ICES ACOUSTIC DATABASE

SPECIFICATION DOCUMENT

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ATLANTOS WP2.4

DELIVERABLE 1

ICES CIEM
International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

Version History

Version	Date	Author(s)	Description
1.0	12/12/2015	AO, MA, HP,NH	Initial document published
1.1	11/03/2016	HP	Changes applied to the acoustic trawl data model
1.2	01/06/2016	HP	Changed the acoustic log entity by removing end properties and adding origin instead.

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Contents

1 Operationalisation of ship based observations – the acoustic and pelagic trawl component

This specification is part of the AtlantOS Horizon 2020 project, work package 2, which focuses on improvement, expansion, integration and innovation of ship-based observations undertaken by existing observing networks. Fish biomass, distribution and community structure will be based on national surveys coordinated by ICES. In this regard there is a pressing need to improve the regional data flow, inter-operable standards and transparency of processing of data in to what results as a data product that feeds regional fisheries management processes.

There are several working groups at ICES that coordinate pelagic/acoustic surveys in the North-East Atlantic. These groups are overseen by the Science Steering Group in Integrated Ecosystem Observation and Monitoring (SSGIEOM). While the surveys are well documented, improvements in the harmonization of data capture methods, agreement on variable definitions, standardized vocabularies and an automated process for both supplying and receiving post-processed data and meta-data would significantly improve the timeliness and quality of the resulting data products, and enable the groups to focus on scientific issues as opposed to data management issues.

There are essentially two data types in primary focus for the project presented: acoustic observations (referred to as acoustic data) – the echo soundings that are associated to species, and pelagic net trawls (referred to as Pelagic trawl data) – used for validation of the acoustic observations and calculation of population variables like size and age structures. This document focuses on the data flow for these two datatypes, and the systems that will need to be created, or expanded if they are already in operation.

2   Acoustic components

The diagram shows the overall planned components of the Acoustic system, and how it fits in with the other systems within the ICES data centre.

A key aspiration is to facilitate simple input and output procedures.
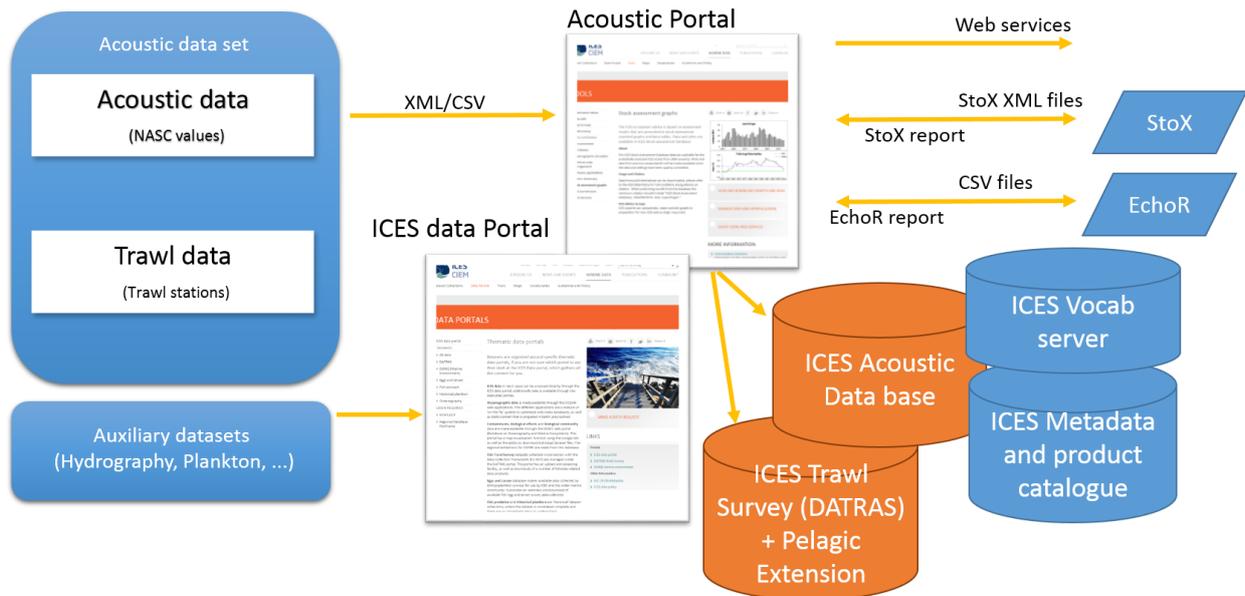
Figure 1. The components of the proposed system, where interpreted acoustic data (acoustic data associated to an acoustic category) and the Pelagic trawl data is uploaded to the ICES data portal. The data are stored in the ICES acoustic database and an extended version of the ICES Trawl survey database (DATRAS). The controlled vocabularies and product catalogue are stored in the ICES vocabulary and metadata and product catalogue databases, respectively. Output from the system is data files (in varying formats) that can be directly interfaced with StoX and EchoR.

2.1   Data flow to the regional system at ICES

The ICES Acoustic Portal will allow data submitters to upload both Acoustic and Pelagic trawl data collected during the Acoustic surveys. The Acoustic and Pelagic trawl data will be checked for format, datatype, range, and vocabulary conformity and uploaded into the ICES Acoustic database and DATRAS accordingly.

2.2   Data output from the regional systems at ICES

The data output will be facilitated through the ICES Acoustic Portal. The website will provide the user with functionality to download data in different format and the output will be compatible with the acoustic post processing softwares (StoX and EchoR).

2.2.1 Post-processing software: STOX

StoX (**Sto**ck inde**X**) [1] is an open source software developed at IMR, Norway to calculate survey estimates from acoustic and swept area surveys. The program is a stand-alone application built in Java for easy sharing and further development in cooperation with other institutes. The underlying high resolution data matrix structure ensures future implementations of e.g. depth dependent target strength and high resolution length and species information collected with optival sensors. Despite the complexity, the execution of an index calculation can easily be controlled from a user interface with an interactive GIS module, or by accessing the Java function library and parameter set using external software like R. Accessing StoX projects from R is an efficient way of processing time series or performing boot-strapping on one dataset, where for each run, the content of the parameter dataset is altered.

Simple flow chart of the principals behind acoustic abundance estimation
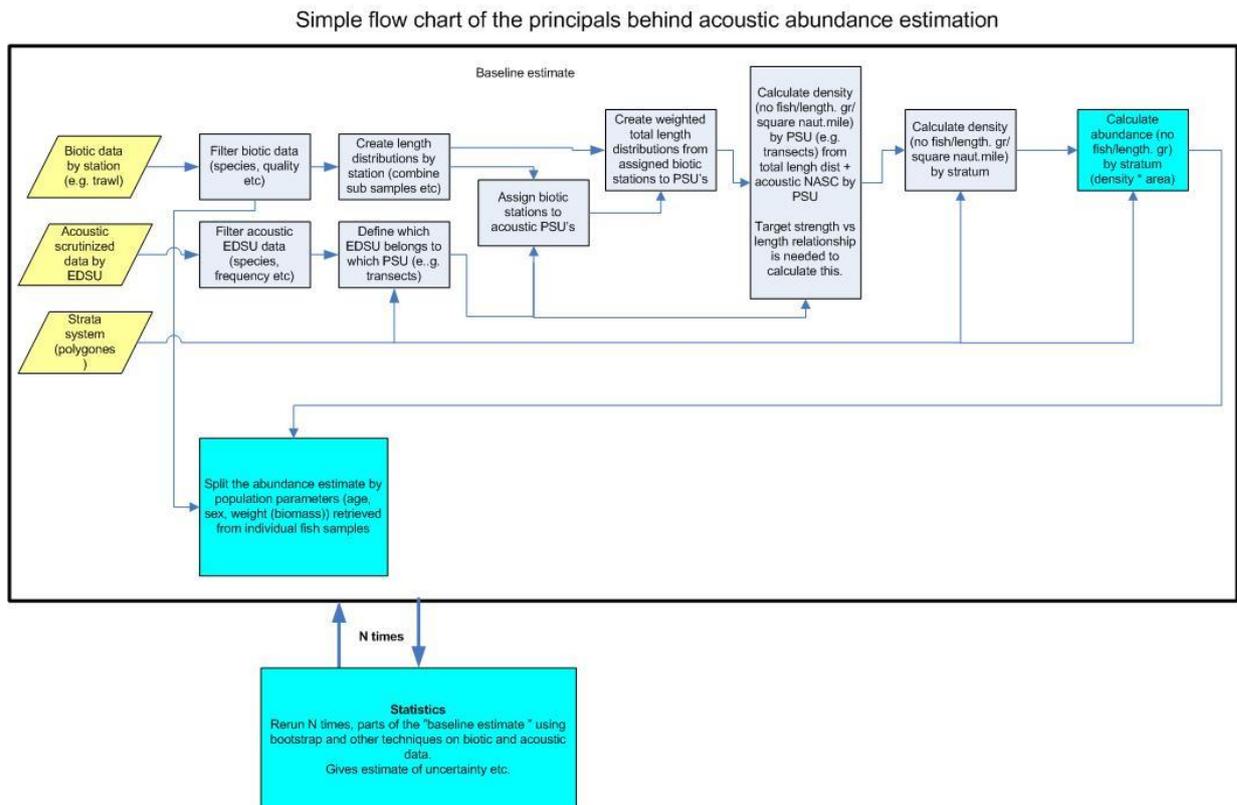
Figure 2. Acoustic abundance estimation flow chart

A key feature of StoX is the architecture which focuses on flexibility and modularity. Any program hosted by StoX is built up by functions performing a limited logic task. The functions that make up a program or model (StoX terminology), are executed in a sequential order. The behaviour of a function is governed by input parameters. Figure 2 shows the flow chart of the acoustic abundance estimation model in StoX. Yellow boxes shows three input data file for Stox:

1. Strata system (polygons): Contains a collection of geographic strata files. These are the system resource files.
2. Biotic data (Biotic XML files): Contains a collection of Biotic data from surveys.
3. Acoustic scrutinized data (Acoustic XML files): Contains a collection of Acoustic data from surveys.

