Port Sampling Summary

compiled for

Fisheries Ecosystems and Advisory Service

Marine Institute, Rinville, Oranmore, Galway

Foras na Mara
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ACOM ICES Advisory Committee

CFP Common Fisheries Policy

DCF Data Collection Framework

DC MAP Data Collection Multi Annual Programme

DG MARE Directorate-General for Maritime Affairs and Fisheries

EC European Commission

EMFF European Maritime and Fisheries Fund

EU European Union

ICES International Council for the Exploration of the Seas

JRC Joint Research Centre

MS Member States

RDB Regional Database

STECF Scientific, Technical & Economic Committee for Fisheries

TAC Total Allowable Catch

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PURPOSE OF DATA COLLECTION

1.1 DATA COLLECTION MULTI-ANNUAL PROGRAMME (DC-MAP)

Since the early 1990's the Irish fisheries industry has been supported by the European Union (EU) in the assessment of commercial fish stocks. In 2002, an EU framework for the collection and management of fisheries data was put in place. This framework was originally based on Commission Regulation (EC) No 1639/2001 and obliged the Member States (MS) to collect, manage and make available a wide range of fisheries data needed for scientific advice. Since then Data Collection Regulations have been regularly updated and the current framework is a multi-annual programme which was initiated in 2016 (see Table 1)

Table 1: Table summarising the timeline of EU funding for fisheries data collection

Year	Title
1992-1994	EU STRIDE initiative for Ireland (Science and Technology for Regional Innovation and Development in Europe)
1995	EU Study Contract "Improved Sampling of Fish Stocks"
1997	FIEFA -Framework Improved European Fisheries Assessment
2000	SAMFISH - Improving Sampling of Western & Southern European Atlantic Fisheries
2002-2008	EU Data Collection Regulation (1639/2001)
2009-2010	EU Data Collection Regulation (199/2008)
2011-2015	EU Data Collection Framework (199/2008)
2016-	DCMAP (Data Collection Multi Annual Programme)

In 2011, the European Commission presented its proposals for the reform of the EU Common Fisheries Policy (CFP) which is the fisheries policy of the EU. As described in the European Commissions website [1], *"the CFP is a set of rules for managing European fishing fleets and for conserving fish stocks. Designed to manage a common resource, it gives all European fishing fleets equal access to EU waters and fishing grounds and allows fishermen to compete fairly"*. The CFP sets quotas, known as Total Allowable Catch (TAC) for each member states per fish stock, as well as encouraging the fishing industry by various market interventions.

In late 2011 the EC proposed a new fund for the EU's maritime and fisheries policies for the period 2014-2020 - the European Maritime and Fisheries Fund (EMFF). Details of the proposals for the new regulation of the European Parliament and of the Council on the common fisheries policy COM(2011) 425, can be found on their website [2]

Multiannual plans under the new CFP includes the target of fishing at maximum sustainable yields and deadlines for achieving this target. They also contain measures for the implementation of the landing obligation, safeguards for remedial action and review clauses where needed, and technical measures.

1.1.0.1 *EU Data Calls*

Data is collected from member countries, on the basis of National Programmes in which the Member States (MS) indicate which data is collected, the resources they allocate for the collection and how the data is collected. MS must report annually on the implementation of their National Programmes and the Scientific, Technical and Economic Committee for Fisheries (STECF) evaluates these Annual Reports.

Data calls are regularly issued to MS by the Directorate-General for Maritime Affairs and Fisheries (DG MARE) and MS upload the relevant part of their collected data to databases managed by the Joint Research Centre (JRC). The JRC assembles the data, stores it in databases, analyses its quality and coverage and makes it available to the Scientific, Technical & Economic Committee for Fisheries (STECF) working groups. The STECF analyse the data and disseminate it in aggregated form for a target audience of experts for further use in scientific analyses and policy. The results form the basis for scientific opinions and recommendations and the advice is used to inform the CFP decision making process.

1 https://ec.europa.eu/fisheries/cfp_en
2 https://ec.europa.eu/fisheries/reform/proposals

The JRC's website on the DC MAP [3], contains the necessary information and data related to the above described process including:

- latest news in relation to data calls, deadlines, variable definitions, disaggregation levels and uploading procedures;
- National Programs and Annual Report prepared by the MS;
- access to the uploading facilities and data dissemination platforms for the experts and the general public;
- coverage reports on the data provided by the MS in response of the data calls managed by JRC;
- DC MAP technical documents, guidelines and legislation.

1.1.0.2 *ICES Data Calls*

Data Calls are also issued to MS by the International Council of the Exploration of the Seas (ICES). ICES is an intergovernmental organization whose main objective is to increase the scientific knowledge of the marine environment and its living resources and to use this knowledge to provide unbiased, non-political advice to competent authorities.[4].

ICES is comprised of almost 150 expert groups, drawn from it's 20 member countries, dealing with a broad spectrum of marine science topics. Clearly defined data calls are regularly made to member countries and the resulting data is stored in ICES managed databases for evaluation and compilation. The aggregated data is then discussed by relevant working and steering groups who report to the Advisory Committee (ACOM) and/or Science Committee (SCICOM).

ICES delivers scientific publications, information and management advice requested by member countries and international organizations and commissions such as the Oslo Paris Commission (OSPAR), the Helsinki Commission - Baltic Marine Environment Protection Commission (HELCOM), the North East Atlantic Fisheries Commission (NEAFC), the North Atlantic Salmon Conservation Organization (NASCO), and the European Commission (EC).

3 https://datacollection.jrc.ec.europa.eu/
4 http://www.ices.dk/explore-us/who-we-are/Pages/Who-we-are.aspx

1.1.0.3 *Regional Coordination Group (RCG) Data Calls*

According to Council Regulation (EC) No 199/2008 Member States shall coordinate their national programmes with other MS in the same marine region. These Regional Coordination Groups (RCG) meet and coordinate their national programmes and implement the collection, management and use of the data in the same region [5].

Five RCGs are operational in the framework of the DCF, covering four EU marine regions and long distance fisheries. Ireland is a member of the North Atlantic RCG.

All of the above interactions are summarised in Fig 1.1.

5 http://dcf.mir.gdynia.pl/?page_id=365

1.2 MI SAMPLING PROTOCOL OVERVIEW

In Ireland, the Marine Institute has carried out Ireland's obligations under the Data Collection Framework (DCF) since 2002. The current DCMAP programme involves at sea and port sampling of catch and landings, research vessel surveys (e.g. acoustic, egg, groundfish and underwater TV surveys), management and analyses of data and the assessment and provision of scientific advice on the sustainable exploitation of fisheries resources. DC MAP is running over the period 2016 to 2020 and will provide the scientific support to implement the new Common Fisheries Policy (CFP). Ireland has secured funding under the EMFF (European Maritime and Fisheries Fund) to support the implementation of the DCMAP. Biological sampling and assessment and provision of advice for demersal stocks exploited by Ireland's commercial marine fisheries are key components of DCMAP.

In order to collect this data the Marine Institute work programme includes a comprehensive research vessel survey programme, port sampling of landings, sea sampling of discards, age profile of the fisheries resource, analyses of EU logbook and vessel monitoring systems data.

Pelagic sampling is based on unsorted samples from the landed catch from a vessel, usually carried out in a factory. The way the sample is processed varies, depending on the species. For more detailed information see section 2.2 *How Port Sampling Events and Stock Selection is Targeted*

Since Q1 2016 Ireland has employed a Statistically Sound Sampling Protocol (4S) for demersal port sampling events. This ensures that the demersal sampling conducted at the ports are more representative of the landings. To achieve this, analysis was conducted to establish the main demersal species landed in the top 21 ports in the country - chosen as they represent 95% of the national landings.

