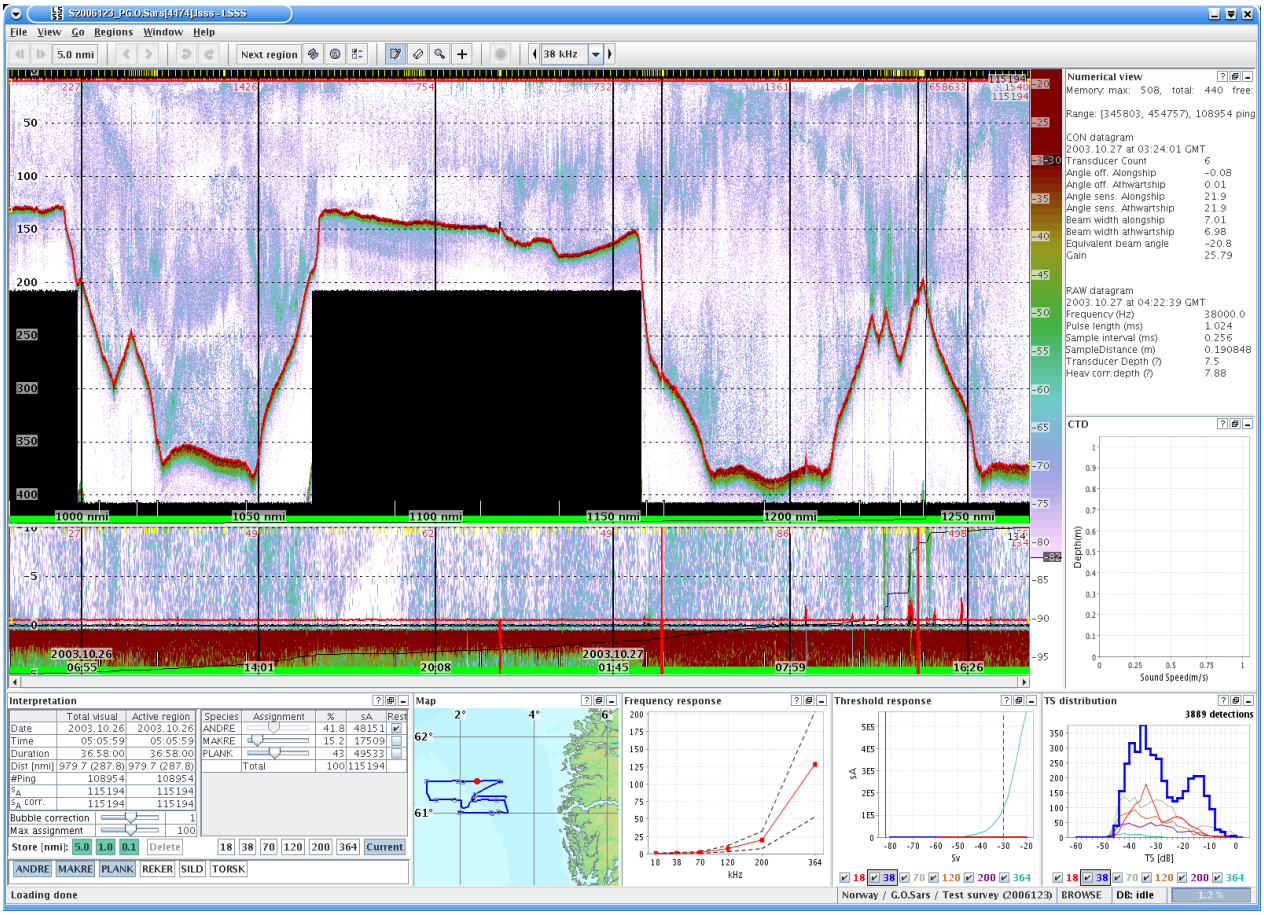


LSSS

User Guide

Version 2.3.0

January 11, 2018

Contents

- LSSS
  - Getting started
    - Loading files
    - Working mode
      - Edit mode
      - Delete mode
      - Zoom mode
      - Add mode
    - Echogram navigation
    - Data loading mode
  - Display organization
    - The menu bar
    - The tool bar
    - Floatable views
    - The status bar
  - Working with LSSS
    - First time configuration
    - Creating a new survey
    - Changing default configurations
      - Changing application configuration
      - Changing default nation or platform
    - Preprocessing
    - Backup survey data
    - Copy remote survey data
    - Regions
      - Managing layers and schools
        - Layers
        - School regions
        - Creating regions
        - Selecting, editing and moving regions
        - Deleting and merging regions
      - Frequency dependent deletion of data
      - Excluding ping ranges
      - School parameters
      - RegionMenu
        - Activate next visible region
        - Activate all visible regions
        - Activate all visible regions with total assignment not 100
        - Activate all regions with acoustic category
        - Labels
        - Merge layers
        - Delete active schools
        - Reset interpretation
        - Set upper boundary from range
        - Set lower boundary from threshold
        - Delete assignments on other frequencies
        - Delete assignments on all frequencies
        - Category editor…
    - Scrutinizing with LSSS
      - Description
      - Scrutinize overview
      - Related topics
    - Tracks
    - Output
      - Report generator
        - Description
          - Naming of print files
          - Intended use of report formats
          - Print formats
            - Compact print format

- Print format 2
- Print format 3
- Print format 4
- Print format 5
- Print format 6
- Print format 7
- Print format 8
- Print format 9
- Print format 11
- Print format 16
- Print format 20
- Print format 21
- Print format 22
- Print format 23
- Print format 24
- Print format 30
- Print format 31
- Print format 40
- Related topics
- Export
  - Echogram plot
  - Echosounder data
  - Korona regions
  - School parameters
  - Tracks
  - TS

- Configuration
  - Application configuration
    - Database
    - Directories
    - Preprocess conf
    - Miscellaneous
  - Survey configuration
    - Survey
    - Acoustic categories
      - Mapping from acoustic category to preprocessed categories
      - Create or edit acoustic category
      - Create or edit area
    - Grid
    - Miscellaneous
      - Pelagic mode
      - Coordinated bottom
    - Data files
    - Preprocessing
      - On the fly
      - KoronaRelay
    - Modules

- Views
  - CTD
    - Description
    - File format
    - Example file
  - Echogram
    - Navigation
    - Context menu
    - Tool tip
    - Colorbar
      - Colorbar context menu
    - Overlays
      - BB TS(f) locations
      - Bottom
      - Comments
      - Depth markers

        - File draw
        - File markers
        - Grid
        - Integration line
        - Map position
        - Masking
        - Ping markers
        - Preprocessed regions
        - Reference log
        - Regions
        - Sa line
        - Ticks
        - Tracks
        - TS locations
        - Vertical lines
- Echogram plot
- Frequency response
    - Configuration
- Interpretation
    - Supporting information
    - Performing interpretation
        - Interpreting multiple regions simultaneously
        - Interpretation initialization
    - Bubble correction
    - Storing the interpretation
        - Storing to database
        - Batch storing
        - Saving to file
        - Restoring interpretation
- Korona experimentation
- Map
    - Navigation
    - Context menu
    - Tool tip
    - Overlays
        - Background map
        - Comments
        - CTD map overlay
        - Echogram position
        - File markers
        - Latitudes and longitudes
        - Length scale
        - Pan
        - Reference log
        - SaMapOverlay
        - Survey line
- Numerical view
    - Description
    - Remarks
- Ping plot
- Plankton
- S_V distribution
    - Description
- System info
- Threshold response
- TS distribution
    - Settings
    - Additional material
        - Gain compensation estimation
        - Computation of mechanical angles
        - Converting from S_V to TS values
- TS positions
- Trawl

        - Description
        - File format
- Database
    - About the fields in the database tables
    - AcCatToBiologicalSpecies
        - Name
        - Synopsis
        - Description
        - Parameters
        - Related topics
        - Related database tables
    - AcousticCategory
        - Name
        - Synopsis
        - Description
        - Parameters
        - Related topics
        - Related database tables
    - AcousticCategoryComposite
        - Name
        - Synopsis
        - Description
        - Parameters
        - Related database tables
    - Area
        - Name
        - Synopsis
        - Description
        - Parameters
        - Related topics
        - Related database tables
    - AreaOfAcousticCategory
        - Name
        - Synopsis
        - Description
        - Parameters
        - Related topics
    - BiologicalSpecies
        - Name
        - Synopsis
        - Description
        - Parameters
        - References
        - Related topics
    - Nation
        - Name
        - Synopsis
        - Description
        - Parameters
        - Related topics
    - Observation
        - Name
        - Synopsis
        - Description
        - Parameters
        - Related topics
        - Related database tables
    - ObservationComment
        - Name
        - Synopsis
        - Description
        - Parameters
        - Related topics

    - Related database tables
- ObservationType
    - Name
    - Synopsis
    - Description
    - Parameters
    - Related topics
    - Related database tables
- Personnel
    - Name
    - Synopsis
    - Description
    - Parameters
    - Related topics
    - Related database tables
- Platform
    - Name
    - Synopsis
    - Description
    - Parameters
    - Related topics
    - Related database tables
- PlatformCodes
    - Name
    - Synopsis
    - Description
    - Related topics
    - Related database tables
    - Parameters
- PlatformName
    - Name
    - Synopsis
    - Description
    - Parameters
    - Related topics
    - Related database tables
- PlatformType
    - Name
    - Synopsis
    - Description
    - Parameters
    - Related topics
    - Related database tables
- Purpose
    - Name
    - Synopsis
    - Description
    - Parameters
    - Related topics
    - Related database tables
- Scatter
    - Name
    - Synopsis
    - Description
    - Parameters
    - Related topics
    - Related database tables
- ScatterData
    - Name
    - Synopsis
    - Description
    - Parameters
    - Data storage

    - Related topics
    - Related database tables
- ScatterObject
    - Name
    - Synopsis
    - Description
    - Parameters
    - Related topics
    - Related database tables
- ScatterType
    - Name
    - Synopsis
    - Description
    - Parameters
    - Related topics
    - Related database tables
- SchoolCategory
    - Name
    - Synopsis
    - Description
    - Parameters
    - Related topics
    - Related database tables
- SchoolCategorySystem
    - Name
    - Synopsis
    - Description
    - Parameters
    - Related topics
    - Related database tables
- SchoolData
    - Name
    - Synopsis
    - Description
    - Parameters
    - Related topics
    - Related database tables
- SchoolDetect
    - Name
    - Synopsis
    - Description
    - Parameters
    - Related topics
    - Related database tables
- SchoolMorphology
    - Name
    - Synopsis
    - Description
    - Parameters
    - Related topics
    - Related database tables
- SchoolObjectType
    - Name
    - Synopsis
    - Description
    - Parameters
    - Related topics
    - Related database tables
- StandardComment
    - Name
    - Synopsis
    - Description
    - Parameters

        - Related topics
        - Related database tables
    - Survey
        - Name
        - Synopsis
        - Description
        - Parameters
        - Related topics
        - Related database tables
    - Database import/export
        - Exporting surveys
        - Importing surveys
- Broadband
    - Broadband export
        - BB bottom data export
        - BB sample data export
        - BB Sv(f) export
        - BB TS(f) export
        - BB TS(f) tracks export
    - Broadband views
        - BB calibration plot
        - BB Sv(f)
        - BB TS(f)
        - BB TS(f) histogram
- Appendix
    - File types
        - Data input files
        - Data output files
        - Default configuration files
    - Data correction
        - Corrected errors
        - Errors not corrected
    - Ping alignment
    - Ref log data
    - File draw data
    - EK500
        - Settings
        - Loading EK500 data
        - Converting work files
- Keyboard shortcuts
    - General
    - Echogram
    - Map
- Tips and tricks
- Glossary

Large Scale Survey System

Large Scale Survey System, abbreviated LSSS, and pronounced L-triple-S, is a system for interpreting multi-frequency echo sounder data. The system also supports other data types to supplement the acoustic data in the interpretation process. Interpretation can be done either offshore during a survey or later onshore as postprocessing.

The interpretation process consists of defining regions on the echogram and assigning acoustic categories to each region. The regions with assignments are then used for computing a coarse representation of the interpretation on a rectangular grid that is stored to a database.

This documentation organized in the following main sections:

- Getting started: Brief introduction on how use the system.
- Display organization: Description of the components of the main frame.
- Working with LSSS: Explanation of the work processes in LSSS.
- Configuration: Description of how the system is configured.
- Views: Descriptions of the windows and modules of LSSS.
- Database: Descriptions of the database tables.
- Appendix: Reference material.

Getting started with LSSS

Loading files

The data files to load are selected in the 'Data files' section of the survey configuration dialog. This dialog can be opened through the 'File' menu. Data files, or a directory containing data files, can also be dragged from a file browser into the echogram.

Note that all raw-files must have corresponding idx-files. Idx-files can be created by LSSS from the 'Data files' section of the survey configuration dialog if they are missing. If bot-files are missing, LSSS can only be run in pelagic mode.

If there are corresponding work-files and snap-files in the folder specified in the 'Data files' section of the survey configuration dialog, the saved interpretation (regions and species interpretation) will also be loaded. See also Saving to file and Restoring interpretation".

Working mode

There are four different working modes. The toolbar buttons  may be used to select working mode. Alternatively press the Tab (Shift + Tab) to go to the next (previous) mode. If a mode has submodes then Spacebar (Shift + Spacebar) selects the next (previous) submode.

The delete, zoom and add modes are onetime operations. Double-click on the corresponding toolbar button to apply one of these modes several times.

Edit mode 

The edit mode is context sensitive. The action depends on the mouse location.

- Click the left mouse button in a region to select that region.
- Drag the mouse over several regions to select the regions intersecting the drawn rectangle.
  - Hold down Ctrl to toggle selection of the regions intersecting the draw rectangle.
  - Hold down Shift to additionally select the regions intersecting the draw rectangle.
- Press down the left button near a region boundary and drag the mouse to edit that region boundary.
- Press down the left button at the center marker of a school region and drag the mouse to move that region.

This mode is described in more detail in the section on regions.

Delete mode 

This mode is for frequency dependent deletion of data. Deleted data is marked with a semi-transparent gray overlay.

- Press Spacebar to toggle between delete and undo delete.
- Use Plus and Minus keys to change the size of the deletion area.

Zoom mode 

Zoom in:

- Click the left mouse button to zoom in horizontally around the mouse position.

Zoom out:

- Click the middle mouse button to zoom out both horizontally and vertically around the mouse position.

- Press down the Ctrl key and click the middle button to zoom out maximally both horizontally and vertically. Pressing 'Home' on the keyboard has the same effect.

Alt + Left button may be used instead of middle button.

Zoom in to a rectangular area:

- Press the left mouse button and drag the mouse to draw a rectangular area.
- The shape of area may be automatically expanded vertically or horizontally depending on whether the initial mouse movement is horizontal, vertical or diagonal.
- Press Spacebar to change the automatic expansion of the area.
- Release the mouse button to zoom in to the drawn area.
- Press Esc to cancel the zoom.

Add mode +

- Click the left mouse button to insert a new layer boundary.
- Press Spacebar to change between inserting horizontal and vertical layer boundaries, vertical separators and school regions.

This mode is described in more detail in the section on regions.

Echogram navigation

Navigation in addition to the zoom mode:

- Press Ctrl + arrow keys to pan. Ctrl + Up and Down arrow keys operate only on the echogram in which the mouse is located.
- Press Ctrl + Alt + Left (Right) to go to the previous (next) location.
- Use the mouse scroll wheel to zoom horizontally. Press Shift to zoom vertically and Ctrl to zoom in both directions.

See also the chapter about the echogram.

Data loading mode

There are two data loading modes:

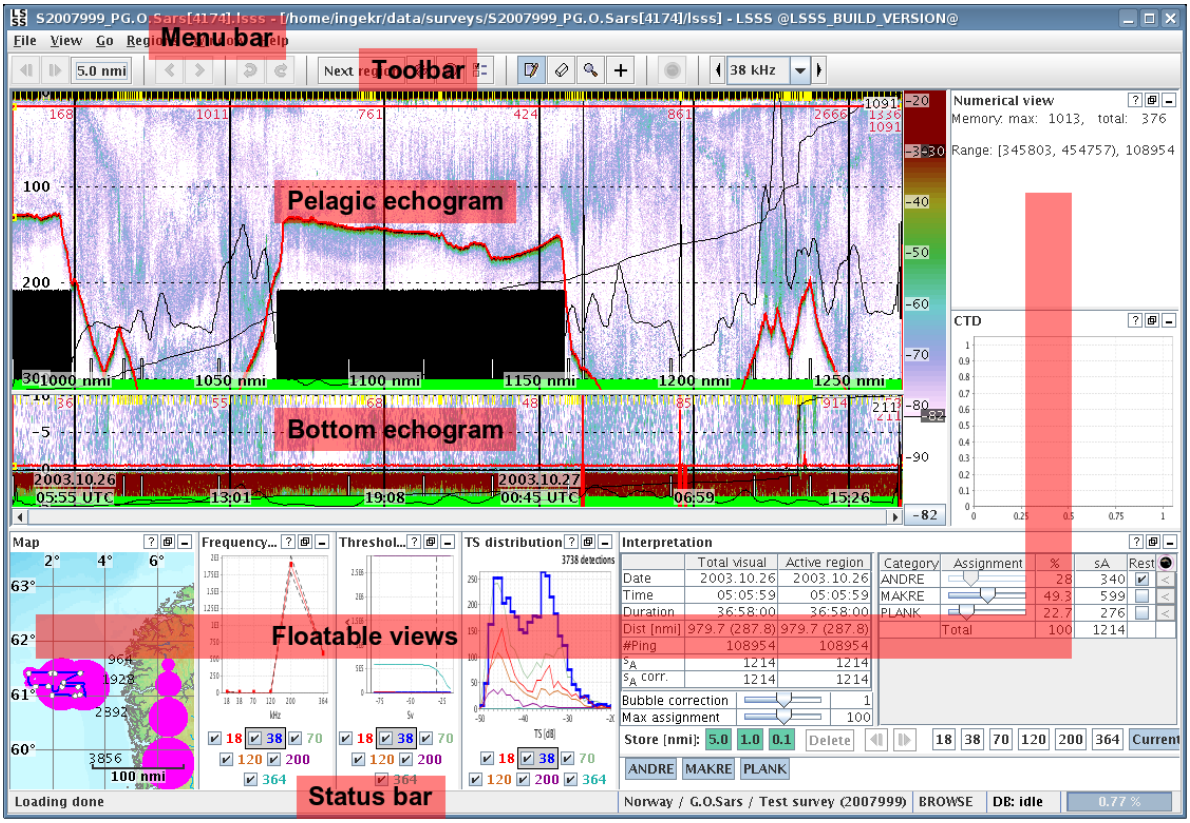
- BROWSE: Only enough pings are loaded to cover the echogram window.
- DETAIL: All pings in the current range are loaded.

NB: If DETAIL mode is used on a too large interval the system may run out of memory.

The data loading mode may be changed by clicking on the data loading mode indicator on the status bar or through the context menu of the echogram view.

Display organization

The basic layout of the LSSS main frame is illustrated in the picture below:



The main frame consists of the following components:

- The menu bar.
- The toolbar.
- The echogram consisting of a pelagic echogram and a bottom echogram.
- The floatable views along the bottom and right edges of the frame.
- The status bar.

The menu bar

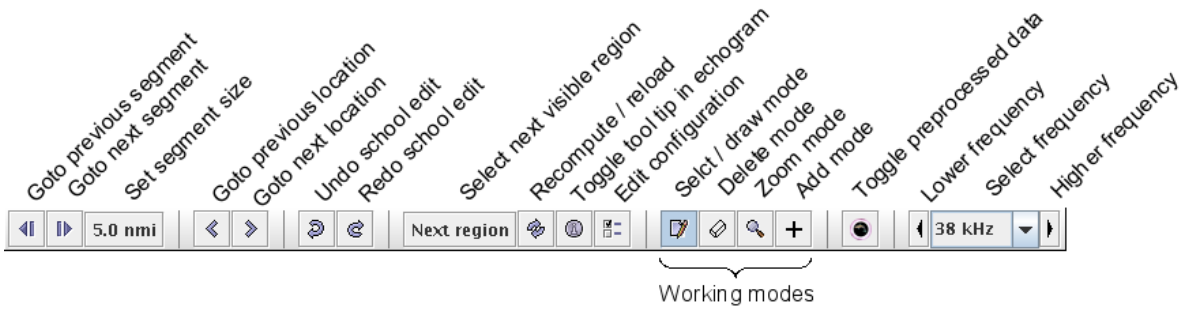
The main menus are laid out as follows:

File View Go Regions Window Help

- File: Functionality for creating/opening/saving surveys.
- View: Functions for configuring the appearance of the main frame.
- Go: Functionality for navigating in the echogram. The echogram context menu has more functions.
- Regions: Functionality for manipulating regions.
- Window: Options for hiding / showing each of the floatable views.
- Help: Online help system (this document).

The toolbar

The toolbar has buttons for commonly needed functionality:



All toolbar buttons have tool tips, and most of them have keyboard shortcuts displayed in the tool tip.

Floatable views

The smaller frames along the bottom and right sides of the main frame are called floatable views. Each of these views has three possible states:

- Docked: When it is attached to the main frame. A floating view in a separate window can be docked by closing that window.
- Floating: When it is displayed in a separate window. A docked view can be made floating by clicking the float button.
- Hidden: When it is not visible. A view can be hidden either by clicking the hide button, or by using the window menu. A hidden view can be made visible again by using the window menu.

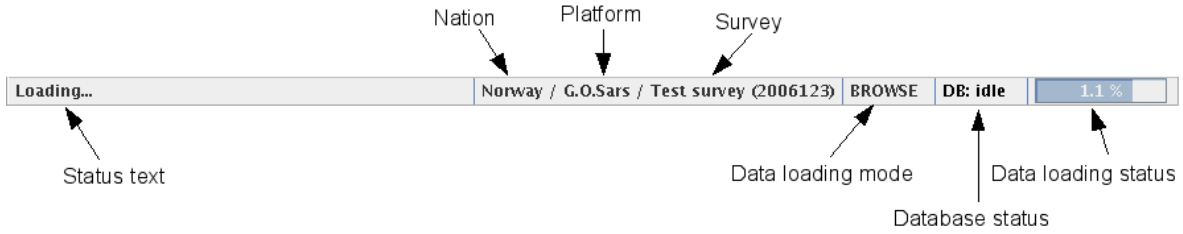
If a help button is shown, a help-page for the view will be shown when clicking the button.

Similarly, if a configure button is shown, a configure-menu for the view will be shown when clicking the button.

Each view is described the chapter on views.

The status bar

The status bar shows the following information:



- Status text: A short description of the current system status.
- Survey information: Nation / Platform name / Survey name (survey number)
- Data loading mode:
  BROWSE: Only enough pings required for displaying the echogram image are loaded.
  DETAIL: All pings are loaded.
  Click to change.
- Database status:
  DB: none if the database is not connected.
  DB: idle if the database is connected.
  DB: busy if there is currently communication with database.
- Ping loading status:
  The number shows the percentage of the available pings that will be loaded. In DETAIL mode this is

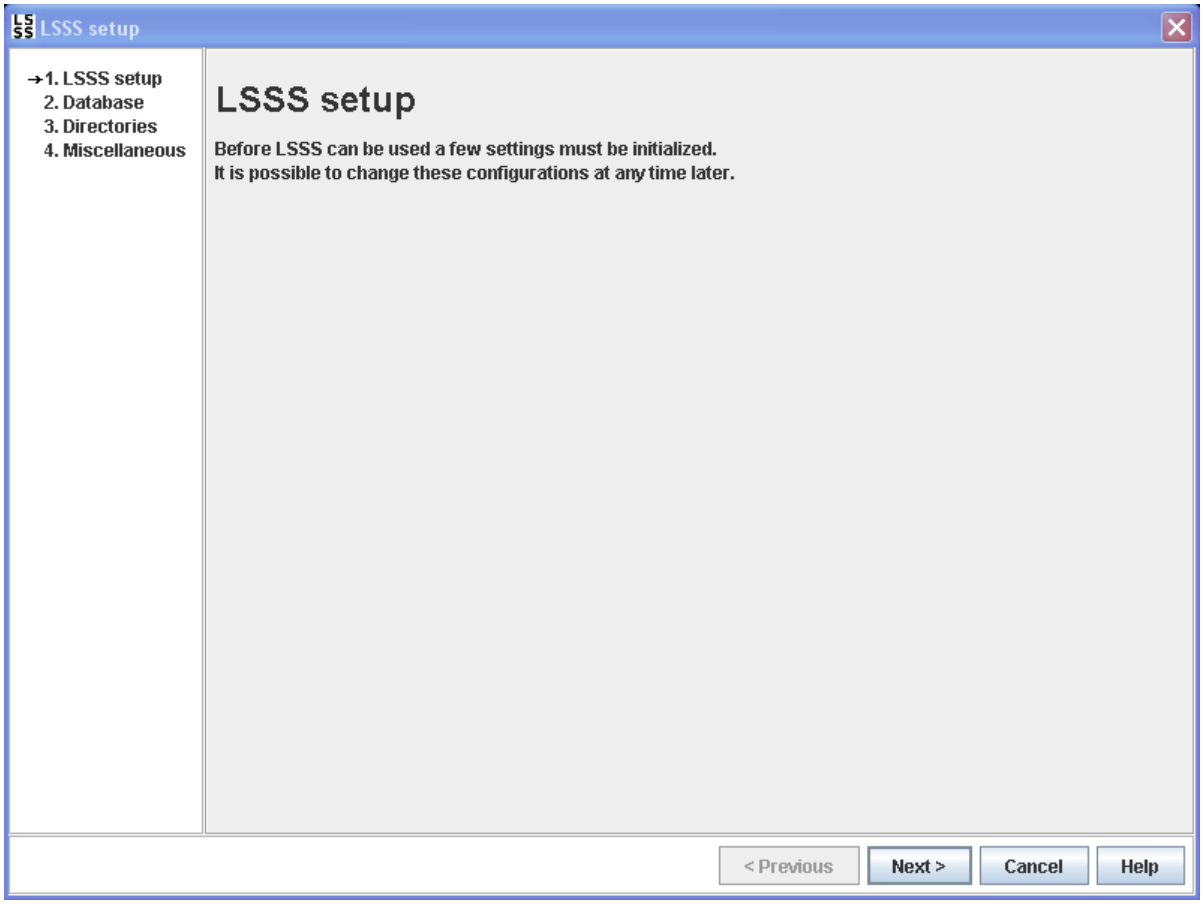
always 100%.
The progress indicator shows how many of the required pings that have been loaded.

Working with LSSS

This chapter gives a description of some of the typical tasks when working with LSSS. These tasks include configuring the application, setting up a new survey, working with regions and masking of data. There is also a chapter about the preprocessing system 'Korona', which can provide helpful information for the interpretation.

First time configuration

The first time LSSS is started, some global settings must be configured. These settings can be changed at any later time. The LSSS setup wizard is a guide through this process.

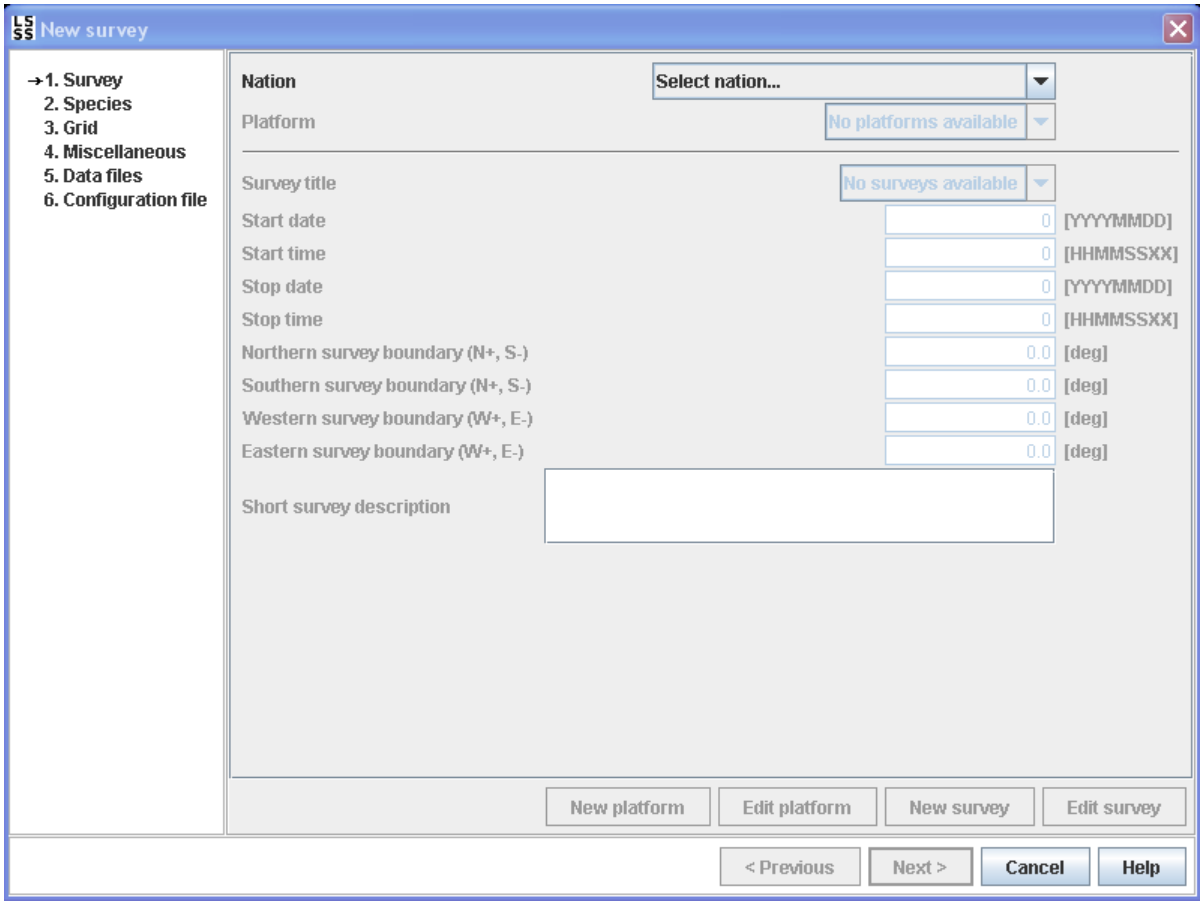


Refer to the sections in the configuration chapter for explanation of the elements in the wizard:

- Setting the database.
- Setting the main directories.
- Miscellaneous settings.

Creating a new survey

A new survey can be configured by selecting **New survey...** field in the **File** menu. A survey configuration wizard will then appear, as a guide through the configuration.

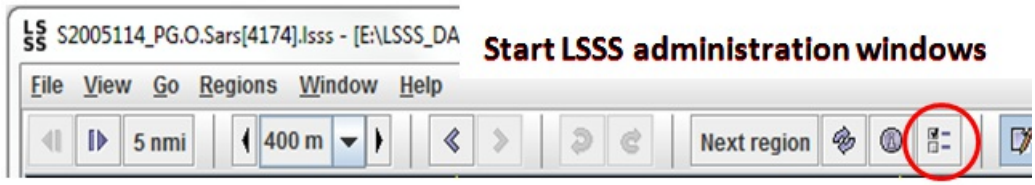


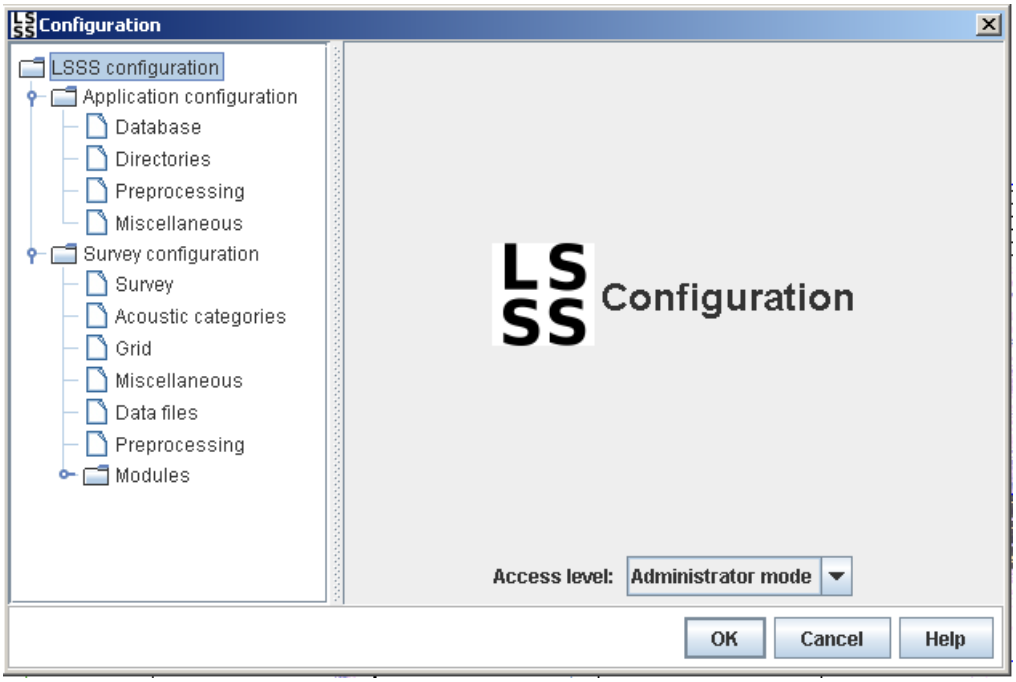
Refer to the sections in the survey configuration chapter for explanation of the elements in the wizard:

- Survey description.
- Selection of acoustic categories.
- Configuring the grids.
- Miscellaneous survey settings.
- Configuring the data file folders.
- The location of the survey configuration file can be selected in the last element. If WorkDir is not specified then work and snap files will be stored in the same folder as the survey configuration file.

Changing default configurations

The first time LSSS is started, some global settings are configured. Those settings can be changed at any later time. The global settings are stored in files with a location decided by LSSS, and neither the location nor the file-names can be changed by the user if LSSS should be able get its content. The global settings are used as default settings when a new survey is created. To change the global settings you need to first start the LSSS administration window and then change to Administrator mode as shown below.



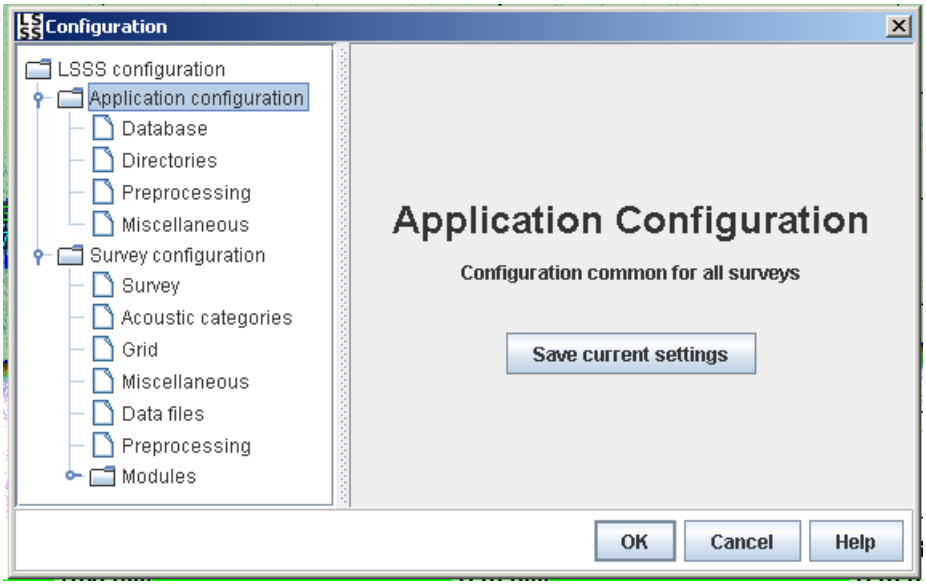


These are examples of the global settings that are used when a new survey is created:

1. default database and database engine. For details, see Database description.
2. default data and work directories. For details, see Directories description.
3. default pre-processing directories and files. For details, see Pre-processing description.
4. miscellaneous. For details, see Miscellaneous description.
5. default nation.
6. default platform (ship).

Changing application configuration

Default database, database engine, data and work directories, preprocessing files and preprocessing directories (including the acoustic feature directories), and application miscellaneous settings may be changed from the "Database", "Directories", Preprocessing" and "Miscellaneous" fields of the Application subsection of the main administration menu (in Access level "AdministratorMode") as shown below. The button "Save current settings" has to be clicked for the LSSS to remember the adjusted application-settings.

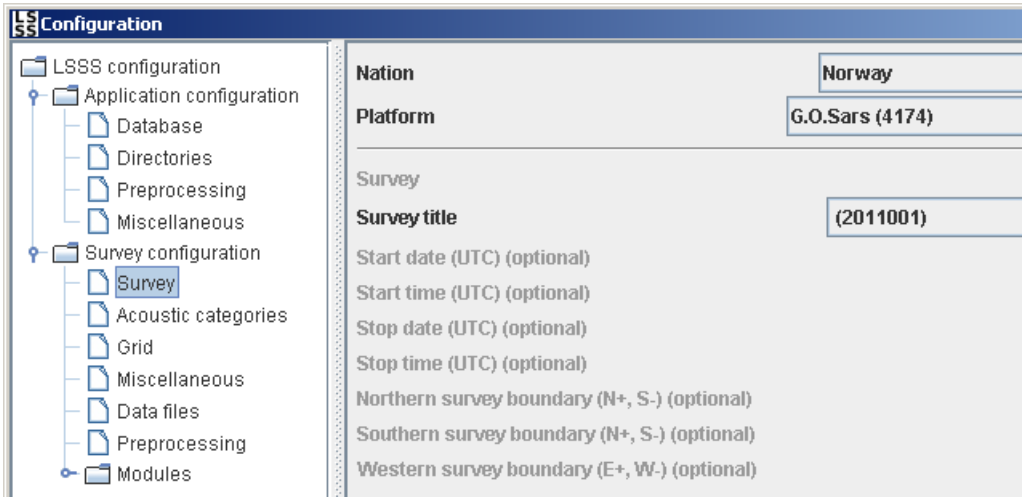


The following global settings are stored in the LSSS-application-file:

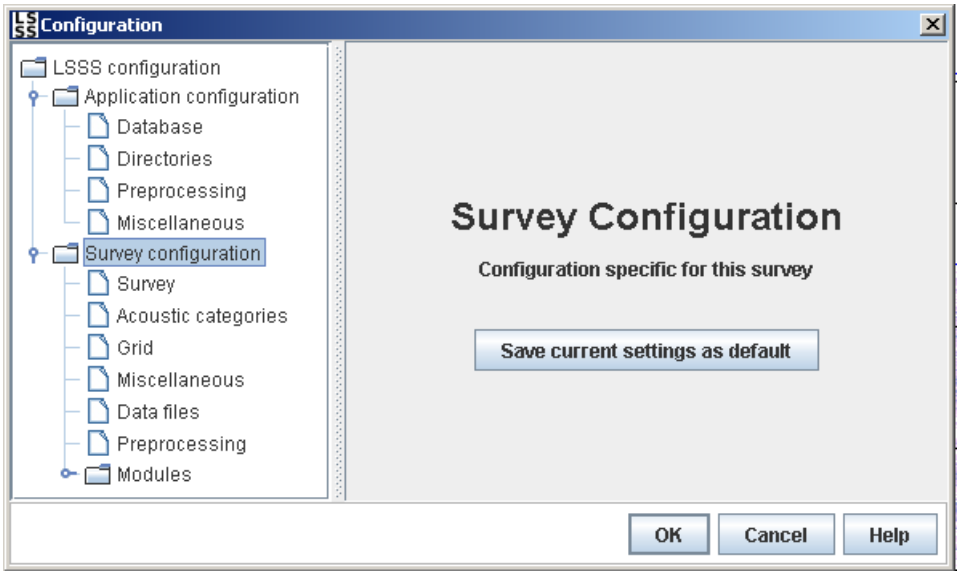
1. default database and database engine. For details, see Database description.
2. default data and work directories. For details, see Directories description.
3. default pre-processing directories and files. For details, see Pre-processing description.
4. miscellaneous. For details, see Miscellaneous description.

Changing default nation or platform

Default nation or platform (ship) may be changed from the "Nation" and "Platform" fields of the Survey subsection of the main administration menu (in Access level "AdministratorMode") as shown below.



When changes are done, they have to be saved to the survey-defaults file by pressing the button marked "Save current settings as defaults" as shown below.



Refer to the sections in the survey configuration chapter for explanation of other elements:

- Survey description.

Preprocessing

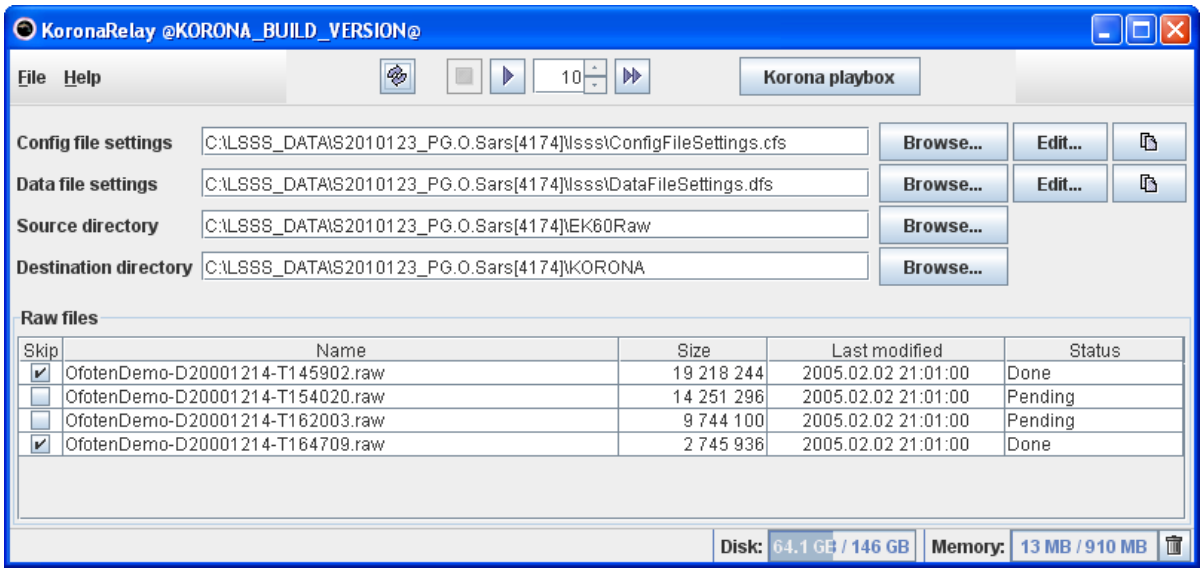
LSSS has a system for doing preprocessing. This system is referred to by the name "Korona". Korona has a very modular design. It contains various computation modules, each performing a specific task, that can be chained together into a processing pipeline. The types of processing available include:

- Bottom detection
- Noise quantification and removal
- Smoothing
- Categorization
- Region detection
- Plankton inversion

The preprocessing system is a separate program and can be started from [Survey configuration - Preprocessing].

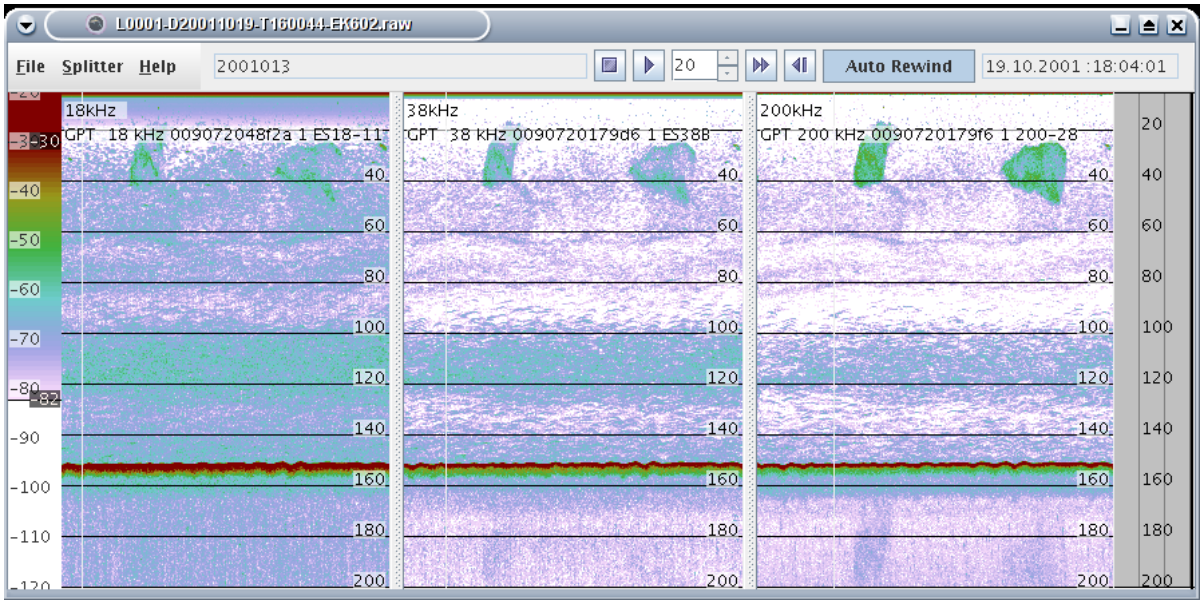
Korona relay

"Korona relay" is intended for batch processing. The files in the source directory are processed and the result is written to the destination directory.



Korona playbox

The processing can be explored interactively. Select a file in the list of files and click the button "Korona playbox". The results are displayed as the processing progresses.