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[1] http://www.imr.no/forskning/prosjekter/stox/nb-no

2.2.2   Post-processing software: EchoR and EchoBase

EchoR[2] has been designed for Ifremer by the Code Lutin IT company. It is built upon an open source PostgreSQL database, ensuring large storage capacities and easy integration into Geographical Information Systems or dynamic websites. It has been designed to store data collected during both acoustic and bottom trawl based ecosystem cruises. The EchoBase data model is based on the ICES WGFAST Topic Group on metadata standards recommendations[3] . It comprised a main «cruise metadata branch » on which are plugged acoustic and fishing (« Operation ») data (Figure 3). Biomass estimation results can also be stored in the database (green branches) at both the acoustic cell (small scale results) and voyage (large scale results) levels. The database also allows for the storage of length-weight and Target Strength-length reference relationships, as well as map data at the voyage level (Figure 3). EchoBase features a Java web-browser interface for selecting working databases, managing users, importing, editing and querying data. It also can be easily connected to LibreOffice base or the R statistical software for querying data. Portable H2 databases can be extracted from the server-based EchoBase instance and stored on a local hard drive. Grid maps of NASC and egg density produced by the WGACEGG working group for 2010 and 2011 have been imported into and extracted from EchoBase to demonstrate the database capabilities. EchoBase was proposed to serve as a shared repository for the WGACEGG shared data.
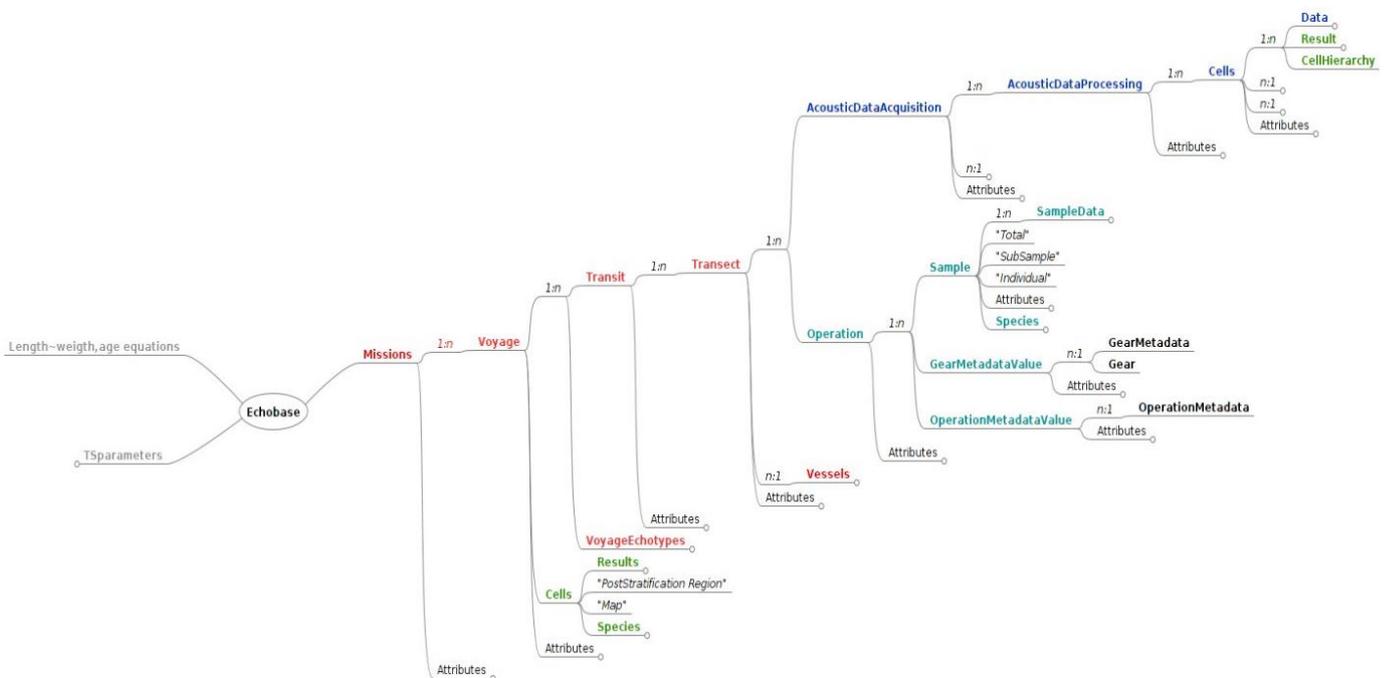
Figure 3. EchoBase data model. Cruise metadata branch in red, acoustic branch in blue, fishing (operation) branch in teal, results branches in green, reference relationships in grey.

EchoR introduces the use of "echotypes", or acoustic categories, that allow to handle mixed pelagic species cases, typical for (sub)tropical pelagic ecosystems. This notion has been discussed extensively and an "acoustic category" added to the acoustic data table to ensure compatibility with EchoR data and procedures."

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[2] https://forge.ifremer.fr/plugins/mediawiki/wiki/echor/index.php/Accueil

[3] http://www.acoustics.washington.edu/FAST/

3   Major data sources

Acoustic and related biological data are collected during dedicated surveys around the Northeast Atlantic. Major surveys that are expected to deliver data to ICES Acoustic Database are described briefly in this section.

3.1   International Baltic Acoustic Surveys by WGBIFS (SISP 8 – IBAS[4])

International acoustic surveys in Baltic are the Baltic International Acoustic Surveys (BIAS) and Baltic Acoustic Spring Survey (BASS) that cover the total area of ICES Division III. The Baltic Acoustic Spring Survey (BASS) and Baltic International Acoustic Survey (BIAS) are carried out yearly in May and September/October, respectively.

Surveys collect acoustic, biological, and hydrographic data.

Standard equipment used to collect the acoustic data is the Simrad EK/EY–60 echo-sounder and the standard frequency is 38 kHz.

Pelagic and bottom trawling are performed with a variety of gears to perform biological sampling to support the acoustic readings. Species composition, length, weight, and age sampling are recorded from these sample hauls.

Temperature, salinity and oxygen content are measured with a CTD probe before or after each haul, and recorded at least in 1-m intervals.

Data from the Baltic Acoustic Spring Survey (BASS) are stored in the BASS_DB.mdb. Data from the Baltic International Acoustic Survey (BIAS) are stored in the BIAS_DB.mdb. These Microsoft Access-files also include queries with the used algorithms for creation of the report tables and the calculation of the different tuning fleets. The current versions of the database files are located in the folder "Data" of the Baltic International Fish Survey Working Group (WGBIFS) page on ICES community SharePoint environment, and can be accessed by very limited amount of scientists.

3.2   Fishery-independent trawl-acoustic surveys on pelagic beaked redfish (Sebastes mentella) in the Irminger and Norwegian Seas basins coordinated by the WGIDEEPS (SISP11[5]).

Irminger Sea survey targeting pelagic beaked redfish covers area from 52°30′N to 65°30´N and from 24°W to 58°W down to 1000 m. The survey area is in ICES Areas Vb, XII and XIV and NAFO Areas 1F, 2H, 2J and 3K. The IDEEPS in the Irminger Sea and adjacent waters is carried out biennially in June/July. The survey is conducted with research vessels from Germany, Iceland and Russia.

Survey collects hydroacoustic, biological and hydrography data.

Large pelagic trawls (Gloria 1024 and Russian pelagic trawl (design 75/448) collect biological data since 1999.

Simrad EK60 split-beam echosounder and the standard frequency is 38 kHz with hull-mounted transducers are used to collect the acoustic data.

CTDs are used for hydrographic observations.

Data are collected and recorded according to the standard procedures as described in the survey manual. However, data storage is the responsibility of individual nations. There is currently no common database for acoustic data collected during the survey. It is planned to deliver pelagic trawl survey data to DATRAS.

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[4]http://ices.dk/sites/pub/Publication%20Reports/ICES%20Survey%20Protocols%20%28SISP%29/SISP%208%20-%20Manual%20of%20International%20Baltic%20Acoustic%20Surveys%20%28IBAS%29.pdf

[5]http://www.ices.dk/sites/pub/Publication%20Reports/ICES%20Survey%20Protocols%20(SISP)/SISP%2011%20Survey%20Manual%20for%20the%20International%20Deep%20Pelagic%20Ecosystem%20Survey%20in%20the%20Irminger%20Sea%20and%20Adjacent%20Waters.pdf

Survey in the Norwegian Sea has similar settings and challenges. It collects biological, hydroacoustic, and hydrographic data in the Norwegian Sea. Norway, Iceland and Russia are the participating countries. No official manual is produced for the survey yet. No common data storage for the survey data is used, but it is planned to provide the Pelagic trawl data to DATRAS.