All information regarding Ireland's data collection work programme can be found on the dedicated DC MAP (Data Collection Multi annual Programme) website. [6]

6 http://www.miextranet.ie/fss/sites/DCMAP/Pages/default.aspx/

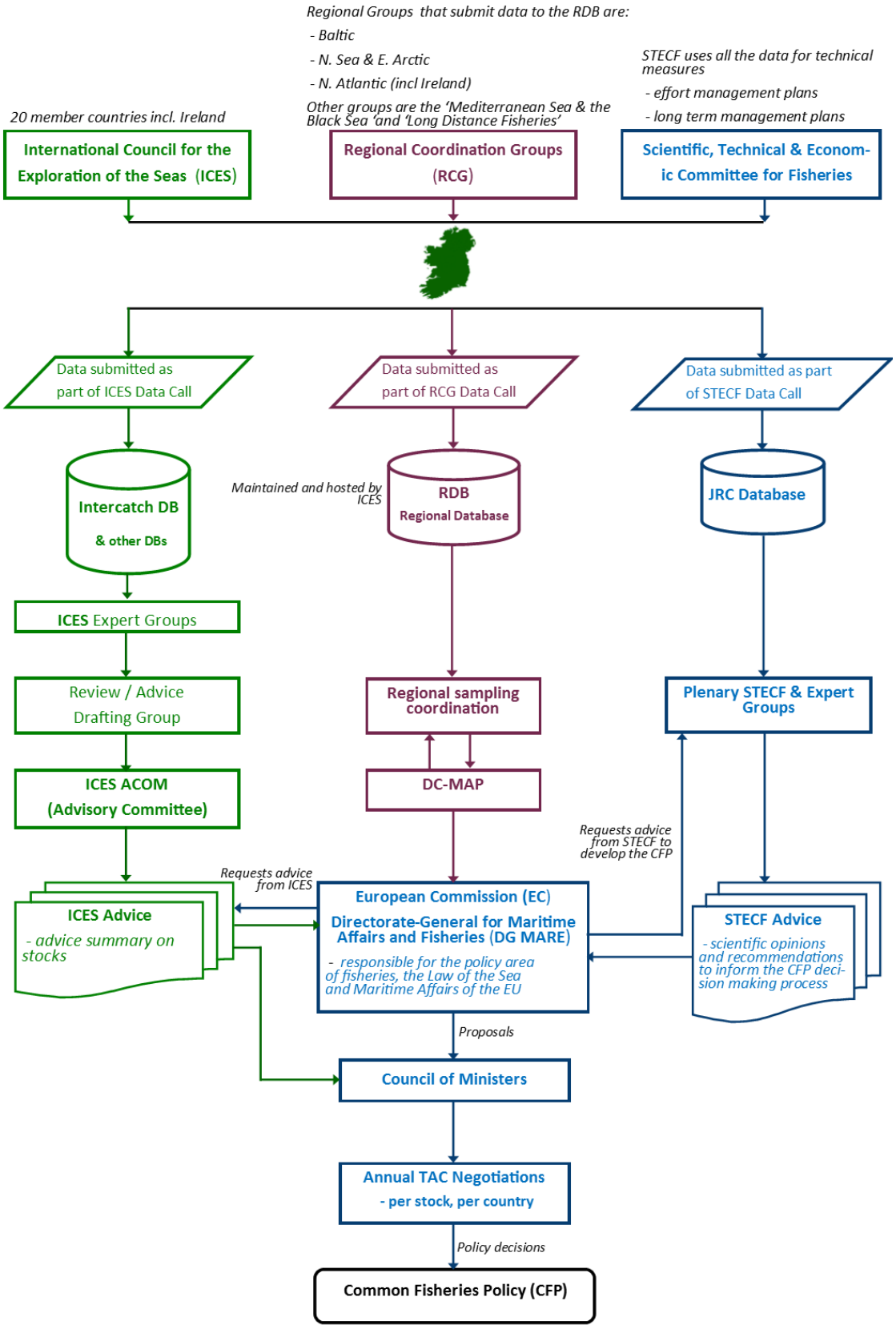


Figure 1.1: Work-flow summarising data submitted to ICES and the EU

2

DATA COLLECTION OVERVIEW

2.1 TYPES OF DATA COLLECTED & STORAGE METHODS

The Marine Institutes, Fisheries Ecosystems and Advisory Services (FEAS) database - Stockman2015 - contains datasets from the following types of sampling carried out by analysts:-

- Port Sampling - morphometric data compromising of
  - age length
  - length frequency
  - targeted biological data
- Catch Sampling

An overview of each of these data-sets are contained in the following sections.

2.1.1 *Port Sampling*

Fishery dependent information involves collection of catch per unit effort data (CPUE) as well as biological sampling from commercial fisheries. CPUE data are usually collected from logbooks. The underlying assumption is that changes in CPUE accurately reflect changes in the abundance of the fish stocks.

In addition to the above all age structured assessment models used by scientists require accurate estimates of the number, weights and age of all fish removed from the population by various fisheries. These should include both landed and discarded fish.

Length distributions of landed fish can be obtained from samples taken in the auction halls, ports, quays side sampling or sampling at sea on commercial vessels. Generally, the

length sampling is carried out by area, gear and time to ensure that the estimated size distribution is accurate. In addition, Marine Institute scientists collect data on the age and weight-at-length from these samples. Sampling throughout the year allows scientists to monitor differences in growth and age over the year.

The sampled length frequency information for either landings or catch can be converted to ages using age-length keys derived from the relationship between age and length. Ages are estimated using a small bone found in the head of fish called the otolith. Counting the rings on these otoliths gives an estimate of the age of the fish (similar to the rings of a tree). The numbers of fish at different ages for various gears, areas, quarters and nations are combined to produce annual catch numbers-at-age for each assessed stock.

2.1.1.1 *Age Length Data*

The age structure for a large number of fish can be estimated by summarising the relationship between age and length for a relatively small sub-sample of fish and then applying this summary to the entire sample of fish. This summary is called an age-length key. A set number of fish is randomly selected from each length interval ensuring the range of lengths in the sub-sample covers the entire range of lengths in the original sample. This sub-sample of fish is called the age sample, because the relationship between age and length will be determined from this group of fish only. Fisheries assessments often rely on this age composition data to infer information about growth, mortality, and the outcome of various management policies.

2.1.1.2 *Length-Frequency Data*

Length-frequency data are widely used to derive growth estimates, and when plotted, can be used to get a first assessment of the status of a stock.

The main advantage of length-based methods is that the basic data are quick and easy to obtain. It is a very practical way to collect statistically adequate information, i.e., data that take full account of the variability in the sizes (and ages) of fish caught at different times and places and with different gears. However length samples need to be collected according to a careful statistical design. Analysts are trained in the different quantities that may be referred to as the length of a fish, depending on the species involved - standard length, fork length, carapace width, etc. As far as the application of length-based assessment methods is concerned it does not matter which length is used provided the same quantity is always used.

Measurements should be done with reasonable precision. Very high precision is not needed as most applications require the data to be grouped into length-classes.

2.1.1.3 *Targeted Biological Data*

Sampling of maturity parameters is required under DC MAP. The objective is to monitor the length and age at which commercially exploited fish stocks mature in order to determine the spawning stock biomass and thereby inform the stock assessment process. In previous years sampling took place on a dedicated Q1 survey on the Celtic Voyager (Biological Sampling Survey). Since 2010 this survey has not been funded and an alternative method of collecting samples are employed by determining the sex and maturity of discards for all commercial species in port. Targets are given to analysts at the beginning of the year and these targets are met during the first quarter. The data sheet FRM-02b - see Fig 2.3 and [1], contains an aged component including sex and maturity, which is filled by the analyst. This data is then entered into Stockman2015 under 'Species Metadata'. in the 'Sex' and 'Maturity Code' columns.

2.1.2 *Catch Sampling Data*

The demersal catch sampling programme is based on a stratified metier approach. This means sampling trips are divided into separate groups, made up of all vessels that fish with similar gears and catch similar species. The programme commenced in 1992 and has one of the longest time series of discard data collection in Europe. Since 2002 it has been mandatory for the Marine Institute to collect catch sampling information as part of the Data Collection Framework and now it is carried out as part of DCMAP (Data Collection Multi-Annual Programme). At sea catch sampling is essential to quantify the size and age structure of all species in the catch. Without accurate catch information, assessments become more uncertain and advice on sustainable fishing levels becomes more conservative, leading to lower quotas. Sampling at sea is also important for monitoring catches of non-quota species (including protected, endangered and threatened species).