Using preprocessed data in LSSS

When preprocessing is done, the results can be used in LSSS. The directory with the preprocessed files must be specified in [Survey configuration - Data files]. The preprocessed files are output as temporary files from KoronaRelay, to not intervene with earlier preprocessed files open in LSSS. When entering the [Survey configuration - Data files], the user will be asked if the new temporary files should be copied for use in LSSS. If there are older preprocessed versions of the raw file, these will then be replaced. If the preprocessed data files are compatible with the selected original files, then the Korona toolbar button becomes enabled. This button can then be used to toggle between the original data and the preprocessed data.

Results of the preprocessing are used in several ways. The processing that modifies the original data, such as smoothing and noise removal, are used directly in all computations in LSSS. In addition:

- If categorization is done: The echogram can display categories instead of signal strength. This can be selected through the context menu of the colorbar.
- If plankton inversion is done: The echogram can display plankton categories instead of signal strength. This can be selected through the context menu of the colorbar.
- If region detection is done: The detected regions are displayed on the echogram. The detected regions can be converted to school regions for use in the interpretation through their context menu.

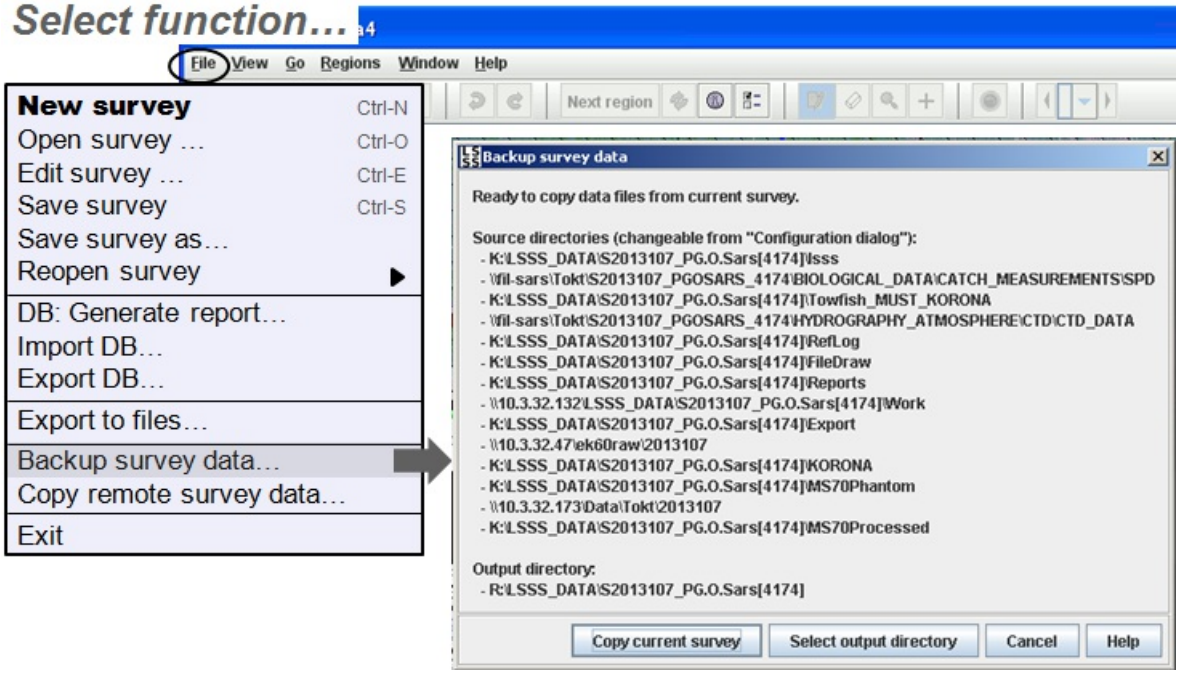
The categorization and plankton inversion results can further be used in the interpretation by setting up mappings between preprocessed categories and acoustic categories.

Preprocessing help system

More information can be found in the help system in Korona, that can also be launched from the help menu or from [Survey configuration - Preprocessing].

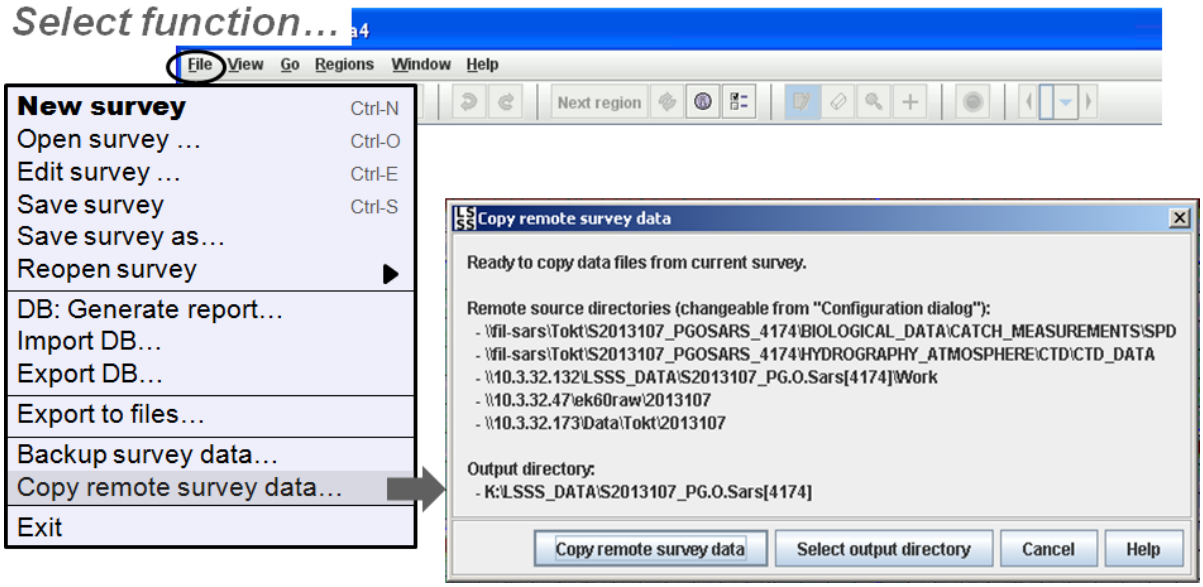
Backup survey data

Backup survey data copies all data to a backup directory. The backup is started from the "File" menu as illustrated below. See also [Working with - Copy remote survey data].



Copy remote files

Copy remote survey data copies all data not being on the same hard drive as the survey-file. The data is copied to a standard data structure. Only files that are changed since last copying is copied. The copying is started from The *default* data directory structure is set in [Application configuration - Default directories], while the actual data directory structure for the current survey is set in [Survey configuration - Data directories].
One common way to organise the LSSS data directories on board the ships is to point to the original data source, e.g. that DataDir points to the computer where the echosounder data is collected. The functionality to copy data is intended to make routine work simpler. It is started from the "File" menu as illustrated below.
See also [Working with - Backup survey data].



Working with regions

Region is a common term for layers and schools. The purpose of regions is to separate the survey into parts that can be more easily interpreted. The regions are common for all frequencies. A fundamental concept is that all region edits affect only the visible ping range. That is, the effects of region edits do not extend beyond the left or right edges of the visible part of the echogram. If the echogram is zoomed vertically, however, the effects of region edits can extend above or below the visible part of the echogram.

When interpreting a large survey, a typical use of the region system can be as follows:

1. When viewing the whole survey, insert some 'global' horizontal layer boundaries to separate the main layers in the survey. These boundaries will then exist as a starting point when interpreting smaller segments of the survey in more detail.
2. Add some acoustic categories to be interpreted in each of the layers, and optionally assign one or more of the acoustic categories to be rest-acoustic-category (see interpretation module).
3. Optionally exclude some ping ranges from further interpretation. Typically, a user may want to exclude parts of a survey where the boat made a detour to take trawl samples.
4. Start a more detailed interpretation by zooming in, or by clicking the button for the preferred segment size on the toolbar.
5. Add more layers and school regions as needed, and assign interpretations to the regions.

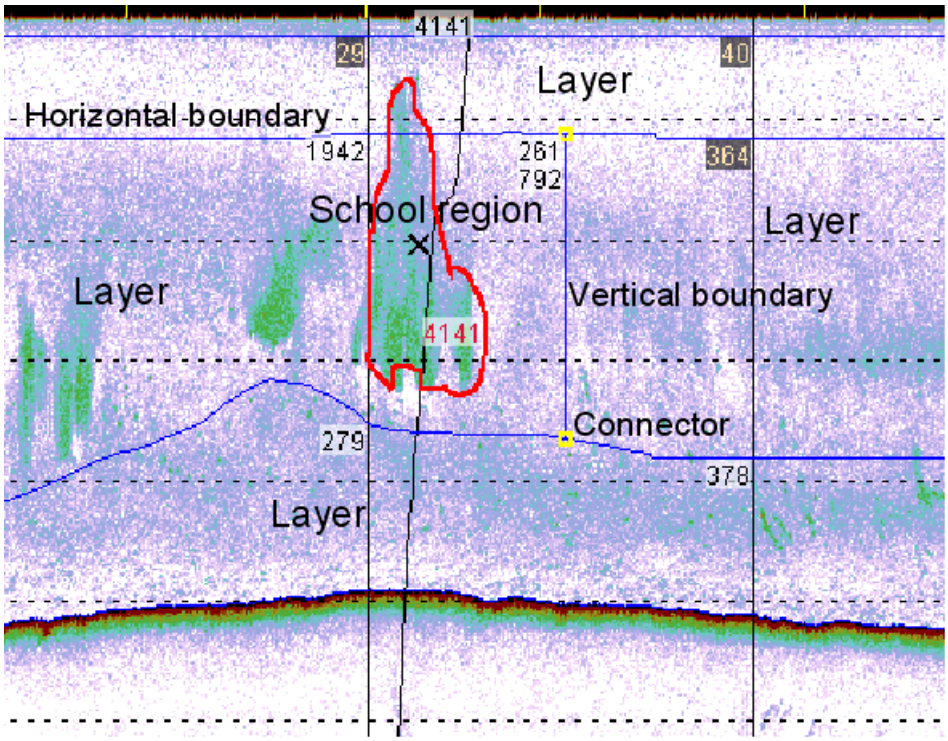
Layers and schools

Layers

Layers are defined by a set of layer boundaries. Two types of boundaries exist: horizontal boundaries and vertical boundaries. For each ping, a layer is limited by exactly one upper horizontal boundary and one lower horizontal boundary. The layer boundaries are not allowed to cross other layer boundaries. The layer boundaries are connected by yellow square connectors (see figure below).

School regions

School regions are defined by a closed outline. The points inside a school region are excluded from the layers with which the school region overlaps. School regions are not allowed to overlap other school regions, or to extend above/below the uppermost/lowermost layer boundaries.



Creating regions

Layer boundaries and school regions can be created by clicking the + button on the toolbar. The Spacebar can be used to cycle through different adding modes:

: Add a horizontal boundary at the mouse position when clicking in the echogram. The horizontal boundary will extend to the nearest vertical boundaries to the left and right of the insertion point. If such vertical boundaries do not exist in the visible ping range, vertical boundaries are inserted at the edges of the screen.

: Add a vertical boundary at the mouse position. The vertical boundary will extend to the nearest horizontal boundaries above and below the insertion point. School regions are not modified.

: Add ping index boundaries at the mouse position. All layers with a ping range containing the insertion point will get a vertical boundary at this ping, and all school regions intersecting the insertion point will be split at this ping index.

: Start drawing a school box at the mouse position. Holding the mouse button down and dragging the

mouse extends the school box. Releasing the button creates the school region. Press Esc to cancel.

If automatic school detection has been performed in a preprocessing step, the detected regions can be transformed into editable school regions by using the context menu. The automatically detected schools will appear with a purple outline. By moving the mouse close to the outline and then right clicking, a menu option will appear to transform the region.

Selecting, editing and moving regions

The layers and schools can be edited with the button on the toolbar. The default action in this mode is selection of regions. Regions can be selected by clicking in the interior of the regions. Dragging the mouse over several regions selects all regions intersecting the dragged box. Holding Ctrl down while dragging selects unselected regions and unselects selected regions. Press Ctrl + A to select all currently visible regions in the survey.

When the mouse is close enough to a region boundary, the cursor will change:

- If the mouse is close enough to a horizontal layer boundary, the cursor will change to the (edit mode) or the system dependent cursor for resizing up and down (move mode). Pressing the Spacebar will cycle between the two modes. When in the mode, dragging the mouse will edit the boundary. When in the move mode, dragging the mouse will move the boundary vertically. The boundary will 'drape' around colliding boundaries to avoid boundary crossings.

- If the mouse is close enough to a vertical layer boundary, the cursor will change to the system dependent cursor for resizing left and right. Dragging the mouse will move the vertical boundary to the left and right. The vertical boundary is not allowed to move past other vertical boundaries or connector points in the same layer.

- If the mouse is close enough to a connector, the cursor will change to the system dependent move cursor. Dragging the mouse will move the connector, and also edit the layer boundaries attached to the connector.

- If the mouse is close enough to a school outline, the cursor will change to the symbol or the system dependent symbol for resizing up/down or left/right depending on the edge. Pressing the Spacebar will cycle between the two modes. In the mode, the school outline can be edited in a freehand manner, while in the resizing mode whole edges can be moved uniformly. The resizing mode is only available for newly created schools which still are square. In both modes, dragging the mouse will edit the school outline. The edited school outline will be drawn in black, and the part of the school outline which will be replaced will be drawn in cyan. Pressing Spacebar toggles which part that will be replaced. Releasing the button performs the replacement. Pressing Esc while editing cancels the edit operation. If an edit is such that the outline will intersect another school, the edit is rejected and the outline goes back to the way it was. Self-intersections are not allowed. If the user tries to create self-intersections, these will be removed when the user releases the button. The school edit will be clamped between the uppermost and lowermost layer boundaries.

- If the mouse is close enough to a school center and the whole school is inside the visible area, the cursor will change to the system dependent move cursor. Pressing Spacebar while at the school center will make the cursor cycle through the modes "scale", "draw", "select" and back to "move". Dragging the mouse while in the move mode will move the school to the mouse position. Dragging the mouse upward and downward while in the scale mode will alter the size of the school; the school becomes bigger by dragging the mouse upward, and smaller by dragging the mouse downward. If the school is moved or scaled so that the school outline intersects another school outline, the school boundary will adjust so that the schools do not overlap. While moving and scaling the school, the outline will be limited by the visible ping range. Upon releasing the mouse button, the school will also be clamped between the uppermost and the lowermost layer boundary.

Keyboard shortcuts:

- Key '1' : Can be used as an alternative to the left mouse button when editing regions. Position the

mouse where the edit should start and then press and release the key '1'. (Do not hold the key down.) Move the mouse without pressing any mouse buttons to draw. When finished type '1' again to stop the editing.
- Key '2' : Selects the drawing mode in all contexts that has a drawing mode.
- Key '3' : Selects the select mode in all contexts that has a select mode.

The following table summarizes the edit mode.

Mouse location	Sub-modes
Inside region	Select
	Draw
	Move
Horizontal layer boundary	Select
	Draw
	Move vertically
Vertical layer boundary	Select
	Move horizontally
Connector point	Move
School outline	Select
	Draw
	Move school edges
	Move school
School center	Move
	Scale
	Select
	Draw

Deleting and merging regions

Layers can be merged with other layers by selecting all layers to be merged, right clicking in the echogram window and choosing **Merge layers** from the context menu. Alternatively use the **Region** menu and choose **Merge layers** (shortcut Ctrl + M). The resulting layer after a merge must be such that exactly one upper horizontal boundary and one lower horizontal boundary exist per ping. If this is not the case, the merge operation will be aborted and only partially carried out. Also note that if a region extends beyond the visible range, vertical dividers will be inserted to isolate the visible ping range before the merge operation.

Schools can be deleted by right clicking inside the school, and choosing **Delete school** from the context menu. Alternatively select one or more schools and choose **Delete active schools** in the **Region** menu.

Schools can also be merged by selecting two schools, and choosing **Merge schools** from the context menu. Schools can only be merged if their ping ranges does not intersect.

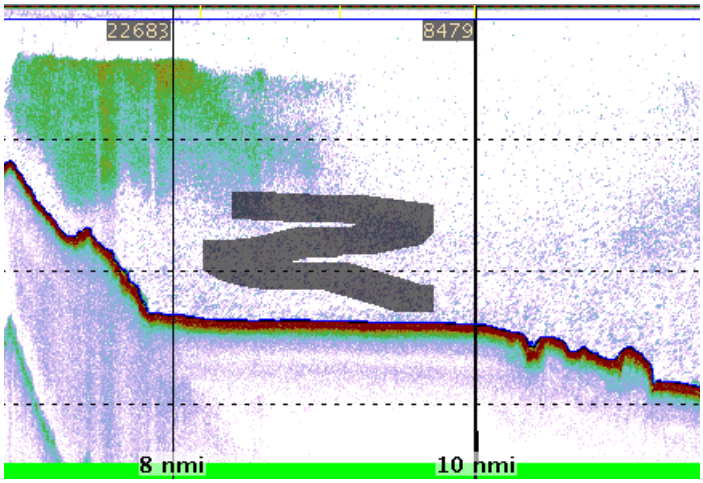
Frequency dependent deletion of data

Sometimes it is necessary to delete some data from the interpretation. It may be that some of the frequencies have erroneous pings, or that data has to be deleted because of artifacts near the bottom or the surface.

Pressing the toolbar button enters the deletion mode. The deleted area will be marked as a grayed out area on the echogram. Deleted data points are not used by any calculations in any of the modules.

Keyboard commands:

Keystroke	Description
+ -	Changes size of the eraser
Spacebar	Changes deletion mode 1. Delete (on current frequency) 2. Delete (on all frequencies) 3. Undelete (on current frequency) 4. Undelete (on all frequencies)
Ctrl + Spacebar	Changes draw mode 1. Box 2. Horizontal interval 3. Vertical interval



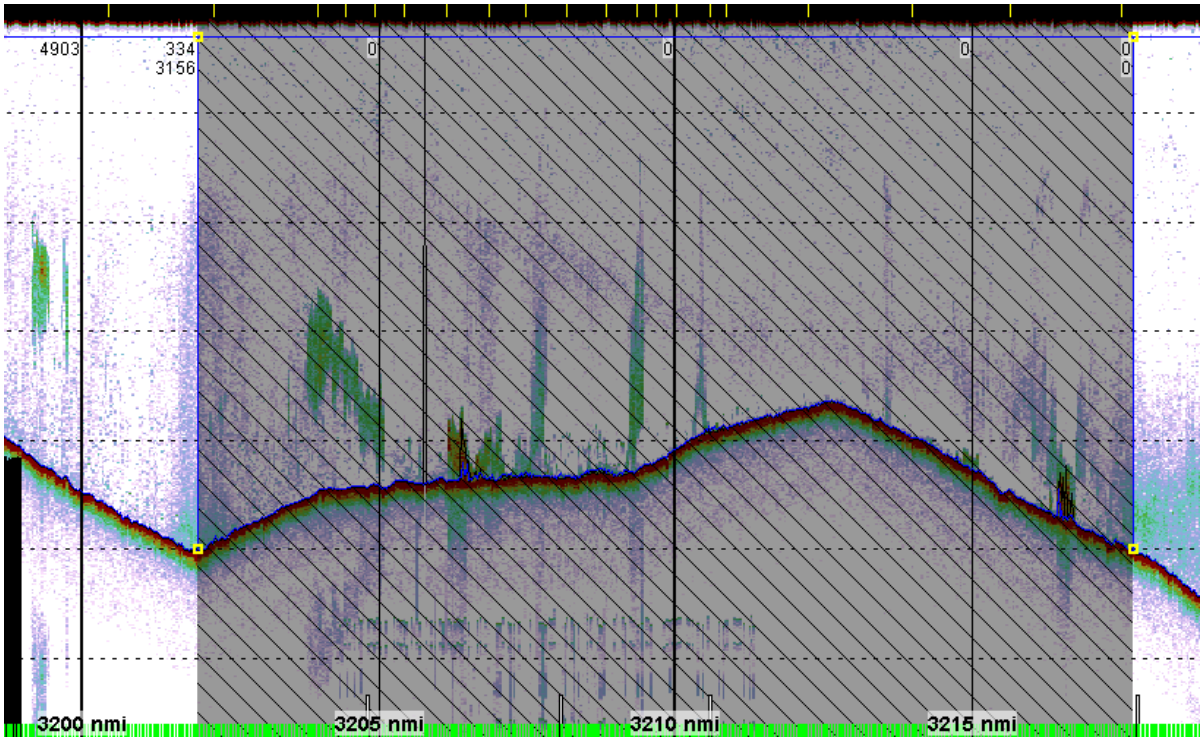
Excluding ping ranges

Sometimes a whole ping range must be excluded from the interpretation. This may for example be because of a detour from the survey line because of trawling.

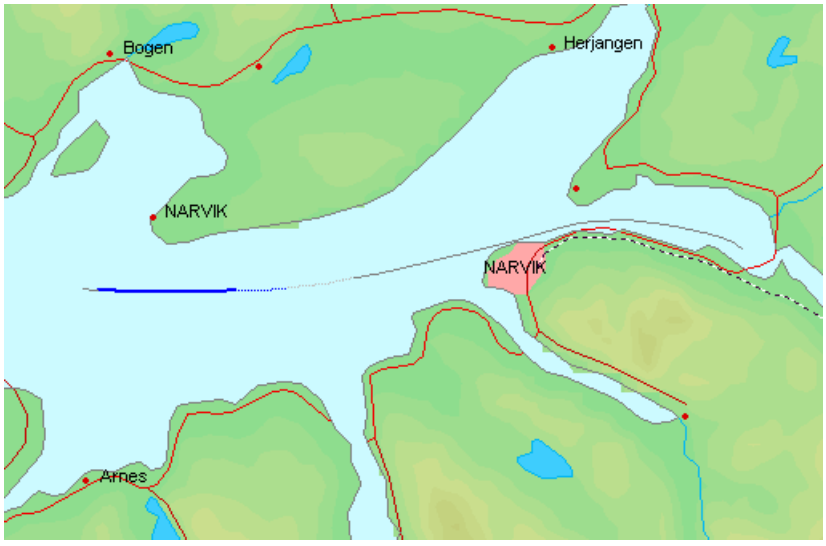
The effect of exclusion:

- Pings from excluded ranges will not be used in any computation.
- Grid cells containing any excluded pings will not be stored to the database.

To exclude a ping range, right click on a region and select **Exclude region range** from the context menu. Only the visible part is excluded. If necessary, zoom to cover the range to be excluded or create a region with the desired range. Excluded ranges can be re-included by right clicking on a region and selecting **Include region range**. The excluded ranges will be shown in the echogram by the masking overlay as black diagonal lines on a semi-transparent gray overlay as shown below.



The excluded segments are also shown in the map by the survey line overlay as thin dotted lines as shown below.



School parameters

A number of parameters are calculated for each school. These parameters are saved to work files, and can be exported. They can also be shown in the echogram tool tip.

To enable calculation of school parameters go to [Survey configuration - Miscellaneous] and make sure the "Compute school parameters" is selected. The school parameters are recomputed whenever a school is modified. All pings are used when calculating the school parameters.

The calculation of school parameters uses masking this way:

- Morphological parameters, such as length and area, do not any kind of masking or thresholding.
- Value based parameters, such as s_A and mean s_v, use exclusion and frequency dependent deletion, but do not use conditional masking or thresholding.

The school parameters include the flag "Data processed" signalling whether the parameters were computed using original or processed data. The parameters are computed using the currently selected data and are not automatically recomputed when switching between original and processed data. To recompute all school parameters go to [Survey configuration - Miscellaneous] and click the "Recompute" button.

Frequency independent parameters

These parameters do not depend on the data of specific frequencies.

- *Area*: The area of the school.
- *Bottom depth*: The bottom depth at the ping where *Min dist bottom* is found.
- *Circumference*: The circumference of the school.
- *Length*: The horizontal extent of the school.
- *Max depth*: The maximum depth of the school.
- *Min depth*: Minimum depth of the school.
- *Min dist bottom*: The minimum distance from the deepest part of the school to coordinated bottom.

Per frequency parameters

These parameters are computed for each frequency.

- s_A
- *Sample count*
- s_v statistics:
  - *Kurtosis*: The forth standardized moment, a measure of "tailedness".
  - *Max*: The maximum value.
  - *Mean*: The average value.
  - *Mean, truncated x%*: The x% lowest and x% highest values are discarded before computing the mean.
  - *Median*: The median value.
  - *Min*: The minimum value.
  - *Skewness*: The third standardized moment, a measure of asymmetry.
  - *Variance*: The variance.

Region menu

Activate next region

Activate next region in echogram

Activate all visible regions

Activate all visible regions in echogram

Activate all visible regions with total assignment not 100%

Activate all visible regions where the total assignment is not 100% on all frequencies. This is a useful function to check that all regions are scrutinized prior to saving to the database.

Activate visible regions with category ...

Activate all visible regions that is scrutinized as specified category (e.g. mackerel).

Labels

Add labels to regions. Select regions based on labels.

Merge active layers

Merge active layers. The scrutinizing of the first selected layer is used for the merged layer.

Delete active schools

Delete all active schools. (The function that is selectable from the right mouse button from the echogram can delete one school only).

Reset interpretation

Reset interpretation, i.e. discard all allocated categories and set layer-lines to default. In surface-mode (i.e. bottom window active), the lower integration line is drawn according to the detected bottom. Note that the bottom detected by the echosounder and by the preprocessor is in general slightly different. If the echogram mode is set to pelagic mode, the lower integration line is drawn at a predefined depth.

Set upper boundary from range

Set upper boundary from range.

Set lower boundary from threshold

Set lower integration line in the visible part of the echogram based on the colours. If the noise threshold is set so that only the bottom is visible, the lower integration line will be drawn to follow the bottom.

Delete assignments on other frequencies

Delete assignments on other frequencies than the one that is currently active.

Delete assignments on all frequencies

Delete assignments on all frequencies.

Category editor

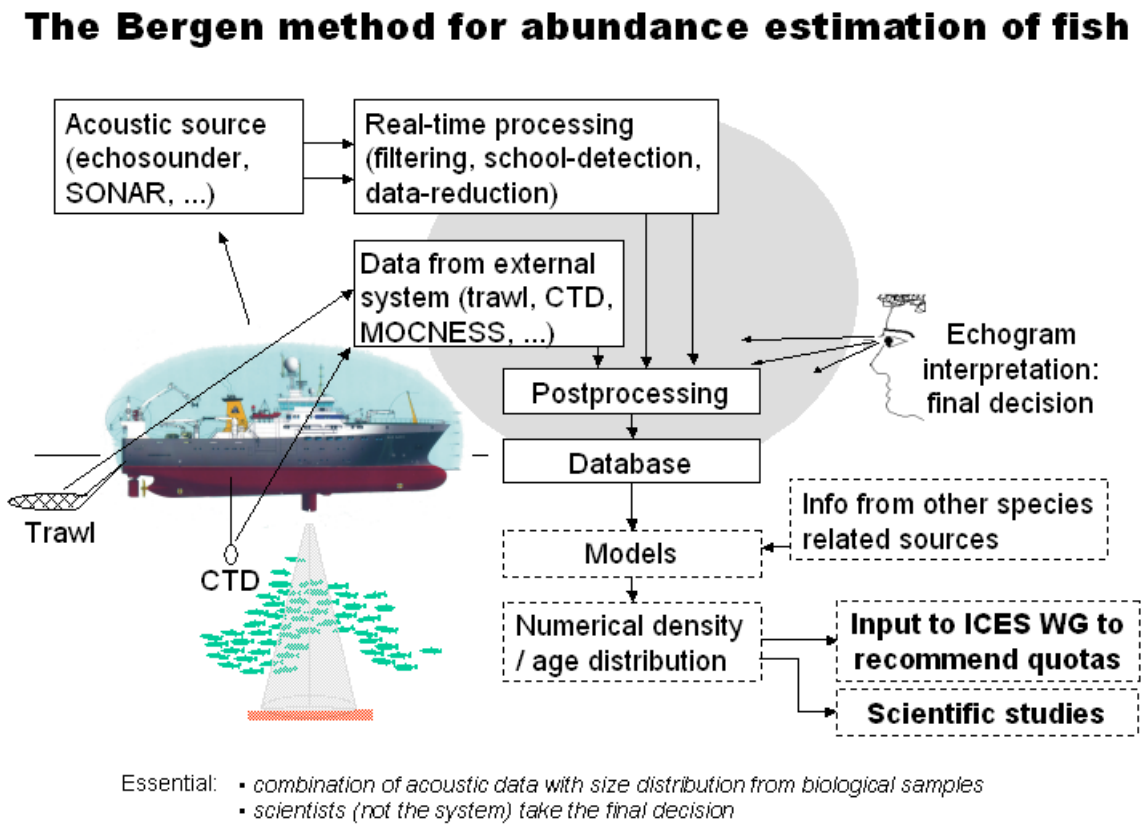
(See KORONA manual)

Scrutinizing with LSSS

Description

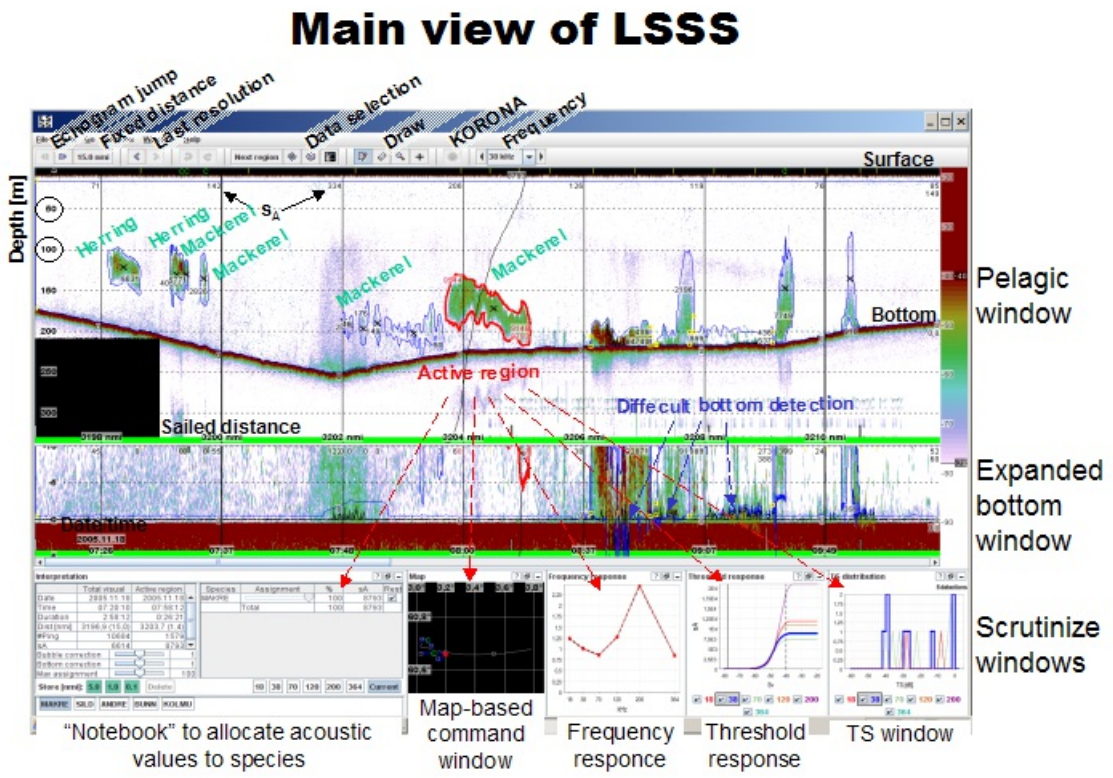
Description of the interpretation process of LSSS, and the results of the actions.

The process of interpreting acoustic data, combining these with biological samples, and finally calculate biological abundance is supposed to be a general process. However, fisheries research institutes around the world have adapted to different procedures that may be surprisingly different. The figure below gives an overview over one of these working procedures, which is the one used by the Institute of Marine Research. The combination of acoustic data and biological samples are essential in this method. Acoustic data is collected with echo sounder or sonar. These acoustic data may be partly processed in real-time to reduce the time needed to be used during the interpretation process itself. Data are also collected from other data sources than the acoustic sources. Sometimes, the data to be collected are planned at the start of a survey, and sometimes data are collected when the acoustic data indicate that so should be done. Trawling is commonly triggered from acoustic registrations.



Scrutinize overview

Some of the main windows of LSSS are shown below. The text in the figure gives the overall description of the LSSS windows. The windows can be contained in a common frame as shown below, but each of the sub-windows may also be free-coupled from the frame and be used as an independent window.



Acoustic data is scrutinized with LSSS through the following steps:

- Preprocess data if needed. (Noise removal, categorization, school-detection). This could be done in Korona before starting LSSS, or initiated from LSSS using KoronaRelay. See the Preprocessing section for more.
- Set or check the LSSS application configuration. (Database, default data directories, data reading strategy, ...)
- Set or check the LSSS survey configuration. (Survey, acoustic categories, storage grid, data catalogs, ...). A common storage grid is 1.0 nmi horizontally and 10 m vertically for pelagic echogram channels.
- Set or check the LSSS module configurations.
- Select all data files to be scrutinized in this session, e.g. 24 hours of data.
- Draw region-lines to limit the extent of the acoustic registrations covering large distances. Use available means to assign one or several "default" acoustic categories to the regions. Do not try to be too detailed: it is only the "default" acoustic categories that should be assigned at this stage. Available means to improve interpretation are described below.
- Reduce echogram distance to cover e.g. 50 nautical miles, and draw new region-lines or adjust existing region-lines to limit the extent of the regions covering large distances. Available means to improve interpretation are described below.
- The data interpretation is now to be done in detail: reduce visualised echogram to an appropriate elementary scrutinizing distance (ESD), e.g. 5.0 nmi (which could be set in the grid-setup).
- Draw new region-lines or adjust existing region-lines to limit the extent of the regions covering large distances. Import school-regions from preprocessed data (i.e. KORONA data) whenever desired. Switch frequency if necessary to see the extent of the echo-traces better. Switch to preprocessed data to visualize acoustic categories if desired. Zoom in or out to get a closer look on the echo-traces. Some of the other available tools during data interpretation are e.g. target strength distribution, frequency response, threshold response, trawl catches, CTD, geographical area, depth of registrations, echo-trace shape and strength, time of day ...
- Assign NASC to each acoustic category in each layer.
- Switch to "DETAIL" mode.
- In "DETAIL" mode, the storage-grid are shown when the cursor above one of the storage-buttons. When all layers and regions are interpreted, store the results to the database. The stored sections are marked.
- Go to next distance (ESD) and repeat the procedure described above.
- Continue until all selected ESD are scrutinized and stored to the database.

- Print the desired reports from the database by using Database reports;.

Related topics

Database
Working with LSSS
First time configuration
Changing default configurations
Changing default nation or platform
Preprocessing
Survey interpretation
Regions
Exclusion ping ranges
Managing layers and schools
Frequency dependent deletion of data

Working with tracks

This section lists some of the possibilities when working with tracks in LSSS.

Tracks are generated by the KORONA tracking module.

Visualization

Tracks are be visualized:

- By the tracks echogram overlay
- Positions of selected tracks are shown by the TS positions view

Selection

Tracks can be selected by:

- Drawing a selection rectangle in the echogram
- Clicking on individual tracks in the echogram
- By using the labels assigned to tracks

Labels

In LSSS tracks can be assigned custom labels. The labels can optionally be display by the tracks echogram overlay.

Editing

Tracks can be manually edited by:

- Merging tracks
- Splitting a track into two separate tracks
- Deleting tracks

The editing functionality can be accessed via the context menu of the tracks echogram overlay.

Export

Tracks can be exported:

- Narrowband: Tracks export
- Broadband: BB TS(f) tracks export

Output from LSSS

This chapter describes ways of getting output from LSSS.

- ReportGenerator
- Export

Report generator

Description

The report generator provides means to output data from the database. The user selects survey and at least one report from a set of pre-defined report formats. The reports are stored in the **ReportsDir** directory, which is set from the *Data files* sub-dialog in the SurveyConfiguration dialog. The actual directory **ReportsDir** are also seen in the report generator window. The reports are generated for all frequencies. For some pre-defined report-formats, only some species are printed. The number of species printed those special reports are set from the report generator window. The naming of the print-files is similar to the report generator of Bergen Echo Integrator, BEI, i.e. the report format 5 is the same as ListUser05 in BEI. Some reports was not much used during the latest years of BEI, and those are not currently included in LSSS.

Naming of print files

The print files are named: **List***Type*_**L***Start-stop_Postfix*

- *Type* gives the format name but also the frequency and transceiver if there is only one of those, e.g. "User02_F038000_T02". If the file contains all frequencies and transceivers, frequency and transceiver is not given in the file name.
- *Start-stop* is the start and stop distance of the print-file. Note that *Start* is at or after the requested start-distance of the reporting, and that the distance is independent of frequency. In other words, if the requested start-distance is 1000 nmi, and there is stored data from 1000 nmi at 38 kHz and from 1200 nmi at 70 kHz, both the name of the 38 kHz file and the 70 kHz file be named "....._L1000.0-....". The similar is true for the stop distance.
- *_Postfix* gives the name of the acoustic category (="acoustic species") in short form (5 letters) if the file only contains only one.

Example of file names are: ListUserFile05__F038000_T2_L3197.0-3234.0_HERRI and ListUserFile20__L3197.0-3234.0

Intended use of report formats

- Compact format: Paper printouts. Each species occupy one column.
- Print format 02: Same as "Compact" format, but with comments, empty lines and all but the first heading excluded to make the files more suitable for automatic use.
- Print format 03: Similar to "Print format 02", but comma separated columns suited for use in e.g. MS Excel.
- Print format 04: Input fitted for e.g. MS Excel with all info on each line. Max number of pelagic depth channels. Each file contain one species measured at one acoustic frequency.
- Print format 05: General output suitable as input to a long range of programs, e.g. SAS. Each file contain one species measured at one acoustic frequency.
  Note that only the selected number of acoustic category on the Species sub-dialog in the SurveyConfiguration dialog will be printed.
- Print format 06: Same as "Print format 02" format, but with different resolution in time, logs, and positions
- Print format 07: PGNAPES format (1)
- Print format 08: PGNAPES format (2)
- Print format 09: Input fitted for e.g. MS Excel with all info on each line. High number of pelagic and bottom depth channels. Each file contain one species measured at one acoustic frequency.
- Print format 11: Each file contains one species measured at one acoustic frequency.
- Print format 16: Each file contains all selected species at one frequency.
- Print format 20: XML file suitable for general abundance estimation. Each file contains all selected species and is sorted by increasing time and increasing frequency.
- Print format 21: Report format intended for estimating the backscatter at frequency "f" relative to "38 kHz" (i.e. the "relative frequency response). Print format 21 has fixed columns. The file contains the relative frequency response for the first species selected.
- Print format 22: Report format intended for estimating the backscatter at frequency "f" relative to "38

kHz" (i.e. the "relative frequency response). Print format 22 is comma separated unlike print format 21 that has fixed columns. The file contains the relative frequency response for the first species selected.
- Print format 23: Report format intended for estimating the backscatter at frequency "f" relative to "38 kHz" (i.e. the "relative frequency response). Print format 23 is comma separated like print format 22, but channel 0 that contains the sum of all of the water column, is omitted. The file contains the relative frequency response for the first species selected.
- Print format 24: Report format intended for estimating the backscatter at frequency "f" relative to other frequencies (i.e. the "relative frequency response). Print format 24 has the same print format as 22 and 23, but the data are not normalized to 38 kHz. This allows for normalization to other frequencies when 38 kHz data does not exist. Channel 0 (i.e. the sum channel) is omitted. The file contains data for the first species selected.
- Print format 30: Report format intended for school analysis: compact print format sorted on object-number, date, time. The object-number identifies a school with the same object-number across the frequencies. The object-number also identifies the echogram that was visible when storing to database.
- Print format 31: Report format intended for school analysis. General output similar to print format 5, but sorted on object-number, date, time. Each file contain one species measured at one acoustic frequency.
- Print format 40: Report format intended for analysis of vertical distribution. Data parallel to surface and bottom are in separate files.

Print formats

("%s") means string, ("%d") means integer, ("%f") means floating number, (NEWLINE) means line shift. ("%4d") means 4 positions are used to print an integer, (" %4d") means a leading space before the 4 positions of an integer, ("%02d") means that 2 positions are used to print an integer, and that the first position is zero if the integer is a single digit integer.