3.3 International Pelagic Survey (IPS) steered by WGIPS (SISP 9[6])

WGIPS coordinates 29 individual surveys undertaken in the Northeast Atlantic by nine countries (Ireland, Germany, UK (England, Scotland, Northern Ireland), Russian Federation, Norway, Netherlands, Faroe Islands, Denmark and Iceland), accounting for 519 at-sea survey days per annum.

All surveys are using standard equipment used for surveying - Simrad EK60 operating a split-beam transducer at 38 kHz. Trawl sampling is made to obtain a sample from the school or the layer that appears as an echotrace on the sounder by means of directed trawling. A range of pelagic midwater trawls of different dimensions are employed. The details of trawls used in coordinated and national survey programs are reported in the Annex's of the WGIPS annual report:

http://prep.ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/SSGESST/2012/WGIPS12b.pdf

Temperature, salinity and oxygen content in the water column are measured with a CTD probe either at predetermined positions or in connection with each haul.

WGIPS-coordinated surveys use WGNAPES database server located at the Faroe Marine Research Institute (FAMRI), as a repository for acoustic, biological and hydrographic data. WGNAPES database was developed on a Microsoft Access platform. Data are stored in an Oracle 10g Express edition database (freeware). By executing SQL queries through the Application Express web-interface, the user can extract data in any form. Access to the database is given to every nation participating in the surveys. But only schema owner can perform insert, update and delete operations.

In addition, WGIPS used to use FishFrame 4 Acoustic module as a tool to derive global estimates from the national aggregated data. At present, RDB-FishFrame does not support work with acoustic data.

Below are some data collection details specific to the particular WGIPS surveys, both national and international. All surveys report results through WGIPS.

3.3.1 International blue whiting spawning stock survey (IBWSS)

The survey was established in 2004 and is carried out annually in March/April by vessels from Russia, Norway, Ireland, Faroes and the Netherlands. The survey aims to determine the distribution and abundance at age and length of the Northeast Atlantic blue whiting stock during the spawning season to the west of Britain and Ireland. Acoustic, biological and hydrographical data are recorded. Survey participants collect acoustic data with Simrad EK60 scientific echosounder. All vessels use a midwater trawl for biological sampling. Environment details (temperature and salinity) are measured by CTD casts taken at evenly spread out stations up to a maximum depth of 1,100m in open water along survey tracks, maximally 30 nm apart.

3.3.2 International ecosystem survey in the Nordic Seas (IESNS)

The survey is undertaken annually, starting from 1995, in May to determine the distribution, abundance and age structure of the Norwegian Spring-spawning Herring stock. Participants: the Faroese, Iceland, Norway and Russia and EU. The survey area is split into three Subareas: Area I, Barents Sea area, Area II, Northern and central Norwegian Sea Area, and Area III, the Southwestern Area. The survey collects acoustic, biological (fish trawling and plankton sampling), and hydrographic data.

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[6]http://www.ices.dk/sites/pub/Publication%20Reports/ICES%20Survey%20Protocols%20(SISP)/SISP%209%20Manual%20for%20International%20Pelagic%20Surveys%20(IPS).pdf

Acoustic data are collected by an EDSU (elementary sampling distance unit) of 1 nautical mile. Acoustic data are collected using a Simrad EK60 scientific echosounder. Split-beam transducers are mounted on the various vessels in different configurations. Biological sampling is carried out using a single vessel pelagic midwater trawls (country dependent); with a vertical opening of 25–55 m. Zooplankton is sampled by a WPII on all vessels except the Russian vessel which uses a Dyedi net, according to the standard procedure for the surveys. Mesh sizes are 180 or 200 μm. All vessels collect hydrographical data using a SBE 911 CTD. Maximum sampling depth is 1000 m.

3.3.3   Coordinated Nordic Seas ecosystem survey (IESSNS)

The survey aims to determine the distribution and abundance at age and length of Northeast Atlantic (NEA) mackerel and Norwegian spring-spawning herring during the feeding season in the Nordic Seas and surrounding coastal and offshore areas. Research vessels and chartered commercial fishing vessels from Norway, Faroe Islands and Iceland. The survey includes acoustic, trawl, zooplankton and hydrographic components. Acoustic data are collected using a Simrad EK60 scientific echosounder. Different pelagic trawls were applied prior to 2012, but after that all vessels applied the Multpelt 832. The standard equipment for zooplankton sampling is the WP2 net, with 180 or 200 μm mesh size and 56 cm aperture. CTDs are used for hydrographic sampling.

3.3.4   International acoustic survey in the North Sea, West of Scotland and Malin Shelf (HERAS)

The HERAS and MSHAS surveys are carried out annually in June/July to determine the distribution and abundance of herring and sprat in the North Sea region (HERAS) and to the west of Ireland and Scotland (MSHAS). The survey is carried out by vessels from Denmark, Germany, Netherlands, Ireland, Norway and Scotland. Survey targets on collecting acoustic data, which are supported by trawl samples. The acoustic data are collected using a Simrad EK60 scientific echosounder with 38 kHz transducers mounted on the hull, drop keel or towed bodies depending on vessel. Prior to 2006, Simrad EK500 and EY500 were also used. Trawl catches are used to obtain a sample from the school or the layer that appears as an echotrace on the sounder. The trawling gear used is of little importance as long as it is suitable for catching a sample of the target-school or layer.

3.3.5   The Irish Sea acoustic survey (ISAS)

The survey is undertaken annually to determine the distribution, abundance and age structure of the herring stock within ICES Divisions VIIaN. The survey is carried out during late August to mid-September on board the RV 'Corystes' since 2005 and before that on the RV 'Lough Foyle'.

Acoustic data are collected along with biological and hydrographic data. Acoustic data at 38 kHz and 120 kHz are collected with Simrad EK-60 echosounder with hull-mounted split-beam transducer in 15-minute Elementary Distance Sampling Units (EDSUs) with the vessel steaming at 10 knots. Biological sampling is carried out using a standardized single pelagic midwater trawl with a vertical opening of c. 15 m, fitted with a 20 mm codend liner to ensure the retention of small and juvenile fish. Surface temperature and salinity were recorded using the through-flow thermosalinograph.

3.3.6   Celtic Sea herring acoustic survey (CSHAS)

The survey is undertaken annually to determine the distribution, abundance and age structure of autumn and winter spawning components of the herring stock within ICES Divisions VIIj-g and VIIaS. Acoustic surveys have been carried out since 1989, and currently are the only tuning indices available for this stock. Since 2004 the survey has been carried out on board the RV 'Celtic Explorer', prior to this a commercial charter vessel was used.

Acoustic data are collected along with biological and hydrographic data. Acoustic data are collected using a Simrad EK60 scientific echosounder. Split-beam transducers are mounted within the vessel's drop keel and lowered to the working depth of 3.3 m below the vessel's hull or 8.8 m sub surface. Four operating frequencies are used during the survey (18, 38, 120 and 200 kHz) for trace recognition purposes. Biological sampling is carried out using a single pelagic midwater trawl with a vertical opening of c. 9 m. Water samples are not routinely taken during the survey. Sea-bird 911 sampler equipped with a full sensor suite is used for hydrographic sampling.

3.3.7   Boarfish acoustic survey (BFAS)

The survey was first carried out as a pilot survey in 2011 and has continued annually using a commercial charter vessel. The survey is used to determine the distribution of abundance of spawning aggregations of boarfish within the core spawning areas to the west of Ireland and the Celtic Sea. The survey is carried out in July and is timed to coincide with the Malin shelf herring survey (HERAS, RV 'Celtic Explorer').

Acoustic data are collected along with biological and hydrographic data. The tow body contains a Simrad ES-38B (38 KHz) split-beam transducer and is operated using a portable EK 60 scientific echosounder topside unit. Biological sampling is used to verify the composition of echotraces during echo integration. The pelagic trawl operated during the survey is provided by the charter vessel and is rigged and fished as would be during commercial operations. Regardless of the trawl dimension, a 20 mm codend liner will be fitted prior to the survey to ensure the retention of small and juvenile fish. All components of the catch from the trawl hauls are to be sorted and weighed; fish and other taxa are identified to species level. Environment details (temperature and salinity) are taken from a CTD cast taken in open water or exposed bays in the survey area. A portable CTD unit is used to determine hydrographic conditions when commercial vessel is used.

3.3.8   Pelagic ecosystem survey in the Western Channel and eastern Celtic Sea (PELTIC)

The survey is an annual survey which focuses on the distribution, abundance and age structure of small pelagic fish species in ICES Divisions VIIe-f, predominantly sprat, sardine, mackerel and anchovy. The survey is carried out in October on board the RV 'Cefas Endeavour'. Starting in 2012 five autumn surveys are scheduled to take place.

Acoustic data are collected along with biological (fish trawl and plankton sampling) and hydrographic data. Acoustic data are collected using a Simrad EK60 scientific echosounder. Split-beam transducers are mounted on the vessel's drop keel and lowered to the working depth of 3.2 m below the vessel's hull or 8.2 m sub surface. Three operating frequencies are used during the survey (38, 120 and 200 kHz) for trace recognition purposes, with 38 kHz data used to generate the abundance estimate for clupeids (and other fish with swimbladder) and 200kHz for mackerel. Biological sampling is carried out using a single pelagic midwater trawl with a vertical opening of c. 12m. All components of the catch from the trawl hauls are sorted and weighed; fish and other taxa are identified to species level. Fish samples are divided into species composition by weight. Length frequency and length weight data are collected for all species of the catch. The various planktonic size components are sampled at ~70 fixed plankton stations along-transects using two ring-nets of different mesh: 270 μm (ichtyoplankton and macro-zooplankton) and 80 μm (zooplankton), which are fixed to a frame to enable simultaneous deployment. Both nets contain flowmeters (General Oceanics mechanical flowmeters with standard rotor, model 2030R) mounted in the centre of the aperture of the net and a mini-CTD (SAIV) is attached to the bridle. Hydrographic sampling is carried out by in situ measurements using CTDs and a ferrybox, and via remote sensing. Daily satellite derived maps of chlorophyll concentration, sea surface temperature and frontal systems are monitored.

