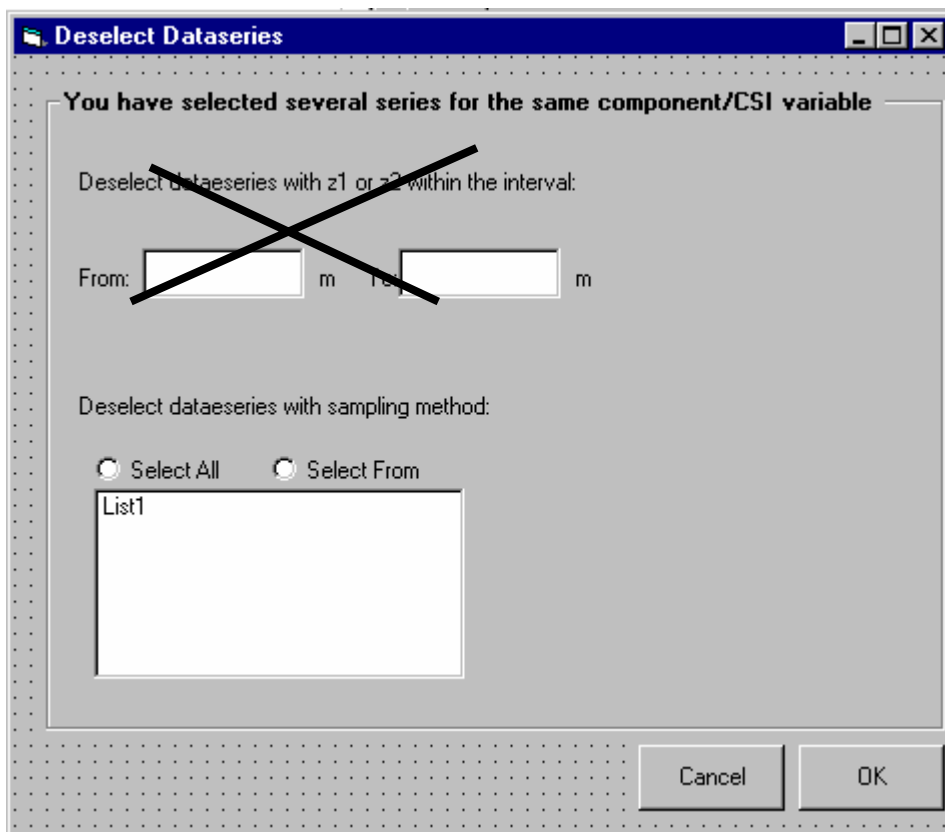
It shall be possible to save all dataset which are created as in the current application, and the user may change the legend of the dataset by copying legend from a classification system (as in the current application).



The user starts the calculation on the map by pushing OK. In order to calculate, only one dataset series per component/CSI variable can be selected at each station.

If several series are selected which do not satisfy this criteria it shall be easy to deselect the necessary series by marking several of the series and move to the left.

For this type of measurements also an intermediate form could pop up in order for the user to easily deselect, however for this type of measurements the depth is not of relevance.



### 6.5.9 Common Sampling Information

There will be a link to common sampling information. This will open a form where the same dates are opened. The table is explained under common sampling information.

One important functionality however, is that if the user mark a row(s) in the measurement table the same row(s) (=the row(s) with the same timestamp) will be marked in the common sampling information form.

## 6.6 Common Sampling Information\_Fish

### 6.6.1 What is common sampling information for biotachemsitry \_fish

The common sampling information is for these types of measurements used to describe the catch and the physical characteristics of each fish in the catch/sample.

The common sampling information can only (as for physical/chemical measurements) be reached from the registration form for measurements.

The common sampling information registration form for biota chemistry\_fish is very different from the common sampling information for the physical/chemical measurement types described in chapter 4 since it has “2 levels” of information.

- ◆ Information describing the catch
- ◆ Information for each fish in the catch

The registration of the catch is undertaken in the main form, while the registration of each fish is undertaken in a separate form linked to the main form.

The results from the registration are organised in the flexigrid table, which can be viewed in a separate window.

The three parts of the form are explained below:

- ◆ Registration modus
- ◆ Registration of one catch (including registration of each fish)
- ◆ Table view

The common sampling information are linked to the measurements in the same manner as described in chapter 4. The user can i.e. mark a row in the measurement table and the corresponding row will be marked in the common sampling information table.

However, the key for linking the CSI information table to the measurements are different. The CSI are linked to the measurements if they have the same and following properties:

- ◆ Measurement Type
- ◆ Same Location (station and position)
- ◆ Date
- ◆ Sampling type
- ◆ Fish ID/composite ID

Medium (liver, kidney etc) is not an issue since the CSI will be common for a measurement as long as the Fish ID/Fish composite ID and the above listed properties are the same.

### 6.6.2 Registration Modus, Part 1

By default the form above is opened with the same modify/add data within period, and the date format as determined in the measurement registration form.

Also the registration modus will be the same (for the properties that are common with measurements registration form). The user may change the modus and save it.

The registration modus may be unchecked and leave more space for the common sampling information table.

This is the same functionality as described under physical and chemical data for the same type of functionality.



### 6.6.3 Registration of common sampling information, part 2

The user needs to determine the link to the dataserie of relevance before the registration can start. These are the same as described in chapter 4. Except for the fact that medium is not a property in order for the connection to measurements to be unique (see explanation above).

The next step is to determine a date and a time.

Thereafter the user determines the specific details for a catch.

#### Catch Information (optional)<sup>25</sup>

The name of fisherman, scientist in charge, and vessel are text fields.

The catch depth is not the same as measurement position because for biota samples this can vary from time to time, and still the data belongs to the same dataserie. The catch depth is therefore only for information purpose<sup>26</sup>.

CPU (Catch pr unit effort) is a unitless number .

#### Other Common sampling Information variables<sup>27</sup>

Other common sampling information gives the user the possibility to enter information about the CSI variables linked to the measurement type in question.

After the user has entered catch information and other common sampling he/She can go to registration of fish data or use apply to add the information to the flexigrid table.

---

<sup>25</sup> The user may end up by entering this information and the other common sampling information twice if the user within one catch have both individual samples and composite samples.

<sup>26</sup> Since measurements position depth (z1 and z2) is not a property of this type of measurements Catch depth is the only identification related to this type of information.

<sup>27</sup> In earlier stages of this specification the sampling equipment and the sampling procedure was part of the common sampling information. However these are now determined as properties of each measurement , in order to get it more consistent with the registration of biological data and physical/chemical data in water)

### Detailed registration form for fish data

To actual do the details around the common sampling information the user enters the registration of fish data>> button.

**Registration of fish data**

**Link to measurements**

Station: Station Name MP.Code Measurement Type: Name Sampling Type: Name Date: Date Time: Time

**Registration of each fish in the catch**

Select Fish ID: Fish ID: Unique number Fish belongs to: Composit ID: Unique number

**Physical Characteristics**

Sex: Age: Year Maturation Index: Color of meat: Disease:

**Weight and Length**

Length: cm Weight: g Gonade Weight: g Liver Weight: g Conditional Factor:

**Stomach Content**

Stomach Fullness: Piscivore: Yes/no

Stomach Content: Species % New Apply Delete

**All fish samples in the catch**

Fish ID	Composit ID	sex	Age	Length	Weight	Gonade Weight	Liver Weight	Conditional Factor	Stomach fullness
---------	-------------	-----	-----	--------	--------	---------------	--------------	--------------------	------------------

**Catch statistics/Composite samples**

Calculate based on fish data  Overwrite manually

Calculate Manual Registration

Composit ID	Nnbr of individuals	Length	Weight	Gonade Weight	Liver Weight	Conditional Factor	Age
-------------	---------------------	--------	--------	---------------	--------------	--------------------	-----

OK Cancel

#### Link to measurements

This is for information purposes and only for the user to see the main link to the measurements.

#### Registration of each fish in the catch

The user may enter detail information about a fish in a catch independently of sampling type.

However, if the sampling type is of type composite and the user enters the statistical data about the composite sample manually, the user does not have to fill in this part.

If the sampling type is individual the user must fill in this information, or if he/she wants to use the information to calculate the statistics for the composite sample or the whole catch.

**Fish ID:** The ID is a unique identification of each of the fishes analysed in a batch, or used to create the composite sample. This field is always enabled. A number can for

the actual link to measurements (station, St code, Measurement type, sampling type, date and time) only be used once (unique).

If the the sampling type is of type composite, the user must also fill in the composite ID the fish belongs to. This is also a number, and the combination Fish ID and Composite ID must be unique for the link to measurement

The entries Sex (name), age (Number), Maturation Index (Code), Color of meat (Name) and Disease (name), length (number), weight (number) , gonade weight(number) and liver weight (number) speaks for them selves. The user picks either from the combo boxes or write the numbers in the different fields. The numbers needs to be given with the units that are specified.

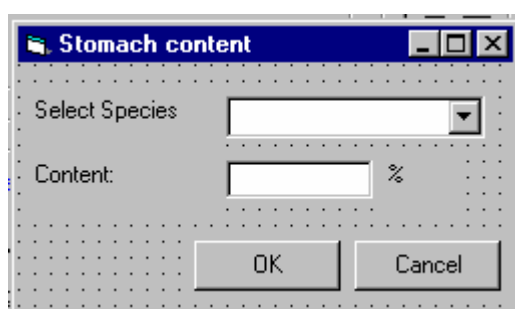
The entry conditional factor is calculated automatically based on already entered information and based on the formula =  $(\text{Length}^3) / (\text{Weight}(\text{g}) * 100) =$  length in exponent three divided with weight in gram multiplied with 100. The number shall be unitless.

The user can overwrite the automatically calculated conditional factor and also leave it blanc.

Stomach fullness (name) is a descriptive variable . In addition the user may enter the stomach content identified as other species. The user write directly in the table the name of the species and the % of content. Available species to select from are linked to the measurement type through the species definition .

If a fish is classified piscivore (eat other fish species) or not is only a yes/no answer. (The admin may change the language i.e. si/no)

The stomach content may be given for each species contained in the stomach in %. Which species to be linked to the combobox is determined in the species registry. The registartion of each species in the stomach are after registartion listed in the table.



After the user has entered information of one fish in the catch the user uses apply or new. Both will move the registartion to the table : All fish samples in the catch. New will in addition blank the entries already explained.

### All fish samples in the catch

This table will list all fishes which are entered and the properties of these listed in columns to the right

### Catch statistics/composite statistics

By default the radio button calculate based on fish data is turned on, and the statistical figures shown in the form average, mean, min, max and standard deviation for the different variables are calculated automatically if the user presses the calculate button.

The statistics are calculated for each composite if this is a composite samples or for the whole catch if this is sampling type with property "individual". If it is not a composite sample the Composite ID column will have the text "Catch statistics".

The number of fishes which is the basis for the Catc/composite sample is also calculated .

The user may not have information about each individual. If he/she does not have information about the individuals (or want to edit a record) the user may use the manual mode and enter (average, mean, max, min, and St.dev for the length, weight and age properties), manually for each of the composite sample/catch.

The user also needs for each composite ID give the numbers which the composite sample is based on (not required).

After the user is done with all individuals he/she can push OK and the information will be saved.

**Manual registration of composite sample**

**Identify composite ID and Number of individuals in sample**

Composite ID:  No of individuals:

**Properties of composite sample**

	Average	Mean	Min	Max	St.dv
Length (cm)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Weight (g)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Gonade W(g)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Liver weight(g):	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Conditional Factor:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Age (year):	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Cancel OK

6.6.4 Content of the CSI table , part 3

After the user is done with the registration of the catch information and the fish data, the record with all properties will be available in the table.

As described in chapter 4, the user can chose to view the information in a separate window. The sorting possibilities and the copy to clipboard for the table will function as described in chapter 4. However, it is must likely that the user will use the forms to enter the information and not directly in the table.

The registration table may contain the following columns from left to right

Column	Column Heading	Sort rows by properties in the coloumn <sup>28</sup>
Start Time	Start Time	-
End Time	End Time	-
Measurement Type	Measurement Type	Name
Sampling Type	Sampling Type	Name
Station	Station	Name
Measurement Position Code	M. Pos Code	Code(text)
Fish ID/Composite ID	Fish ID/Composite ID	Number (the user know from the sampling type if it referes to To a composite ID or a Fish ID)
Name of fisherman	Fisherman	Text
Scientist in charge	Scientist in charge	Text
Vessel	Vessel	Text
Catch depth (m)	Catch depth (m)	Number
CPU	CPU	Number
Samp.info., variable 1	Name of variable 1(value)	Value
Samp.info., variable 1	Name of variable 1(unit)	Unit (txt)
Sampling information, variable (N) <sup>29</sup>	Name of variable (N) <sup>30</sup> (vaule)	Value
Sampling information, variable (N) <sup>31</sup>	Name of variable N(unit)	Unit (txt)
Sex	Sex	Text (not filled in if composite sample)
Age	Age	Number (represents an average if compoiste sample)
Maturation Index	Maturation Index	Only given if individual sample
Color of Meat	Color of Meat	Only given if individual sample
Disease	Disease	Only given if individual sample
Length	Length	Number (represents an average if compoiste sample)
Weight	Weight	Number (represents an average if compoiste sample)
Gonade Weight	Gonade Weight	Number (represents an average if compoiste sample)
Liver Wight	Liver Wight	Number (represents an average if compoiste sample)
Conditional Factor	Conditional Factor	Number (represents an average if compoiste sample)
Stomach fullness	Stomach fullness	Only given if individual sample
Piscivore	Piscivore	Only given if individual sample

Catch Info  
May be the same for several rows (several FishID/composite ID)

Fish data defined for each fish

Some of the columns may be hidden.

<sup>28</sup> This is also the properties that shall be available in the cell comboboxes. The user can write directly in the cell, and he will jump to the right space in the combobox.

<sup>29</sup> N indicates the total number of variables which exist for the selected measurement type

<sup>30</sup> N indicates the total number of variables which exist for the selected measurement type

<sup>31</sup> N indicates the total number of variables which exist for the selected measurement type

### 6.6.5 Search

Search will function in the same manner as for the measurement table. If the user has already applied this as a search before entering the registration form, this will already be filled in.

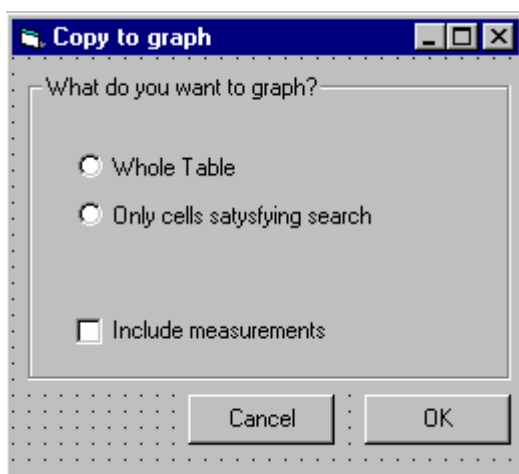
Only the text for the frames will be changed.

- ◆ Find CSI linked to measurements with a link to
- ◆ Find CSI with link to measurments with values....
- ◆ Find CSI based on Fish data
- ◆ Find CSI with values within limits.

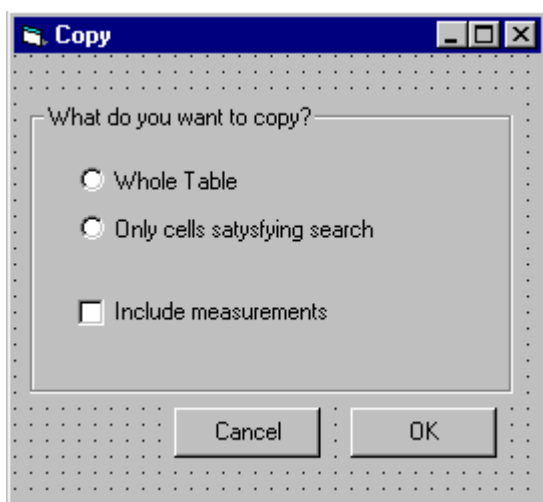
### 6.6.6 Graphics

The numeric common sampling information variables may be graphed by marking the actual rows to be graphed or by graphing the whole table. The same functionality and rules as described for measurements will be available.

The user will get the question if he/she wants to also include the measurement values.



### 6.6.7 Copy



The user may copy the content of the table to clipboard. The same functionality as described when copying from the measurement table will be available. Both numeric and text variables may be copied and the user will get the same question if he/she also wants to include the measurements linked to the common sampling information. If the two tables are linked the common sampling information will be organised in columns before the measurements.

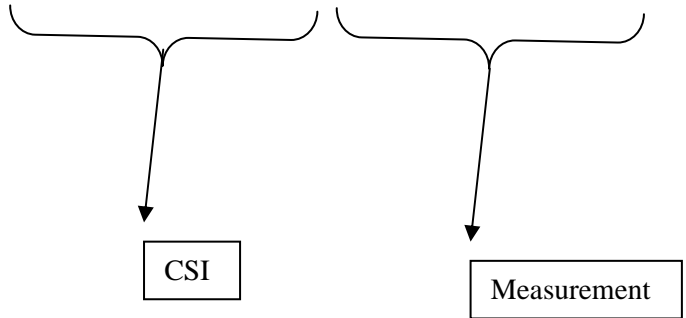


## Measurement (part II) and geography

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A copy to clipboard may look like (depending on which columns which has been hidden and type of sampling information):

From Date	Sampling Type	Station	Species	Replicate ID	Fish ID/ ComplID	Age (year)	Weight (g)	Gonade Weight (g)	Liver Weight (g)	QA flag	Hg (liver)	unit	QA flag	Hg (gills)	Unit
1997.12.01	composite	BS, Black Sea	Cod	1	1					>	0.5	ug/l	A	3	Ug/l
1998.12.01	composite	BS, Black Sea	Cod	1	1					A	0.6	ug/l	A	4	Ug/l



## 6.7 Biota Chemistry *\_Benthic animal*

The principles and functionality is the same as for biota chemistry in fish. However, the forms shall not be programmed before the functionality for the fish is tested and approved. The forms maybe revised based on the experience with the bitota chemistry in fish. The forms that are different are shown below.

### 6.7.1 Registration form

The measurement registration form for mussel, snails, and crabs is exactly the same as for fish, except for the fact that Only composite samples are used.

**Biotachemistry\_Benthic Animal**  
**Registration Modus**  Show registration modus  Saved modus is currently active

**Period of Data currently worked with:**  
 Modify/ add data within: Selected Period [v] ...  
 Data Exist period: [ ]

**Link to Dataseries**  
 - Basic Link  
 Medium: Name [v] ...  
 Measurement Type: Name [v] ...  
 Sampling Type: Name [v] ...  
 - Location  
 Station: Code [v] Name [v] ...  
 P.Code: Code [v] ...  
 New Dataseries

**Register Observation**  
**Species**  Expand list  
 Rubin Code [v] Other Code [v] Details  
 Scientific Name [v] Tax. Tree  
 Component  Expand list  
 Component Code [v] ...  
 Component Name [v]  
**Date/Time (Format xxx)**  
 Date From [ ] Time From [ ]  
 Date to [ ] Time to [ ] ...  
**Quantification**  
 ID: [1] Composite ID: [1]  
 Replicate ID: [1]  
 Value [ ] Unit [v]

**Sampling and Analysis**  
 Sampling Equipment: Code [v] ...  
 Sampling Procedure: Code [v] ...  
 Analysis Method: Code [v] ...

**Admin project and Security Flag**  
 Project: Code [v] ...  
 Security Flag: Code [v] ...

**Quality Assurance**  
 QA Status Flag: Code [v] ...  
 QA Level Flag: Code [v] ...

Search Cancel Apply New

**Data for selected period and stations**  Extend with all properties  Limit to search  One row pr dataseries link  View Table in Separate Window

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Common Sampling Information Graphics Copy Close

### 6.7.2 Common sampling information

The common sampling information may vary a little bit from mussels, to cra to snails, but for the time being this is organised in the same form. The form is simplified compared to fish.

The difference from the fish form, is that both the average and standard deviation (from the registration of length, weight etc) shall be shown in the table (if the user chooses to do so through the modus) and not only the average.

**Registration of details for common sampling information**

**Common Sampling Information-Registration of individuals and composite**

**Link to measurements**

Station:  MP.Code:  Measurement Type:  Sampling Type:  Date:  Time:

---

**Registration of each fish in the catch**

ID of individual:

Composite ID:

Description of individual:

Length:  cm      Fat Content:  %

Weight:  g      Sex:  ...

Dry Weight:  %

---

**All individuals in the catch**

Fish ID	Composit ID	sex	Age	.....	Length	Weighth	Gonade Weight	Liver Weight	Conditional Factor	Stomach fullnes.....

---

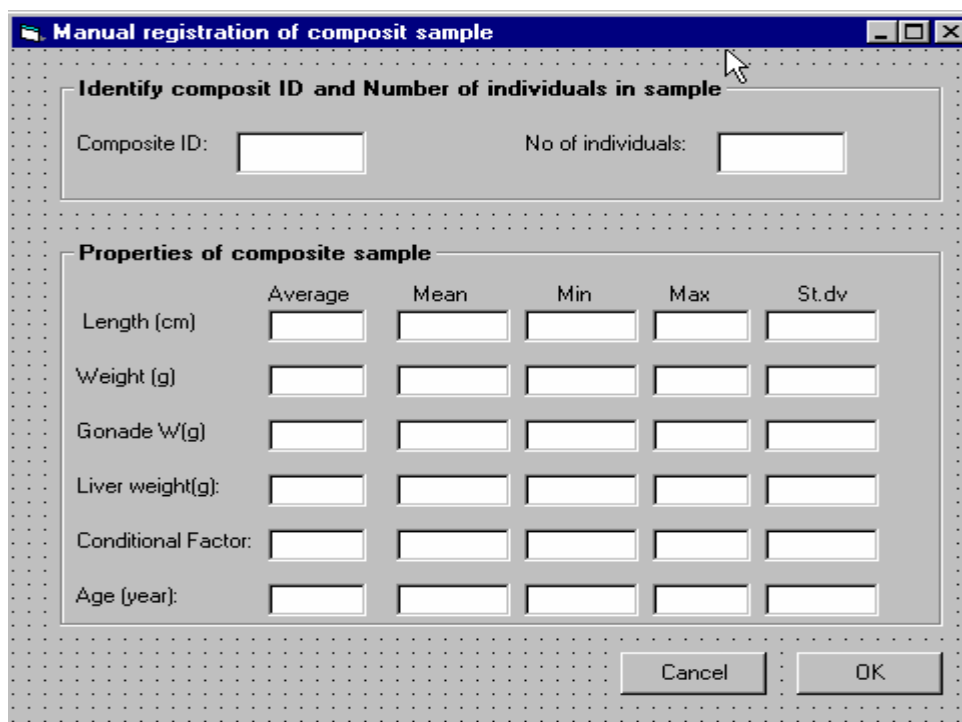
**Catch statistics/Composite samples**

Calculate based on registration of individuals           

Composit ID	Nmbr of individuals	Length	Weighth	Dry Weight	Fat Content

The detail registration function in the same manner as for fish, but is simplified. The statistical parameters for the composite is the same, but the variables are different and shall be limited to: Length, weight, dry weight(%), Fat (%). For manual registration the user may use the same form as below.



**Manual registration of composite sample**

**Identify composite ID and Number of individuals in sample**

Composite ID:  No of individuals:

**Properties of composite sample**

	Average	Mean	Min	Max	St.dv
Length (cm)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Weight (g)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Gonade W(g)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Liver weight(g):	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Conditional Factor:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Age (year):	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Cancel OK

### 6.7.3 Search criteria

The detailed search criteria reach from the main search from applied to the registration table, is more simple than for fish.

**Find Dataseries based on measurement details**

Find dataseries based on measurements with a link to

Adm. Projects Analysis and sampling Time Step Flags  Apply

Find dataseries based on measurements with values within limits:

Select Medium: Name Select Species: Name

Select component: Name Operator Unit

Select component: Name Operator Unit

Select component: Name Operator Unit

Find Dataseries based on measurements with values linked to catch information:

Name of fisherman: Name Vessel: Name

Scientist in charge: Name Catch Depth: Operator Unit m

Find Dataseries based on the species in the samples/catch:

Based on individuals  Based on average No of individuals: Operator Unit

Weight, Length and age

Length: Operator Unit cm Fat: Operator Unit %

Weight: Operator Unit g Sex: Male/Female

Dry Weight: Operator Unit %

Find Dataseries based on measurements with values linked to other CSI:

Select CSI variables: Name Operator Unit

Select CSI variables: Name Operator Unit

OK Cancel

## 6.8 BiotaChemistry\_Vegetation

Only the main form without common sampling information shall be implemented. The functionality for the measurements is the same as for Biota chemistry\_Fish (except for the fact that the user do not give the ID information in the frame quantification, since there are no other common sampling information based on each "plant"). However the form shall not be programmed before the result from the BiotaChemistry\_Fish is received and tested.

### 6.8.1 Registration form for measurements

The screenshot shows a software window titled "BiotaChemistry\_Benthic Animal" with a "Registration Modus" header. The interface is organized into several functional areas:

- Period of Data currently worked with:** Includes a dropdown for "Selected Period" and a "Data Exist period:" field.
- Link to Dataseries:** Contains a "Basic Link" section with dropdowns for "Medium:", "Measurement Type:", and "Sampling Type:". Below this is a "Location" section with dropdowns for "Station" and "P.Code", and a "New Dataseries" button.
- Register Observation:** The central section, containing:
  - Species:** "Rubin Code" and "Other Code" dropdowns, "Scientific Name" dropdown, and buttons for "Details", "Tax. Tree", and "New".
  - Component:** "Component Code" dropdown and "Component Name" dropdown.
  - Date/Time (Format xxx):** Fields for "Date From", "Time From", "Date to", and "Time to".
  - Quantification:** Fields for "ID:", "Replicate ID:" (with value "1"), "Value", and "Unit".
- Sampling and Analysis:** Fields for "Sampling Equipment:", "Sampling Procedure:", and "Analysis Method:", each with a dropdown menu.
- Admin project and Security Flag:** Fields for "Project:" and "Security Flag:", each with a dropdown menu.
- Quality Assurance:** Fields for "QA Status Flag:" and "QA Level Flag:", each with a dropdown menu.

At the bottom, there are checkboxes for "Data for selected period and stations" (with options "Extend with all properties", "Limit to search", "One row pr dataseries link", "View Table in Separate Window"), a table area, and buttons for "Common Sampling List", "Graphics", "Copy", and "Close".

### 6.8.2 Search criteria

The detailed search criteria reach from the main search from applied to the registration table, is the same as above, but more simple.

