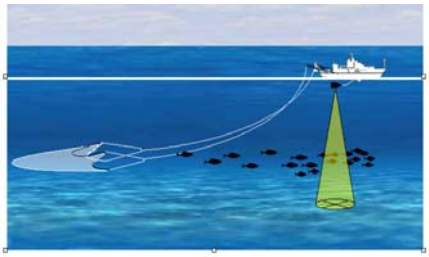
KB-WOT
Quality assurance acoustics
Overview and protocols
2008 version

Sytse Ybema

Report number 09.003



Institute for Marine Resources and Ecosystem Studies

Wageningen IMARES

Location IJmuiden

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- Wageningen ***IMARES*** conducts research providing knowledge necessary for the protection, harvest and usage of marine and coastal areas.
- Wageningen ***IMARES*** is a knowledge and research partner for governmental authorities, private industry and social organisations for which marine habitat and resources are of interest.
- Wageningen ***IMARES*** provides strategic and applied ecological investigation related to ecological and economic developments.

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Contents

1 Introduction

The quality of IMARES' acoustic surveys proved quite unstable in recent years despite extra effort in this field to bring this instability down. Most important problems are all related to an insufficiency within the acoustic team:

- fragmentation of expertise in combination with absence of protocols,
- increasing complexity of the methods used,
- imbalance between production and development

It has been estimated that around a 10000 extra hours over the past 5 years were needed to meet deadlines and to correct errors caused by this unstable situation.

The amount of involved scientists in acoustics has been small compared to demersal survey work. Therefore scientific standards of acoustic surveys are relatively low compared resulting in poor standardisation and minimal transparency. Highly specialised technical work made it even more difficult to exchange scientists within IMARES and the quality of acoustic surveys proved to be very sensitive to loss or change in personnel. This situation improved drastically in 2008 when more scientists got involved in acoustic projects and more effort was put in standardisation.

However, quality of acoustic projects requires more than clear defined protocols; long term experience is essential in this field, especially when new methodologies are being introduced such as species classification. When Ad Corten left behind the acoustic surveys in 1999, no expertise was available to replace him. Bram Couperus took over and started from scratch, initially forced to focus on production rather than development. This situation changed gradually when Sytse Ybema was introduced into the programme in 2002.

Although both production and development were now taken care of, the quality of the work did not increase proportional. Extra effort was put into the use of new complex technologies such as species classification (multi frequency work) and coastal surveys; improvement of production work such as data quality checks and calibration issues remained under prioritised.

Expanding exchange between ICES scientists onboard requires full standardisation of all practical activities. The use of international databases such as Fishframe and the PGNAPES database requires standardisation of data handling. Both developments have lead to an extra financial input for quality assurance within acoustic projects. The budget has been used for giving an overview of the current situation and the manufacturing of a hardware tool which should guarantee high quality acoustic data collection onboard.

The document presented here summarises all improvements which have been accomplished to upgrade the quality of acoustic projects within IMARES.

Several protocols for acoustic surveys have been compiled in recent years and are based on acoustic surveys executed by the research vessel ‘Tridens’. These protocols are meant for project leaders and cruise leaders and inform on practical steps to be taken before, during and after voyages. All protocols need to be treated as working documents which need annual revision.

2 Project transparency

In recent years effort has been made to integrate acoustics more into the fisheries and ecology departments. Scientists having non-acoustic (such as mathematical, technical and ecological) background have been participating in existing surveys and newly developed projects such as the self sampling project of the Dutch freezer trawlers. This development has lead to integration of acoustic data into the Frisbe database, a watchdog for acoustic data collection and a better insight into survey design. In 2008 all acoustic surveys have been live promoted over the internet and in newspapers which put acoustics even further into the spotlight.

Summarised:

- non acoustic expertise was allocated to:
    - data analysis
    - survey design
    - standardisation of data check
    - integration of acoustic data into the IMARES database. This introduces an extra quality step.
- Dick de Haan was appointed as permanent contact man for all communication with Simrad in Norway and the Dutch representative 'WNL' in IJmuiden, the main acoustic hardware suppliers.
- Several initiatives have been launched to assemble acoustic expertise within all establishments of IMARES.
- Survey reports have been expanded, standardised and made available on internet.
- Survey weblogs have been launched as a pilot for better communication with stakeholders, colleagues and public.
- Newspapers and external internet sites have been used more often to improve awareness of our acoustic projects within fisheries industry and the LNV ministry.
- A cooperative project on self sampling of the commercial pelagic fleet has been initiated to improve collaboration and communication with the pelagic industry.

Future aspects:
In order to improve internal awareness of acoustic projects more effort should be put into regular presentations of our work.

3 Standardisation and quality control

Standardisation has taken place on all levels from data collection to survey reporting. For all essential activities a protocol has been included in the appendix. These include:

- Protocol – preparation at the institute
    - Equipment
    - Calendar
- Protocol – preparations onboard
- Protocol – onboard data system setup
- Protocol – calibration
- Protocol – acoustic sampling / scrutiny in Echoview
- Protocol – fish sampling
- Protocol – data analysis

Besides all IMARES protocols an international manual for acoustic surveys has been compiled combining the historic PGHERS and PGNAPES manuals. Most of the document has been written during acoustic surveys.

Data collection

It wasn't until now that a duplicate or backup hardware system was realised suitable for all existing surveys. The main echosounder (transceiver) has proven to be very stable but the risk of breakdown could no longer be taken having far offshore oceanic surveys such as the blue whiting survey. A spare 38kHz transceiver will be purchased early 2009. Spare transducers of the main frequencies (38 kHz and 200 kHz) have been purchased in 2008.

Calibration of the acoustic hardware system has always been executed prior to a survey but after consulting the technical department it was decided that a post calibration should be executed if possible. This is to check whether the system is still in the same state as when starting the survey. The blue whiting survey, west of Ireland now includes this post calibration in its survey plan. The calibration method has been adapted to international standards by repeating a calibration using the results from the previous calibration as long as no changes in results can been observed. Earlier a double or triple calibration was the standard to call a calibration successful.

Hardware is now checked prior to departure and all equipment is tested before starting the first calibration. Possible problems can then be solved in an early stage when being near shore during calibration. Hardware monitoring is performed continuously compared to previous years when cables were only checked every other day. A watchdog system has been developed to monitor acoustic signal quality . The system installed in the transducer circuitry produces minimum/maximum/average trends of the applied energy and alerts the operator on sudden fall-outs or slower ramping drifts. These energy data are also recorded during calibrations and thus the survey data trends can be linked to these results and become references. The sensor has been developed outside the SIMRAD environment to derive a fully independent watchdog, which has not a single electrical or software link to the SIMRAD equipment. The sensor monitoring/display has been developed as virtual instrument in Labview (National Instruments) and can be combined with other sensors measuring the towing stability on the towed body.

Simultaneously, a software solution with a similar goal has been developed onboard Tridens with the assistance of Marlab expertise (Scotland). This software tool can be included into any acoustic survey using Echoview post processing software.

Data flows onboard have been greatly standardised by utilising the ships network. Data from multiple sources are now back upped regularly checked and processed in standard SAS routines. Paper data entry sheets have been adjusted according to specific survey needs which means that special sheets are now available for length measurements of the catch.

Since acoustic surveys focus more on the ecosystem than on the target species only, species determination becomes more important. Therefore, the acoustic team took the initiative to upgrade the available species guides onboard Tridens and to generate our own extensive deep-sea species photo guide.

Data processing

Data analysis of standard surveys is now highly automated in SAS. The routine has been designed to standardise data organisation, data check, data analysis and output of results. Data check is now a built in tool to search for errors or outliers and their cause. Another important improvements is the extraction of assumptions and choices from the main code into a separate overview. This makes it fairly easy to work with multiple projects simultaneously and to re-run analysis with different settings when needed. The created output files now consist of data exploration such as distribution maps, catch overviews and reflationary plots such as length/weight- or growth curves. Another powerful element of the SAS routine is the possibility to export data into international database formats which makes data upload to Fishframe or other ICES databases easy and robust.