3.4   The Working Group on Acoustic and Egg Surveys for Sardine and Anchovy (WGACEGG)

The WGACEGG refers to several national acoustic surveys that could also potentially contribute data to the ICES Acoustic Database. Data collected during these surveys are stored by the national institutes, unless covered by the WGNEACS (BFAS and PELTIC)

The surveys and projects found in the group's report 2013 are as follows (acronym, season, sub-divisions covered, and country):

- PELAGO (spring – VIIIc – PT)
- PELACUS (spring – VIIIbc - ES)
- PELGAS (spring - VIIIab - FR)
- BFAS (summer – VIIb-j-g - IE)
- ECOCADIZ (summer –IXa south – ES)

- PELTIC (autumn - VIIe-j – GB-ENG)
- JUVENA (autumn – VIIIabc - ES)
- CSHAS (autumn – VIIbjg - IE)

There are other national projects and surveys considered by the group. But, as there was not issued any separate manual depicting all WGACEGG-related acoustic surveys, no further details would be provided for the separate surveys in this document.

4   Overall flow of data

The diagram in Figure 4 shows the overall planned dataflow and technical development of the Acoustic system, and how it fits in with the other systems within the ICES data centre.
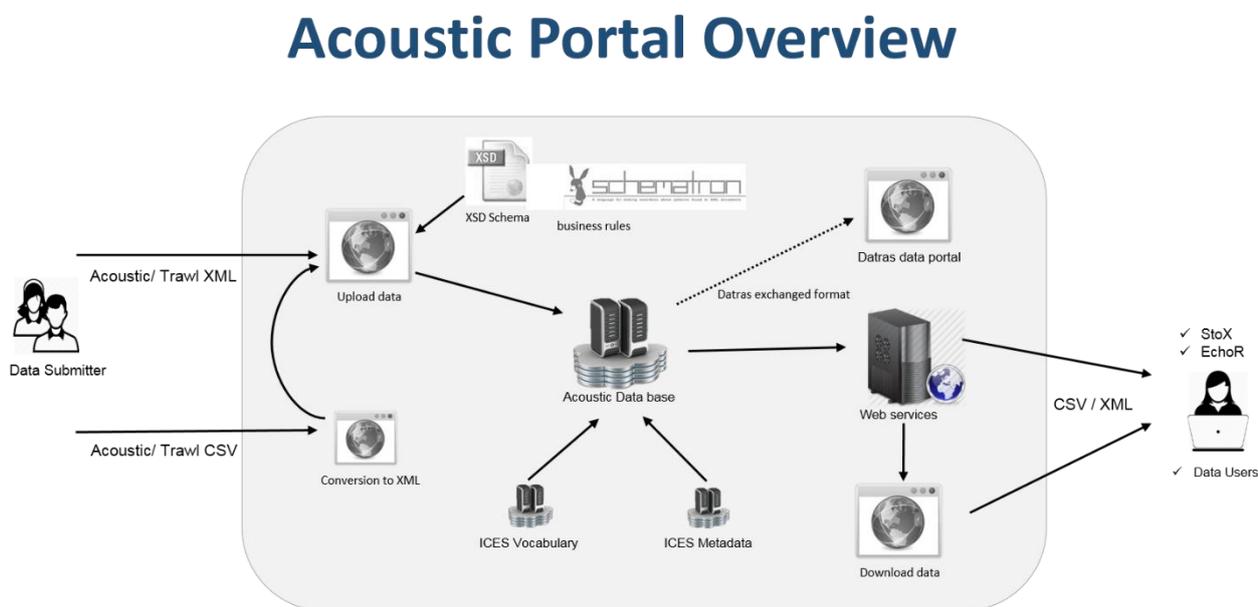
Figure 4. Acoustic Portal Overview and data flow within the ICES data centre

4.1   Tools & Technologies

The Acoustic Portal will be based on the standard ICES development software, the Microsoft platform using the following tools and technologies:

- Microsoft Visual Studio
  - o   .NET Framework
  - o   ASP.NET MVC (C#)
  - o   Entity Framework
- Microsoft SQL Server

On request, ICES will make a copy of the SQL server database available in a standalone format i.e. MySQL if project partners would like to see the database design in detail, or implement it locally.

4.2   ICES Acoustic Portal

The ICES Acoustic portal will accommodate the functionalities below:

- **Upload data**
  Data submitters can deliver either text files (CSV) or structured mark-up files (XML) for Acoustic and Pelagic trawl data. In the case of XML a template will be released for the users to validate their data before submitting it to ICES. This is done by using an XSD[7] (XML Schema). An Acoustic XSD schema and Trawl XSD schema

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1   [7] XML Schema Definition Language (XSD) http://www.w3.org/TR/xmlschema11-1/

will be provided separately to facilitate independent submission of the two data types. All general validation rules, quality control, constraint checking and statistical consistency will be implemented by using Schematron[8] as an ISO standard. In the case of CSV submitted file will be converted into XML. Submitted data will as such be validated against the XSD and the Schematron rules and a report of possible errors and warnings will be produced. If no errors result, and the data submitter accepts all warnings, then the submitted data will be ready to upload into the Acoustic database.

- **Download data**
  All data delivered to the database will be available to review or download in accordance with the ICES data policy.

Web services

Web Services will offer a possibility to search and retrieve data from the Acoustic database by granting direct access to the data.

StoX files

ICES Acoustic portal will facilitate the output for StoX files as a biotic XML and acoustic XML files.
IMR will provide the XSD schema for the StoX files based on the finalization of the content fields.

EchoR files

ICES Acoustic portal will facilitate the output for EchoR as CSV files. IFREMER will provide the schema for the EchoR based on the finalization of the content fields.

DATRAS

Additionally the Pelagic trawl data will also be available in the DATRAS exchange format at DATRAS data portal[9].

4.2.1 ICES Vocabulary[10]

ICES Vocabulary is the library of ICES and other non-ICES reference codes including trawl survey, oceanographic, commercial fishery and environmental references. New codes can be requested at any time[11]. In order to prevent duplicate codes for the same item, clear descriptions should be included. In the acoustic format all the controlled lists will be defined and stored in the ICES vocabulary. ICES vocabulary web services[12] offer a possibility to search and retrieve data from ICES Vocabularies by granting direct access to the data. Annex 1: List of all required controlled vocabularies specifies vocabularies to support acoustic data model.

ICES Data Centre has further developed the web-based Platform Code Requests application[13] as part of ICES commitment to the SeaDataNet project. The application provides a user-friendly interface for requesting Platform Codes from ICES. The existing acoustic meta standard[14] extensively records attributes related to the platform that exist

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[8] Schematron is an ISO standard which has uptake in many industries, notably the financial sector (especially insurance), governmental record exchange, and technical and reference publishing http://www.schematron.com/

[9] https://datras.ices.dk

[10] http://vocab.ices.dk/

[11] Requesting new codes http://www.ices.dk/marine-data/vocabularies/Pages/Requesting-new-codes.aspx

[12] http://vocab.ices.dk/services/

[13] http://vocab.ices.dk/Request/Login.aspx?ReturnUrl=%2frequest%2f

[14] Survey Protocol SISP 04, a metadata convention for processed acoustic data from active acoustic systems. ICES, 2014. http://ices.dk/sites/pub/Publication%20Reports/ICES%20Survey%20Protocols%20(SISP)/SISP-4%20A%20metadata%20convention%20for%20processed%20acoustic%20data%20from%20active%20acoustic%20systems.pdf

already as part of the platform code system, therefore a simplification of the metadata standard will be possible by making use of these vocabularies. We recommend that the ICES metadata standard is revised accordingly.

4.2.2   ICES Metadata

Metadata on all datasets, services and products within the Acoustic Portal will be published to and stored in ICES GeoPortal[15], when the Acoustic database is fully functional the respective metadata services will be accessible from here.