Data collected during catch-sampling trips at sea, is entered into the 'Discards' database. This data includes measured only information from the discarded and retained catch. Once a year the measured only data from the retained catch is transferred to the 'Stockman' database with identification that marks it as coming from the 'Discards' database.

1 Z:/TechniciansMasterFolder/QUALITYMANAGEMENTSYSTEM/SOPS/INABLive

This data augments the information gathered during port sampling trips to help give a fuller picture of stock populations

2.2 HOW PORT SAMPLING EVENTS AND STOCK SELECTION IS TARGETED

2.2.1 *Pelagic Sampling and Stock Selection*

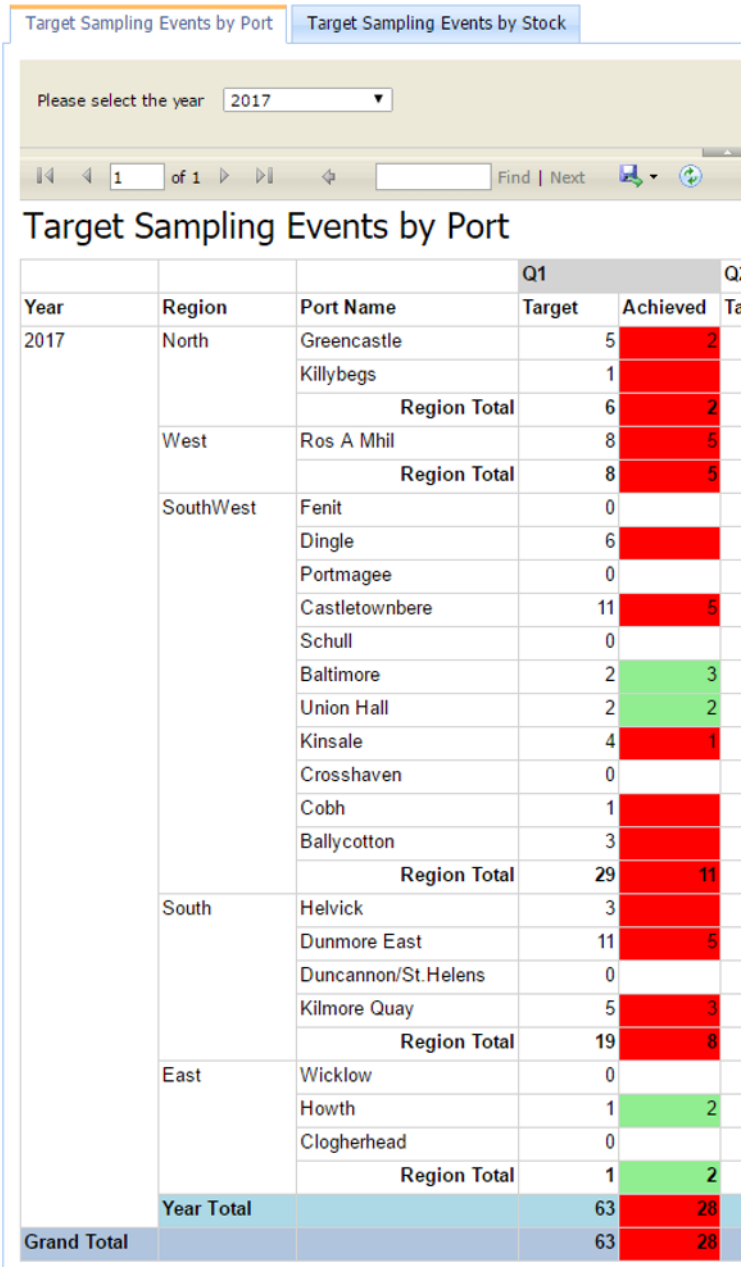
Due to the nature of the pelagic fishery, port sampling is determined on an opportunistic basis: when a particular fishery is open sampling is carried out wherever the relevant fish are being processed to achieve weekly targets and avoid duplication. Killybegs is the main port for pelagic landings so most of the sampling is carried out there, but also smaller ports and non-ports in the south like Skibbereen are targetted.

Pelagic sampling is based on unsorted samples from the landed catch from a vessel, usually done in the factory. A random sample of unsorted catch (usually about half a basket) is taken and processed. The way the sample is processed varies, with random sampling for age in Celtic Sea herring, and stratified for age (5 or 10 fish per length class) for everything else. The measured only and aged parts come from the same original sample. Boarfish data is measured only (i.e. length frequencies) with no age data collected.

2.2.2 *Demersal port selection*

As mentioned in section *1.2 MI Demersal Sampling Protocol Overview* the target number of sampling trips to each port is now proportional to the landings of the main demersal species in each port. Because there are a large number of small ports that contribute very little to the overall landings, only the top 21 ports are sampled. These ports represented 95% of the demersal landings in the last 2 years. Each of the ports has a probability of being selected for sampling in each quarter, but some of the smaller ports might end up with a sampling target of zero. The port sampling targets can be accessed through the Stockman2015 homepage [2] by clicking on "View Reports" - "Analysts" - "Target Sampling Events by Port". An excerpt of this page is shown in Fig 2.1. Sampling targets are compiled on a quarterly basis with cell colours changing from red to amber (when 90% of the target is reached) to green as data is gathered and target levels are achieved.

2 http://mifeasapp01/Stockman2015/



Target Sampling Events by Port | Target Sampling Events by Stock

Please select the year 2017

1 of 1 Find | Next

Target Sampling Events by Port

			Q1		Q
Year	Region	Port Name	Target	Achieved	Ta
2017	North	Greencastle	5	2	
		Killybegs	1		
		Region Total	6	2	
	West	Ros A Mhil	8	5	
		Region Total	8	5	
	SouthWest	Fenit	0		
		Dingle	6		
		Portmagee	0		
		Castletownbere	11	5	
		Schull	0		
		Baltimore	2	3	
		Union Hall	2	2	
		Kinsale	4	1	
		Crosshaven	0		
		Cobh	1		
		Ballycotton	3		
		Region Total	29	11	
	South	Helvick	3		
		Dunmore East	11	5	
		Duncannon/St.Helens	0		
		Kilmore Quay	5	3	
		Region Total	19	8	
	East	Wicklow	0		
		Howth	1	2	
		Clogherhead	0		
		Region Total	1	2	
	Year Total		63	28	
Grand Total			63	28	

Figure 2.1: Target sampling events by port, contained in the Stockman Database

The "Port Sampling Protocol 2016 V2" is available on Irelands DCMAP website, within which analysts are advised to note the following:

- it is important to spread the sampling trips out throughout the quarter.
  There is flexibility in the actual timing of the trips as the sampling trips obviously need to be planned around the availability of samples and staff.
- the number of samples taken for each stock is the most important driver of precision, so it may be necessary to increase the number of sampling trips in some ports in order to achieve a sufficient number of samples.
- the sampling targets refer to landings ports (this could be different from the location where analysts access the samples, like processors or auctions in different ports).
- if fish are landed in a port but are accessible in a different location, the analysts must try and also sample other species or stocks from the landed port on the day they are in the sampling location.
- there is a spreadsheet called "WhichVesselsInWhichPorts.xlsx" in the Technicians folder in the FEAS drive [3] that can help guide analysts in determining which vessels land in which ports.

2.2.3 *Demersal stock selection*

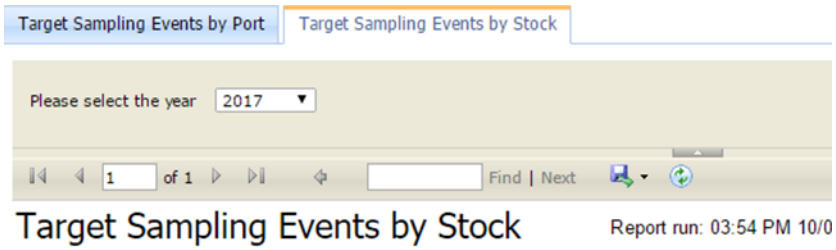
The "Port Sampling Protocol 2016 V2" (see `http://www.miextranet.ie/fss/sites/DCMAP/Pages/default.aspx`) also contains guidelines on which stock to sample during a sampling event. Ultimately the analyst decides which species to sample. The aim is to take a sample of each species or stock as there might be landings of more than one stock of the same species. However it is more important to sample as many different stocks as possible, than to sample as many vessels as possible. If the analyst cannot sample all stocks that are landed, they prioritise. The following table (Table 2) was compiled to gives them some guidance. An analyst therefore can assess the priorities of the sampling trip based on the stock available from each vessel.