**Find Dataseries based on measurement details**

Find dataseries based on measurements with a link to

Adm. Projects Analysis and sampling Time Step Flags  Apply

Find dataseries based on measurements with values within limits:

Select Medium: Name Select Species: Name

Select component: Name Operator Unit

Select component: Name Operator Unit

Select component: Name Operator Unit

Find Dataseries based on measurements with values linked to catch information:

Name of fisherman: Name Vessel: Name

Scientist in charge: Name Catch Depth: Operator Unit m

Find Dataseries based on the species in the samples/catch:

Based on individuals  Based on average No of individuals: Operator Unit

Weight, Length and age

Length: Operator Unit cm Fat: Operator Unit %

Weight: Operator Unit g Sex: Male Female

Dry Weight: Operator Unit %

Find Dataseries based on measurements with values linked to other CSI:

Select CSI variables: Name Operator Unit

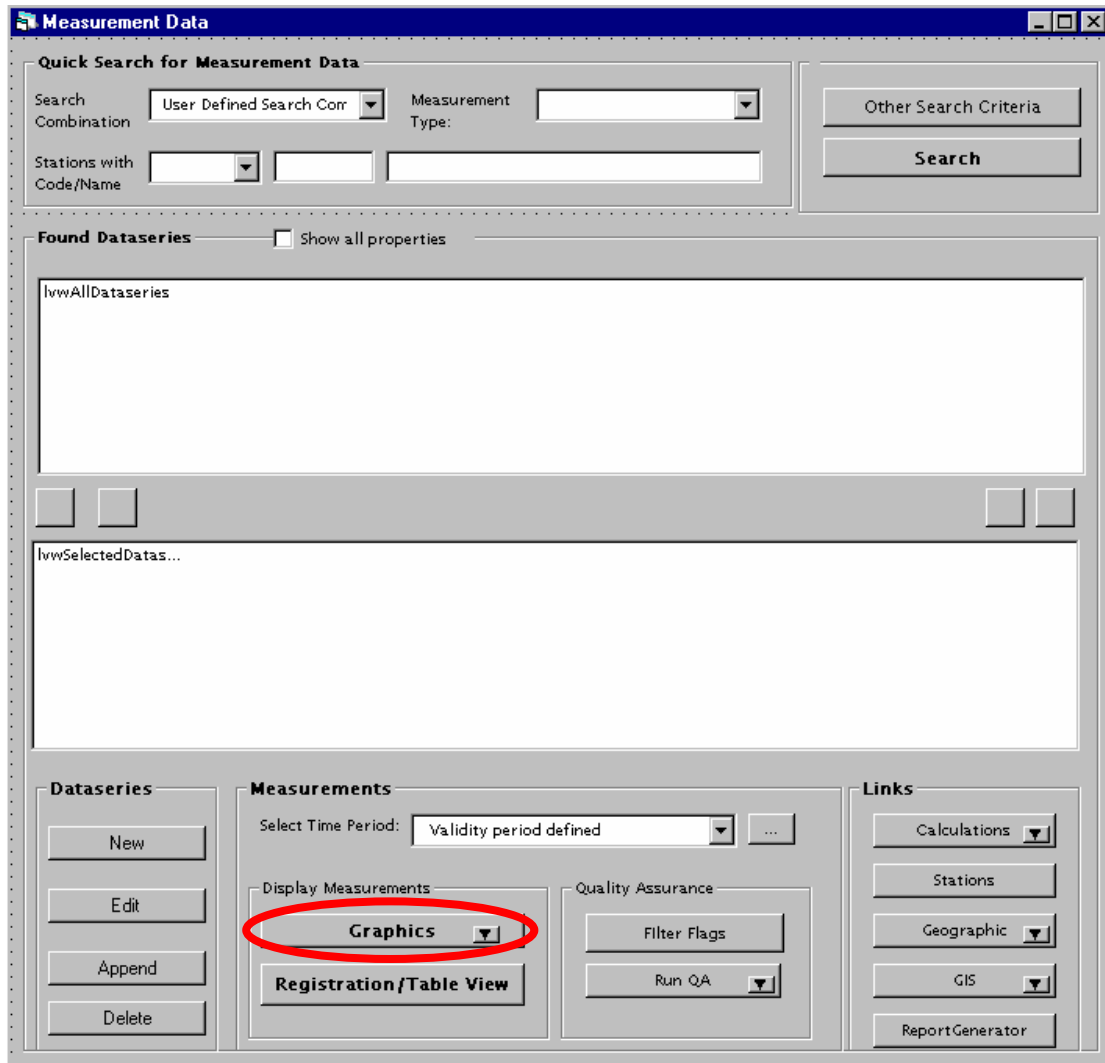
Select CSI variables: Name Operator Unit

OK Cancel



## 7 Main entry to measurement data-Graphics

This chapter explains the graphics reached from the main form for dataserie



## 7.1 Graphics Selection before entering the graph

### 7.1.1 Drop down entries

The available graphics (reached from main form for dataseries) is listed as a drop down menu (see the drop down arrow on the graph button). One option must be chosen before the user enters the graph. The user also chooses how the graph window shall be organised. Within the graph the user can change to any other relevant type of graph<sup>32</sup>. The user can also within the graph deselect the dataseries in the graph including common sampling information, change settings and create sub graphs (all graph windows which are opened have an option TAB where it is possible to divide on graph in other subgraphs (maximum 6))

The wording of the entries is due to the fact that several types of measurement types belonging to the three main categories: 1) Physical and chemical data, 2) Biological data and 3) Biota chemistry may be selected for graphing. All types of dataseries may be opened in the same graph for all three main types.

The options in the graph is described more in detail in chapter 7.2, and chapter 7.1 only explain the logic and default choices in order for the user to get a default graph after selecting one of the sub entries for the four options below.

The following graph types shall be available in the drop down menu. The sub types indicate the organisation which also must be selected.

#### 1. Time plot

- >All dataseries in one graph
- >One graph pr station
- >One graph pr station and component/species
- >One graph pr dataseries

This graph has time on x axis and value of component, species or CSI on y axis.

The selection above only determine which of the series that shall be available from each graph. If biotachemistry data (fish) is present in the selected dataseries, the user must in addition set some additional limitations in an intermediate form before entering the graph.

#### 2. variable \* variable plot

- >All dataseries in one graph
- >One graph pr station
- >One graph pr dataseries

This graph has value of component, species or CSI on x axis and value of component, species or CSI on y axis.

---

<sup>32</sup> When reached from the measurement table the graphics is not a drop down menu. The user enters a standard time series plot which default settings depend on the measurement type as explained in chapter 4,5 and 6.

The selection above only determine which of the series that shall be available from each graph, but which not necessarily shall be displayed in order for the graph not to be caotic. The user must therefore also (from an intermediate form) determine 2 variables from component, specie or CSI which shall be displayed when the graph is opened. The user may display several other relations after entering the graph by use of several y axis and sub graphs.

### **3. Variable\* depth plot**

- >One graph pr station
- >One graph pr dataserie

This graph has value of component, species or CSI x axis and value of depth on the y axis

The selection above only determine which of the series that shall be available from each graph, but in addition the user must decide (from an intermediate form) which date/timestamp within the selected period that shall be plotted.

### **4. Stations \*variable plot**

No sub entries. The plot produce one graph pr measurement type, medium and measurement variable.

This graph has stations on x axis and value of component, species or CSI value on the y axis

### 7.1.2 General description of timeplot

If the user chooses time plot he/she will get different default types of graph depending on measurement type and sampling method. The proceeding chapters describe the default types, and this chapter only describes the different types of time plot.

According to the graphic specification time plot may be Lines, scattered, column, and area. Spline and histogram are also available timeplots, and are special categories of lines.

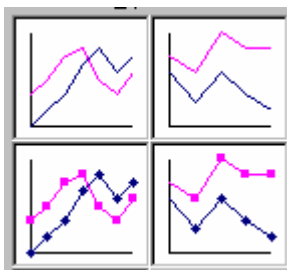
Also a *combination* of the plots listed above are available.

The time proportional functionality is not handled when selecting the graph, but is an option in connection to the graph. The options in the graph is described more in detail in chapter 4.7.5.

#### Different types of plot

*Line:*

- 1) Line plot (with and without markers)
- 2) Timeproportional Line plot (with and without markers),
- 3) Stacked Line plot (with and without markers)
- 4) Stacked Timeproportional Line plot (with and without markers)

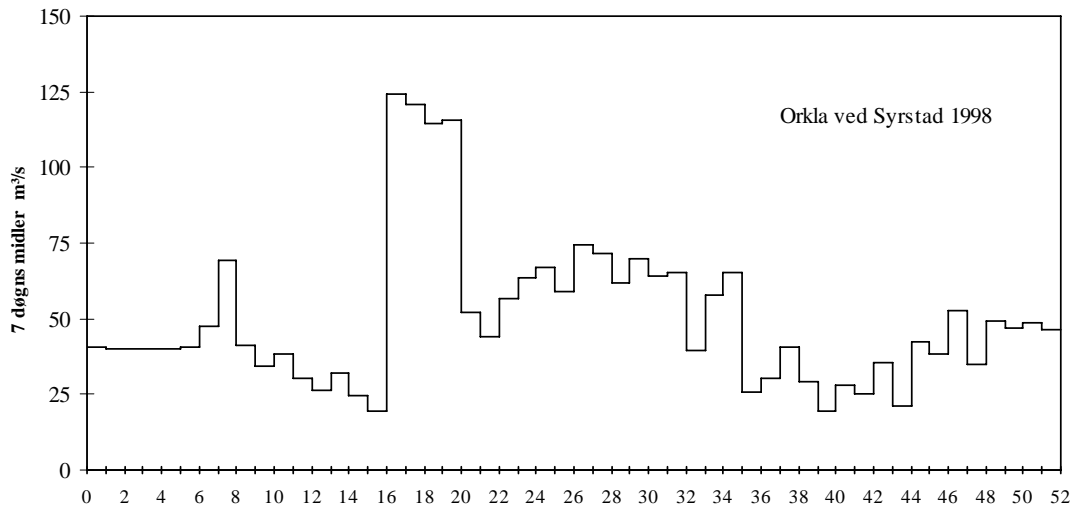


Line plot Without Markers	Stacked Line plot without Markers
Line plot With Markers	Stacked Line plot with Markers

*Histogram = special type of line plot:*

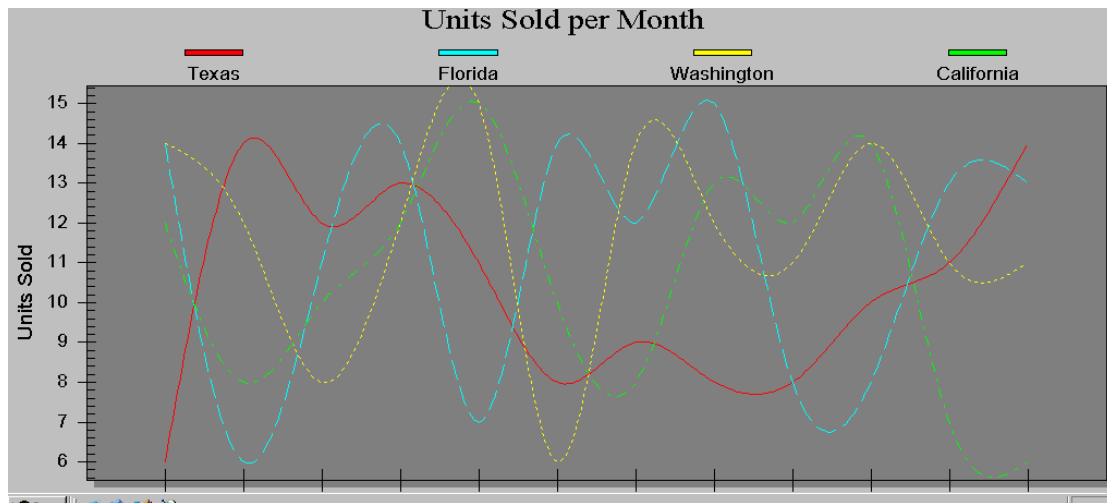
- 1) Line plot with full or partly duration over the timestep(staircase)<sup>33</sup>,
- 2) Stacked line plot with full duration over the timestep(staircase)

Example of graph type 1



*Spline = Smooted line*

- 1 Spline plot (with and without markers)
- 2 Timeproportional spline plot (with and without markers),



- 1 In the case of partly duration the staircase will be drawn as for full duration, but the the partly duration intervall shall be marked in particular.

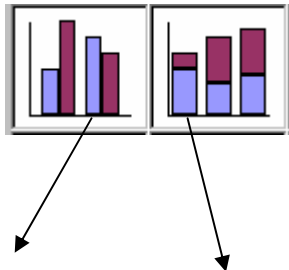
*Scattered plot:*

- 1) Time proportional and
- 2) Not timeproportional



*Column*

- 1) Clustered Column (one or several series),
- 2) Stacked columns (sum of series)



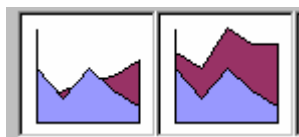
Clustered

Stacked

If time proportional timeline is selected in combination with columns the width of the column will be impacted= $\text{time between to timestep}$

*Area:*

- 1) Area,
- 2) Stacked area (sum of area)



### 7.1.3 Timeplot form the drop down menu

#### Physical and chemical data

If the user chooses timeplot there are no intermediate form as long as only this measurement type is selected.

The graph(s) will be open with default plot, and there might be a mix of plot types within the graph depending on the sampling type the dataserie belong to. The plot type defaults are listed below.

Step Type	Value Type	Default graphs for <u>time plot</u> depending on the sampling type
Regular	Instant	<u>Line without markers</u> . Lift pen for missing is the system default (maximum allowed missing value is zero),however the user can change this under filter flags and decide to graph continuous between non missing points by determining maximum number of missing values before the pen must be lifted (any number >=1).
Regular	Part. Dur.	<u>Line with markers</u> at the end of the part duration period.
Regular	Full Dur.	<u>Line without markers</u>
Irregular	Instant	<u>Line : with markers displayed at each value</u> , with a timeproportional time line.
Irregular	Full dur.	<u>Histogram</u> : An horizontal line form the "from date"vaule to the next sample. The length is proportional with the time
Irregular	Part dur	<u>Histogram</u> : An horizontal line form the "from date" value. The length is equal to the partial duration time given in dataserie definition. The time line is time proportional. The length from the partial duration time to the next measurement may be dotted.

If the dataserie opened belongs to different unit types, the graph(s) opened will have several y axis (maximum 6 as explained under graph options)

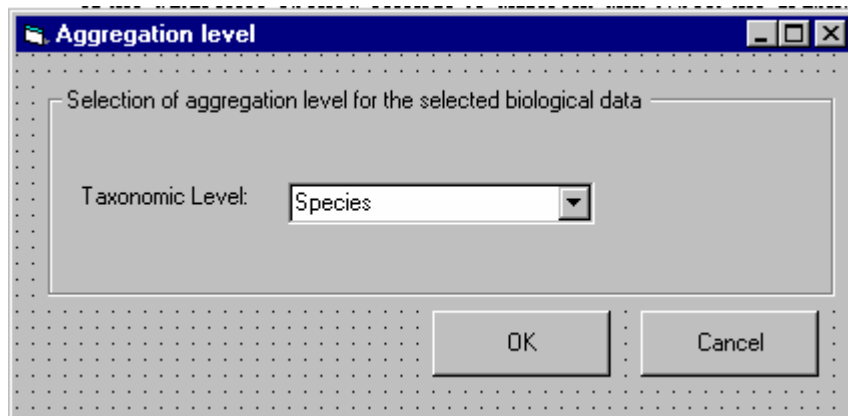
### **Biological data**

If the user has not limited the search in the first place to a taxonomic level (when finding the dataserie(s)), there will be an intermediate form where the user determines if he/she wants to show an aggregated presentation based on a higher taxonomic level than species. By default the lowest taxonomic level (species) is selected. NB the form does not show up if the user already has used this criteria when searching for data.

This intermediate form will be integrated with the intermediate form for biotachemistry.fish data if this measurement type is selected as well.

The default plot type for biological data are columns independently of sampling type.

If the dataserie(s) opened belongs to different unit types, the graph(s) opened will have several y axis (maximum 6 as explained under graph options)





Since several measures may describe the biological data the different measurement types will be opened with one of the measurement types as default. The user may change this in the graph (see options).

The list of possible measures for the different types are listed below and the default type is identified in bold:

### Phytoplankton

- ◆ **Concentration**
- ◆ Biovolume

### Zooplankton

- ◆ **Concentration**
- ◆ Biovolume/Biomass

### Benthic Animal

- ◆ **Number Counted**
- ◆ Coverage
- ◆ Biomass

### Macrovegetation

- ◆ Counted
- ◆ **Coverage**
- ◆ Biomass

### Pheriphyton

- ◆ **Counted**
- ◆ Coverage
- ◆ Biomass

## **Biodata chemistry-Fish**

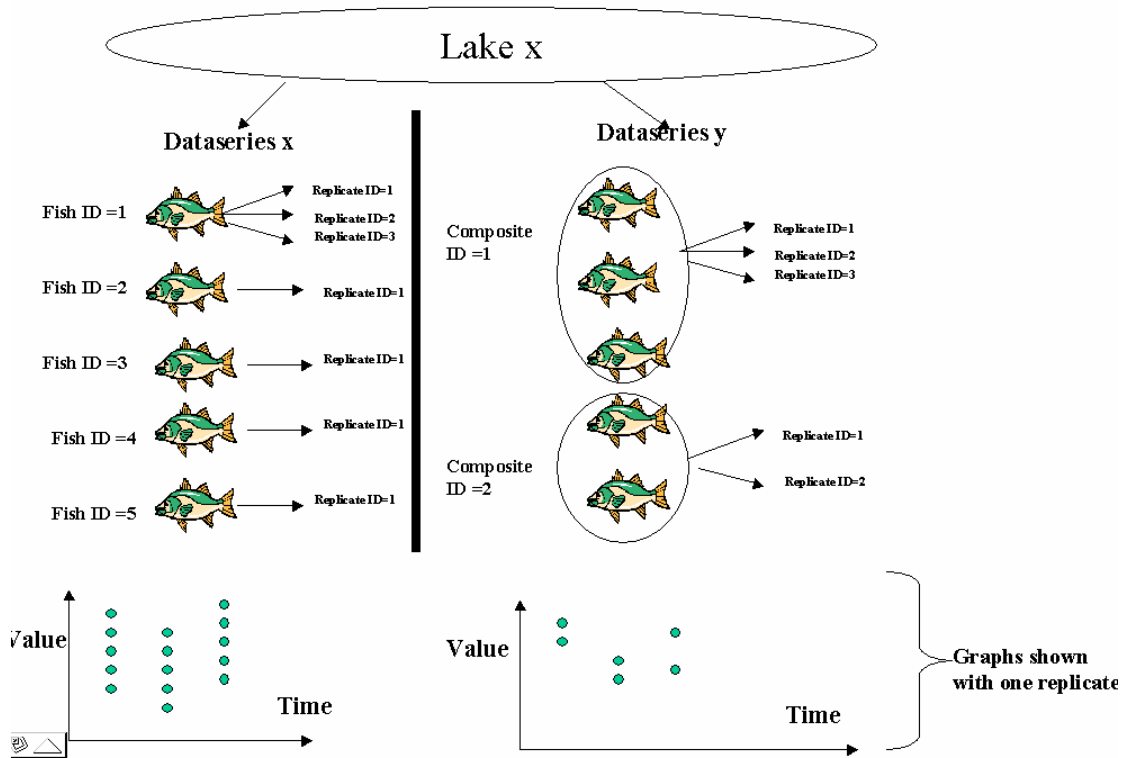
If the user has selected Biodata-Fish the user will reach an intermediate form. The intermediate form and the reason to have this is explained below. The intermediate form will not show up if any of these criteria already have been used to search for the dataserie.

### Explanation

Since several fishes or composite samples of fishes may be analysed at the same place and date/time, there might be parallel samples for one replicate ID. The difference between replicates and parallel samples are shown below (as mentioned before replicates are not graphed)

The figure shows two dataserie from a lake. Dataserie x represents a dataserie with individual samples (pr. fish) where 5 fishes are analysed each time. Replicates may be taken for each individual. Dataserie y represent a series with composite samples. Each time 2 composite samples are taken and sometimes also replicates.

The example graph shows the analysis results, but not the analysis results for the replicates.

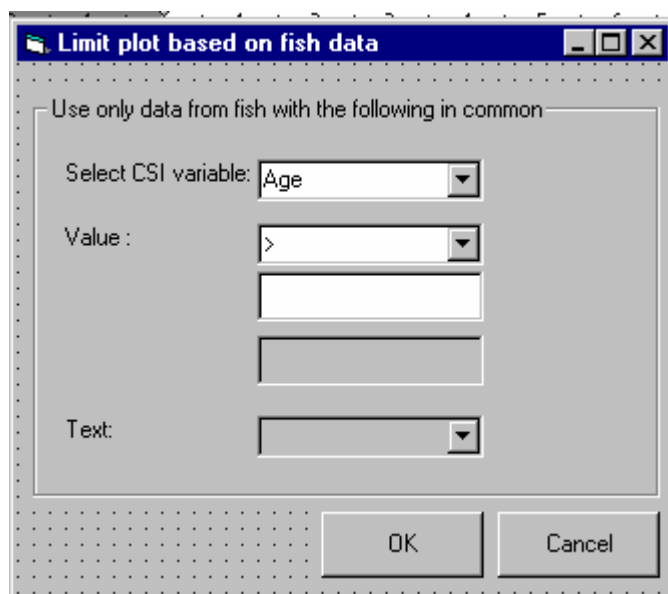


However, the plot above is not scientifically correct if the fish representing the samples are very different. It is not relevant to graph the measurement values within a dataseries over time independently of the property of the fish where the measurements are taken..

A typical scenario is that the user wants to compare measurements which originate from fish with the same age.

The user must therefore as explained above get an intermediate form if time plot is selected and one of the selected series is of type biotachemistry\_fish.

The user only get the form as explained if such limitations not already have been done in the search.



The user must decide which CSI variable/fishdata to base the plot on. The default variable to be selected is as mentioned age (In the example below this means that in order to get all measurements plotted, the Fish or the average of the fish in a composite must have an age bigger than a certain number.) The variables to be listed are:

- ◆ Age
  - ◆ Length
  - ◆ Weight
  - ◆ Gonade Weight
  - ◆ Liver Weight
  - ◆ Conditional factor
  - ◆
  - ◆ Sex
  - ◆ Maturation index
  - ◆ Color of meat
  - ◆ Disease
  - ◆ Stomach fullnes
  - ◆ Pisivore
- } Numerical
- } Text variable

The logical operator is only valid for the numerical variabls >, <, >=, <=, between. And if the user has selected a text variable the value field fields are disabled, and the "value" of the text variable is selected from the combobox..

The default plot type for biochemistry\_fish data are markers only.

If the dataseries opened belongs to different unit types, the graph(s) opened will have several y axis (maximum 6 as explained under graph options)

**Intermediate form if both biological and biota fish are selected**

If the user has chosen dataserie belonging both to the main group biological data and biotachemistry\_fish the intermediate forms described above will be combined in one. The form will only show up if these type of criteria have not been used when searching for data.

**Define plot conditions**

Biological Data-Selection of aggregation level for the selected biological data

Taxonomic Level: Species

Limit the plot of measurements in fish based on Fish Data

Select CSI variable: Age

Value : >

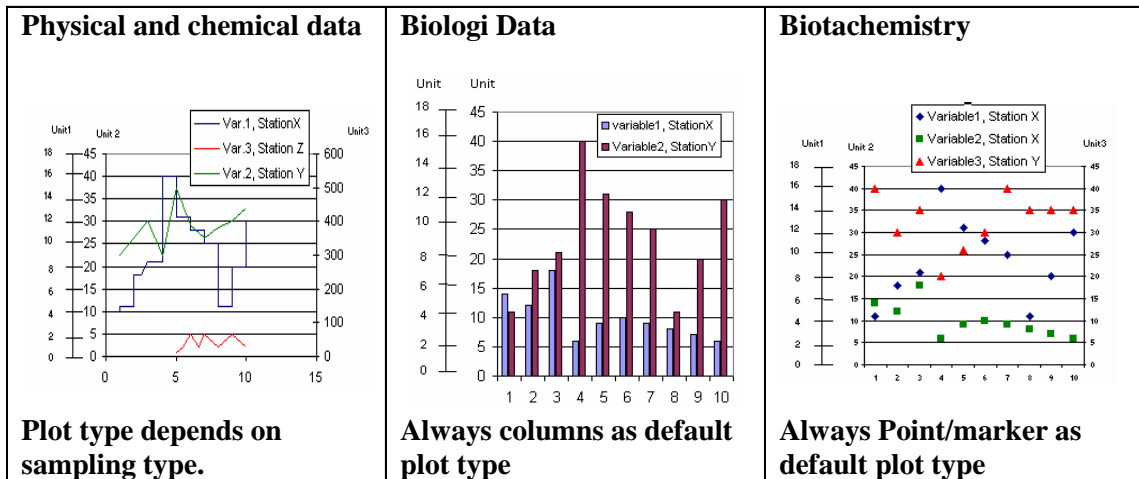
Text:

OK Cancel

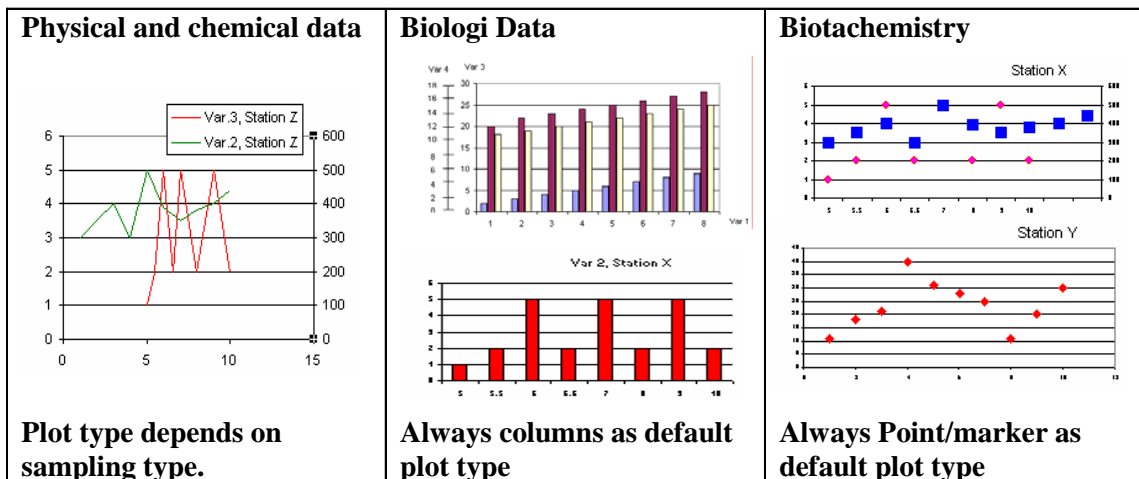
7.1.4 Examples of Timeplot

There might be a mix of the three main types depending on the selection of dataserries.

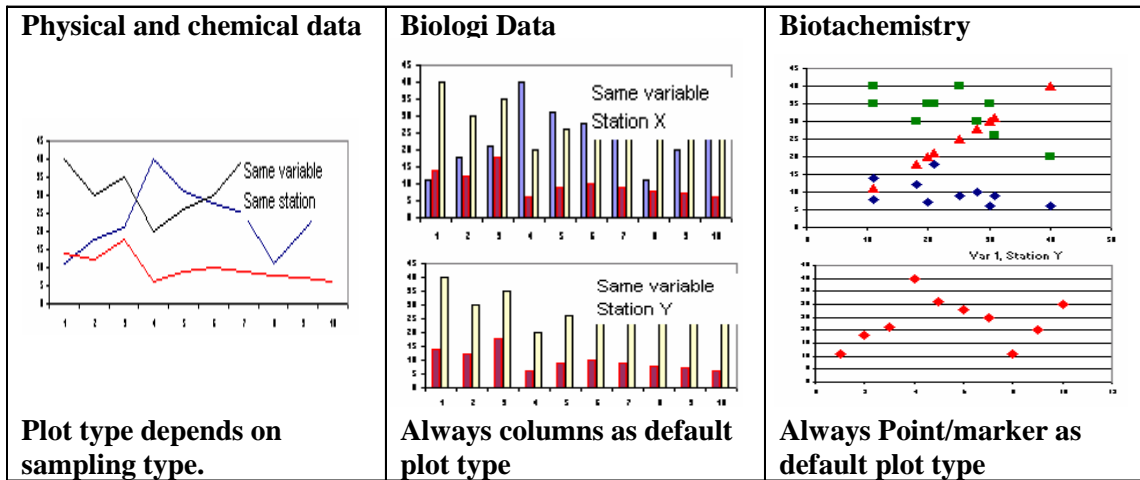
- ◆ All dataserries in one graph



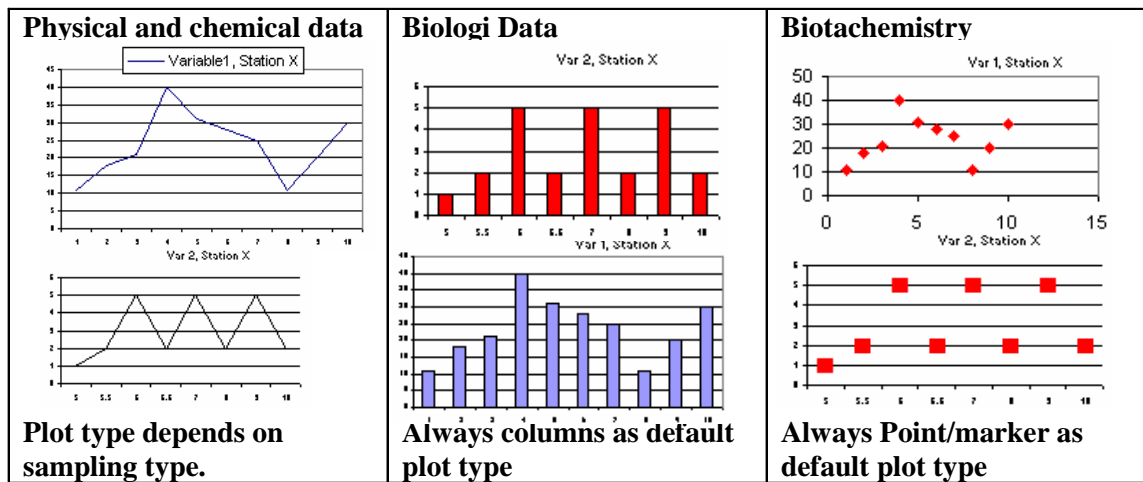
- ◆ One graph pr. Station



- ◆ One graph pr. Station and variable



- ◆ One graph pr. Dataseries



### 7.1.5 Variable\*variable plot from the drop down menu<sup>34</sup>

#### Default plot and criteria to be used

This type of plot may be used for all three main categories 1) physical and chemical data, 2) Biological data and 3) Biotachemistry. The default plot type will be point/marker (without lines) for all types.