ICES managed data are available via the ICES data portal. For the purpose of updating the survey list that includes the acoustic-trawl surveys, it is important that each of the survey groups generates shape files of the surveyed areas. The shapefiles will also be integrated to the new ICES Spatial Facility[16], so any data users can visualize and download survey area layers (Figure 5).
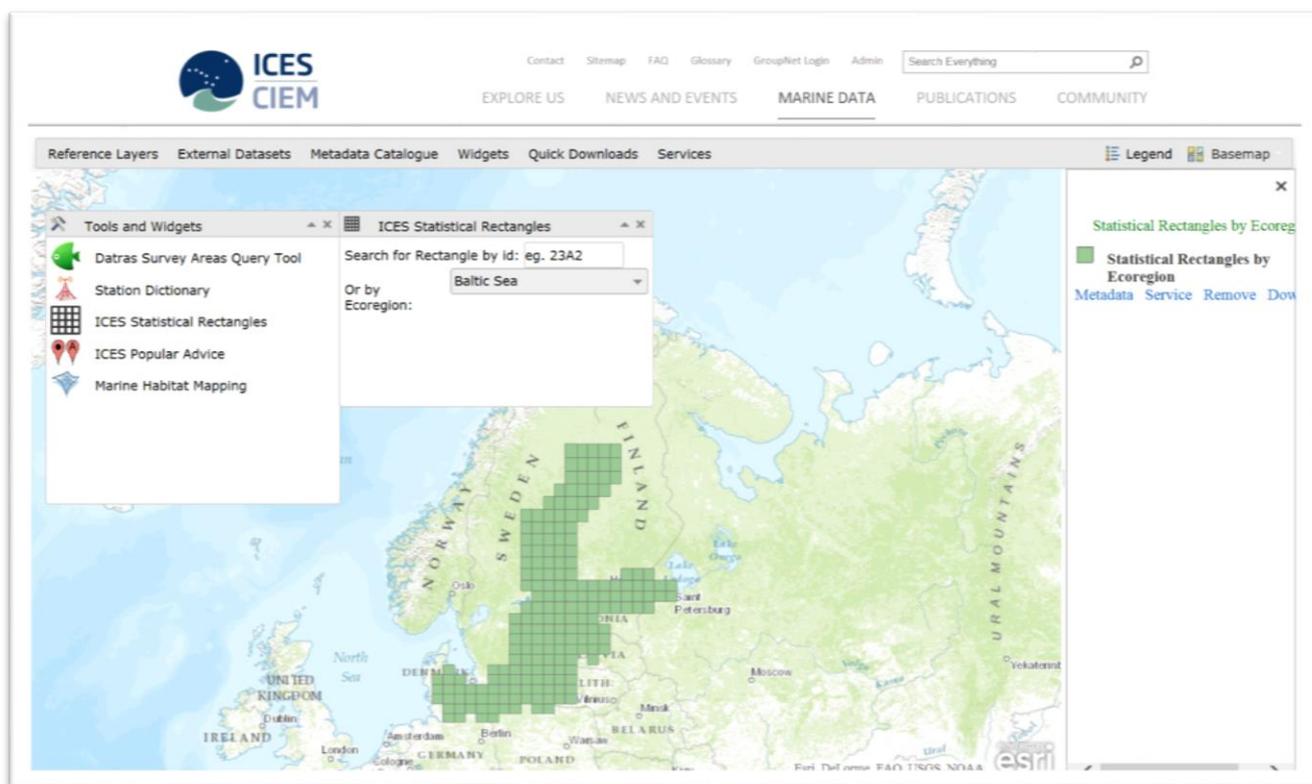
Figure 5: ICES Spatial Facility

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5 Acoustic Data model

5.1 Acoustic data

The diagram below (Figure 6) shows the hierarchical view of the acoustic data model. This version is based on the proposed format from WKEVAL (SEP 2015) [17] amended by WKIACTDB (October 2015).[18]
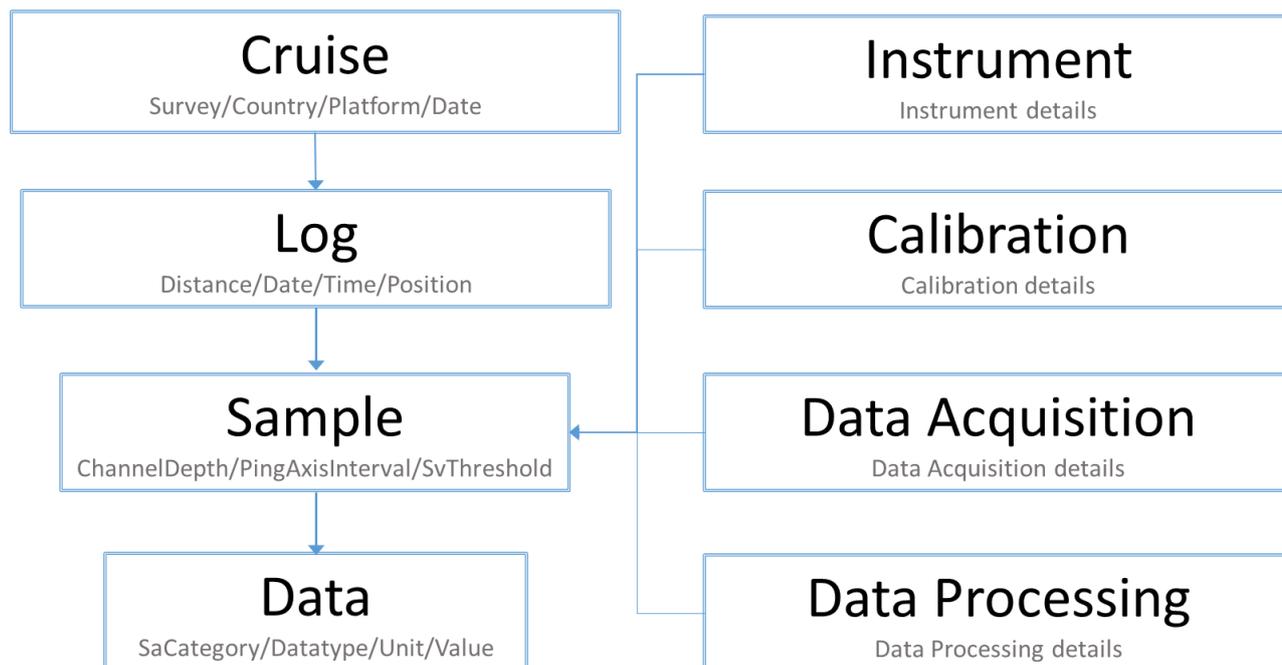
Figure 6. Hierarchical view of the Acoustic data model.

The Acoustic data is composed of the data entities:

1) Cruise

2) Log

3) Sample

4) Data

5) Instrument

6) Calibration

7) Data Acquisition

8) Data Processing

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[17] WKEVAL (SEP 2015): Workshop on evaluating current national acoustic abundance estimation methods for HERAS surveys
http://www.ices.dk/community/groups/Pages/WKEVAL.aspx

[18] WKIACTDB (October 2015): Workshop on the review of the ICES acoustic-trawl survey database design
http://www.ices.dk/community/groups/Pages/WKIACTDB.aspx

5.1.1 Acoustic data entities

The data entities are specified in the below tables.

All controlled vocabularies fields marked as a list in description, see Annex 1: List of all required controlled vocabularies. The unique key fields in each entity are highlighted with the pink colour.

Cruise

Field Code	Field Header	Status *	DataType	Description	Reference
SurveyCode	Survey code	M	string	List. ICES Survey code	
CountryCode	Country code	M	string(6)	List. ISO 3166 Country code	
OrganisationCode	Organisation code	O	integer	List. EDMO Organisation code	
PlatformCode	Platform code	M	string(4)	List. ICES Platform/Ship code	
StartDate	Cruise start date	M	string(10)	Cruise start date using ISO 8601 YYYY-MM-DD	
EndDate	Cruise end date	M	string(10)	Cruise end date using ISO 8601 YYYY-MM-DD	
LocalID	Cruise local ID	O	string	Cruise Identifier	

* Status M - mandatory, O - optional, R – recommended

Log

Field Code	Field Header	Status	DataType	Description	
SurveyCode	Survey code	M	string	List. ICES Survey code	
CountryCode	Country code	M	string(6)	List. ISO 3166 Country code	
OrganisationCode	Organisation code	O	integer	List. EDMO Organisation code	
PlatformCode	Platform code	M	string(4)	List. ICES Platform/Ship code	
CruiseStartDate	Cruise start date	M	date	Cruise start date	
CruiseEndDate	Cruise end date	M	date	Cruise end date	
Distance	Log distance	M	decimal	Log distance	
Time	Log time	M	string(16)	Log time using ISO 8601 YYYY-MM-	

				DDThh:mm	
Latitude	Log latitude	M	decimal	Log latitude	
Longitude	Log longitude	M	decimal	Log longitude	
Origin	Log origin	M	string	Log origin e.g. start, middle or end	

Sample

Field Code	Field Header	Status	DataType	Description	Reference
SurveyCode	Survey code	M	string	List. ICES Survey code	
CountryCode	Country code	M	string(6)	List. ISO 3166 Country code	
OrganisationCode	Organisation code	O	Integer	List. EDMO Organisation code	
PlatformCode	Platform code	M	string(4)	List. ICES Platform/Ship code	
CruiseStartDate	Cruise start date	M	date	Cruise start date	
CruiseEndDate	Cruise end date	M	date	Cruise end date	
LogDistance	Log start distance	M	decimal	Log start distance in nm	
ChannelDepthUpper	Upper channel depth	M	decimal	Upper channel depth (m) Rel. to surface	SISP 4 -> dataset_uplimit
ChannelDepthLower	Lower channel depth	M	decimal	Lower channel depth (m) Rel. to surface	SISP 4 -> datatset_downlimit
DataPingAxisInterval	Data ping axis interval value	M	decimal	Numeric value for data ping axis interval according to its type	SISP 4 -> data_ping_axis_interval_value
DataPingAxisIntervalType	Data ping axis interval type	M	string	Ping-axis interval by which data have been binned	SISP 4 -> data_ping_axis_interval_type
DataPingAxisIntervalUnit	Data ping axis interval unit	M	String	List	
DataPingAxisIntervalOrigin	Data ping axis interval origin	O	string	Location of ping axis interval value in the ping axis interval	SISP 4 -> data_ping_axis_interval_origin
SvThreshhold	Log	M	decimal		