4 Future considerations

Some of the above mentioned considerations need to be dealt with on an international level (ICES) but others can be addressed directly within IMARES. From 1 January 2009 Sytse Ybema will chair the PGNAPES group and has 5 distinct goals for improving the surveys' quality:

1. Separating data exploration from survey planning activities,
2. Improving communication by introducing online technologies
3. Defining specific year-round chairman tasks,
4. Agreement on the implementation of ecosystem approach in the surveys
5. Implementing the combined acoustic manual in agreement with the planning group for herring surveys (PGIPS)

Listed below are the main scientific considerations which have been mentioned along the way:

- Acoustic scrutiny is highly dependent on the link between what we see on the echosounder and what we find in the catch. In some situations, the catch is believed not to be representative for what we see on the echosounder. Multi-frequency work has helped us classifying the acoustic backscatter without need catch information but for biological purposes it is highly recommended to know exactly which school went into the gear.
- How should we deal with changing stock behaviour for example the late arrival on spawning grounds? Should we change our survey design and how does that influence the time series?
- Some species such as Sardinella, herring in the Norwegian Sea and Horse mackerel in the Pacific tend to avoid fishing or research vessels since they are distributed in the most upper layers of the water column. Echosounding will highly underestimate the stock and the use of horizontally looking sonars need to be considered as a substitute for downward looking echosounders..
- Currently, IMARES wonders if our surveys provide robust information on maturity of the surveyed stocks. Comparing the proportion mature/immature found in the surveys with the proportion found in other surveys and the assessment could give more insight.
- Many of the surveys areas are to allow a full coverage. Using qualitative information from the fishing fleets could help us plan our surveys more efficient.
- Calibration of the transducers often occurs in bad weather having to much motion of the target sphere which has hampered the results in the past. An adaptation of the setup is needed to be able to overcome this problem.
- Quality of data check onboard Tridens is still highly dependable on the scientist in charge. Having an operational database or data server would standardise these activities.
- Post calibration is now performed within the blue whiting survey only but is highly recommended for all acoustic surveys including the coastal ones.
- The 200kHz echosounder produces a wave like pattern at greater depths which has not been understood yet. A solution needs to be found quickly if we want to use this data for quantitative analysis.

5 Conclusions

IMARES has kept the level of their acoustic expertise on an average level in the 90's but is now fully equipped to run high quality acoustic projects. Having all protocols documented and centralized, priority for the upcoming years is the security of expertise, coordination of projects, staffing and markets.

6 Protocols

A) Preparation at the institute

Prior to any acoustic survey quite some preparation work needs to be done long in advance. The ship and all it's equipment need to be prepared, (scientific) crew needs to be informed on sailing dates and several necessary documents require an official status. International exchange of scientists is more common these days and requires extra logistic preparation. A checklist of the steps to be taken is given below.

Prior to departure all equipment onboard is checked by the main technician and cruise leader, but the vessel will not always be ready for inspection.

What needs to be arranged?		**status**	**remarks**	
Request for ship time (ship owner)			Template available	
International sailing permits			Template available	
Invitation guest scientists				
Cruise plan inluding:			Template available	
	Short summary on the scientific programme			
	Aim of the trip			
	Use of results			
	Data to be collected			
	Survey area			
	Survey period			
	Vessel			
	Foreign port calls			
	Project leader			
	Cruise leader(s)			
	(Guest) scientists			
	Transects			
	Time schedule			
	Remarks			
	Gear types to be installed			
	Acoustic frequencies used			
	Fish sampling remarks			
	Acoustic sampling remarks			
	Hydrographic sampling remarks			
Contact list				
sample ID's			Request for ID's with data managers	
Equipment check				
Transportation ways to and from the vessel				

A.1 Equipment

Preparation starts with having the correct documents and equipment. Most equipment is stored on a central location at the institute and includes several containers with equipment. Some equipment can be found onboard but the essential material is prepared at the lab. All containers contain a contents list. The person responsible for the use of its contents is also responsible for keeping track of material consumption. Containers need to be re-filled after the cruise preferably by the warehouse manager but always checked by the cruise leader. This way the responsibility always lays with the end user. The lists below (in Dutch) show the content of all individual containers.

Echosurvey's: Vislab kist

Inhoud	inhoud	inhoud	Aantal	verantwoordelijke
doos snijgerei:	pincetten grof		1	D.Uijl
	pincetten fijn 07,70,11		2 van ieder	D.Uijl
	kwastjes		4	D.Uijl
	scalpels		5	D.Uijl
	scalpelmesjes		25	D.Uijl
	naalden		setje	D.Uijl
doos otholieten:	pipetten		1 zakje	D.Uijl
	glazen petrischaal		5	D.Uijl
	plastic petrischaal		10	D.Uijl
	papiertape		2 rol	D.Uijl
	otholietenplaatjes		10	D.Uijl
doosje inlegplaatjes			min 40	D.Uijl
elastieken			1gr 1kl	D.Uijl
handschoenen L + XL			4paar	D.Uijl
handschoenen M			4paar	D.Uijl
messen in doos			5	D.Uijl
aanzetstaal			1	D.Uijl
plastic zak groot			50	D.Uijl
plastic zak klein			250	D.Uijl
plastic zak druksluiting			250	D.Uijl
maturity stages plaat			1	D.Uijl
alcohol			2 fles	D.Uijl
Histokit (inleglijm)			2 fles	D.Uijl
lege spuitflessen			2	D.Uijl
Binoculair met schaalverdeling			1	D.Uijl
otholietplaten			15	D.Uijl
otholietbakjes (uit IJsland)			2000	D.Uijl

Echosurvey's: Electro kist 1

Inhoud	inhoud	Aantal	Verantwoordelijke
kabel kistje	UTP kabels echorecording	5	S.Ybema
	UTP kabels PC's	2 lange	S.Ybema
	extra lange monitorkabel	2	S.Ybema
	GPS antenne kabel	2	S.Ybema
	voedingskabels (geaard)	4	S.Ybema
	voedingskabels (8-je)	2	S.Ybema
	GPS voedingskabel	1	S.Ybema
	external triggering kabel	1	S.Ybema
	firewire kabel	1	S.Ybema
	usb kabel	2 gewoon + 2	S.Ybema
	stekkerdozen	3 grote	S.Ybema
heel en pitch kastje		1	S.Ybema
GPS module		1	S.Ybema

Echosurvey's: Literatuur kist

Inhoud	Aantal	Verantwoordelijke
Fisheries acoustics (Simmonds en Mc Lennan)	1	S.Ybema
surveymap van betreffende survey	1	S.Ybema
echoview map	1	S.Ybema
ER60 users manual	1	S.Ybema
Ocean Data View manual	1	S.Ybema
Hardware map	1	S.Ybema
Calibrate map	1	S.Ybema
map met lege invoervellen	1	S.Ybema
oude cruise rapporten	1	S.Ybema