By default the user shall only show one relationship of variable\*variable since if not the graph will be very caotic, and also the system will not know what to compare. The user may do more comparison after entering the graph by defining more y axis and sub graphs.

In order to perform a variable\*variable plot (scattered plot) special rules need to be applied for the two variables to be plotted. The rules to perform a scattered plot for the three main categories are listed below:

#### Physical and chemical data

A scattered plot will consist of many dataserie, but the two dataserie to make one of the plot (one mark) in the graph must have the same location (station and position).

However the user may make the limitation even stricter by defining that the dataserie of the two variables to be compared must be exactly the same, except for the variable to be compared.

#### Biological data

The same rules apply to biological data as described for physical and chemical data.

#### Biota chemistry Fish

If the user has selected to variables to be compared both from this measurement type, the two dataserie to make one of the plot (one mark) in the graph must have the same dataserie definition except for the component or CSI variable measured. Also the Fish ID must be the same. This means that the user will in this case not have the option of making a coparison only based on location.

However, if one of the variables are selected from another measurement type other rules apply, as described below.

#### Rules for comparison of variables from two different measurement types

It is possible to make a scattered plot based on one variables from different measurement types. In this case the comparison based on dataserie definition is disabled (ref. Intermediate form described below)

If physical and chemical data are plotted against biological data the location except for the component and species need to be the same. For those biological data where depht (measurement position z1 and z2 ) is not a property of the dataserie, an average of the physical/chemical data (taken at different depth) are compared towards the biological data.

---

<sup>34</sup> The reason to use the term variable is because the variable can be a measurement variable and a CSI variable for all three main group of measurments.

This is also the case if physical and chemical data are plotted towards measurements taken in fish. If physical and chemical data are plotted against biotadata the location need to be the same.

But as for som biological data the biotachemistry data only refers to a location by station and position without relating to z1 and z2 position (deopth). Measurements from this type must therefore be compared with an average from the pysical chemical data if these exist on several depth for the same station. The user must in this case also determine the property of the fish to be compared (as for timeplot) because if not the comparison is not relevant.

### Other criteria

In additon to the above mentioned criteria, also the timestamp must be the same. However, the user shall be able to allow a “gap” in time in order to get a plot. By default the “gap” is zero, but the user can change this gap. The system will then compare values from the two dataseries to be plotted and choose those two values that are closest in time to each other within the limit given.



**Intermediate form**

Due to these selection that the user needs to do before he/she enters the graph, an intermediate form is needed.

The dialog box is titled "Variable\*Variable Plot" and contains the following sections:

- Select Measurement variable:** Two columns of dropdown menus. The left column has "Measurement type: Comp1", "Medium: Comp1", and "Variable on x axis: Comp1". The right column has "Measurement type: Comp1", "Medium: Comp1", and "Variable on y axis: Comp2". A button labeled "Aggregate to taxonomic level" is located at the bottom right of this section.
- Select CSI variable:** Two columns of dropdown menus. The left column has "Measurement type: Comp1", "Medium: Comp1", and "Variable on x axis: Comp1". The right column has "Measurement type: Comp1", "Medium: Comp1", and "Variable on y axis: Comp2".
- Criteria to plot two variables:** Two radio button options: "The dataseries must have the same location" and "The dataseries must have the same dataseries reference except for the variable to be plotted". Below these is a text input field "Maximum difference in timestamp to get plot:" containing "Day: [ ]" and "Hour: [ ]". A button labeled "Special Fish Data Criteria" is at the bottom right of this section.

At the bottom of the dialog box are "OK" and "Cancel" buttons.

The user can either choose two measurement variables, two CSI variables or one of each.

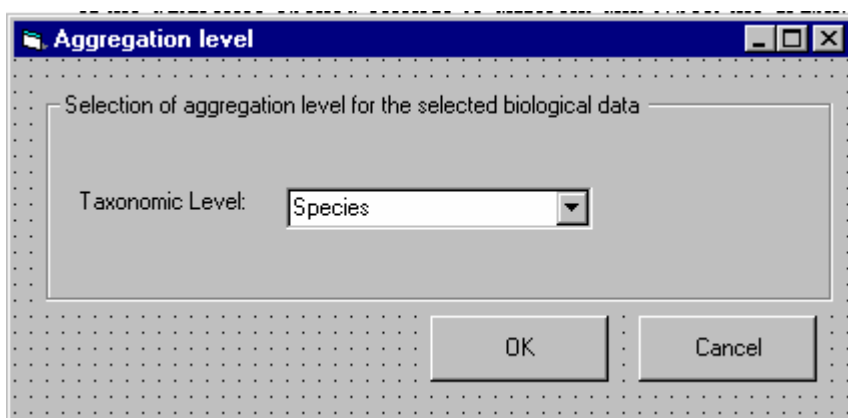
**Measurement variable**

If the user has selected to graph a combination of measurement types and mediums, the user must also select these. If there is only one selection in the comboboxes (the selected dataseries originate from the same measurement type and medium), these will be selected as default.

The measurement variable to select will be those connected to the selected dataseriees, for physical and chemical data this will be the components (component code), for biological data this will be the species (latin name) or group of species (name) and for biotachemistry this will be the combination of species and component (Component code with species in pharenthesis)

If biological data are one of the sub modules in the system this form will also have the button aggregate to taxonomix level. If ENSIS is implemented with this module, but the user has not selected any dataseriees to plot from this main group the button will be disabled (also if the user has applied this criteria when searching for the dataseriees the button will be disabled)

If the user has selected biological data the button will be enabled. The species name already selected will be transformed to the group name. The user may also use this before selecting species and have all group names listed which are relevant for the selected dataseriees and the taxonomic level selected.



### Select CSI variable

The user may also select to graph the measurments towards the CSI relevant for the measurments. Also here the user select the measurement type and medium, by default the same measurement type and medium as selected above is selected. Only the numerical CSI variable for the selected measurementtypes will be listed. The CSI variable name will be listed by the name.

If the user has already selected 2 measurement variables from previous step this frame will be disabled.

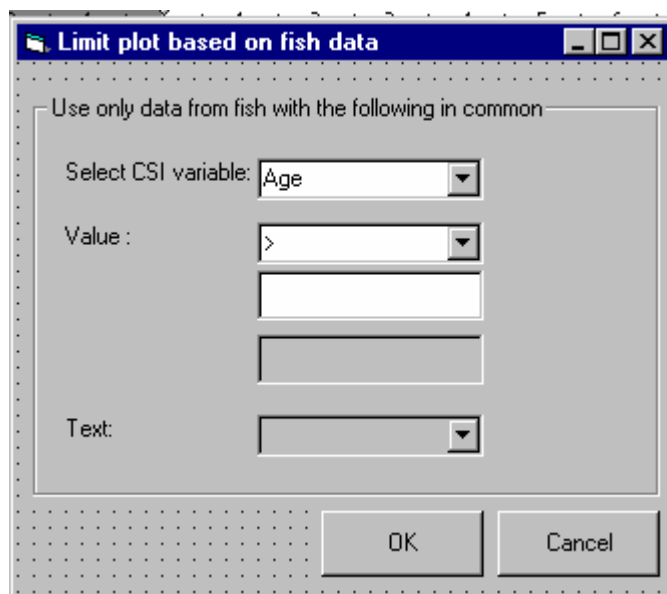
The user may also choose only two CSI variabel (i.e. length of fish towards age for the selected biota chemistry analysis)

### Criteria to plot two variables

As explained above the user must define how strict the comparison of variables shall be.

By default the comparison will be done based on location with the rules explained above. However if the user has selected the measurement type biotachemistry fish for both variables, the comparison must be undertaken based on that the variables has the same dataseries definition (except medium) and the same fish ID.

If the user has selected this measurement type, the user must in addition set a limitation on which fish that shall be compared. The button will lead to the form below which only will be implemented if the user has access to the biodatachemsitry module. The form below is explained earlier. The button will only be enabled if these type of criteria has not been used to search for the dsataseries.

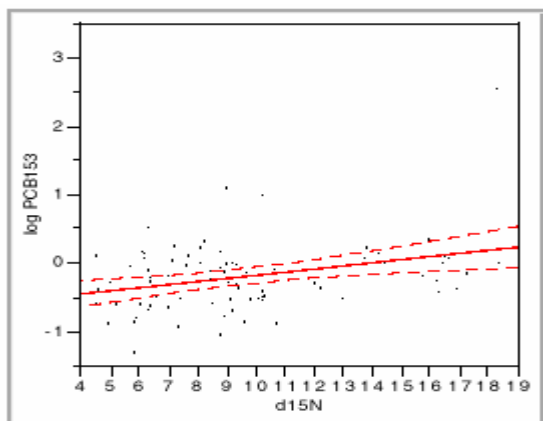


The image shows a dialog box titled "Limit plot based on fish data". The dialog box has a blue title bar with standard window controls (minimize, maximize, close). The main content area is light gray and contains the following elements:

- A label: "Use only data from fish with the following in common"
- A label: "Select CSI variable:" followed by a dropdown menu showing "Age".
- A label: "Value:" followed by a dropdown menu showing ">".
- Two empty text input fields stacked vertically.
- A label: "Text:" followed by a dropdown menu.
- At the bottom, there are two buttons: "OK" and "Cancel".

Finally the user must select which e maximum allowed difference in timestamp between the two variables. The form is by default filled in with zero for day and zero for hour.

When the user enters the graph it shall also be possible as part of the graph options to add a linear regression line.



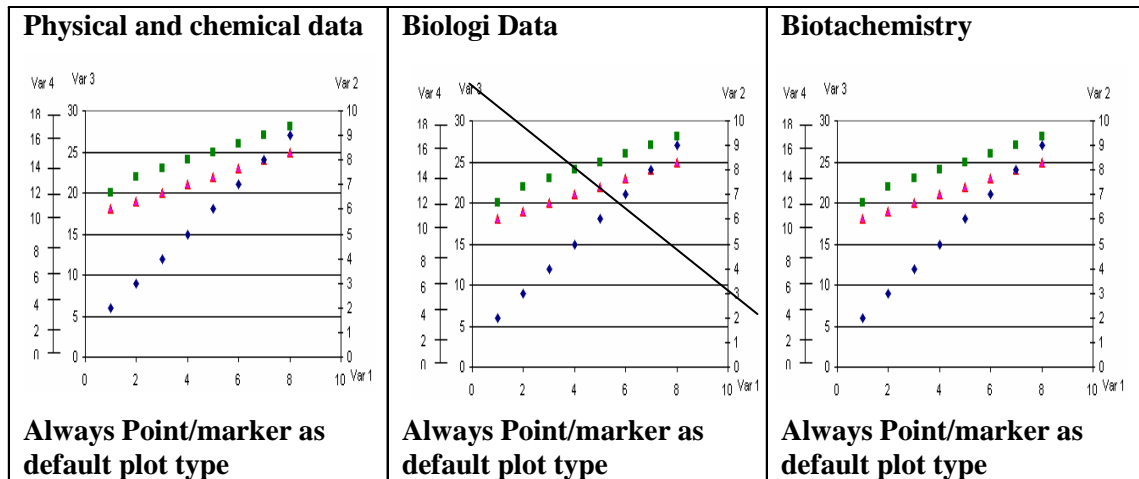
In the graph the user will also have the possibility to change the settings given above, to deselect selected data series, and to make several sub graphs allowing the user to compare more than two variables. This is explained more in the chapter 7.2

The options are described in detail in chapter 4.7.6.

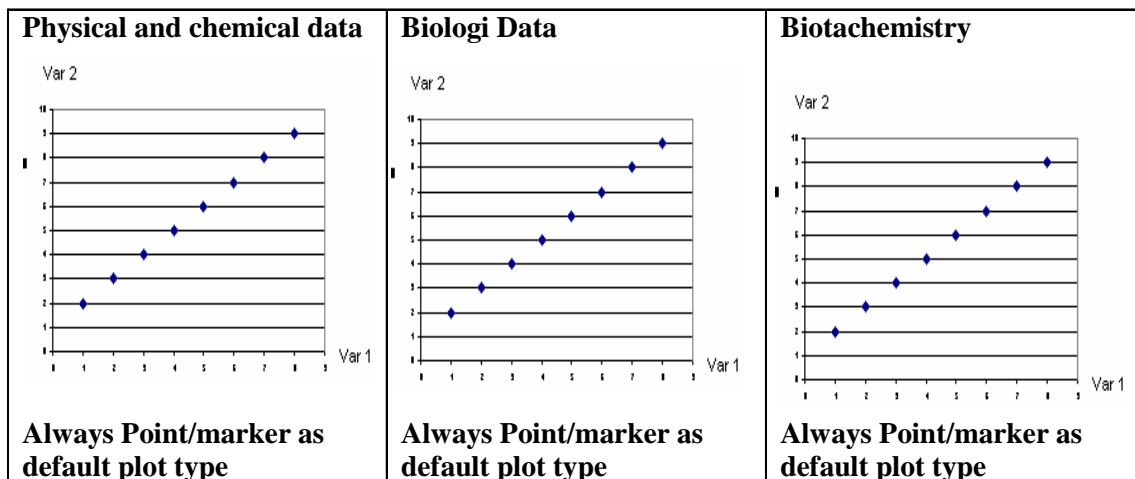
7.1.6 Examples variable\*variable plot

There might be a mix of the three main types depending on the selection of dataseries.

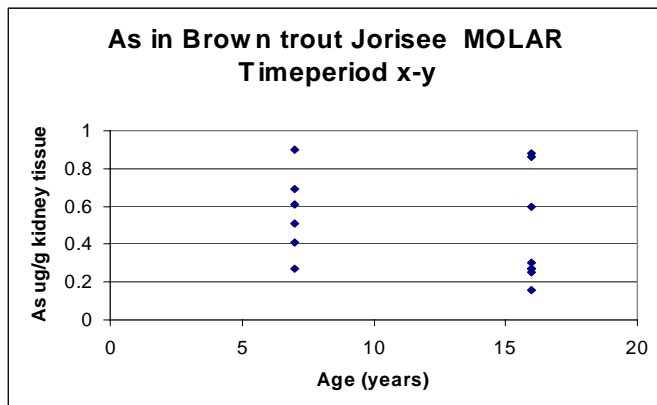
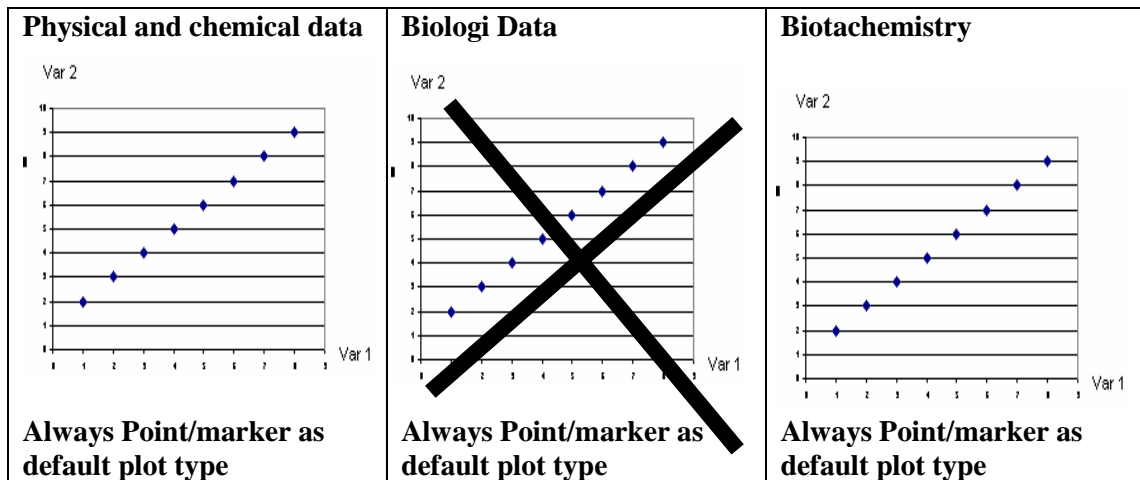
- ◆ All dataseries in one graph



- ◆ One graph pr. Station (NB the figure shows only two variables, but may have several plots since several measurement variable may be plotted against each other but still on the same graph)



- ◆ One graph pr. dataserie (component/species) (relevant when plotting i.e measurement variable against CSI, i.e concentration in liver in Fish against age) (NB the biologi plot is not relevant since the biologi data does not have CSI)



### 7.1.7 Variable\*depth plot from the drop down menu

In order to get a variable\* depth plot the user must also go through an intermediate form. Both dataserie with sampling type with property “individual” and composite can be used. The depth shall always refer to the Z2 value (=z1 for individual). The graph type is only relevant for the two main groups:

- 1) Physical and chemical data and
- 2) Biological data (only those having a z1 and z2 reference in their dataserie reference)

#### Select type of plot

The user will get two options:

- ◆ One dimensional with component on x axis

- ◆ Two dimensional with time on x axis

One dimensional plot is default.

**Variable\*depth**

Select type of plot

One dimensional with component on x axis

Two dimensional with time on x axis

Aggregate to taxonomic level

Select measurement variables

Measurement type:

Medium:

Variable 1:

Variable 2:

Variable 3:

Variable 4:

Variable 5:

Variable 6:

Select CSI variables

Measurement type:

Medium:

Variable 1:

Variable 2:

Variable 3:

Variable 4:

Variable 5:

Variable 6:

Select timestamp Within selected timeperiod

Year:

Month:

Min:

Day:

Hour:

Sec:

OK Cancel

If the user has selected dataseriees belonging to biological data, the aggregate to taxonomic level button will be enabled (if the module is not implemented, the button will not be part of the form). The button will also be disabled if the user has already used this criteria when searching for the data.

The functionality is before .

**Aggregation level**

Selection of aggregation level for the selected biological data

Taxonomic Level:

OK Cancel

### Option 1: One dimensional with variable on x axis

#### *Select measurement variables*

The user selects measurement type and medium which refers to the already selected dataserie. If only one is presented in each of the comboboxes these are selected by default .

The variable list will depend on which measurement type and medium type selected. Only those valid for the selected dataserie will be available. The variables will either be components (component code) or species (species name) depending on the measurement type selected (or both).

#### *Select CSI variables*

Depending on how many measurement variable the user has selected, the user can select 1-6 CSI variables. Only those relevant for the selected measurement and medium will be listed. The sum of measurement variable and CSI variable can not exceed 6.

#### *Select timestamp within selected time period*

The user must also assign the plot to a specific date and time within the given time period.

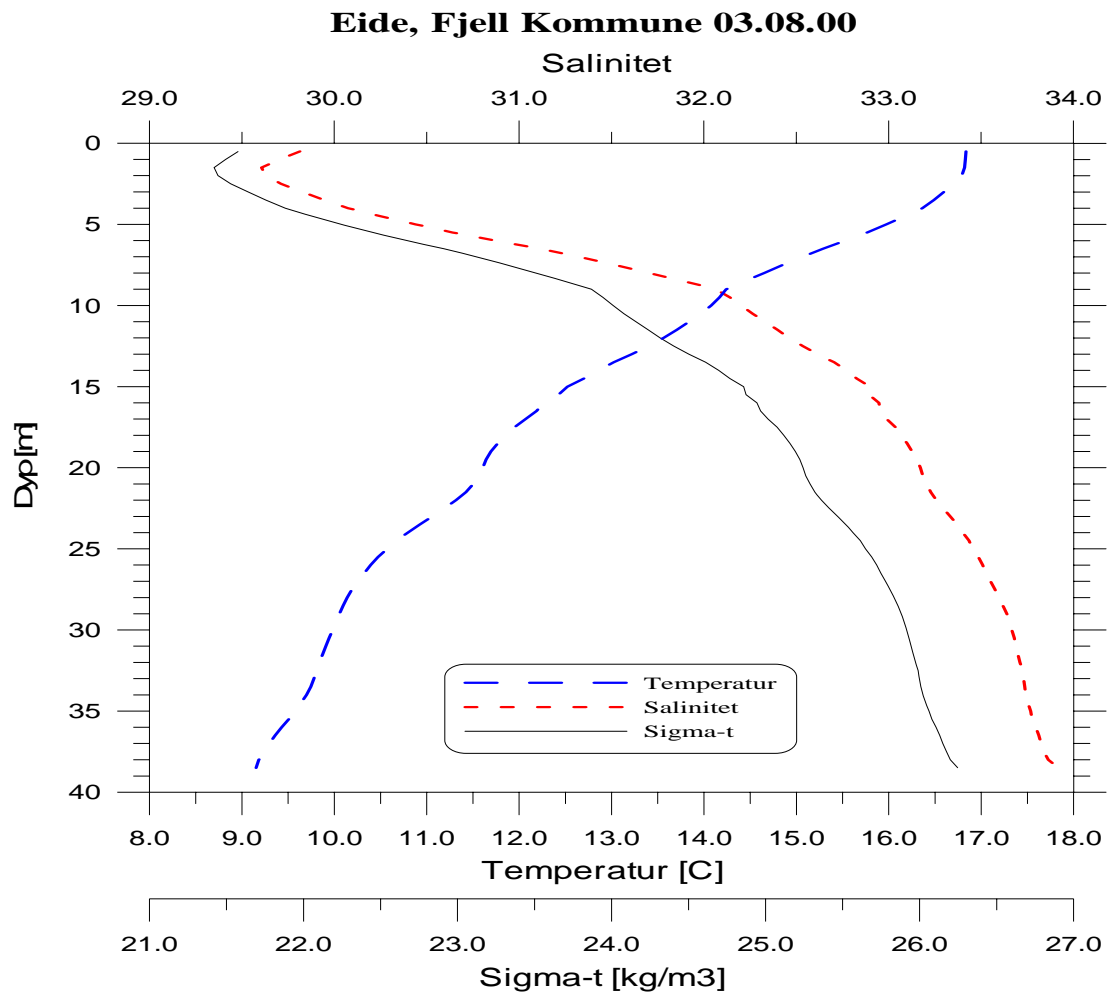
The user has already selected a time period, but for this type of plot the user needs to limit the plot to a particular timestamp.

Only the year, months, day, etc where there exist measurements for the selected variable will be available, within the period already selected in the main form. The content of the date/time comboboxes will be updated according to what the user chooses. I.e. if the user chooses year, the content of the other comboboxes will be limited to those month, days etc which is valid for the selected components and the selected year.

If the user chooses a particular day (and do not choose hour, minute and second), and there exist several measurements a particular day, the system will choose the measurement closest to the day (meaning closest to hour 00). The same apply if the user chooses hour (and not minute and second), and there exist several measurement within an hour. The system will choose the value closest to the hour.

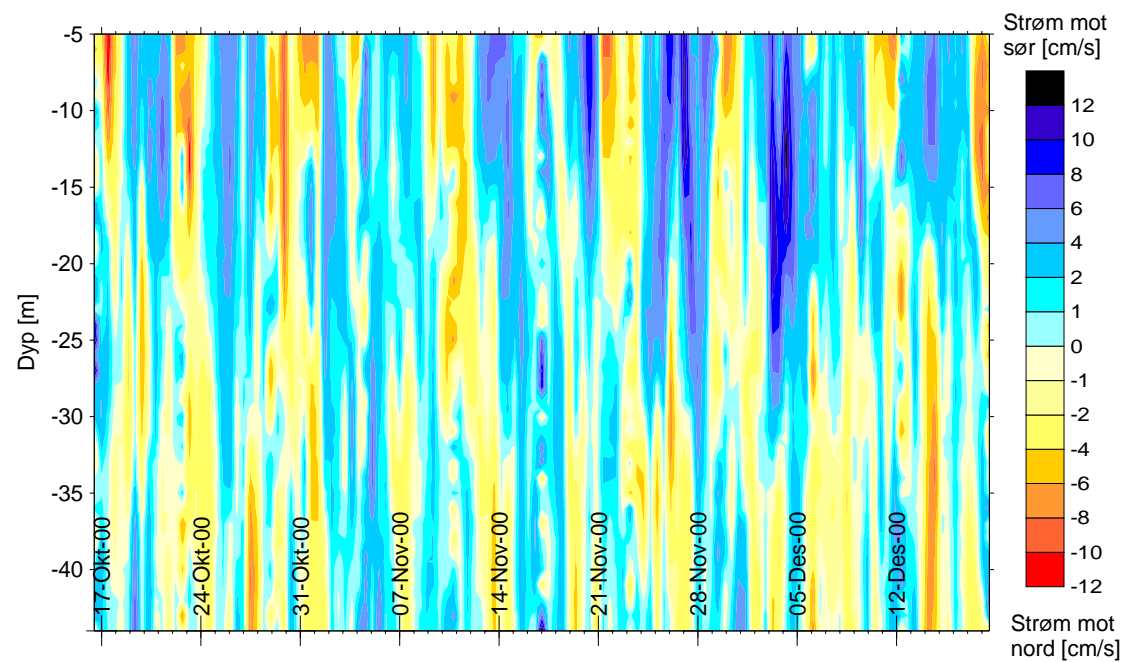
The y axis will function as the depth axis, and will be reversed of a normal y axis if the Z values are negative = depth (not height). If the z values are positive (=height) the y axis orientation will be "normal" (upwards).





If the user has chosen variables with different unit types, there will be prallellele x axis (maximum 6)

### Option 2: Two dimensional with time on x axis



#### *Select variable/CSI variable*

If the user chooses the second option (two dimensional plot) the user can only select one variable and the other variables will be disabled.

#### *Select timestamp for given time period*

Also the select time within time period will be disabled since the limitation of the period is already given.

In the graph the user will among others also have the possibility to change the settings given above, and to deselect selected dataseries. The options are described more in detail in chapter 7.2.

### 7.1.8 Examples of Variable\*depth plot

There might be a mix of the three main types depending on the selection of dataserries.

- ◆ One graph pr station (only possible for one dimensional)

<b>Physical and chemical data</b>	<b>Biologi Data</b>	<b>Biotachemistry</b>
<b>Always line as default plot type (if not two dimensional is selected)</b>	<b>Always line as default plot type (if not two dimensional is selected)</b>	<b>NOT Relevant</b>

- ◆ One graph pr. Dataseries

◆

<b>Physical and chemical data</b>	<b>Biologi Data</b>	<b>Biotachemistry</b>
<b>Always line as default plot type (if not two dimensional is selected)</b>	<b>Always line as default plot type (if not two dimensional is selected)</b>	<b>NOT Relevant</b>

### 7.1.9 Station- variable plot from the drop down menu

For this type of graph the station are located on the y axis. The graph is relevant for all measurement types.

This will always produce one graph pr unique combination of measurement type, medium, and measurement variable. The measurement variable can be species, component or component-species depending on the sereies selected. Also for this type of graph the user might aggregate the biological data to a higher taxonomic level.

The user may also decide if he/she wants to base the plot on a stricter limitation, only plotting those which have the same dataseries definition except station and sampling type or only those which have the same dataseries definition except station.

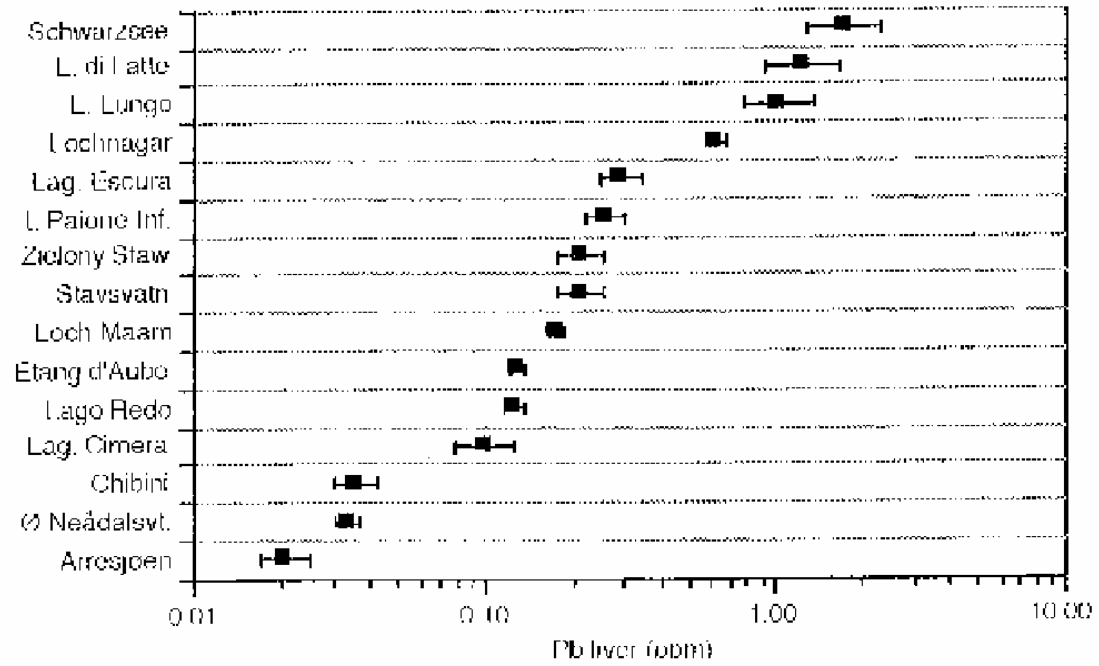
The standard plot type for this type of graph is a box-whisker plot. In order to determine the setting for box-whisker plot and aggregate the biological data if necessary, the user needs to fill in an intermediate form.