Data

Field Code	Field Header	Status	DataType	Description	

Field Code	Field Header	Status	DataType	Description	
SurveyCode	Survey code	M	string	List. ICES Survey code	
CountryCode	Country code	M	string(6)	List. ISO 3166 Country code	
OrganisationCode	Organisation code	O	Integer	List. EDMO Organisation code	
PlatformCode	Platform code	M	string(4)	List. ICES Platform/Ship code	
CruiseStartDate	Cruise start date	M	date	Cruise start date	
CruiseEndDate	Cruise end date	M	date	Cruise end date	
LogDistance	Log start distance	M	decimal	Log start distance in nm	
ChannelDepthUpper	Upper channel depth	M	decimal	Upper channel depth (m) Rel. to surface	
ChannelDepthLower	Lower channel depth	M	decimal	Lower channel depth (m) Rel. to surface	
SaCategory	SA species category	M	string	List. String that identifies Acoustic Category	
Type	Acoustic data type	M	string	List. In what form are the acoustic data reported	SISP 4 -> data_acoustic_datatype
Unit	Acoustic data unit	M	string	List.	
Value	Acoustic data values	M	decimal	Acoustic data values	

Instrument

Field Code	Field Header	Status	DataType	Description	Reference
SurveyCode	Survey code	M	string	List. ICES Survey code	
CountryCode	Country code	M	string(6)	List. ISO 3166 Country code	
OrganisationCode	Organisation code	O	integer	List. EDMO Organisation code	
PlatformCode	Platform code	M	string(4)	List. ICES Platform/Ship code	
CruiseStartDate	Cruise start date	M	date	Cruise start date	
CruiseEndDate	Cruise end date	M	date	Cruise end date	
LogDistance	Log start distance	M	decimal	Log start distance in nm	
ChannelDepthUpper	Upper channel depth	M	decimal	Upper channel depth (m) Rel. to surface	
ChannelDepthLower	Lower channel depth	M	decimal	Lower channel depth (m) Rel. to surface	
Frequency	Instrument frequency	M	decimal	Frequency of the transceiver/transducer combination in kHz	SISP 4 -> instrument_frequency
TransducerLocation	Instrument transducer location	M	string	List. Location of installed transducer	SISP 4 -> instrument_transducer_location
TransducerManufacturer	Instrument transducer manufacturer	O	string	Transducer manufacturer	SISP 4 -> instrument_transducer_manufacturer
TransducerModel	Instrument transducer model	O	string	Transducer model	SISP 4 -> instrument_transducer_model
TransducerSerial	Instrument transducer serial number	O	string	Transducer serial number	SISP 4 -> instrument_transducer_serial
TransducerBeamType	Instrument transducer beam type	M	string	List. Transducer type	SISP 4 -> instrument_transducer_beam_type
TransducerDepth	Instrument transducer depth	O	decimal	Mean depth of transducer face beneath the water surface.	SISP 4 -> instrument_transducer_depth
TransducerOrientation	Instrument transducer orientation	M	string	List. Direction perpendicular to the face of the transducer	SISP 4 -> instrument_transducer_orientation
TransducerPSI	Instrument transducer psi	R	decimal	Manufacturer specified transducer	SISP 4 -> instrument_transducer

Field Code	Field Header	Status	DataType	Description	Reference
				equivalent beam angle	_psi
TransducerBeamAngle Major	Instrument transducer beam angle major	R	decimal	Major beam opening, also referred to athwartship angle	SISP 4 -> instrument_transducer_ beam_angle_major
TransducerBeamAngle Minor	Instrument transducer beam angle minor	R	decimal	Minor beam opening, also referred to alongship angle	SISP 4 -> instrument_ transducer_ beam_angle_minor
TransceiverManufactur er	Instrument transceiver manufacturer	O	string	Transceiver manufacturer	SISP 4 -> instrument_transceiver_manufactu rer
TransceiverModel	Instrument transceiver model	O	string	Transceiver model	SISP 4 -> instrument_transceiver_model
TransceiverSerial	Instrument transceiver serial number	O	string	Transceiver serial number	SISP 4 -> instrument_transceiver_serial
TransceiverFirmware	Instrument transceiver firmware version	O	string	Transceiver firmware version	SISP 4 -> instrument_transceiver_firmware
Comments	Instrument and calibration comments	O	string	Free text field for relevant information not captured by attributes	SISP 4 -> calibration_comments, instrument_comments

Calibration

Field Code	Field Header	Status	DataType	Description	Reference
SurveyCode	Survey code	M	string	List. ICES Survey code	
CountryCode	Country code	M	string(6)	List. ISO 3166 Country code	
OrganisationCode	Organisation code	O	integer	List. EDMO Organisation code	
PlatformCode	Platform code	M	string(4)	List. ICES Platform/Ship code	
CruiseStartDate	Cruise start date	M	date	Cruise start date	
CruiseEndDate	Cruise end date	M	date	Cruise end date	
LogDistance	Log start distance	M	decimal	Log start distance in nm	
ChannelDepthUpper	Upper channel depth	M	decimal	Upper channel depth (m) Rel. to surface	
ChannelDepthLower	Lower channel depth	M	decimal	Lower channel depth (m) Rel. to surface	
Date	Calibration date	M	string	Date of calibration in ISO 8601 format	SISP 4 -> calibration_date

Field Code	Field Header	Status	DataType	Description	Reference
				including local time zone	
AquisitionMethod	Calibration acquisition method	M	string	List. Method used to acquire calibration data	SISP 4 -> calibration_aquisition_method
ProcessMethod	Calibration processing method	M	string	List. Method of processing used to generate calibration offsets	SISP 4 -> calibration_processing_method
AccuracyEststimate	Calibration accuracy estimate	M	string	Estimate of calibration accuracy with units and description	SISP 4 -> calibration_accuracy_estimate
Report	Calibration report	O	string	References to documents on calibration processing and results	SISP 4 -> calibration_report
Comments	Instrument and calibration comments	O	string	Free text field for relevant information not captured by attributes	SISP 4 -> calibration_comments, instrument_comments

Data Acquisition

Field Code	Field Header	Status *	DataType	Description	Reference
SurveyCode	Survey code	M	string	List. ICES Survey code	
CountryCode	Country code	M	string(6)	List. ISO 3166 Country code	
OrganisationCode	Organisation code	O	integer	List. EDMO Organisation code	
PlatformCode	Platform code	M	string(4)	List. ICES Platform/Ship code	
CruiseStartDate	Cruise start date	M	date	Cruise start date	
CruiseEndDate	Cruise end date	M	date	Cruise end date	
LogDistance	Log start distance	M	decimal	Log start distance in nm	
ChannelDepthUpper	Upper channel depth	M	decimal	Upper channel depth (m) Rel. to surface	
ChannelDepthLower	Lower channel depth	M	decimal	Lower channel depth (m) Rel. to surface	
SoftwareName	Data acquisition software name	R	string	List. Name of software controlling echo sounder and its data logging	SISP 4 -> data_aquisition_software_name
SoftVersion	Data acquisition software version	R	string	Version of software that controls echo sounder and its data logging	SISP 4 -> data_acquisition_software_version
StoredDataFormat	Data acquisition stored data format	M	string	List. Name of the format in which data are stored	SISP 4 -> data_acquisition_stored_data_for

Field Code	Field Header	Status *	DataType	Description	Reference
					mat
PingDutyCycle	Data acquisition ping duty cycle	M	string	Free text field to describe ping duty cycle	SISP 4 -> data_acquisition_ping_duty_cycle
Comments	Data acquisition and processing comments	O	string	Free text field for relevant information not captured by attributes	SISP 4 -> data_processing_comments and data_acquisition_comments
QualityFlag	Acoustic Quality Flag	O	string(2)	List.	

Data Processing

Field Code	Field Header	Status *	DataType	Description	Reference
SurveyCode	Survey code	M	string	List. ICES Survey code	
CountryCode	Country code	M	string(6)	List. ISO 3166 Country code	
OrganisationCode	Organisation code	O	integer	List. EDMO Organisation code	
PlatformCode	Platform code	M	string(4)	List. ICES Platform/Ship code	
CruiseStartDate	Cruise start date	M	date	Cruise start date	
CruiseEndDate	Cruise end date	M	date	Cruise end date	
LogDistance	Log start distance	M	decimal	Log start distance in nm	
ChannelDepthUpper	Upper channel depth	M	decimal	Upper channel depth (m) Rel. to surface	
ChannelDepthLower	Lower channel depth	M	decimal	Lower channel depth (m) Rel. to surface	
SoftwareName	Data processing software name	M	string	List. Name of software that was used to process raw acoustic data	SISP 4 -> data_processing_software_name
SoftVersion	Data processing software version	M	string	Version of software that was used to process raw acoustic data	SISP 4 -> data_processing_software_version
ChannelID	Data processing channel ID	R	string	Unique identifier for each data channel	SISP 4 -> data_processing_channel_id
Bandwidth	Data processing bandwidth	R	decimal	Bandwidth associated with processed data	SISP 4 -> data_processing_bandwidth