An example of the target sampling events listed by stock as displayed in Stockman2015, is shown in Fig 2.2. Similar to the Port Sampling Target report, it is dynamically compiled and can be accessed by clicking on "View Reports" - "Analysts" - "Target Sampling Events

3 `Z:/TechniciansMasterFolder/PortSamplingGuidelines`

Table 2: Table highlighting the stock priority from different ICES divisions

Priority	Stock	Comments
1	Ang in VI Cod, Had, Meg, Whg in VIa Cod, Had, Meg, Whg in VIb Cod, Ple, Sol, Whg in VIIa Cod, Ple, Sol in VIIbc	• These should be always sampled in the ports where they are landed. • Eg: In Rosaveal you would expect cod, ple and sol from VIIbc to be landed. • If the target is 7 trips per quarter you should aim for 7 samples of each of these species. This may mean you have to make more than 7 trips. • Trips will need to be planned around availability of samples.
2	Cod in VIIek Had in VIIa Ple in VIIhjk and VIIfgh	These stocks should be sampled after the priority 1 stocks or if no priority 1 stocks are landed.
3	Ang in VII Hke, Meg in VI, VII Had, Whg in VIIbk Pol in VII	These stocks should be sampled after the priority 1 and 2 stocks. Rule of thumb: sample them every other port visit (you could toss a coin if you want to randomise the decision).
4	All other stocks (deepwater, rays, skates etc)	Sample opportunistically, i.e. whenever they are available in any quantity.



		Q1			Q2		
Year	Stock	Target	Achieved	Otoliths Collected	Target	Achieved	Otoliths Collected
2017	Monk bud in VIIb-k,VIII	8	8	72	8	0	0
	Monk spp in IV,VI	5	2	18	5	0	0
	Monk pis in VIIb-k,VIII	15	9	156	15	0	0
	Cod in VIIbc	5	3	49	5	0	0
	Cod in VIIe-k	20	13	203	20	0	0
	Cod in VIIa	5	2	41	5	0	0
	Cod in VIa	5	1	31	5	0	0
	Haddock in III,IV,VIa	5	2	49	5	0	0
	Haddock in VIIb-k	20	16	278	20	0	0
	Haddock in VIIa	5	2	43	5	0	0
	Haddock in VIb	2	0	0	2	0	0
	Hake in IV,VI,VII,VIII	10	12	175	10	0	0
	Ling in VI-XII	5	6	44	5	0	0
	Megrim spp in VIa,VIa	5	1	33	5	0	0
	Megrim whif in VII,VIII	15	9	269	15	0	0
	Plaice in VIIh-k	10	5	92	10	0	0
	Plaice in VIIfg	10	8	147	10	0	0
	Plaice in VIIa	5	1	27	5	0	0
	Pollack in VI,VII	10	12	189	10	0	0
	Saithe in IV,VI	5	1	19	5	0	0
	Saithe in VII	5	7	50	5	0	0
	Sole in VIIh-k	10	4	122	10	0	0
	Sole in VIIfg	10	4	67	10	0	0
	Sole in VIIa	5	1	25	5	0	0
	Whiting in VIIb-k	20	17	278	20	0	0
	Whiting in VIIa	5	1	21	5	0	0
	Whiting in VIa	5	0	0	5	0	0

Figure 2.2: Target sampling events by stock, contained in the Stockman Database

by Stock". Each stock (species and ICES division) is listed against the targeted number of sampling events. As individual events are entered into Stockman the number of achieved events per quarter is updated and the cell colour changes from red to amber (90% of the target) to green when the targeted limit is reached. This page also shows the total number of otolith samples per stock per quarter. See section *2.3.2 Otolith Targets* for details on achieving otolith targets.

- if analysts sample multiple grades from one stock from one vessel this is considered a single sample. So a sample is defined as the measurements taken from the unique combination of a stock and fishing trip.
- some of the stocks in the table above will be difficult to sample, particularly VIIa stocks and some VIa and VIb stocks. Analysts are advised to give priority to the 'difficult' stocks and plan sampling trips accordingly. If they don't achieve the stock targets but have achieved the port targets for the port where those stocks are landed, they may have to do additional sampling trips.
- if a fishery suddenly picks up, then the targets will need to be increased.
- it is more important to sample different stocks than it is to sample different vessels, so if analysts have the choice between sampling the same stock from two vessels or two stocks from the same vessel, they are advised to go for the second option.
- in regards to monk and megrim, the two species of each should be sampled in proportion to their landings. For example, if 10% of the landings are *L. budegassa*, there should be 10% of *budegassa* in the monkfish samples. So within monkfish stocks and megrim stocks, specific species are not targeted.

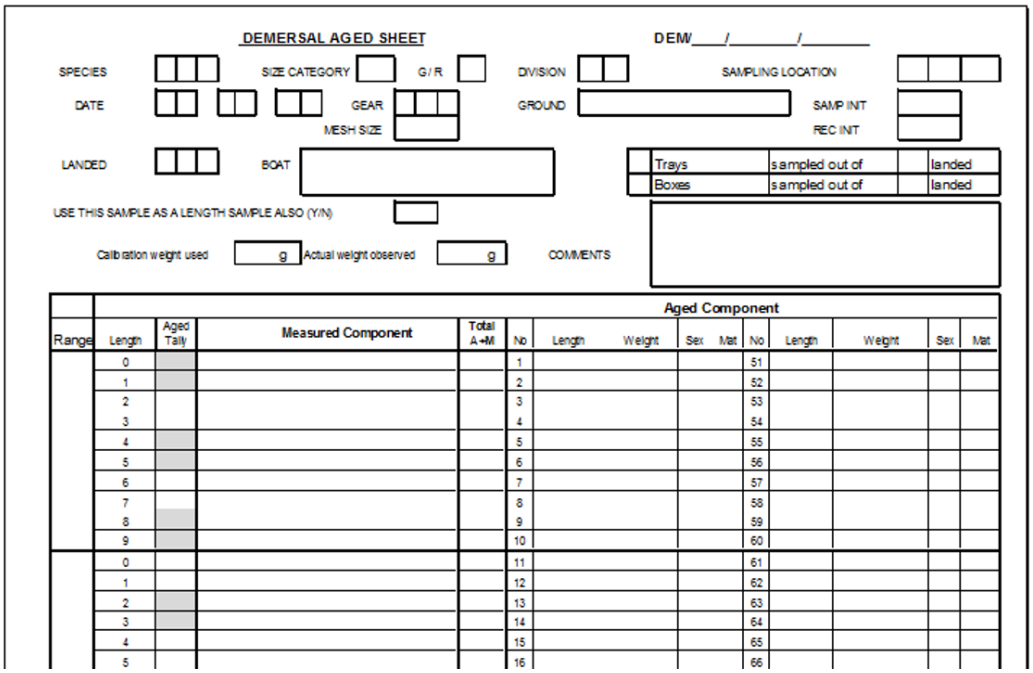
2.2.4 *Size Categories - Commercial Grades*

When selecting a sample that is sorted into size categories (grades), analysts make sure they can sample all size categories landed by the vessel and that they know the total landings of each grade for that vessel. If they cannot access all size grades for both gutted and round of the species, the sample is invalid for measured only data purposes i.e. for raising the landings figures. However lengths and weights can still be taken for the purpose of populating Age Length Keys (ALK).

Analysts do not sample different grades from different vessels (e.g. small fish from one vessel and medium fish from another).

2.2.5 *Logbooks*

Logbook data are collected by the Sea-Fisheries Protection Authority and supplied to the Marine Institute by the Department of Agriculture, Food & the Marine. Landings data are generally not available for non-Irish vessels, unless the vessels landed in Ireland.