All these conditons give the following form.

The screenshot shows a dialog box titled "Variable\*Station plot". It is divided into two main sections. The first section, "Criteria for plot", contains three radio button options: "Same measurement type, medium and variable", "Same dataseries reference except Station and sampling type", and "Same dataseries reference except Station". Below these options is a button labeled "Aggregate to taxonomic level". The second section, "Determine box whisker plot conditions", contains three input fields: "Upper Percentile:", "Middle percentil:", and "Lower Percentile:". At the bottom of the dialog are "OK" and "Cancel" buttons.

The aggregate to taxonomic level will only be enabled if the suer has not already used this as a criteria when searching for data.

7.1.10 Examples of Station variable plot

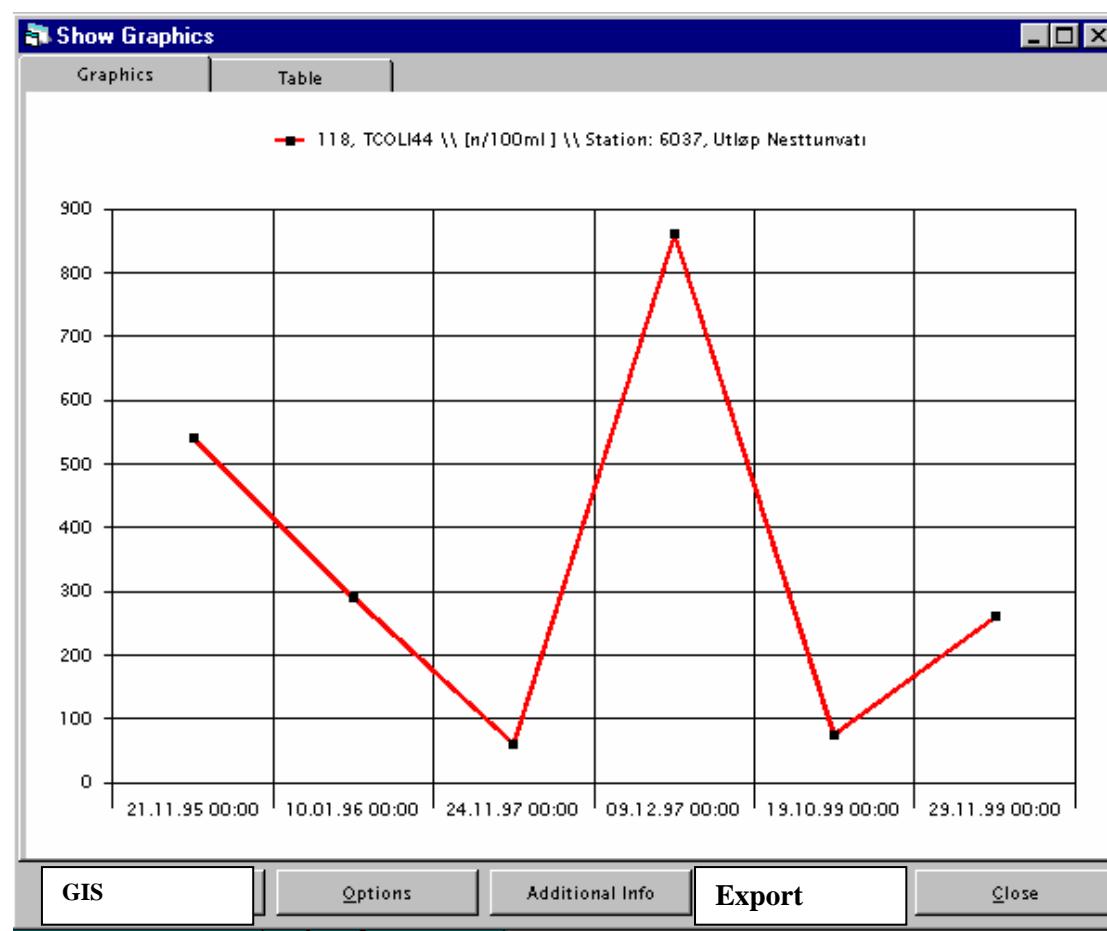


7.1.11 Other Graphics

To use other graphics i.e. statistic plot the user needs to go to the calculation menu and to use special graphic i.e. wind rose, Waterflux, Box-Whisker plot, cumulative frequency distribution, and distribution.



## 7.2 Options within the graph



After the previous selections described in chapter 7.1, the user will end up in one or several graphs. The example above is taken from ENSIS 2.05 and shows only one graph with one data series with plot style line with markers.

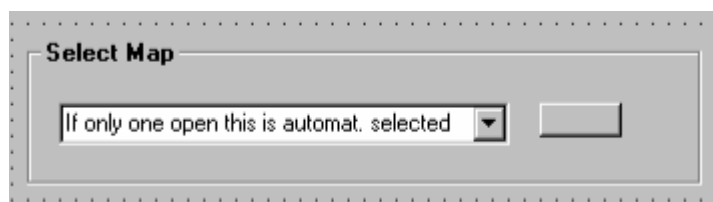
From the graph window the user has several possibilities:

- ◆ GIS
- ◆ Options
- ◆ Additional Info
- ◆ Export
- ◆ Close

The functionality in this chapter describes mainly the functionality behind the options button and the interactivity of the graph, but the export, GIS and Additional Info are briefly explained below.

### 7.2.1 Gis

If the user applies GIS from this position the user will get an overview of the stations involved in the graph. The stations will be marked with a special colour and symbol on the map (which the user can change). The station subset may be exported to shape file. If the user does not have any map open or several maps, the user will get to the intermediate form below.

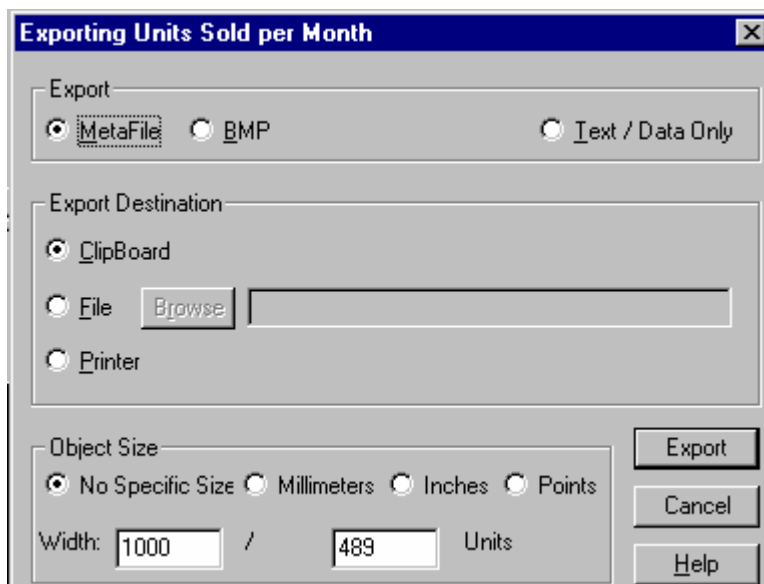


### 7.2.2 Additional Info

The additional info will function as in the previous application. The user marks a graph or a point in the graph and gets the whole dataset definition (s) behind that graph/point.

### 7.2.3 Export graph

This will replace the existing copy to clipboard and print button in the current ENSIS 2.05 application.



The default choice will be:

- ◆ Text/data only
- ◆ Clipboard



### 7.2.4 Options button

The graph options described by the user is partly general/standard functionality of the new graph tool. However, we believe that some of the requirements are special and must be programmed to satisfy the requirement for the user.

The user requirements for the user was earlier described in a separate document, but are implemented in this document as a functionality description.

In the current ENSIS 2.05 application most of the graph functionality is located under options. Also in ENSIS 3.0 it is suggested to have the special functionality located on this "option" button separated by TABS. Also the user will have most of the graph functionality available **by right mouse button** in the graph , or by double clicking on graphs, plot area, axis etc.

The zoom functionality shall be available in the graph by the **left mouse button**.

In designing the different graph options we have in addition to the user requirements, used the current ENSIS application, example given in the Gigasoft software (Proessential) and Excel as the basis.

The final design of the special options compared to the functionality available in the graph package can only be finished in close co-operation with the programmer.

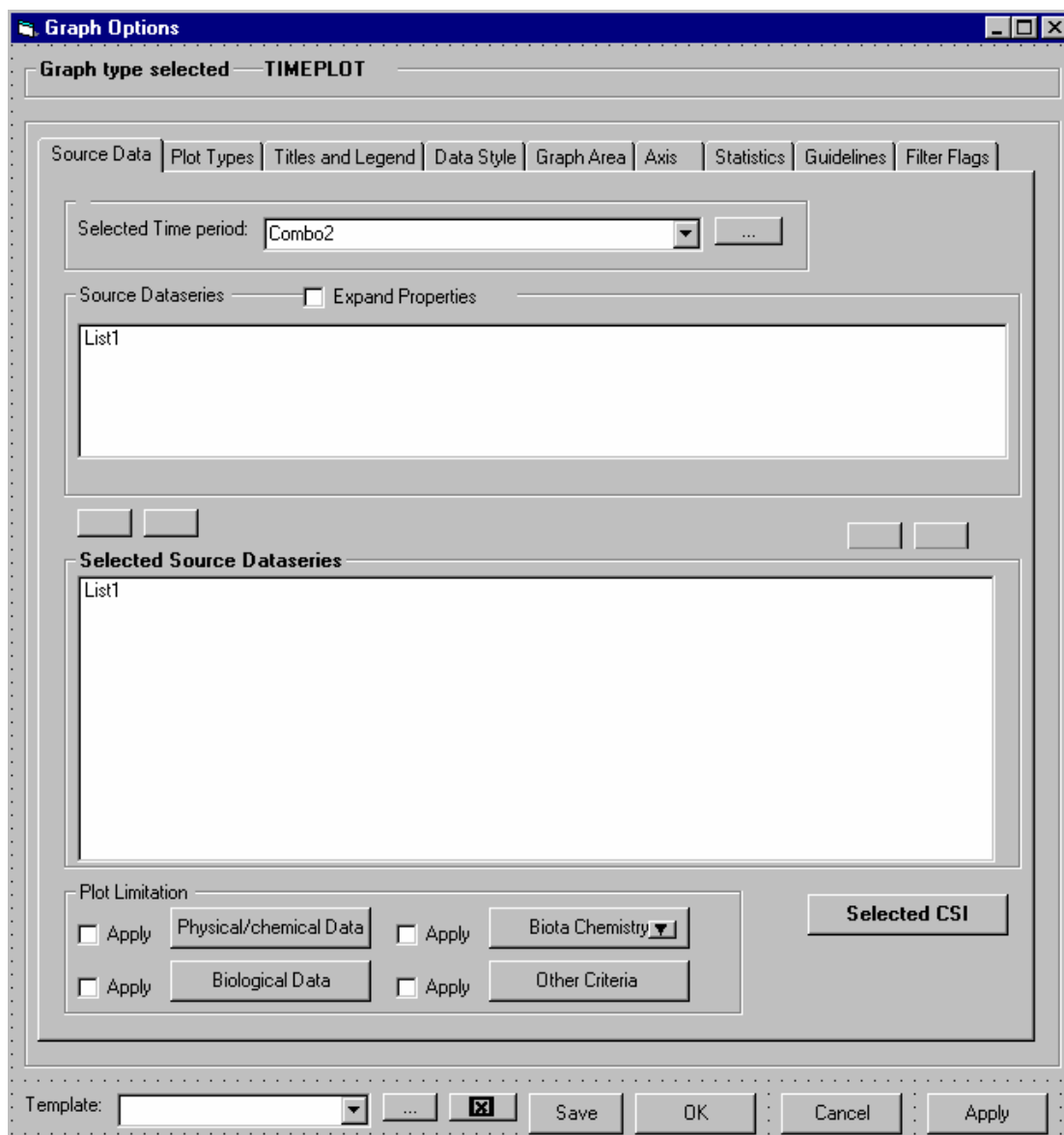
NB the user has already selected from previous steps the main type og graph:

- ◆ Time plot
- ◆ Variable\*variable plot
- ◆ Variable\*depth/height plot
- ◆ Staions\*variable plot

If the user wants to change the main plot type and still keep the already selected plot (or close the existing and deselect plot type), he/she needs to select graphics again in the main frame and select another plot type.

The plot type selected will always be written as information above the TABS under the options TAB.

7.2.5 Time Plot- TAB 1-Source Data



**Selected time period**

The user may already have made a limitation to the time period for the plot. However the user may change the time period within the already selected time period.

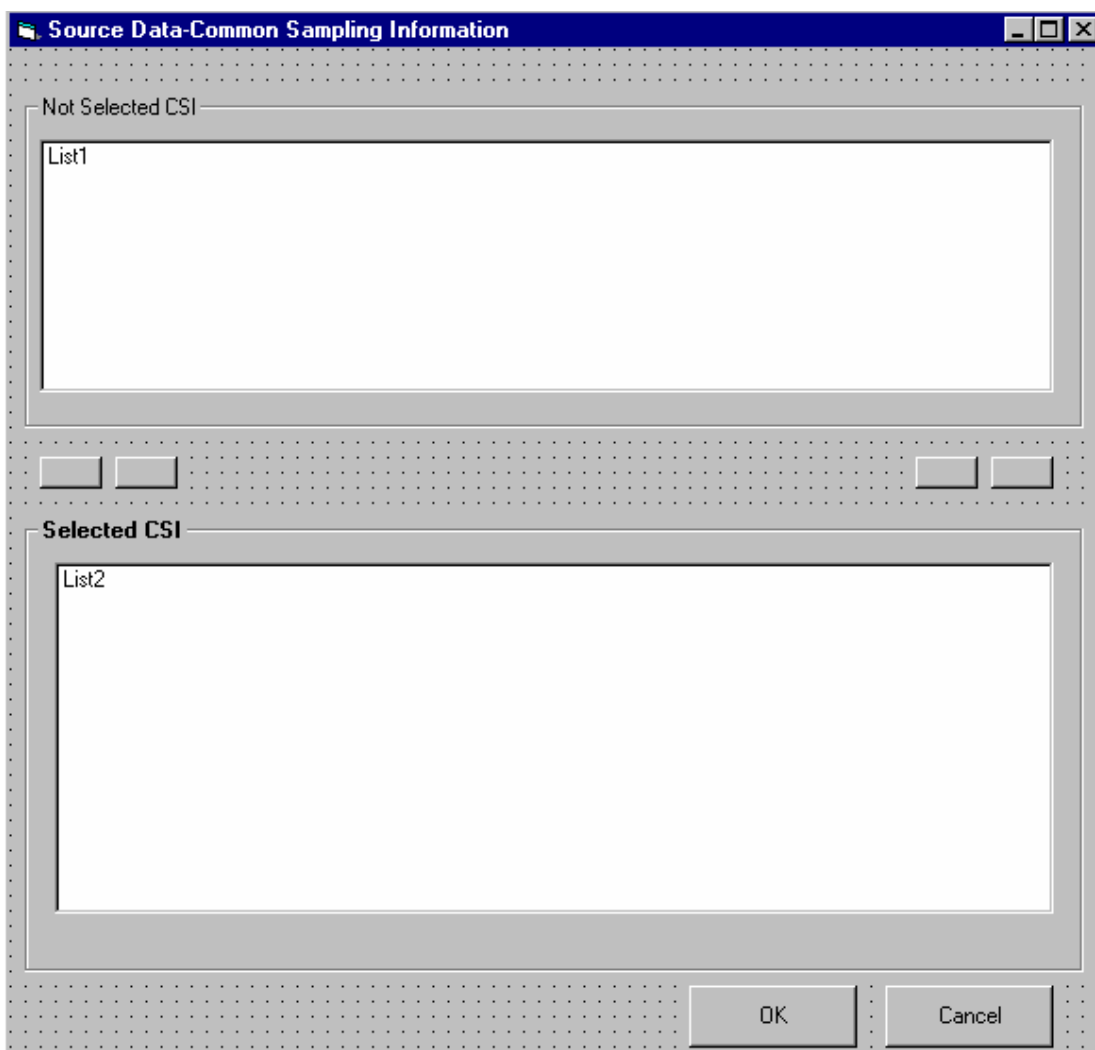
**Found and selected timeseries**

The user has already made a selection of dataseries to include in the plot and these will be listed in the selected dataseries list as in the main form. How many dataseries which will be listed depends on how many dataseries which belong to the graph, and hence on the selection done by the user in the previous step (i.e. one graph pr station, all dataseries in the same graph etc)

However , the user might want to deselect some of the series after entering the graph, but he/she can not add more.

### Selected CSI

The numerical common sampling information linked to the dataserie will not be selected, but the user might want to include some of these as well in the graph. The user enter the Common sampling information button. The CSI is listed with their links to the dataserie (dataserie link properties) and the variables.



### Limitation to the plot

Also the user may have made limitations to the plot for the data to be used within a dataserie. The limitations were either made from the original search for dataserie, in the intermediate forms before entering the graph, or if the user enters the graphics from the measurement registration table the limitation was maybe set there.

The apply button will be checked if this is the case in order to remind the user of the limitations. The user may change the limitations.

The functionality behind the buttons are explained before, but shown below.

Physical and chemical

The text in the form must be changed to reflect the operation. I.e

**Use only data in the plot satisfying the criteria.** The criterias will be filled in with the criteria already set by the user i.e when searching for the dataseries in the first place, before entering the graph form from the found dataseries, and from the measurement table.

**Find dataseries based on measurements in the series**

Find dataseries based on measurements with a link to

Adm. Projects Instrumens Analysis and sampling Time Step Flags  Apply

Find dataseries based on measurements with values within limits:

Select Component: Name Operator [ ] [ ] Unit

Select Component: Name Operator [ ] [ ] Unit

Select Component: Name Operator [ ] [ ] Unit

Select Component: Name Operator [ ] [ ] Unit

Find dataseries based on measurements with values linked to CSI:

Select CSI variable: Name Operator [ ] [ ] Unit

Select CSI variable: Name Operator [ ] [ ] Unit

Select CSI variable: Name Operator [ ] [ ] Unit

Select CSI variable: Name Operator [ ] [ ] Unit

OK Cancel

### Biological data

The text in the form must be changed to reflect the operation. I.e

**Use only data in the plot satisfying the criteria.** The criterias will be filled in with the criteria already set by the user i.e when searching for the dataseries in the first place, before entering the graph form from the found dataseries, and from the measurement table.

Also when reached from this location the selection of taxonomic level must be enabled. If the user selects another taxonomic level than already selected, the listing of dataseries will be updated according to this selection.

**Special Search criteria**

Search for dataseries containing measurements with a link to :

Adm.projects Counting and sampling Flags  Apply

**Dataseries at the aggregated level satisfying:**

Aggregation (Taxonomic level)  
Already selected level/select another level

Select species/Group of species  
Combo1

Number/Coverage/Concentration  
Operator [ ] Unit

Biomass/Biovolume:  
Operator [ ] Unit

Semi Quantitative Measure:  
Operator [ ] **Apply >>**

List1

**Special Search Criteria**

Zooplankton Macrovegetation  Apply

Measures to be used for plot

OK Cancel

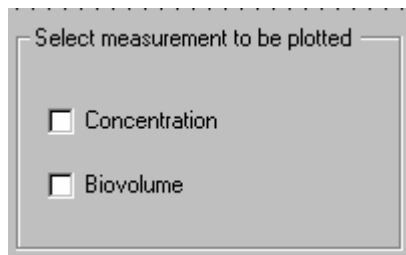
As mentioned several time before biological data may be represented by several measures.

In order for the user to decide which measurmes that should be plotted, the user must enter this button "Measures to be used for plot". The button will have a drop down in order to set the criteria for each of the measurement types.

Each entry will open a form with check boxes for the following conditions (the one in bold will already be selected).

Phytoplankton

- ◆ **Concentration**
- ◆ Biovolume



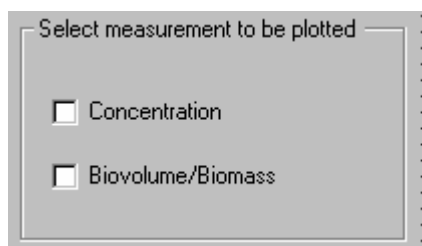
Select measurement to be plotted

Concentration

Biovolume

Zooplankton

- ◆ **Concentration**
- ◆ Biovolume/Biomass



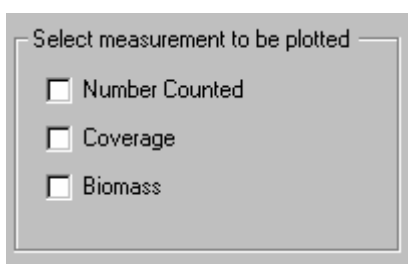
Select measurement to be plotted

Concentration

Biovolume/Biomass

Benthic Animal

- ◆ **Number Counted**
- ◆ Coverage
- ◆ Biomass



Select measurement to be plotted

Number Counted

Coverage

Biomass

Macrovegetation

- ◆ Counted
- ◆ **Coverage**
- ◆ Biomass

Select measurement to be plotted

Counted

Coverage

Biomass

Pheriphyton

- ◆ **Counted**
- ◆ Coverage
- ◆ Biomass

Select measurement to be plotted

Counted

Coverage

Biomass

Biota chemistry

The text in the form must be changed to reflect the operation. I.e

**Use only data in the plot satysfying the criteria. There will be three different search form depending on type (Fish, benthic animal and vegetation) The user has already selected the type by the drop down on the button before entering the limitation.**

The citerias will be filled in with the criteria already set by the user i.e when searching for the dataserias in the first place, before entering the graph form from the found dataserias, and from the measurement table.

Form for fish



**Find Dataseries based on measurement details**

Find dataseries based on measurements with a link to

Adm. Projects    Analysis and sampling    Time Step    Flags     Apply

Find dataseries based on measurements with values within limits:

Select Medium: Name    Select Species: Name

Select component: Name    Operator          Unit

Select component: Name    Operator          Unit

Select component: Name    Operator          Unit

Find Dataseries based on measurements with values linked to catch information:

Name of fisherman: Name    Vessel: Name

Scientist in charge: Name    Catch Depth: Operat          m

CPUE: Operat         

Find Dataseries based on information about the fishes in the samples/catch:

Based on individuals     Based on average    No of individuals: Operat         

Weight, Length and age

Length: Operat          cm

Weight: Operat          g

Gonade Weight: Operat          g

Liver Weigth: Operat          g

Conditional Factor: Operat         

Age: Operat          Year

Other physical characteristics

Sex: Male/Female

Maturation Index:   

Color of meat:   

Disease:   

Piscivore: Yes/no

Stomach Fullness:   

Find Dataseries based on measurements with values linked to other CSI:

Select CSI variables: Name    Operator          Unit

Select CSI variables: Name    Operator          Unit

OK    Cancel

Form for Benthic animals

**Find Dataseries based on measurement details**

Find dataseries based on measurements with a link to

Adm. Projects    Analysis and sampling    Time Step    Flags     Apply

Find dataseries based on measurements with values within limits:

Select Medium: Name    Select Species: Name

Select component: Name    Operator          Unit

Select component: Name    Operator          Unit

Select component: Name    Operator          Unit

Find Dataseries based on measurements with values linked to catch information:

Name of fisherman: Name    Vessel: Name

Scientist in charge: Name    Catch Depth: Operator          m

Find Dataseries based on the species in the samples/catch:

Based on individuals     Based on average    No of individuals: Operator         

Weight, Length and age

Length: Operator          cm    Fat: Operator          %

Weight: Operator          g    Sex: Male/Female

Dry Weight: Operator          %

Find Dataseries based on measurements with values linked to other CSI:

Select CSI variables: Name    Operator          Unit

Select CSI variables: Name    Operator          Unit

OK    Cancel

Form for vegetation

**Find Dataseries based on measurement details**

Find dataseries based on measurements with a link to

Adm. Projects Analysis and sampling Time Step Flags  Apply

Find dataseries based on measurements with values within limits:

Select Medium: Name Select Species: Name

Select component: Name Operator Unit

Select component: Name Operator Unit

Select component: Name Operator Unit

Find Dataseries based on measurements with values linked to catch information:

Name of fisherman: Name Vessel: Name

Scientist in charge: Name Catch Depth: Operator Unit m

Find Dataseries based on the species in the samples/catch:

Based on individuals  Based on average No of individuals: Operator Unit

Weigh, Length and age

Length: Operator Unit cm Fat: Operator Unit %

Weight: Operator Unit g

Dry Weight: Operator Unit % Sex: Male/Female

Find Dataseries based on measurements with values linked to other CSI:

Select CSI variables: Name Operator Unit

Select CSI variables: Name Operator Unit

OK Cancel

**Other criteria**

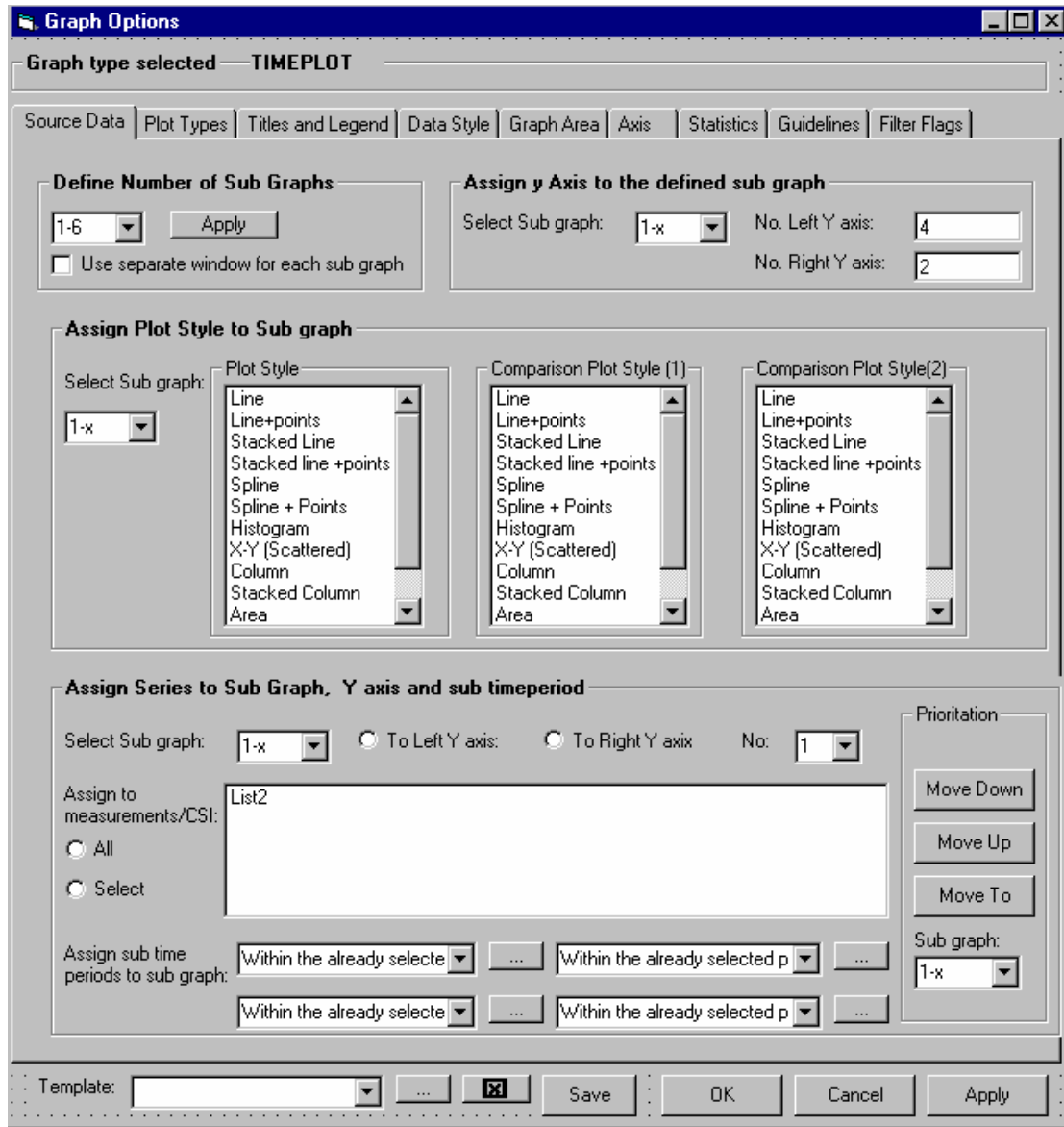
Not relevant for time plot

**Operation in the graph**

The user may do some of these operations through the "option" button.

If the user wants to delete a series plotted he/she may point on the dataserie plot/CSI plot and delete. Also the user can use the right mouse button and use the "source data" entry. This operation will bring the user directly to the TAB above.