Echosurvey's: IT koffer

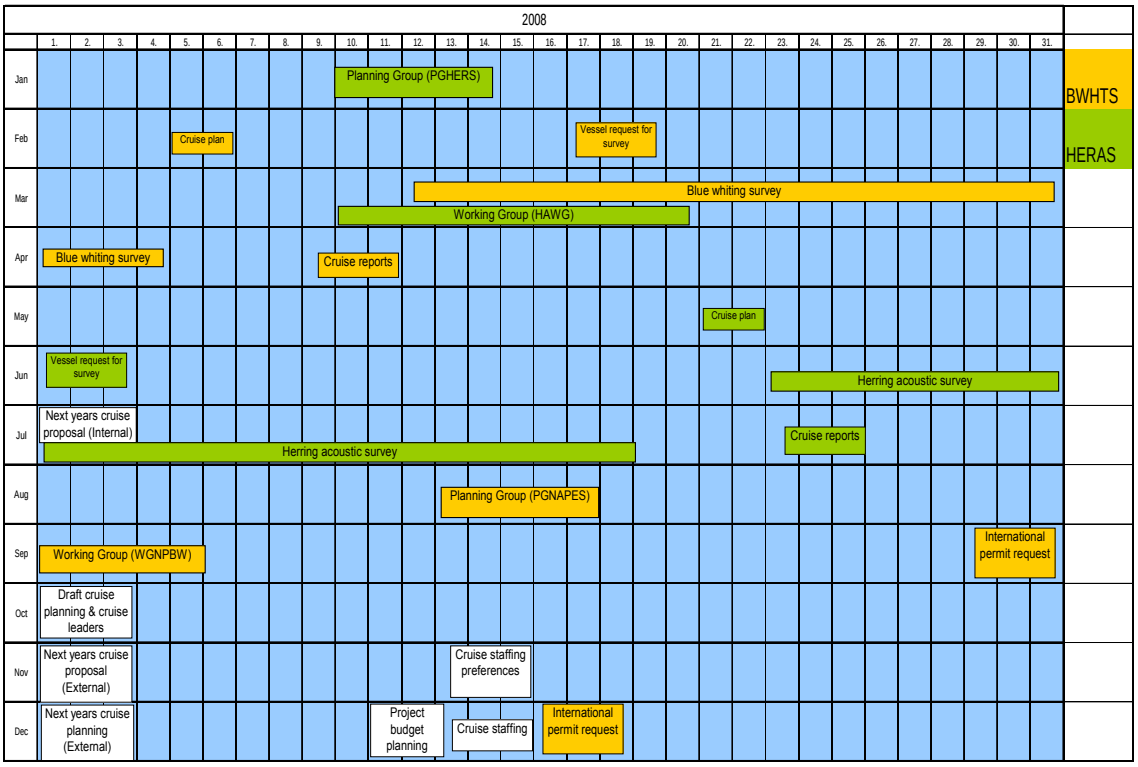
Inhoud	inhoud	Aantal	Verantwoordelijke
IT koffer			
	HD 80Gb IOMEGA	1	S.Ybema
	HD 160 Gb Maxtor	1	S.Ybema
	externe USB behuizing HD	1	S.Ybema
	8-poorts ethernet switch	1	S.Ybema
	4-poorts ethernet hub	1	S.Ybema
	software CD's	?	S.Ybema
	lege CD's DVD's	1 pakje	S.Ybema
	4 poort USB hub	2	S.Ybema

Echosurvey's: Calibratie kist

Inhoud	inhoud	Aantal	Verantwoordelijke
Motorendriehoek		1	C. Bakker
Transformatorkast (grijs kunststof)		1	C. Bakker
Bedieningskastje		1	C. Bakker
Verlengsnoer bedizening (grijs)		1	C. Bakker
Koppelsnoer transformatorkast è motorendriehoek		1	C. Bakker
Netsnoer		1	C. Bakker
Molens met tellers voor calibratiehengels		4	C. Bakker
Bouten RVS M16 x100mm om beugel te monteren		4	C. Bakker
Bouten RVS M10 x100mm om plaat te monteren		4	C. Bakker
Grijze kunststof koffer met de volgende inhoud:	38 Kc Cal. Sphere	2	C. Bakker
	120 Kc Cal. Sphere	1	C. Bakker
	200 Kc Cal. Sphere	1	C. Bakker
	Dynema draad dun op rol	1	C. Bakker
	Dynema draad dik op rol	1	C. Bakker
	Plastic haspels	4	C. Bakker
	Warteltje	1 zakje	C. Bakker
Niet in deze kist maar wel belangrijk om niet te vergeten:			
Calibratie hengels		4	
Cal. Hengels voor Towed Body		3	
Plaat om hengels op Towed Body te monteren		1	
Beugel voor Towed Body (om plaat te monteren)		1	
Hijspijp 40 mm diameter 3 meter lang		1	

A.2 Calendar

Planning of activities for both the “International blue whiting spawning stock survey” and “North Sea herring acoustic survey” have been summarized on the calendar below. This calendar is inserted as an EXCEL object and can be adjusted at any time.
North Sea herring acoustic survey (HERAS) and International blue whiting spawning stock survey task calendar



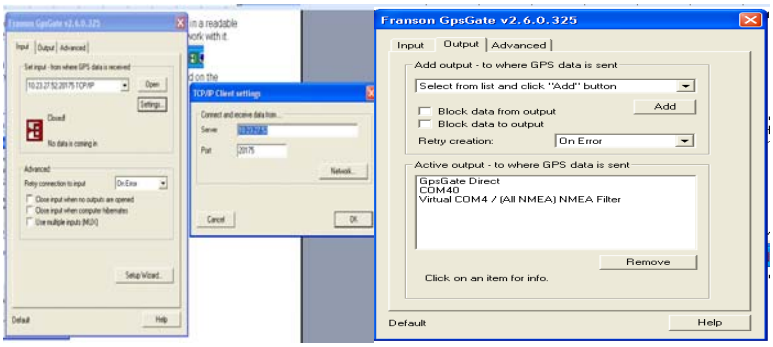
B) Preparations onboard

1. While steaming from the home port towards the calibration site both gear, hydrographic and acoustic equipment are to be tested so that in case of malfunctioning an extra port call can be made.
2. Data flows are set up to ensure data backups and correct equipment communication.
    a. Start TRIMON on LABVIEW PC
    b. Assign all PC's their unique IP address
    c. Create shared folder for LAN-backups
    d. Connect external triggering between Simard EK60 and other sounders like Simard ES60.
3. Prepare a shift arrangement for the scientific crew.
4. A preparatory talk with the scientific crew including:
    a. Shifts
    b. Tasks and responsabilities
    c. Planning
    d. Rules
5. A preparatory talk with the entire crew including:
    - Planning
        - Calibration
        - Intercalibration
        - How to work on the final day
        - Bad weather scenarios
        - Survey area for our ship and others
        - Holidays and weekends
        - Flexibility requested from the vessel?
    - Tasks
        - CTD
            - Responsable scientist?
            - Effort from the crew as agreed upon
        - Fishing
            - Responsable scientist?
            - How to treat non-target species?
            - What if a trawl is requested during or just prior to a meal?
            - No fish processing during CTD sampling
            - Testing the equipment prior to calibration
        - Acoustics
            - Responsable scientist?
            - Who decides when to fish?
            - How to use ships equipment like ES60 and sonar?
    - Other
            - Data server, ship GPS matters should be reported
            - Internet use
            - Weblog to increase transparancy

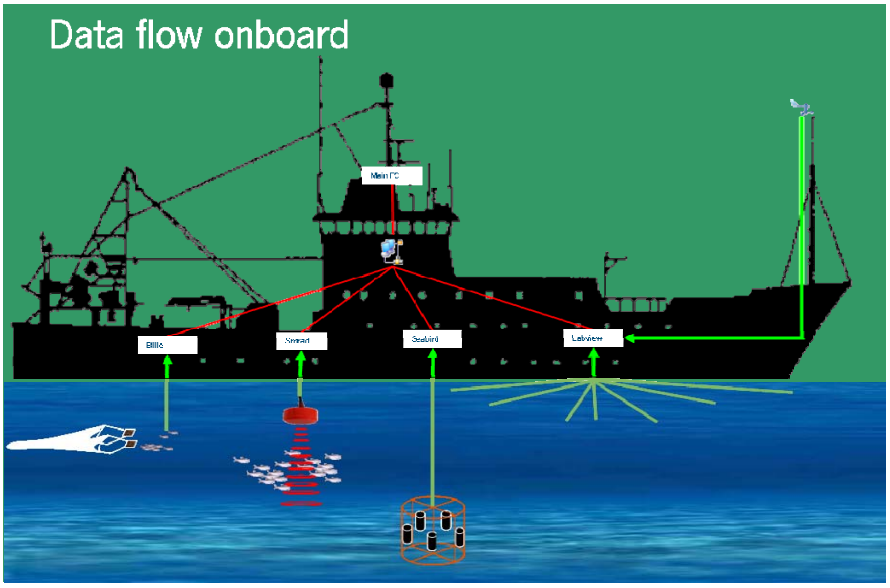
C) Onboard data system setup

Much of the hardware used in these surveys are being used throughout the year in other projects. Therefore it is essential to connect and check connections long before starting data collection.
The fish- and hydrographic hardware is managed relatively easy but a connection need to be made with a data storage computer operated by the cruiseleader. Acoustic hardware needs most attention since multiple devices need to communicate simultaniously.