DEMERSAL AGED SHEET

DEM/____/_____/_____

SPECIES | SIZE CATEGORY | G/R | DIVISION | SAMPLING LOCATION

DATE | GEAR | GROUND | SAMP INT

MESH SIZE | REC INT

LANDED | BOAT

	Trays	sampled out of	landed
	Boxes	sampled out of	landed

USE THIS SAMPLE AS A LENGTH SAMPLE ALSO (Y/N)

Calibration weight used g | Actual weight observed g | COMMENTS

					Aged Component								
Range	Length	Aged Tally	Measured Component	Total A+M	No	Length	Weight	Sex	Mat	No	Length	Weight	Sex	Mat
	0				1					51				
	1				2					52				
	2				3					53				
	3				4					54				
	4				5					55				
	5				6					56				
	6				7					57				
	7				8					58				
	8				9					59				
	9				10					60				
	0				11					61				
	1				12					62				
	2				13					63				
	3				14					64				
	4				15					65				
	5				16					66				

Figure 2.3: Analysts datasheet FRM-02b, which is filled during a sampling event recording data for age analysis. If the fish sampled are representative then the box 'Use this sample as a length sample also(Y/N)' is ticked 'Y'

2.3 WHAT HAPPENS DURING A SAMPLING EVENT

Sampling targets for all demersal fish species are defined within DC MAP. These targets are broken down by Species / ICES (Area/Division) / Quarter. See section *2.2.1 Species and Port selection*. Prior to sampling, it is essential that the sampler inform other samplers who may be working on fish from the same ICES Area/Division on the same day that they intend to sample, so that duplication of work does not occur.

2.3.1 *Data Sheets*

Fig 2.3 and Fig 2.4 show the datasheets filled out by the analysts, depending on whether the event covers length only or aged information. Fish to be aged require length, weight and otolith extraction.

A combined length frequency can be produced under one of the following circumstances:

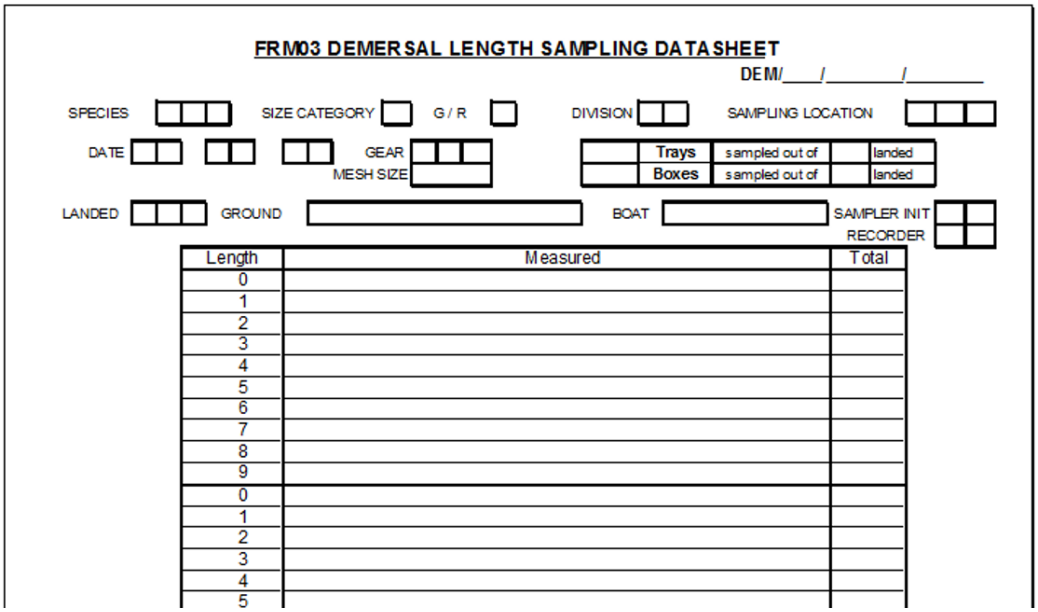


Figure 2.4: Analysts datasheet FRM-03 which is filled during a sampling event recording length only

1. Sample is ungraded.

2. Sample is graded and sampling is conducted across all of the grades. Prior to age sampling a species, it should be known if it is possible to sample across all the grades landed for that vessel. If it is not, only the lengths of fish that are to be aged are recorded.

3. Only one grade of a species is landed for the boat, e.g. large plaice.

In these instances, the length measurements recorded in the age component of the sample can be combined with the length measurements recorded in the length component of the sample, resulting in a combined length frequency. The datasheet FRM02b held in the Technicians folder on the FEAS drive [4] (an example of which is shown in Fig 2.3) has a box on the header part of the form that has to be ticked "Y" if a combined length frequency can be used.

4 Z:/TechniciansMasterFolder/PortSamplingGuidelines

2.3.2 *Otolith Targets*

In the course of a routine sampling event, analysts extract otoliths for aging following the guidelines for numbers of otoliths per size class per species as illustrated in Table 3. This helps to ensure that all sampled size classes (or combinations) are represented over the course of the quarter.

A sample may consist of a number of grades (e.g. large, medium, small); if length measurements overlap (two grades having the same size class of fish) then analysts only need to take one sample of the size class.

Species	**Otolith Extraction Target**
Monkfish (black and white), Hake	Sample one fish per two cm
Cod, haddock, ling, pollock, whiting	Sample one fish per cm
Mergim, plaice, sole	Sample two fish per cm

Table 3: Table showing the number of otoliths extracted per size class per species

- the Statistically Sound Sampling Protocol (4S), ensures that all available size classes are represented for otolith extractions.
- a sample may consist of a number of grades; if these overlap, e.g. they both have a fish of 30cm, then you only need to take one age sample at 30cm.
- in the "Target Sampling Events by Stock" report in Stockman2015 analysts can keep track of the number fish that have been sampled for age. There are no overall age targets but if the number of aged fish is very low, the number of fish per size class may need to be increased.

All of the above port sampling steps are summarised in Fig 2.5, where a representative sample will have 'Aged' data and/ or 'Measured Only' data extracted from it.

Analysts can also get an overall view of the total numbers of otoliths collected per stock per quarter in the 'Target Sampling Events Listed by Stock' report as illustrated in Fig 2.2.

2.3.3 *Landings Obligation*

Fish under the minimum conservation reference size that are landed under the landing obligation are currently not sampled