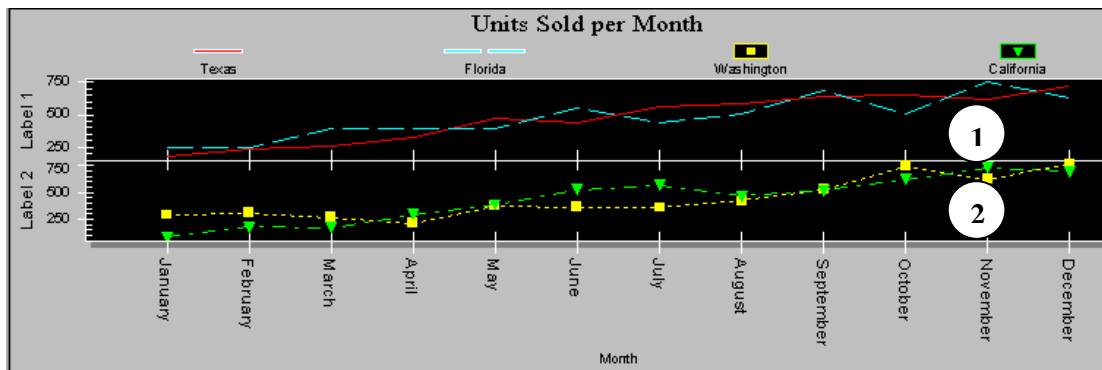
7.2.6 Time plot-TAB 2-Plot Types



## Measurement (part II) and geography

### Define number of sub graphs:

The user may choose the number of sub graph. Maximum is 6 and the system default Is 1. See example what we define as sub graph . The example has 2 sub graphs.



Also the user checks if the sub graphs shall be opened in a separate window, or in the same window as shown in the example below. The example above would have produced to graph windows. The checkbox is by default unchecked.

**In many cases the user will not define sub graph. The system default “1” will therefore in these cases be the only available sub graph in the combobox. As explained for the TABS below sub graph 1 will always be the default choice.**

### Assign y axis to the defined sub graph

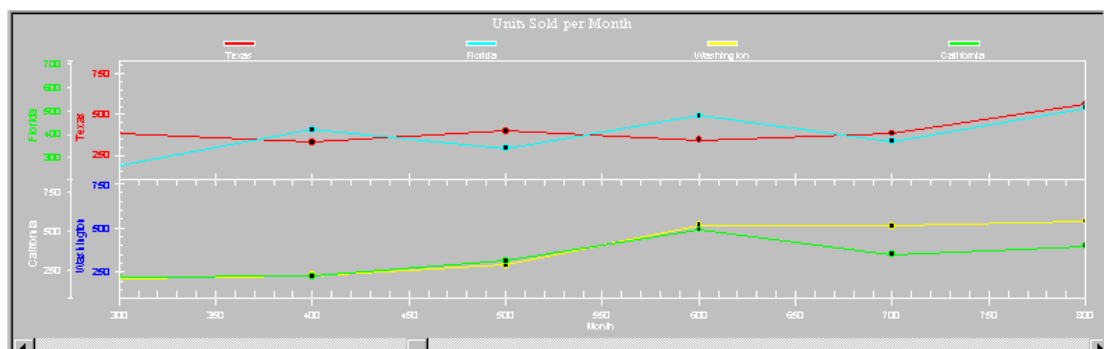
The user needs to assign y axis to the sub graphs and the orientation(right or left).

The system default is 1 left axis and 0 right axis for all defined sub graphs.

The maximum y axis (right+left) pr sub graph is 6 in total.

The example below shows 2 axis pr sub graph. The 2 axis are both right y axis.

The user apply the apply button at the bottom of the form to activate the definitions.



### Assign plot style to the defined sub graph

The user may assign plot types to each of the defined sub graph. The default choice for the sub graph 1 depends on the series involved and the sampling type these have. See description earlier. A combination of maximum three different plot types might be chosen. The plot types are as earlier mentioned:

- ◆ Line
- ◆ Line+points
- ◆ Stacked Line
- ◆ Stacked Line+points'
- ◆ Spline
- ◆ Spline+points

- ◆ Histogram
- ◆ X-Y Scattered
- ◆ Column
- ◆ Stacked Column
- ◆ Area
- ◆ Stacked Area
- ◆ Ribbon

Assign measurement dataseries and CSI “dataseries” to sub graph, y axis and determine sub time period

The default choices are subgraph 1, “To Right y axis” and Right y axis no= 1. All series are selected.

If the user has defined several sub graphs the dataseries and CSI information will be divided in equal parts between the sub graph and in the order they are listed. I.e. if the user has defined 3 sub graphs and there are 13 series and common sampling information, this means the default division and selection is:

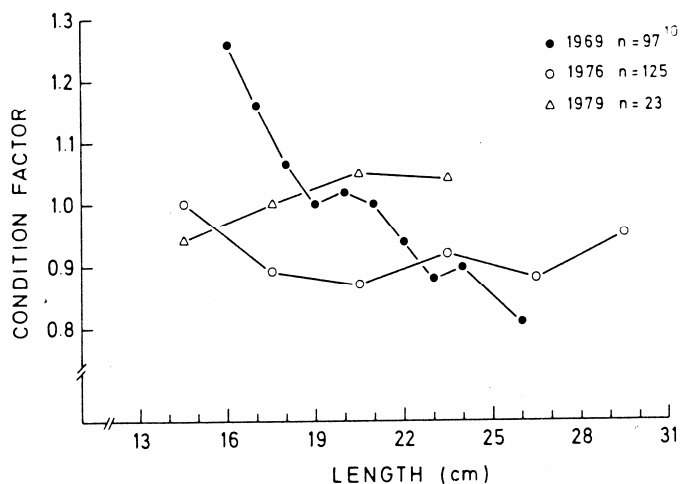
Sub graph 1: 4  
Sub graph 2: 4  
Sub graph 3: 5

The user may prioritise the order of the series or move some of the series to another sub graph (move to )

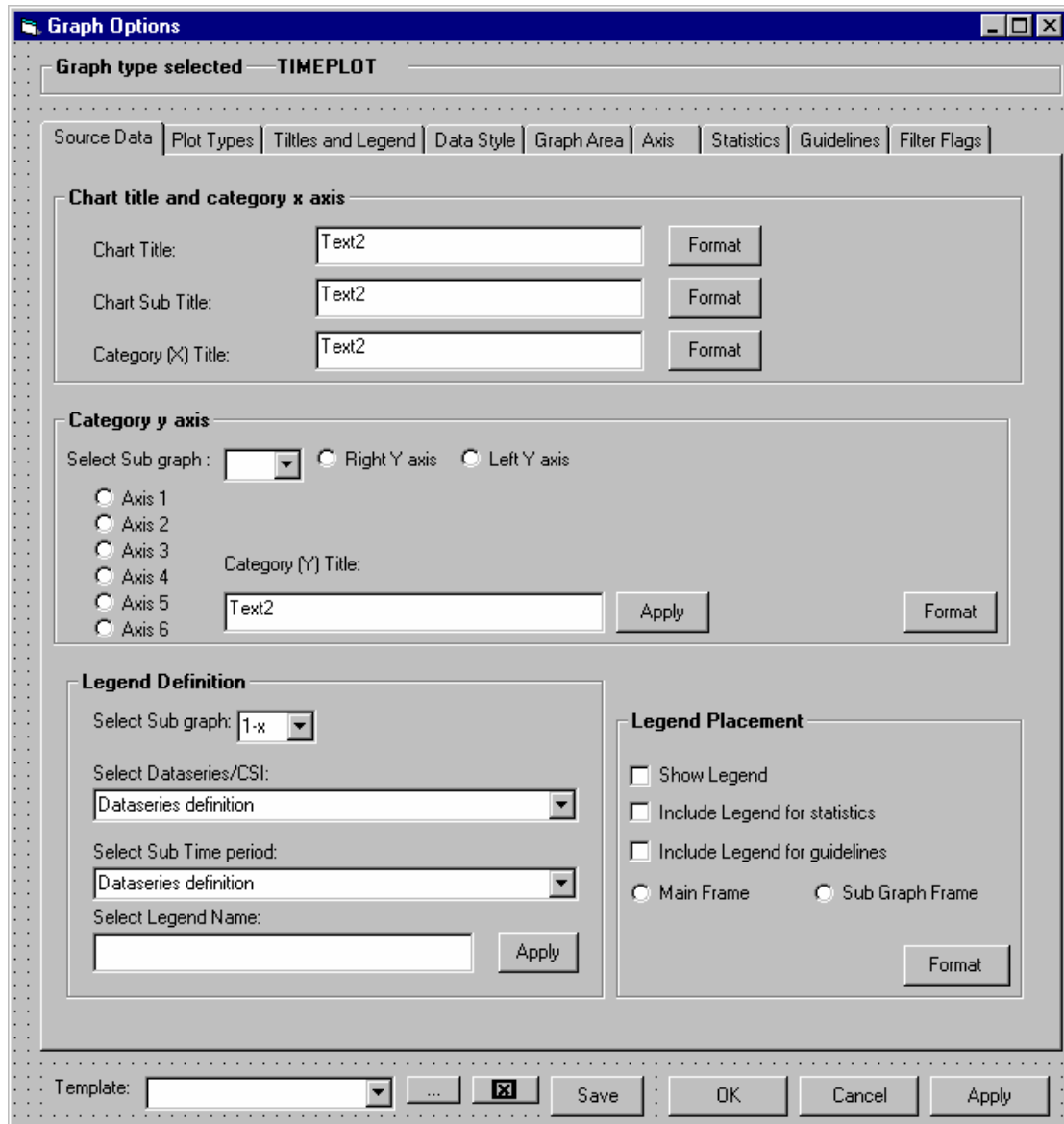
The user may also for one dataseries define sub time periods within the already selected period in order for the user to change colour on the graph in these period. The functionality is in particular important for variable variable plot. See example below.

Access from the graph

The user may access this tab from the graph by using the right mouse button “Time plot”.



7.2.7 Timeplot- Tab 3-Titles and legend

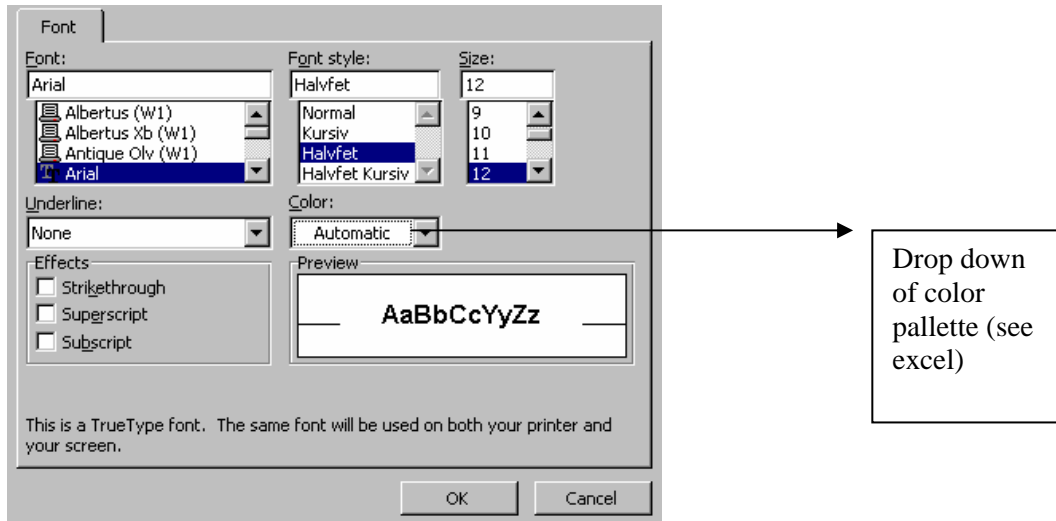




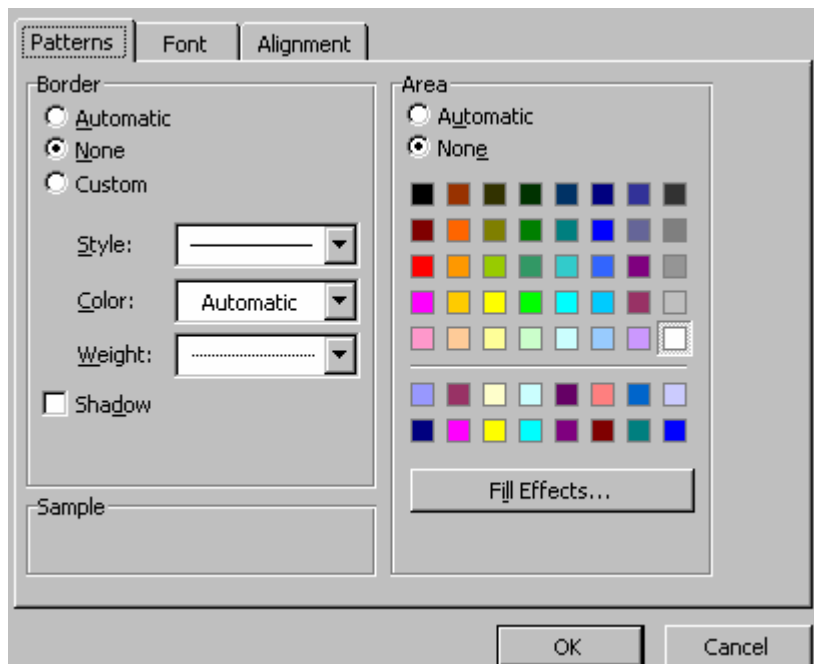
### Chart title and category x axis

The user may define the titles of the graph ( including a sub title) and the title of the x axis  
The user may change the format .

#### *Format for Titles*



#### *Format for axis*

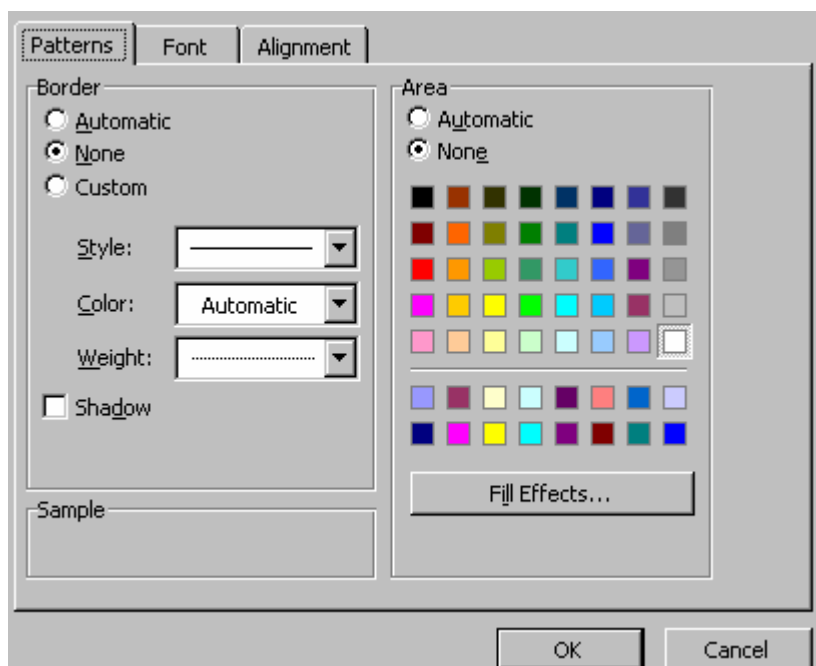


### Category Y axis

There might be several y axis defined for each of the sub graph. However, ususally there will be only one sub graph and one y axis.

The user enter one title pr axis.

The user may set the format of each graph title. The format contains the same as for the x axis:



### Legend Definition

The user must define the legends. The combobox show all selected dataseries and CSI definition. The combobox has a yellow tooltip in order for the user to see the whole definition.

By default the legend is given with some of the properties of the dataseries definition in the following order and separated by comma .

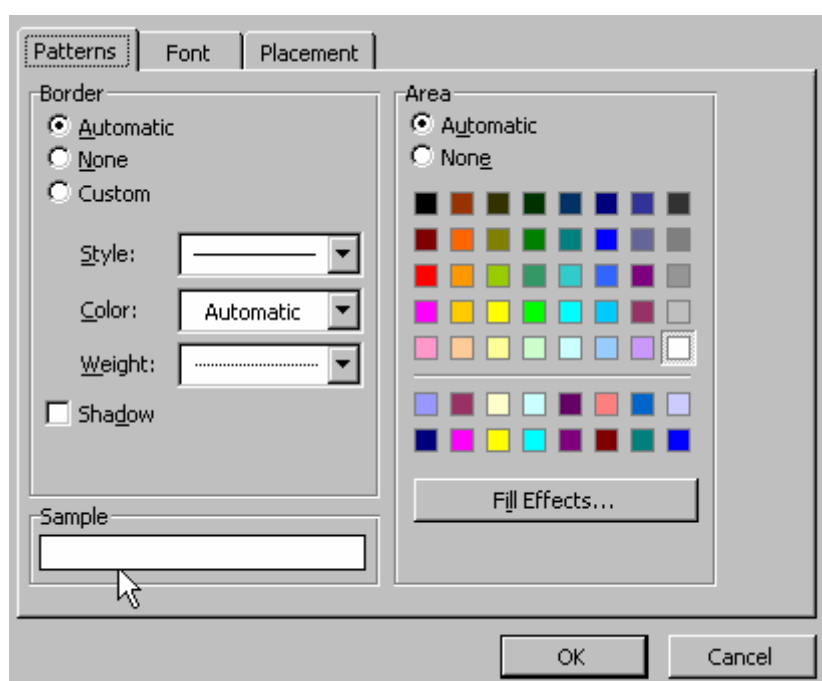
Station	Name
Component	Component
Measurement position- Code	Code
Measurement position, Z1 value	Z1=Number
Measurement position, Z2 value	Z2=number
Medium	Medium
Sub time period	Only if relevant

### Legend Placement

The user must decide if the legend should be shown. The checkbox will by default be checked. Also the user must decide if the legend should contain the legend for the statistics or guidelines applied. These will also by default be checked.

Finally the user determine if the legend should be present on each sub graph or only in the main frame. The default choice is main frame.

The format of the legend is given by :



The placement is given by:

<input type="radio"/> Top	<input type="radio"/> Top Left
<input type="radio"/> Left	<input type="radio"/> Top Right
<input type="radio"/> Right	<input type="radio"/> Bottom Left
<input type="radio"/> Bottom	<input type="radio"/> Bottom Right

Top is selected by default.

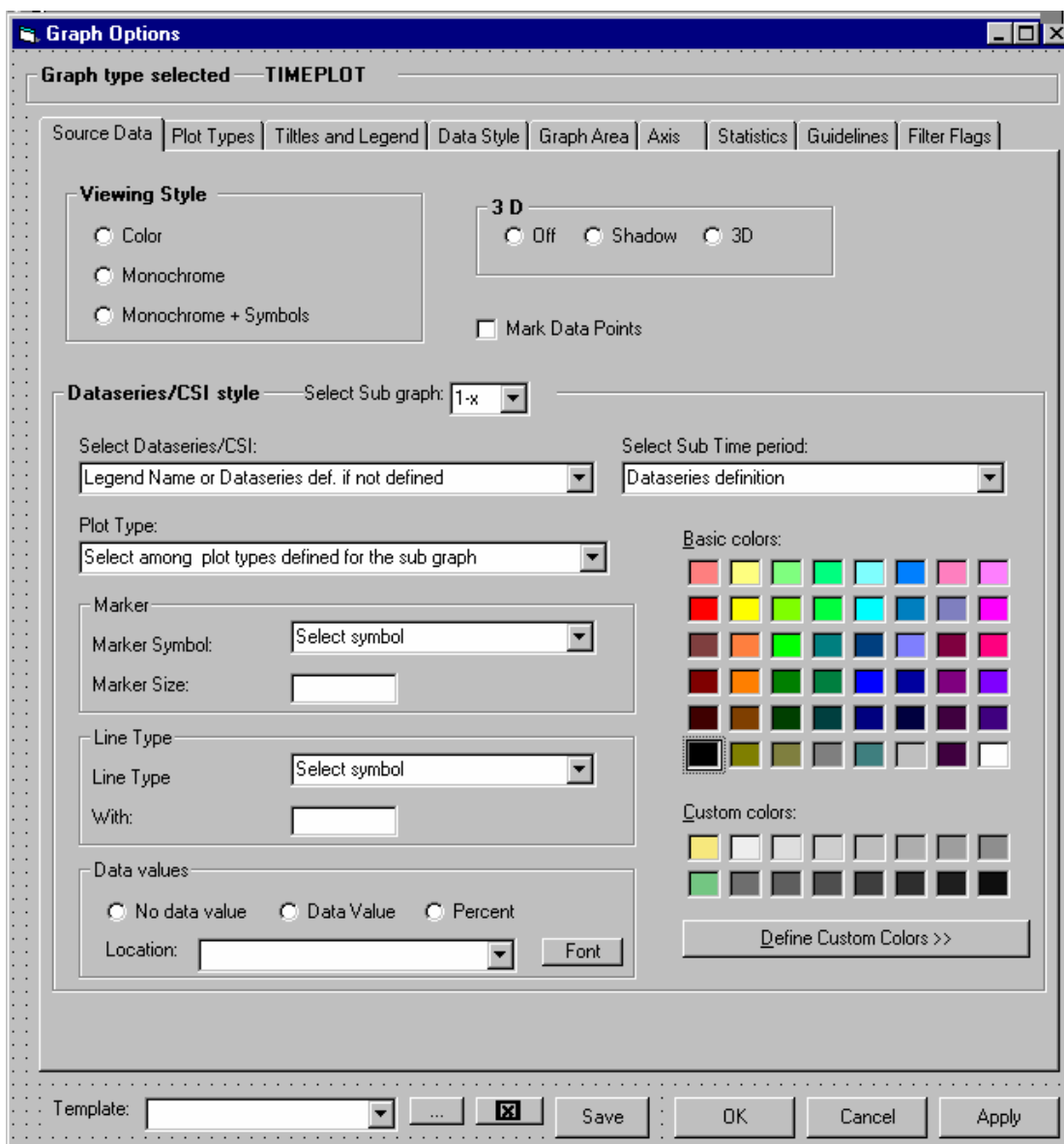
### Access from the graph

The user access this TAB by the right mouse button "Titles and legend". Also the following functionality is accesible from the graph.:

The user may access the titles (title+ titles on axis) directly from the graph by double clicking on them.

Also the legend definitions can be rached by double clicking on the legend.

7.2.8 Timeplot-TAB 4- Data style



Viewing Style

The user choses among the three options:

- ◆ Color
- ◆ Monochrome
- ◆ Monochrome+Symbols

The default is Color. The monochrome options are typically used when sending the graph to a black and white printer.

3D

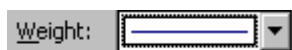
The user chooses if the graph should be shown with a three dimensional effect or with shadow. The default is 3D.

### Mark Data Points

The checkbox will be unchecked as default. This is independent if the user has chosen lines with markers (ref proessential)

### Dataseries/CSI style

The different dataseries/CSI are opened with default colors and with a standard weight.



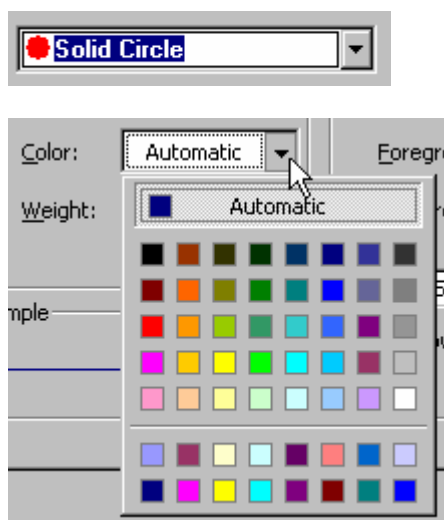
The default choice is subgraph 1, and the dataseries/CSI defined for this sub graph will be listed.

The dataseries/CSI are listed with their short definition as described above with the full dataseries definition as tooltip. Common sampling information have their variable instead of component listed. If the user has defined legend the dataseries are listed with their legend instead. The user also select one of the defined sub time periods if relevant.

One sub graph is defined with one or several plot types, and plot types are assigned to each dataseries. The user may change the plot type to another of the defined plot types for the graph.

### Marker

The user may determine marker symbol (from a list) and marker size. The color is selected from the color palette. Alternatively the color palette may be available from a drop down menu within the marker frame as shown below.



### Line

The user may determine the line type (from a list) and the weight.  
The color is selected from the color palette. Alternatively the color palette may be available from a drop down menu within the marker frame as shown above.

If the dataserie is not represented by a line, but i.e. area, column, etc which have solid fill.  
The user can select any symbol. Ref. example in proessential.

### Data values

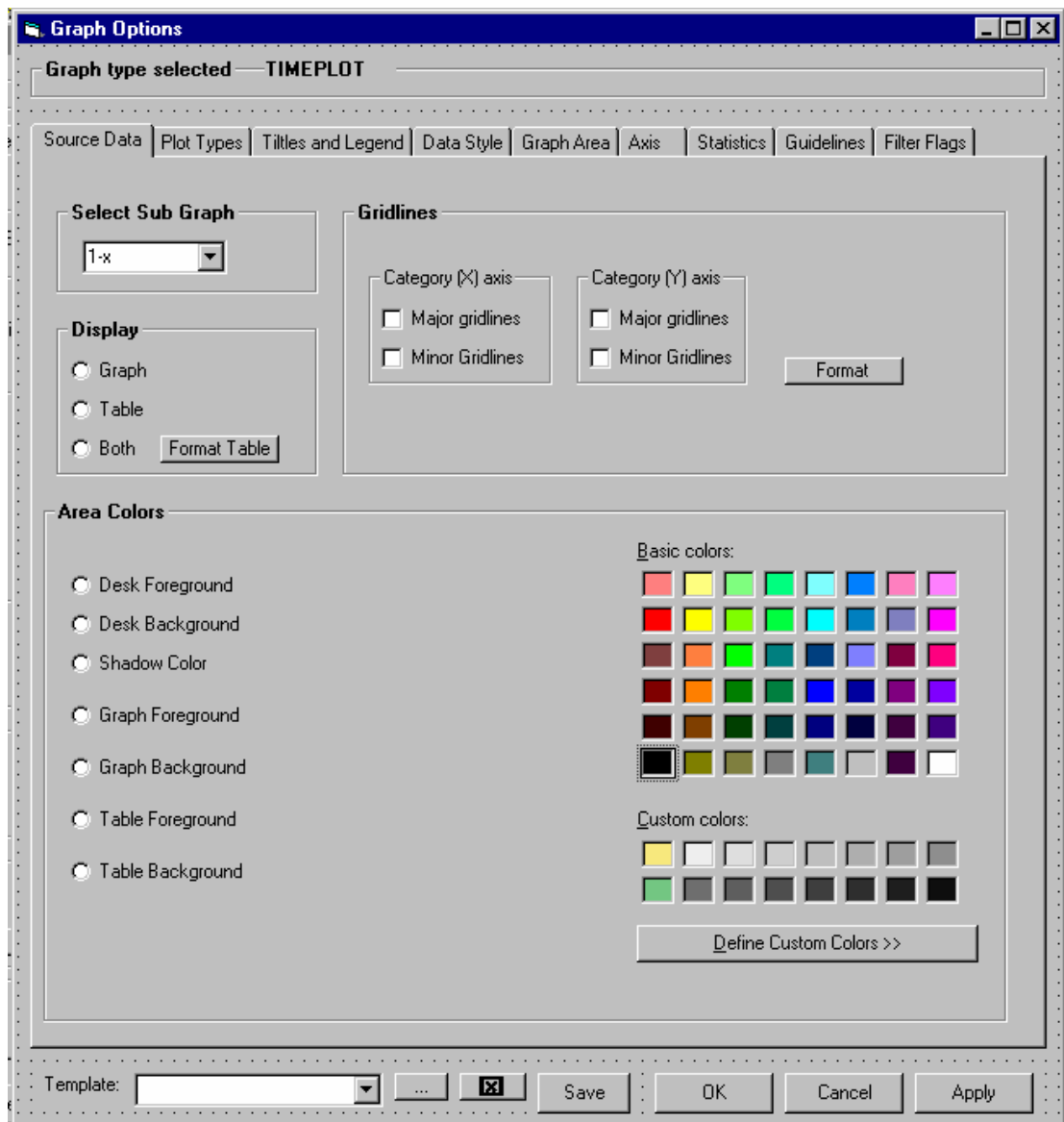
The user may define if the data values shall be shown and the placement. The font is defined separately.

### Access from the graph

The user may access the TAB for defining Data style by the right mouse click in the graph window.

Also the user may double click on the plot to get to this definition. In this case the TAB will be filled in with the actual information.

7.2.9 Timeplot- TAB 5-Graph Area



### Select Sub graph

The user select the sub graph. The default is sub graph 1. The user uses apply to "apply" the link.