Field Code	Field Header	Status *	DataType	Description	Reference
Frequency	Data processing frequency	M	decimal	Transmit frequency associated with processed data	SISP 4 -> data_processing_frequency
TransceiverPower	Data processing transceiver power	M	decimal	Nominal transceiver power	SISP 4 -> data_ processing_ transceiver_power
TransmitPulseLength	Data processing transmit pulse length	M	decimal	Transmit pulse length	SISP 4 -> data_processing_transmit_pulse_length
On-axisGain	Data processing on axis gain	M	decimal	Total system gain value when calibration sphere is on-axis.	SISP 4 -> data_processing_on_axis_gain
On-axisGainUnit	Data processing on axis gain units	M	string	List. Units for the data_processing_on_axis_gain attribute	SISP 4 -> data_processing_on_axis_gain_units
SaCorrection	Data processing Sa correction	O	decimal	SA correction value (Simrad transceivers)	SISP 4 -> data_processing_Sacorrection
Absorption	Data processing absorption	R	decimal	Absorption of sound by seawater value	SISP 4 -> data_processing_absorption
AbsorptionDescription	Data processing absorption description	R	string		SISP 4 -> data_processing_absorption_description
SoundSpeed	Data processing sound speed	R	decimal	Sound speed used by transceiver	SISP 4 -> data_processing _soundspeed
SoundSpeedDescription	Data processing sound speed description	R	string		SISP 4 -> data_processing _soundspeed_description
TransducerPSI	Data processing transducer psi	M	decimal	Transducer equivalent beam angle	SISP 4 -> data_processing_transducer _psi
Comments	Data acquisition and processing comments	O	string	Free text field for relevant information not captured by attributes	SISP 4 -> data_processing_comments and data_acquisition_comments

5.2 Pelagic trawl data

The Pelagic trawl data are composed data entities (Figure 7):

1) Cruise

2) Haul

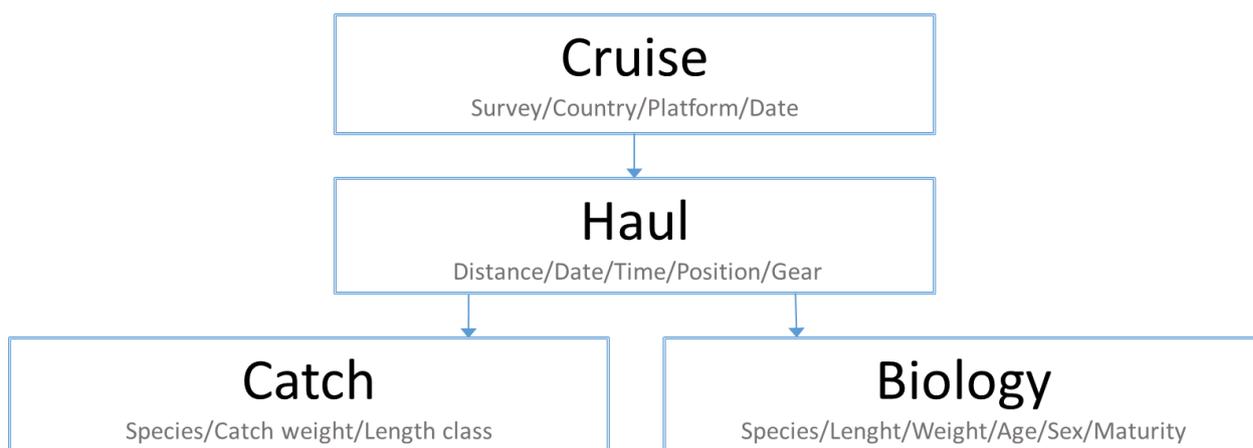3) Catch

4) Biology (individual)

Figure 7. Figure of the Biological data model.

5.2.1 Trawl data entities

The Pelagic trawl data entities are specified in the below tables.

All controlled vocabularies fields marked as a list in description. Annex 1 specifies the list of all required controlled vocabularies. The key fields in each entity are highlighted with the orange colour.

Haul

Field Code	Field Header	Status*	DataType	Description
SurveyCode	Survey code	M	string	List. ICES Survey code
CountryCode	Country code	M	string(6)	List. ISO_3166 country and region codes
OrganisationCode	Organisation code	O	integer	List. EDMO Organisation code
PlatformCode	Ship reference code	M	string(4)	List. ICES Platform/Ship code
CruiseStartDate	Cruise start date	M	date	Cruise date start
CruiseEndDate	Cruise end date	M	date	Cruise date start
Gear	Gear	M	string	List. ICES Gear type code
StNo	Station number	M	string	Station number. National coding system, not defined by ICES
HaulNo	Haul number	R	integer	Sequential numbering of hauls during cruise
Month	Month	M	integer	Month of haul
Day	Day	M	integer	Day of haul
TimeShot	Time shot	M	string	Start time (GMT) of the shot
HaulDur	Haul duration	M	integer	Haul duration in minutes

Field Code	Field Header	Status*	DataType	Description
StartLat	Start latitude	M	decimal	Start fishing position: Degree.Decimal Degree of latitude
StartLong	Start longitude	M	decimal	Start fishing position: Degree.Decimal Degree of longitude
HaulLat	Hauling latitude	O	decimal	Stop fishing position: Degree.Decimal Degree of latitude
HaulLong	Hauling longitude	O	decimal	Stop fishing position: Degree.Decimal Degree of longitude
StatRec	ICES statistical rectangle	O	string(4)	ICES statistical area rectangle
Depth	Depth	O	integer	Bottom depth
MinTrawlDepth	Minimum trawl depth	M	integer	Minimum depth (in m) of the trawl headline. Use only min. for the same trawl depth, if different depths applied, report both min/max
MaxTrawlDepth	Max trawl depth	O	integer	Maximum depth (in m) of the trawl headline
Distance	Distance	O	integer	Actual distance in metres between haul start and haul end point
HaulVal	Haul validity	M	string(2)	List. Haul validity and purpose of the haul code
DataType	Data type	M	string(2)	List. Code that specifies the data type for reported catch values.
Netopening	Netopening	M	decimal	Mean value in metres of vertical net opening measurements
CodendMesh	Codend mesh size	O	Integer	Codend mesh size in mm
SweepLngt	Sweep length	O	Integer	Length of sweep in metres
GearExp	Gear exceptions	O	string(2)	List. Gear exceptions
DoorType	Door type	O	string(2)	List. Door type
Warplngt	Warp length	O	integer	Length of warp in metres. Defined by fishing depth
Warpdia	Warp diameter	O	integer	Warp diameter in millimetres
WarpDen	Warp demsity	O	integer	Warp weight in kg per linear meter of warp
DoorSurface	Door surface	O	decimal	Door surface area in square metres
DoorWgt	Door weight	O	integer	Door weight in kilograms
DoorSpread	Door spread	O	decimal	Mean value in metres of door spread measurements
WingSpread	Wing spread	O	decimal	Mean value in metres of wing spread measurements
Buoyancy	Buoyancy	O	integer	Total buoyancy of the net floats in kilograms
KiteDim	KiteDim	O	decimal	Kite area in square metres
WgtGroundRope	Ground rope weight	O	integer	Ground rope total weight in kilograms.
Rigging	Rigging	O	string(2)	Rigging is used in the beam trawl surveys
Tickler	Tickler	O	integer	Number of ticklers in the Beam trawl surveys

Field Code	Field Header	Status*	DataType	Description
HydroStNo	Hydrographic station number	O	string(8)	The national hydrographic station reference
TowDir	Tow direction	O	Integer	Direction of towing in degrees. 360=direction from south to north
GroundSpeed	Ground speed	O	decimal	Ground speed of towing in knots
SpeedWater	Speed on water	O	decimal	Trawl speed on water in knots
WindDir	Wind direction	O	integer	Direction of wind in degrees
WindSpeed	Wind speed	O	integer	Speed of wind in metres/sec
SwellDir	Swelldirection	O	integer	Direction of swell in degrees
SwellHeight	Swell height	O	decimal	Swell height in metres
AcousticLogDistance	Acoustic Log distance	O	decimal	Log reference to acoustic data

* Status M - mandatory, O - optional, R – recommended

Catch

Field Code	Field Header	Status*	DataType	Description
SurveyCode	Survey code	M	string	List. ICES Survey code
CountryCode	Country code	M	string(6)	List. ISO_3166 country and region codes
OrganisationCode	Organisation code	O	integer	List. EDMO Organisation code
PlatformCode	Ship reference code	M	string(4)	List. ICES Platform/Ship code
CruiseStartDate	Cruise start date	M	date	Cruise date start
CruiseEndDate	Cruise end date	M	date	Cruise date start
Gear	Gear	M	string	List. ICES Gear type code
StNo	Station number	M	string	Station number. National coding system, not defined by ICES
HaulNo	Haul number	R	integer	Sequential numbering of hauls during cruise
SpecCode	Species code	M	string(10)	List. Official species WoRMS AphiaID
SpecVal	Species validity	M	string(2)	List. Flagging of species catch data in the record
Sex	Sex	O	string(2)	List. Gender category
TotalNo	Total number	O	decimal	Total number of fish in the given haul and species
CatIdentifier	Category identifier	M	Integer	Size or weight category for sorting and subsampling of species
NoMeas	Number of fish measured	O	Integer	Counted number of fish in the category of species
SubFactor	Subsampling factor	M	Decimal	Sub-sampling factor in the given category
SubWgt	Weight of the subsample	O	Integer	Weight of the subsampled fish for a given haul, species, category
CatCatchWgt	Category weight	O	Integer	Catch weight per category, or weight per haul per hour for CPUE data
LngtCode	Length code	O	string(2)	List. Length class code for the given species
LngtClass	Length class	O	Integer	Length class registered for this catch