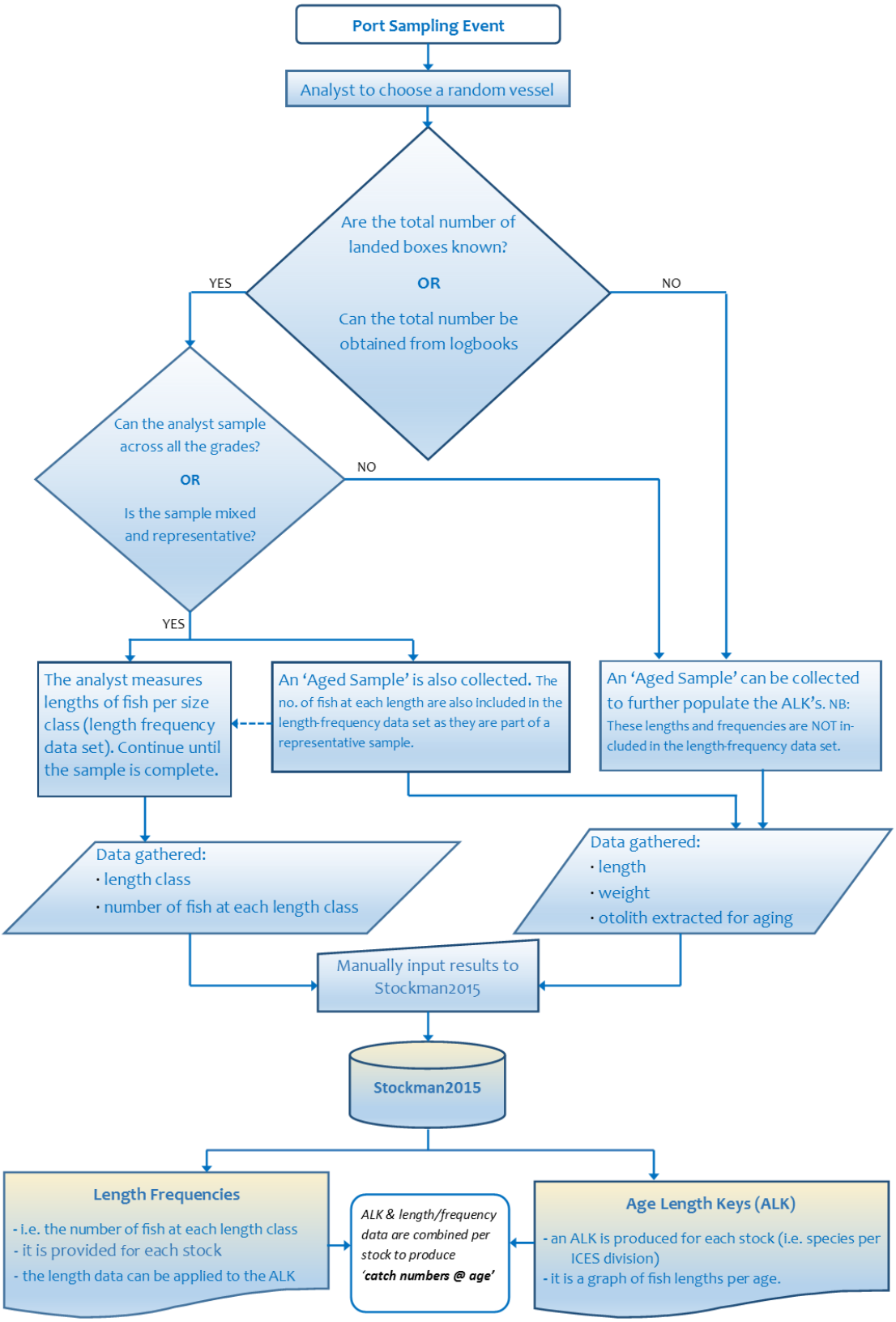


Figure 2.5: Work-flow summarising port sampling carried out by analysts

3

STOCKMAN2015 DATA ENTRY & REPORTS

3.1 DATA ENTRY

Once data forms are completed at the ports or on board vessels, the data is manually entered into the FEAS database - Stockman2015

3.1.1 *Stockman Instructions*

A comprehensive set of instructions for Stockman2015 Data entry can be accessed from the Stockman2015 home page [1].

This instruction manual gives step by step instructions on all aspects of data entry into Stockman through screen shots. Typically the analysts follow a sequence of entering data under the following levels:-

- **Sampling Trip Metadata -** the highest level of information on the sampling trip. Details required include:
  - the sampling type, sampling place and the landing port
  - the names of the sampler, recorder and inputter
  - any comments about the trip
- **Sample Metadata -** the next level of data required. One sampling trip can have many samples associated with it. Details required include:
  - the sample date
  - the vessel name and log-sheet id

1 http://mifeasapp01/Stockman2015/Resources/Stockman2015_Manual.pdf

  - the ICES division and common ground name
  - the gear type, catch type (whether landings, discards, survey etc) and sample type
  - any comments about the sample

- **Species Metadata -** the next level which contains data associated with each species sampled in a sample. One sample can have many species associated with it. Details required include:
  - the species and sample presentation
  - the measurement unit, sampled quantity and total quantity
  - the sampling type and size category
  - the names of the two age readers
  - a tick box to include the size class values in the 'measured only' data if applicable
  - a tick box to indicate whether the morphology data entry is complete or not
  - any comments about the sample
  - a tick box for sexing fish during biological sampling in the first quarter
- **Morphology Data -** allows length, weights and aging results to be inputted per species
- **Measured Data -** allows frequencies per size class to be inputted per species
- **Age Data -** the age data is entered separately, at a later date after age QC has been carried out. It is entered under the morphology section of the species metadata.

3.1.2 *Data Link to Logbooks*

Once a new 'Sample Metadata' record has been inserted and saved in Stockman2015, it can be linked to a logbooks record. The logbooks data list in Stockman2015 comes from information received from the Sea Fisheries Protection Agency (SFPA) and runs approximately a week behind the live logbooks data. This means that sometimes the relevant trip might not be shown if the sample metadata is entered soon after a sampling event. Analysts are instructed to check the logbooks list regularly and enter the date of checking in the comments box to help them keep track.

3.2 DATA QUALITY CONTROL

Analysts can carry out preliminary quality control checks once the data has been entered in Stockman2015. A graph of length versus weight is generated on the morphology data at sample entry and any outliers - highlighted as red triangles - can be checked. Checks include whether the transcript from data sheets to Stockman entry is correct, and whether any comments or observations recorded at port will account for the outlier. For this reason analysts are trained in the importance of including comments on the data sheets and transferring these to stockman.

3.2.1 *Data QC Reports*

A second option for QC checks on data is available through the 'Data QC' report, found at Stockman Home Page - "Data QC", where analysts can choose the year, all or specific quarters in that year, the species, all or specific ICES divisions and all or a specific fish presentation. Once these parameters are chosen the analyst can see details on four different aspects of data presentation - 'Length Weight', 'Age Length', 'Age Length Key' and 'Length Frequency'.

An example of the **'Length Weight'** option is shown in Fig 3.1. The graph shows cod data from Q1 in 2016 for all presentations from ICES division VIIa.

Outliers, denoted by red triangles, are determined based on the parameters chosen with the 'Outlier Inter Quartile Range multiplier' and the 'Outlier Absolute Threshold' as seen in Fig 3.1. By hovering the cursor over a triangle, analysts are given the SSN number, the index, and the length and weight of the outlier in question. This information is also presented in table format, along with the Cruise Code from which the sample came. All this specific information enables the analyst to go back to the original data entry in Stockman2015, and carry out checks, as specified in the first paragraph of this section.

It should be noted that guidelines for statistical interpretation of the data and recommendations for the setting of the 'Outlier Inter Quartile Range multiplier' and the 'Outlier Absolute Threshold' levels are being compiled at present. Until this is complete, great care must be taken in accepting a data point as an outlier.

Other graphs in this tab include box-plots of the 'Length Outlier Inter Quartile Range multiplier' and 'Weight Outlier Inter Quartile Range multiplier'. However until the statistical guidelines are concluded these will not be discussed in this report.

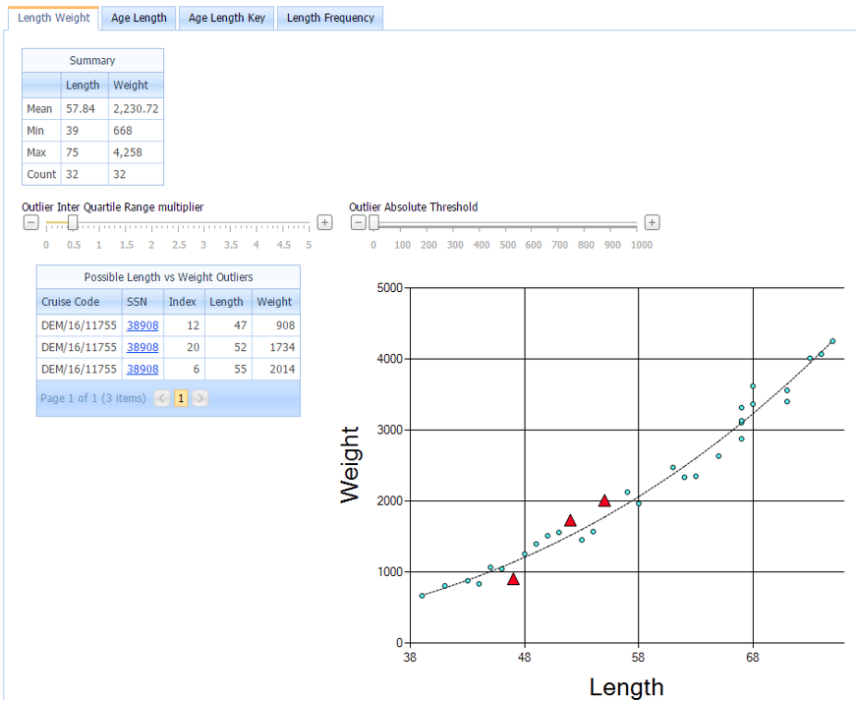


Figure 3.1: Example of the Length Weight page of the Data QC report in Stockman2015

The next option is the **'Age Length'** tab. There is an option where the presented graph can show historic data or not for comparison. If chosen, the historic data is displayed offset to the current data chosen. There is also a histogram version displayed (see Fig 3.2). It is recommended to choose the previous 5 years as historic data.