### Display

The user determine if the table shall be part of the graph window or not. Also the user may define the format on the table as well as the font used.

### Gridlines

The user may switch on the gridlines (major or minor) both on the x axis and the yaxis, and change the style of the lines (stile, weight and color) . The major and minor gridline are defined under the axis TAB.

### Area Colors

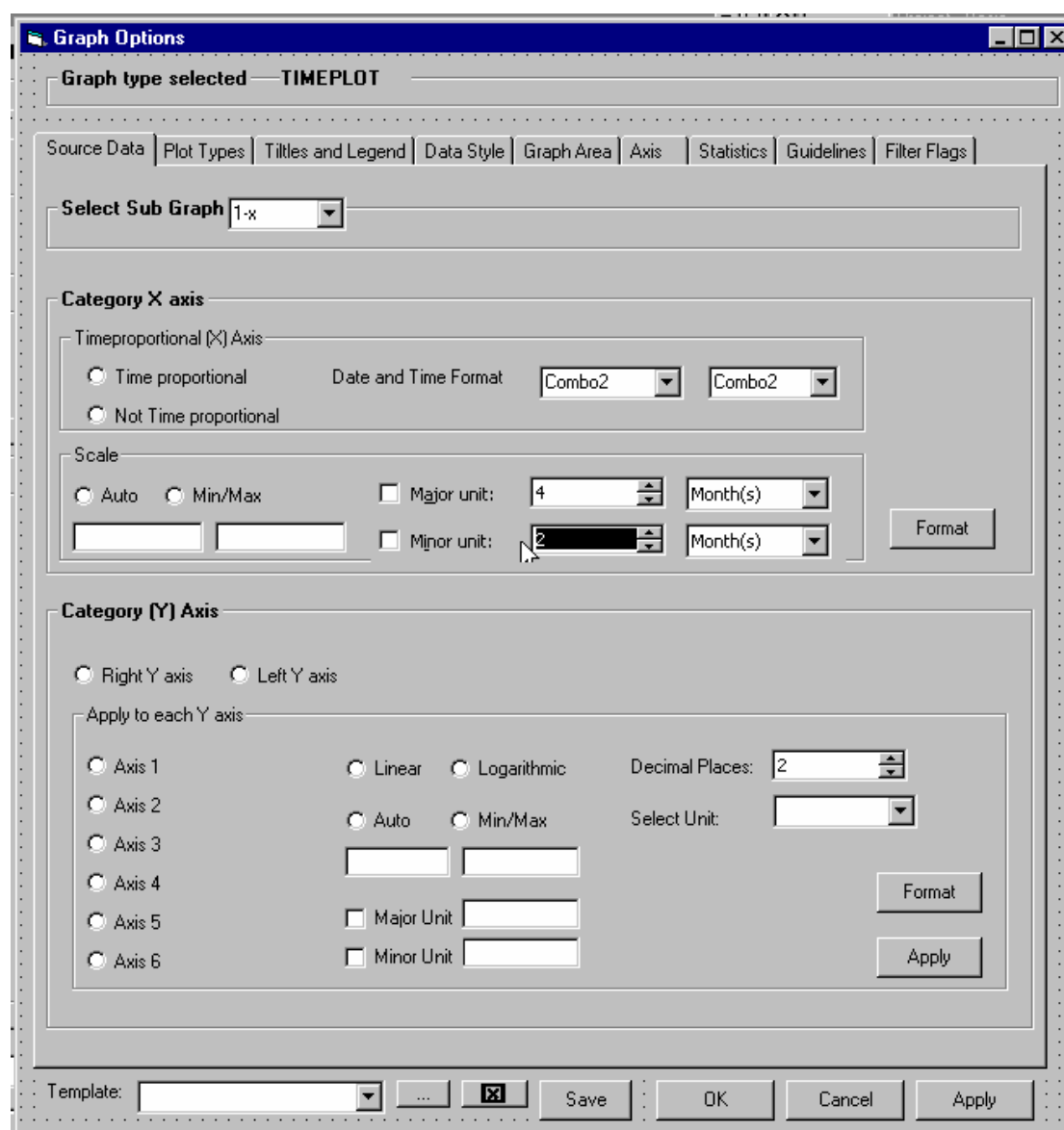
The area colours as listed might be defined (ref the demo version of Proessential software)

### Access from the graph

The user may access the above mentioned functionality by the right mosue click "Graph Area". Also the user may access the functionality by doubleclicking on the following items: Table,Gridlines, graph area(plot area).



### 7.2.10 Timeplot-TAB 6 Axis



#### Select Sub Graph

The user select sub graph to edit the axis , and use the apply to enable the changes to this specific sub graph. The default selection is as elsewhere sub graph 1.

#### Category X axis

The user determine if the x axis shall be timeproportional or not.  
The defaultt is linear.

Also the user chooses as in the current ENSIS application the date format.

The scale is given as "auto" (the whole selected period), however the user may change the min and max scale. Also the user selects major and minor unit.

The user may change the format (Pattern, font and alignment).

### Category Y Axis

For each sub graph the user needs to determine the Y axis. The user selects the right or left y axis. The right axis is default. There might be 1-6 right axis for the sub graph depending on how many left y axis which have been defined.

For each axis the user defined if:

- The axis is linear or Logarithmic. Linear is default.
- The scale , auto is default, but the user may define a min and max different from the default.
- Major unit
- Minor unit
- Number of decimals
- Unit of the axis (only units within unit types of the selected dataserie will be listed)
- Format(Pattern, font, and alignment)

The user uses apply for each axis.

### Actions in graph:

The user may apply the right mouse button "Axis" in order to access the above mentioned functionality.

Also the user may double click on the axis.

The scaling of the axis can also be applied directly in the graph by using the left mouse button after marking the axis. The user will in this case have access to :

- Scale by zooming
- Autoscale

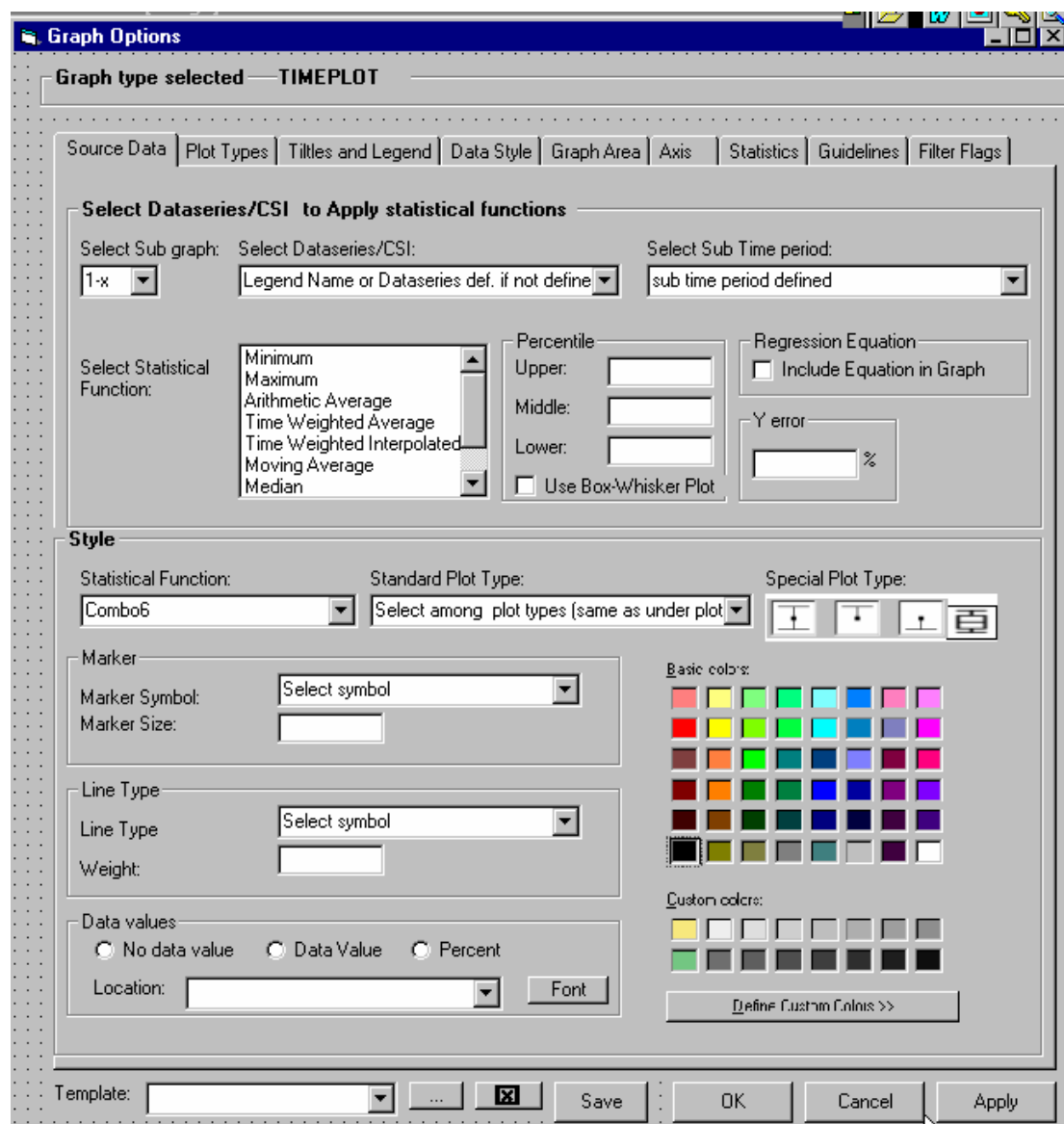
If the user chooses scaling by zooming the user may:

Scale by pointing on the y-axis (or x axis) and drag up and down:

- To reduce the range (i.e. from 0-100, to 0-30): Drag mouse from bottom to top
- To expand the range (i.e. from 0-30, to 0-100): Drag mouse from top to bottom
- To move the whole scale up and down (parallel. I.e. Showing 30-60 instead of 0-30): Point with mouse on y-axis, hold ctrl and drag up or down

(If the user stands in the plot area and use zooming, the user will be able to zoom the graph itself "hot graph")

7.2.11 Timeplot -TAB 7- Statistics



Select Dataseries/CSI to apply statistical function

The user chooses which sub graph and data series to apply the statistical function to.

The default choice of sub graph is 1(an usually there is only one). The dataseries are listed with their legend names if these are defined. If not these are listed with the short dataseries definition as described earlier.

The user can choose one or several of the following statistical functions(list with check boxes):

- ◆ Minimum
- ◆ Maximum
- ◆ Arithmetic Average
- ◆ Time Weighted Average

- ◆ Time Weighted Interpolated Average
- ◆ Moving Average
- ◆ Median
- ◆ Percentile
- ◆ Y Error (including only percentage)
- ◆ Standard deviation
- ◆ Regression

If the user checks the percentile or median the percentile frame will be enabled. The user may enter three different percentiles (upper, middle and lower). If the user has checked median "50" will automatically be written in the middle field. The user can overwrite this and hence be able to have maximum 4 percentiles including the median. If the user check the "Use for Box-Whisker plot" this will imply that the minimum, maximum and the three percentiles will be used in the box whisker plot and not be available as single lines.

If the user has checked error bars the Y error bar will be enabled. The user must decide if what percentage he/she wants to present.

If the user has chosen linear regression he/she can decide to include the equation in the graph. If the user includes this in the graph he/she will be able to format the equation (font, alignment)

### Style

After the user has turned on the statistical functions, these will be available in the graph with default graph types.

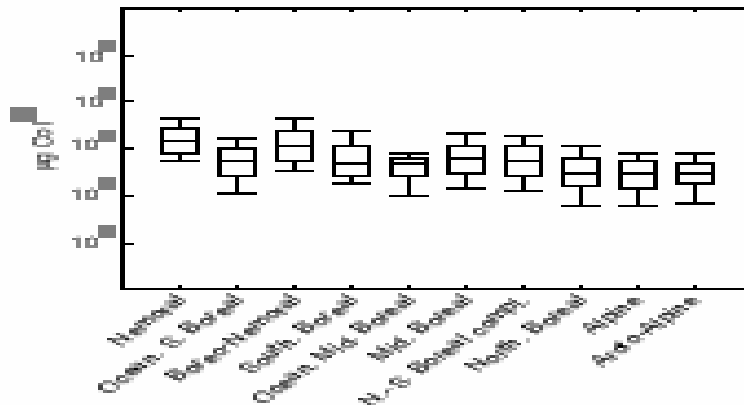
However the user can change the style of the selected statistical functions. The user chooses one of the above listed statistical function (only those that have been checked will be listed). The available standard plot options will be used for all, except for Y error and Box Whisker plot. The standard plot are the same as listed under plot style. Line without markers are the default choice (with the default weight as shown below), however area or one of the other plot types might be chosen. The user changes the style in the same manner as explained for dataserries.



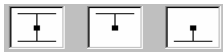
However, if the user has selected both min, max and three percentile ranges and in addition the checkbox "Use for box-Whisker plot" the minimum, maximum and percentiles will as mentioned not be available. In this case the "box whisker plot" will be one of the available options in the combobox "select statistical function". If the user chooses the box-whisker plot the standard plot type and the plot type for Y error will be disabled, only the Box whisker plot symbol will be enabled and selected (Symbol to the right as shown below). The default style will be black and white.



The bound represents the max and min, while the box represents the three percentile ranges. The user can change the style (colour, line with etc) for the box whisker plot.



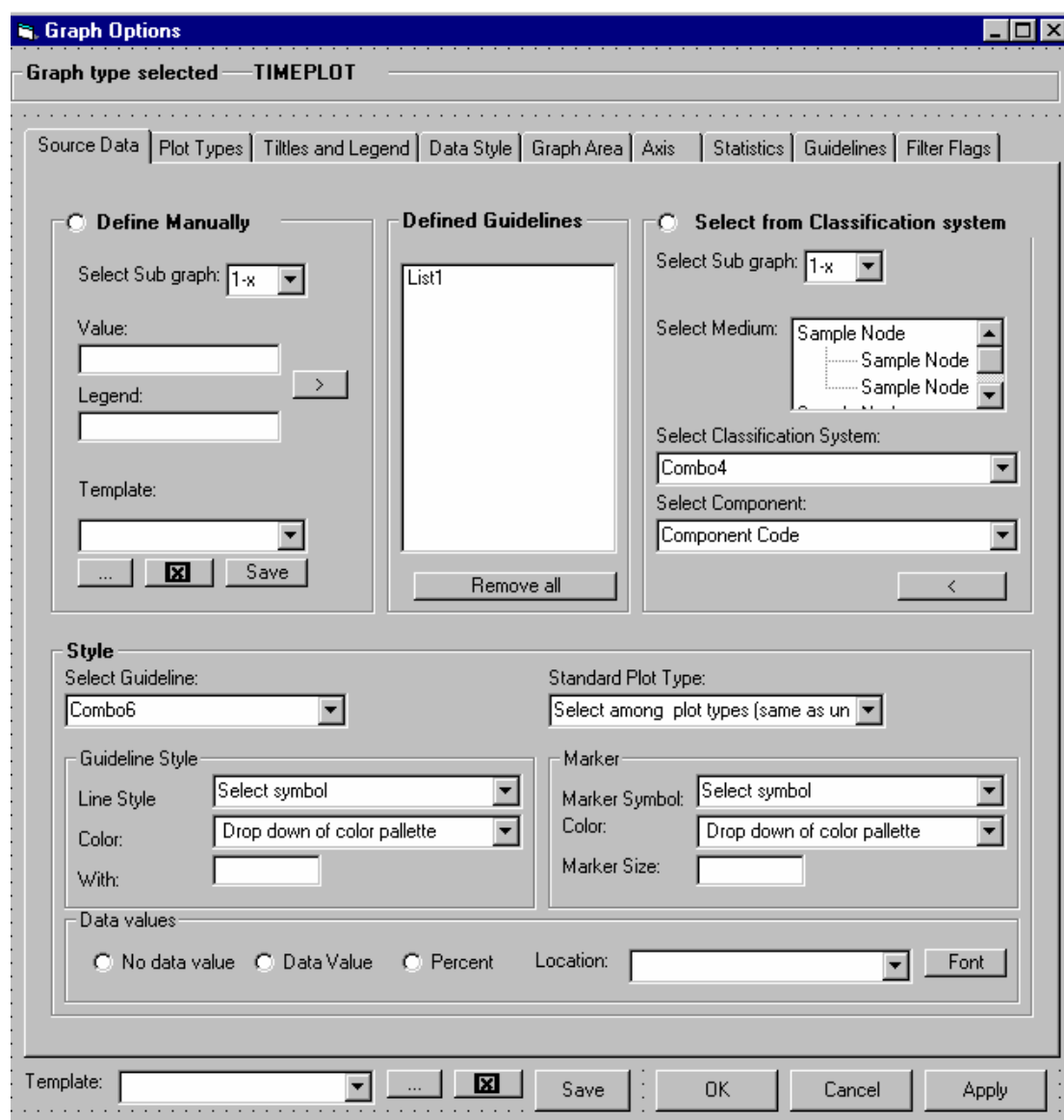
If the user chooses the y error function, the standard plot will be disabled including the box whisker plot option. Only the y error bars plot styles will be enabled



The first one (combination of +/-) will be selected as default.

The user may change the style of the line and marker. The default will be black with a standard line weight and marker/point size.

### 7.2.12 Timeplot-TAB 8-Guidelines



#### Define manually

The user may define the guideline limits manually. The user select as elsewhere the sub graph which by default is no 1.

The user enters the value and the legend name for the limit and transfer (by the ">" button) to the check list box. After defining the guidelines the user may save this as a template (with a user name).

Also the user may select already defined templates and apply the (">") to apply to the list box.

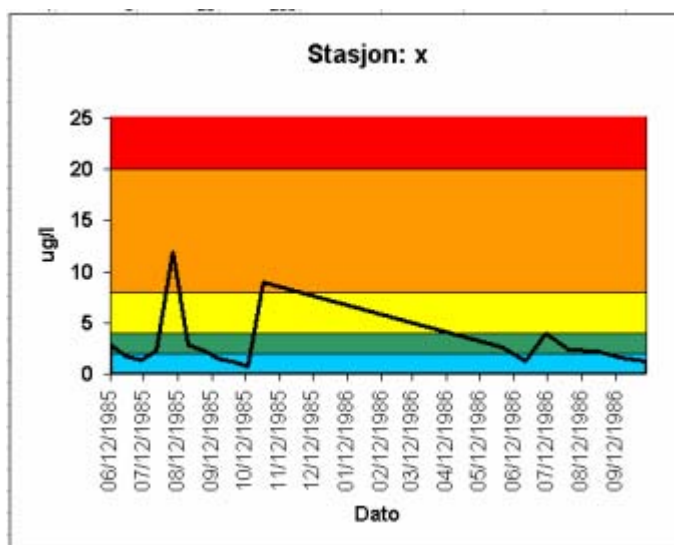
#### Select from Classification System

Alternatively the user selects class limits from a defined classification system. If the user selects medium this will limit the classification system defined for this medium or any submedium of the medium.

The user then select the component to apply the limits to. Only components which are valid for the classification system and which are available in the sub graph will be listed. The user uses the "<" button to define the limits.

### Style

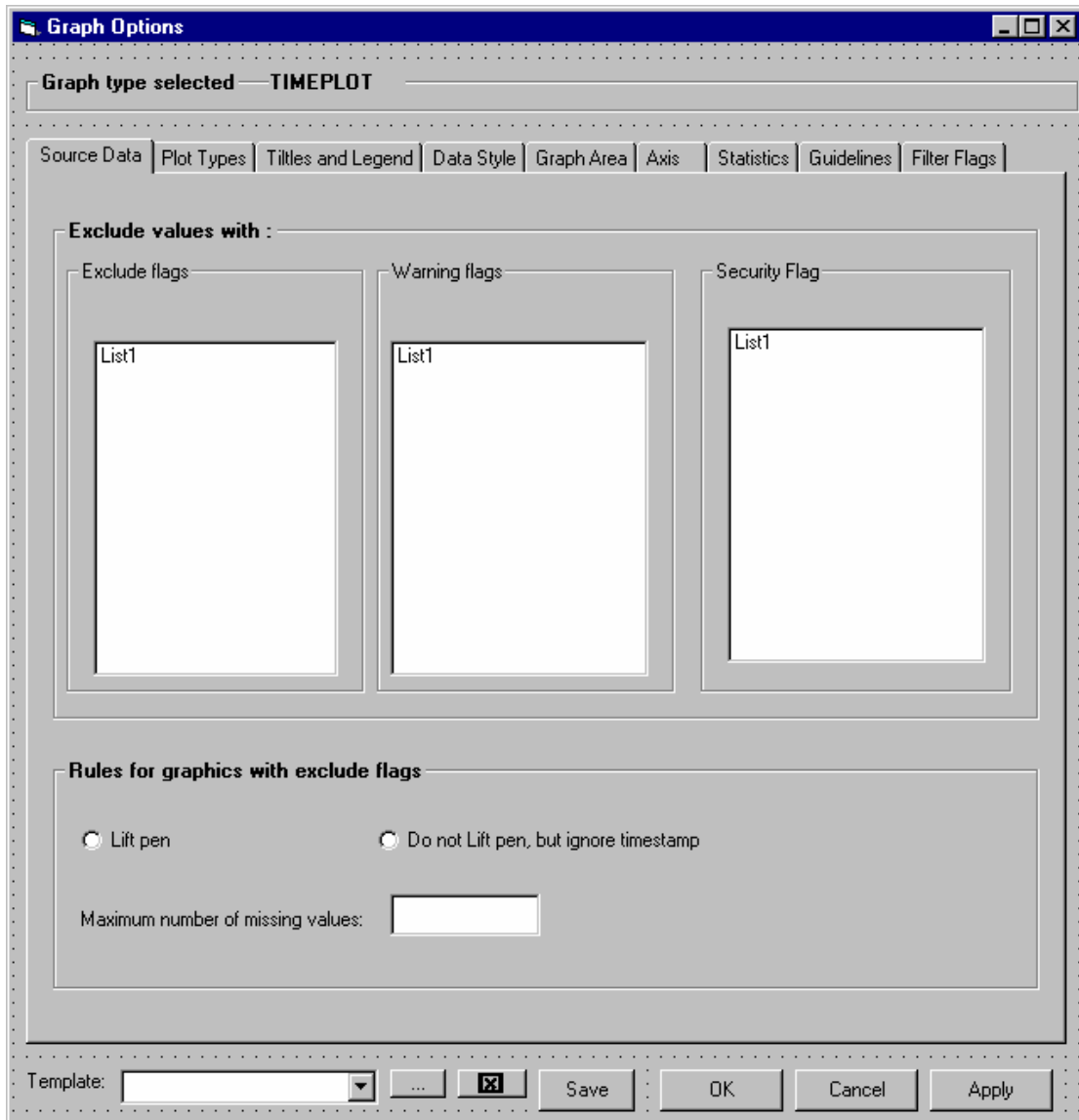
All guidelines are drawn as Area plot as default as shown in the figure below. If the user has applied a classification system, the colors will be given by the classification system. If the user has applied a template the colors will be given as last time.



The user may use lines or any other plot type. If the user uses lines the standard default weight is as shown on the figure.



### 7.2.13 Timeplot-TAB 9-Filter Flag



The functionality of the form is explained later in the main chapter Quality Assurance.



#### 7.2.14 Variable\*Variable plot

The same graph functionality with some modifications applies to this type of graph compared to what has been described in the previous chapter.

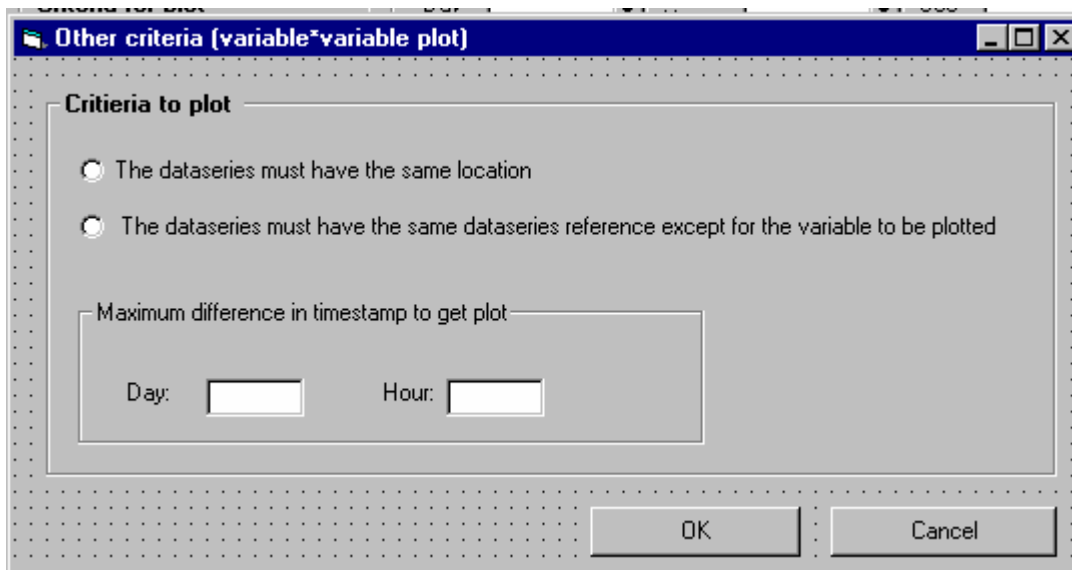
Only the differences are explained here.

#### 7.2.15 Variable\*Variable plot-TAB 1-Source Data

The same as for time plot, except for the fact that only the dataserie with measurement variables/CSI variables satisfying the variable\*variable selection in the previous step are selected. The user may select more dataserie in order to get more variables\*variables plotted.

Also the other criteria button will be valid for this type of plot. Some of the criteria will be checked from the (NB these are defined as global criteria and are not set for each variable\*variable selection defined at the next TAB Plot types).

If the user changes the criteria from this position the "selected" dataserie list will be updated.



#### 7.2.16 Variable\*Variable plot –TAB 2 - Plot Types

The plot style is by default scattered plot (points), and the other option available is points with line)

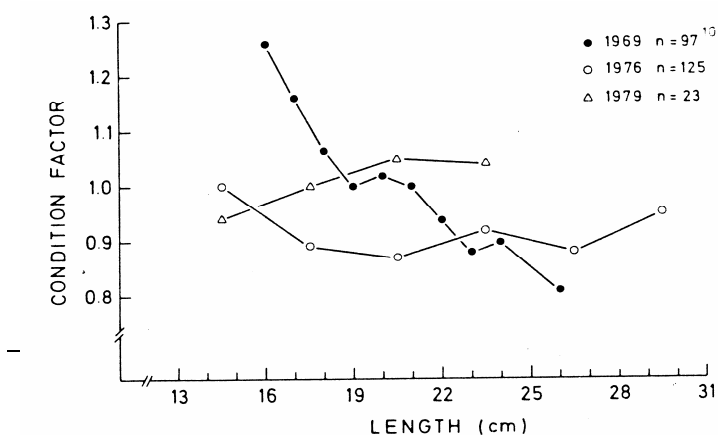
Instead of assigning dataserie to the sub graph, the user assigns measurement variables and CSI variable to the x and y axis. The combination can be measurement variable\*measurement variable, Measurement variable \*CSI variable and CSI variable\*CSI variable. Only those variables which are relevant for the dataserie in the source dataserie list box and the selected

## Measurement (part II) and geography

dataserries on the source TAB will be available. Some of these combinations are already selected when entering the graph, but all of these are assigned to sub graph 1.

The user may change the assigned combinations and define new combinations. The user assigns the combination to one of the defined y axis (if several). The maximum difference of timedifference in order to get plot is defined at TAB 1.

The user may also assign different time sub time periods to a plot in order to as explained earlier get a plot as demonstrated below.