Compact print format

```
"SHIP: "("%s")"     NATION: "("%s")"    SURVEY: "("%d")"
"Frequency: "("%8d")" [Hz]   Transceiver: ("%d")"
"   DATE    TIME         LOG            POSITION       DEPTH"
Initials_of_acoustic_category("%7s"){No_acoustic_categories_to_be_printed times} ("  TOTAL SC'
Date("%4d"."%02d"."%02d ") Time("%02d":"%02d  ") Latitude("N/S""%03d":"%4.1f ")
Longitude("E/W""%03d":"%4.1f") Bottomdepth("%5.0f ")
sa_of_acoustic-category(" %6.0f"){No_acoustic_categories_to_be_printed times} Total_sa(" %6.0:
Number_of_schools_starting_in _distance ("%1d")
If_comment_exist( Date("%4d"."%02d"."%02d ") Time("%02d":"%02d  ") Comment("%s")
If_10_lines_with_different_date_time_are_printed(
If_40_lines_with_different_date_time_are_printed(
```

Example: ListComScatter_F0380000_T2_L3205.0-3235.0.txt

```
SHIP: G.O.Sars   NATION: Norway   SURVEY: 2005115
FREQUENCY:    38000 [Hz]   TRANSCEIVER: 2

   DATE    TIME         LOG            POSITION       DEPTH  MACKE   HERR  PSIDE  OTHER  PLANI
2005.11.18  6:54  3203.0 - 3204.0  N60:38.5 E003:10.3   230   2564      0      0      0      (
2005.11.18  7:00  3204.0 - 3205.0  N60:38.0 E003:09.2   222   8967      0      0      0      (
2005.11.18  7:21  3205.0 - 3210.0  N60:38.5 E003:08.2   111    662      0      0      0      (
2005.11.18  8:49  3210.0 - 3215.0  N60:42.5 E003:03.2   198      0      0      0      0      (
2005.11.18  9:18  I kursretning,PT221
2005.11.18  9:36  3215.0 - 3220.0  N60:40.4 E003:06.1   254      0      0      0      0      (
2005.11.18 10:03  3220.0 - 3225.0  N60:39.4 E003:16.1   307      0      0      0      0      (
2005.11.18 10:14  This is a free text comment
2005.11.18 10:29  3225.0 - 3230.0  N60:39.3 E003:26.1   314      0      0      0      0      (
2005.11.18 10:56  3230.0 - 3235.0  N60:39.5 E003:36.2   311      0      0      0      0      (
```

Print format 2

```
"SHIP: "("%s")"     NATION: "("%s")"    SURVEY: "("%d")" "Frequency: "("%8d")" [Hz]   Transce
"   DATE    TIME         LOG            POSITION       DEPTH"
Initials_of_acoustic_category("%7s"){No_acoustic_categories_to_be_printed times} ("  TOTAL SC
Date(4d.02d.02d ) Time(02d:02d  ) Latitude(N/S03d:4.1f) Longitude(E/W03d:4.1f) Bottomdepth(5.
sa_of_acoustic-category(" %6.0f"){No_acoustic_categories_to_be_printed times} Total_sa(" %6.0
Number_of_schools_starting_in _distance ("%1d")
```

Example: ListUserFile02_F0380000_T2_L3205.0-3235.0.txt

```
SHIP: G.O.Sars   NATION: Norway   SURVEY: 2005115   FREQUENCY:  38000 [Hz]   TRANSCEIVER: 2

   DATE    TIME         LOG            POSITION       DEPTH  MACKE   HERR  PSIDE  OTHER  PLANI
2005.11.18  6:54  3203.0 - 3204.0  N60:38.5 E003:10.3   230   2564      0      0      0      (
2005.11.18  7:00  3204.0 - 3205.0  N60:38.0 E003:09.2   222   8967      0      0      0      (
2005.11.18  7:21  3205.0 - 3210.0  N60:38.5 E003:08.2   111    662      0      0      0      (
2005.11.18  8:49  3210.0 - 3215.0  N60:42.5 E003:03.2   198      0      0      0      0      (
2005.11.18  9:36  3215.0 - 3220.0  N60:40.4 E003:06.1   254      0      0      0      0      (
2005.11.18 10:03  3220.0 - 3225.0  N60:39.4 E003:16.1   307      0      0      0      0      (
2005.11.18 10:29  3225.0 - 3230.0  N60:39.3 E003:26.1   314      0      0      0      0      (
2005.11.18 10:56  3230.0 - 3235.0  N60:39.5 E003:36.2   311      0      0      0      0      (
```

Print format 3

```
"SHIP, NATION, SURVEY, FREQUENCY, TR, DATE, TIME, LOGSTART,  LOGSTOP, LONGITUDE,  LATITUDE, DI
Initials_of_acoustic_category(%s, ){No_acoustic_categories_to_be_printed} ("TOTAL")
Ship(%s, ), Nation(%s, ), Survey(%d, ), Frequency(%d, ), Transceiver(%d, ), Date(%4d.%02d.%02
Longitude(%9.5f, ), Latitude(%9.5f, ), Bottomdepth(%.1f, ),
sa_of_acoustic-category(%.1f, ){No_acoustic_categories_to_be_printed times} Total_sa(%.1f)
```

Example: ListUserFile03__F038000_T2_L3831.5-3838.6

```
 SHIP, NATION, SURVEY, FREQUENCY, TR, DATE, TIME, LOGSTART, LOGSTOP, LONGITUDE, LATITUDE, DEP
Johan Hjort, Norway, 2008101, 38000, 2, 2008.01.18, 19:12:51, 3831.50, 3831.60, -36.45084, -5
Johan Hjort, Norway, 2008101, 38000, 2, 2008.01.18, 19:13:51, 3831.60, 3831.70, -36.44816, -5
Johan Hjort, Norway, 2008101, 38000, 2, 2008.01.18, 19:14:48, 3831.70, 3831.80, -36.44543, -5
Johan Hjort, Norway, 2008101, 38000, 2, 2008.01.18, 19:15:47, 3831.80, 3831.90, -36.44263, -5
Johan Hjort, Norway, 2008101, 38000, 2, 2008.01.18, 19:16:49, 3831.90, 3832.00, -36.43991, -5
Johan Hjort, Norway, 2008101, 38000, 2, 2008.01.18, 19:17:59, 3832.00, 3832.10, -36.43721, -5
Johan Hjort, Norway, 2008101, 38000, 2, 2008.01.18, 19:19:15, 3832.10, 3832.20, -36.43447, -5
Johan Hjort, Norway, 2008101, 38000, 2, 2008.01.18, 19:20:35, 3832.20, 3832.30, -36.43200, -5
 ...
```

Print format 4

```
"   StartDate StartTime START_LOG  STOP_LOG  LATITUDE LONGITUDE MIN_DEPTH MAX_DEPTH FREQUENCY

   "SHIP: "("%s")"     NATION: "("%s")"    SURVEY: "("%d")" "Frequency: "("%8d")" [Hz]   Trans
"   DATE    TIME         LOG            POSITION       DEPTH"
Initials_of_acoustic_category("%7s"){No_acoustic_categories_to_be_printed times} ("  TOTAL SC
Date(4d.02d.02d ) Time(02d:02d  ) Latitude(N/S03d:4.1f) Longitude(E/W03d:4.1f) Bottomdepth(5.
sa_of_acoustic-category(" %6.0f"){No_acoustic_categories_to_be_printed times} Total_sa(" %6.0
```

Example: ListUserFile04_F0380000_T2_L3205.0-3235.0_Mackerel.txt

StartDate	StartTime	START_LOG	STOP_LOG	LATITUDE	LONGITUDE	MIN_DEPTH	MAX_DEPTH	FREQUENCY
20051118	6542406	3202.998	3203.998	60.648	3.177	222.789	236.585	38000
20051118	7001806	3203.999	3204.999	60.635	3.158	220.378	223.302	38000
20051118	7214170	3205.000	3210.000	60.648	3.141	0.000	222.605	38000
20051118	8492984	3210.000	3215.000	60.716	3.058	181.933	213.674	38000
20051118	9361548	3214.999	3219.999	60.679	3.104	211.559	295.765	38000
20051118	10030548	3219.999	3224.999	60.662	3.270	295.164	319.674	38000
20051118	10294662	3224.997	3229.997	60.660	3.439	306.957	320.643	38000
20051118	10562862	3229.998	3234.998	60.665	3.607	305.178	316.521	38000

Print format 5

```
1) Survey("%10d ") Nation("%10d ") Ship("%10d ") Date[YYYYMMDD]("%10d ") Time[hhmmssxx]("%10d
   Start_distance[nmi]("%10.3f ") Stop_distance[nmi]("%10.3f ") Latitude("%10.3f ") Longitude
   Min_bottomdepth[m]("%10.3f ") Max_bottomdepth("%10.3f ") Frequency("%10d ")
   Transceiver("%10d ") Threshold("%10.3f ") Acoustic_category_code("%10d ")       (NEWLINE)
2) Pelagic_channel_thickness("%10.3f ")
   Number_pelagic_channels_with_values("%10d ") Sum_channel_pelagic("%16.5f ")
   Pelagic_channel("%16.5f "){Repeated Number_pelagic_channels_with_values times}  (NEWLINE)
3) Bottom_channel_thickness("%10.3f ")
   Number_bottom_channels_with_values("%10d ") Sum_channel_bottom("%16.5f ")
   Bottom_channels("%16.5f "){Repeated Number_bottom_channels_with_values times}   (NEWLINE)
```

Example: ListUserFile05_F0380000_T3_L3205.0-3235.0_Mackerel.txt

```
   2005115        578       4174   20051118    6542406   3202.998   3203.998     60.648      1
    10.000         24       2563.86255          0.00000          0.00000          0.00000
     2.000          5          0.00000          0.00000          0.00000          0.00000
   2005115        578       4174   20051118    7001806   3203.999   3204.999     60.635      1
    10.000         23       8967.27148          0.00000          0.00000          0.00000
     2.000          5          3.95492          0.00000          0.00000          0.00000
   2005115        578       4174   20051118    7214170   3205.000   3210.000     60.648      1
    10.000         23        661.50940          0.00000          1.16307          0.85633
     2.000          5        145.96831         35.77621         48.37823         36.46689
   2005115        578       4174   20051118    8492984   3210.000   3215.000     60.716      1
    10.000         22          0.00000          0.00000          0.00000          0.00000
     2.000          5          0.00000          0.00000          0.00000          0.00000
   2005115        578       4174   20051118    9361548   3214.999   3219.999     60.679      1
    10.000         30          0.00000          0.00000          0.00000          0.00000
     2.000          5          0.00000          0.00000          0.00000          0.00000
   2005115        578       4174   20051118   10030548   3219.999   3224.999     60.662      1
    10.000         32          0.00000          0.00000          0.00000          0.00000
     2.000          5          0.00000          0.00000          0.00000          0.00000
   2005115        578       4174   20051118   10294662   3224.997   3229.997     60.660      1
    10.000         33          0.00000          0.00000          0.00000          0.00000
     2.000          5          0.00000          0.00000          0.00000          0.00000
   2005115        578       4174   20051118   10562862   3229.998   3234.998     60.665      1
    10.000         32          0.00000          0.00000          0.00000          0.00000
     2.000          5          0.00000          0.00000          0.00000          0.00000
```

Print format 6

```
"SHIP: "("%s")"     NATION: "("%s")"    SURVEY: "("%d")" "Frequency: "("%8d")" [Hz]   Transce
"   DATE      TIME           LOG              POSITION        DEPTH"
Initials_of_acoustic_category("%7s"){No_acoustic_categories_to_be_printed times} ("  TOTAL SC
Date(4d.02d.02d ) Time(02d:02d:02d  ) Latitude(N/S03d:4.2f) Longitude(E/W03d:4.2f) Bottomdeptl
sa_of_acoustic-category(" %6.0f"){No_acoustic_categories_to_be_printed times} Total_sa(" %6.0
Number_of_schools_starting_in _distance ("%1d")
```

Example: ListUserFile06_F0380000_T2_L3205.0-3235.0.txt

```
SHIP: G.O.Sars   NATION: Norway   SURVEY: 2005115   FREQUENCY:  38000 [Hz]   TRANSCEIVER: 2

   DATE      TIME          LOG              POSITION        DEPTH  MACKE   HERR  PSIDE  OTHE
2005.11.18  6:54:01  3203.00 - 3204.00  N60:38.51 E003:10.31   230   2564      0      0      (
2005.11.18  7:00:02  3204.00 - 3205.00  N60:38.02 E003:09.21   222   8967      0      0      (
2005.11.18  7:21:11  3205.00 - 3210.00  N60:38.51 E003:08.22   111    662      0      0      (
2005.11.18  8:49:05  3210.00 - 3215.00  N60:42.52 E003:03.22   198      0      0      0      (
2005.11.18  9:36:21  3215.00 - 3220.00  N60:40.43 E003:06.13   254      0      0      0      (
2005.11.18 10:03:31  3220.00 - 3225.00  N60:39.41 E003:16.14   307      0      0      0      (
2005.11.18 10:29:01  3225.00 - 3230.00  N60:39.31 E003:26.13   314      0      0      0      (
2005.11.18 10:56:09  3230.00 - 3235.00  N60:39.52 E003:36.22   311      0      0      0      (
```

Print format 7

```
"Country(tab)Vessel(tab)Cruise(tab)Log(tab)Year(tab)Month(tab)Day(tab)Hour(tab)Min(tab)AcLat(t
"%s\t%s\t%s\t%s\t%d\t%02d\t%02d\t%02d\t%02d\t%s\t%s\t%s\t%02d\t%s\t" (NEWLINE)
```

Example: ListUserFile07__F070000_T3_L3197.0-3234.5_HERR.txt

```
Country Vessel Cruise Log Year Month Day Hour Min AcLat AcLon Logint Frequency Sv_threshold
NO LMEL 2005114 3197.0 2005 11 18 06 20 60.663 3.034 0.5 70000 -82.0
NO LMEL 2005114 3197.5 2005 11 18 06 23 60.663 3.051 0.5 70000 -82.0
NO LMEL 2005114 3198.0 2005 11 18 06 26 60.663 3.068 0.5 70000 -82.0
NO LMEL 2005114 3198.5 2005 11 18 06 29 60.664 3.085 0.5 70000 -82.0
NO LMEL 2005114 3199.0 2005 11 18 06 31 60.664 3.102 0.5 70000 -82.0
NO LMEL 2005114 3199.5 2005 11 18 06 34 60.664 3.118 0.5 70000 -82.0
NO LMEL 2005114 3200.0 2005 11 18 06 37 60.664 3.135 0.5 70000 -82.0
...
```

Print format 8

```
"Country(tab)Vessel(tab)Cruise(tab)Log(tab)Year(tab)Month(tab)Day(tab)Species(tab)ChUppDepth(t
"%s\t%s\t%s\t%s\t%d\t%02d\t%02d\t%s\t%s\t%s\t%s\t"   (NEWLINE)
```

Example: ListUserFile08__F038000_T2_L3197.0-3234.5_HERR.txt

```
Country Vessel Cruise Log Year Month Day Species ChUppDepth ChLowDepth SA
NO LMEL 2005114 3198.0 2005 11 18 HER 50.0 100.0 0.00
NO LMEL 2005114 3198.0 2005 11 18 HER 100.0 150.0 689.44
NO LMEL 2005114 3198.0 2005 11 18 HER 150.0 200.0 3965.84
NO LMEL 2005114 3198.0 2005 11 18 HER 200.0 250.0 2530.23
NO LMEL 2005114 3198.0 2005 11 18 HER 250.0 300.0 145.48
NO LMEL 2005114 3198.0 2005 11 18 HER 300.0 350.0 0.00
NO LMEL 2005114 3198.0 2005 11 18 HER 350.0 400.0 0.00
...
```

Print format 9

Example: ListUserFile09__F070000_T3_L3197.0-3204.9_PLANK.txt

```
% Lines starting with % are comments
% The format of and definitions in this file may change in future versions of LSSS, last chan
% Export time: Fri Jan 03 16:02:48 CET 2014, LSSS version 2.3.0
%
% Printout with many bottom channels sorted by date, time.
% Nation: Norway(578);  Platform: G.O.Sars(4174);
% Survey:  (2005114);
% Description: ;
% Scatter type: SCATTER(1000);
% Frequency: 70000[Hz];  Transceiver: 3[-];
%

% StartDate[yyyymmdd],StartTime[hhmmssxx],StartLog[nmi],StopLog[nmi],Latitude[deg],Longitude[
Date,Time,StartLog,StopLog,Latitude,Longitude,MinDepth,MaxDepth,Freq,Tran,Thresh,Species,ChPe
20051118,6204206,3196.999,3197.999,60.663,3.034,173.777,188.729,70000,3,-82.000,6,10.000,50,1
20051118,6262006,3198.000,3199.000,60.663,3.068,188.920,204.310,70000,3,-82.000,6,10.000,50,2
20051118,6315406,3198.998,3199.998,60.664,3.102,204.607,224.097,70000,3,-82.000,6,10.000,50,2
20051118,6372906,3199.997,3200.997,60.664,3.135,224.221,239.449,70000,3,-82.000,6,10.000,50,2
20051118,6425906,3200.997,3201.997,60.664,3.169,238.890,251.459,70000,3,-82.000,6,10.000,50,2
20051118,6483606,3202.000,3203.000,60.662,3.198,236.366,251.380,70000,3,-82.000,6,10.000,50,2
20051118,6542406,3202.998,3203.998,60.648,3.177,222.783,236.530,70000,3,-82.000,6,10.000,50,2
20051118,7001806,3203.999,3204.999,60.635,3.158,220.298,223.263,70000,3,-82.000,6,10.000,50,2
...
```

Print format 11

```
"      DATE       TIME  START_LOG   STOP_LOG   Latitude  Longitude   MinDepth   MaxDepth  
"Threshold    Species ScatterPCT  NoPelagic          P_CH000          "
(50)"P_CH(%03d)          BottomUpper            B_CH0"      (NEWLINE)
(data)                                                     (NEWLINE)
```

Example: ListUserFile11__F038000_T2_L4502.0-9906.0_TORSK.txt

```
     DATE       TIME  START_LOG   STOP_LOG   Latitude  Longitude   MinDepth   MaxDepth  Freq
  20070912   21294378   7852.999   7853.999     76.332     32.676    290.175    296.486     
  20070912   21353778   7853.994   7854.994     76.348     32.680    294.204    300.959     
  20070912   21412978   7854.999   7855.999     76.365     32.683    289.232    298.648     
  20070912   21471992   7855.999   7856.999     76.381     32.686    288.388    292.509     
  20070912   21530992   7856.996   7857.996     76.398     32.689    285.787    291.348     
  20070912   21590192   7857.997   7858.997     76.415     32.692    282.790    290.778     
  20070912   22045392   7858.999   7859.999     76.431     32.694    273.763    284.869     
  20070912   22104792   7859.999   7860.999     76.448     32.696    260.288    273.865     
  20070912   22240992   7860.998   7861.998     76.464     32.703    258.368    267.798     
  20070912   22410192   7861.999   7862.999     76.480     32.712    257.891    269.814     
  20070912   23053556   7863.000   7864.000     76.495     32.739    254.266    261.933     
  20070913     401969   7864.000   7865.000     76.502     32.689      0.000    264.180     
```

Print format 16

```
(see example)
```

Example: ListUserFile16__F038000_T2_L4502.0-9906.0.txt

YEAR	MO	DA	UTC	LOG1	LOG2	LATITUDE	LONGITUD	BDMIN	BDMAX	CH	PDMIN	PDMAX	PDI
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	1	0	15	
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	2	15	20	
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	3	20	30	
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	4	30	40	
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	5	40	50	
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	6	50	60	
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	7	60	70	
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	8	70	80	
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	9	80	90	
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	10	90	100	
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	11	100	110	1
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	12	110	120	1
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	13	120	130	1
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	14	130	140	1
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	15	140	150	1
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	16	150	160	1
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	17	160	170	1
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	18	170	180	1
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	19	180	190	1
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	20	190	200	1
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	21	200	210	2
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	22	210	220	2
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	23	220	230	2
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	24	230	240	2
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	25	240	250	2
2007	08	15	01:45	4502.0	4503.0	71.25774	20.96285	211.6	259.5	26	250	260	2

Print format 20

(see example)

Example: ListUserFile20__L3197.0-3204.0.txt

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE echosounder_dataset SYSTEM "echosounder_dataset.dtd">
<echosounder_dataset>
   <report_time>2009-0-12 15:22:2</report_time>
   <lsss_version>2.3.0</lsss_version>
   <nation>578</nation>
   <platform>4174</platform>
   <cruise>2005114</cruise>
   <distance_list>
      <distance log_start="3196.999" start_time="2005-11-18 06:20:42">
         <stop_time>2005-11-18 06:26:20</stop_time>
         <integrator_dist>1.0</integrator_dist>
         <pel_ch_thickness>10.0</pel_ch_thickness>
         <bot_ch_thickness>1.0</bot_ch_thickness>
         <include_estimate>1</include_estimate>
         <lat_start>60.663258</lat_start>
         <lat_stop>todo</lat_stop>
         <lon_start>3.0336995</lon_start>
         <lon_stop>todo</lon_stop>
         <frequency freq="18000" tranceiver="1">
            <threshold>-82.0</threshold>
            <num_pel_ch>19</num_pel_ch>
            <min_bot_depth>173.8402</min_bot_depth>
            <max_bot_depth>188.75859</max_bot_depth>
            <upper_interpret_depth>10.0</upper_interpret_depth>
            <lower_interpret_depth>190.0</lower_interpret_depth>
            <upper_integrator_depth>15.0</upper_integrator_depth>
            <lower_integrator_depth>190.0</lower_integrator_depth>
            <quality>3.0</quality>
            <bubble_corr>1.0</bubble_corr>
            <ch_type type="P">
               <sa_by_acocat acocat="54">
                  <sa ch="2">33.15636</sa>
                  <sa ch="3">19.715197</sa>
                  <sa ch="4">5.6092787</sa>
                  <sa ch="5">2.1511433</sa>
                  <sa ch="6">2.0593028</sa>
```

```
            <sa ch="7">2.0839925</sa>
            <sa ch="8">3.308937</sa>
            <sa ch="9">3.7050188</sa>
            <sa ch="10">4.0737996</sa>
            <sa ch="11">3.6416912</sa>
            <sa ch="12">3.4502923</sa>
            <sa ch="13">2.6673105</sa>
            <sa ch="14">3.66677</sa>
            <sa ch="15">1.5594624</sa>
            <sa ch="16">2.6120777</sa>
            <sa ch="17">7.266288</sa>
            <sa ch="18">34.237774</sa>
            <sa ch="19">24.81409</sa>
         </sa_by_acocat>
      </ch_type>
      <ch_type type="B">
         <sa_by_acocat acocat="54">
            <sa ch="1">4.1424947</sa>
            <sa ch="2">10.149836</sa>
            <sa ch="3">7.9149327</sa>
            <sa ch="4">5.5000014</sa>
            <sa ch="5">7.21047</sa>
            <sa ch="6">5.73566</sa>
            <sa ch="7">8.451172</sa>
            <sa ch="8">4.121539</sa>
            <sa ch="9">1.4932095</sa>
            <sa ch="10">1.9569955</sa>
         </sa_by_acocat>
      </ch_type>
   </frequency>
   <frequency freq="38000" tranceiver="2">
      <threshold>-82.0</threshold>
      <num_pel_ch>19</num_pel_ch>
      <min_bot_depth>173.83311</min_bot_depth>
      <max_bot_depth>188.87947</max_bot_depth>
      <upper_interpret_depth>10.0</upper_interpret_depth>
      <lower_interpret_depth>190.0</lower_interpret_depth>
      <upper_integrator_depth>15.0</upper_integrator_depth>
      <lower_integrator_depth>190.0</lower_integrator_depth>
      <quality>3.0</quality>
      <bubble_corr>1.0</bubble_corr>
      <ch_type type="P">
         <sa_by_acocat acocat="54">
            <sa ch="2">2.820259</sa>
            ...
         </sa_by_acocat>
      </ch_type>
      <ch_type type="B">
         ...
      </ch_type>
   </frequency>
   <frequency freq="70000" tranceiver="3">
      ...
   </frequency>
   <frequency freq="120000" tranceiver="4">
      ...
   </frequency>
   <frequency ...>
      ...
   </frequency>
</distance>
<distance log_start="3198.0" start_time="2005-11-18 06:26:20">
   <stop_time>2005-11-18 06:31:54</stop_time>
   <integrator_dist>1.0</integrator_dist>
   <pel_ch_thickness>10.0</pel_ch_thickness>
   <bot_ch_thickness>1.0</bot_ch_thickness>
   <include_estimate>1</include_estimate>
   <lat_start>60.66341</lat_start>
   <lat_stop>todo</lat_stop>
   <lon_start>3.0676317</lon_start>
   <lon_stop>todo</lon_stop>
   <frequency freq=...>
      ...
   </frequency>
</distance>
<distance log_start="3198.9978" start_time="2005-11-18 06:31:54">
```

```
      <distance log_start= 3198.9978  start_time= 2005-11-18 00:31:54 >
         ...
      </distance>
      <distance log_start=...>
         ...
      </distance>
      <acocat_list>
         <acocat acocat="12" acocat="12">
            <purpose>2</purpose>
         </acocat>
         <acocat acocat="21" acocat="21">
            <purpose>1</purpose>
         </acocat>
         <acocat acocat="54" acocat="54">
            <purpose>2</purpose>
         </acocat>
      </acocat_list>
   </distance_list>
</echosounder_dataset>
```

Print format 21

(see example)

Example: ListUserFile21__L3198.1-3205.0.txt

```
RELATIVE FREQUENCY RESPONSE FOR SPECIES FIRST ON LIST
Nation: Norway(578);  Platform: G.O.Sars(4174);
Survey: Acoustic mackerel survey in the Norwegian Sea and North sea (2005114);

SPECIES     DATE     TIME  CH  dCH          sA38    r018    r038    r070    r120    r200
  MAKRE 20051118 06581006   0 10.0 001490.741577    1.23    1.00    0.59    1.74    3.65
  MAKRE 20051118 06581006  16 10.0 000178.783676    1.16    1.00    0.47    2.21    3.60
  MAKRE 20051118 06581006  17 10.0 000696.505981    1.31    1.00    0.62    1.80    3.91
  MAKRE 20051118 06581006  18 10.0 000582.495605    1.16    1.00    0.60    1.55    3.37
  MAKRE 20051118 06584606   0 10.0 007781.001465    1.32    1.00    0.64    1.57    3.42
  MAKRE 20051118 06584606  14 10.0 000038.046261    1.19    1.00    1.09    1.15    1.43
  MAKRE 20051118 06584606  15 10.0 000984.670227    0.93    1.00    0.60    1.57    4.05
  MAKRE 20051118 06584606  16 10.0 002309.793945    1.22    1.00    0.61    1.64    3.49
  MAKRE 20051118 06584606  17 10.0 002411.605957    1.37    1.00    0.60    1.55    3.33
  MAKRE 20051118 06584606  18 10.0 001665.804810    1.58    1.00    0.75    1.59    3.29
  MAKRE 20051118 06592706   0 10.0 016382.260742    1.36    1.00    0.80    1.32    2.52
  MAKRE 20051118 06592706  14 10.0 001029.219849    1.05    1.00    0.57    1.79    3.97
  MAKRE 20051118 06592706  15 10.0 002284.780029    1.47    1.00    0.78    1.83    4.04
  MAKRE 20051118 06592706  16 10.0 002734.623047    1.48    1.00    0.91    1.46    3.19
  MAKRE 20051118 06592706  17 10.0 005953.727051    1.34    1.00    0.85    1.13    1.86
  MAKRE 20051118 06592706  18 10.0 003770.844482    1.33    1.00    0.74    1.10    1.77
  MAKRE 20051118 06592706  19 10.0 000598.735107    1.31    1.00    0.72    1.23    2.34
```

Print format 22

(see example)

Example: ListUserFile22__L999888768.0-0.0.txt

```
% Lines starting with % are comments
% The format of and definitions in this file may change in future versions of LSSS, last chan
% Export time: Tue Oct 30 14:18:31 CET 2012, LSSS version 2.3.0
%
% Relative frequency response for species first on list
% Nation: Norway(578);  Platform: G.O.Sars(4174);
% Survey: MACKEREL2005 (2005114);
%
% Species[-],Date[yyyymmdd],Time[hhmmssxx],Ch[#],dCh[#],sA38[m2/nmi2],r018[-],r038[-],r070[-],
Species,Date,Time,Ch,dCh,sA38,r018,r038,r070,r120,r200
MACKE,20051118,06315406,0,225.0,726.096130,1.287,1.000,0.752,1.441,3.475
MACKE,20051118,06315406,11,10.0,1.093859,1.030,1.000,1.281,3.490,10.893
MACKE,20051118,06315406,12,10.0,48.467468,0.889,1.000,0.801,1.607,5.292
MACKE,20051118,06315406,13,10.0,241.868881,1.213,1.000,0.676,1.431,3.634
MACKE,20051118,06315406,14,10.0,275.624390,1.443,1.000,0.726,1.462,3.239
MACKE,20051118,06315406,15,10.0,102.189629,1.209,1.000,0.940,1.410,3.351
MACKE,20051118,06315406,16,10.0,55.125656,1.260,1.000,0.789,1.217,2.421
```

Print format 23

```
   (see example)
```

Example: ListUserFile23__L3199.0-3201.6_SCHOOL.txt

```
% Lines starting with % are comments
% The format of and definitions in this file may change in future versions of LSSS, last chan
% Export time: Wed Jul 16 11:10:38 CEST 2014, LSSS version 2.3.0
%
% Relative frequency response for species first on list
% Nation: Norway(578);  Platform: G.O.Sars(4174);
% Survey:  (2005114);
%
% Species[-],Date[yyyymmdd],Time[hhmmssxx],Ch[#],dCh[#],sA38[m2/nmi2],r018[-],r038[-],r070[-],
Species,Date,Time,Ch,dCh,sA38,r018,r038,r070,r120,r200,r364
MACKE,20051118,06340006,59,2.0,0.132725,17.480,1.000,1.351,20.629,18.654,15.520
MACKE,20051118,06340006,60,2.0,63.658890,0.544,1.000,0.708,1.192,4.845,2.720
MACKE,20051118,06340006,61,2.0,185.237289,0.842,1.000,0.329,1.408,2.956,1.484
MACKE,20051118,06340006,62,2.0,221.067673,1.127,1.000,0.365,1.097,3.189,1.921
MACKE,20051118,06340006,63,2.0,154.936142,2.167,1.000,0.633,1.259,3.029,1.444
MACKE,20051118,06340006,64,2.0,76.636337,3.997,1.000,0.955,2.036,3.079,1.296
MACKE,20051118,06340006,65,2.0,43.216690,1.771,1.000,0.790,3.121,6.050,1.152
MACKE,20051118,06341306,57,2.0,27.320374,0.509,1.000,1.449,0.866,9.824,5.307
MACKE,20051118,06341306,58,2.0,69.640884,0.802,1.000,0.486,1.102,7.107,3.891
MACKE,20051118,06341306,59,2.0,167.044632,0.653,1.000,0.684,1.252,5.956,2.939
MACKE,20051118,06341306,60,2.0,305.711823,0.668,1.000,0.633,1.454,4.803,2.898
MACKE,20051118,06341306,61,2.0,724.720032,1.013,1.000,0.653,1.238,2.874,1.901
MACKE,20051118,06341306,62,2.0,636.544739,2.421,1.000,0.673,1.812,2.799,1.689
MACKE,20051118,06341306,63,2.0,824.960327,1.389,1.000,0.763,1.299,4.441,1.436
MACKE,20051118,06341306,64,2.0,674.545227,1.740,1.000,1.112,1.109,4.211,2.345
MACKE,20051118,06341306,65,2.0,996.906433,1.272,1.000,0.393,0.989,3.444,1.160
MACKE,20051118,06341306,66,2.0,1203.183838,0.888,1.000,0.447,1.308,1.858,0.911
MACKE,20051118,06341306,67,2.0,1110.959595,2.358,1.000,0.372,1.325,2.670,1.573
MACKE,20051118,06341306,68,2.0,902.212402,2.230,1.000,0.704,1.445,2.357,1.465
MACKE,20051118,06341306,69,2.0,1182.017212,1.074,1.000,0.644,1.584,3.373,1.012
   ...
```

Print format 24

```
   (see example)
```

Example: ListUserFile24__L3199.0-3201.6_SCHOOL.txt

```
% Lines starting with % are comments
% The format of and definitions in this file may change in future versions of LSSS, last chan
% Export time: Wed Jul 16 11:10:38 CEST 2014, LSSS version 2.3.0
%
% Nautical Area Scattering Coefficient (Area backscattering coefficient - sA) for species fir
% Nation: Norway(578);  Platform: G.O.Sars(4174);
% Survey:  (2005114);
% Scatter type: SCHOOL(3000);
%
% Species[-],Object[-],Date[yyyymmdd],Time[hhmmssxx],Threshold[dB],Ch[#],dCh[#],sa018[m2/nmi2
Species,Object,Date,Time,Threshold,Ch,dCh,sa018,sa038,sa070,sa120,sa200,sa364
MACKE,20,20051118,06340006,-82.000,59,2.0,2.320,0.133,0.179,2.738,2.476,2.060
MACKE,20,20051118,06340006,-82.000,60,2.0,34.650,63.659,45.045,75.888,308.433,173.138
MACKE,20,20051118,06340006,-82.000,61,2.0,155.978,185.237,61.010,260.739,547.603,274.941
MACKE,20,20051118,06340006,-82.000,62,2.0,249.228,221.068,80.631,242.534,704.973,424.775
MACKE,20,20051118,06340006,-82.000,63,2.0,335.756,154.936,98.085,195.080,469.372,223.746
MACKE,20,20051118,06340006,-82.000,64,2.0,306.336,76.636,73.217,156.020,235.990,99.344
MACKE,20,20051118,06340006,-82.000,65,2.0,76.529,43.217,34.160,134.868,261.445,49.800
MACKE,20,20051118,06341306,-82.000,57,2.0,13.913,27.320,39.587,23.647,268.404,144.984
MACKE,20,20051118,06341306,-82.000,58,2.0,55.883,69.641,33.876,76.761,494.969,270.998
MACKE,20,20051118,06341306,-82.000,59,2.0,109.143,167.045,114.294,209.104,994.836,491.019
MACKE,20,20051118,06341306,-82.000,60,2.0,204.180,305.712,193.459,444.561,1468.425,886.104
MACKE,20,20051118,06341306,-82.000,61,2.0,734.483,724.720,473.555,897.018,2082.553,1378.042
MACKE,20,20051118,06341306,-82.000,62,2.0,1541.346,636.545,428.300,1153.552,1781.837,1075.328
MACKE,20,20051118,06341306,-82.000,63,2.0,1145.573,824.960,629.367,1071.816,3663.388,1184.466
MACKE,20,20051118,06341306,-82.000,64,2.0,1173.830,674.545,749.858,747.857,2840.445,1582.139
MACKE,20,20051118,06341306,-82.000,65,2.0,1267.728,996.906,391.734,985.963,3433.482,1156.723
MACKE,20,20051118,06341306,-82.000,66,2.0,1068.319,1203.184,537.628,1573.807,2235.468,1095.91
MACKE,20,20051118,06341306,-82.000,67,2.0,2619.738,1110.960,413.007,1471.909,2966.537,1747.44
MACKE,20,20051118,06341306,-82.000,68,2.0,2011.519,902.212,634.922,1303.409,2126.148,1321.607
MACKE,20,20051118,06341306,-82.000,69,2.0,1269.807,1182.017,760.736,1871.926,3986.393,1195.72
MACKE,20,20051118,06341306,-82.000,70,2.0,1232.428,867.654,824.211,1331.342,4731.134,1532.500
MACKE,20,20051118,06341306,-82.000,71,2.0,1255.538,562.578,406.719,852.456,2328.134,547.030
MACKE,11,20051118,06341906,-82.000,59,2.0,39.093,9.844,9.793,30.716,61.794,53.701
MACKE,11,20051118,06341906,-82.000,60,2.0,78.987,45.299,69.424,43.180,165.049,100.745
MACKE,11,20051118,06341906,-82.000,61,2.0,199.109,107.659,57.569,74.901,256.755,254.048
MACKE,11,20051118,06341906,-82.000,62,2.0,96.104,89.417,253.521,245.986,433.700,183.920
MACKE,11,20051118,06341906,-82.000,63,2.0,156.047,278.634,236.816,308.673,757.587,252.076
   ...
```

Print format 30

Printed in native resolution only. See example below for description of print format.

Example(1): ListUserFile30__F038000_T2_L3198.1-3199.4__SCHOOL.txt

```
% Lines starting with % are comments
% The format of and definitions in this file may change in future versions of LSSS, last chan
% Export time: Tue Oct 30 14:18:30 CET 2012, LSSS version 2.3.0
%
% Compact printout sorted by object-number. A school is an object, and also the echogram visi
% Nation: Norway(578);  Platform: G.O.Sars(4174);
% Survey: MACKEREL2005 (2005114);
% Description: Acoustic investigations of mackerel in the North Sea;
% Frequency: 38000[Hz];  Transceiver: 2[-];
%
% Object[-],Date[yyyymmdd],Time[hhmmssxx],StartLog[nmi],StopLog[nmi],Latitude[deg],Longitude[
Object,Date,Time,StartLog,StopLog,Latitude,Longitude,Depth,MACKE,HERR,Pe/La,OTHER,PLANK,Total
61,20051118,6335006,3199.35010,3199.40015,60.66367,3.11337,211.66,347.46,0.00,0.00,0.00,0.00,
61,20051118,6340706,3199.39990,3199.44995,60.66369,3.11508,212.52,7170.29,0.00,0.00,0.00,0.00,
62,20051118,6353206,3199.64990,3199.69995,60.66378,3.12357,217.13,465.03,0.00,0.00,0.00,0.00,
62,20051118,6354806,3199.69702,3199.74707,60.66380,3.12517,216.33,6190.70,0.00,0.00,0.00,0.00,
63,20051118,6271006,3198.14990,3198.19995,60.66347,3.07269,191.13,0.00,228.60,0.00,0.00,0.00,
63,20051118,6272706,3198.19995,3198.25000,60.66348,3.07439,191.81,0.00,20688.93,0.00,0.00,0.0
63,20051118,6274306,3198.24707,3198.29712,60.66349,3.07601,192.80,0.00,27367.08,0.00,0.00,0.0
63,20051118,6280106,3198.30005,3198.35010,60.66351,3.07784,194.03,0.00,10868.07,0.00,0.00,0.0
63,20051118,6281706,3198.35010,3198.40015,60.66352,3.07946,194.95,0.00,5633.10,0.00,0.00,0.00,
63,20051118,6283406,3198.39746,3198.44751,60.66354,3.08118,195.29,0.00,4038.08,0.00,0.00,0.00,
63,20051118,6285106,3198.44995,3198.50000,60.66357,3.08291,195.77,0.00,4272.90,0.00,0.00,0.00,
63,20051118,6290706,3198.50000,3198.55005,60.66356,3.08455,197.38,0.00,10775.00,0.00,0.00,0.0
63,20051118,6292406,3198.54858,3198.59863,60.66357,3.08627,198.81,0.00,11825.12,0.00,0.00,0.0
63,20051118,6294106,3198.60010,3198.65015,60.66359,3.08801,198.53,0.00,2653.61,0.00,0.00,0.00,
64,20051118,6324306,3199.14844,3199.19849,60.66369,3.10656,208.05,0.00,8437.97,0.00,0.00,0.00,
64,20051118,6330006,3199.19995,3199.25000,60.66368,3.10831,209.05,0.00,18611.03,0.00,0.00,0.0
64,20051118,6331706,3199.25000,3199.30005,60.66371,3.11004,209.97,0.00,20000.58,0.00,0.00,0.0
64,20051118,6333306,3199.29736,3199.34741,60.66370,3.11166,211.05,0.00,145505.56,0.00,0.00,0.0
64,20051118,6335006,3199.35010,3199.40015,60.66367,3.11337,211.66,0.00,7706.23,0.00,0.00,0.00,
```

Example(2): ListUserFile30__F200000_T5_L3198.1-3199.4__SCHOOL.txt

```
% Lines starting with % are comments
% The format of and definitions in this file may change in future versions of LSSS, last chan
% Export time: Tue Oct 30 14:18:31 CET 2012, LSSS version 2.3.0
%
% Compact printout sorted by object-number. A school is an object, and also the echogram visi
% Nation: Norway(578);  Platform: G.O.Sars(4174);
% Survey: MACKEREL2005 (2005114);
% Description: Acoustic investigations of mackerel in the North Sea;
% Frequency: 200000[Hz];  Transceiver: 5[-];
%
% Object[-],Date[yyyymmdd],Time[hhmmssxx],StartLog[nmi],StopLog[nmi],Latitude[deg],Longitude[
Object,Date,Time,StartLog,StopLog,Latitude,Longitude,Depth,MACKE,HERR,Pe/La,OTHER,PLANK,Total
61,20051118,6335006,3199.35010,3199.40015,60.66367,3.11337,211.66,1357.83,0.00,0.00,0.00,0.00,
61,20051118,6340706,3199.39990,3199.44995,60.66369,3.11508,212.52,22855.18,0.00,0.00,0.00,0.0
62,20051118,6353206,3199.64990,3199.69995,60.66378,3.12357,217.13,2166.80,0.00,0.00,0.00,0.00,
62,20051118,6354806,3199.69702,3199.74707,60.66380,3.12517,216.33,22823.38,0.00,0.00,0.00,0.0
63,20051118,6271006,3198.14990,3198.19995,60.66347,3.07269,191.13,0.00,146.95,0.00,0.00,0.00,
63,20051118,6272706,3198.19995,3198.25000,60.66348,3.07439,191.81,0.00,9162.43,0.00,0.00,0.00,
63,20051118,6274306,3198.24707,3198.29712,60.66349,3.07601,192.80,0.00,12592.55,0.00,0.00,0.0
63,20051118,6280106,3198.30005,3198.35010,60.66351,3.07784,194.03,0.00,4403.77,0.00,0.00,0.00,
63,20051118,6281706,3198.35010,3198.40015,60.66352,3.07946,194.95,0.00,2475.70,0.00,0.00,0.00,
63,20051118,6283406,3198.39746,3198.44751,60.66354,3.08118,195.29,0.00,1730.74,0.00,0.00,0.00,
63,20051118,6285106,3198.44995,3198.50000,60.66357,3.08291,195.77,0.00,1922.91,0.00,0.00,0.00,
63,20051118,6290706,3198.50000,3198.55005,60.66356,3.08455,197.38,0.00,4391.66,0.00,0.00,0.00,
63,20051118,6292406,3198.54858,3198.59863,60.66357,3.08627,198.81,0.00,4845.13,0.00,0.00,0.00,
63,20051118,6294106,3198.60010,3198.65015,60.66359,3.08801,198.53,0.00,1152.91,0.00,0.00,0.00,
64,20051118,6324306,3199.14844,3199.19849,60.66369,3.10656,208.05,0.00,7701.72,0.00,0.00,0.00,
64,20051118,6330006,3199.19995,3199.25000,60.66368,3.10831,209.05,0.00,18424.60,0.00,0.00,0.0
64,20051118,6331706,3199.25000,3199.30005,60.66371,3.11004,209.97,0.00,17378.00,0.00,0.00,0.0
64,20051118,6333306,3199.29736,3199.34741,60.66370,3.11166,211.05,0.00,58701.35,0.00,0.00,0.0
64,20051118,6335006,3199.35010,3199.40015,60.66367,3.11337,211.66,0.00,5063.31,0.00,0.00,0.00,
```

Print format 31

Printed in native resolution only. See example below for description of print format.

Example: ListUserFile31__F038000_T2_L3198.4-3198.6_MACKE_SCHOOL.txt

```
% Lines starting with % are comments
% The format of and definitions in this file may change in future versions of LSSS, last chan
% Export time: Fri Nov 02 16:26:33 CET 2012, LSSS version 2.3.0
%
% Compact printout sorted by object-number. A school is an object, and also the echogram visi
% Nation: Norway(578);  Platform: G.O.Sars(4174);
% Survey: MACKEREL2005 (2005114);
% Description: Acoustic investigations of mackerel in the North Sea;
% Frequency: 18000[Hz];  Transceiver: 1[-];
%
% Survey[-],Nation[-],Platform[-],Object[-],Date[yyyymmdd],Time[hhmmssxx],StartLog[nmi],StopL
% ChannelThickness[m],MaxPelagicChannel[-],sA_Ch0,sA_Ch1,sA_Ch2,...
% ChannelThickness[m],MaxBottomChannel[-],sA_Ch0,sA_Ch1,sA_Ch2,...
2005114,578,4174,61,20051118,6335006,3199.35010,3199.40015,60.66367,3.11337,211.214,212.106,18
5.000,27,543.685,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0
0.000,0,0.000
2005114,578,4174,61,20051118,6340706,3199.39990,3199.44995,60.66369,3.11508,212.020,213.022,18
5.000,29,9480.824,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0
0.000,0,0.000
2005114,578,4174,62,20051118,6353206,3199.64990,3199.69995,60.66378,3.12357,216.722,217.537,18
5.000,26,568.802,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0
0.000,0,0.000
2005114,578,4174,62,20051118,6354806,3199.69702,3199.74707,60.66380,3.12517,215.798,216.869,18
5.000,33,7664.604,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0
0.000,0,0.000
2005114,578,4174,63,20051118,6271006,3198.14990,3198.19995,60.66347,3.07269,190.724,191.542,18
5.000,27,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.
0.000,0,0.000
2005114,578,4174,63,20051118,6272706,3198.19995,3198.25000,60.66348,3.07439,191.474,192.154,18
5.000,27,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.
0.000,0,0.000
2005114,578,4174,63,20051118,6274306,3198.24707,3198.29712,60.66349,3.07601,192.187,193.404,18
5.000,27,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.
0.000,0,0.000
2005114,578,4174,63,20051118,6280106,3198.30005,3198.35010,60.66351,3.07784,193.374,194.685,18
5.000,27,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.
0.000,0,0.000
2005114,578,4174,63,20051118,6281706,3198.35010,3198.40015,60.66352,3.07946,194.560,195.342,18
5.000,27,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.
0.000,0,0.000
2005114,578,4174,63,20051118,6283406,3198.39746,3198.44751,60.66354,3.08118,195.177,195.406,18
5.000,26,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.
0.000,0,0.000
2005114,578,4174,63,20051118,6285106,3198.44995,3198.50000,60.66357,3.08291,195.228,196.314,18
5.000,28,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.
0.000,0,0.000
2005114,578,4174,63,20051118,6290706,3198.50000,3198.55005,60.66356,3.08455,196.446,198.313,18
5.000,29,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.
0.000,0,0.000
2005114,578,4174,63,20051118,6292406,3198.54858,3198.59863,60.66357,3.08627,198.353,199.261,18
5.000,30,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.
0.000,0,0.000
2005114,578,4174,63,20051118,6294106,3198.60010,3198.65015,60.66359,3.08801,197.913,199.142,18
5.000,29,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.
0.000,0,0.000
```

Print format 40

Printed in native resolution only. See example below for description of print format.

Example: ListUserFile40_F38000_T2_PELAGIC.txt

```
% Lines starting with % are comments
% The format of and definitions in this file may change in future versions of LSSS, last chan
% Export time: Tue Jun 23 11:29:39 CEST 2015, LSSS version 2.3.0
%
% SHIP: G.O.Sars, NATION: Norway, SURVEY: 2005114, FREQUENCY: 38000 [Hz], TRANSCEIVER: 2
%