The **Age Length Key** tab presents a table of ages at length. There is an option to show historic data and also to export the table to Excel.

As it's name suggests, the **Length Frequency** tab presents a graph of the total numbers of fish plotted against lengths, for the parameters chosen e.g. VIIa Cod for Q1, 2016. There is an option to choose each individual sample that makes up the total, and plot it's data against the total dataset (see Fig 3.3).

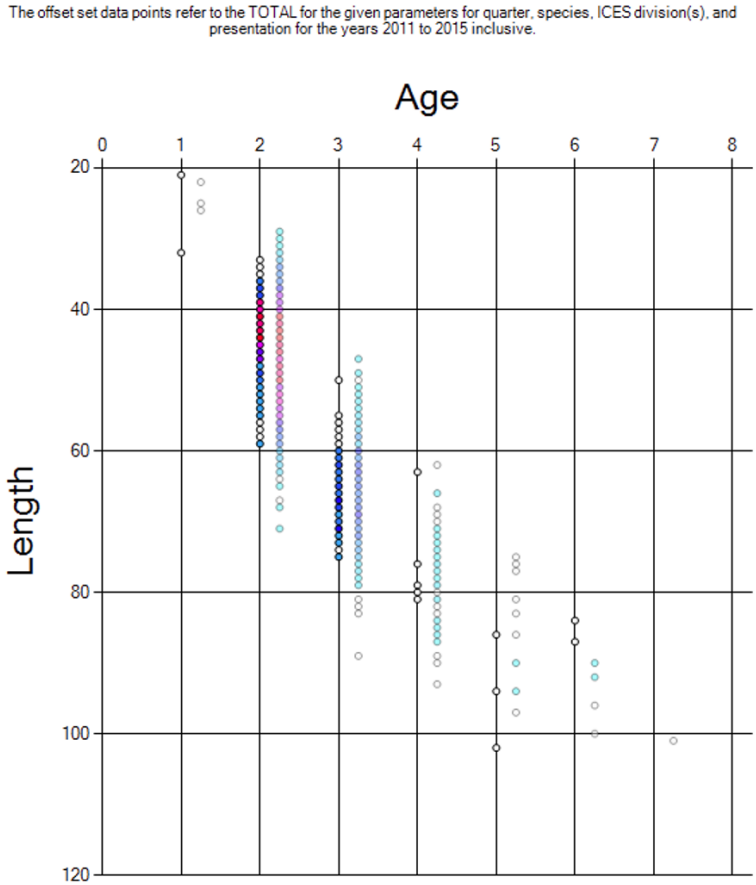


Figure 3.2: Example of the Age Length page of the Data QC report in Stockman2015. Note the offset 5 year historic data.

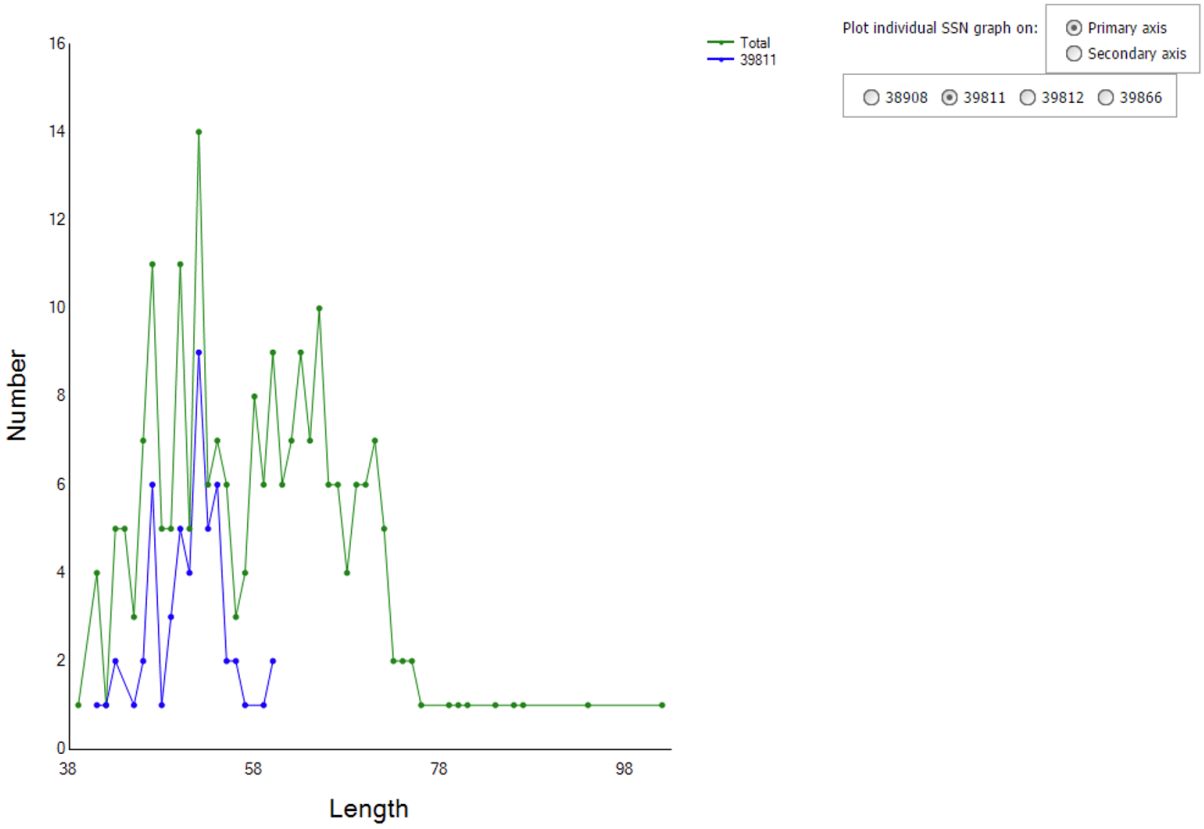


Figure 3.3: Example of the Length Frequency page of the Data QC report in Stockman2015.

3.2.2 *Data Entry Reports*

3.2.2.1 *Data Entry Issues*

The **Data Entry Issues** report can be found by accessing the Stockman home page, then clicking on ”View Reports” - ”Analysts” - ”Stockman Data Issues” - ”Data Entry Issues”. This report is emailed on a monthly basis to the analysts by Stockman.

The report provides counts of data issues under the following headings.

- trips without samples
- sample metadata without species records
- species without length and morphology data
- morphology zero record count
- measured data zero record count
- measured only problem record count
- unknown ICES record count
- unknown vessel count

On receiving the report, analysts check if their name is under the ’inputter’ detail on any of the records. If it is they can access the record using the SSN number link or the Cruise Code, depending on the nature of the issue, and amend the metadata. Fig 3.4, shows an excerpt of the Data Entry Issues Report issued monthly by Stockman2015.

3.2.2.2 *Missing Logbooks Report*

The **Missing logbooks Links** report can be found by accessing the Stockman home page, then clicking on ”View Reports” - ”Analysts” - ”Stockman Data Issues” - ”Missing logbooks Links”. This report is also emailed on a monthly basis to the analysts by Stockman.

The Missing Logbooks Links contains a list of all records in Stockman that have not been linked to a logbooks record. It contains information on the sample in question, instructions on how to link the records and a quick-link to the Sample Metadata via the SSN number. Fig 3.5, shows an example of the Missing Logbook Report issued monthly by Stockman2015

Data Entry Issues

Summary
These are counts of the number of records affected by each issue.

Trips without samples	Sample metadata without species records	Species without length and morphology data
7	5	0

Morphology zero record count	Measured Data zero record count	Measured Only problem record count	Unknown ICES record count	Unknown Vessel count
6	4	8	3	2

Details
This section gives the specific records affected by each problem - these are the records that need fixing.