7.2.17 Variable\*Variable plot - TAB 3 -Titles and Legend

This will be the same as for time plot except for the heading and that the legend definition field must have the following definition. Select Scattered plot combination (instead of select dataseries definition)

**Graph Options**

Graph type selected — TIMEPLOT

Source Data | Plot Types | **Titles and Legend** | Data Style | Graph Area | Axis | Statistics | Guidelines | Filter Flags

**Chart title and category x axis**

Chart Title: Text2 [Format]

Chart Sub Title: Text2 [Format]

Category (X) Title: Text2 [Format]

**Category y axis**

Select Sub graph: [dropdown]  Right Y axis  Left Y axis

Axis 1  
 Axis 2  
 Axis 3  
 Axis 4  
 Axis 5  
 Axis 6

Category (Y) Title: Text2 [Apply] [Format]

**Legend Definition**

Select Sub graph: 1-x [dropdown]

Select Dataseries/CSI: Dataseries definition [dropdown]

Select Sub Time period: one of the already defined sub timeperiod [dropdown]

Select Legend Name: [text field] [Apply]

**Legend Placement**

Show Legend  
 Include Legend for statistics  
 Include Legend for guidelines

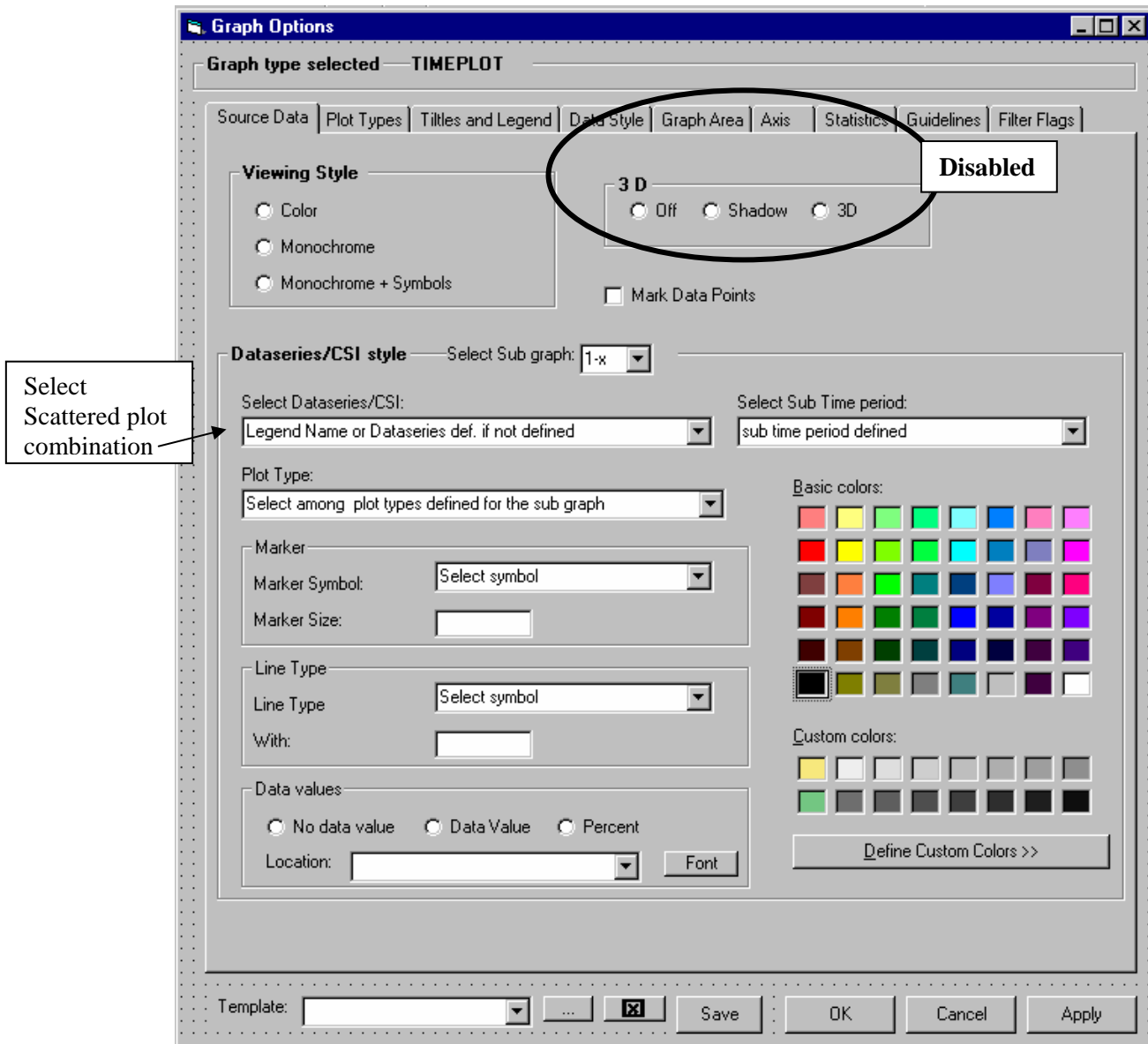
Main Frame  Sub Graph Frame [Format]

Template: [dropdown] [Save] [OK] [Cancel] [Apply]

### 7.2.18 Variable\*Variable plot -TAB 4- Data style

The functionality will be exactly the same, except for

- ◆ Change the heading
- ◆ Disable 3D
- ◆ Select scatterplot instead of dataseries definition

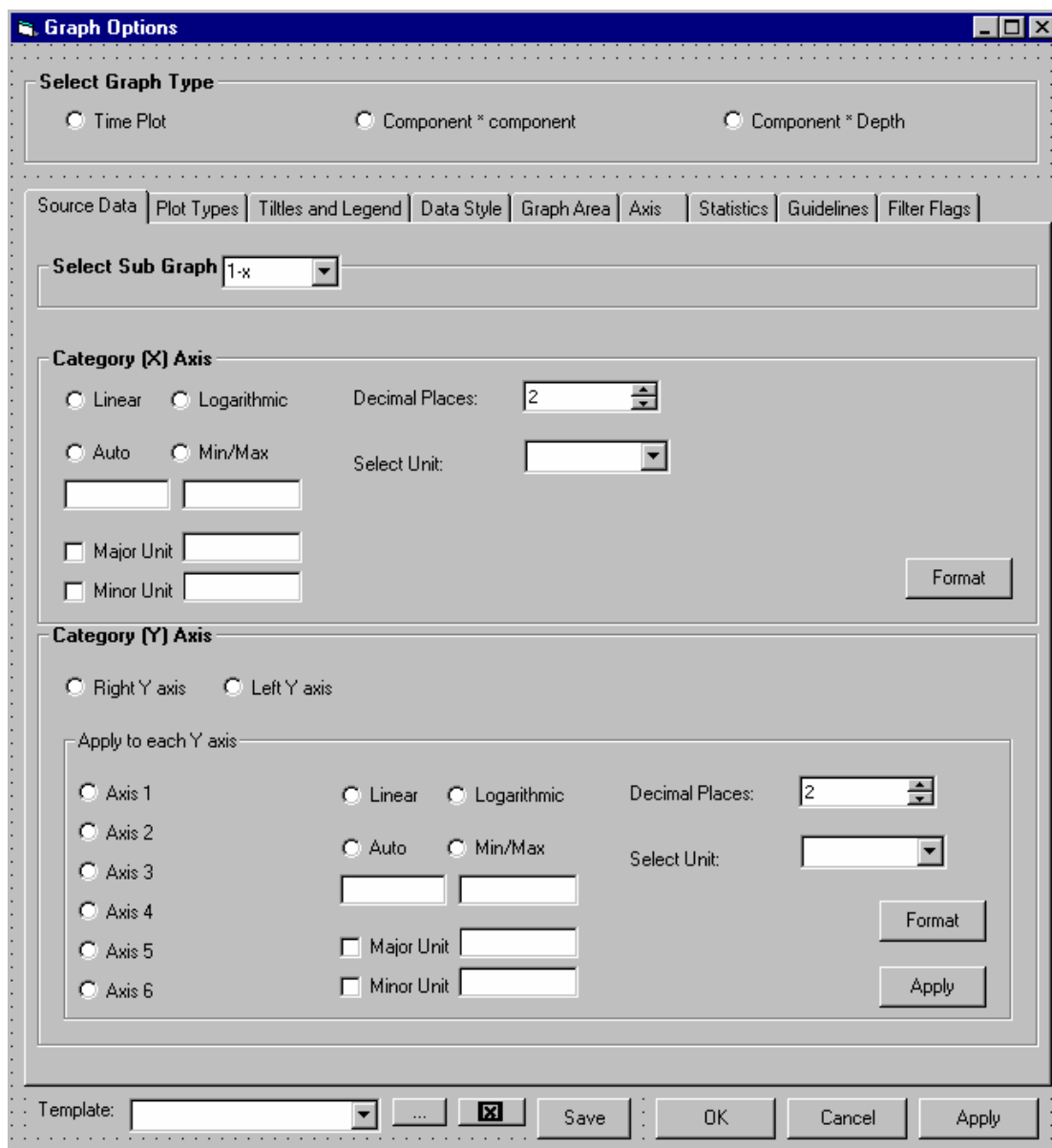


7.2.19 Variable\*Variable plot -TAB 5-Graph area

The same as for timeplot.

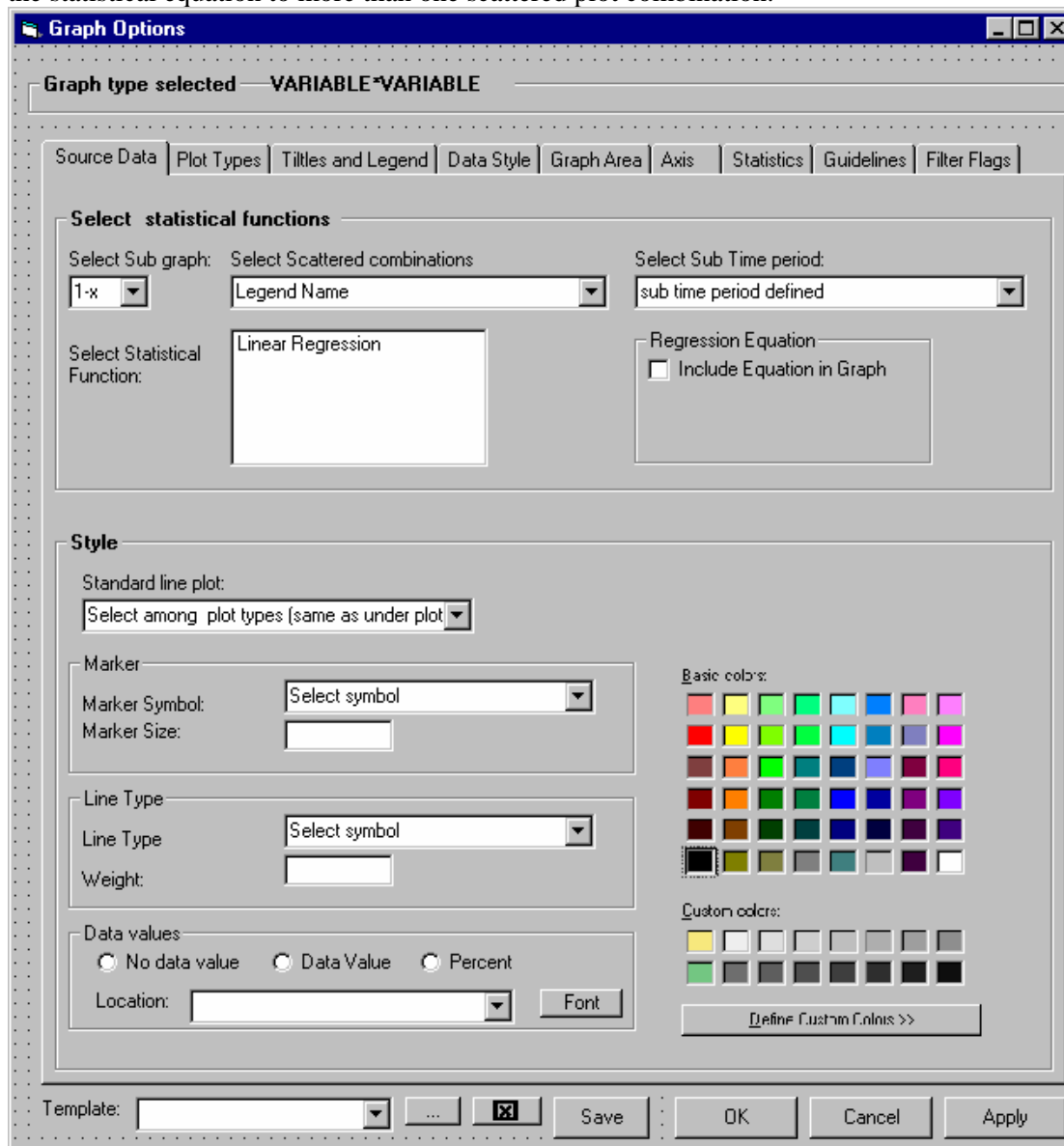
7.2.20 Variable\*Variable plot -TAB 6 Axis

The same as for time plot except that the Category X axis has the same properties as the Y axis.



7.2.21 Variable\*Variable plot -TAB 7- Statistics

The statistics are simplified, for this type of graph only linear regression is relevant. However the user must define which scattered plot combination he/she wants to assign the linear regression to(in case of several y axis and sub timeperiods) , and use apply in order to apply the statistical equation to more than one scattered plot combination.



### 7.2.22 Variable\*Variable plot -TAB 8- Guidelines

The same as for timeplot. Depending on the measurement variable selected the guidelines will be drawn with either the x axis or one of the y axis as a basis.

### 7.2.23 Variable\*Variable plot -TAB 9 Filter Flag

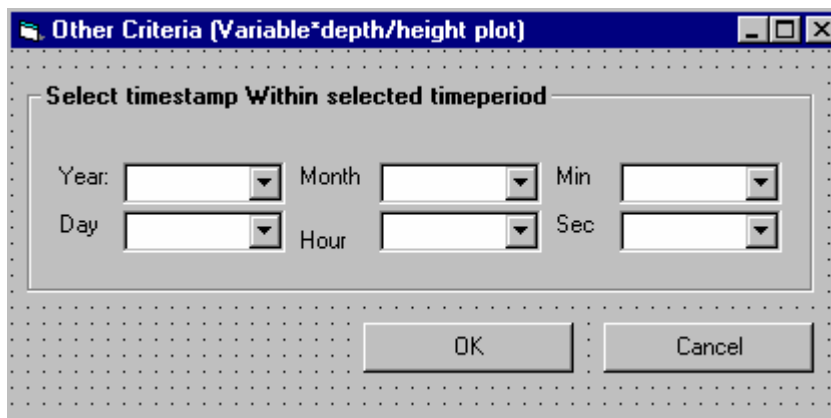
Same as for timeplot

### 7.2.24 Variable \*depth plot

The same graph functionality with some modifications applies to this type of graph compared to what has been described in the previous chapter. Only the differences are explained here.

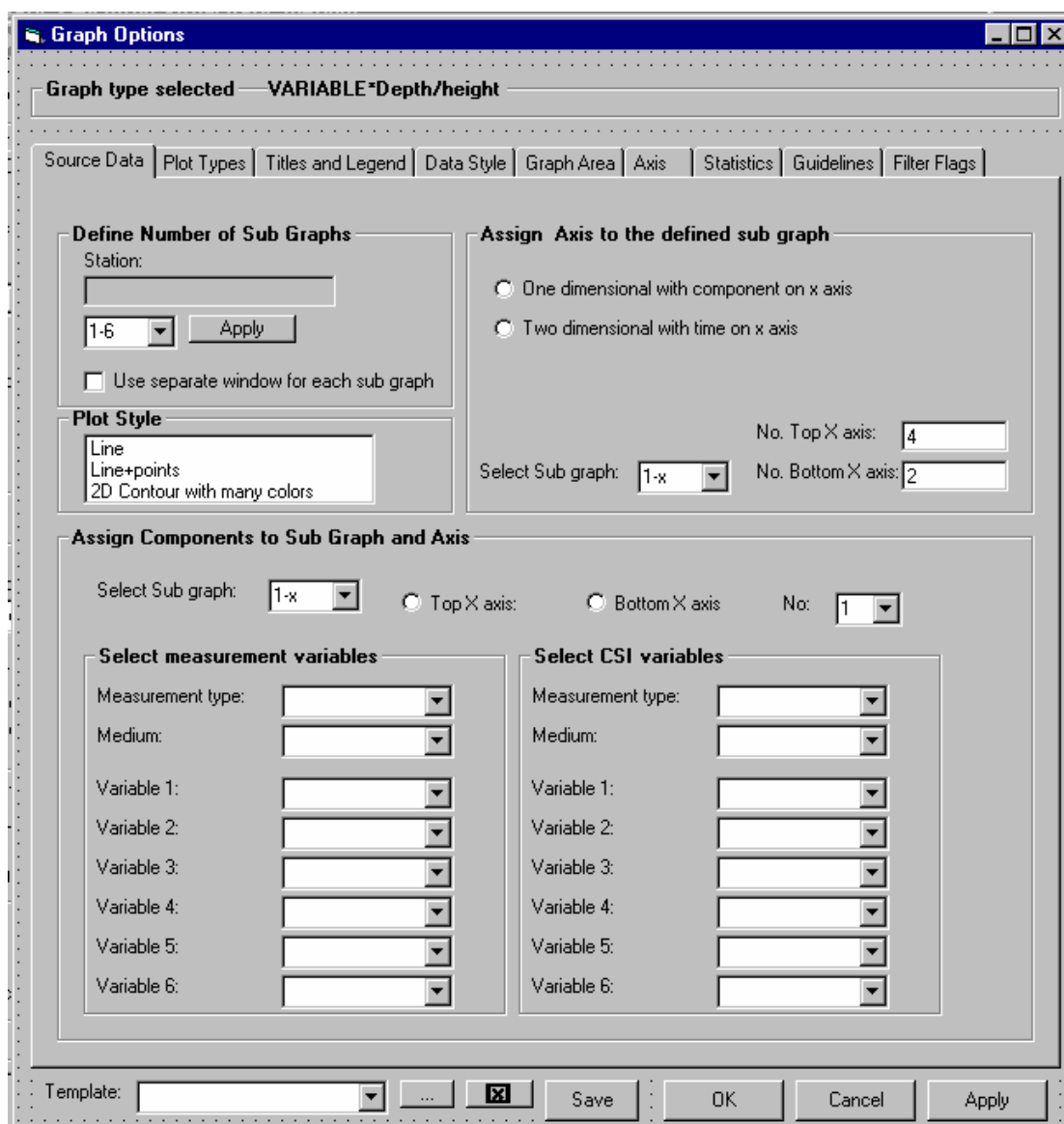
### 7.2.25 Variable \*depth plot TAB 1\_Source Data

The form will be the same as explained earlier, however as explained earlier there will be one graph pr stations, either with several dataserie pr station or one dataserie pr. Station.



Also there will be other criteria set for the plot with respect to timestamp. The time selection only applies to the plot if it is one dimensional.

7.2.26 Variable \*depth plot-TAB 2 \_Plot Types



Define Number of sub graphs

This will function in the same manner as explained earlier, but the user will have the station name for information only (not changable)

Assign Axis to sub graph

The user needs to define if the plot should be one dimensional with component on x axis or two dimensional with time on x axis. This choice will guide further registration.

If the user chooses 2 dimensional only on x and y axis will be possible to define and the x axis will be the time axis. In this case the no of X axis will be disabled. If the user chooses one dimensional the user can as for the y axis define maximum 6 axis either located at the top or bottom of the figure (see example in chapter 4.7.4.



### Plot Type

If the user chooses one dimensional Line and Line+point will be available as plot types. If the user chooses 2D only 3D contour plot will be available.

### Assign components to sub graph

The user must also assign component to one of the defined X axis.

In the case the user has selected two dimensional plot, the user does not have to assign variables to axis, but must select one variable to plot.

7.2.27 Variable \*depth plot -TAB 3 -Titles and Legend

This will function in the same manner as explained earlier (except for the fact that sub time period is not relevant) . Also the the text in the form will change depending on the plot type selected.

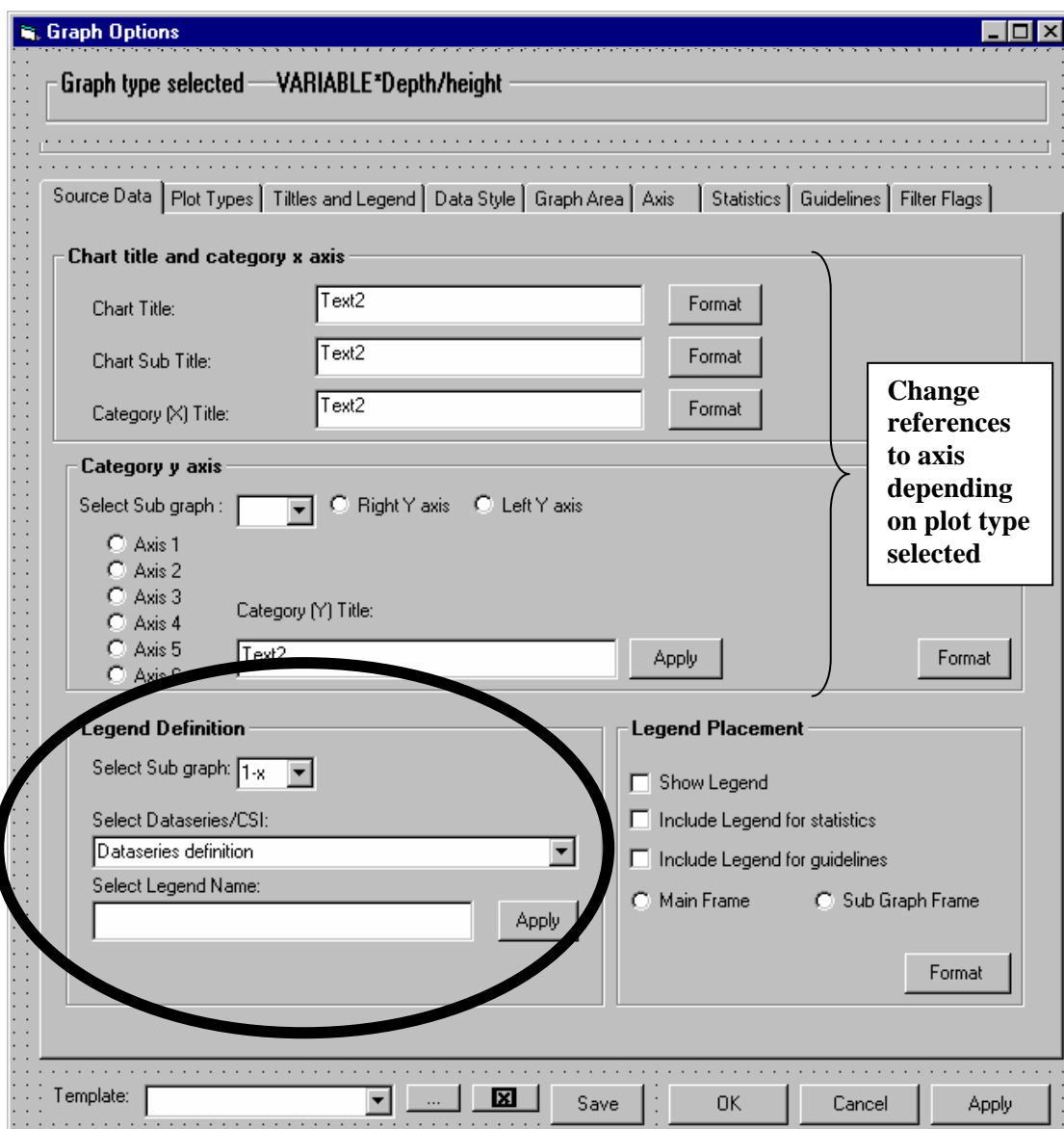
One dimensional will change the names for the X and Y axis frame to

”Chart title and category Y axis”

”Category X axis (with radio button Top X axis and Bottom X axis”

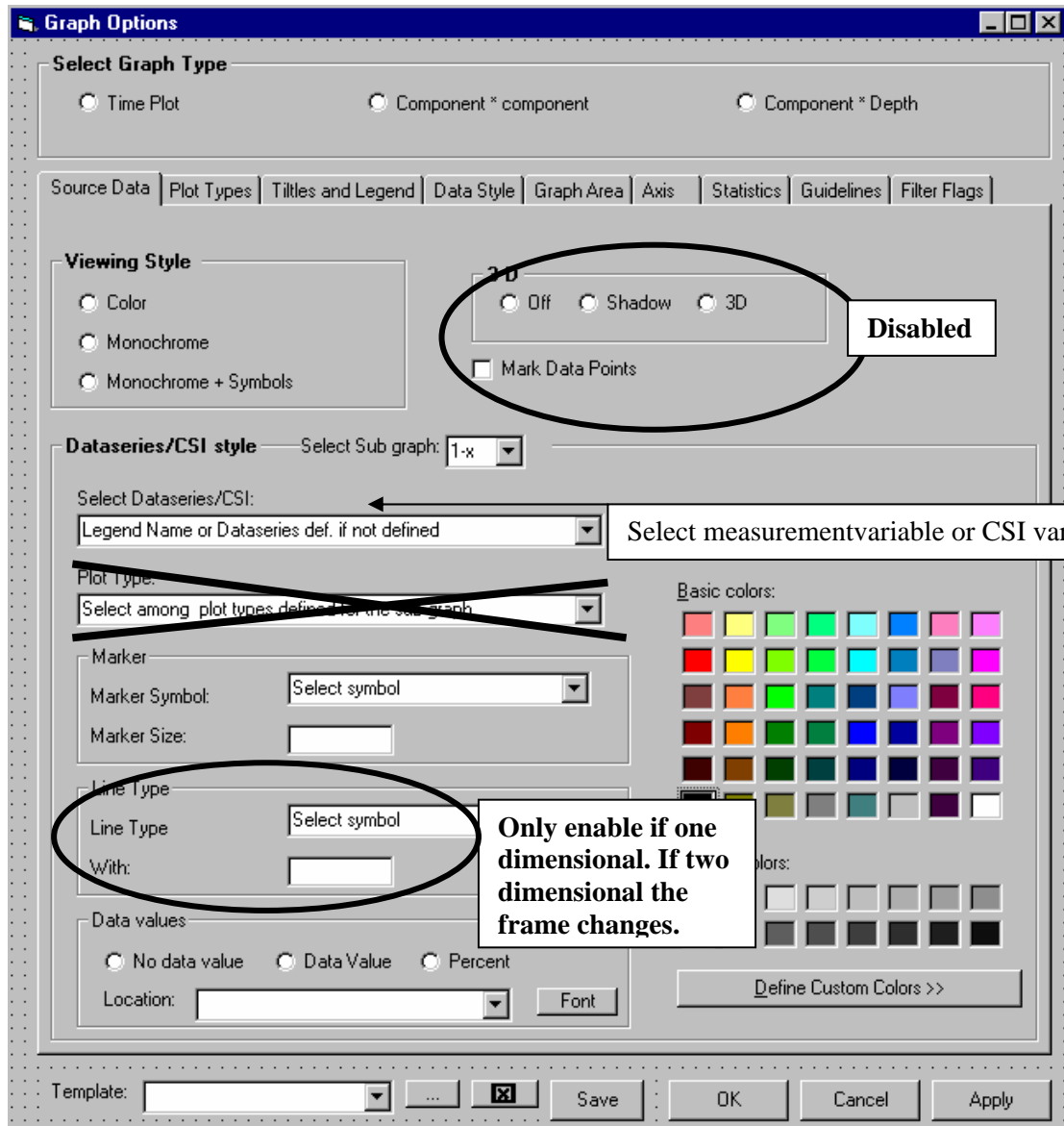
Two dimensional plot will keep the names, but the radio buttons will be disabled

Also the select dataseries/CSI will change name to ”Select component/CSI variable

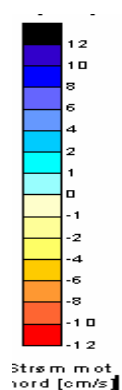


Variable \*depth plot TAB 4- Data style

There are some fields which are disabled, and if the user has chosen 2 Dimensional plot type the Line style frame will be replaced by another frame in order for the user to determine the Dataset interval (Dataset style)



### Dataset style



No:	From Value	To Value	Color	Description	Add row
					Del. Row

For each colour to be displayed for a selected component the user determine the collors and the value interval.