- Connect GPS signal through the LAN port from the Labview PC to the acoustic PC using Franson **GPSgate** (runs at background).
    - Open GPS gate on the acoustics PC. GPSgate reads incoming GPS data from the network and puts it in a readable format for ER60. It runs in the background so you don't have to work with it.
    - Just make sure the indicator in the taskbar is green at all times. 
    - If this is not the case, the network connection is bad or no GPS data is generated on the network. Ask Kees Bakker.



- Onboard Tridens, data is not stored into a central database onboard. Instead, Syncback software (freeware version) creates automatic backups of all data sources on a central PC. This folder is later on used by SAS analysis software to generate results, overviews, maps etc. So first we need to create data storage directories on all data collecting computers. This includes fish data, acoustic data, CTD data and ships sensor data.



- Then we create backup directories on a main PC which will also be used by SAS routines at a later stage. Thus this main PC needs to have both backup software and SAS installed. **Syncback** (runs at background), makes sure that all data sources are copied hourly. After the backup has completed it may open a webpage with summarizing results.
- Connect watchdog and record data.

Acoustic lab tasks

Before trawling
Make a 'print screen' of every haul → open ACDSee SOFTWARE → browse to the desktop folder ' HERAS2008' → and 'paste ' the screen dump using the number of the haul. 54005…. Right click to print.

ER60
When switching transducers, calibration settings need to be updated through the calibration software link on the desktop. Calibration files are listed on the drive in a separate folder (e.g D:\Acoustic data__Calibration files__). Files are listed by serial number (e.g 38kHz=30501 200kHz=345), date and calibration sequence number.

SAS
Run SAS **a few times per day** to update all data displayed into Google Earth on the web.
Bug fix!!: first remove all .lck files from D:\1_sas_projects\projecten\HERAS\data\Billie\2008

Then press Start → Programs → SAS. Open Main_analysis_tool.sas in D:\1_sas_projects\. Press F12. That's all.

Logbook maintenance

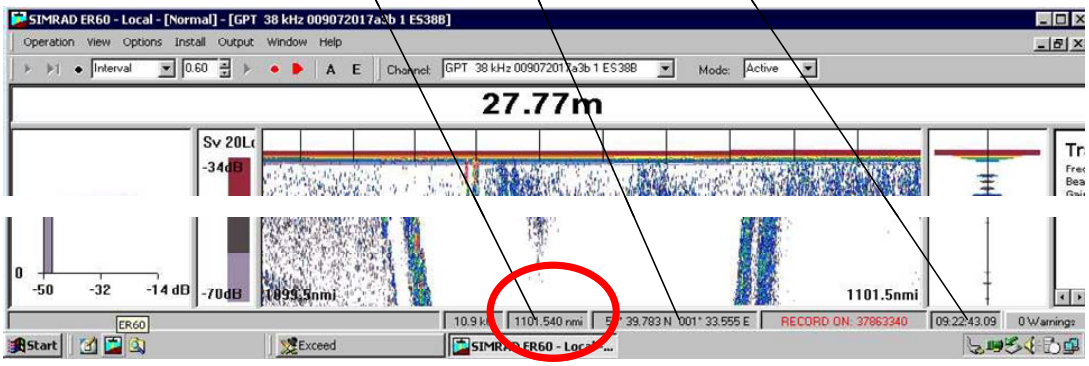
Acoustic log-book **Page ... of ...**

PROJECT: HERRING 2005

Date	Log	Latitude	Longitude	Time (GMT)	Station	Comment

If present, fill in station number/type

Each event or unusual (software) situation and be complete when commenting



The logbook sheet below can be printed and used.

SURVEY .... **Sheet no:** **of:**

YEAR .... **Scientist in charge** ....

Date	**Time**	**Log**	**LATITUDE**		**LONGITUDE**		**E/W**	**STATION**	**TYPE**	**REMARKS**
dd/mm	GMT		Deg	Mm.mmm	Deg	Mm.mmm	E/W	no.	**H/T/O**	

D) Acoustic calibration

Setting up the ER60:

- Check the manual for standard procedures.
- CTD downcast -> put Temp and salinity in Install -> Environment menu ER60
- Switch off any other sounder; external triggering with ES60 ONLY AFTER calibration
- Operation -> Normal -> set depth of transducer according to the actual transducer depth
- Create a layer around the target: +2 and -2m
- Record raw data during calibration
- Set max recording depth
- Select frequencies to be used by installing the transceivers
- Ping rate is set to 1 sec
- In Single target menu the standard settings are normally used but check the manual for details.
-

Hull mounted:

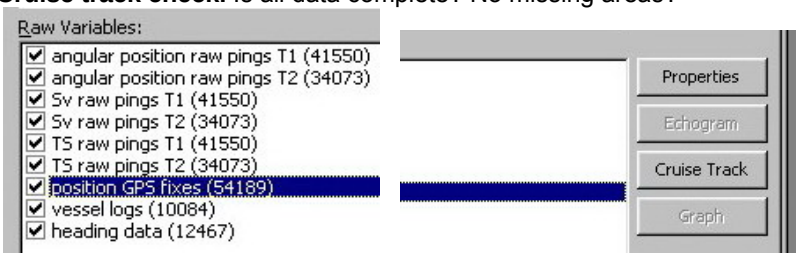
- Unwind nylon lines till the markers. At 10m depth, pulling a single nylon by 40cm will get the sphere from the centre of the beam just on the beam edge!

E) Acoustic sampling / scrutiny in Echoview

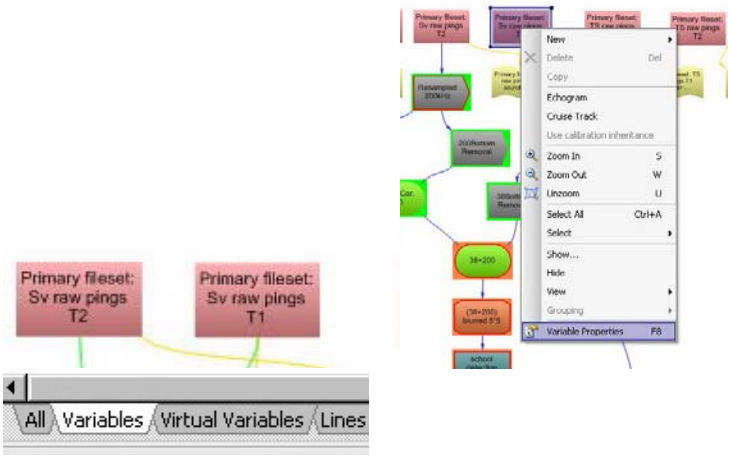
Preparation (objective)

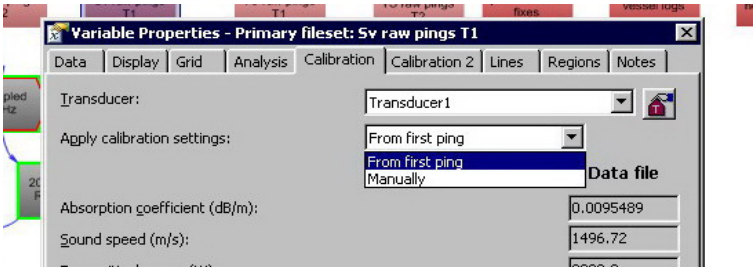
Scrutiny of biological targets should only be conducted by an experienced Echoview user who is familiar with the target species and survey area. Before data is scrutinized, the following preparations need to be done:

- **Open Echoview BETA (!) → File → new to create a new EV file** using an existing template. This template contains the decision tree and settings like species names, fixed depth lines etc.
- **Add data files** into this 'filesets window'. All raw data files from 1 day can mostly be put into 1 EV file.
- **Cruise track check.** Is all data complete? No missing areas?