AcCat,sA_Tot,sA_Ch1,sA_Ch2,sA_Ch3,sA_Ch4,sA_Ch5,sA_Ch6,sA_Ch7,sA_Ch8,sA_Ch9,sA_Ch10,sA_Ch11,sA
BUNN,29569.297,0.000,11.634,12.584,6.597,5.627,7.934,11.114,13.206,16.530,17.798,134.139,1027
SILD,29569.297,0.000,11.634,12.584,6.597,5.627,7.934,11.114,13.206,16.530,17.798,134.139,1027
MAKRE,10033.944,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.011,2.027,31.655,99.0
La/Ly,18024.876,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,1.779,30.948,52.5
```

Related topics

Database
Observation
ObservationType
Scatter
ScatterType
ScatterData
ObservationType

Export

Many of the LSSS modules can export data. By selecting File->Export to files..., a dialog with all available exports pops up, and exporters can be selected/deselected and configured individually.

Common for all export types:

- Area exported:
  - The exported area is limited to the horizontally zoomed range.
  - Vertical zooming does not limit the exported area.
    (Except for exporting echosounder data with option 'Zoomed vertically' selected.)
  - The export is limited to selected regions.
    (Except for exporting echosounder data and Korona regions.)
- All pings are used, even if browse mode is currently active.
- The exported file names are of the form

  <Optional prefix><Export type>_T<Start time>-<Stop time>[_nn].<Suffix>

  where start time and stop time are on the form YYYYMMDD_HHMMSSXX, and nn is a counter added to avoid overwriting existing files.
- If the export is done on preprocessed data, then the module setup is also saved.
- The format and content of the exported files may change in future version of LSSS.

Echogram plot

Exports the variables selected by the Echogram plot module.

Echosounder data

Exports the horizontally visible echosounder data to raw files. Selected regions do not limit what is exported.

Options:

- Zoomed vertically: When selected then
  - Only the vertical extent visible in the pelagic echogram is exported.
  - Only RAW0 datagrams are exported.

Korona regions

Exports regions detected by the RegionModule in Korona. Only the regions completely contained in the horizontally visible range are exported. Selected regions do not limit what is exported.

School parameters

Exports school parameters for the selected schools.

Tracks

Exports tracks detected by the KORONA tracking module. Only tracks completely contained in the selected regions are exported.

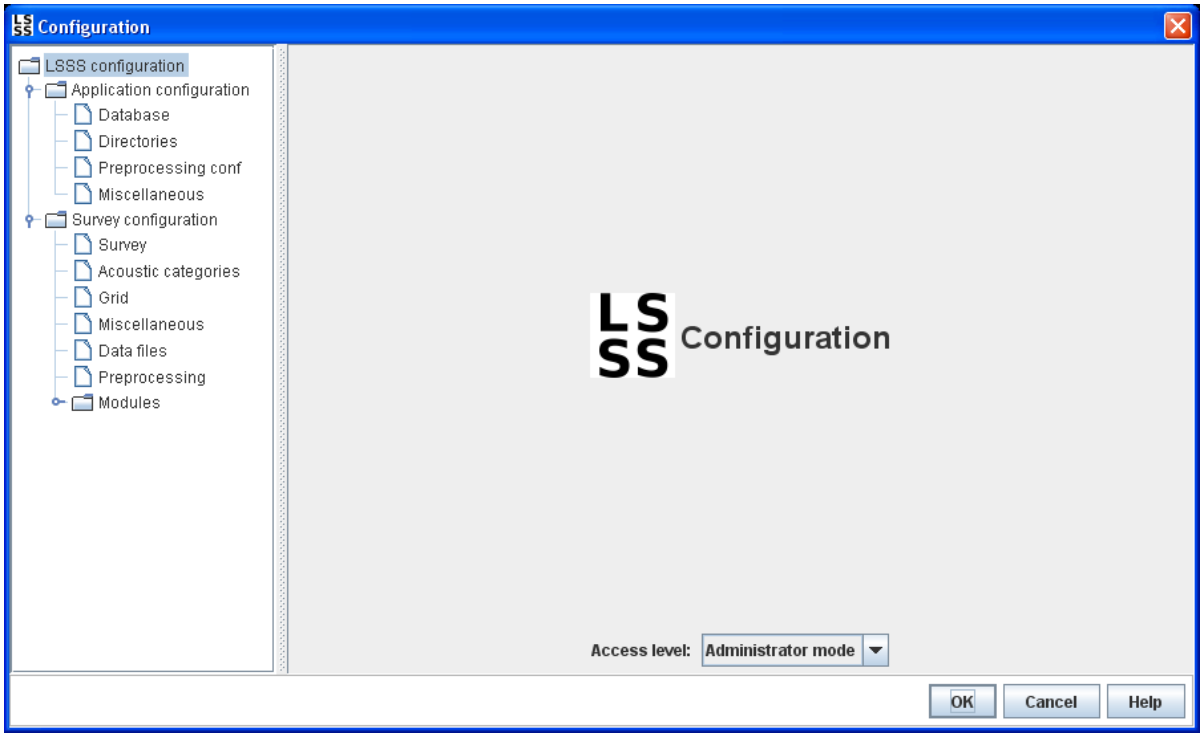
TS

Exports TS targets detected by TS module in the selected regions.

Configuration

This section explains the different elements of the LSSS configuration. The configuration is organized in two parts:

- Application configuration - Common for all surveys.
- Survey configuration - Specific for each survey.

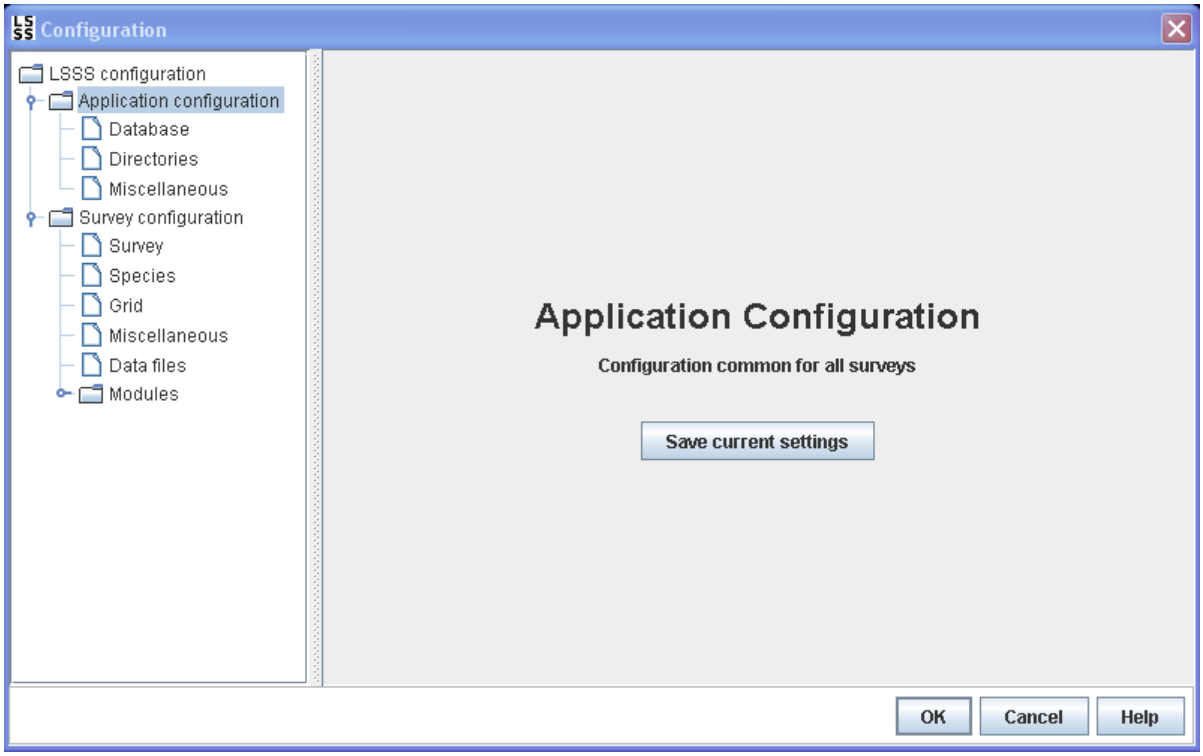


On the top level of the LSSS configuration, the user can set the access level of the configuration mode:

- **Normal use:** Only settings required for doing interpretation within a survey can be changed.
- **Survey setup:** The settings required for defining a new survey can be changed.
- **Administrator mode:** All settings can be changed.

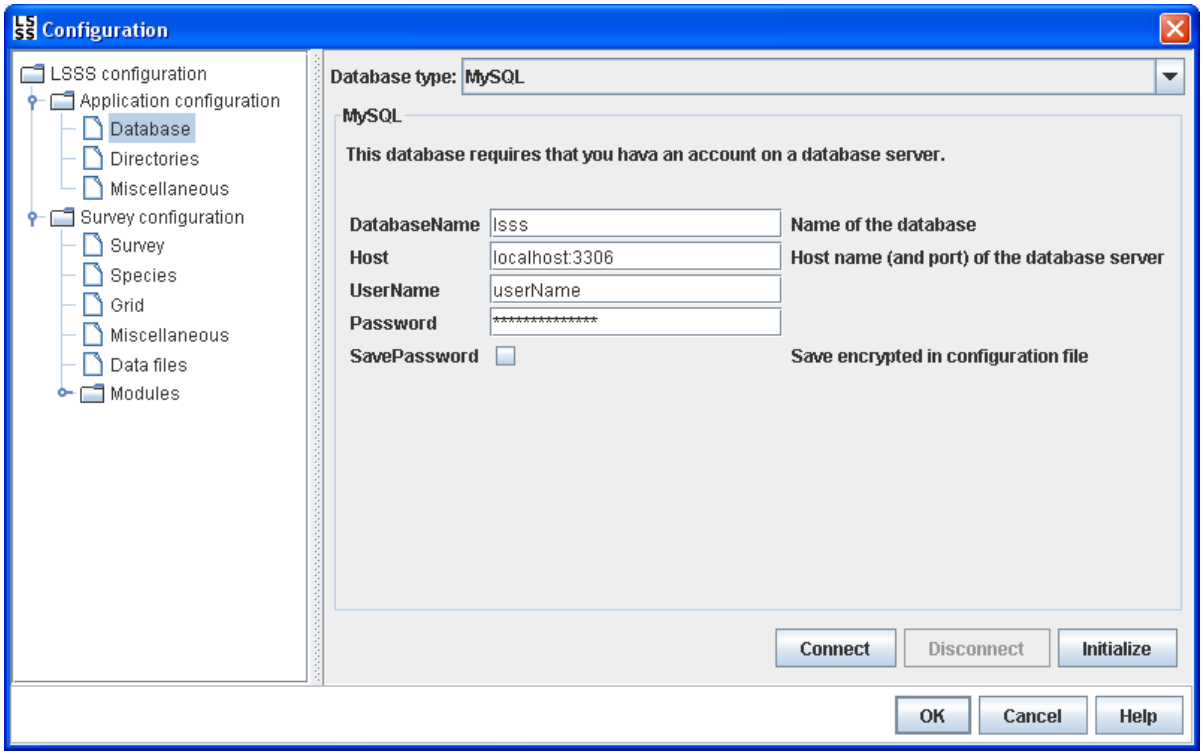
The point of the division into three modes is to prevent an operator from accidentally changing important settings in the application. By using the tree modes, such changes become a conscious choice.

Application configuration



The application configuration is common for all surveys. This configuration is stored in one file that is shared across all surveys. The current settings are stored to that file when storing a survey, and can also be saved from the application configuration main tab.

Database



Before LSSS can be used for setting up a new survey, the database connection must be configured. This is

done in the following steps:

1. Select one of the supplied database types.
2. Configure the relevant parameters for the selected database.
3. Press the "Connect" button to connect to an existing database or press the "Initialize" button to initialize a database. Note that initializing a database will delete all existing data.

Most database types require access to an account on an external database server. This is the case for the database types Firebird and PostgreSQL. It may also be required, depending on account privileges, that the database is already created on the database server.

The databases HSQLDB and Java DB do not require any additional installation. The content of HSQLDB is stored in files (text or binary), and kept in memory while in use. This means that it is suitable only for relatively small databases.
Java DB stores data to binary files. It has no limitations on the size of the database.

Generic database connection

This option enables the use of any database with a JDBC connection and a Hibernate SQL dialect implementation. No guarantees are given about the interoperability between any particular such database and LSSS.

To use this option first do this:

1. Download the jar file containing the JDBC driver from the database vendor.
2. Place the jar file in the directory `[LSSS installation]/korona/lib/jar`
3. Restart LSSS.

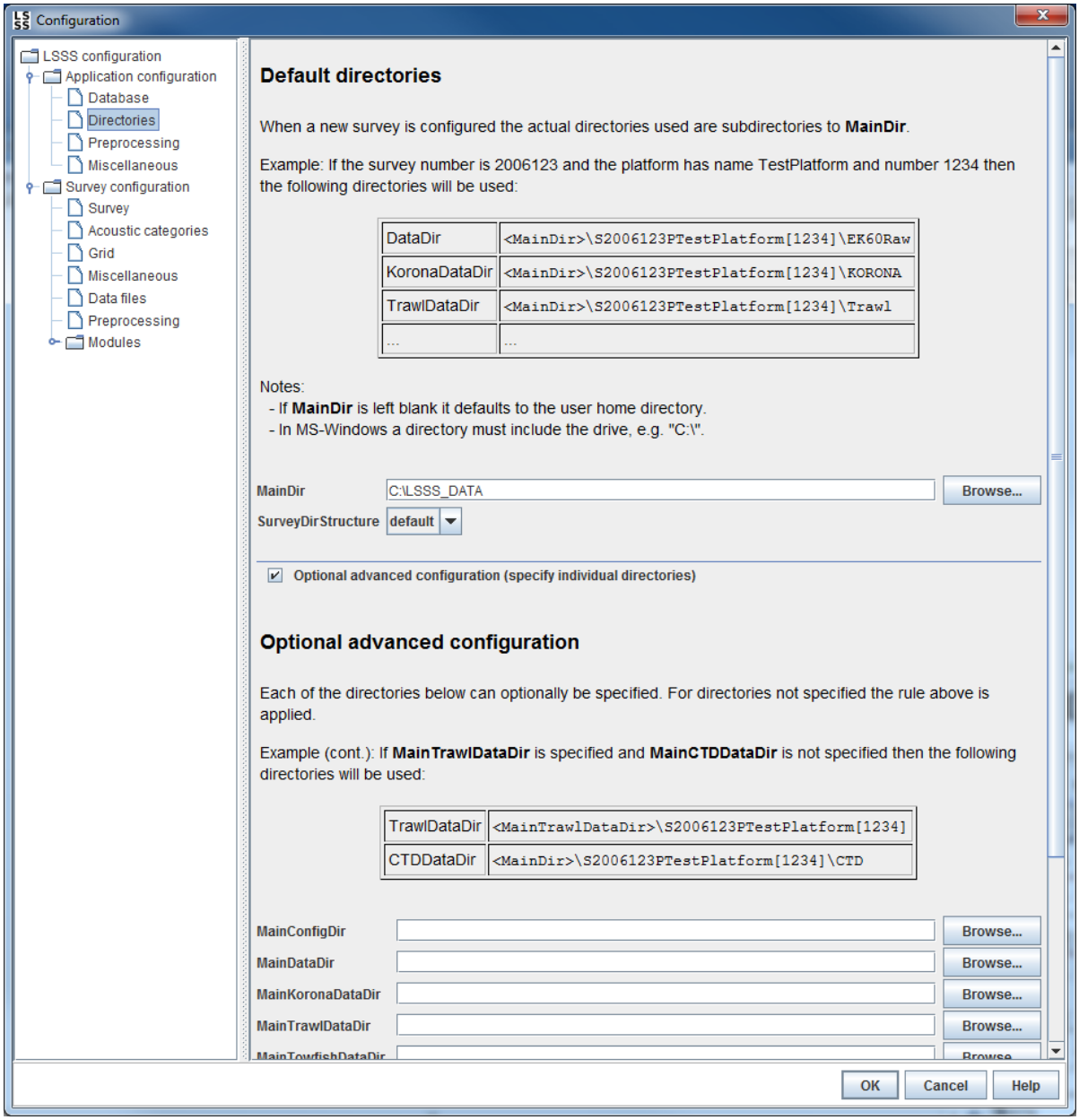
Then configure these parameters:

- **`JdbcDriver:`** The fully qualified class name of the JDBC driver.
- **`SqlDialect:`** The fully qualified class name of the Hibernate SQL dialect.
- **`ConnectionURL:`** The URL for connecting.
- **`UserName:`** The user name (if required).
- **`Password:`** The password (if required).

Example for the H2 Database Engine:

- JdbcDriver: `org.h2.Driver`
- SqlDialect: `org.hibernate.dialect.H2Dialect`
- ConnectionURL: `jdbc:h2:file:C:/data/test`

Directories



The main directories are meant to contain subdirectories for each survey. When a new survey is set up the actual directories used are subdirectories to the main directories. The names of the subdirectories are derived from survey and platform.

The naming scheme of the subdirectories uses the parameter SurveyDirStructure. The default naming scheme is given in the example below. Other naming schemes are defined in files in the directory [LSSS installation]/lsss/data/surveyDirStructure.

The directories derived from the main directories together with survey and platform are default values used when defining a new survey. These directories can later be changed in [Survey configuration - Data files].

Example:
- The MainDir is set to `C:\surveys` and the other directories are left blank.
- The SurveyDirStructure is set to default.
- The platform is called TestPlatform with id 1234.
- The survey id is 2006123.

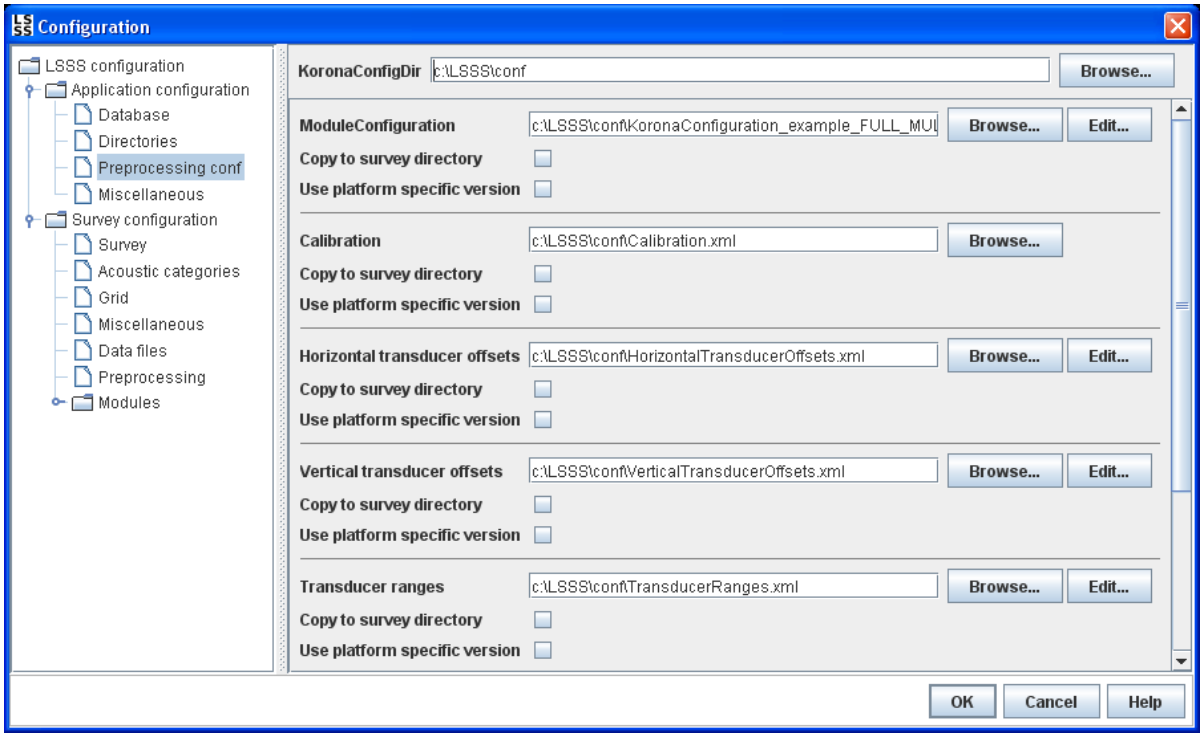
Then the survey directory will be `C:\surveys\S2006123PTestPlatform[1234]` and

`C:\surveys\S2006123PTestPlatform[1234]\lsss` - Survey configuration files
`C:\surveys\S2006123PTestPlatform[1234]\Raw` - Raw data files
`C:\surveys\S2006123PTestPlatform[1234]\KORONA` - Preprocessed raw data files
`C:\surveys\S2006123PTestPlatform[1234]\Trawl` - Trawl data files

`C:\surveys\S2006123PTestPlatform[1234]\Towfish` - Towfish data files
`C:\surveys\S2006123PTestPlatform[1234]\CTD` - CTD data files
`C:\surveys\S2006123PTestPlatform[1234]\RefLog` - Reference log files
`C:\surveys\S2006123PTestPlatform[1234]\FileDraw` - Files with geometrical shapes
`C:\surveys\S2006123PTestPlatform[1234]\Reports` - Generated reports
`C:\surveys\S2006123PTestPlatform[1234]\Work` - Work and snap files
`C:\surveys\S2006123PTestPlatform[1234]\Export` - Exported files

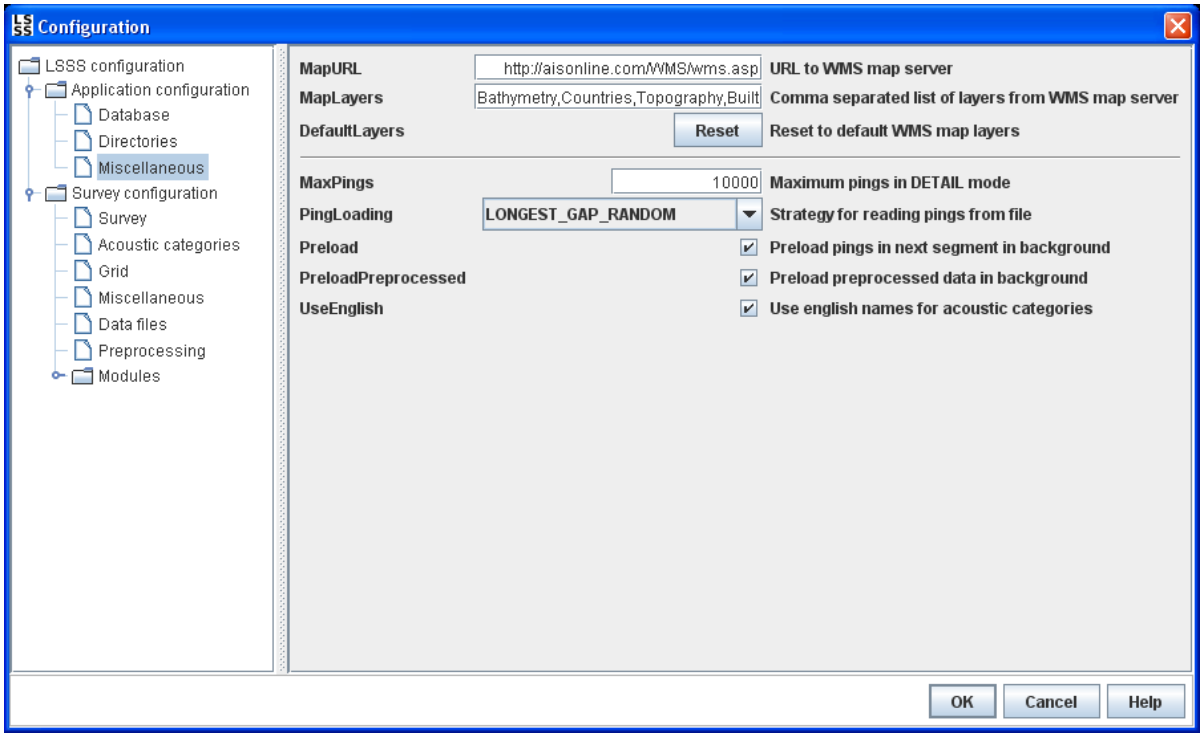
It is also possible to specify a default root directory for each of the data input types. If in the example above MainDataDir is set to `C:\data` then the directory for raw data files will be `C:\data\S2006123PTestPlatform[1234]`.

Preprocessing



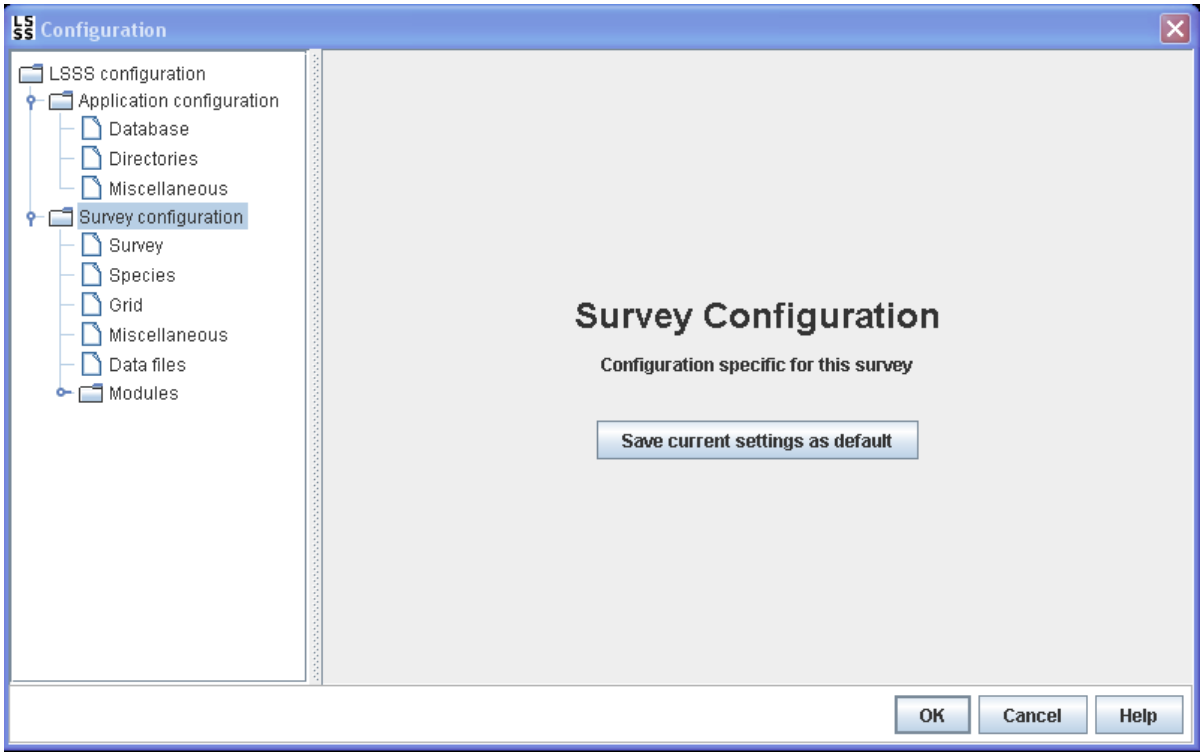
This dialog shows the paths to the default set of config files for the preprocessing. These files are intended as reference config files, and can be copied to the survey directory for use with the survey when a new survey is created. See Preprocessing for more information on the use of these files.

Miscellaneous



- **MapURL:** The Map WMS URL is used by the map view to produce the background map image. Example: `http://aisonline.com/WMS/wms.asp`.
- **MapLayers:** The layers requested from **MapURL**. This should be a comma-separated list of identifiers.
- **DefaultLayers:** Reset **MapLayers** to its default value.
- **MaxPings:** The maximum number of pings that will be read in DETAIL mode.
- **PingLoading:** The strategy for how pings should be read from file:
  - LEFT_TO_RIGHT: The pings are read from left to right. Arguably the fastest way to read the pings, but the user will have to wait a while before an impression of the echogram appears.
  - RANDOM: The pings are read in a completely random sequence.
  - LONGEST_GAP_LEFT_TO_RIGHT: The pings are read so that the longest gap in the echogram is filled first. The gaps of equal length are ordered from left to right.
  - LONGEST_GAP_RANDOM: The pings are read so that the longest gap in the echogram is filled first. The gaps of equal length are ordered randomly.
- **Preload:** If checked the system will preload pings in the next segment in the background.
- **PreloadPreprocessed:** If checked the system will preload pings from the preprocessed data files in the background if available. This preloading will be started after preloading the next segment is completed. If the preprocessed data is activated then the original data will be preloaded.
- **UseEnglish** If checked, English initials and names are used for acoustic categories in LSSS. Otherwise, the native initials and names are used. This setting also affects the naming of acoustic categories in the reports.

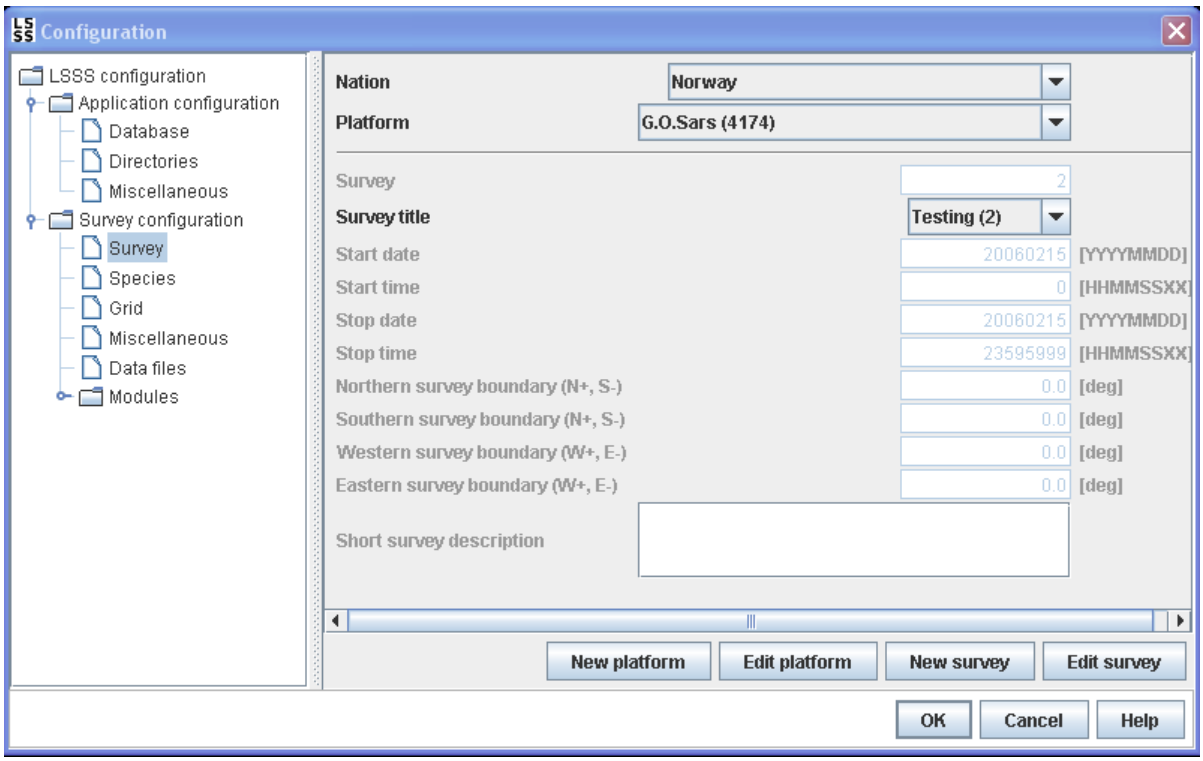
Survey configuration



The configuration for each survey is stored in a separate file with extension lsss. The location of this file is selected when setting up a new survey.

From the main tab for the survey configuration, the current settings can also be saved as default settings.

Survey



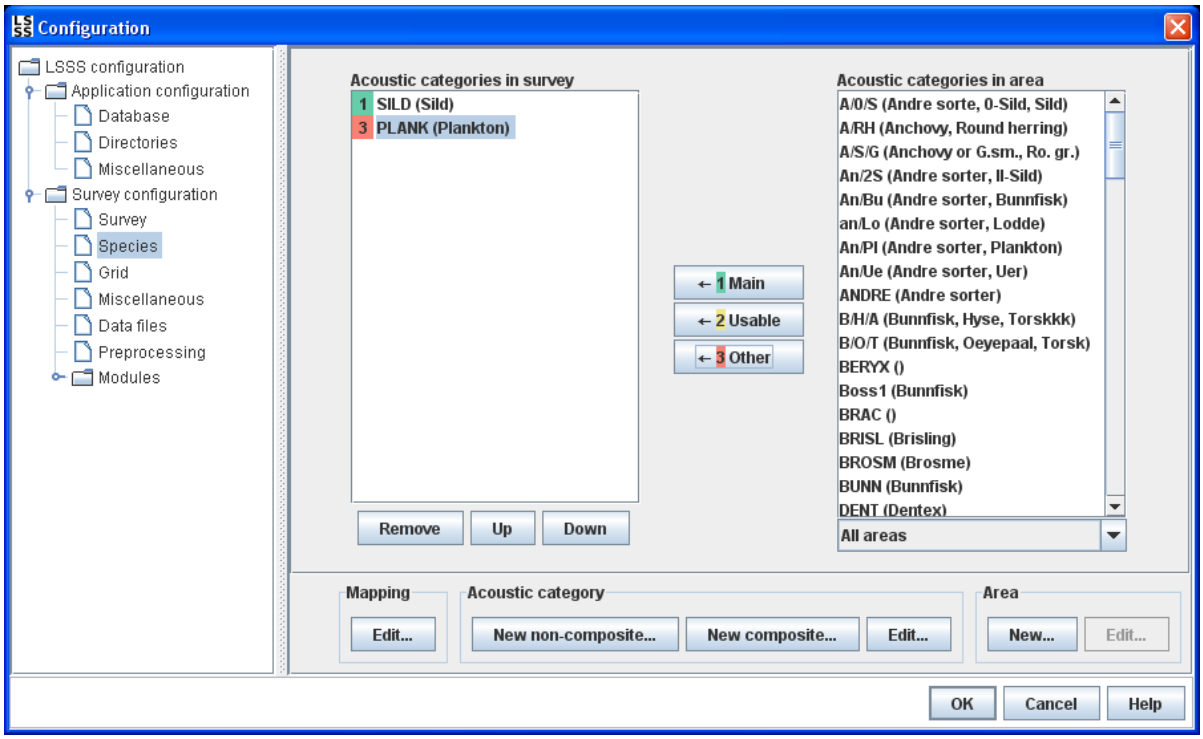
In this panel, the parameters for the current survey can be adjusted, or a new survey can be created.

When creating a new survey, all parameters except the survey title are optional. The parameters are there for later searches in the database, so it is recommended to use some reasonable values where possible.

- **Nation:** Select the nation from a list.
- **Platform:** After selecting nation, select the platform (ship or stationary platform) from a list. If the platform does not exist, it can be created with the **New platform** button.
- **Survey:** The survey number. The number must be unique, since it is used as a key in the database together with Nation and Platform. When creating a new survey, an available number in the database will be selected by default.
- **Start date (UTC):** The start date of the survey. Today's date will be chosen by default.
- **Start time (UTC):** The start time of the survey. 00:00 will be chosen by default.
- **End date (UTC):** The end date of the survey. Today's date will be chosen by default.
- **End time (UTC):** The end time of the survey. 23:59 will be chosen by default.
- **Northern survey boundary:** The (approximate) northern boundary of the survey.
- **Southern survey boundary:** The (approximate) southern boundary of the survey.
- **Western survey boundary:** The (approximate) western boundary of the survey.
- **Eastern survey boundary:** The (approximate) eastern boundary of the survey.
- **Short survey description:** A short description of the survey.

The start and end times can optionally specify seconds (using format HH:MM:SS) or even hundreds of a second (using format HH:MM:SS:XX).

Acoustic categories



Select which acoustic categories to interpret in the survey from a list of available acoustic categories. By selecting an area in the combo box, only the acoustic categories associated to that area are shown in the list to the right.

Use the buttons 1, 2 or 3 to add one or more acoustic categories. A selected category can have one of three different statuses in the interpretation:

1: Use the species as a *main category* if one of the main purposes of this survey is to interpret this acoustic category.
2: Use the species as a *usable category* if it is an interesting category, but not the main focus of this survey.

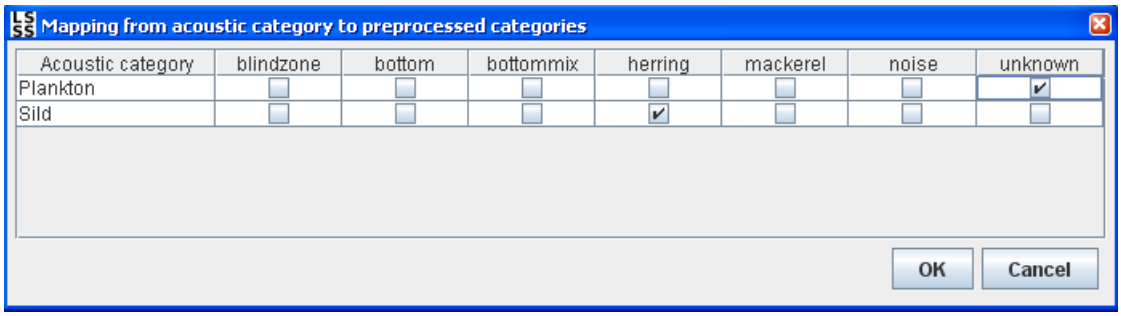
3: Use the species as a *fill category* if it is known to exist in the survey, but is primarily used for assigning the rest of the s_A.

The selected acoustic categories will appear in the same order in the interpretation module.

Buttons

- **Mapping**
  - Edit... - opens a dialog for setting a mapping between the selected acoustic categories and preprocessed categories.
- **Acoustic category**
  - New non-composite... - opens a dialog for creating a new non-composite acoustic category. This is a category either associated to one biological species or not associated to any species.
  - New composite... - opens a dialog for creating a new composite acoustic category. This is a category consisting of other acoustic categories.
  - Edit... - opens a dialog for editing an acoustic category selected from the right hand list of acoustic categories.
- **Area**
  - New... - opens a dialog for creating a new area.
  - Edit... - opens a dialog for editing the currently selected area.

Mapping from acoustic category to preprocessed categories

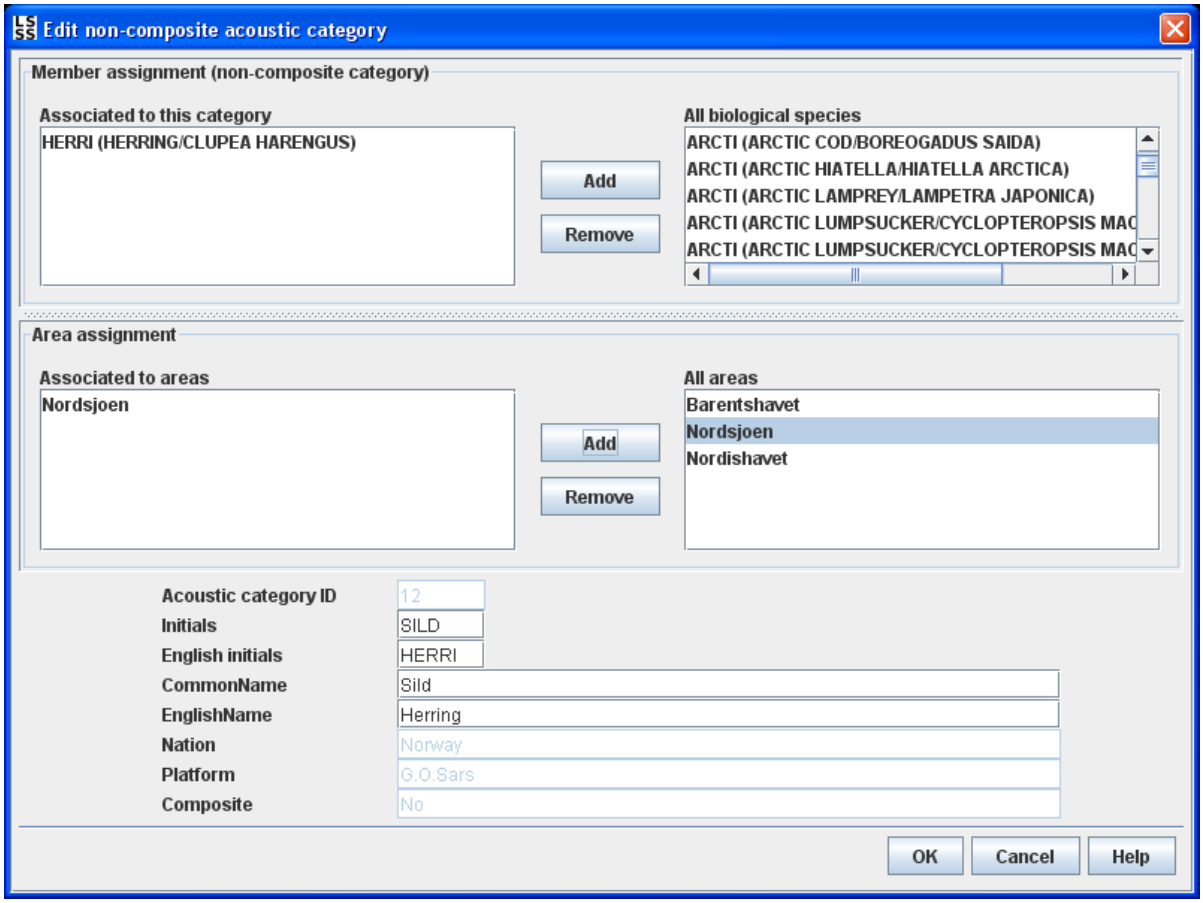


This dialog can be used to configure a relationship between acoustic categories and preprocessed categories. For each acoustic category, the user can select which preprocessed categories correspond to the acoustic category by checking the boxes in the table.

To use this dialog, the preprocessing must have been performed or a configuration file with categorization or plankton categorization must have been configured in the preprocessing panel. If not, no categories will appear as columns in the dialog.

The relationship can be used for faster interpretation in the interpretation module.

Create or edit acoustic category



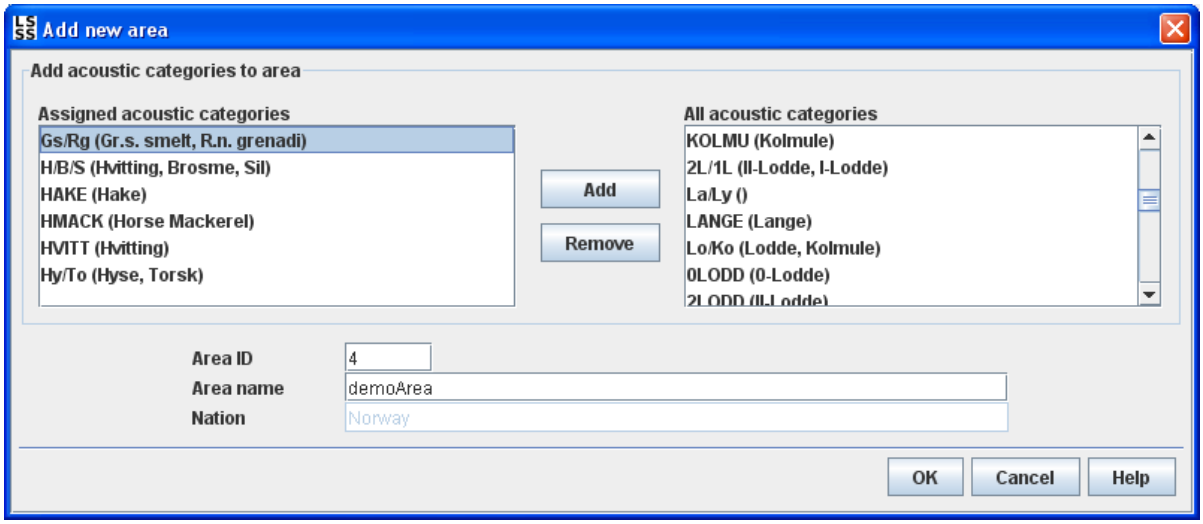
This dialog is used for creating a new or editing an existing acoustic category.
The upper section of the dialog lets the user decide the contents of an acoustic category. The right list shows the available elements, while the left list shows the elements that the category is currently composed from. If the user is creating or editing a non-composite category, a list of biological species will be displayed in the list to the right. In case of editing or creating a composite category, the list to the right will show all acoustic categories.

The middle part of the dialog lets the user associate the acoustic category to one or more areas.

The user can define native and English initials as well as native and English names for each category. In the case of a new category, the user can also decide the ID, although the first available ID is suggested. If the user tries to create a category with an ID that is already in use, an error message will appear.

The category is stored in the database when the user pushes the OK button. An acoustic category is always associated to a platform.

Create or edit an area

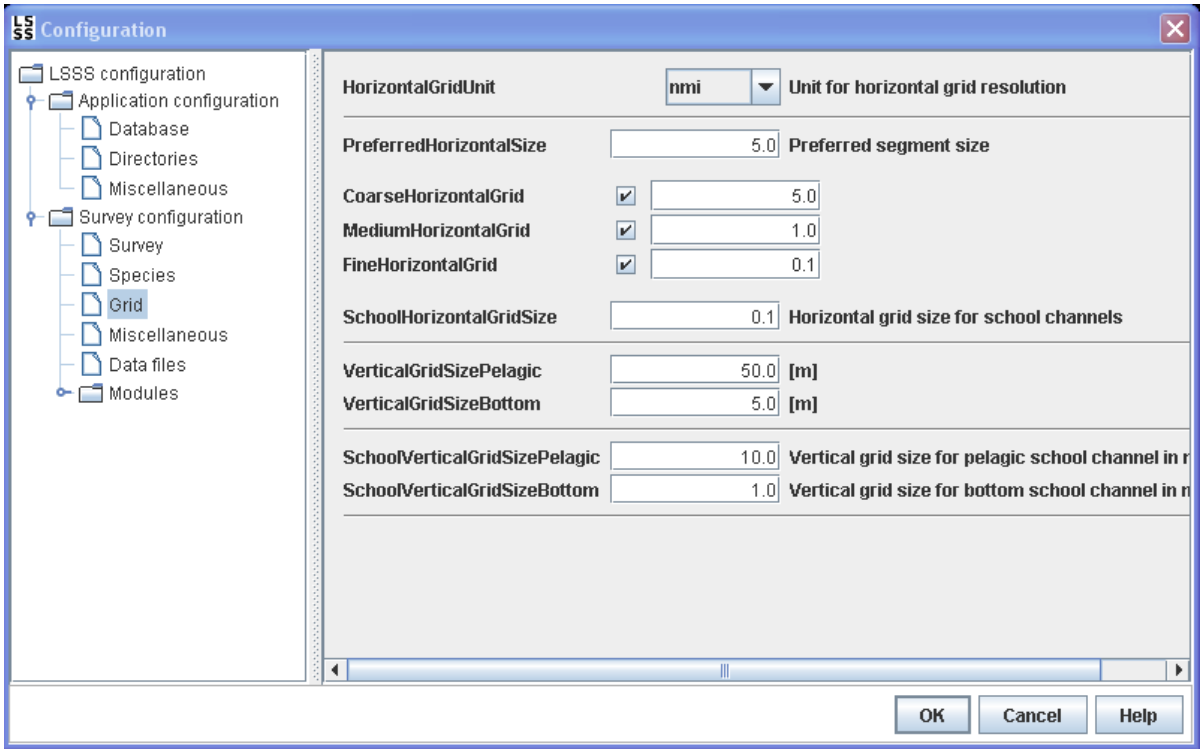


This dialog is used for creating a new or editing an existing area.

The user can select which acoustic categories to associate to this area, as well as the name of the area. An area is associated to a nation, and is stored to the database when the user pushes the OK button.

NB: Since Area is a nation-wide table, i.e. common to all platforms of a nation, addition of new Areas needs to be coordinated. If a single platform defines its own areas, a conflict might occur when surveys from several platforms are imported to the same database.

Grid

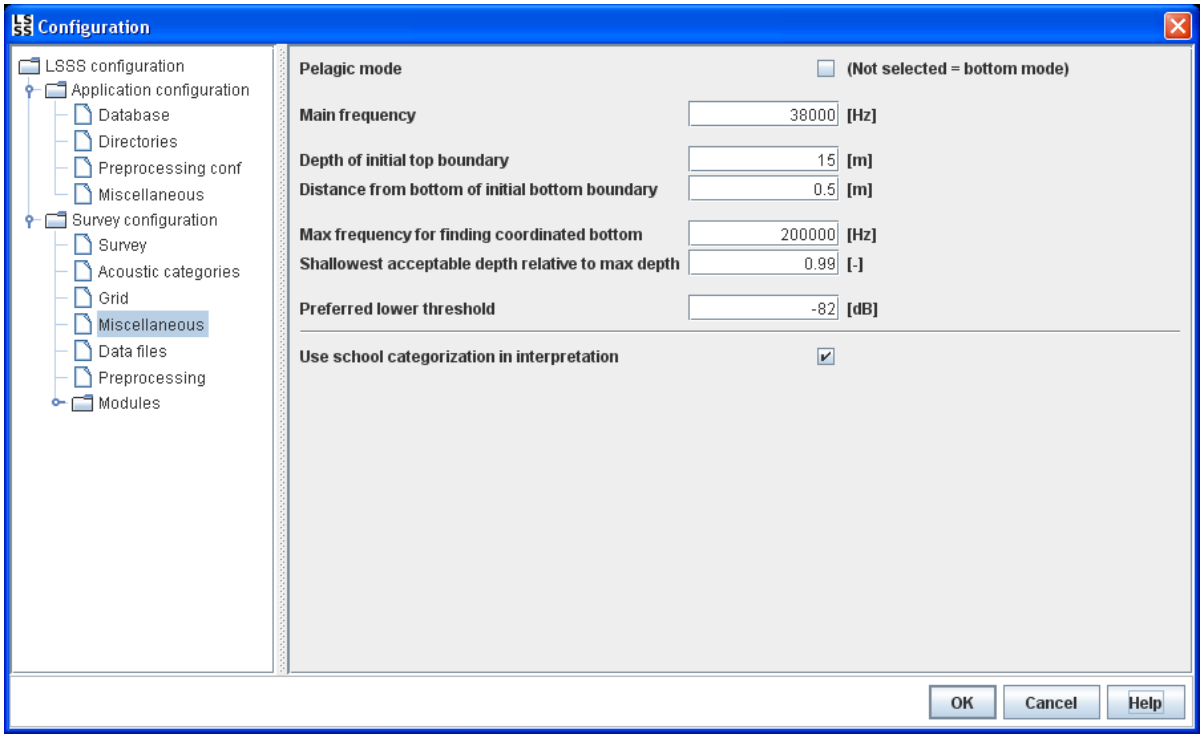


Configuration of grid resolutions. The grid is used by the interpretation module and displayed as an overlay on the echogram.

- **HorizontalGridUnit:** The unit used for the horizontal grid settings below. Possible choices are *pings*, *nmi* and *seconds*.
- **PreferredHorizontalSize:** The preferred segment size when interpreting a survey. The toolbar button for setting segment size uses the size specified here.
- **CoarseHorizontalGrid:** The checkbox indicates if the coarse grid should be available when storing to

the database. The number is the horizontal grid size.
- **MediumHorizontalGrid:** The checkbox indicates if the medium grid should be available when storing to the database. The number is the horizontal grid size.
- **FineHorizontalGrid:** The checkbox indicates if the fine grid should be available when storing to the database. The number is the horizontal grid size.
- **SchoolHorizontalGridSize:** The horizontal grid size used when storing school interpretation to the database.
- **VerticalGridSizePelagic:** The vertical grid size of the pelagic channel (in meters).
- **VerticalGridSizeBottom:** The vertical grid size of the bottom channel (in meters).
- **SchoolVerticalGridSizePelagic:** The vertical grid size for schools in the pelagic channel (in meters).
- **SchoolVerticalGridSizePelagic:** The vertical grid size for schools in the bottom channel (in meters).

Miscellaneous



Miscellaneous survey configuration.

- **Pelagic mode:** If selected then pelagic mode is used and the bottom echogram will be hidden.
- **Main frequency:** The main frequency. Used in the frequency response module when computing relative frequency response.
- **Depth of initial top boundary:** The depth (in meters) to place the initial top layer boundary.
- **Distance from bottom of initial bottom boundary:** The distance above the coordinated bottom (in meters) to place the initial bottom layer boundary.
- **Max frequency for finding coordinated bottom:** The maximum frequency to be used when computing the coordinated bottom.
- **Shallowest acceptable depth relative to max depth:** Used in the coordinated bottom calculation.
- **Preferred lower threshold:** The lower threshold set when pressing the bottom below the echogram colorbar.
- **Use school categorization result in interpretation:** Determines which type of categorization to use for echogram display of categorization results. Also affects the assignment of sa from categorization results.

Pelagic mode

The following table lists the differences between pelagic mode and full / bottom mode:

Feature	Pelagic mode	Full mode
The bottom echogram	Hidden	Visible
Pings with depth 0	Used as normal	Displayed white on the echogram and not used in any calculations
Definition of the lower boundary for the initial layer	**BottomBoundaryOffset** above the coordinated bottom	Using 90% of the maximum depth of the pelagic echogram

Pelagic mode can also be selected in the echogram context menu.

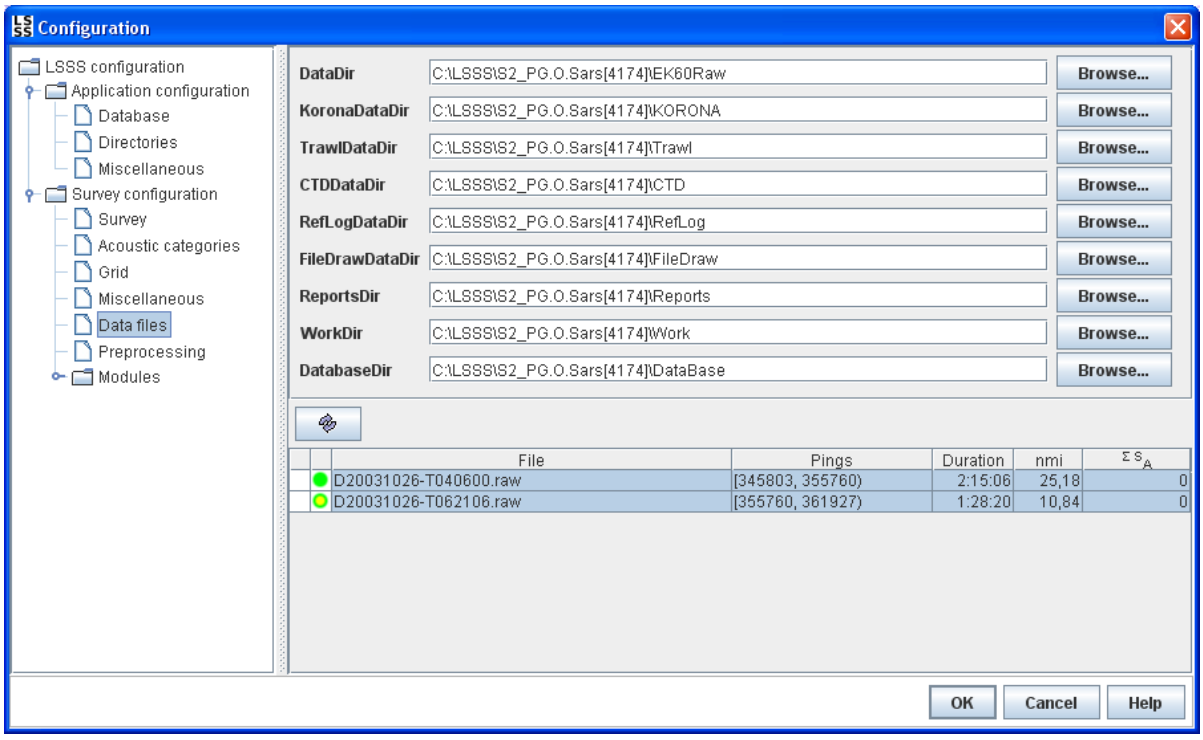
Coordinated bottom

The following algorithm is used for finding the coordinated bottom:

1. Use the bottom depths detected on all frequencies less than **MaxFrequencyForBottom**.
2. Find the maximum depth.
3. Reject the depths less than **MinimumDepthThresholdFactor** times maximum depth.
4. The coordinated depth is the smallest of the remaining depths.

The coordinated bottom is used for defining the lower boundary of the initial layer. It is also displayed on the echogram.

Data files



The default settings for the directories are based on settings in [Application - Directories] and the survey number and the name of the platform configured in [Survey configuration - Survey]. When a valid data directory has been selected, the data files will appear in a list below.

The button "EK500..." will become enabled if there are EK500 data files in the DataDir directory. Press this button to edit settings and to convert work files. Read more in the EK500 appendix.

The button "Create idx..." will become available if any of the EK60 data files are missing index files. Pressing this button gives the option of creating new index files based on speed and position datagrams in the EK60 files.

- The first column shows the status of preprocessed data files. Hovering the mouse over the symbol will give a description in the tool tip of any errors or notices. Status symbols:

	No preprocessed file is available.
	The preprocessed file is found, but has not been checked yet.
	The preprocessed file is found, has been checked, and is OK.
	The preprocessed file is found, has been checked, and is OK, but a notice to the user is given.
	There is an error, and the file cannot be used. This will also disable the toolbar button for preprocessed files.

- The second column shows the status of original data files. Hovering the mouse over the symbol will give a description in the tool tip of any errors or notices. Status symbols:

	The file has not been checked yet.
	The file has not been checked yet, but a notice to the user is given. The last file on the list is for example always given the notice symbol.
	The file is checked and everything is OK.
	File is checked and is OK, but a notice to the user is given about for example correction done to the file.
	There is an error, and the file cannot be used.

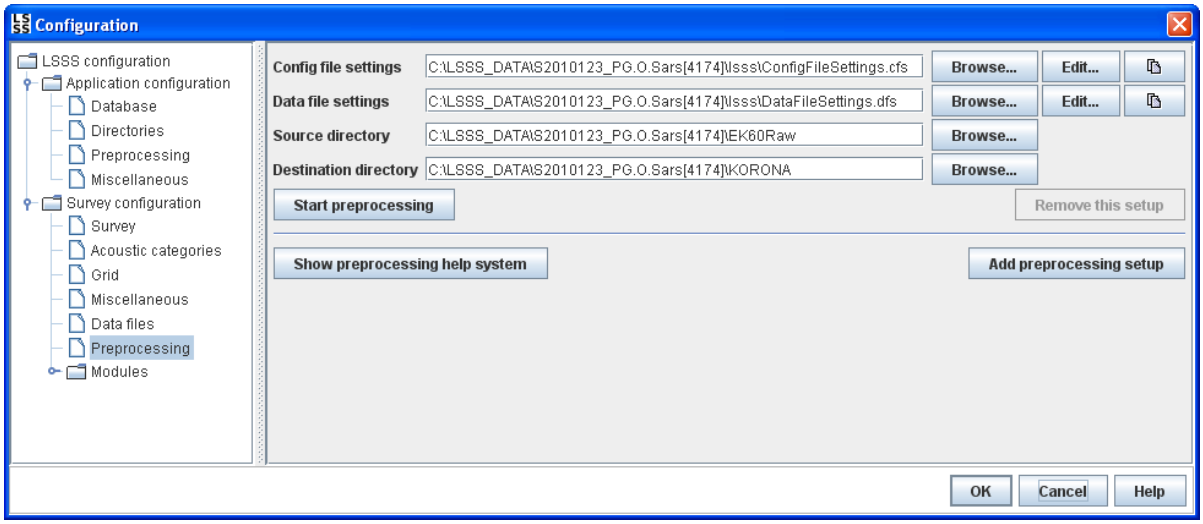
If a file has not been checked, then one of the following symbols may be shown:

F	File has frequencies that are compatible with the current selection.
F	File has frequencies that are not compatible with the current selection.

- The **File** column is the name of the file.
- The **Pings** column gives the ping range for the data in the file.
- The **Duration** column gives the duration, in format H:MM:SS, that the file represents.
- The **Dist** column gives the start position and distance in parenthesis, in nautical miles, that the file represents.
- The **Σ s_A** column gives the sum of the interpreted area backscatter that is stored to the database.

Refer to the section on data correction for details on errors and warnings.

Preprocessing



On the fly

Some of the Korona modules can be used on the fly while loading data. This kind of processing can be done without writing the processed data to files in a directory. If on the fly processing is configured, a notice is shown in the status bar.

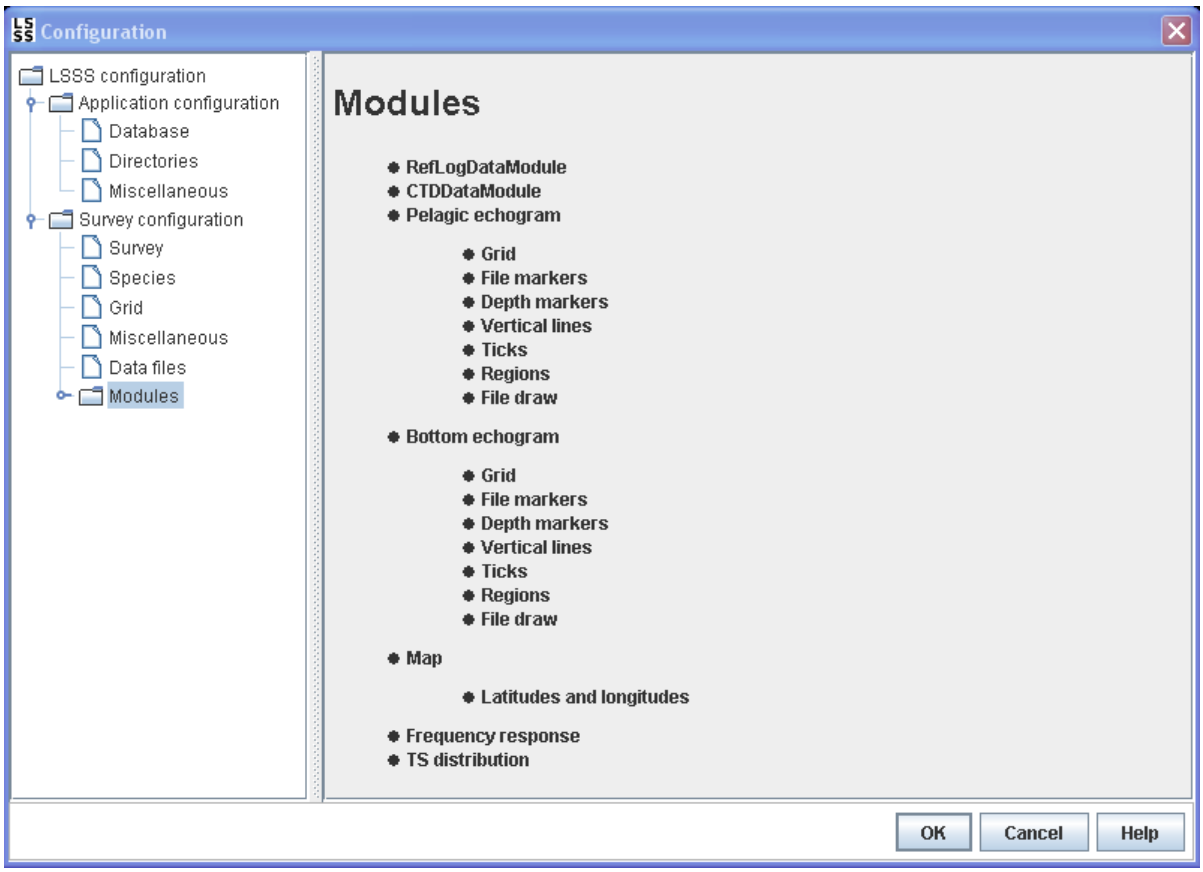
- **`Use on the fly processing`**: Select if on the fly processing should be used.
- **`On the fly processing of DataDir`**: The processing setup to use for on the fly processing.
- **`Apply even if already processed`**: Select if on the fly processing should be applied even if the data is already processed.

KoronaRelay

The preprocessing program, KoronaRelay, can be started from this panel. Several different preprocessing setups can be defined by clicking the "Add preprocessing setup" button.

- **`Config file settings:`** A file containing the paths to config files used by processing. See the Korona help system, section "Config File Settings" for more information.
- **`Data file settings:`** A file containing the paths to data files used by processing. See the Korona help system, section "Data File Settings" for more information.
- **`Source directory:`** Location of files to be processed.
- **`Destination directory:`** Location of the processed files.

Modules



From here the settings for the different modules can be adjusted. A module can mean either a stand-alone window / floatable view or an overlay on the echogram or map. See [Views] for a description of the views and overlays.

Views

This chapter contains descriptions of the separate floatable views and the overlays to the echogram and map windows.

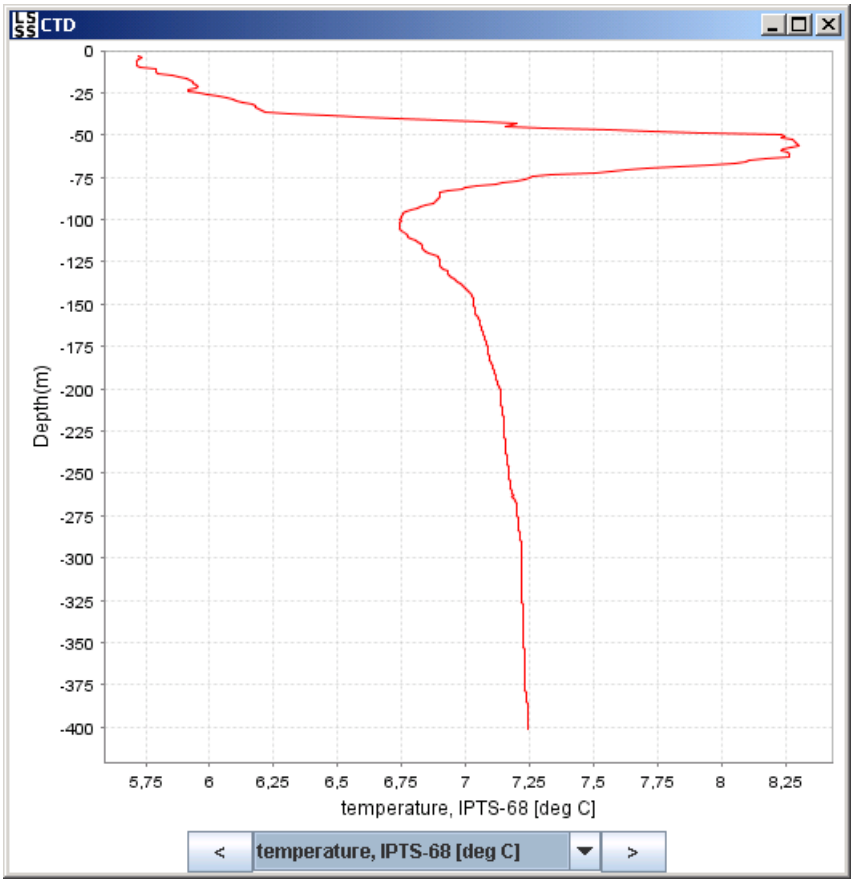
Input domains and domains affected by user actions

It is important to understand which domain is used in computation modules and which domain is affected by different user actions.

- The computation modules which are shown in separate views (for example frequency response module, threshold response module and TS distribution module) will only use the visible ping range of the active region(s) as the domain. Zooming in and out vertically will therefore not change the result of these computations, while zooming in and out horizontally will.
- For the computation results which are overlaid the echogram module, the domain is also limited to what is visible in the vertical direction. Examples here are the s_A integration curve and the grid integration.
- The s_A assignments in the interpretation module will be stored as part of the regions. These assignments may therefore affect parts of the survey outside the visible ping range. Note however that when storing to the database, the ping range to be stored will be isolated from the rest of the survey by automatic insertion of vertical boundaries.
- When storing to the database, only the grid cells completely inside the visible area will be stored. Hovering the mouse over the store button(s) will show which grid cells will be stored if all pings are loaded.

CTD

The CTD module displays CTD sensor samplings as function of water depth.



Description

The CTD module reads CTD data files of filename sta????.cnv specified by the directory. The CTD data can contain information from different sensors. The sensor data to be shown is selected in the column selector located under the x-axis. To skip between CTD files, the buttons on each side of the column selector is used.

When the mouse pointer is moved over the Echogram window, the CTD station closest in time will be shown. CTD stations will be marked as z in the map window, the markers are placed according to the geographic position in the CTD data.

The CTD module reads only files with the filename sta????.cnv.

File format

The .cnv file format that is read by the module can be seen here.

The file is read in the following way:

- The time, date, station, latitude, longitude, number of data columns, data column name are read from the header.
- Data is expected to start after "*END*" mark and be columns corresponding to the data header.

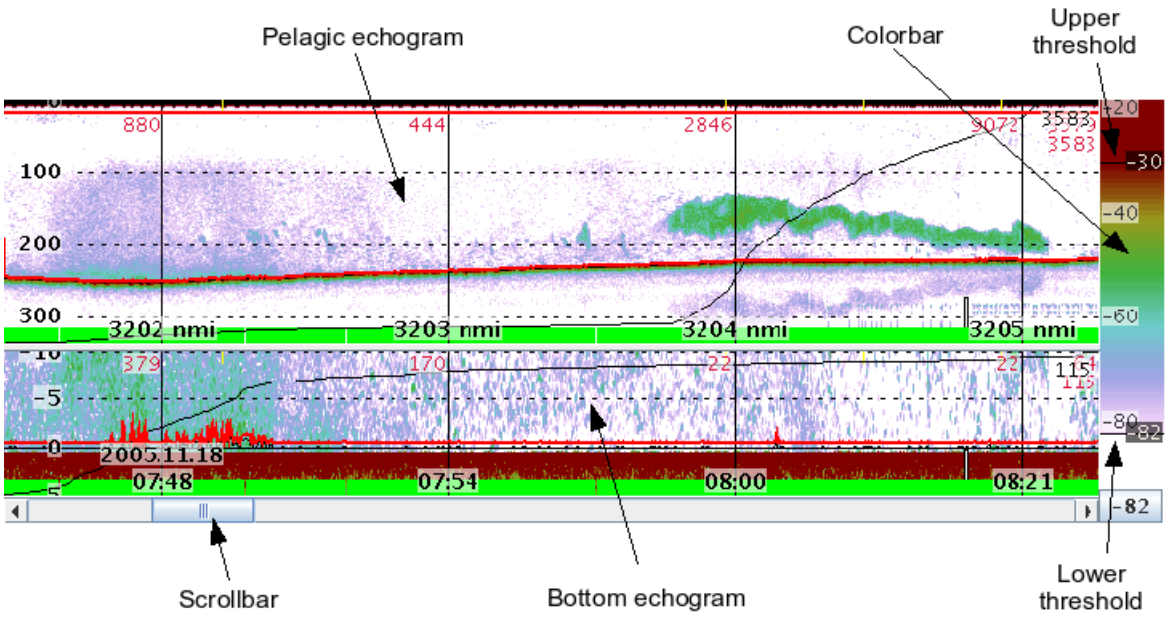
Example .cnv file