### 7.2.29 Variable \*depth plot- TAB 5-Graph area

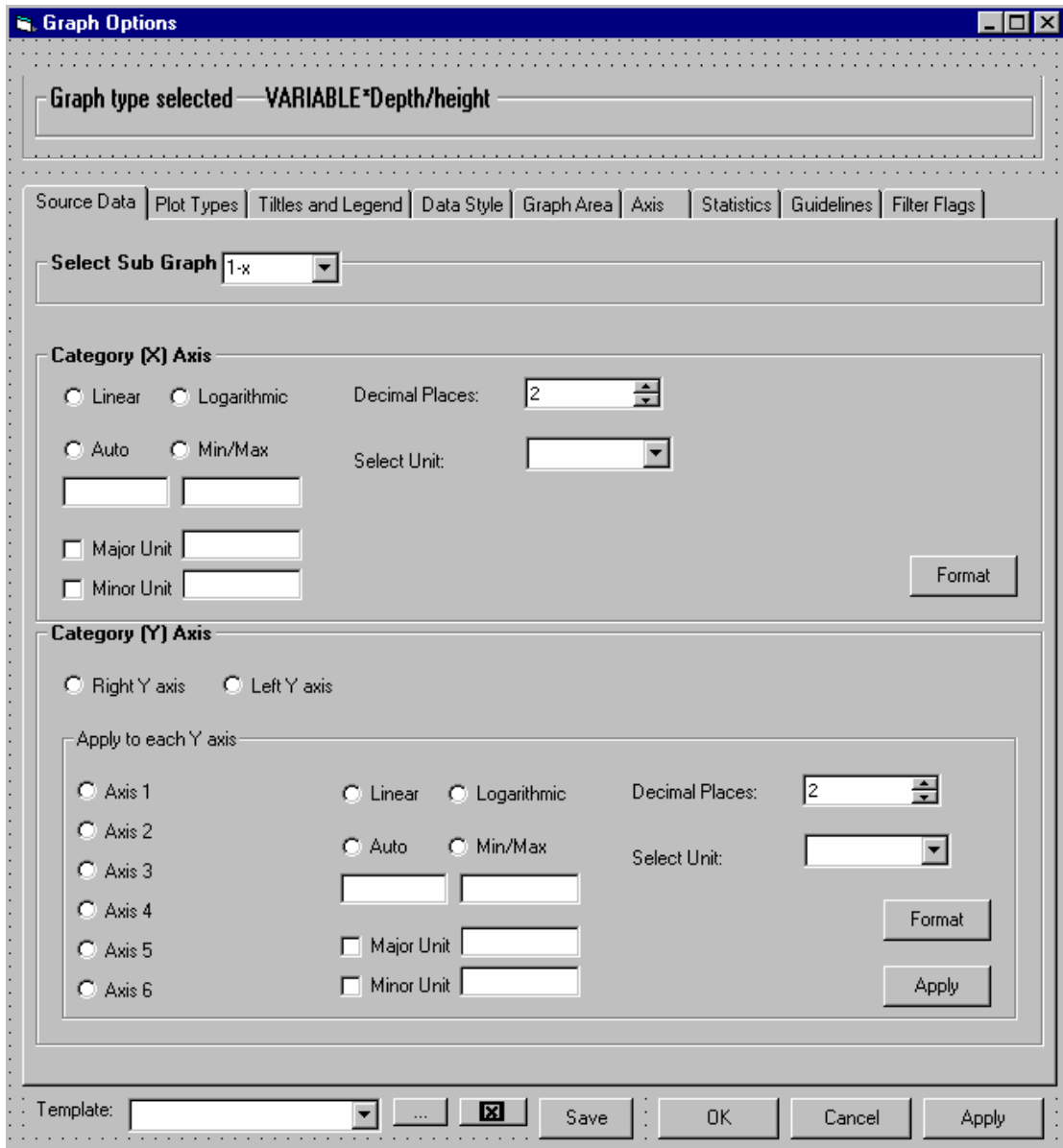
The same as for timeplot

7.2.30 Variable \*depth plot- TAB 6-Axis

The same as for variable\*variable with some changes:

One dimensional plot with components/CSI on the x axis

The names on the frames are switched, frame 1 refers to the Y axis and frame two refers to the X axis.



Two dimensional plot

The name on the frames are kept. However the properties of the X axis are as for time plot except that timeproportional is disabled.

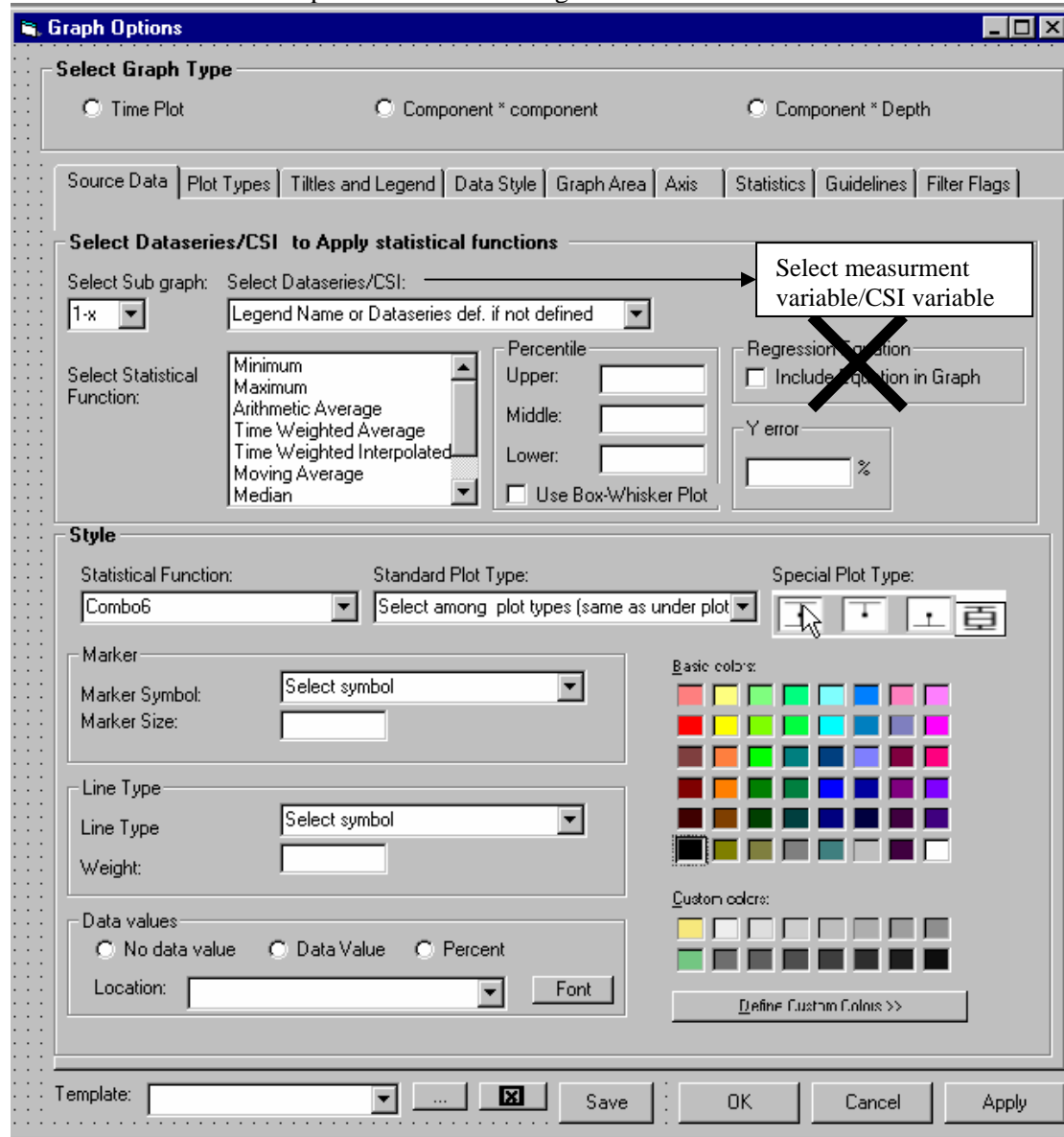
The image shows a dialog box titled "Category X axis". It is divided into two main sections: "Timeproportional (X) Axis" and "Scale".

In the "Timeproportional (X) Axis" section, there are two radio buttons: "Time proportional" and "Not Time proportional". The "Time proportional" option is disabled, indicated by a diagonal slash through the radio button. To the right of these radio buttons is the label "Date and Time Format" followed by two "Combo2" dropdown menus.

In the "Scale" section, there are two radio buttons: "Auto" and "Min/Max". The "Auto" option is selected. To the right of these radio buttons are two checkboxes: "Major unit:" and "Mjnor unit:". The "Major unit:" checkbox is checked, and its value is "4". The "Mjnor unit:" checkbox is unchecked, and its value is "2". To the right of these checkboxes are two "Month(s)" dropdown menus. A "Format" button is located on the right side of the dialog box.

7.2.31 Variable \*depth plot-TAB 7- Statistics

The statistics will only be available for the one dimensional plot. The functionality will be the same as described for timeplot with the following modifications:



Select componet/CSI variable apply statistical function

The user chooses which sub graph and measurement varibale/CSI variable to apply the statistical function to.

The default choice of sub graph is 1(an usually there is only one). The variables are listed with their legend names if these are defined.

The user can choose one or several of the following statistical functions (some are removed compare to time plot)

- ◆ Minimum
- ◆ Maximum
- ◆ Arithmetic Average
- ◆ Median
- ◆ Percentile
- ◆ Y Error (including only percentage)
- ◆ Standard deviation

### Style

After the user has turned on the statistical functions, these will be available in the graph with default graph types.

The only difference from the time plot is that the statistical functions are drawn vertical and not horizontal.

### **7.2.32 Variable \*depth plot TAB 8 -Gridlines**

Only possible for one dimensional, and in this case it is the same as for timeplot. Depending on the measurement variable selected the guidelines will be drawn with the x axis as the basis (vertical )

### **7.2.33 Variable \*depth plot-TAB 9- Filter Flag**

Same as for timeplot



### 7.2.34 Stations \*variable plot

This is a special type of plot where the stations are located on the y-axis, and the values on the x axis. The plot always produce one box-whisker graph pr measurement type, medium and measurement variable/CSI variable.

### 7.2.35 Stations \*variable plot-TAB 1- Source Data

The source data form will be as described earlier, however the content of the "other criteria" will be different.

Other criteria decide how strict the plot should be, and which percentiles that shall be used . This was decided by the user before entering the graph, but can be changed by entering the other criteria button

**Other Criteria (Stations\*variable plot)**

**Criteria for plot**

- Same measurement type, medium and variable
- Same dataserie reference except Station and sampling type
- Same dataserie reference except Station

**Determine box whisker plot conditions**

Upper Percentile:

Middle percentil:

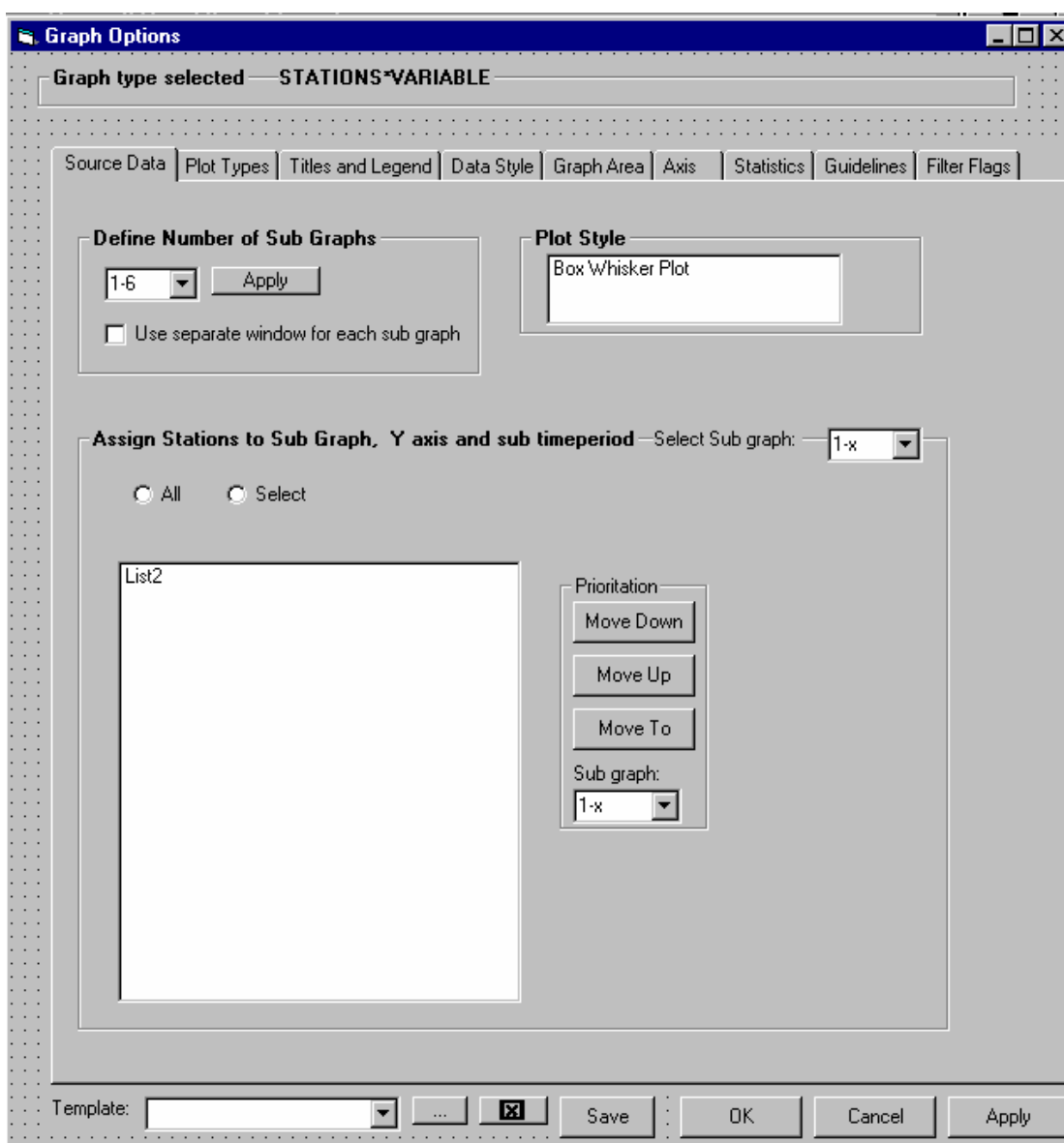
Lower Percentile:

OK Cancel

### 7.2.36 Stations \*variable plot-TAB 2- Plot Types

There are as mentioned one graph pr all stations, and the only plot type available is box whisker plot. However the user may as elsewhere choose to create sub graphs and split the group of stations in sub group.

The stations are divided in equal group between the sub graphs, but the user may move the stations to another sub graph my marking a row in the station table and use the “move to” functionality. Even though the stations are assigned to a graph the user may uncheck some of them (make the invisible in the graph), by using the the “select” radiobutton. The stations will be plottet on the y axis by their names in the order they are listed, but the user may change the order by “Move ip “ and “Move down”.



### 7.2.37 Stations \*variable plot-TAB 3- Titles and legend

This will function in the same manner as explained earlier (except for the fact that sub time period is not relevant) .

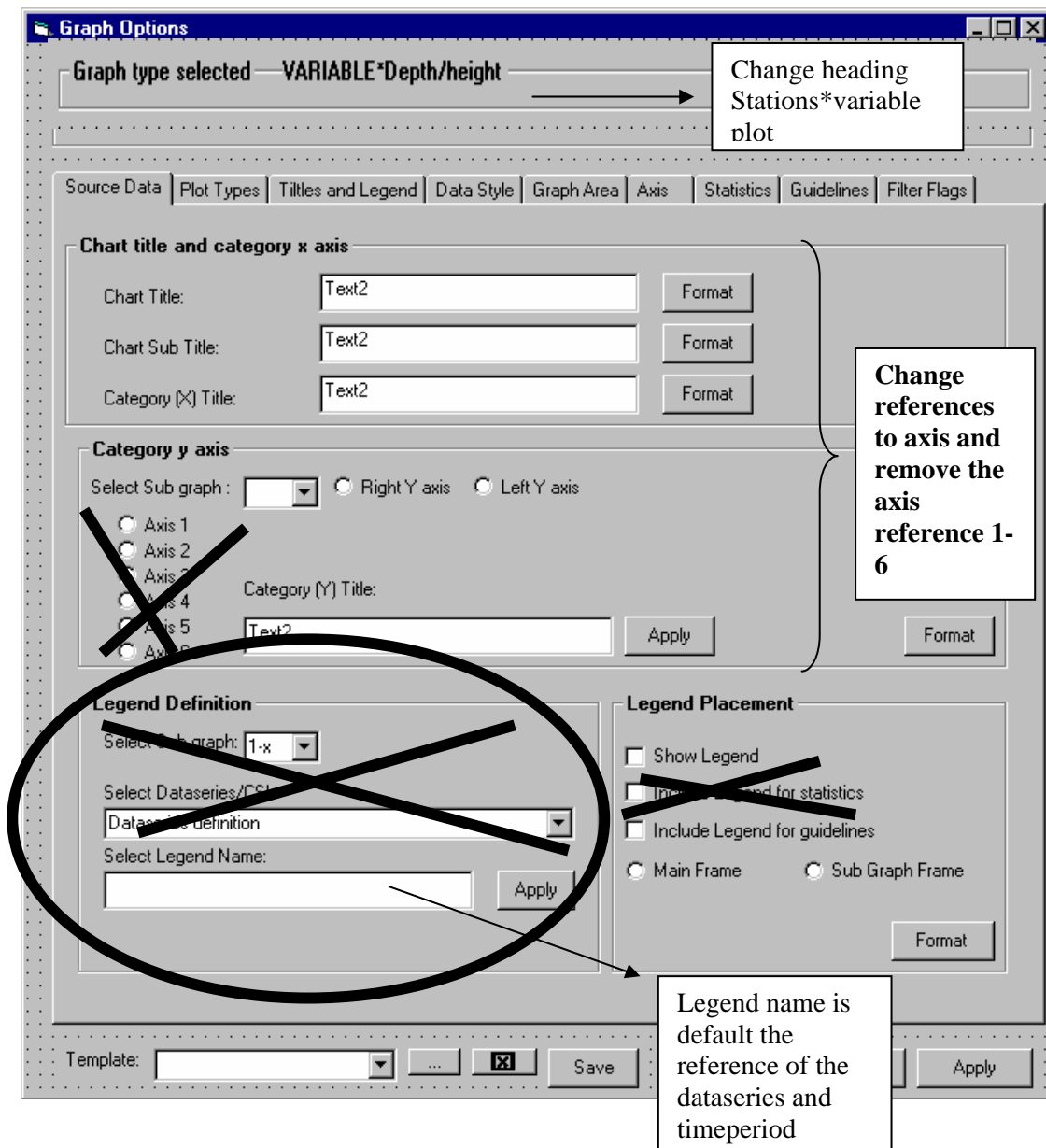
Except for that the names for the X and Y axis frame will change to:

”Chart title and category Y axis”

”Category X axis (with radio button Top X axis and Bottom X axis)”

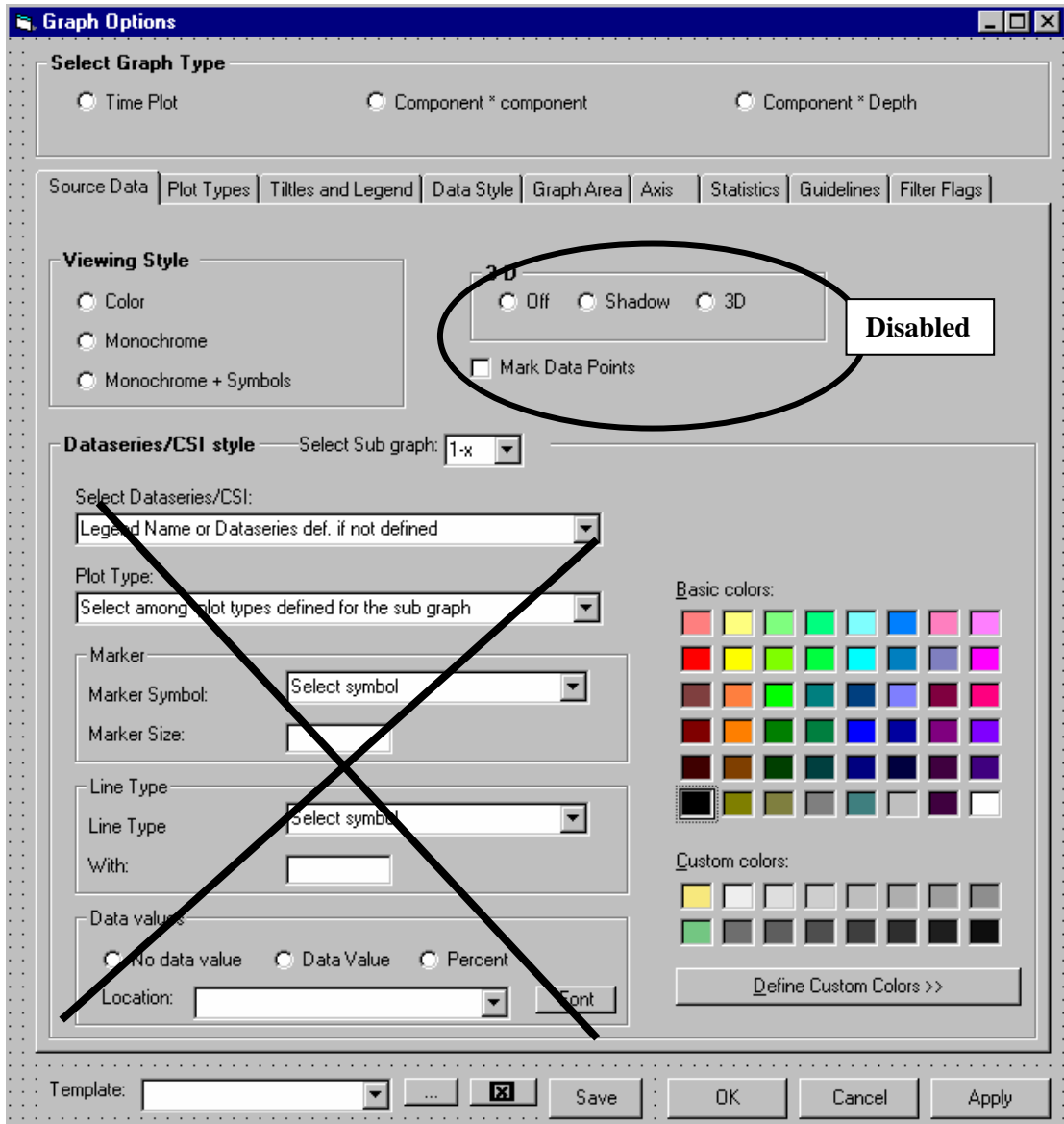
The axis radiobutton will be disabled. The legend name is by default the dataserie reference (or what is common fromm the dataserie definitions, see other criteria) and the time period

The statistics legend is not relevant.



### 7.2.38 Stations \*variable plot-TAB 4- Data style

It is only Box-whisker plot which is available and the only possible choices for the user is to change the color and the if it should be monochrome.

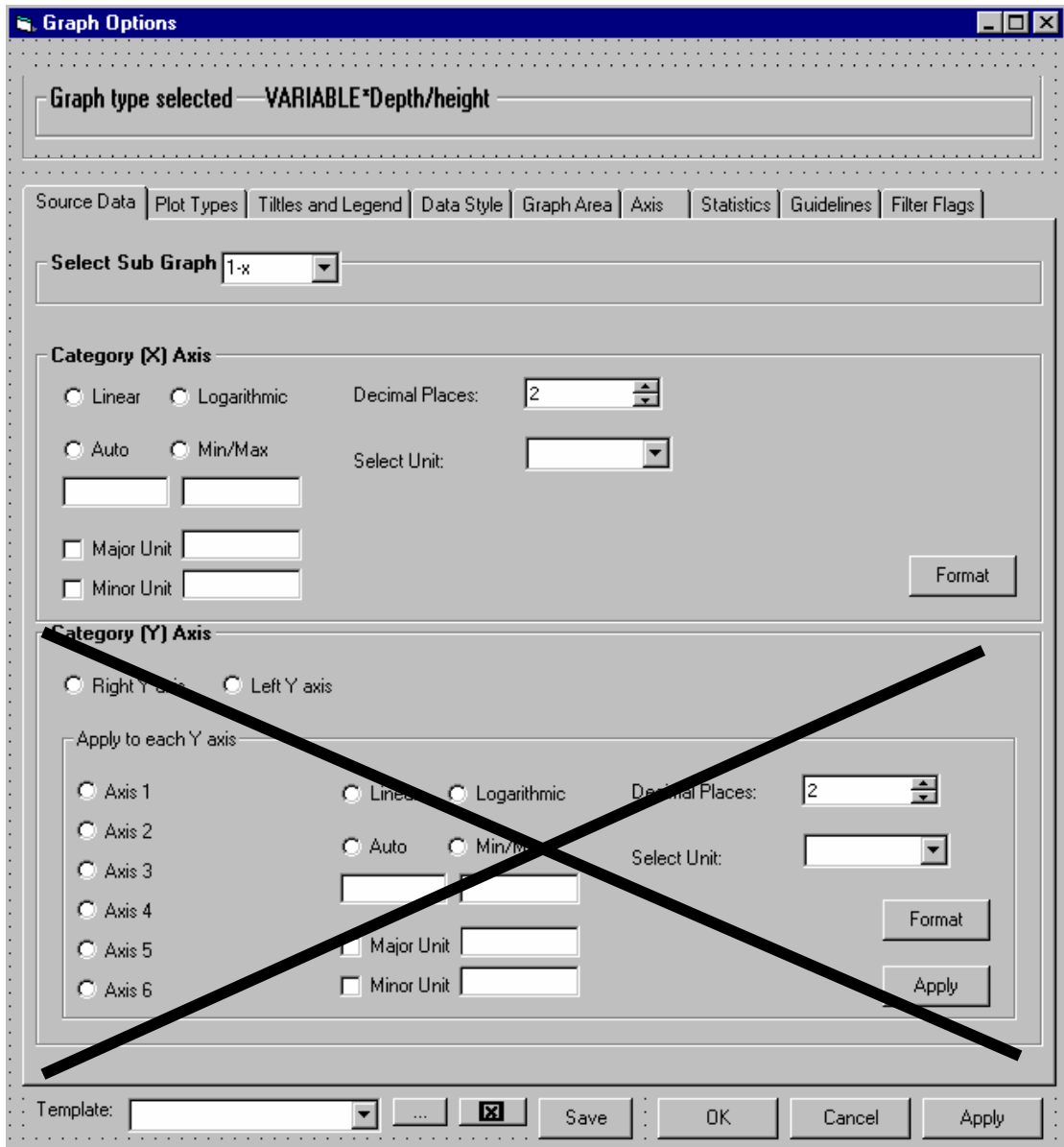


7.2.39 Stations \*variable plot-TAB 5-Graph Area

The Same as for time plot

7.2.40 Stations \*variable plot-TAB 6-Axis

It is only the X axis which is of relevance.



**7.2.41 Stations \*variable plot-TAB 7-Statistics**

Not relevant

**7.2.42 Stations \*variable plot-TAB 8-Guidelines**

As for staion depth plot

**7.2.43 Stations \*variable plot-TAB 8-Filter Flags**

As for staion depth plot

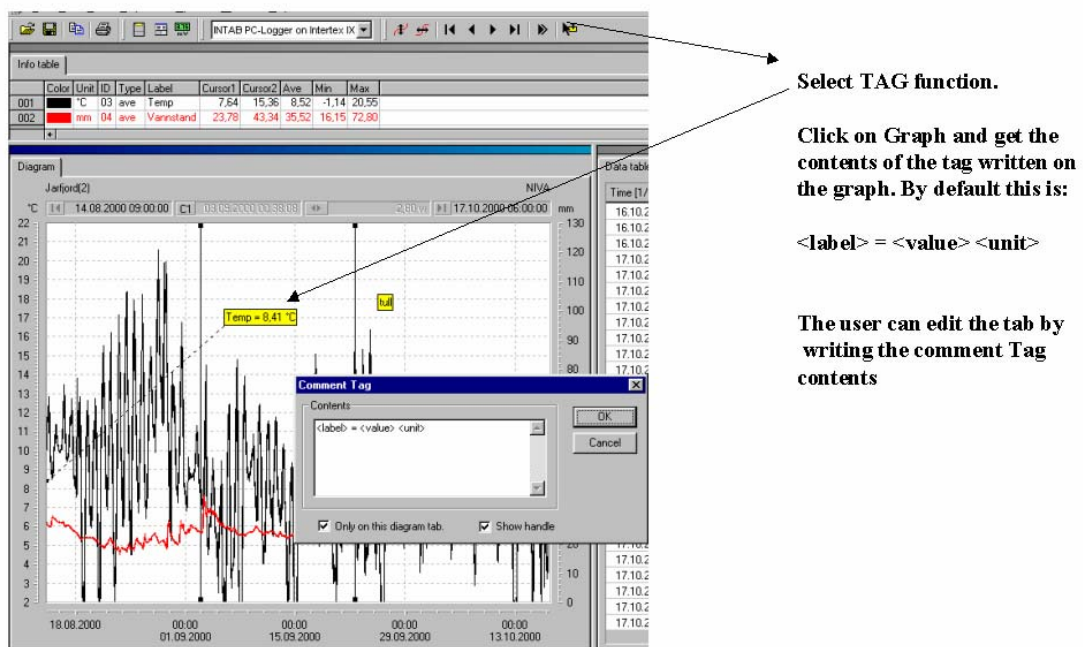
### 7.2.44 Template

NB. How should we define rules for templates. One template belongs to a graph type, and a special criteria selection. If the user selects a template the source data will be organised according to this template, but the organisation of source data between sub graphs will be arbitrary if more than one combination is possible.

Tenke mer på dette.

### 7.2.45 Tags

The user might write tags in the graph. This is for export to picture.



### **7.2.46 Right Mouse button**

If the user applies the right mouse button in the graph he/she has access to:

- ◆ Plot Type
- Titles and Legend
- Datastyle
- Dataseries Style
- Monochrome (off/on)
- Graph Area
- Axis
- Statistics
- Guidelines
- Filter Flags