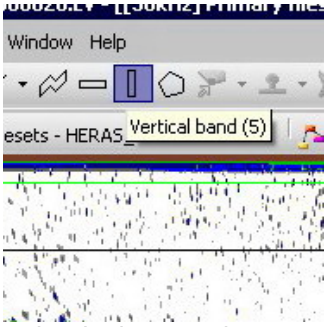


- **Save the file** using a logic name (e.g. cruiseID_date → IESNS_20080325) in H:\2008 HERAS\EV
- **Check the calibration settings** in the 'Variables & Geometry' window and 'Variables' Tab at the bottom (for all frequencies if using a multi-frequency approach). Right mouse click on the Sv variable you want to check (see T1 and T2 in the image below)and select the 'variable properties'. To open the calibration files created by ER60, open 'Super NoteTab light' and open both 38 and 200 kHz calibration files. You can leave those open for the rest of the cruise.
  38 kHz: G:\Backups\Acoustic data__Calibration files__\serial 30501 (38kHz towed body)
  200 kHz: G:\Backups\Acoustic data__Calibration files__\serial 345 (200kHz towed body)

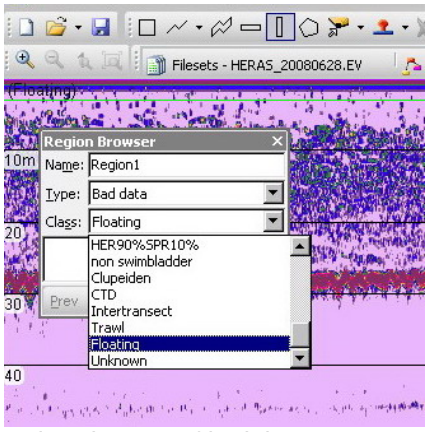




- In the main frequency Sv variable (variables & geometry window):
  - **Block out bad data** (takes about 10 minutes) by selecting the vertical band tool and then the bad areas. Right mouse click on the selected area → 'define region' and select the type of data (bad data) and the type of bad data (CTD, Trawl or inter transect). Save the file.

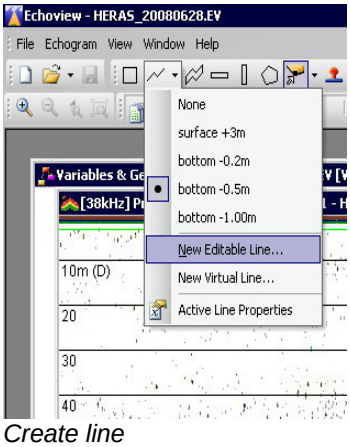


Select bad area tool



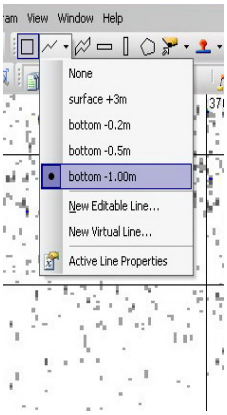
Select the type of bad data

  - **Create a bottom line** using the line tool (new editable line). Choose 'line pick from current echogram'. The line pick algorithm is set in the EV file properties and is already present in the template.



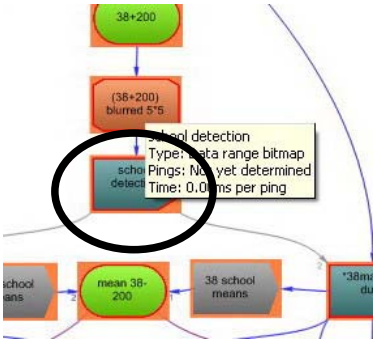
Create line

  - **Check the bottom line** (20 minutes) for bottom errors. You don't need to check the bottom in bad areas.

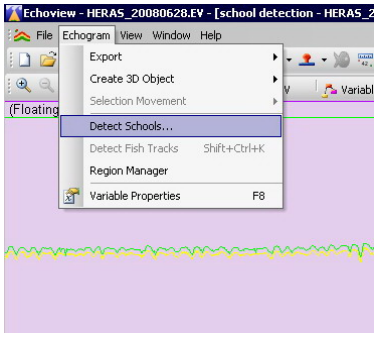


Edit line

- **Detect schools** (automatic process, 10 minutes) according to the template and the species you would like to output. Open the 'School detection' variable in the 'Variables & Geometry' window. Click the 'Echogram' menu and select 'Detects schools'. Select 'Unknown' as the region class you would like to use. All distinct signals of both frequencies will be highlighted as a school. This means also strong plankton layers have been detected as schools. These are often similar to non-swimbladder fish and have to be removed manually in the scrutiny part.



Select echogram for school detection



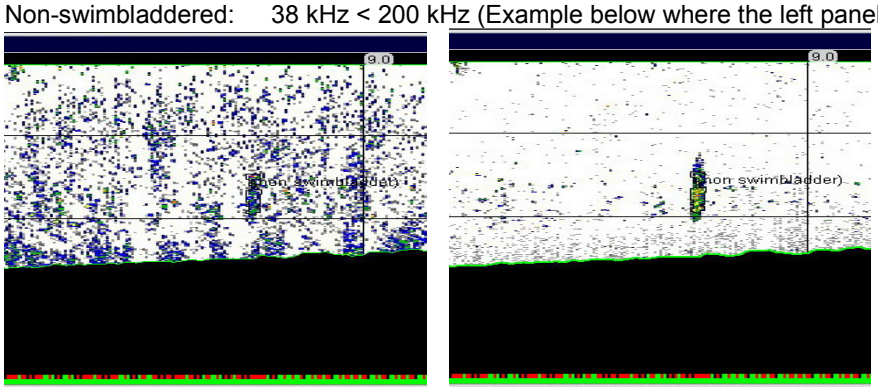
Detect schools

Scrutiny (party subjective)

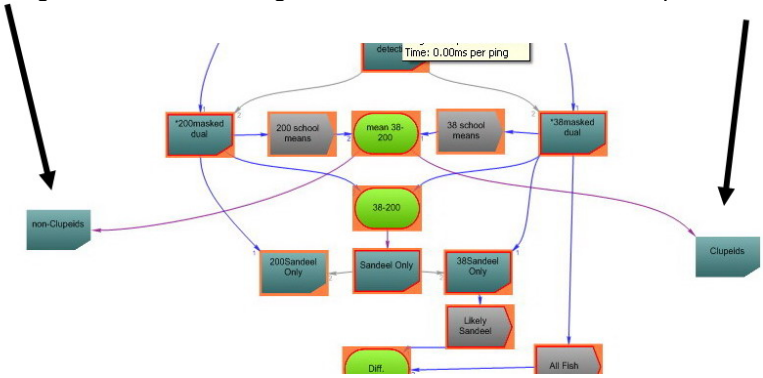
Based on the school detection in step 7, the acoustic backscatter of each individual region has been averaged for all frequencies. These 'mean values' have been compared and based on the following rules, the regions are displayed in non-swimbladder and swimbladdered variables (windows).