```
* Sea-Bird SBE 9 Raw Data File:
* FileName = C:\SEABIRD4.227\STA1013.DAT
* Software Version 4.227
* Temperature SN = 1445
* Conductivity SN = 2140
* Number of Bytes Per Scan = 15
* Number of Voltage Words = 1
* System UpLoad Time = Nov 24 2002 05:48:25
* NMEA Latitude = 68 22.43 N
* NMEA Longitude = 016 05.85 E
* NMEA UTC (Time) = 05:46:04
* Store Lat/Lon Data = Add to Header Only
* Command Line = seasave -cSeasoft.con
** Ship: 12
** Station: 1013
** Echodepth: 529
** Log: 9779.40
** Wind-Dir Force: 06 10
** Air temp (dry): -0.7
** Weather Sky: 2 3
** Sea Ice: 4 0
# nquan = 10
# nvalues = 493
# units = metric
# name 0 = scan: scan number
# name 1 = pr: pressure [db]
# name 2 = t068: temperature, IPTS-68 [deg C]
# name 3 = c0S/m: conductivity [S/m]
# name 4 = oxC: oxygen, current [æA]
# name 5 = oxT: oxygen, temperature [deg C]
# name 6 = sigma-é00: density, sigma-theta [kg/m^3]
# name 7 = sal00: salinity, PSS-78 [PSU]
# name 8 = svC: sound velocity, chen millero [m/s]
# name 9 = flag:  0.000e+00
# span 0 = 575, 13446
# span 1 = 2.000, 494.000
# span 2 = 5.7126, 8.2210
# span 3 = 3.142001, 3.575705
# span 4 = 0.00000, 0.00000
# span 5 = 0.00000, 0.00000
# span 6 = 25.1805, 27.3952
# span 7 = 31.9574, 35.0082
# span 8 = 1469.79, 1487.80
# span 9 = 0.000e+00, 0.000e+00
# interval = decibars: 1
# start_time = Nov 24 1902 05:48:25
# bad_flag = -9.990e-29
# sensor 0 = Frequency  0  temperature, 1445, 11-May-02s
# sensor 1 = Frequency  1  conductivity, 2140, 10-May-02s, cpcor = -9.5700e-08
# sensor 2 = Frequency  2  pressure, 70766, 05-11-1998
# sensor 3 = Extrnl Volt  0  oxygen, current
# sensor 4 = Extrnl Volt  1  oxygen, temperature
# datcnv_date = Nov 24 2002 05:58:14, 4.227
# datcnv_in = STA1013.DAT SEASOFT.CON
# datcnv_skipover = 0
# wildedit_date = Nov 24 2002 05:58:25, 4.227
# wildedit_in = STA1013.CNV
# wildedit_pass1_nstd = 2.0
# wildedit_pass2_nstd = 20.0
# wildedit_npoint = 10
# wildedit_vars = scan pr t068 c0S/m oxC oxT
# wildedit_excl_bad_scans = yes
# celltm_date = Nov 24 2002 05:58:35, 4.227
# celltm_in = STA1013.CNV
# celltm_alpha = 0.0300, 0.0000
# celltm_tau = 7.0000, 0.0000
# celltm_temp_sensor_use_for_cond = primary,
# filter_date = Nov 24 2002 05:58:44, 4.227
# filter_in = STA1013.CNV
# filter_low_pass_tc_A = 0.030
# filter_low_pass_tc_B = 0.150
```