Field Code	Field Header	Status*	DataType	Description
				category
LenMeasType	Length measurement type	O	string(3)	List. Length measurement type
NoAtLngt	Numbers at length	O	decimal	Counted number of fish of the given category and length in this haul
LngtGroupWgt	Length group weight	O	decimal	Baltic Acoustic survey weight of the category by length class

Biology (individual)

Field Code	Field Header	Status*	DataType	Description
SurveyCode	Survey code	M	string	List. ICES Survey code
CountryCode	Country code	M	string(6)	List. ISO_3166 country and region codes
OrganisationCode	Organisation code	O	integer	List. EDMO Organisation code
PlatformCode	Ship reference code	M	string(4)	List. ICES Platform/Ship code
CruiseStartDate	Cruise start date	M	date	Cruise date start
CruiseEndDate	Cruise end date	M	date	Cruise date start
Gear	Gear	M	string	List. ICES Gear type code
StNo	Station number	M	string	Station number. National coding system, not defined by ICES
HaulNo	Haul number	R	integer	Sequential numbering of hauls during cruise
SpecCode	Species code	M	string(10)	List. Official species WoRMS AphiaID
StockID	Stock ID	O	string(12)	List. ICES fish stock ID
FishID	Fish ID number	M	Integer	Running sampling number of the specimen
LngtCode	Length code	M	string(2)	List. Length class code for the given species
LngtClass	Length class	M	Integer	Length class registered for this catch category
Sex	Sex	M	string(2)	List. Gender of the given specimen as defined by dissection
Maturity	Maturity	M	string(4)	List. Maturity code of the reported speciman. Requires dissection
PlusGr	Plus group	O	string(2)	List. Flag the age used for age grouping if any
AgeRings	Age rings	M	Integer	Age of specimen in years
AgeSource	Age source	O	string(4)	List. Age reading source material
NoAtLngt	Numbers at length	M	Integer	Amount of fish at this species category. Individual fish is
IndWgt	Individual weight	O	decimal	Individual weight in grams
GenSamp	Genetic sampling	O	string(2)	List. Flag for genetic sampling
StomSamp	Stomach sampling	O	string(2)	List. Flag for stomach sampling
ParSamp	Parasite sampling	O	string(2)	List. Flag for parasite sampling
VertebraeCount	Vertebrae count	O	Integer	Herring stock identifier

6   Combined data model

Presented in figure 8 is the combination of acoustic and Pelagic trawl data. The text in grey is representative of the main type of information that is associated to that entity in the hierarchy.
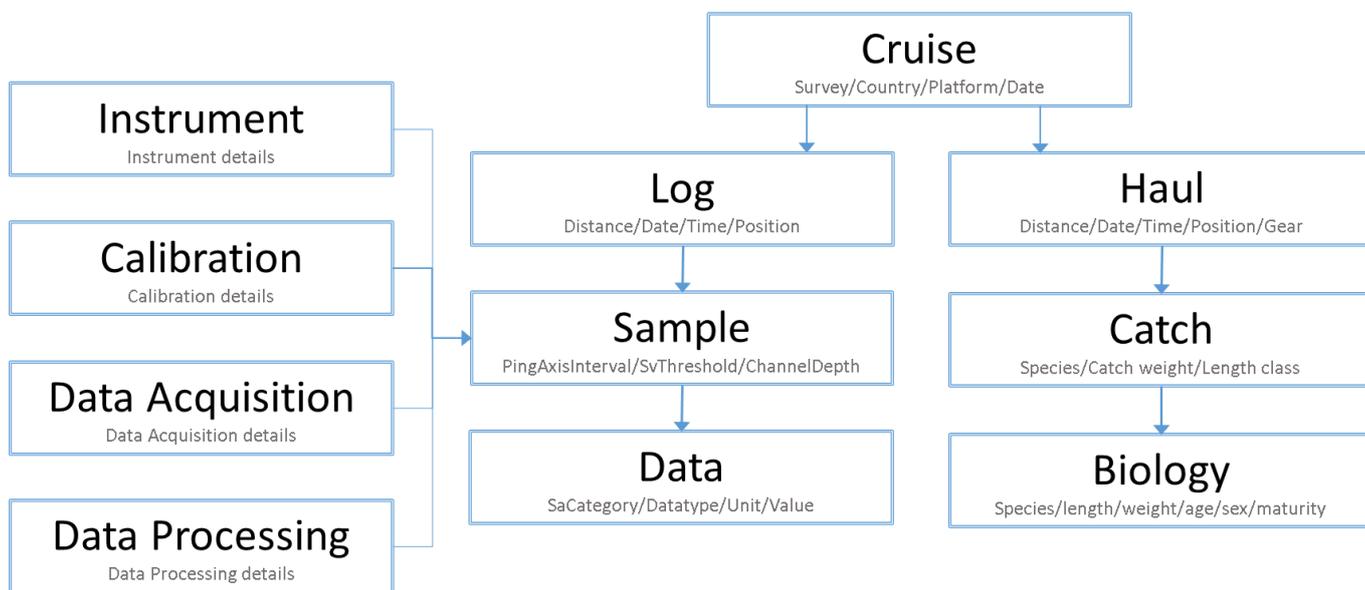

Figure 8 overall high-level data model for acoustic sampling

7   Activities and timeline for next stage of development

The next milestone will be the WGIPS meeting in January 2016 where the current Acoustic data content tables and hierarchy will be discussed. According to the WKIACTDB recommendation, the ICES Data Centre will provide support and guidance during the WGBIFS meeting in March to facilitate the use of the final Acoustic data format. It is expected that the ICES Acoustic Portal will be available by the end of September. This will enable the expert groups to transform their data into the Acoustic database and as such be used by the post processing software.

8   Annex 1: List of all required controlled vocabularies

Field Code	Field Header	ICES Vocabulary URL	Description
Country	Country	**Subset of http://vocab.ices.dk/?ref=337**	ISO 3166 country and region codes used by ICES
Platform	Ship reference code	**Subset of http://vocab.ices.dk/?ref=315**	SeaDataNet Ship and Platform Codes
Survey	Survey	**Subset of http://vocab.ices.dk/?ref=102**	Survey acronym. Request a code for your survey
Gear	Gear	**Subset of http://vocab.ices.dk/?ref=2**	Gear type code
HaulVal	Haul validity	**Subset of http://vocab.ices.dk/?ref=1**	Haul validity and purpose of the haul code.
GearExp	GearExp	**Subset of http://vocab.ices.dk/?ref=97**	Gear exceptions
DoorType	DoorType	**Subset of http://vocab.ices.dk/?ref=98**	Door type
SpecCode	Species code	**Subset of http://vocab.ices.dk/?ref=102**	Official species WoRMS AphiaID
SpecVal	Species validity	**Subset of http://vocab.ices.dk/?ref=5**	Flagging of species catch data in the record
Sex	Sex	**Subset of http://vocab.ices.dk/?ref=17**	Gender reference
LngtCode	Length code	**Subset of http://vocab.ices.dk/?ref=18**	Length class code for the given species
LenMeasType	Length measurement type	**Subset of http://vocab.ices.dk/?ref=1392**	Length measurement type
StockID	Stock ID	**Subset of http://vocab.ices.dk/?ref=357**	ICES fish stock ID
Maturity	Maturity	**Subset of http://vocab.ices.dk/?ref=128**	Maturity code of the reported specimen. Requires dissection
PlusGr	Plus group	**Subset of http://vocab.ices.dk/?ref=14**	Flag the lowest age used for age+ grouping if any
AgeSource	Age source	**Subset of http://vocab.ices.dk/?ref=1393**	Age reading source material
GenSamp	Genetic sampling	**Subset of http://vocab.ices.dk/?ref=1390**	Flag for genetic sampling
StomSamp	Stomach sampling	**Subset of http://vocab.ices.dk/?ref=1390**	Flag for stomach sampling
ParSamp	Parasite sampling	**Subset of http://vocab.ices.dk/?ref=1390**	Flag for parasite sampling
DA_Software	Data acquisition software name	Needs to be built	Name of software controlling echosounder and its data logging
DA_StoredFormat	Data acquisition stored data format	Needs to be built	Name of the format in which data are stored
DP_Software	Data processing software name	Needs to be built	Name of software that was used to process raw acoustic data
DP_On-	Data processing on	Needs to be built	Units for the

Field Code	Field Header	ICES Vocabulary URL	Description
axisGainUnit	axis gain units		data_processing_on_axis_gain attribute
QualityFlag	Acoustic Quality Flag	Needs to be built	
Instr_TransducerLoc	Instrument transducer location	Needs to be built	Location of installed transducer.
Instr_TransducerBeam	Instrument transducer beam type	Needs to be built	Transducer type
Instr_TransducerOrient	Instrument transducer orientation	Needs to be built	Direction perpendicular to the face of the transducer
Cal_AquisitionMet	Calibration acquisition method	Needs to be built	Method used to acquire calibration data
Cal_ProcessMet	Calibration processing method	Needs to be built	List. Method of processing used to generate calibration offsets
PingAxisIntType	Data ping axis interval type	Needs to be built	Ping-axis interval by which data have been binned
PingAxisIntOrigin	Data ping axis interval origin	Needs to be built	List. Location of ping axis interval value in the ping axis interval