Swimbladdered: 38 kHz ≥ 200 kHz

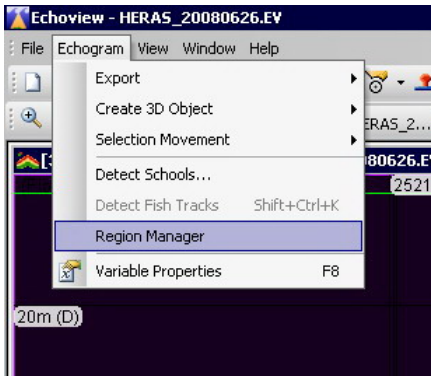
Non-swimbladdered: 38 kHz < 200 kHz (Example below where the left panel is the 38 kHz)

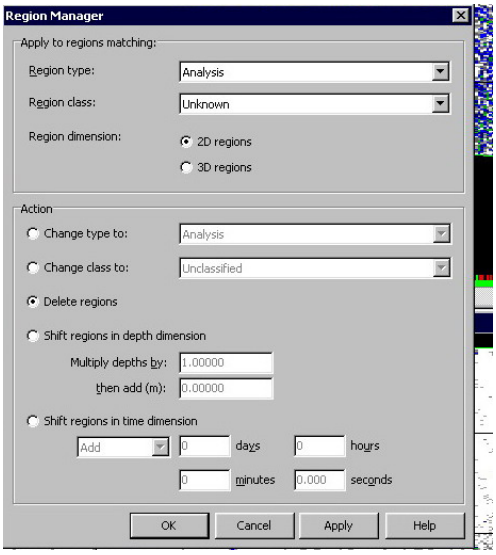


- **Running new school detections** in these separate variables indicated below (10 minutes each) will give you the opportunity to allocate all 'unknown' schools from step 7 into 'clupeids' and 'non-swimbladdered fish'. They are not really re-named: you run a new school detection in the 'clupeid' variable, where only clupeids are visible and select 'clupeids' as region class; in the 'non-swimbladder' you select 'non-swimbladdered' as region class. So a new region is placed on top of the old 'unknown' region. All 'unknown' regions will be deleted in the next step.

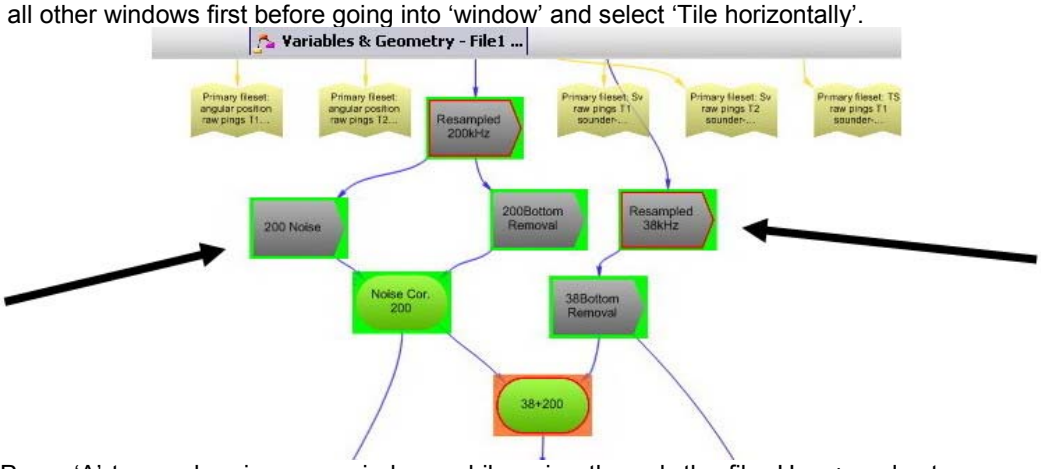


- Keep the current variable open, go to 'Echogram' menu → 'region manager' and **delete only the 'unknown'** regions. This will leave you with both 'clupeids' and 'non-swimbladdered' regions.





- Now you have to check whether the algorithm did a good job. Open all frequencies (make sure that you pick the noise cleaned versions). Tip: To line them up, minimize all other windows first before going into 'window' and select 'Tile horizontally'.



Press 'A' to synchronize your windows while going through the file. Use + and – to keys to in- or decrease the threshold. Based on your experience and trawl information, check if each region has a correct 'class' defined. If not, click/select the region and click the region button to change. You can also use the stamp tool. Select the class to be used by the stamp first by clicking the arrow next to the stamp.

To remove detected plankton regions:

- Either select an area → right click and select 'Delete all regions within selection'. Notice that schools which are only partly in this selection will NOT be removed.
- Or select a region and press 'delete' on your keyboard (or right click and select 'delete').
- In some cases fish and plankton have been detected as 1 region: remove this region and draw a new selection only around the fish school → right click → define region → type: 'analysis' class: your choice.

Finally, open the Sv of the 38kHz transducer → Echogram → Export → Analysis by regions by cells → integration → all classes. Export to H:\2008 HERAS\Export.

F) Fish sampling

Prior and during trawling:

- Check if the haul arameters have been filled in by the crew.
- Reset ther conveyor balance.
- Make room in the fish lab for all kinds of activities and prepare empty baskets.
- Prepare paper fish entry sheets (turflijst (ZE14)), small note paper etc.
- Calibrate the fish lab balances.

De vangst is aan boord (in de last)

Het gewicht van de totale vangst of – in het geval van zeer grote vangsten – het deel van de totale vangst dat wordt uitgezocht moet (tenminste bij benadering) worden vastgesteld. De reisleider beslist of de vangst over de band-weger moet ter bepaling van het totale vangstgewicht of dat ze in manden wordt gewogen.

Uitzoeken en wegen van de vangst: algemeen
De vangst bestaat dan uit tientallen of honderden kilo's.
Hoewel de survey zich in de eerste plaats richt op de doelsoorten, worden de vangst gewichten van alle soorten vis, inktvis en kwallen (bij benadering) bepaald. Alle vis en inktvis wordt op naam gebracht. Van alle soorten wordt een (deel)monster doorgemeten. Haring, sprot en overige clupeiden worden op de halve cm nauwkeurig gemeten. Overige soorten worden op de hele cm gemeten. Van inktvis wordt de mantel-lengte bepaald.
Van vangsten die over de band gaan, worden niet algemene en/of grote vissen uit de vangst gehaald ten einde voldoende exemplaren te hebben voor een representatieve lengteverdeling. Wanneer de verzamelde hoeveelheid vervolgens de benodigde hoeveelheid ruim overstijgt, kan besloten worden om deelmonsters ("subsamples") te nemen.