```
# filter_low_pass_A_vars = c0S/m
# filter_low_pass_B_vars = pr
# loopedit_date = Nov 24 2002 05:58:58, 4.227
# loopedit_in = STA1013.CNV
# loopedit_minVelocity = 0.250
# loopedit_excl_bad_scans = yes
# binavg_date = Nov 24 2002 05:59:09, 4.227
# binavg_in = STA1013.CNV
# binavg_bintype = Pressure Bins
# binavg_binsize = 1.00
# binavg_excl_bad_scans = yes
# binavg_downcast_only = yes
# binavg_skipover = 0
# binavg_surface_bin = no, min = 0.000, max = 0.000, value = 0.000
# derive_date = Nov 24 2002 05:59:15, 4.227
# derive_in = STA1013.CNV SEASOFT.CON
# file_type = ascii
*END*
        575      2.000     5.7149   3.142035    0.00000    0.00000    25.1842    31.9587    1
        624      3.000     5.7199   3.142460    0.00000    0.00000    25.1832    31.9582    1
        661      4.000     5.7159   3.142122    0.00000    0.00000    25.1833    31.9577    1
        694      5.000     5.7158   3.142220    0.00000    0.00000    25.1839    31.9584    1
        721      6.000     5.7152   3.142167    0.00000    0.00000    25.1836    31.9579    1
        749      7.000     5.7126   3.142001    0.00000    0.00000    25.1840    31.9580    1
        772      8.000     5.7128   3.142105    0.00000    0.00000    25.1844    31.9585    1
        795      9.000     5.7139   3.142137    0.00000    0.00000    25.1833    31.9574    1
        822     10.000     5.7232   3.143066    0.00000    0.00000    25.1831    31.9585    1
        847     11.000     5.7291   3.143567    0.00000    0.00000    25.1821    31.9581    1
        872     12.000     5.7298   3.143677    0.00000    0.00000    25.1821    31.9582    1
        897     13.000     5.7303   3.143761    0.00000    0.00000    25.1820    31.9582    1
        924     14.000     5.7301   3.143780    0.00000    0.00000    25.1820    31.9581    1
        950     15.000     5.7287   3.143702    0.00000    0.00000    25.1822    31.9580    1
        976     16.000     5.7279   3.143676    0.00000    0.00000    25.1822    31.9580    1
       1000     17.000     5.7273   3.143695    0.00000    0.00000    25.1826    31.9583    1
       1024     18.000     5.7299   3.143981    0.00000    0.00000    25.1825    31.9586    1
       1049     19.000     5.7385   3.144761    0.00000    0.00000    25.1816    31.9587    1
       1074     20.000     5.7417   3.145049    0.00000    0.00000    25.1810    31.9584    1
       1098     21.000     5.7441   3.145300    0.00000    0.00000    25.1808    31.9585    1
       1122     22.000     5.7454   3.145434    0.00000    0.00000    25.1805    31.9583    1
       1147     23.000     5.7457   3.145514    0.00000    0.00000    25.1805    31.9584    1
       1173     24.000     5.7457   3.145557    0.00000    0.00000    25.1805    31.9584    1
```

Echogram

The echogram is the main part of the LSSS display. It is divided into two parts: the pelagic echogram and the bottom echogram. The difference between these two echograms is the vertical representation. In the pelagic echogram the vertical corresponds to depth, whereas in the bottom echogram the vertical corresponds to distance from the bottom. In both echograms the vertical axis is directed downwards.



The scrollbar below the echogram shows the location and extent of the visible part of the echogram relative to the total range of data selected in [Survey configuration - Data files].

The echogram images are continually updated while pings are read from the data files. When the data loading mode is set to BROWSE the width of the echogram image decides how many pings that will be read from file and used in computations. At most one ping corresponding to each pixel column will be used. In the DETAIL data loading mode all pings will be used in the computations, but still only one ping will be used for each pixel column. Vertically, however, the samples corresponding to one pixel are averaged.

Navigation

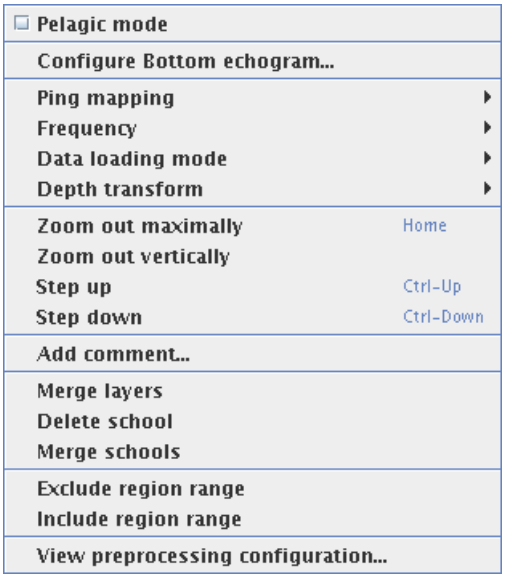
Different ways to navigate in the echogram:

- Use the mouse to drag the scroll bar below the echogram.
- Use the zoom working mode.
- Use keys:
  - Press Ctrl + arrow keys to pan. Ctrl + Up and Down arrow keys operate only on the echogram in which the mouse is located.
  - Press Ctrl + Alt + Left (Right) to go back to the previous (next) location.
- Use the mouse scroll wheel to zoom horizontally. Press Shift to zoom vertically and Ctrl to zoom in both directions.
- Use the toolbar buttons.
- Use the go menu.
- Use the context menu.

See also the section in keyboard shortcuts.

Context menu

The echogram context menu is shown below. Some of the overlays have specialized context menus.



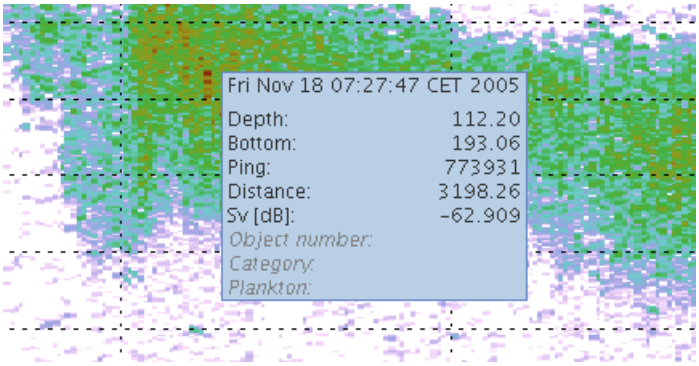
- **Pelagic mode**: For switching between pelagic mode and full mode.
- **Configure Pelagic / Bottom echogram...**: Brings up the configuration dialog for the echogram.
- **Ping mapping**: Decides how the pings are laid out horizontally. Choices:
  - Ping: Pings are laid out horizontally according to ping number.
  - Distance: Pings are laid out horizontally according to vessel distance.
  - Time: Pings are laid out horizontally according to time.
- **Frequency**: Selecting the frequency to show in the echogram. This can also be set in the toolbar.
- **Data loading mode**: Choices:
  - BROWSE: Only enough pings are loaded to cover the echogram.
  - DETAIL: All pings in the current range are loaded.

  This can also be set in the status bar.
- **Depth transform**: Only applicable to bottom echogram. Sets which bottom that should be horizontal for the displayed frequency. Choices:
  - The bottom for each frequency.
  - Coordinated bottom.
  - Bottom layer boundary.

  The default for each frequency is the corresponding bottom for that frequency.
- **Zoom out maximally**: Zooms out maximally horizontally and vertically in both echograms.
- **Zoom out vertically**: Zooms out maximally vertically in the echogram where the context menu was brought up.
- **Step up**: If the echogram is zoomed vertically this shifts the visible echogram area upwards. The horizontal extent remains the same. The other echogram is not affected.
- **Step down**: If the echogram is zoomed vertically this shifts the visible echogram area downwards. The horizontal extent remains the same. The other echogram is not affected.
- **Add comment...**: Brings up a dialog for entering a new comment.
- **Merge layers**: Merges the currently active layers.
- **Delete school**: Deletes the school region in which the popup menu was triggered.
- **Merge schools**: Merges the currently active schools if possible.
- **Exclude region range**: Excludes the visible horizontal extent of the region in which the popup menu was triggered.
- **Include region range**: Includes a previously excluded range.
- **View preprocessing configuration...**: Displays a module editor with the configuration used during preprocessing.

Tool tip

The toolbar button can be used to toggle on and off the echogram tool tip. The tool tip displays information about ping and sample pointed at with the mouse.



The object number refers to the Scatter database table. Category and plankton are results of categorization and plankton inversion during preprocessing.

The contents of the echogram tool tip can be configured in the echogram configuration. Some of the overlays have specialized tool tips.

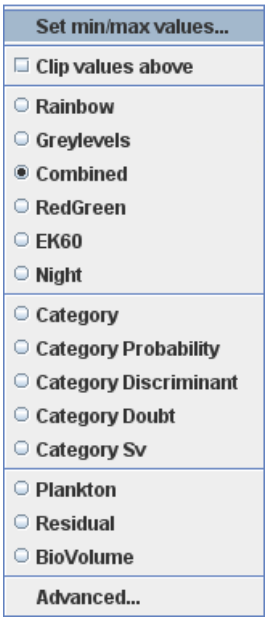
Colorbar

The colorbar to the right of the echogram shows the mapping between the colors in the echogram image and signal strength, S_V, measured in dB. The thresholds on the colorbar decide which samples that are included in the s_A integrations and other computations. The lower threshold is always active, while the upper threshold can be activated through the colorbar context menu (when the checkbox "Clip values above" is unchecked). The threshold response view shows how s_A integration depends on the thresholds. Sample values that are outside the threshold range are shown in white in the echogram.

The threshold values can be set either by the colorbar context menu, or by dragging the threshold indicators in the colorbar.

Colorbar context menu

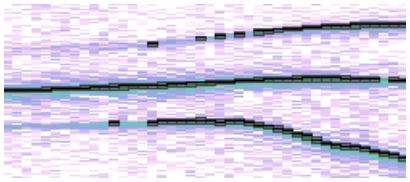
Different color scales can be selected in the colorbar context menu. If preprocessing with categorization or plankton inversion is done, the colorbar context menu will also contain special color scales for displaying automatically detected categories. The Advanced... option can be used to customize visualization of the available parameters.



Overlays

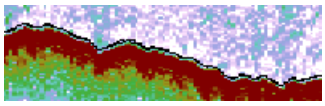
Both the pelagic and the bottom echograms are organized as a background picture with several overlays stacked on top of it. Each overlay can be turned on or off in the configuration dialog for the echograms.

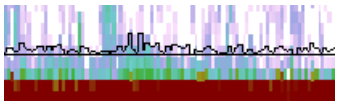
BB TS(f) locations



This overlay displays the targets detected by BB TS(f) module. A gray area marks a depth range identified at an individual target. The back line indicates the depth of the target's maximal target strength.

Bottom





This overlay displays the detected bottom as two black lines. One line shows the detected bottom for the current frequency. The other line shows the coordinated bottom.

Comments

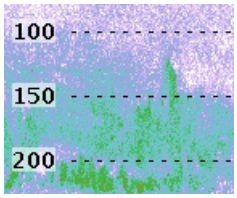


This overlay displays the letter "C" near the upper edge of the echogram at the location of a comment. This symbol has a context menu with options for editing and deleting the comment. The context menu for the echogram has an item for adding new comments.

Comments are also displayed on the map.

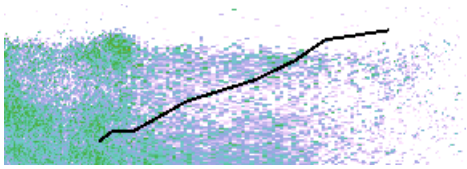
Comments are stored in the database ObservationComment table.

Depth markers



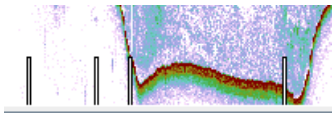
This overlay shows equidistant horizontal lines stretching across the echogram. The depth corresponding to each line is written to the left. For the bottom echogram these numbers are distance from the bottom.

File draw



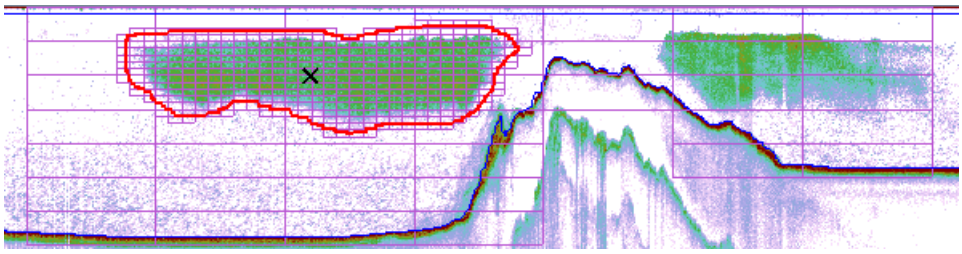
This overlay draws geometric shapes defined in file draw data files.

File markers



This overlay shows white markers at the bottom of the echogram at the start of each data file. This corresponds to the file markers on the map.

Grid

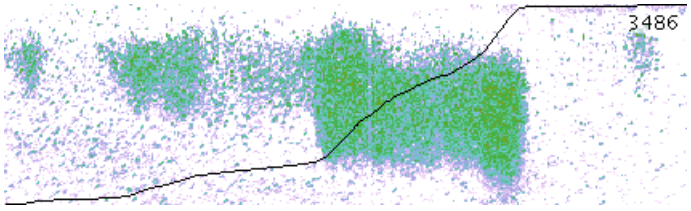


This overlay displays the grids as defined in the [Survey configuration - Grid]. The grid is displayed when the mouse is over one of the buttons for storing and deleting in the interpretation module.

When the mouse is over one of the store buttons this overlay displays the grid cells that will be stored. Note that all pings in the visible range must be loaded for the grids to be displayed.

When the mouse is over the delete button this overlay displays the stored grid cells that will be deleted from the database if the action is carried through.

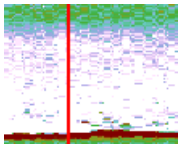
Integration line



This overlay draws the integration line for the selected regions if the $s_A > 0$. Only data from the visible part of the echogram is used even if the regions extend further. The steepness of this line indicates how much the corresponding pings are contribution to the s_A.

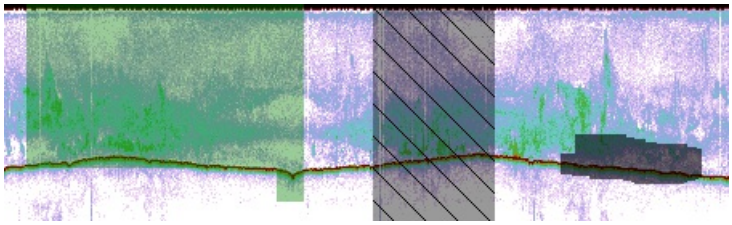
The integration line is given by the function f(ping) = s_V integrated over the visible area of the selected regions to the left of that ping. This function is scaled so that the line extends from the bottom to the top of the echogram whatever the actual integration value is.

Map position



This overlay displays a red vertical line corresponding to the mouse position in the map.

Masking



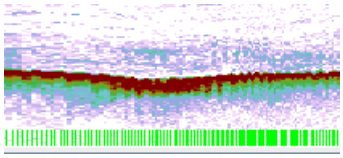
This overlay displays three different kinds of semi-transparent masks on the echogram.

Areas that are stored to the database are shown with a semi-transparent green overlay. These green areas correspond to the areas covered by stored grid cells for the current frequency. The vertical line overlay also indicates stored areas by using green numbers. The map also shows the stretches along the survey path that are stored.

Ranges that are excluded from storing to the database are displayed with black diagonal lines and a semi-transparent gray overlay. Grid cells that overlap completely or partly with an excluded range will not be stored to the database.

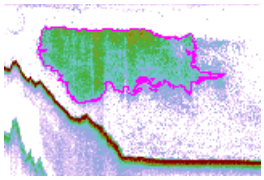
Frequency dependent deleting of data is shown using semi-transparent gray overlay. The deleting can be edited using the ⌀ toolbar button. The deleting is done only on the current frequency. Data from the deleted areas are not used in computations of s_A.

Ping markers

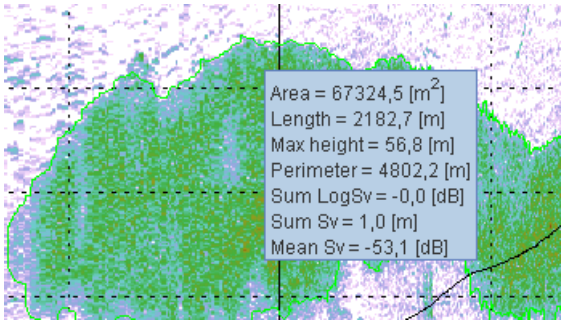


This overlay shows the start of each loaded ping as green lines at the bottom of the echogram.

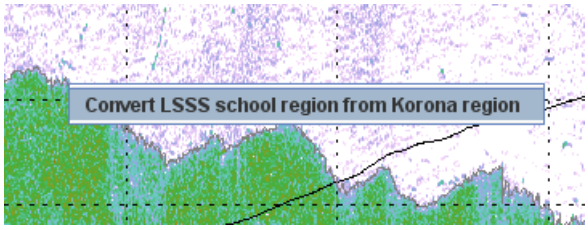
Preprocessed regions



This overlay displays regions that are automatically detected during preprocessing. These regions are drawn with a purple line. They are not used in the interpretation. The context menu for these regions includes an item for conversion to a school region that can be used in the interpretation.

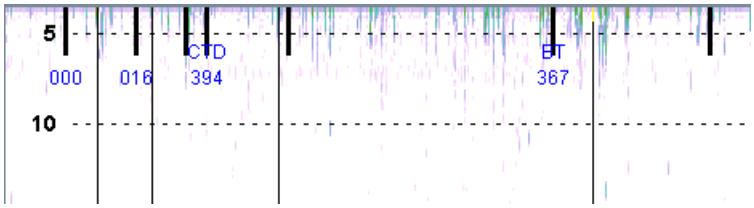


The preprocessed regions overlay has a specialized tool tip giving some parameters for the school as shown above.



There is also a specialized context menu for converting to a school that can be used in the interpretation. The conversion can be applied multiple times, under the restriction that interpretable schools cannot overlap.

Reference log

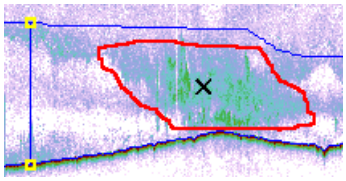


This overlay displays information from the reference log data files.

The following stations are shown with station abbreviation and station number:

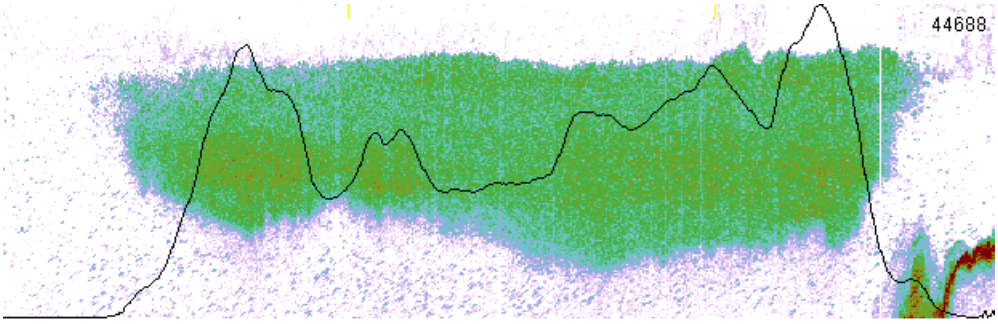
- CTD with watersampler start (CTD)
- CTD start (CTD)
- Plankton-net start (PN)
- Pelagic trawl start (PT)
- Bottom trawl start (BT)
- Mocness start (MOC)
- Bergen Acoustic Bouy start (BAB)

Regions



This overlay displays layers and schools. Active regions are red, the other are blue.

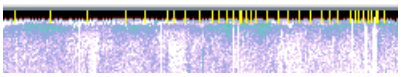
Sa line



This overlay draws the s_A line for the selected region.

This function is scaled so that the line extends from the bottom to the top of the echogram whatever the actual integration value is. The integration of this function corresponds to the integration line. The s_A is also represented in the map.

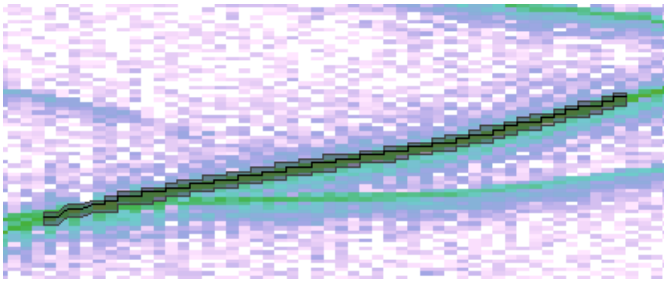
Ticks



This overlay shows equidistant yellow markers at the top of the echogram. The distance between the lines and the unit used (Ping / Distance / Time) can be configured.

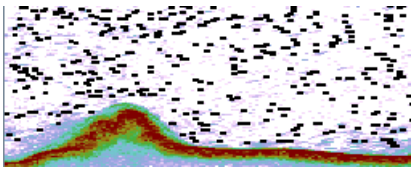
The default tick interval is 10 minutes.

Tracks



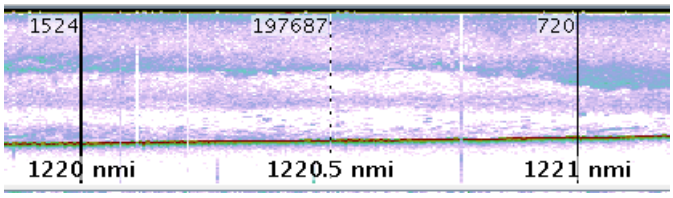
This overlay displays detected tracks.

TS locations



This overlay displays the locations of the TS detections done by the TS module. Each detection is shown as a black horizontal line. NB: This overlay should be used with caution since it may cause the system to run slower.

Vertical lines



This overlay shows equidistant vertical lines stretching from top to bottom of the echogram. A line is drawn

- Thick if it corresponds to a distance divisible by 10 nmi.
- Normal if it corresponds to a distance divisible by 1 nmi.
- Dashed if none of the above.

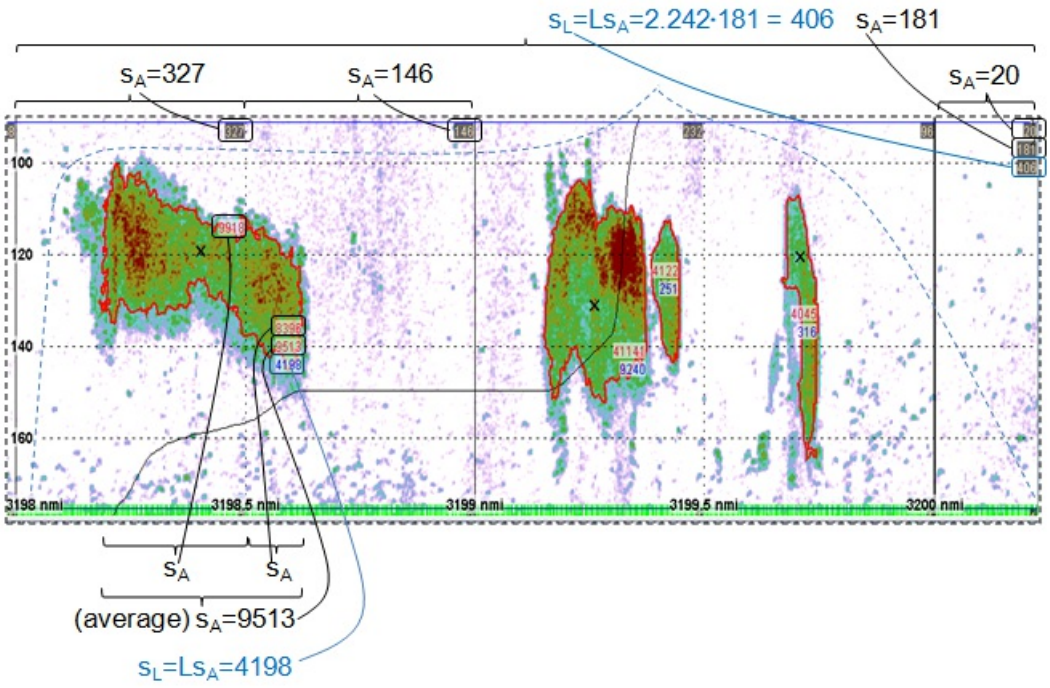
At the bottom of each line is textual information about the corresponding distance and time.

Each line also displays s_A values for the regions it intersects. These values are calculated for the visible area of the region between two successive lines. At the end of each region the s_A values for both the visible area from the previous intersecting line and for the entire visible part of the region are displayed. If the visible part of the region is completely contained in the area between two successive lines these values are equal and hence displayed only once. In addition, s_L for the entire region is displayed, where $s_L = s_A * L$ and L is the length of the region in nmi. If the s_A value for the entire visible part of the region is exactly 0, then no values are displayed.

The color of the s_A / s_L values for a region is

- **Crimson** / **Blue** if the region is selected.
- **Moccasin** if the region has never been selected.
- **Black** if the region has been selected at least once.
- **Green**/**Cyan** if an interpretation is stored to the database.

There are several s_A and s_L numbers in the echogram below. s_A is always shown just prior to the vertical live. If there are three numbers by the vertical line, the second and third are averages s_A and s_L of the visible part of the region respectively. Numbers on a white background indicate that the region has been inspected using the Interpretation window, i.e. it has been active. Numbers on a black background, as some of the numbers in the figure below, indicate that the region has never been active (and is therefore not yet scrutinized).



Echogram plot

This view is placed under the echogram, and can plot various functions defined from ping to a real number.

Some of the available functions (such as Sv, TSC and TSU) depend on the mouse position in the echogram. These functions are evaluated at the depth corresponding to the mouse position (or the z coordinate for the bottom echogram).

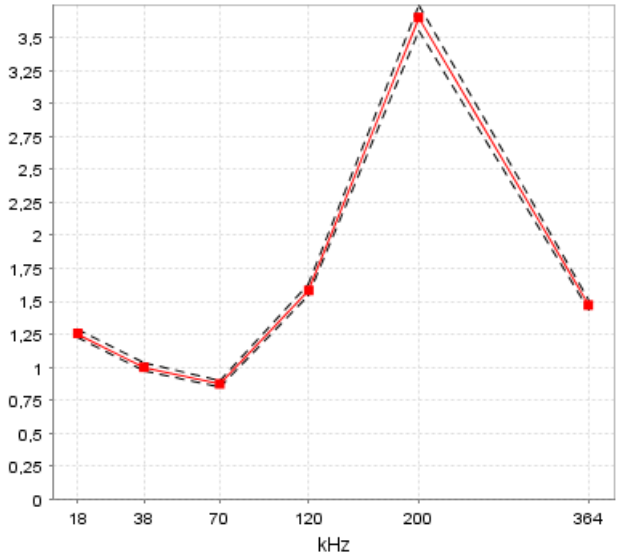
The selected variables can also be exported.

Additional information

- Transducer impedance
- Noise quantification

Frequency response

This view shows the frequency response curve with standard error curves for the currently selected region(s).



The normalized frequency response, r, for frequency f with f_N as normalization frequency is defined as

$$r(f) = \bar{s}_v(f) / \bar{s}_v(f_N)$$

where

$$\bar{s}_v(f) = \frac{1}{N_f} \sum_{i=1}^{N_f} s_v(f)$$

The summation is over all samples in the selected regions (N_f samples). If a sample has a s_v value below the lower threshold or above the upper threshold (if the upper threshold is active), then $s_v = 0$ is used for that sample.

The normalization frequency f_N can be configured in [Survey configuration - Miscellaneous].

The standard error for frequency f of the frequency response function is estimated as

$$\mathrm{SE}(\mathrm{r}(f)) = \frac{\mathrm{SE}(f)}{\bar{s}_v(f_N)}$$

where the standard error of the mean for frequency f is estimated as

$$\mathrm{SE}(f) = \frac{\sigma(f)}{\sqrt{N_f}}$$

where sigma is the estimated standard deviation of the sample values.

Configuration

XAxis: The type of x-axis. Possible choices:

- IDENTITY: Linear mapping.
- SQRT: Square root mapping.
- CBRT: Cube root mapping.
- LOG: Logarithmic mapping.

YAxis: The type of y-axis. Possible choices:

- DYNAMIC: The axis is linear, and dynamically expands depending on the range of the axis values.

- FIXED: The axis is linear, and the range is fixed between 0 and 6.
- SQRT: Dynamical square root mapping.
- CBRT: Dynamical cube root mapping.
- LOG: Dynamical logarithmic mapping.

PlotStdErr: If checked, standard error curves will be plotted.

Interpretation

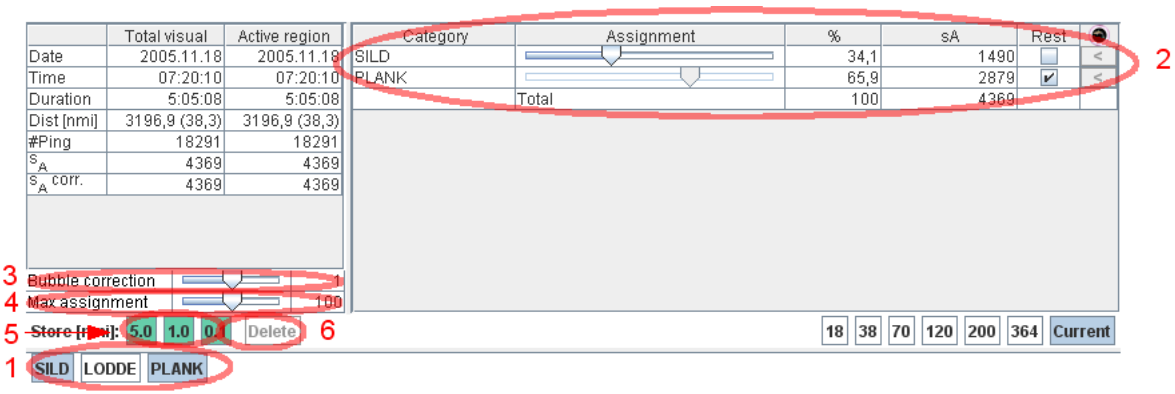
The purpose of the interpretation window is to assign the total s_A for each region to the selected acoustic category and to store the interpretation to the database. Each region has one set of assignments per frequency for the total extent of the region.

Supporting information

In the top left corner, some numerical information is displayed, both for the visual range and for the active region.

- Date: The date of the first ping.
- Time: The time of day of the first ping.
- Duration: The time duration.
- Dist: The start position and the distance in parenthesis.
- #Ping: The number of pings.
- s_A: The s_A computed based on the currently read pings. Note that the s_A reported for the active region is based on only the pings in the visible part of the region.
- s_A corr.: The same as above, with the exception that bubble correction is taken into account.

Performing interpretation



1. The selected acoustic category for the survey will appear at the bottom of the interpretation window. For each region, a subset of these acoustic categories can be interpreted. Select a region and select the acoustic category you want to assign to that region by clicking on the acoustic-category buttons.

2. After selecting which acoustic category to interpret for a region, use the sliders in the right hand part of the window to assign a percentage of the total s_A to the corresponding acoustic category. The fraction of the total s_A for each acoustic category will also be reported here. It is possible to make one or more of the acoustic categories a 'rest acoustic category'. The unassigned s_A will be distributed equally among the rest acoustic category. In addition to using the sliders it is also possible to enter the numbers for assignment and s_A. If categorization has been performed in the preprocessing, and a mapping from acoustic categories to preprocessed categories is configured, the buttons in the last row will be activated. Pressing such a button will compute s_A for the samples categorized as a category which the acoustic category maps to, and adjust the slider accordingly. This can be used to get a quick initial guess for the interpretation.

3. A slider for bubble correction is included if the user wants to correct the computed s_A. The corrected s_A is simply the uncorrected s_A multiplied with this factor. The s_A assigned to each acoustic category will increase accordingly.

4. The max assignment slider can be used to adjust the range for the assignment sliders for each acoustic category.

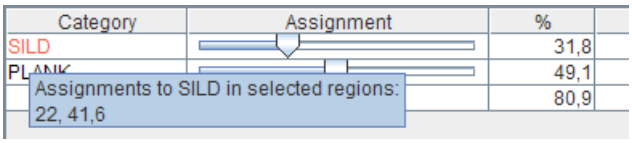
5. After all regions in the visible range have been assigned interpretations, press one of the green buttons to store to the database. The interpretation can be stored on up to 3 different grid sizes. Grids are defined in [Survey configuration - Grid] and displayed as an overlay on the echogram. By using the buttons at the lower right, the user can decide which frequencies to store.

6. The interpretation stored to the database can be deleted with the delete button. This button will only be enabled if the database contains an interpretation in the visible range. Hovering the mouse over the button will show the grid cells that will be deleted. Note that the interpretation must be deleted before a new interpretation can be stored to the database. If a whole file is inside the visible range, the corresponding snap-file will also be deleted.

Interpreting multiple regions simultaneously

Multiple regions can be interpreted simultaneously by selecting more than one region. Adjusting the assignment then applies to all selected regions.

If the selected regions have different assignments for the same acoustic category, then the average assignment is displayed, and the name label is colored red. The name label then has a tool tip with all the different assignment values.



The name label is also colored red if an acoustic category is used as 'rest acoustic category' in some, but not all, of the selected regions.

Interpretation initialization

The interpretation of a region consists of assignments to a set of species for each frequency. For example will 3 species and 6 frequencies result in 3 × 6 = 18 assignment values. As a help for setting all these values the assignments are copied to uninitialized frequencies.

The interpretation of a region is initialized for the current frequency when a species is added to the assignment table by selecting one of the species buttons. When changing the current frequency to a frequency where the interpretation is not initialized, the interpretation is initialized for that frequency by copying all assignments. The source for this copy is selected from the following prioritized list:

1. The previously selected frequency if the interpretation is initialized on that frequency.
2. The nearest lower frequency for which the interpretation is initialized.
3. The nearest higher frequency for which the interpretation is initialized.
4. If none of the above, then the interpretation is not initialized on any frequency and is left uninitialized.

When storing to the database, and the interpretation is not initialized for all frequencies to be stored, a dialog will appear with the following options:

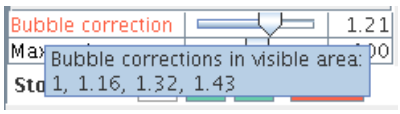
- *Inherit interpretation:* Initialize the interpretation based on the list above. If a region is uninitialized on all frequencies, then the interpretation is initialized with no assignments. Interpretation initialization applied only to the frequencies to be stored.
- *Leave unassigned:* Uninitialized interpretation is left as is and used as no assignments.
- *Cancel:* Don't initialize any interpretation, and cancel database storing.
- *Help:* Show this help page.

Note that it is possible to reinitialize the interpretation through the 'Delete assignments on other frequencies' item in the regions menu.

Bubble correction

Bubble correction is a factor that is multiplied to the s_A in order to compensate for reduced echo due to air bubbles. Initially all pings have a bubble correction of 1 meaning that the s_A values are unchanged. The bubble correction can be modified using the slider or nearby input field marked 3 in the figure above.

If several different bubble corrections have been specified for the visible range the bubble correction label is displayed in red as shown in the figure below. The label then has a tool tip with all the different bubble correction values. The average of the minimum and maximum of these values is used when computing the corrected s_A.

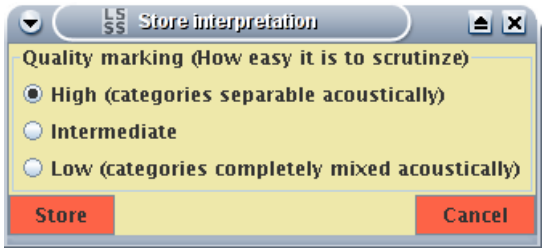


The bubble correction used in a grid column is the average of the minimum and maximum bubble corrections for all pings in the range of the grid column. This means that corrected s_A values shown on the screen is not exactly equal to the corrected s_A values stored to the database.

Storing the interpretation

Storing to database

Storing the interpretation requires that all pings are loaded and being used in the calculations of the s_A. This can be achieved by entering the DETAIL data loading mode. In this mode the grid that will be stored can be seen overlaid on the echogram when moving the mouse over one of the store buttons. When pressing one of the store buttons the confirmation dialog below appears.



After selecting the quality of the interpretation the grids are stored to the database updating the tables Observation, Scatter and ScatterData. The communication with the database is done in the background so that it is possible to continue working. The state of the database communication can be seen in the status bar.

Note that after storing there will automatically be inserted vertical separators isolating the stored segment from the rest. This ensures that the interpretation in stored areas will remain unmodified when editing regions and assignments in areas that are not stored.

Batch storing

If not all pings are loaded when the storing is initiated the program will enter a batch mode for loading all pings before storing to the database. If the number of pings in the current range exceeds the limit for maximum loaded pings specified in [Application configuration - Miscellaneous], then the current range will be split into shorter sequences each of the preferred segment size specified in [Survey configuration - Grid]. If any of the shorter segments contain more than maximum allowed number of pings then those segments will be subdivided using the next finer horizontal grid resolution. For each of these segments all pings will be loaded and the interpretation stored to the database. While the batch storing is in progress it is not possible to continue working and the dialog below will appear.



Saving to file

The interpretation will be stored to file either when storing to the database, or by actively selecting **Save survey** or **Save survey as...** from the file menu. There are two types of files for the interpretation: snap files and work files. These files are written to WorkDir configured in [Survey configuration - Data files]. The snap and work files share the same format, but have different roles as explained below. Each snap/work file is associated with a raw data file through the file name.

Snap files
Every time the user stores to database, the regions and the interpretations of each region are stored to so-called snap files. These files represent the survey at the time of storing to the database. If only a subset of the ping range of a data file is stored to the database, then only that sub range will be updated in the corresponding snap file.

Work files
The work files are created or updated when actively saving the interpretation to file (from the file menu). These files are meant as temporary backup files for the interpretation, before storing to the database.

Restoring interpretation

When selecting another set of files the corresponding snap/work files will be read as long as the WorkDir folder is specified correctly in [Survey configuration - Data files]. Layers will be merged across file boundaries if the following criteria are met:

- The layer connectors have matching depths.
- The layers have the same interpretation.

The snap files have precedence over the work files. The only exception is when the work files are created or modified after the current interpretation session was started. There is at most one snap file and one work file per data file.

Korona experimentation

This module is intended for experimenting with Korona preprocessing. The selected regions are preprocessed using one of the setups defined in [Survey configuration - Preprocessing] and the result is displayed in a secondary LSSS frame.

The ping range processed is the span of the selected regions extended according to the parameter **`Ping padding`**, but limited to the currently visible ping range.

The module view, shown in Figure 1, has these inputs:

- *Preprocessing setup #n*: The selected setup in [Survey configuration - Preprocessing].
- *Process*: Starts processing using the currently selected setup.
- *Edit*: Shows the module editor for the currently selected setup.

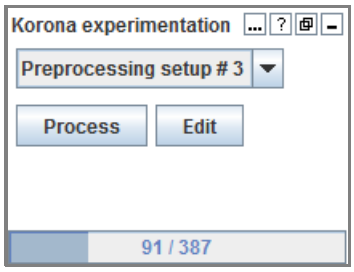


Figure 1. Screenshot of the Korona experimentation module.

Settings

Preprocessing setup

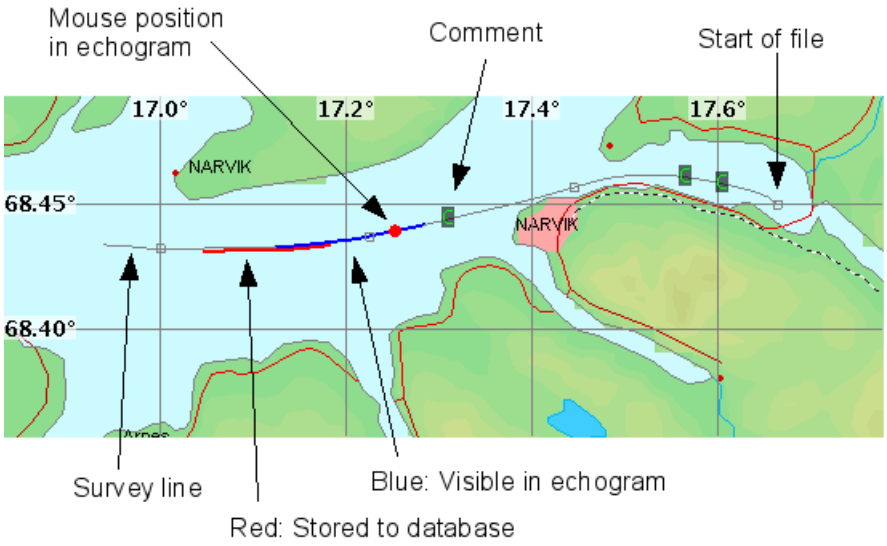
The selected setup in [Survey configuration - Preprocessing]. The same setting is also shown in the dropdown in the module view.

Ping padding

The number extra pings added on each side of the selected range.

Map

This view displays a map together with other types of geographical information. This information is organized in a stack of overlays shown on top of each other. Each overlay can individually be set active or inactive in the map configuration dialog. This dialog can be reached from the map view context menu.



Navigation

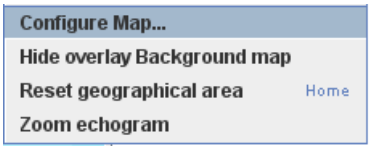
The map view has two modes (use Tab to shift):

- Zoom mode. Click the left (middle) mouse button to zoom in (out) and recenter. Press down the left mouse button and drag the mouse to draw a zoom rectangle.
- Pan mode. Press down the left mouse button and drag the mouse to move the map.

In either mode the mouse scroll wheel can be used to zoom around the mouse location. See also the section in keyboard shortcuts.

Context menu

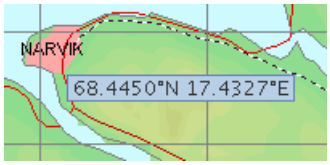
The map context menu is shown below:



- **Configure Map...**: Brings up the configuration dialog for the map.
- **Reset geographical area**: Zooms the map to fit the entire survey line.
- **Zoom echogram**: Zooms the echogram to include the parts of the survey line that is currently visible on the map.

Tool tip

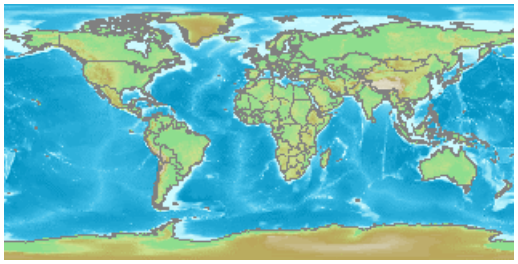
The toolbar button can be used to toggle on and off the map tool tip. The tool tip displays latitude and longitude corresponding to the mouse location.



Overlays

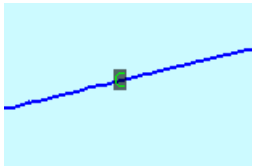
The map view is organized as a stack of several overlays. Each overlay can be turned on or off in the configuration dialog for the map.

Background map



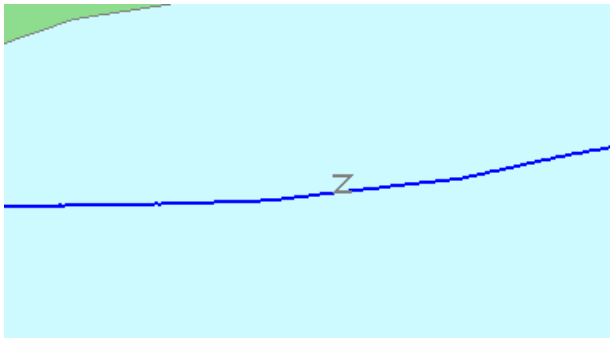
This overlay displays the background map. The map image is provided by a WMS server. The URL of the WMS application can be configured in [Application configuration - Miscellaneous].

Comments



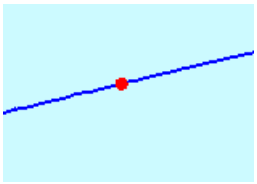
This overlay displays the letter "C" at the location of a comment. Comments are also displayed on the echogram. Comments may be added using the context menu of the echogram.

CTD map overlay



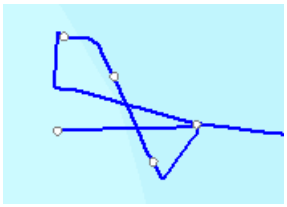
This overlay displays a Z corresponding to where CTD data exists.

Echogram position



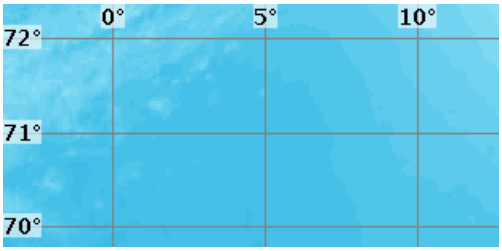
This overlay displays a red dot corresponding to the mouse position in the echogram.

File markers



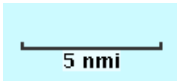
This overlay draws a small circle at the beginning of each data file. This corresponds to the file markers on the echogram.

Latitudes and longitudes



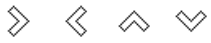
This overlay displays a geographical grid of latitude and longitude lines.

Length scale



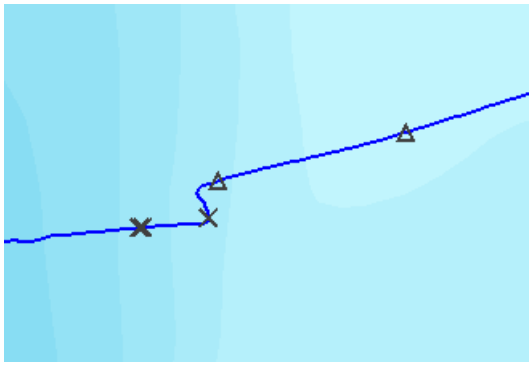
This overlay displays a length scale in the lower right corner of the map.

Pan



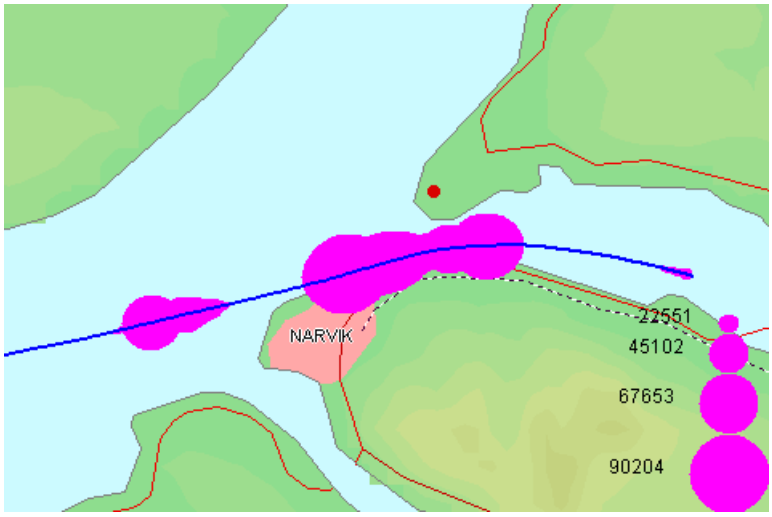
This overlay is active near the edges of the map. Here the mouse cursor will change to indicate panning direction: east, west, north, south. If the left mouse button is clicked the view area is shifted in the indicated direction.

Reference log



This overlay displays information from the reference log data files.

Sa map overlay



This overlay displays s_A in the map as circles of different sizes depending on the s_A value. Circles in bottom right corner shows what s_A value corresponds to which circle size. The s_A is also represented in the echogram.

Survey line



This overlay shows the vessel line. This line is thick blue for the distance shown in the echogram view, and thin gray elsewhere. Segments that are excluded are drawn using a thin dotted line. In addition, the parts where interpretation is stored to the database a red line is shown.

Click on the line to center the echogram around that point.

Numerical view

This view shows information about the datagrams in .raw files.

Description

The following fields are shown in the numerical view:

```
Numerical view                          -View heading

Memory: max: 64,   total: 64   free: 25              -????

Range:[198625,203481),4856 pings, 3,80 nmi, 1:20:26  -[start ping nr.,end ping nr.),number o

CON datagram                                         -Data gram type
Transducer Count                                     -Number of transducers in this file
Angle off. Alongship(degree)                         -Acoustic angel offset in the alongship
Angle off. Athwartship(degree)                       -Acoustic angel offset in the athwartsh
Angle sens. Alongship(degree)                        -Conversion factor between electrical t
Angle sens. Athwartship(degree)                      -Conversion factor between electrical t
Beam width alongship(degree)                         -Acoustic angel sensitivity in the athw
Beam width athwartship(degree)                       -Acoustic angel sensitivity in the athw
Equivalent beam angle(dB)                            -Equivalent beam angle
Gain(dB)                                             -Gain used for this frequency and pulse

RAW datagram                                         -Data gram type
2006.01.24 at 03:08:44 GMT                           -Date (yyyy.mm.dd at hh:mm:ss GMT)
Frequency(Hz)                                        -Frequency of the transducer
Pulse length(ms)                                     -Sound pulse length in this ping
Sample interval(ms)                                  -The temporal distance between each samp
SampleDistance(m)                                    -The spatial distance between each samp
Transducer Depth(m)                                  -Depth of the transducer
Heave corr.depth(m)                                  -Heave corrected depth
```

Remarks

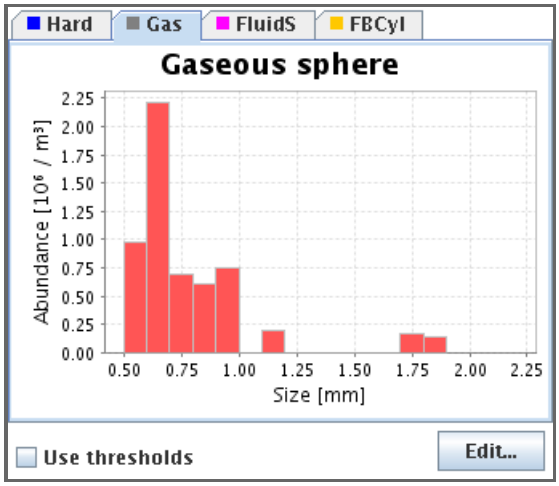
Each raw file starts with one CON datagram and is followed by consecutive RAW datagrams. Detailed information about the .raw datagrams can be found under help in the EK60 and ER60 program.

Ping plot

This view plots S_V against depth for the ping corresponding to the mouse position.

Plankton

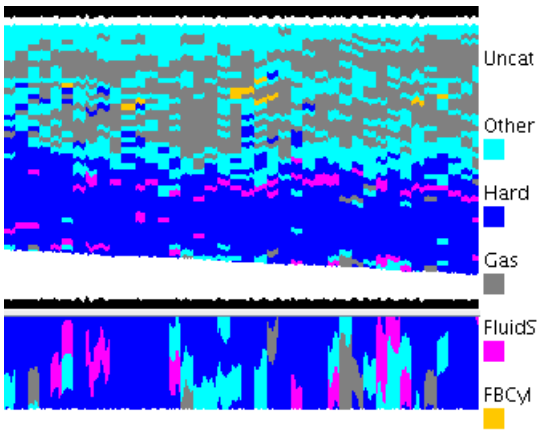
This view shows the results of plankton inversion done during preprocessing. The histogram is the combination of all histograms for all pixels in the currently selected region(s).



If "Use thresholds" is checked only pixels with S_V values within the thresholds for the current frequency are used.

The edit button brings up an editor for adjusting the initial size distribution.

Plankton inversion results can also be used in the interpretation if mappings between plankton categories and acoustic categories have been defined in the configuration. The plankton categories can also be displayed in the echogram by selecting the plankton color map from the context menu of the colorbar.



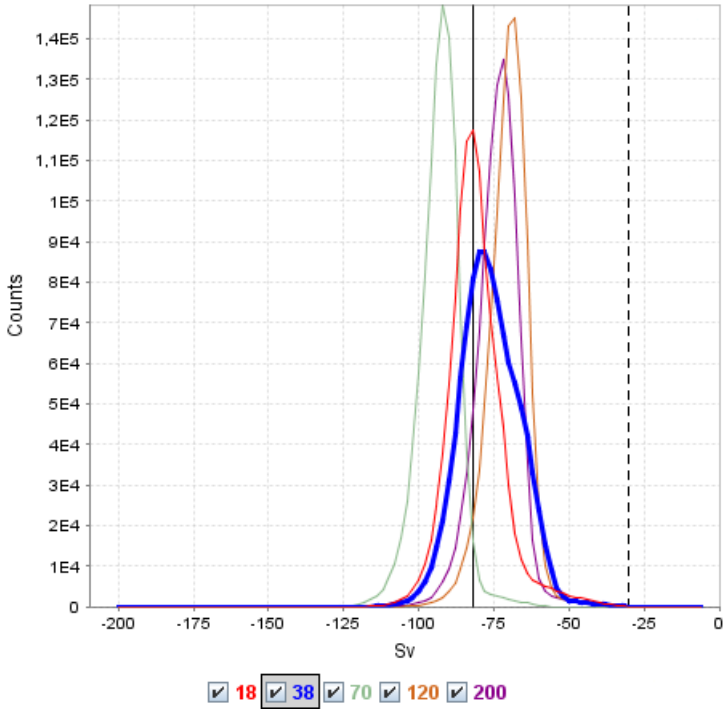
More information about the plankton inversion and algorithm details can be found in the preprocessing help system.

S_V distribution

This view shows the probability density function of S_V values in the echogram.

Description

The distribution is calculated over all active regions, and one curve for each frequency. The thickest line indicates the active frequency. Vertical lines indicate the threshold values in the colorbar.



System info

This view shows some basic system information, such as Java version, memory usage, etc.

Threshold response

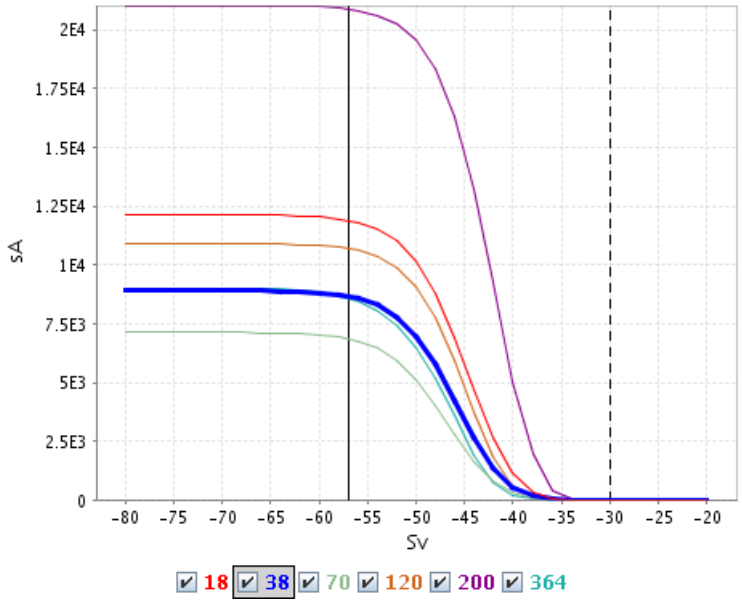
This view shows a plot of the threshold response curve, t = t(dB), defined as

$$t(dB) = s_A(dB, \infty).$$

The curve is computed for the currently active region(s).

With lower threshold dB_{low} and upper threshold dB_{high} the s_A is

$$s_A(dB_{low}, dB_{high}) = t(dB_{low}) - t(dB_{high}).$$



There is one curve for each frequency. The checkboxes below the plot can be used to select which frequencies that should be plotted. The curve for the current frequency is always plotted and with a thick line.

The vertical lines indicate the threshold values set in the colorbar. If the upper threshold value only is used for modifying the color scale and not for clipping, then that line is dashed.

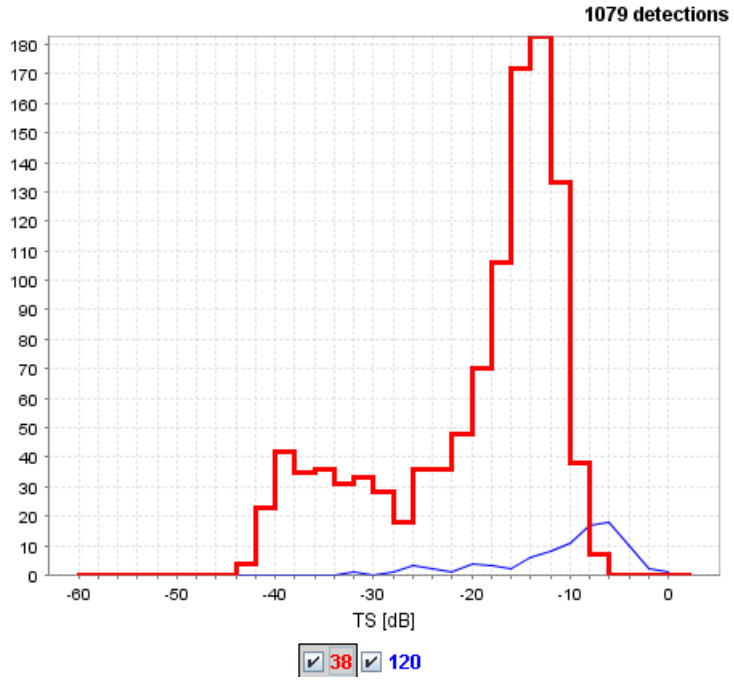
TS distribution

The purpose of the TS module is to visualize the target strength distribution of the detected single targets in the active regions. The distribution for the currently active frequency is shown with a thick piecewise histogram-like curve as shown below. To avoid a cluttered plot, the distributions for the other frequencies are shown with piecewise linear curves.

Two different target detectors are available:

- `SED`, and
- `Narrowband`.

The two target detectors are the same as the ones use in the equally named target trackers available in the KORONA tracking module.



See also TS locations overlay on the echogram for visualizing the positions of the detected targets.

The angles of the detected targets are visualized by TS positions.

Settings

The settings can be adjusted through the configure dialog in the view itself or the dialog [Survey configuration - Modules].

Target detector settings

- `MinTS`: Minimum corrected TS value to be detected [dB]
- `PulseLengthDeterminationLevel`: Pulse length determination level [dB]
- `MinEchoLength`: Minimum echo length (relative to pulse length)
- `MaxEchoLength`: Maximum echo length (relative to pulse length)
- `MaxGainCompensation`: Maximum (one way) gain compensation [dB]. See Gain compensation estimation for details.
- `DoPhaseDeviationCheck`: Check this if phase deviation check should be performed.
- `MaxPhaseDevSteps`: Max phase deviation [phase steps]. See Computation of mechanical angles) for details.
- `MaxDepth`: Maximal depth of targets [m]. Optional, may be left blank.

Display settings

- **`MaxTS`**: The maximum value shown in the TS plot, i.e. upper limit of x-axis.

Export

The detected targets can be exported to file.

Background

SED algorithm

The input to the algorithm is TS values. First, find all the TS candidates, which are contiguous sequences of samples (echolines) above minimum TS value. The minimum TS value for the samples in an echoline is **`MinTS`** - 2 *__`MaxGainCompensation`__ - __`PulseLengthDeterminationLevel`__:
For each TS candidate:

1. Decrease the length of the echoline by backstepping by the pulse length determination level relative to the peak value of the echoline.
2. Reject the candidate if the length of the echoline relative to the pulse length of the transducer is not within the values set in the parameters.
3. If phase deviation checks should be performed: Reject the candidate if the standard deviation of the phase steps is not less than the specified value.
4. Estimate the one way gain compensation value. Reject the candidate if the gain compensation is higher than the specified value.
5. Reject the candidate if there are multiple peaks in the echoline.
6. Compute the compensated TS value of the peak value in the echoline. Reject the candidate if the compensated value is below the minimum TS value.
7. If all tests pass, move the TS candidate to the list of accepted candidates.

Narrowband target detector

See here.

One-way gain compensation estimation

The gain compensation is estimated according to the following polynomial approximation to the first order Bessel function of first kind:

$$B(a, b) = 3.0103 (x^2 + y^2 - 0.18x^2y^2)$$

where
a is the alongship angle.
b is the athwartship angle.
$x = 2a / BW_a$ and BW_a is the beam width alongship.
$y = 2b / BW_b$ and BW_b is the beam width athwartship.

Computation of mechanical angles

The 'electrical degree', e, is computed as

$$e = i * 180 / 128$$

where
i is the signed byte stored on the data file (the phase step).

The 'mechanical degree', m, is then computed as

$$m = e / sensitivity - offset$$

where
sensitivity is the angle sensitivity stored in the configuration datagram.

offset is the angle offset stored in the configuration datagram.

Converting from S_V to TS values

$TS = S_V + 10 \log (TVG(r)) + 10 \log ((c * tau * psi) / 2) + 2 S_aCorr$

where

TVG(r) is the 20 log r time varying gain function.
c is the speed of sound in water
tau is the pulse length
psi is the equivalent beam angle
S_aCorr is a calibration offset.

TS positions

This view displays the angles of the targets detected by:

- Targets detected by TS distributions
- Targets detected by BB TS(f)
- Selected tracks

Targets close to the mouse position in the echogram are highlighted in red.

Trawl

The Trawl module view catch data from trawl stations.

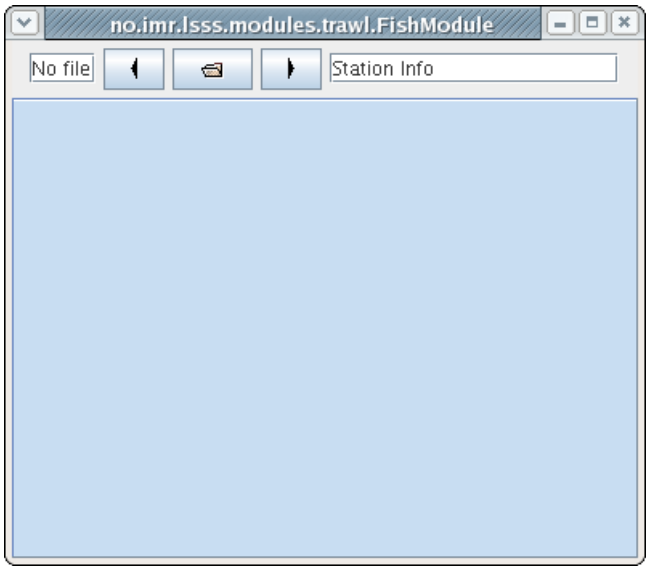
Description

If the Trawl-module is enabled when LSSS is started, a window like the one in the picture below should appear on the screen.

The module contains two main parts, a toolbar and a graphic window.

The toolbar contains five items from left to right:

Station number *-shows number of current station*
Previous station *-select previous station*
Filebrowser *-open newspd file*
Next station *-select next station*
Station info *-display station information*



File format

The trawl data files have extension *.spd. The spd files usually contains data from several fish stations.

The spd file format is an internal IMR format.

Format description can be found in the following reference:

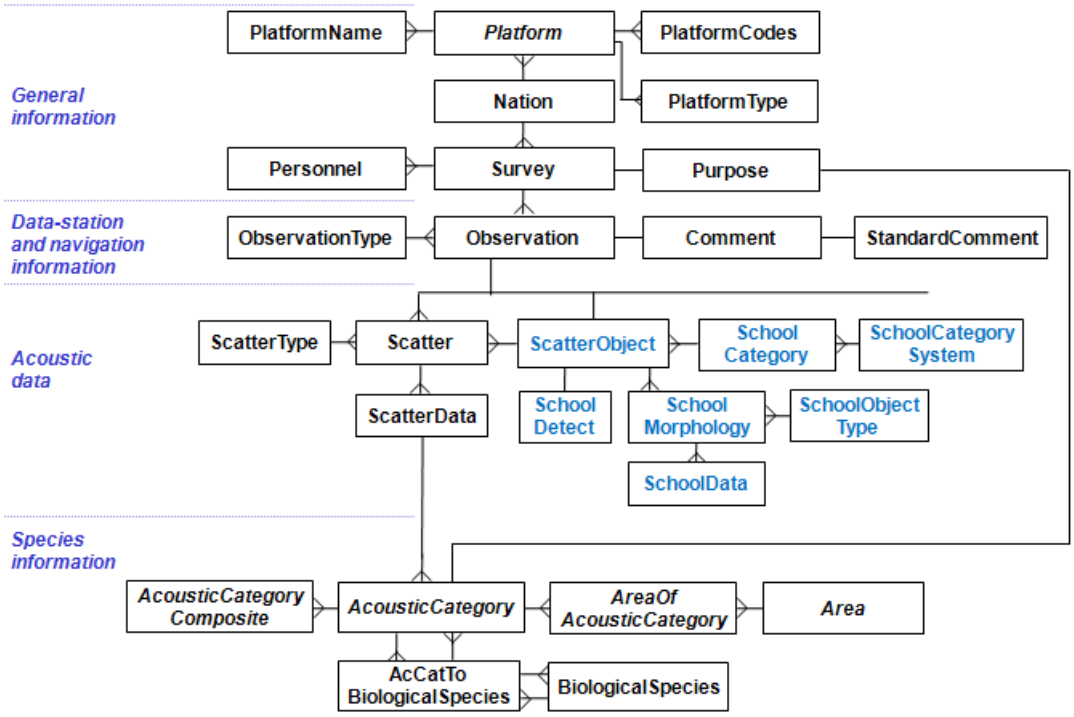
> Håndbok for prøvetaking av fisk og krepsdyr ver. 3.15 by Hildegunn Mjanger, John Alvsvåg, Knut Hestenes, Bjørn Vidar Svendsen and Thomas de Lange Wenneck

Database LSSS

The database contains the results of the scrutinizing of the acoustic data and some information needed during the scrutinizing process. The communication with the relational database is done through Hibernate and JDBC. Several different database engines may be used. Currently these are:

- Firebird
- HSQLDB - Requires no server. Stored in files, text or binary. This database may not be not suitable for large databases.
- JavaDB - Requires no server. Stored in binary files.
- PostgreSQL

The figure below shows how the database tables relate to each other. Some tables keep general information about the data, i.e. name and code of nation, observing platform and survey. Some tables keep information about the observations itself, i.e. about the data-stations and its belonging navigation data and comments. Some tables keep the data from the data-stations, e.g. the acoustic data. Some tables keep the information about the biological species and acoustic categories.



The LSSS database model

The database tables in alphabetic order are as follows (tables in red are implemented, but not fully used):

- AcCatToBiologicalSpecies - Coupling between acoustic category and biological species
- AcousticCategory - Acoustic category, i.e. "acoustic species" used during data interpretation
- AreaOfAcousticCategory - Coupling between acoustic category and area
- AcousticCategoryComposite - Acoustic category composed by several non-composite acoustic categories
- Area - Name of sea areas
- AreaOfAcousticCategory - Areas an acoustic category is associated with
- BiologicalSpecies - Names and codes of biological species
- Nation - Name and code of nation
- Observation - Observation and its coordinates
- ObservationComment - Observation comments
- ObservationType - Observation type
- Personnel - personnel and duty on survey
- Platform - Observing platform (e.g. ship or buoy)

- PlatformCodes - Platform codes in alternative coding systems
- PlatformName - Platform names
- PlatformType - Name of platform types and sub-types
- Purpose - Purpose of using acoustic category in the scrutinizing process
- Scatter - Main scatter information
- ScatterData - Depth-channel data of acoustic scatter
- ScatterObject - Group of scatter (e.g. entire school)
- ScatterType - Type of scatter-channels
- SchoolCategory - Acoustic category for school object
- SchoolCategorySystem - Code system for school
- SchoolData - Data for school object (in addition to Scatter)
- SchoolDetect - Settings used to detect school
- SchoolMorphology - Morphology of school
- SchoolObjectType - Type of school object
- StandardComment - Frequently used observation comments
- Survey - Survey information

About the fields in the database tables

The size of the fields of each table is given as short, int, long, char or float. The sizes of each of these fields are as follows:

```
short:  2 byte (int 2)
int:    4 byte (int 4)
long:   4 byte (int 4)
char:   1 byte (int 1)
float:  4 byte (float 4)
double: 8 byte (float 8)
```

The fields Date and Time (ObservationDate, StartDate, ObservationTime, StartTime, ...)

- Date format - YYYYMMDD where YYYY is year, MM is month, DD is day.
- Time format - hhmmssxx where hh is hour, mm is minutes, ss seconds, xx 1/100 of seconds

AcCatToBiologicalSpecies

Name

AcCatToBiologicalSpecies - Coupling between acoustic categories and biological species

Synopsis

```
struct AcCatToBiologicalSpecies {
  short Nation;
  short Platform;
  int   AcousticCategory;
  int   BiologicalSpecies;
};
```

Description

This table contain coupling between the AcousticCategory and the BiologicalSpecies database tables. An acoustic category may be identical to a biological species, i.e. Cod, but it may also be a combination of acoustic categories where each is a single biological species, i.e. Ha/Co (Haddock/Cod), or it may be a subset of a biological species, e.g. 0-Herring (Zero group herring - herring less than 1 year), or a more generic acoustic category, e.g. "Large krill". The table should be updated at least when a new entry is inserted into AcousticCategory.

Parameters

- **Nation** - Unique nation identification code. Refer to the Nation database table.
- **Platform** - Unique identification code for observation platform. Note that **Platform** = 0 means "national-wide" or "institute-wide" entry of the database table. Refer to the Platform database table.
- **AcousticCategory** - Acoustic category, i.e. "acoustic species". Refer to the AcousticCategory.
- **BiologicalSpecies** - Unique identification code for biological species found in the BiologicalSpecies database table.

Related topics

Database

Related database tables

AcousticCategory; BiologicalSpecies; AcousticCategoryComposite;

AcousticCategory

Name

AcousticCategory - Acoustic categories of the database

Synopsis

```
struct AcousticCategory {
  short Nation;
  short Platform;
  int   AcousticCategory;
  short Composite;
  char  Initials[5];
  char  EnglishInitials[5];
  char  CommonName[80];
  char  EnglishName[80];
};
```

Description

This table contains information characterizing individual acoustic categories - name, identification code etc. An acoustic category may be a fish-species (e.g. herring), a group of fish-species (e.g. Ha/Co - Haddock or Cod), a sub-group of a species of fish (e.g. 0Herr - Zero group herring, i.e. herring less that one year) or similar, a group of zooplankton (e.g. large fluid-like zooplankton), or similar.

Parameters

- **Nation** - Unique nation identification code. Refer to the Nation database table.
- **Platform** - Unique platform (vessel) identification code. Refer to the Platform database table.
- **AcousticCategory** - Unique identifier for acoustic category.
- **Composite** - Flag indicating if the acoustic category given by **Nation-Category** is a composition of several acoustic categories or not. If sub-categories are assigned this parameter is set to 1, and with no sub-categories it is set to 0.
- **Initials** - Short form category name used by the Interpretation window and the printout programs.
- **EnglishInitials** - Short form category name in English.
- **CommonName** - Complete category name in native language. Note that number of characters is limited.
- **EnglishName** - Complete category name in English. Note that number of characters is limited.

Related topics

Database

Related database tables

AreaOfAcousticCategory; BiologicalSpecies; AcousticCategoryComposite;

AcousticCategoryComposite

Name

AcousticCategoryComposite - List of composite acoustic categories and the members of each category.

Synopsis

```
struct AcousticCategoryComposite {
  short Nation;
  short Platform;
  int   AcousticCategory;
  int   AcousticCategoryMember;
};
```

Description

This table contains the name of the composite acoustic categories and which non-composite acoustic categories are allocated as "members" of the composite acoustic category.

Parameters

- **Nation** - Unique nation identification code. Refer to the Nation database table.
- **Platform** - Unique identification code for observation platform. Note that **Platform** = 0 means "national-wide" or "institute-wide" entry of the database table. Refer to the Platform database table.
- **AcousticCategory** - Code of the acoustic category, which of course is composite (e.g. code for group of species). Refer to the AcousticCategory database table.
- **AcousticCategoryMember** - Code of the non-composite acoustic category (e.g. code for species) defined as a member of the composite category given by the field *AcousticCategory*. Refer to the AcousticCategory database table.

Related topics

Database

Related database tables

AcousticCategory;

Area

Name

Area - Areas of the seas

Synopsis

```
struct Area {
  short Nation;
  int  Area;
  char AreaName[80];
};
```

Description

This table contain name of sea areas, e.g. Barents Sea or Norwegian Sea.

Parameters

- **Nation** - Unique nation identification code. Refer to the Nation database table.
- **Area** - Unique identification code for area.
- **AreaName** - Name of the sea area.

Related topics

Database

Related database tables

AreaOfAcousticCategory;

AreaOfAcousticCategory

Name

AreaOfAcousticCategory - Coupling between sea area and acoustic category

Synopsis

```
struct AreaOfAcousticCategory {
  short Nation;
  short Platform;
  int   AcousticCategory;
  int   Area;
};
```

Description

This table contain coupling between the AcousticCategory and the Area database tables. The coupling is done to reduce the list of acoustic categories to a more convenient size when selected to be used in the scrutinize session.

Parameters

- **Nation** - Unique nation identification code. Refer to the Nation database table.
- **Platform** - Unique identification code for observation platform. Note that **Platform** = 0 means "national-wide" or "institute-wide" entry of the database table. Refer to the Platform database table.
- **AcousticCategory** - Acoustic category, i.e. "acoustic species". Refer to the AcousticCategory.
- **Area** - Unique identification code for area. Refer to the Area database table.

Related topics

Database

BiologicalSpecies

Name

BiologicalSpecies - Species of the database

Synopsis

```
struct BiologicalSpecies {
  short Nation;
  int   BiologicalSpecies;
  char  Initials[5];
  char  CommonName[80];
  char  EnglishName[80];
  char  LatinName[80];
  char  NODC[12];
  int   ITIS;
};
```

Description

This table contains information characterizing individual species - name, identification code etc. The species are biological species. Since the content of the database table is seldom expanded, there is no GUI in LSSS to insert content.

Parameters

- **Nation** - Unique nation identification code. Refer to the Nation database table.
- **Category** - Unique identifier for acoustic category.
- **Composite** - Flag indicating if the acoustic category given by **Nation-Category** is a composition of several acoustic categories or not. If sub-categories are assigned this parameter is set to 1, and with no sub-categories it is set to 0.
- **Initials** - Short form category name used by the Interpretation window and the printout programs.
- **CommonName** - Complete category name in native language. Note that number of characters is limited.
- **EnglishName** - Complete category name in English. Note that number of characters is limited.
- **LatinName** - Complete category name in Latin. Note that number of characters is limited.
- **NODC** - Internationally standardized species code (National Oceanographic Data Center).
- **ITIS** - International standard species code (Integrated Taxonomic Information System).

Related topics

Database

References

1. *National oceanographic data center taxonomic code, Volume 2 - Alphabetical (scientific name order) listing Key to Oceanographic Records Documentation, Number 15, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Oceanographic Data Center, Washington D.C., 1984.*
2. *K.G.Foote - Fish target strengths for use in echo integrator surveys, Journal of the Acoustical Society of America, Volume 82, Number 3, pages 981-987, September 1987.*

Nation

Name

Nation - Names and codes of nations

Synopsis

```
struct Nation {
  short Nation;
  char  NationName[80];
};
```

Description

The Nation database table contains names and codes of nations.

Parameters

- Nation - Unique nation identification code. By default, the codes used are those defined by United Nation's list of countries and area codes
- NationName - Name of nation.

Related topics

Database

Observation

Name

Observation - Data-stations and belonging navigation information.

Synopsis

```
struct Observation {
  short  Nation;
  short  Platform;
  int    Survey;
  int    ObservationDate;
  int    ObservationTime;
  short  ObservationType;
  float  Distance;
  float  Latitude;
  float  Longitude;
  float  BottomDepth;
};
```

Description

The Observation database table contains information about all data-stations and corresponding navigation information.

Parameters

- **Nation** - Unique nation identification code. Refer to the Nation database table.
- **Platform** - Unique platform (vessel) identification code. Refer to the Platform database table.
- **Survey** - Unique survey identification code. See the Survey table.
- **Date** - Date [YYYYMMDD] (UTC) of the observation.
- **Time** - Time [hhmmssxx] (UTC) of the observation.
- **ObservationType** - This parameter defines the type of observation made. Refer to the ObservationType table.
- **Distance** - The vessel distance (in nautical miles) at the time of the observation measured from the vessel's logged distance at the start of the survey. If the vessel log shows NN nautical miles at the beginning of the survey, the Distance parameter will contain NN+X, where X is the sailed distance from the start of the survey.
- **Latitude** - The latitude of the geographical position (in degrees) of the platform (often a ship) at the time of the observation.
- **Longitude** - The longitude of the geographical position (in degrees) of the platform (ship) at the time of the observation.
- **BottomDepth** - The detected bottom depth (in meters) at the time of the observation.

Related topics

Database

Related database tables

ObservationType ObservationComment

ObservationComment

Name

ObservationComment - Comment to observation

Synopsis

```
struct ObservationComment {
  short Nation;
  short Platform;
  int   Survey;
  int   ObservationDate;
  int   ObservationTime;
  short ObservationType;
  int   StandardComment;
  int   Mantissa;
  int   Exp;
  char  Text[200];
};
```

Description

ObservationComment contains the mapping link between observations and comments.

Parameters

- **Nation** - Unique nation identification code. Refer to the Nation database table.
- **Platform** - Unique platform (vessel) identification code. Refer to the Platform database table.
- **Survey** - Unique survey identification code. See the Survey table.
- **Date** - Date of event or observation. Refer to the Observation database table.
- **Time** - Time of day of event or observation. Refer to the Observation database table.
- **ObservationType** - Code for which type of observation made. Refer to the Observation database table.
- **StandardComment** - Comment code. Refer to the StandardComment database table. If the code value is 0, the comment is defined in the **Text** parameter.
- **Mantissa** - See the CommentExp parameter below.
- **Exp** - Any comment may have a specific value assigned to it. This value can be any number, and the value stored as two different parameters in the ObservationComment database table; Mantissa and Exp. Value = Mantissa × 10^{Exp}. The conversion from the assigned value to the two parameter values is performed automatically when the data is stored to the database.
- **Text** - Free text to enter comment. Note that maximum size is 200 characters. This parameter is empty if a standard comment is used (**StandardComment** parameter > 0).

Related topics

Database

Related database tables

The database table StandardComment contains standard comments frequently used.

ObservationType

Name

ObservationType - Type of observation made

Synopsis

```
struct ObservationType {
  short ObservationType;
  char  ObservationTypeName[80];
};
```

Description

This table provides a mapping between the observation type code and the observation type name. Note that there is a maximum length of the name.

Parameters

- ObservationType - Unique identifier code for defined event types. Currently, the following observation types are defined:
  0 = Unspecified 1000 = NAVIGATION = Navigation Data Input
  2000 = ACOUSTIC_START = Start of data file containing acoustic data
  2010 = ACOUSTIC_STOP = End of data file containing acoustic data.
  3000 = SCATTER = Scattered Fish Data
  4000 = SCHOOL = Scattered Fish Data interpreted as a school of fish
  5000 = OCEANOGRAPHY = Oceanography Data Input
  6000 = BIOLOGY = Biology Data Input
  7000 = METEOROLOGY = Meteorology Data Input
  8000 = SCATTER_OBJECT_DUMMY
  9000 = SCATTER_OBJECT_SCHOOL = Scatter object of type school
  10000 = SCATTER_OBJECT_PELAGIC = Scatter object of type pelagic echogram
  A Scattered Fish Data event line is added to the Observation table for each interpreted grid column where date, time, log, latitude, longitude and bottom depth all refer to the start of the grid column. Note that the content may be expanded when LSSS is expanded with new plugin subsystems (see manual of plugin subsystem).
- ObservationTypeName - Free text to name and/or describe the event. Note the maximum length.

Related topics

Database

Related database tables

Observation; Scatter;

Personnel

Name

Personnel - Name of person and (on??) duty on survey

Synopsis

```
struct Personnel {
  short Nation;
  short Platform;
  int   Survey;
  char  Person[80];
};
```

Description

Name of person and (on??) duty on survey

Parameters

- **Nation** - Unique nation identification code. Refer to the Nation database table.
- **Platform** - Unique platform (vessel) identification code. Refer to the Platform database table.
- **Survey** - A survey code is assigned to each survey. Refer to the Survey database table.

Related topics

Database

Related database tables

Survey

Platform

Name

Platform - Information about observation platforms

Synopsis

```
struct Platform {
  short Nation;
  short Platform;
  short PlatformType;
  short PlatformSubType;
  int   FirstValidDate;
  int   LastValidDate;
};
```

Description

This table contains the mapping from the name of the observation platform to nation code and platform code. The observation platform is often a ship.

Parameters

- **Nation** - Unique nation identification code. Refer to the Nation database table.
- **Platform** - Platform identification code. This information must be unique for the corresponding Nation code.
- **PlatformType** - Type of observation platform, e.g. Ship
- **PlatformSubtype** - E.g. research ship
- **FirstValidDate** - [YYYYMMDD] First date the observation platform was operational.
- **LastValidDate** - [YYYYMMDD] Last date the observation platform was operational.

Related topics

Database

Related database tables

The database table PlatformName contains names of observation platforms.
The database table PlatformType contains info about types of platforms.
The database table PlatformCodes contains platform codes in other coding systems.

PlatformCodes

Name

PlatformCodes - Platform codes in several code systems

Synopsis

```
struct PlatformCodes {
  short Nation;
  short Platform;
  char  PlatformCodeSysName[80];
  int   FirstValidDate;
  int   LastValidDate;
  char  PlatformCode[12];
};
```

Description

This table contains the mapping from the unique platform code used by the database internally to other code systems. Other code systems may be e.g. "Callsign", which for RV "G.O.Sars" (1970-2002) were LLZG, or ICES ship codes are "ICESnnsss", where nn is nation and sss is shipcode, which for the same RV "G.O.Sars" were "ICES58015" (Norway=58, "G.O.Sars"=15).

Parameters

- **Nation** - Unique nation identification code. Refer to the Nation database table.
- **Platform** - Platform identification code. Refer to the Platform database table.
- **PlatformCodeSysName** - Name of code system.
- **FirstValidDate** - [YYYYMMDD] First date the observation platform was operational.
- **LastValidDate** - [YYYYMMDD] Last date the observation platform was operational.
- **PlatformCode** - Code of platform in this code system.

Related topics

Database

Related database tables

The database table Platform contains unique platform codes.

PlatformName

Name

PlatformName - Information about observation platforms

Synopsis

```
struct PlatformName {
  short  Nation;
  short  Platform;
  char   PlatformName[80];
  int    FirstValidDate;
  int    LastValidDate;
};
```

Description

This table contains the mapping from the name of the observation platform to nation code and platform code. The observation platform is often a ship.

Parameters

- **Nation** - Unique nation identification code. Refer to the Nation database table.
- **Platform** - Platform identification code. This information must be unique for the corresponding Nation code. Refer to the Platform database table.
- **PlatformName** - Name of observation platform, e.g. "G.O. Sars"
- **FirstValidDate** - [YYYYMMDD] First date the observation platform was operational.
- **LastValidDate** - [YYYYMMDD] Last date the observation platform was operational.

Related topics

Database

Related database tables

The database table PlatformType contains info about types of platforms.
The database table PlatformCodes contains platform codes in other coding systems.

PlatformType

Name

PlatformType - Information about platform types and sub-types

Synopsis

```
struct PlatformType {
  short PlatformType;
  short PlatformSupType;
  char  PlatformTypeName[80];
  char  PlatformSubTypeName[80];
};
```

Description

This table contains the mapping from the name of the observation platform to nation code and platform code. The observation platform is often a ship.

Parameters

- **PlatformType** - Code for type of observation platform. The standard list of observation platforms are:
  0 = Unknown
  0 = Unknown
  1 = Land/Sea floor
  2 = Submersible
  3 = Ship *(Default)*
  4 = Buoy/Mooring
  5 = Balloon
  6 = Aircraft/Satellite/Rocket
  7 = Unassigned
  8 = 'Grid'
  9 = Other
- **PlatformSubtype** - Code for sub-type observation platform.
- **PlatformTypeName** - Name of platform type, e.g. "ship".
- **PlatformSubTypeName** - Name of platform sup-type, e.g. "research ship".

Note that currently always PlatformType=3 and PlatformSubtype=1, which means "Research vessel".

Related topics

Database

Related database tables

Platform; PlatformCodes;

Purpose

Name

Purpose - Purpose of scrutinizing acoustic category on survey.

Synopsis

```
struct Purpose {
  short Nation;
  short Platform;
  int   Survey;
  int   AcousticCategory;
  short Purpose;           //OLD:SpeciesPurpose; char Purpose
};
```

Description

This table contains the purpose code for the acoustic categories used in the current survey.

Parameters

- **Nation** - Unique nation identification code. Refer to the Nation database table.
- **Platform** - Unique platform (vessel) identification code. Refer to the Platform database table.
- **Survey** - Unique survey identification code. See the Survey database table.
- **AcousticCategory** - Unique identification code for acoustic category. Refer to the AcousticCategory database table.
- **Purpose** - Identification code assigning the requested purpose (priority) to one or more species. The purposes of scrutinizing this acoustic category is as follows:
  1 = *Most important category.* This is the main (or one of the few main) acoustic category scrutinized on this survey. There are experts on the species represented by the acoustic category at the observation platform. The survey is designed to cover the residential area of the stock. The biological sampling is optimized for the species represented by the acoustic category, e.g. for the purpose of using the acoustic data (in Scatter and ScatterData) to estimate fish stock abundance.
  2 = *Not very important category.* The biological sampling is not optimized for the species represented by the acoustic category, or the survey area only covers parts of the residential area of the stock. The acoustic data may with some care be used as support information to acoustic data from other cruises to calculate fish stock abundance.
  3 = *Unimportant category.* The acoustic category is used as a collector for "the rest of the acoustic data". Typical acoustic categories marked by **Purpose**=3 are "Others", "Mix of pelagic fish", "Mix of bottom fish". The acoustic category may not be used to estimate abundance.
  0 = *Unknown importance.* Means that the category purpose code has not been assigned or is unknown as for some historical data.

Related topics

Database

Related database tables

The database tables Personnel and Survey also contain survey related information.

Scatter

Name

Scatter - Processing and support parameters for acoustic data

Synopsis

```
struct Scatter {
  short Nation;
  short Platform;
  int   Survey;
  int   Object;
  int   ObservationDate;
  int   ObservationTime;
  int   Frequency;
  short Transceiver;
  short ScatterType;
  short ObservationType;
  int   Duration;
  float DistanceInterval;
  float MinBottomDepth;
  float MaxBottomDepth;
  float Threshold;
  float BubbleCorrection;
  float ChannelThickness;
  float UpperDepth;
  float LowerDepth;
  float SA;
  float Quality;
  float PctSA;
  float UpperInterpretationDepth;
  float LowerInterpretationDepth;
  short BottomActive;
};
```

Description

Interpreted echo data from scattered fish are stored in the tables Scatter and ScatterData. The data are stored in the tables with a selectable horizontal resolution. The database table Scatter contains processing and support parameters. The database table ScatterData contains the integrated echo levels in depth-channels as s_A (Nautical Area Scattering Coefficient). Vertically, the data in Scatter and ScatterData tables are resolved into depth-channels; pelagic and bottom. The **ScatterType** parameter determines if the scatter data are taken from pelagic or bottom channels, while channel thickness is controlled by the **ChannelThickness** parameter. When stored to the database, there will for each sub-interval be stored: one **ObservationType**=*"Scattered Fish Data"* event line is added to the ObservationType table, one line is added to the Scatter table several lines are added to the ScatterData table.

Parameters

- **Nation** - [-] Unique nation identification code. Refer to the Nation database table.
- **Platform** - [-] Unique platform (vessel) identification code. Refer to the Platform database table.
- **Survey** - [-] Unique survey identification code. See the Survey table.
- **Object** - [-] Object identification number. The number is used to group scattered data. The primary gain is thought to be by using the Object number to group scattered data from schools. The Object (number) is shared between the frequencies. There are currently two types of objects that are numbered: echogram and school. Each of these two object-types have surface-referenced depth-channels (scatter-type Echogram-Pelagic or School-Pelagic of the ScatterType database table), and may in addition also have bottom-referenced depth-channels (scatter-type Echogram-Bottom or School-Bottom of the ScatterType database table) if BottomActive=TRUE (see below).

For *School*: each of the regions of acoustic data (at all frequencies) in the section visible on the computer-display scrutinized as a single school is given the same Object (number) when stored to the database.
For *Echogram*: all acoustic data (at all frequencies) in the section visible on the computer-display is given the same Object number when stored to the database if stored in the same store-operation. If the echograms at different frequencies are NOT stored in the same operation, the echograms will be given different Object number. Note that if a section of the echogram-object is deleted at a later stage, the same section is deleted at all frequencies simultaneously, and the remaining undeleted section will keep the original Object number. Further, if the deleted section is re-scrutinized and stored to the database again, the new section stored to the database will be given a different Object number than the original.

- **ObservationDate** - [YYYYMMDD] (UTC) Each line in the Scatter table is time stamped with the start of the associated sub interval, and there is a "Scattered Fish Data" event line in the ObservationType table with a matching time stamp.
- **ObservationTime** - [hhmmssxx] (UTC) Each line in the Scatter table is time stamped with the start of the associated sub interval, and there is a Scattered Fish Data event line in the ObservationType table with a matching time stamp.
- **Frequency** - [Hz] Echo sounder operating frequency in Hz.
- **Transceiver** - {1; ...} Echo sounder transceiver or GPT channel number.
- **ScatterType** - {...} Type of scatter data. See the ScatterType database table
- **ObservationType** - {...} Type of observation. See the ObservationType table.
- **Duration** - [1/100 s] This parameter state the duration in hundredths of seconds (1/100) for the current sub interval.
- **DistanceInterval** - [nmi] This parameter state the distance in nautical miles (1 nmi = 1852 m) covered by the current sub interval.
- **MinBottomDepth** - [m] Minimum bottom depth in meter within this sub interval.
- **MaxBottomDepth** - [m] Maximum bottom depth in meter within this sub interval.
- **Threshold** - [dB] LSSS computes integrated echo level (s_A) from volume backscattering (s_v) coefficients by performing integration vertically and averaging horizontally. s_V coefficients are only included in the computations if their value exceeds a certain threshold. The threshold is identical to the lower boundary of the color scale as set in the color scale field of the echogram view. The **Threshold** parameter contains the threshold in dB that was used when interpreting this data.
- **BubbleCorrection** - [-] Small air bubbles sometimes attenuates the echosounder signal, and a multiplication factor is available from the Store Interpretation dialogue for manually boosting the signal strength. Both pelagic and bottom channel data are affected by this boosting mechanism. The **BubbleCorrection** parameter contains the multiplication factor value that was used when interpreting this data.
- **ChannelThickness** - [m] Channel thickness in meters.
- **UpperDepth** - [m] Upper depth boundary in meters where acoustic data of specified **ScatterType** exist. **UpperDepth** is the least depth below sea surface for all pings in the current sub interval (see **Duration** and **DistanceInterval**), i.e. **UpperDepth**=MIN(**UpperDepth**$_{ping(i)}$,...,**UpperDepth**$_{ping(i+n)}$). For pelagic channels (i.e. that are referenced to the sea surface), **UpperDepth** is positive. Bottom channels are referred to *detected* (coordinated) bottom and are positive downwards, i.e. UpperDepth is negative.
- **LowerDepth** - [m] Lower depth boundary in meters where acoustic data of specified **ScatterType** exist. **LowerDepth** is the largest depth below sea surface for all pings in the current sub interval (see **Duration** and **DistanceInterval**), i.e. **LowerDepth**=MAX(**LowerDepth**$_{ping(i)}$,...,**LowerDepth**$_{ping(i+n)}$). For pelagic channels (**ScatterType**="Echogram Pelagic" or "School Pelagic"), **LowerDepth** is positive. Bottom channels are referred to *detected* (coordinated) bottom and are positive downwards.
- **SA** - [m^2/nmi^2] This parameter (s_A) contains the sum of the interpreted s_A values for all the acoustic categories for all the channels in the column. The parameter has dimension square meter per square nautical mile.
- **Quality** - {1;2;3} User assigned quality code of for the current interpretation, as defined in the Specify Quality dialogue following the Store Interpretation procedure. The quality code is used to express how confident the user is regarding the acoustic category interpretation.
  1 = best quality, the acoustic category can be separated exclusively by means of the acoustic measurements.
  2 = second best, the acoustic category can be partly separated by the acoustic measurements, but must be supported by biological samples.
  3 = low quality, the acoustic category are completely mixed, and can only be separated by means of biological samples.

- **PctSA** - [%] This parameter expresses in percentage the interpreted s_A value (above) divided by the total s_A in the entire column.
- **UpperInterpretationDepth** - [m] Upper depth where the acoustic data are scrutinized and stored. **UpperInterpretationDepth** >= **UpperDepth**. Note that only visible data are stored, so that vertical zoom may restrict UpperIntegrationDepth further. For pelagic channels (i.e. that are referenced to the sea surface; **ScatterType**="Echogram Pelagic or "School Pelagic",), **UpperInterpretationDepth** is positive. For bottom channels (i.e. that are referenced to the *detected* bottom (i.e. coordinated bottom); **ScatterType**= "Echogram Bottom" or "School Bottom"), **UpperInterpretationDepth** is negative. Bottom channels are restricted by the extent of the (visible) bottom window, which typically by default shows 10 m above bottom. See also **UpperDepth**
- **LowerInterpretationDepth** - [m] Lower depth where the acoustic data are scrutinized and stored. **LowerInterpretationDepth**<=**LowerDepth**. For **ScatterType**="Echogram Bottom" (and "School Bottom"), **LowerInterpretationDepth** is typically restricted by the lower integration line, which is -0.5, i.e. 0.5 m above *detected* bottom (i.e. coordinated bottom).
- **BottomActive** - {1;0} For a given Object, the flag tells if the bottom was active (=1) or not (=0) when the data was scrutinized. The BottomActive=1 if the postprocessing system was running in "FULL MODE" (formerly known as "SURFACE MODE") when the data was scrutinized, and BottomActive=0 if the system was running in "PELAGIC" mode.

Related topics

Database

Related database tables

ScatterData; ScatterType;

ScatterData

Name

ScatterData - Integrated echo-level in depth-channels

Synopsis

```
struct ScatterData {
  short Nation;
  short Platform;
  int   Survey;
  int   Object;
  int   ObservationDate;
  int   ObservationTime;
  int   Frequency;
  short Transceiver;
  short ScatterType;
  int   ChannelNumber;
  int   AcousticCategory;
  float SA
};
```

Description

Interpreted echo data from scattered fish is stored in the tables Scatter and ScatterData. Scatter contains processing and support parameters, while ScatterData contains the integrated echo levels. Interpreted data is stored in the tables with a selectable horizontal resolution. The horizontal resolution is controlled by the DistanceInterval parameter in the Scatter table. Vertically, the data in Scatter and ScatterData is resolved into depth-channels; pelagic and bottom. The vertical resolution is controlled by the **ChannelThickness** parameter in the Scatter table.

Parameters

- **Nation** - Unique nation identification code. Refer to the Nation database table.
- **Platform** - Unique platform (vessel) identification code. Refer to the Platform database table.
- **Survey** - Unique survey identification code. See the Survey table.
- **Object** - see Scatter table.
- **ObservationDate** - [YYYYMMDD] (UTC) Date of observation. Refer to the Observation table.
- **ObservationTime** - [hhmmssxx] (UTC) Time of observation. Refer to the Observation table.
- **Frequency** - [Hz] Echo sounder operating frequency in Hz. Refer to the Scatter table.
- **Transceiver** - Echo sounder transceiver channel number. Refer to the Scatter table.
- **ScatterType** - Type of scatter data. See the ScatterType table
- **ChannelNumber** - The pelagic channels are parallel to the sea surface, and the bottom channels are parallel to the bottom. Their thickness are defined by the **ChannelThickness** parameter in the Scatter table. See ScatterType table for definitions of the channel types. ChannelNumber increase with increasing distance from the reference, i.e. surface-related depth-channels increase with increasing depth below surface, and bottom related channels increase with increasing distance above bottom.
- **AcousticCategory** - Code of acoustic category code. See the AcousticCategory table. Note that category code 0 implies that the s_A parameter contains raw non-interpreted data; bubble correction included, assignment factors onto acoustic categories excluded.
- **SA** - This parameter (s_A, area backscattering coefficient, Nautical Area Scattering Coefficient - NASC) contains the integrated echo level for a particular sub-interval/channel/active-acoustic-category triplet. The parameter has dimension square meter per square nautical mile. The value is allocated to one acoustic category.

Data storage

A number of lines are added to the ScatterData table. All permutations of sub-interval, channel or active acoustic category are stored as separate lines. Hence, U x C x A lines are added every base interval:

- **U** is the number of sub-intervals.
- **C** is the number of visible channels within the pelagic and bottom echogram. Note that pelagic channel 0 and bottom channel 0 are special sum channels.
- **A** is the number of active acoustic categories including acoustic category 0. Note that acoustic category 0 is a special identifier for raw noninterpreted echo level. The number of lines added can be quite large with unfavorable settings. Therefore, the Scrutinize program only stores lines containing a nonzero SA value. Hence, no lines are stored for pelagic channels that are located below the bottom echogram and for active categories that are assigned a distribution factor of zero in the Interpretation window. Two examples will illustrate the storage mechanisms further. Typical situation: Assuming a horizontal resolution of 1.0 nautical mile (U = 5), 17 visible channels (C = 17) and 3 active acoustic categories (A = 3+1 = 4) a maximum of 5x17x4 = 340 lines are added every base interval. Typically, the number of lines actually stored will be somewhat lower due to the fact that some pelagic channels are below the bottom and that some acoustic categories are given an assignment factor of zero.

Related topics

Database

Related database tables

Scatter ScatterType

ScatterObject

Name

ScatterObject - Object (number) used to group scatter info (e.g. a school)

Synopsis

```
struct ScatterObject {
  short Nation;
  short Platform;
  int   Survey;
  int   Object;
  int   ObservationDate;
  int   ObservationTime;
  int   Duration;
};
```

Description

Interpreted echo data from scattered fish is stored in the tables Scatter and ScatterData, and is grouped by the number **Object** (described below). Information about object morphology, e.g. a school of fish, is stored in the tables SchoolMorphology contains processing and support parameters, while SchoolData contains the integrated echo levels. Interpreted data is stored in the tables with a selectable horizontal resolution. The horizontal resolution is controlled by the DistanceInterval parameter in the Scatter table. Vertically, the data in Scatter and ScatterData is resolved into depth-channels; pelagic and bottom. The vertical resolution is controlled by the **ChannelThickness** parameter in the Scatter table.

Parameters

- **Nation** - Unique nation identification code. Refer to the Nation database table.
- **Platform** - Unique platform (vessel) identification code. Refer to the Platform database table.
- **Survey** - Unique survey identification code. See the Survey table.
- **Object** - see Scatter table.
- **ObservationDate** - [YYYYMMDD] (UTC) Date of observation. Refer to the Observation table.
- **ObservationTime** - [hhmmssxx] (UTC) Time of observation. Refer to the Observation table.
- **Duration** - [1/100 s] This parameter state the duration in hundredths of seconds (1/100) for the scatter-object.

Related topics

Database

Related database tables

Observation Scatter SchoolCategory SchoolMorphology SchoolDetect

ScatterType

Name

ScatterType - List of scatter data types

Synopsis

```
struct ScatterType {
  short ScatterType;
  char  ScatterTypeName[40];
};
```

Description

This table contains a mapping between a scatter type code and the scatter type name.

Parameters

- **ScatterType** - Scatter type code.
- **ScatterTypeName** - Name of scatter type. Currently, the following choices are available:
  1000 = 'scatter_pelagic' //Data from echogram-object in pelagic channels, i.e. parallel to surface. The pelagic echogram depth-channels 'scatter_pelagic' starts at the sea-surface and continue down to the lower integration line which is defined by the operator, but which is commonly just above the bottom (e.g. 0.5 m). The sea surface is defined relative to the transducer face, which could be e.g. 9.3 m above a transducer mounted on a protruding instrument-keel of a research vessel. The lower integration line is defined by the operator. Note that UpperDepth, LowerDepth, UpperInterpretationDepth and LowerInterpretationDepth express limitations on where data may be collected from. The deepest value of UpperDepth and UpperInterpretationDepth is used, and the shallowest value of LowerDepth and LowerInterpretationDepth. The depth channel 1 starts at the sea surface, channel 2 starts where channel 1 stops, etc. Channel 0 is a special sum channel designed to cover all pelagic channels. Summing up the s_A values from all the pelagic channels for a particular acoustic category produces the s_A value of channel 0 for that acoustic category.
  2000 = 'scatter_bottom' //Data from echogram-object in bottom-related channels, i.e. parallel to bottom. The bottom channels are organised in a similar manner as the pelagic depth-channels and starts at the bottom and increase with increasing distance from the bottom. Channel 1 is next to the bottom, channel 2 starts where channel 1 stops, etc., and channel 0 is a special channel designed to cover all bottom channels. The bottom channels starts from the detected bottom selected by the operator. This may be the bottom detected at 38 kHz, the bottom coordinated between many frequencies. The bottom channel terminates at the surface. Further, the data used is limited by UpperDepth, LowerDepth, UpperInterpretationDepth and LowerInterpretationDepth set for the channel type. The UpperIntegrationDepth is commonly 15 m below the sea surface, and the LowerInterpretationDepth is commonly 0.5 m above the detected bottom.
  3000 = 'school_pelagic' //Data from school-object in pelagic channels. The pelagic school channels 'school_pelagic' are defined exactly as the echogram school channels 'scatter_pelagic', but is limited by the extent of the school region. The upper and lower extent of the data used are indicated by UpperInterpretationDepth and LowerInterpretationDepth or by UpperDepth and LowerDepth if those give a smaller extent.
  4000 = 'school_bottom' //Data from school-object in bottom-related channels. The bottom school channels are defined exactly as the echogram school channels 'scatter_bottom', but is limited by the extent of the school region. The upper and lower extent of the data used are indicated by UpperInterpretationDepth and LowerInterpretationDepth or by UpperDepth and LowerDepth if those give a smaller extent.

Related topics

Database

Related database tables

Scatter; ScatterData;

SchoolCategory

Name

SchoolCategory - Acoustic category for school

Synopsis

```
struct SchoolCategory {
  short  Nation;
  short  Platform;
  int    Survey;
  int    Object;
  short  CategorySystem;
  int    Category;
};
```

Description

Code for acoustic category and in which category system that is used.

Parameters

- **Nation** - Unique nation identification code. Refer to the Nation database table.
- **Platform** - Unique platform (vessel) identification code. Refer to the Platform database table.
- **Survey** - Unique survey identification code. See the Survey table.
- **Object** - see Scatter table.
- **CategorySystem** - see SchoolCategorySystem table.
- **Category** - Code for acoustic category (in given CategorySystem).

Related topics

Database

Related database tables

ScatterObject; SchoolMorphology; SchoolDetect; SchoolCategorySystem;

SchoolCategorySystem

Name

SchoolCategorySystem - Acoustic category system

Synopsis

```
struct SchoolCategorySystem {
  short  CategorySystem;
  char   CategorySystemName[40];
  char   CategorySystemDescription[40];
};
```

Description

Acoustic category system of school. This table is tight connected to how the post-processing system works.

Parameters

- **CategorySystem** - Identification code for coding system.
- **CategorySystemName** - Name of coding system.
- **CategorySystemDescription** - E.g. KORONA_Category suggested by KORONA.

Related topics

Database

Related database tables

SchoolCategory

SchoolData

Name

SchoolData - Multifrequency acoustic measurements on a school object

Synopsis

```
struct SchoolData {
  short   Nation;
  short   Platform;
  int     Survey;
  int     Object;
  short   SchoolObjectType;
  int     Frequency;
  int     Transceiver;
  int     FrequencyRef;
  int     TransceiverRef;
  double  SA;
  double  SL;
  double  RF;
  double  rf_sdev;
  double  sv_mean;
  double  sv_sdev;
  double  Skewness;
};
```

Description

This table provides a mapping between the observation type code and the observation type name. Note that there is a maximum length of the name and the description.

Parameters

- **Nation** - Unique nation identification code. Refer to the Nation database table.
- **Platform** - Unique platform (vessel) identification code. Refer to the Platform database table.
- **Survey** - Unique survey identification code. See the Survey table.
- **Object** - see Scatter table.
- **SchoolObjectType**
- **Frequency** [Hz] - see Scatter table.
- **Transceiver** [-] - see Scatter table.
- **FrequencyRef** [Hz] - Reference frequency, usually 38 kHz
- **TransceiverRef** [-] - Transceiver number of reference frequency
- **sA** // Total sA (or total sv?)
- **sL** or object_length // Length [m] (so that abundance can be calculated)
- **rf** (sA/sA_ref) // Corrected value is the same
- **rf_sdev** // Corrected value is the same
- **sv_mean** // Corrected: sv_mean * A / AC * 10**(dSvC/10)
- **sv_sdev** // [(sv_mean - sv_i) / (n-1)] ** 0.5
- **Skewness** // Skewness should be OK for same measurement frequency

Related topics

Database

Related database tables

SchoolMorphology

SchoolDetect

Name

SchoolDetect - Multifrequency acoustic measurements on a school object

Synopsis

```
struct SchoolDetect {   //How calculations were done to process data
  short  Nation;
  short  Platform;
  int    Survey;
  int    Object;
  double DetectionThreshold;
  double DetectionThresholdHole;
  double MinSizeHole;
  double SmoothVertical;
  double SmoothHorizontal;
  String DetectionSettings;
  short  ManuallyCorrected;
};
```

Description

This table provides a mapping between the observation type code and the observation type name. Note that there is a maximum length of the name and the description.

Parameters

- **Nation** - Unique nation identification code. Refer to the Nation database table.
- **Platform** - Unique platform (vessel) identification code. Refer to the Platform database table.
- **Survey** - Unique survey identification code. See the Survey table.
- **Object** - see Scatter table.
- **DetectionThreshold** [dB] - Detection threshold for synthetic channel where school extent was detected.
- **DetectionThresholdHole** [dB] - Detection threshold for hole of school.
- **MinSizeHole** [m] - Minimum length/height of hole to be accepted.
- **SmoothVertical** [m] - Vertical smoothing diameter.
- **SmoothHorizontal** [m] - Horizontal smoothing diameter.
- **DetectionSettings** - Detection settings used by preprocessor (KORONA).
- **ManuallyCorrected** - False if automatically detected school, true else.

Related topics

Database

Related database tables

Observation; ScatterObject; SchoolObjectType; SchoolData; SchoolMorphology; ScatterObject SchoolCategory SchoolMorphology

SchoolMorphology

Name

SchoolMorphology - Object (number) used to group scatter info (e.g. a school)

Synopsis

```
struct SchoolMorphology {
  short  Nation;
  short  Platform;
  int    Survey;
  int    Object;
  short  SchoolObjectType;
  int    ObservationDate;
  int    ObservationTime;
  int    BoxDuration;
  double BoxThickness;
  double BoxLength;
  double MaxThickness;
  double MaxLength;
  double Perimeter;
  double Area;
  double Roughness;
  double ImageCompactness;
  double Circularity;
  double Rectangularity;
  double Elongation;
  double DistanceToBottom;
  double DistanceToSurface;
  int    NmbAcousticCategories;
  int    NmbHoles;
  int    NmbKernels;
};
```

Description

Interpreted echo data from scattered fish is stored in the tables Scatter and ScatterData, and is grouped by the number **Object** (described below). Information about object morphology, e.g. a school of fish, is stored in the tables SchoolMorphology contains processing and support parameters, while SchoolData contains the integrated echo levels. Interpreted data is stored in the tables with a selectable horizontal resolution. The horizontal resolution is controlled by the DistanceInterval parameter in the Scatter table. Vertically, the data in Scatter and ScatterData is resolved into depth-channels; pelagic and bottom. The vertical resolution is controlled by the **ChannelThickness** parameter in the Scatter table.

Parameters

- **Nation** - Unique nation identification code. Refer to the Nation database table.
- **Platform** - Unique platform (vessel) identification code. Refer to the Platform database table.
- **Survey** - Unique survey identification code. See the Survey table.
- **Object** - see Scatter table.
- **SchoolObjectType** - Type of school object: see SchoolObjectType table.
- **ObservationDate** [YYYYMMDD] - (UTC) Date of observation. Refer to the Observation table.
- **ObservationTime** [hhmmssxx] - (UTC) Time of observation. Refer to the Observation table.
- **BoxDuration** [1/100 s] - This parameter state the duration in hundredths of seconds for the current sub interval.
- **BoxThickness** [m] - Uncorrected thickness: T. For corrected thickness: T_{corr} = T - cb/2. c = sound speed, b= pulse length
- **BoxLength** [m] - Uncorrected length: L. For corrected length: L_{corr}=(L - 2R tan(?/2)). R = school mean

range
- **MaxThickness** [m] - Longest range of any vertical line from school bottom to top
- **MaxLength** [m] - Longest range of any horizontal line from school left to right
- **Perimeter** [m] - (P) X m between points. Corrected: $P_{corr} = P * C$
- **Area** [m] - Uncorrected area: A. Corrected area: $A_{corr}=A(L_{corr}T_{corr})/LT$
- **Roughness** [-] - (F) F = 2 * lg(P / 4) / lg(Area). Corrected: FC=2lg(PC/4)/lg(AC)
- **Circularity** [-] - (C) Alternative to image compactness
- **Rectangularity** [-] - (R) R = LT / A
- **Elongation** [-] - BoxLength/BoxHeight. Corrected: LC/TC
- **DistanceToBottom** [m] - Distance where school is closest to bottom. Corrected: + c?/2
- **DistanceToSurface** [m] - Distance where school is closest to surface. Same as corrected
- **BottomDepth** [m] - Distance where school is closest to bottom. Same as corrected
- **NmbAcousticCat** [-] - Number of acoustic categories within school object. Should be =1 for echogram library
- **NmbHoles** [-] - Number of holes in the school
- **NmbKernels** [-] - Number of kernels in the school

Related topics

Database

Related database tables

ScatterObject SchoolData SchoolObjectType SchoolCategory SchoolDetect

SchoolObjectType

Name

SchoolObjectType - Type of school object

Synopsis

```
struct SchoolObjectType {
  short SchoolObjectType;
  char  SchoolObjectTypeName[40];
  char  SchoolObjectTypeDescription[80];
};
```

Description

This table provides a mapping between the observation type code and the observation type name. Note that there is a maximum length of the name and the description.

Parameters

- ObservationType - Unique identifier code for defined event types. Currently, the following choices are suggested for type and type name:
  10 = School-Vertical-Alongship, uncorrected // E.g. from echo sounder or slice from sonar.
  11 = School-Vertical-Alongship, corrected // ---------- ? ---------- ? -------- ? ------
  40 = School-Kernel, uncorrected
  41 = School-Kernel, corrected // Corrected could be ?smoothed? gravitation centre
  100 = Echogram-slice, uncorrected
- SchoolObjectTypeName - Free text to name and/or describe the event. Note the maximum length.

Related topics

Database

Related database tables

SchoolMorphology

StandardComment

Name

StandardComment - Standard comments frequently used

Synopsis