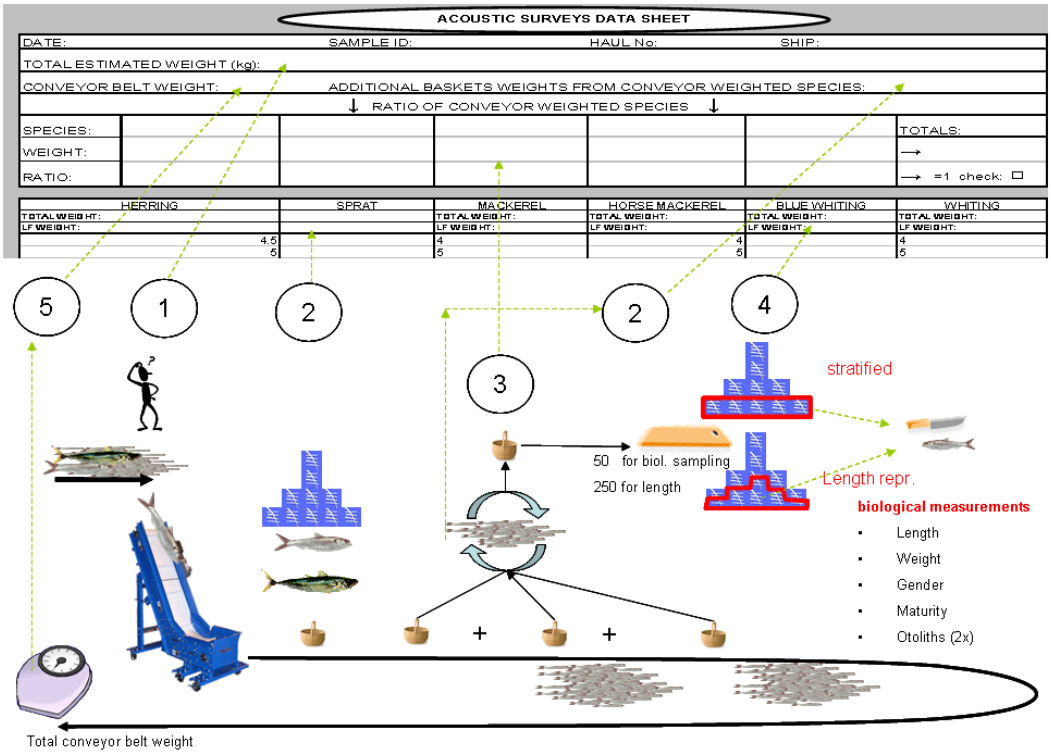
Uitzoeken en wegen van de vangst: grote vangsten
Soms bestaat de vangst uit een grote hoeveelheid vis (tonnen). In dat geval worden verspreidt over de trek *tenminste* drie manden verzameld en volledig uitgezocht. In principe gaat het om een mand ongeveer aan het begin van de trek, het midden van de trek en het einde van de trek. Echter, in het geval van zeer grote vangsten, kan besloten worden om een deel van de vangst te laten lopen (hierbij worden eventuele grote of niet algemene vissen in het deel dat men laat lopen voor verdere verwerking genegeerd).
N.B. Wanneer de bemanning grote hoeveelheden haring wil kaken en hierbij ook aan de "onderzoekers-kant" van de band wil staan en de reisleider besluit hiervoor toestemming te geven, moet voor het vullen van een mandje de band een hele lengte doorlopen zonder dat er vis van af is gehaald. Dit moet duidelijk worden afgesproken met de bemanning en er moet een niet mis te verstaan signaal worden gegeven wanneer men een mandje vangst wil verzamelen zodat iedereen even stopt met het pakken van vis terwijl de band doorloopt.
Het gewicht van de totale vangst in het geval van grote haring trekken (> dan 2 ton) hoeft niet nauwkeurig worden vastgesteld. Een schatting op het oog of aan de hand van de hoeveelheid scheep gezette zakken volstaat. Je kunt hiervoor de bootsman vragen.

Bijzondere vangsten, stekers e.d.
Vlak na het binnenhalen van het net moet gecontroleerd worden of er geen vis is achtergebleven op het dek of in het net (glasgrondels, 0-jarige zandspiering, haaien etc.): hiervan wordt ook een lengte frequentie monster genomen..

Metingen
Alle subsampling acties, inclusief wegingen van vangstdelen worden in een **stroomdiagram** bijgehouden op een **whiteboard** in het natte lab. Minstens 150 vissen uitleggen voor de lengte

frequentie verdeling, afhankelijk van de lengte range: hoe groter de lengte range des te groter het monster. Wanneer je ze uitlegt of in bakjes doet zie je of je een goed beeld hebt van de LF verdeling.
Van de uitgelegde vissen worden willekeurig 5 per cm klasse uitgehaald voor het biologische monster. Deze vissen worden gewogen, lengte gemeten op de mm, otolieten gesneden en eventueel aanvullende monsters genomen, afhankelijk van de opdrachten in het reisplan.

De lengte metingen worden bijgehouden op het **turf-formulier**. Het bovengenoemde stroomdiagram wordt overgenomen op de daarvoor bestemde ruimte op het formulier.



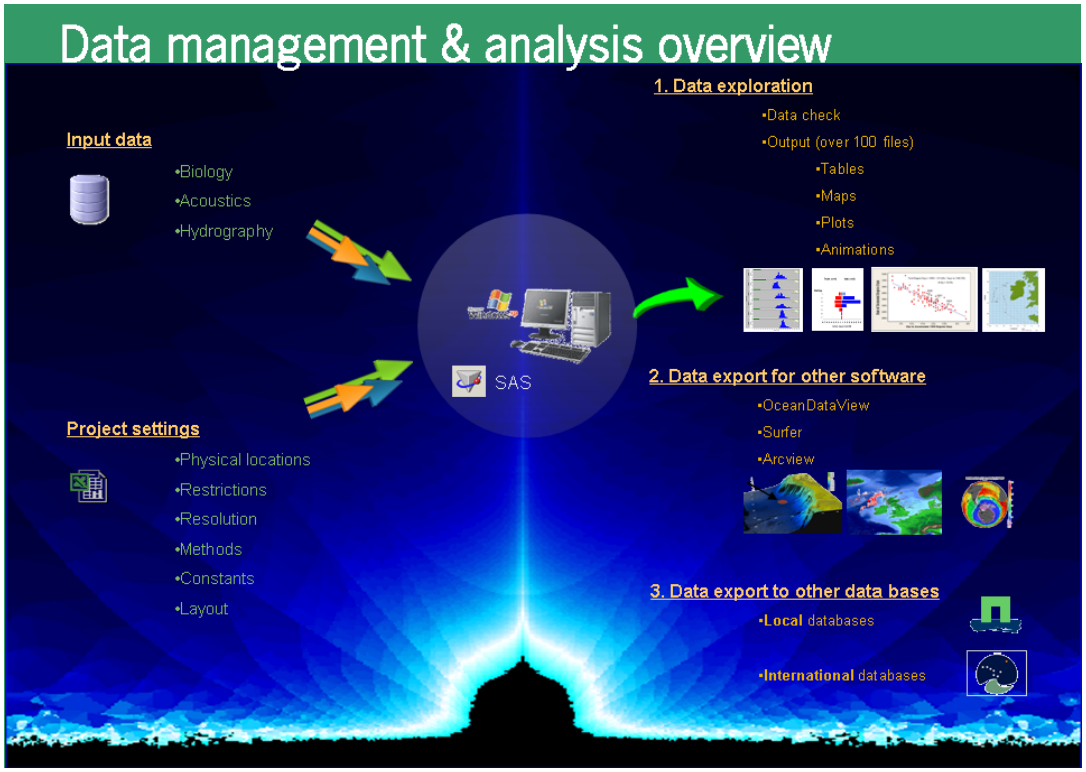
Trimon
Bij het invoeren van de Billiefiles hoeft alleen soortsinformatie worden toegevoegd (derde tabblad). De rest is op de brug ingevoerd. Beschrijving volgt uit trimon documentatie.

Billie
Het is van essentieel belang dat het subsampling proces op de juiste manier wordt ingevuld in Billie, omdat in de analyse gebruik wordt gemaakt van de gewichtssamenstelling van de vangst.

G) Data analysis

Data analysis uses a standardised SAS console which reads, converts and analyses data and outputs results. The interface consists of a main window which includes sub-modules all having specific tasks. By (un)ticking these sub-modules the user is able to select the steps needed. Your washing machine at home uses a similar approach: select a program and it will go though several steps before giving you the output you need.
N.B.: The SAS console has 3 important limitations:

1. The approach is meant for standardised surveys. Build in checks are not yet capable to find any incomplete or erroneous data.
2. The approach is designed for individual trips. Having more then 1 survey within a project will certainly create unexpected results. Contact Sytse Ybema for more information.
3. The order of individual steps is crucial and has not been optimized yet. Compare it to a washing machine where 's possible to dry before washing or open the door while spinning.... A crash is inevitable.

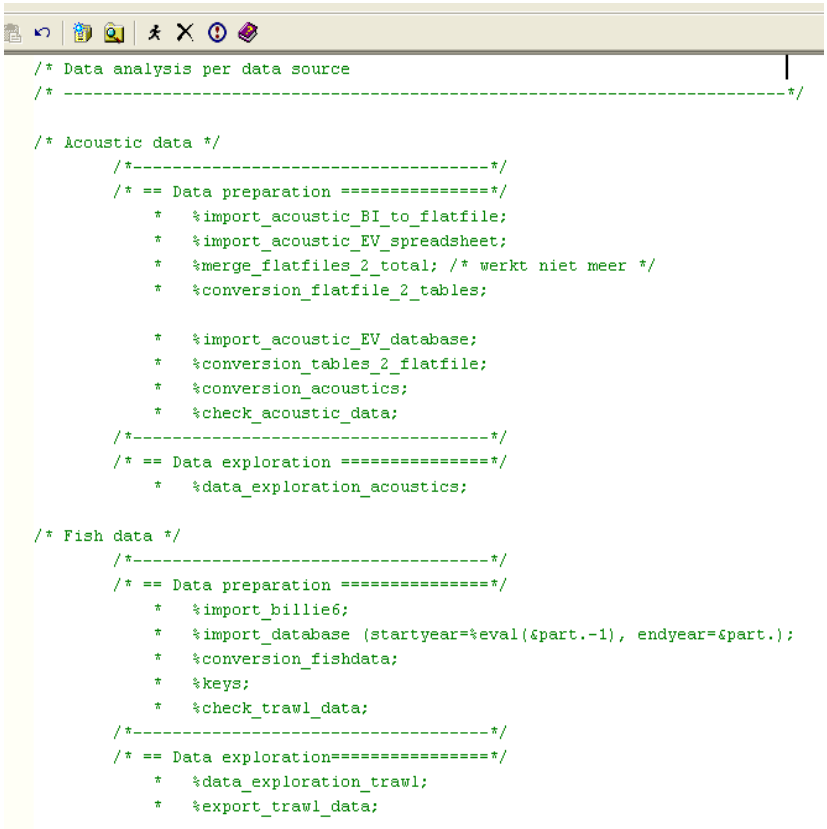


The console needs minimal user input: it only requires a one-time input of choises and assumptions for the specific survey. Input and output folders will be created automatically as well as all output files such as maps, graphs, tables and webpages. The user does not need to be a SAS exprt in order to run the modules as long as the following protocol is followed:

6. First time use of SAS console,
   - read the README file (*1_sas_projects\settings\SAS program files with practical adjustments*);
   - provide main the SAS macro (1_sas_projects\Main_analysis_tool.sas) with the location where you saved the entire SAS directory. This could be anywhere on your PC or network. Here is an example: `%let path_sas =C:\1_sas_projects;`
7. First time analysis of a survey (trip):
   - Review the settings for this trip in the setings file (*1_sas_projects\settings\project_settings.xls).*

- Run the main window without any active modules. This will create all data input folders in your Windows Explorer (1_sas_projects\projecten).

8. All data needs to be provided in a standard format:
   - Acoustische data: BI500 output files of Echoview database output files
   - Fish data: Billie files (Check version number! For example, the module reading version 6 files is named `%import_billie6;`)
   - Hydrografic data: Seabird CTD files need a standard format (contact Kees Bakker for more information) or Hydrolab CTD files (View existing surveys for examples).
   - N.B.: Make sure that file names DO NOT CONTAIN blanks or start with a number! For example, Echoview database output produces blanks in the filenames (View existing surveys for examples).
9. Individual module (marked with an * in front of the module) can now be executed by removing the asterix sign (*). Every module has a description as a text field on top of the macro file. These individual files can be found in '1_sas_projects\macros'. The image below shows an example layout of the main console.



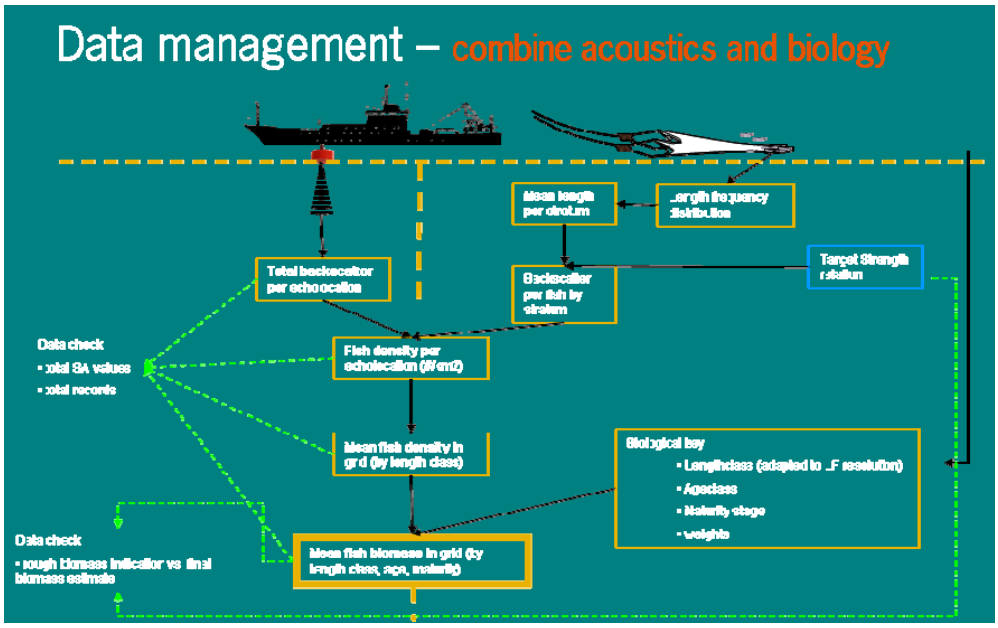
```
/* Data analysis per data source                                                */
/* ---------------------------------------------------------------------------*/

/* Acoustic data */
        /*-------------------------------------*/
        /* == Data preparation ===============*/
            *   %import_acoustic_BI_to_flatfile;
            *   %import_acoustic_EV_spreadsheet;
            *   %merge_flatfiles_2_total; /* werkt niet meer */
            *   %conversion_flatfile_2_tables;

            *   %import_acoustic_EV_database;
            *   %conversion_tables_2_flatfile;
            *   %conversion_acoustics;
            *   %check_acoustic_data;
        /*-------------------------------------*/
        /* == Data exploration ===============*/
            *   %data_exploration_acoustics;

/* Fish data */
        /*-------------------------------------*/
        /* == Data preparation ===============*/
            *   %import_billie6;
            *   %import_database (startyear=%eval(&part.-1), endyear=&part.);
            *   %conversion_fishdata;
            *   %keys;
            *   %check_trawl_data;
        /*-------------------------------------*/
        /* == Data exploration================*/
            *   %data_exploration_trawl;
            *   %export_trawl_data;
```

The methodology is simple: the total acoustic backscatter within an area is divided by the acoustic backscatter of a single fish to estimate the total amount of individual fish in the area. Multiplying this number with the average fish weight results in the total estimated biomass. These calculations only account for a few % of all programming code; the rest of around 100 macro's deals with automation, standardisation, format conversions, data checks and generating output files.



Dit gebeurt vrijwel geheel in een enkele module; de overige modules worden gebruikt om data voor te bereiden op wensen die het project stelt aan bijvoorbeeld de geografische resolutie van de resultaten, of om inzicht te geven in verzamelde data, fouten of gaten in de data op te sporen, data te exporteren in andere formaten of zelfs grafische resultaten op internet te plaatsen.

H) Reporting

The following documents are reuired after each acoustic survey:

What	For whom	Remarks	Language	Where to submit
External cruise report	Project owner	For standard surveys last years report can normally act as a template. No sensitive information allowed	English	Submit to secretariat. Will be distributed from there to stakeholders, libraries and cruise participants.

For WOT-surveys additional reports are required:

What	For whom	Remarks	Language	Where to submit
Cruise summary report	permit providing member states	Template available	English	Provide to secrtariat. Will be distributed to embassy of member states.
Cruise report (optional)	ICES planning group: – PGIPS	Template available; last years document	English	Provide to project leader. Will be included into international cruise report.
CVO cruise summary	CVO / IMARES website	No template available. Keep in mind that this website has non-scientific audience.	Dutch	CVO (Frans van Beek)