```
struct StandardComment {
  short Nation;
  short Platform;
  int   StandardComment;
  char  Text[200];
};
```

Description

This table contains a list of the standard comments provided for the current nation/platform combination.

Parameters

- **Nation** - Unique nation identification code. Refer to the Nation database table.
- **Platform** - Unique platform (vessel) identification code. Note that **Platform**=0 means "national-wide" or "institute-wide" entry of the database table. Refer to the Platform database table.
- **StandardComment** - Identification code for the comment. Refer to the ObservationComment database table.
- **Text** - Free text containing the comment.

Related topics

Database

Related database tables

ObservationComment

Survey

Name

Survey - Survey data

Synopsis

```
struct Survey {
  short Nation;
  short Platform;
  int   Survey;
  char  SurveyTitle[80];
  int   StartDate;
  int   StartTime
  int   StopDate;
  int   StopTime;
  char  SurveyDescription[200];
  float BoundaryNorth;
  float BoundarySouth;
  float BoundaryWest;
  float BoundaryEast;
};
```

Description

This table contains information describing the individual surveys. The survey information may be entered at the beginning of each survey, or alternatively, the complete survey schedule is entered at the beginning of the year with minor updates being performed throughout the year.

Parameters

- **Nation** - Unique nation identification code. Refer to the Nation database table.
- **Platform** - Unique platform (vessel) identification code. Refer to the Platform database table.
- **Survey** - A survey code is assigned to each survey. This code must be unique within each Nation/Platform pair. There may be several ships and nations participating on a survey, and the survey code provides a mechanism for combining observation data from all participating ships.
- **SurveyTitle** - Short title to name the survey. Note that maximum 80 characters may be used.
- **StartDate** - [YYYYMMDD] First day of current survey. Dates must refer to Universal Time Coordinated (previously denoted Greenwich Mean Time). Dates are coded using eight decimal digits, for example 20040823.
- **StartTime** - [hhmmssxx] Time of the when current survey. Date and time refer to Universal Time Coordinated (previously denoted Greenwich Mean Time). Time is coded using eight decimal digits, for example 17235489 (17 hours, 23 minutes, 54 seconds, 89 hundredths of a second).
- **StopDate** - [YYYYMMDD] Last day of current survey.
- **StopTime** - [hhmmssxx] End of current survey.
- **SurveyDescription** - 200 characters space is available for a short survey description and other comments.
- **BoundaryNorth** - Geographical latitude and longitude limiting the area surveyed by this platform on the current survey. Latitude (positive north) and longitude (positive east) are expressed as floating point numbers in degrees.
- **BoundarySouth** - See BoundaryNorth.
- **BoundaryWest** - See BoundaryNorth.
- **BoundaryEast** - See BoundaryNorth.

Related topics

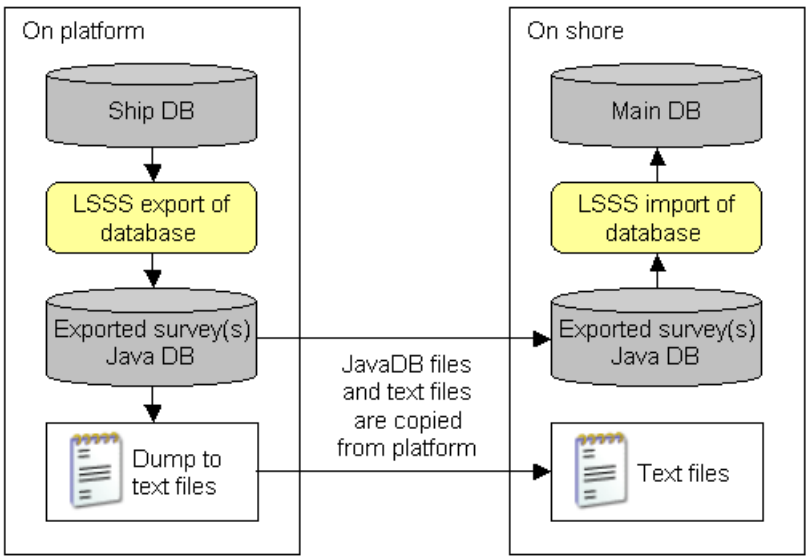
Database

Related database tables

The database tables Personnel and Purpose also contain survey related information.

Database import/export

LSSS allows for the export and import of surveys so that information can be moved between databases. A typical use case would be to export a survey from a platform database to a database on shore. The user can choose to either export a particular survey, or all surveys for a platform. The principle of export/import is shown in the figure below.



Exporting surveys

To initiate an export, select File->Export DB... from the main menu. When an export is performed, a new database containing the exported survey is created. This database is of the type Java DB, and is contained in a set of files located in the database directory defined in [Survey configuration - Data files]. These files are easily transferable to another location, for example the central database on shore, where they can be imported into an existing LSSS database.

The export first copies the nation and platform specific tables to the export DB:

- BiologicalSpecies
- Area
- AcousticCategory
- StandardComment
- AreaOfAcousticCategory
- AcousticCategoryComposite
- AcCatToBiologicalSpecies

It then copies the survey specific tables:

- Survey
- Purpose
- Observation
- Scatter
- ScatterData
- ObservationComment
- Personnel

The export also writes each table to a text file in the DB directory, with the name of the table as filename. The dump of the survey-specific tables gets the ID of the survey attached to their filename. The text files contains one table entry per line, with columns separated by ;.

Importing surveys

Importing surveys to an existing database requires that the database to be imported only contains surveys from one platform, and that this platform already exists in the main database.

In order to import the exported surveys, select File->Import DB... from the LSSS main menu. This will present a dialog asking for the location of the Java DB to import.

The database will by default reside in a subdirectory named **'lsssExportDb'**. This is the directory that should be selected.

Pressing OK will start the import of the database.

LSSS - Broadband

This section describes how complex broadband is used in LSSS.

- Some modules are specialized for complex broadband data.
- Other modules use complex broadband data converted to sv values and angles for the center frequency. This corresponds to the Complex to real module in Korona.
- Broadband data can be exported.

Broadband export

The broadband exports use the JSON format. The general structure is:

Format

```
{
   "info" : {
      "exportType" : "BroadbandSv",                 // The type of this export
      "exportTime" : "2015-09-07T13:47:17Z",        // Time of export in ISO 8601 format
      "lsssVersion" : "1.9.2",                      // The version of LSSS used to generate the
      "formatLastChangedInLsssVersion" : "1.9.2",   // The version of LSSS where for format of
      "parameters" : {                              // Parameter settings used during the expo
         "parameter name": "value",
         ...
      },
      "units" : {                                   // Units of the exported values
         "export value name": "unit",
         ...
      },
      "comments" : [ "comment", ... ],
   },

   // Exported data

   "channelInfo" : [ {                              // Summary information with channel paramet
      "id" : "WBT 2-1 009072085343 ES200-7CD",
      "parameters" : [ {                            // There will be multiple entries if some p
         "startTime" : "2014-11-02T09:45:58.663Z",
         "endTime" : "2014-11-02T09:46:26.630Z",
         "nominalFrequency" : 200000.0,
         "minFrequency" : 160000.0,
         "maxFrequency" : 260000.0,
         "transmitPower" : 120.0,
         ...
      } ]
    } ]
  }
}
```

Acoustic categories

Some exports include assignments to acoustic for each region. The structure of this information is:

```
   "acousticCategories" : {
       "name of acoustic category" : {
          "channels" : [ {
             "id" : "WBT 2-1 009072085343 ES200-7CD",
             "assignment" : 0.13
           }, {
              ...                                   // More channels
       } ]
      },
      ...                                           // More acoustic categories
    }
```

Notes

Note that the format of and definitions in all the export formats may change in future versions of LSSS.

BB bottom data export

This is an export of complex sample data after pulse compression.

The area exported is per ping [bottom depth - delta above, bottom depth + delta below]. The area is split into one or more blocks, each with constant sample distance. The 2D data arrays in each block is indexed as [timeIndex][rangeIndex].

If the available data does not cover the exported area, then the value 0 is used instead.

Format

```
{
   "info" : {
      "exportType" : "BroadbandBottomData",
      ... // See Broadband export for details about the properties in the info block
   },
   "channels" : [ {
      "id" : "WBT 2-1 009072085343 ES200-7CD",        // The channel id
      "nominalFrequency" : 200000.0,                  // Nominal frequency for this channel
      "blocks" : [ {
         "sampleDistance" : 0.00596,                  // The sample distance in this block
         "times" : ["2014-11-02T09:44:52.797Z", ... ] // The ping times in this block
         "depths" : [103.403, ... ]                   // Bottom depths
         "re" : [ [ -1.30926E-4, ... ], ... ],        // The real part of the complex sample v
         "im" : [ [ -5.55039E-5, ... ], ... ]         // The imaginary part of the complex sar
      }, {
         ...                                          // More blocks for this channel
      } ]
   }, {
      ...                                             // More channels
   } ]
}
```

BB sample data export

This is an export of complex sample data after pulse compression.

For each region the rectangular bounding box in the time × range domain is exported. The bounding box is split into one or more blocks, each with constant sample distance. The 2D data arrays in each block is indexed as [timeIndex][rangeIndex].

If the available data does not cover the exported bounding box, then the value 0 is used instead.

Format

```
{
   "info" : {
      "exportType" : "BroadbandSampleData",
      ... // See Broadband export for details about the properties in the info block
   },
   "regions" : [ {
      "objectNumber" : 18,                                  // The object number of this region
      "labels" : [ ],                                       // The labels assigned to this regio
      "acousticCategories": { ... },                        // See Broadband export for details
      "channels" : [ {
         "id" : "WBT 2-1 009072085343 ES200-7CD",           // The channel id
         "nominalFrequency" : 200000.0,                     // Nominal frequency for this channe
         "minRange" : 50.1,                                 // The minimum range of the bounding
         "maxRange" : 60.2,                                 // The maximum range of the bounding
         "blocks" : [ {
            "sampleDistance" : 0.00596,                     // The sample distance in this block
            "times" : ["2014-11-02T09:44:52.797Z", ... ] // The ping times in this block
            "re" : [ [ -1.30926E-4, ... ], ... ],           // The real part of the complex samp
            "im" : [ [ -5.55039E-5, ... ], ... ]            // The imaginary part of the complex
         }, {
            ...                                             // More blocks for this channel
         } ]
      }, {
         ...                                                // More channels for this region
      } ]
   }, {
      ...                                                   // More regions
   } ]
}
```

Notes

- If a region spans more than one depth range for a given ping then the enclosing depth range is used.

BB Sv(f) export

This is the export of Sv-frequency spectra per ping from the depth ranges defined by the active regions, as displayed by the BB Sv(f) view.

Format

```
{
   "info" : {
      "exportType" : "BroadbandSv",
      ... // See Broadband export for details about the properties in the info block
   },
   "regions" : [ {
      "objectNumber" : 18,                              // The object number of this region
      "labels" : [ ],                                   // The labels assigned to this region
      "acousticCategories": { ... },                    // See Broadband export for details
      "pings" : [ {
         "number" : 411,                                // The ping number
         "time" : "2014-11-02T09:44:52.797Z",           // The time of this ping
         "channels" : [ {
            "id" : "WBT 2-1 009072085343 ES200-7CD",    // The channel id
            "nominalFrequency" : 200000.0,              // Nominal frequency for this channel
            "minFrequency" : 160012.22,                 // Minimum frequency
            "maxFrequency" : 250000.0,                  // Maximum frequency
            "numFrequencies" : 2949,                    // The number of evenly spaced frequen
            "sv" : [ -61.28, ...  ],                    // numFrequencies number of Sv values
            "depth" : 10.507                            // Depth for the center
         }, {
            ...                                         // More channels in this ping
         } ]
      }, {
         ...                                            // More pings for this region
      } ]
   }, {
      ...                                               // More regions
   } ]
}
```

Notes

- Depth is for the centre.
- If a region spans more than one depth range for a given ping then Sv is computed for each depth range and then averaged.
- If a depth range is too short to compute Sv then the error property is set and that depth range is ignored.

BB TS(f) export

This is the export of TS-frequency spectra per ping for targets detected in the depth ranges defined by the active regions, as displayed by the BB TS(f) view.

Format

```
{
   "info" : {
      "exportType" : "BroadbandTS",
      ... // See Broadband export for details about the properties in the info block
   },
   "pings" : [ {
      "number" : 411,                                  // The ping number
      "time" : "2014-11-02T09:44:52.797Z",             // The time of this ping
      "channels" : [ {
         "id" : "WBT 2-1 009072085343 ES200-7CD",      // The channel id
         "nominalFrequency" : 200000.0,                // Nominal frequency for this channel
         "minFrequency" : 160012.22,                   // Minimum frequency
         "maxFrequency" : 250000.0,                    // Maximum frequency
         "numFrequencies" : 2949,                      // The number of evenly spaced frequencies
         "targets" : [ {                               // The targets found in this ping
            "ts" : [ -41.23, ...  ],                   // numFrequencies number of beam compensate
            "range" : 10.507,                          // Range from transducer for the sample wi
            "alongshipAngle" : -0.37,                  // Alongship angle for the sample with the
            "athwartshipAngle" : 0.49                  // Athwartship angle for the sample with tl
         }, {
            ...                                        // More targets for this channel
         } ]
      }, {
         ...                                           // More channels in this ping
      } ]
   }, {
      ...                                              // More pings
   } ]
}
```

Notes

- TS values are beam compensated.
- Range and angles are calculated at sample with peak value.
- Angles are calculated at nominal frequency.

BB TS(f) tracks export

This is the export tracks detected by the KORONA tracking module. TS is calculated using the `FrequencyWindowing` and `FrequencyResolution` configured for the BB TS(f) view. Only the tracks where all peak samples are contained in the selected regions are included in the export.

For each track the properties "pingNumber" - "peakDepth" and "minFrequency" - "tsc" are arrays over the pings that the track consists of. If a channel is missing for a particular ping then the value NaN is used.

Format

```
{
   "info" : {
      "exportType" : "BroadbandTracks",
      ... // See Broadband export for details about the properties in the info block
   },
   "tracks" : [ {
      "labels" : [ "labelA", ... ],                                                  // Labels
      "pingNumber" : [ 757, 758, ... ],                                              // Ping numbe
      "time" : [ "2014-11-02T09:46:04.470Z", "2014-11-02T09:46:04.678Z", ... ],      // Time
      "longitude" : [ 5.48296867, 5.48296828, ... ],                                 // Longitude
      "latitude" : [ 59.99294278, 59.99294288, ... ],                                // Latitude
      "heading" : [ 213.15, 213.09, ... ],                                           // Heading
      "heave" : [ 0.0, 0.10, ... ],                                                  // Heave
      "pitch" : [ 0.54, 0.55, ... ],                                                 // Pitch
      "roll" : [ 0.87, 0.88, ... ],                                                  // Roll
      "minDepth" : [ 13.255, 13.255, ... ],                                          // Minimum de
      "maxDepth" : [ 13.279, 13.279, ... ],                                          // Maximum de
      "peakDepth" : [ 13.267, 13.267, ... ],                                         // Depth of t
      "channels" : [ {
         "id" : "WBT 2-1 009072085343 ES200-7CD",      // The channel id
         "nominalFrequency" : 200000.0,                // Nominal frequency
         "minFrequency" : [ 165000.0, 165000.0, ... ], // Minimum frequency
         "maxFrequency" : [ 250000.0, 250000.0, ... ], // Maximum frequency
         "numFrequencies" : [ 86, 86, ... ],           // The number of evenly spaced frequen
         "peakRange" : [ 13.267, 13.267, ... ],        // Range of the peak sample
         "fftDistanceBefore" : [ 0.012, 0.012, ... ],  // Distance above peak included in FFT
         "fftDistanceAfter" : [ 0.012, 0.012, ... ],   // Distance below peak included in FFT
         "alongshipAngle" : [ 0.95, 0.71, ... ],       // Alongship angle for the sample with
         "athwartshipAngle" : [ -1.71, -1.41, ... ],   // Athwartship angle for the sample wi
         "x" : [ 0.22, 0.163, ... ],                   // Alongship position of peak sample,
         "y" : [ -0.396, -0.325, ... ],                // Athwartship position of peak sample
         "z" : [ 13.259, 13.262, ... ],                // Vertical position of peak sample, r
         "tsc" : [ [ -76.96, -80.31, ... ], ... ]      // numFrequencies number of beam compe
      }, {
         ...                                           // More channels for this track
      } ],
   }, {
      ...                                              // More tracks
   } ]
}
```

Notes

- TS values are beam compensated.
- Angles are calculated at sample with peak value at nominal frequency.

LSSS - Broadband Views

This section describes modules in LSSS that are specialized for complex broadband data.

BB calibration plot

This view plots the frequency dependent broadband calibration specified in the file `calibration.xml` and the default correction formulae.

Description

The plot is updated when the mouse is moved and shows the calibration for the corresponding ping. Figure 1 shows an example plot where:

- Gray line: The default formulae
- Blue line: The broadband calibration
- Red line: Constant extrapolation of the broadband calibration

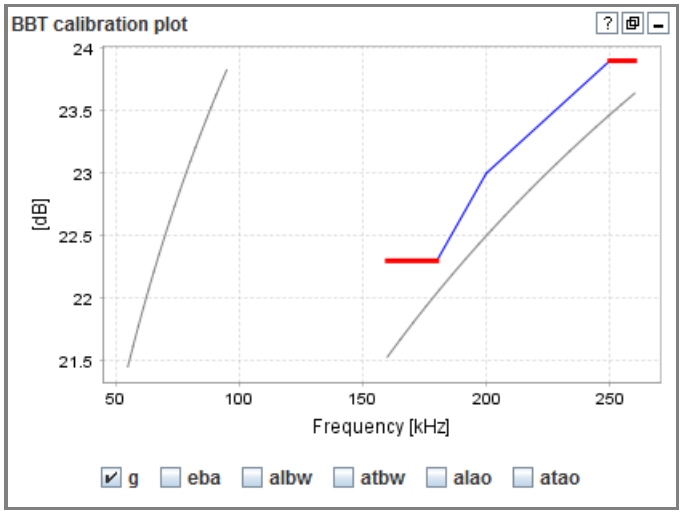


Figure 1. Screenshot of the BB calibration plot view.

BB Sv(f)

This view shows the Sv-frequency spectra for selected regions.

Description

The average Sv-frequency spectra are computed from the depth ranges in the active regions. The Sv spectra for all depth ranges are averaged, weighted by number of samples, to produce the average Sv(f). Depth ranges too small to produce meaningful Sv spectra are ignored. The dashed black lines represent the standard error.

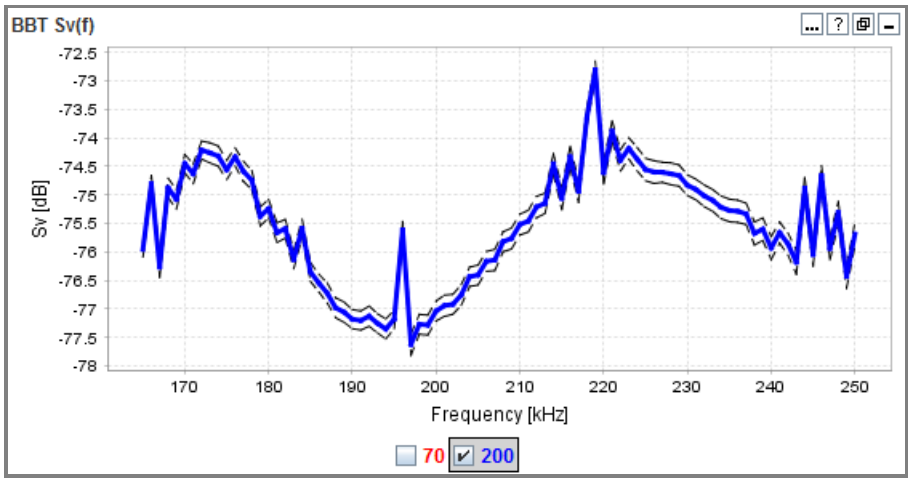


Figure 1. Screenshot of the BB Sv(f) view.

Settings

FrequencyWindowing

The percentage of the frequency band(s) of the spectra to be trimmed at the lower and upper end of the band(s). The view shows the central (100 - 2 × FrequencyWindowing) % of each frequency band.

FrequencyResolution

The distance in kHz between the individual frequencies displayed in the plot. The spectrum is computed at full resolution (determined by the extent of the depth range containing the time signal) and resampled. The resampling of the spectrum uses Fourier resampling, i.e. trigonometric interpolation for upsampling and low-pass filtering for downsampling.

PlotStdErr

Whether or not the dashed black lines representing standard error should be plotted.

Export

See BB Sv(f) export.

BB TS(f)

This view shows the TS-frequency spectra for individual targets.

The detected targets are also shown by other views:

- Locations are visualized on the echogram by BB TS(f) locations
- The angles are visualized by TS positions

Description

The TS-frequency spectra are computed from the depth ranges in the active regions identified as individual targets in each ping. Multiple active regions in the same ping are allowed. The target identification is performed on all available channels. Spectra from different channels are coloured differently, the graphs corresponding to the currently active channel are bold.

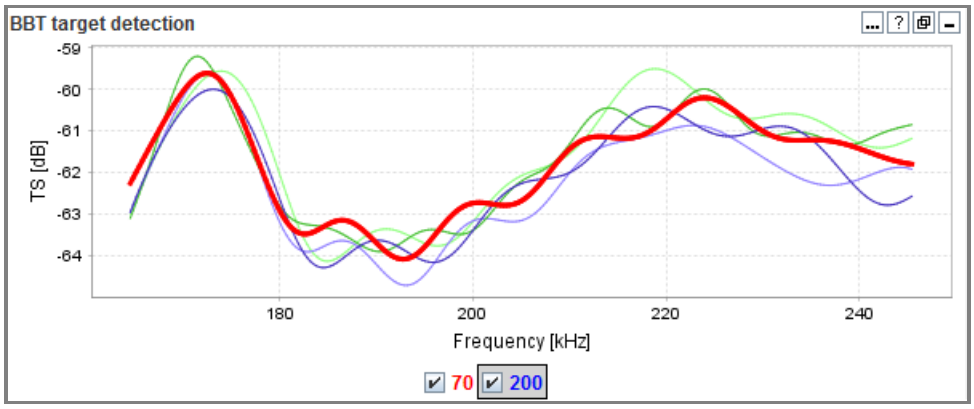


Figure 1. Screenshot of the BB TS(f) view.

In addition to the current ping, the spectra from a number of previous and subsequent pings are plotted. The previous pings are displayed in shades of purple, subsequent pings in shades of green. Darker colours indicate pings closer to the current ping, lighter colours pings further away.

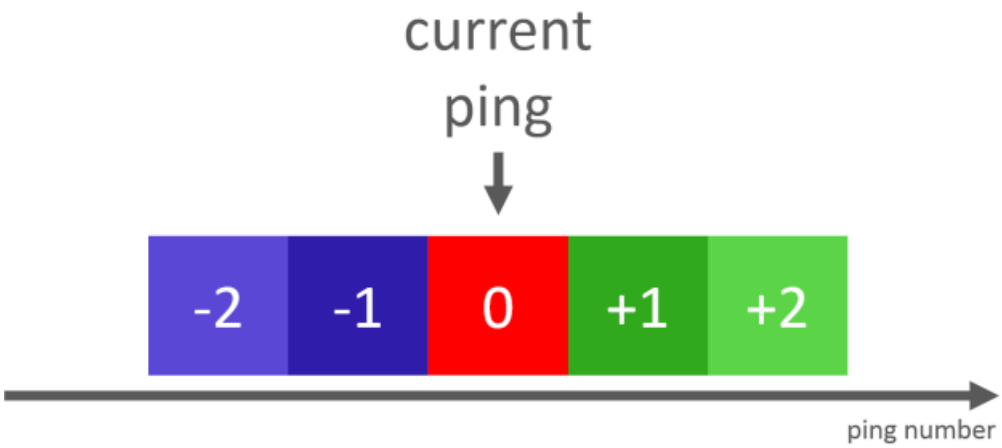


Figure 2. Illustration of the colour scheme coding previous and subsequent pings using shades of purple and green, respectively.

Settings

Target detector settings

A single target is defined by its peak sample and its vertical extent. A peak samples is a sample with a echo strength (squared absolute values of averaged pulse compressed signal) larger then all the samples within a certain threshold distance. This threshold is automatically determined using Ridler and Calvard's (1978) classical iterative threshold selection method, imposing the sent pulse length as upper bound.

The vertical extend of the target are all samples to either side with echo strength lower then the peak echo strength until a local maximum with relative echo strength below **`PulseLengthDeterminationLevel`** is encountered.

The target detector is the same as the one used in the equally named target tracker available in the KORONA tracking module.

The available parameters for the target detector are:

- **`MinTS`**: Minimum corrected TS value to be detected [dB]
- **`PulseLengthDeterminationLevel`**: Pulse length determination level [dB]
- **`MinEchoLength`**: Minimum echo length (relative to pulse length)
- **`MaxEchoLength`**: Maximum echo length (relative to pulse length)
- **`MaxGainCompensation`**: Maximum (one way) gain compensation [dB]
- **`DoPhaseDeviationCheck`**: Check this if phase deviation check should be performed. *NOT* recommended for broadband data.
- **`MaxPhaseDevSteps`**: Max phase deviation [phase steps]

Spectrum extraction settings

The vertical extent of the target used for calculation of its frequency spectrum is determined by the chosen **`Target extent for FFT`** mode. The available options are the following:

- AUTOMATIC: Target extend as extracted by target detector.
- MANUAL: The extent is manually specified, either symmetrically or asymmetrically around the detected peak.
- REGION: The entire depth range of the region is used. Target detection is not performed.

Further parameters are:

- **`ManualTargetExtentSymmetrical`**: The vertical extent of each detected target is centered around the peak if checked.
- **`ManualTargetExtent`**: The *total* vertical extent of each detected target using the peak as center, when TargetExtentMode is set to MANUAL and ManualTargetExtentSymmetrical is checked.
- **`ManualTargetExtentAbove`**: The vertical extent *above* the peak of each detected target, when TargetExtentMode is set to MANUAL and ManualTargetExtentSymmetrical is unchecked.
- **`ManualTargetExtentBelow`**: The vertical extent *below*the peak of each detected target, when TargetExtentMode is set to MANUAL and ManualTargetExtentSymmetrical is unchecked.

Display settings

Several parameters for adjusting the presentation of target spectra are available.

- **`PingRadius`**: Number of pings on either side to use. The number of previous and subsequent pings to be displayed along with the current ping (mouse position in echogram). In total, the view displays 2 × **`PingRadius`** + 1 spectra.
- **`FrequencyWindowing`**: Percentage of extremal frequencies to be discarded (two-sided). The view shows the central (100 - 2 × **`FrequencyWindowing`**) % of each frequency band.
- **`FrequencyResolution`**: Frequency resolution in *display*. The distance in kHz between the individual frequencies displayed in the plot. The spectrum is computed at full resolution (determined by the extent of the depth range containing the time signal) and resampled. The resampling of the spectrum uses Fourier resampling, i.e. trigonometric interpolation for upsampling and low-pass filtering for downsampling.

Export

See BB TS(f) export.

BB TS(f) histogram

This view shows a histogram of targets detected by BB TS(f).

The frequency×TS-plane is discretized into uniformly sized cells. The cell size along the frequency axis is **`FrequencyResolution`** configured in BB TS(f). Each cell counts the number of targets whose TS(f) curve intersects that cell.

The colour of a cell is given by a gray scale  where

- White represents a count of zero
- Black represents the highest count of all cells

Settings

- **`TS resolution`**: The cell size along the TS axis

Appendix

This section contains reference material.

File types

Below is an overview of all the file types used by LSSS:

Data input files

- **raw:** The EK60 main input files containing sample data. Preprocessed files have the same file extension, and may contain additional data not available in standard raw files.
- **idx:** Index files for the raw sample files.
- **bot:** Files containing the detected bottom.
- **ctd:**
- **draw:**
- **reflog:**
- **spd:** Trawl data files.

Data output files

- **work:** Contains the region definitions and interpretation for the raw files. There is one work file per raw file, and will be stored in the directory where the survey configuration file is located. See also the description of the interpretation module about storing the interpretation.
- **snap:** Contains the state of the interpretation at the time the user stores the interpretation to the database. Stored in the directory where the survey configuration file is located. See also the description of the interpretation module about storing the interpretation.
- **lsss:** Contains all the settings specified in [Configuration - Survey configuration]. The location of this file is selected in the last step in the sequence of setting up a new survey.
- **log:** Contains system messages and debug information.

Default configuration files

Two configuration files containing the default settings may exist. They are stored in the directory .ApplicationData/lsss/config in the user home directory.

- **application.xml:** The default application settings. This is stored every time a survey is stored and when actively choosing to store the settings from the application configuration main tab.
- **survey.xml:** The default survey settings. This is saved only when actively choosing to do so from the survey configuration main tab.

Data correction

The data files with echo sounder sample data sometimes contain errors and inconsistencies. Some of these are corrected automatically by the system. The files with errors are marked in the status columns in the table in [Survey configuration - Data files] with the symbol

- or  if an error is corrected.
- or  if an error is not corrected.

Corrected errors

Error	Correction
Missing index datagram within an idx-file	The previous index datagram is duplicated
Missing bot file	Bottom datagrams with depth 0 are used
Too few bottom datagrams in a bot-file	Bottom datagrams with depth 0 are appended
Datagram format error	Datagram is ignored
Gap in ping numbering between two consecutive files	Pings with no data are inserted
Decrease in ping numbering between two consecutive files	The ping numbering of the second file is shifted
Decrease in vessel distance within the same file	The vessel distance in a ping is forced to be larger than or equal to the vessel distance in the previous ping
Decrease in vessel distance between two consecutive files	The vessel distance of the second file is shifted
Non-increasing time from one ping to the next	The time of the second ping is modified. The modified time is found by linear interpolation from the neighbouring pings weighted by vessel distance. If linear interpolation is not applicable then the modified time is set to the time of the previous ping plus 1 NT date unit = 100 nano seconds.

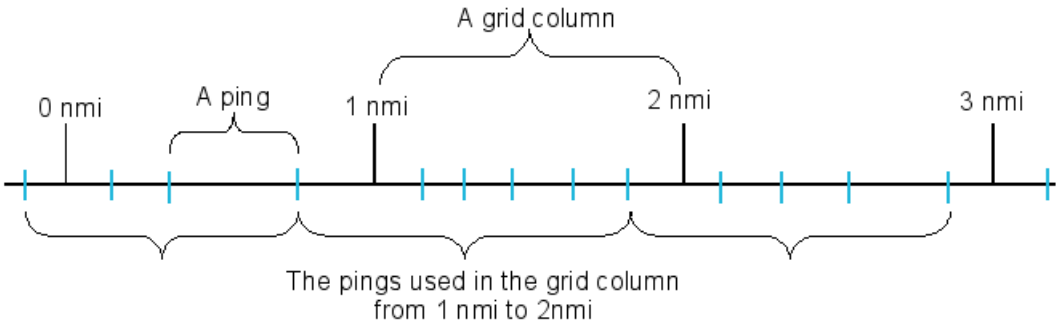
Errors not corrected

Error	Consequence
Missing idx file	The file is not used
Non-increasing time between two consecutive files	The second file is not used
Different sets of frequencies in two files	The second file is not used

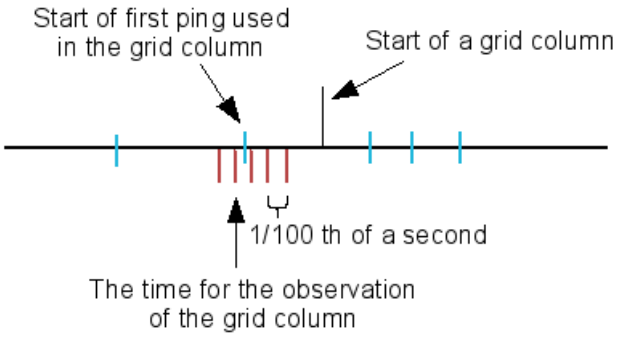
Ping alignment

This section explains the details on how pings are aligned relative to various axes.

The interpretation grid, defined in [Survey configuration - Grid], consists of grid columns of constant width. A ping contributes only to one grid column even though its extent overlaps with two grid columns. Which pings that contribute to which grid column is found by rounding downward as illustrated in the figure below:



The observation date and time for a grid column is found similarly by rounding downward to the nearest 1/100th of a second from the start of the first ping used in that grid column:



Reference log

Data directory is configured in [Survey configuration - Data files].

The data is show as overlays on the map and on the echogram.

File format

Data files must start with prefix ref and end with suffix .csv. The files contains data about ship stations and other events that is logged on the ship.

A file consists of two header lines followed by data lines. The second header line contains description of data fields.

The second field in data line (Time) can have two formats:

1. `HH:mm:ss`
2. `HHmmss.xx` (The xx is ignored by LSSS)

Example

```
"Ship:","10","","Survey:","2004110","","Date:","14.12.2000"

"Station type","Time","Ref. no","Loc.St.no","Logg","Latitude","Longitude","Depth","Heading","
"Video lander start","16:06:19","040","000"," 9562.26","4253.65 N","03025.22 W"," 2644.45","
"Deep towed vehicle start","16:08:11","040","016"," 9564.55","4253.83 N","03022.51 W"," 2854.
"Deep towed vehicle stop","16:09:31","040","016"," 9568.24","4254.29 N","03017.54 W"," 2882.8
"CTD with watersample start","16:10:03","040","394"," 9574.38","4252.9591 N","03023.7552 W","
"CTD with watersample stop","16:12:11","040","394"," 9574.67","4252.99 N","03023.69 W"," 2725
"Bottom trawl start","16:18:55","040","367"," 9594.72","4254.91 N","03020.37 W"," 2960.11","
"Bottom trawl stop","16:22:59","040","367"," 9596.57","4253.11 N","03020.92 W"," 2966.55"," 1
"Video lander stop","16:52:23","040","000"," 9610.64","4254.95 N","03024.87 W"," 2634.33","
"Course change","17:00:51","041","318"," 9610.65","4254.96 N","03024.86 W"," 2634.06","  33","
"CTD with watersample & ADCP start","17:20:03","042","412"," 9640.21","4249.65 N","02945.65 W
"CTD with watersample & ADCP stop","17:33:24","042","412"," 9640.41","4249.65 N","02945.66 W",
"Bergen Acoustic Bouy (BAB)","17:40:00","042","000"," 9641.02","4249.97 N","02944.98 W"," 192
"Video lander start","17:50:44","042","001"," 9642.59","4250.90 N","02943.42 W"," 1920.45","
"Submerged Video Camera start","18:04:28","042","021"," 9653.09","4249.20 N","02942.98 W"," 18
"Submerged Video Camera stop","18:44:16","042","021"," 9653.17","4249.19 N","02942.98 W"," 184
```

File draw

Data directory is configured in [Survey configuration - Data files].

The data is show as an overlay on the echogram.

File format

A data file consists of lines specifying points as [Date] [Time] [Depth]:

1. Date as yyyymmdd in UTC
2. Time as hhmmssXXX in UTC. XXX means milliseconds and is optional.
3. Depth in meters

Example

```
20001214 160237 150.3
20001214 160300 160
20001214 160630 170.7
20001214 160720 170.5
20001214 160807 180.1
20001214 160837 165.1
20001214 160901 150.2
20001214 161007 140.4
```

EK500

This section applies to EK500 data and Bergen Echo Integrator (BEI) work files. Bergen Integrator 500 (BI500) work files is a subset of BEI work files. The functionality described here can be reached from [Survey configuration - Data files].

Settings

The EK500 settings editor is used for specifying parameters that are not available in the EK500 data. These parameters are used for conversion to EK60 format.

The frequencies in the EK500 data are substituted by the closest configured frequencies in the EK500 settings if the difference is less than 1 kHz. If, for example, the EK500 data contains a transducer with frequency 37879 Hz and the EK500 settings are specified for 38 kHz, then the EK500 data will appear in LSSS as 38 kHz.

Loading EK500 data

The times of the index records in the *-Ping files (time format YYYYMMDD HHMMSS) are corrected using the corresponding *-Time files (time format HHMMSSXX) if available. *-Time files does only exists in the late version of BEI, but not in BI500. This correction follows the following algorithm:

1. A representative difference between times, t_t, on *-Time files and times, t_p, on *-Ping files is found by computing Δt = median of $t_t - t_p$ for the first 100 files for each frequency.
2. For each *-Ping file the time of an index record, t_p, is replaced by $t_t + t_{corr}$, where t_{corr} is initially 0. If $|(t_t + t_{corr} - t_p) - \Delta t| > 30$ seconds then t_{corr} is set to $\Delta t - (t_t - t_p)$.
3. The corrected index record times are possibly modified to ensure they are not decreasing.

After correction of times, the index record from the different transducers are organized into pings:

1. The largest group of synchronized transducers is identified. (Two transducers are considered synchronized if the set of corrected times from one transducer overlaps the set of corrected times from the other transducer with more than 80%.)
2. One ping is created for each time in the union set of all corrected times from the transducers in the identified synchronized group.
3. The index records for all transducers are assigned to the ping with time nearest, but not after.

The EK500 data contains separate sections of pelagic data and bottom data.

- If these data segments are disjoint the bottom data is discarded.
- The bottom data is used to overwrite the pelagic data.
- The smallest sample distance is used in the resulting data.

The last index record on a file is often seen to contain erroneous data. Therefore the last index record is replaced by a copy of the second last. Files with frequency 0 Hz are ignored.

Converting work files

Note that if both work files and snap files are found, the snap files are used.

Only layers for the frequency closest to the configured main frequency are converted, while schools for all frequencies are considered in the conversion. The conversion algorithm scans through all frequencies, and converts schools that are not overlapping with already converted schools (LSSS does not accepts new schools which overlaps with existing schools).

The BEI species are converted to LSSS species according to the mapping given in the file SpeciesMap.txt, which can be found in the folder lsss/data/ek500 in the LSSS install directory. The species numbers from 1 through 69 are assumed to have the identity mapping and cannot be reassigned in this file. If a mapping is

not found during the conversion, the interpretation is set to the configured default species.

The conversion of layers and schools uses the following procedure:

1. If the bottom data window was active in BEI, then a layer is created ranging from the bottom layer boundary up to the extent of the bottom data window. Only one layer is created from the bottom data window.
2. The layers in the pelagic data window are created above the layer from the bottom data window. The lowest layer extend down to the extent of the pelagic data window. If the pelagic and bottom channels overlap, then the layer from the bottom data window is used and the pelagic layers are truncated. If there is a gap between the pelagic data window and the bottom data window, then a layer with no species assignments is created.
3. Schools in the pelagic data window are created, but only in the region covered by the layers created from the pelagic data window. If a school extends into the region covered by the bottom data window, then the school is truncated.
4. No schools are expected within the extent of the bottom data window.

Keyboard shortcuts

This is a summary of keyboard shortcuts in LSSS. Some of the keystrokes can be seen in menus and tool tips.

General

Keystroke	Description
Ctrl + E	Edit current survey configuration
Ctrl + F	Freeze / unfreeze the currently selected ping and geographical position as shown by, e.g., overlay on the echogram and overlay on the map
Ctrl + N	Create new survey
Ctrl + O	Open a previously saved survey configuration
Ctrl + S	Save current survey configuration
Ctrl + T	Toggle display of tool tip in echogram and map
Ctrl + Z Ctrl + Shift + Z	Undo / redo last school region edit
Ctrl + Left Ctrl + Right	Step to next echogram segment
Ctrl + Alt + Left Ctrl + Alt + Right	Go to previous / next echogram resolution (and location)
F1	Show help
F2	Toggle showing masking of stored areas
F3	Toggle showing categorization echogram for preprocessed data
F4	Toggle showing plankton echogram for preprocessed data
F5	Toggle conditional masking
F12	Toggle showing only echogram

Echogram

Keystroke	Description
Tab Shift + Tab	Change to next working mode
Esc	Change to the edit working mode In zoom mode when drawing zoom rectangle: Cancel zoom In add mode when drawing new school region: Cancel add
Spacebar Shift + Spacebar	Change to next submode of the current working mode
Home Shift + Home	Zoom out maximally in both directions / only vertically
+ -	For frequency dependent deletion: Change the size of the paintbrush
Left Right Up Down	Pan (Step to next echogram segment)
Shift + Left Shift + Right Shift + Up	Pan with half echogram size

Shift + Down	
Ctrl + Shift + Left Ctrl + Shift + Right Ctrl + Shift + Up Ctrl + Shift + Down	Pan 0.1 of echogram size
Alt + Shift + Left Alt + Shift + Right Alt + Shift + Up Alt + Shift + Down	Pan 0.01 of echogram size
Page Up Page Down	Select next / previous frequency
Ctrl + Alt + Left Ctrl + Alt + Right	Go to the previous / next location
Scroll wheel Shift + Scroll wheel Ctrl + Scroll wheel	Zoom horizontally / vertically / both directions
1	Locking / unlocking when editing regions Similar to pressing / releasing the left mouse button
2	Set tool to draw for all contexts
3	Set tool to select for all contexts
4	Select move tool
A	Select all visible regions
D	Select previous frequency
F	Select next frequency
M	Merge selected layers
N Shift + N	Activate next / previous visible region

Map

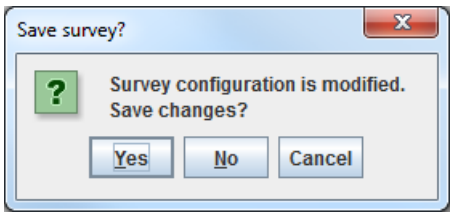
Keystroke	Description
Tab Shift + Tab	Change between zoom and pan mode
Esc	In zoom mode when drawing a zoom rectangle: Cancel zoom
Home	Fit zoom to survey path
+ i	Zoom in
- o	Zoom out
Left Right Up Down	Pan

Tips and tricks

This section contains various tips and tricks.

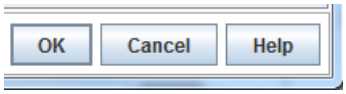
Mnemonics

Some user interface element, like menus and buttons, can also be accessed by typing a mnemonic identified by an underlined character. For example, typing `Alt + F` will open the 'File' menu, and further typing `Alt + P` will trigger the 'Export to files...' menu item. In the following dialog, typing `Alt + N` will press the 'No' button:



Default buttons

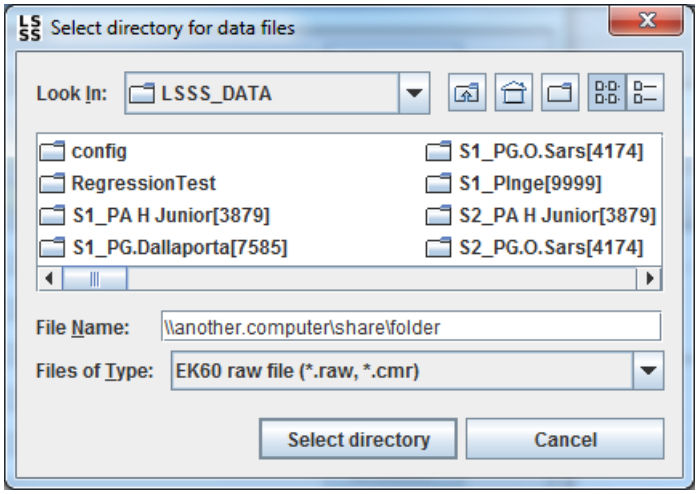
Some dialogs contain a default button. It can be identified by its bold border. In the following screenshot the 'OK' button is the default button.



Typing `Enter` (possibly twice if an input text box has focus) or `Ctrl + Enter` will trigger the default button.

File chooser dialogs

In a file chooser dialog it is possible to enter the path of a directory into the file name text field to browse that directory. This in particular be useful for a network directory that the file chooser dialog cannot browse to.



However, some file choosers are configured to select directories. In this case entering the directory will select the directory rather than browsing it. Typing `Ctrl + Enter` will browse the directory.

Glossary

Area backscatter coefficient: The volume backscatter coefficient integrated over a depth range, multiplied with the scaling factor $4\pi(1852)^2$.

Echogram: A graphical presentation of a sequence of pings in a 2D image.

EK60: An echo sounder system by Simrad, designed for fishery research.

Layer boundary: A boundary separating a layer from other layers.

Module: A LSSS component that performs computation and/or displays information about the echo sounder data or other data. Can loosely be thought of as a common term for views and overlays.

Overlay: A graphical information overlay for the echogram view or the map view.

Pelagic mode: Running LSSS without using the detected bottom as basis for the deepest layer boundary. See [Survey Configuration - Miscellaneous].

Ping: An acoustic pulse, usually concentrated in a cone in front of the transducer. The time between transmission and reception of the pulse is used to decide the distance to a target. In the context of LSSS, a ping usually refers to the data collected in the reception process. If multiple frequencies are used, the different transducers are usually synchronized. If so, a ping means the ensemble of all the receptions for all the frequencies sharing the same timestamp (time of transmission).

Platform: A common term for the observing object. Can for example be a ship or a buoy.

Region: An isolated area of an echogram. A survey can be divided into regions as an aid in the interpretation process. See [Working with LSSS - Working with regions].

s_A: See area backscatter coefficient

Survey: A collection of data gathered during a limited time period and a limited geographical area. In the database each survey is assigned a unique survey identifier consisting of nation, platform and a survey code.

s_v: See volume backscatter coefficient.

View: One of the sub-windows in LSSS. Examples are the echogram view, the map view and the frequency response view.

Volume backscatter coefficient: A measure of the backscattering of targets and inhomogeneities in a volume.

WMS: Short for Web Map Service. A web service to dynamically produce map images on request from clients.