Trips without samples (for data recorded since 2015)

Cruise Code	Year	Inputter
PEL/16/12159	2016	
PEL/16/11708	2016	
PEL/16/12154	2016	
DEM/16/12023	2016	
DEM/16/12024	2016	
DEM/15/11268	2015	
DEM/15/11541	2015	

Sample metadata without species records (for data recorded since 2015)

Cruise Code	Vessel	Sample Date	Inputter
PEL/16/11947		16/02/2016	
PEL/16/12130		31/10/2016	
DEM/15/11546		26/05/2015	
DEM/15/11584		20/08/2015	
DEM/15/11652		15/12/2015	

Morphology records with length and weight 0

SSN	Record Count	Date	Inputter
41261	1	21/11/16	
41237	1	09/11/16	
41236	1	09/11/16	
41154	1	09/11/16	
40921	8	21/09/16	
40104	1	06/01/16	

Figure 3.4: Example of the Data Entry Issues Report issued monthly by Stockman2015

Missing Sample-Logbooks Links since 2016

The records listed below have not been linked to a Logbooks record.
To link records:

- Go to Stockman and select your sample (the SSN in the report below can be used as a shortcut).
- In the Sample Metadata form, click 'Edit'.
- Click on the dropdown list under LogSheetID. This will show you all the vessels that landed in the relevant port within a few days of the sampling event. If you see the correct vessel and landing data, simply select it. *If you cannot find a match, leave it blank.*
- This helps us when we need to raise the data and it will help the samplers to check that the gear and division are correct.
- If there is a reason why a logsheet won't be available please put it in the Comment field in the "Sample Metadata" form on Stockman

Year	Quarter	Date	Cruise Code	Type	Inputted By	Sampler	Recorder	Port	Vessel (ICES)	Comment	First SSN
2017	1	03/01/2017	PEL/17/12270	Landings							41373
		04/01/2017	PEL/17/12272	Landings							41375
2016	1	06/01/2016	PEL/16/11953	Landings						Logsheet not on list.	40103
		06/01/2016	PEL/16/11954	Landings						Logsheet not in list.	40104
		24/03/2016	DEM/16/11902	Landings						Under 14m, No electronic log ID	39866
		24/03/2016	DEM/16/11922	Landings						under 14m, no electronic log ID	39945
		10/03/2016	PEL/16/11891	Landings						Logsheet not on list	39841

Figure 3.5: Example of the Missing Logbook Report issued monthly by Stockman2015

3.3 AGING QUALITY CONTROL

The ability to estimate the age of a fish is an important tool in fisheries biology and, in conjunction with length and weight measurements, provides valuable information on stock composition, age at maturity, life span, mortality, and reproduction of a fish stock. Sagittal otoliths are the otoliths used most frequently in ageing studies and in this document will simply be referred to as otoliths.

The steps involved in ageing a fish using otoltihs, regardless of whether it is a flat fish or a gadoid are basically the same and can be found in section 8 of the SOP FSS - 09 VR 1.0 - Age Reading of Flat Fish which is held in the Technicians Master Folder on the FEAS drive [2]

Also at this link is the SOP FSS - 12 VR 1.0 - Quality Control for Otolith Reading, from which some of the following information is taken.

Quality control is a critical part of age reading and assesses the level of consistency in age reading. A formal quality control programme was implemented by FEAS for age reading in 2006. The aim of the programme is to ensure that all age readers have a sample of their age readings checked each year. This is done by another experienced reader for a species, in order to identify any problems that might affect the precision of the data supplied to the ICES Assessment Working Groups. The level of agreement between the two readers is calculated, and this is used as an indicator of the consistency of age reading within FEAS. This method quickly identifies any discrepancies among experienced readers, or if a person's standard has lowered or developed a serious bias e.g. misidentification of the edge or nucleus. Target levels have been set which, if not achieved, could necessitate further checks. QC checks are an integral part of age reading throughout the year, so poor results can be investigated and samples re-read if necessary before the data are analysed for the working groups.

If the QC check is lower than the target level or if there are ages which cannot be agreed on, guidance should be sought from a third reader for that particular species and/or the stock coordinator on the course of action needed. Depending on the cause and extent of the disagreement it may be necessary to re-examine some or all of the samples aged by that age reader. Internal QC results are recorded in Stockman and can be viewed through "Home" - "View Reports" - "Aging QC". The options now available are illustrated in Fig 3.6.

2 Z:/TechniciansMasterFolder/QUALITYMANAGEMENTSYSTEM/SOPS/INABLive

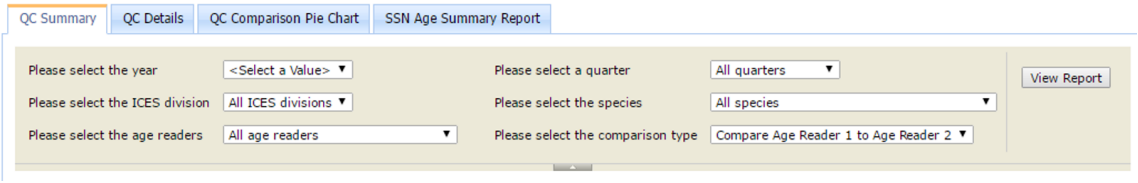


Figure 3.6: Screen shot of the Aging QC page and available options in Stockman.

When viewing the 'QC Summary' or QC Details' tabs, users can select

- a specific sampling year
- all or specific quarters
- all or specific ICES Divisions
- age readers of the species chosen, with options to compare 'Age Reader 1 to Age reader 2', Age Reader 1 to Age reader 3' or 'Age Reader 2 to Age reader 3'

Once the parameters are chosen they are applied to all of the report options named on the tabs. Users can now view all or one of the reports. Each tab is summarised as follows:

- **QC Summary -** compares the accuracy of results between two readers, presented in a spreadsheet style. It displays the percentage agreement between those two readers for a given species, time period and ICES Division. The number of otoliths which contributed to this calculation is also displayed. The average percentage accuracy for each ICES Division is displayed in a blue cell. See Fig 3.7.
- **QC Details -** presents an 'Age Determination Quality Control Record' between two readers results, an excerpt of which can be seen in Fig 3.8.
- **QC Comparison Pie Chart -** presents post QC review agreements between analysts and years difference between age readers in pie charts. It also shows an analysis of the under and over aged differences between readers.
- **SSN Age Summary Report -** shows the number of otoliths extracted and aged per sample. It also shows the breakdown of otolith numbers analysed for QC

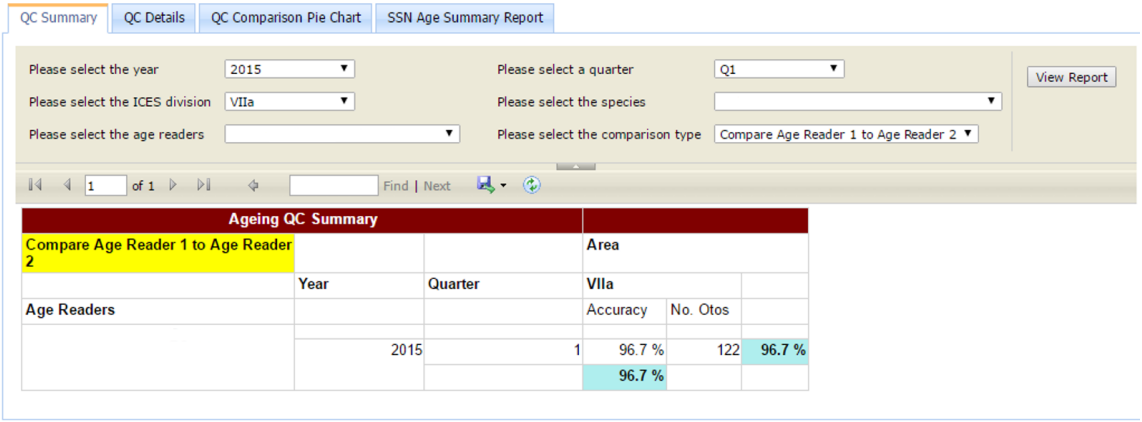


Figure 3.7: The QC Summary tab in the Aging QC page in Stockman.

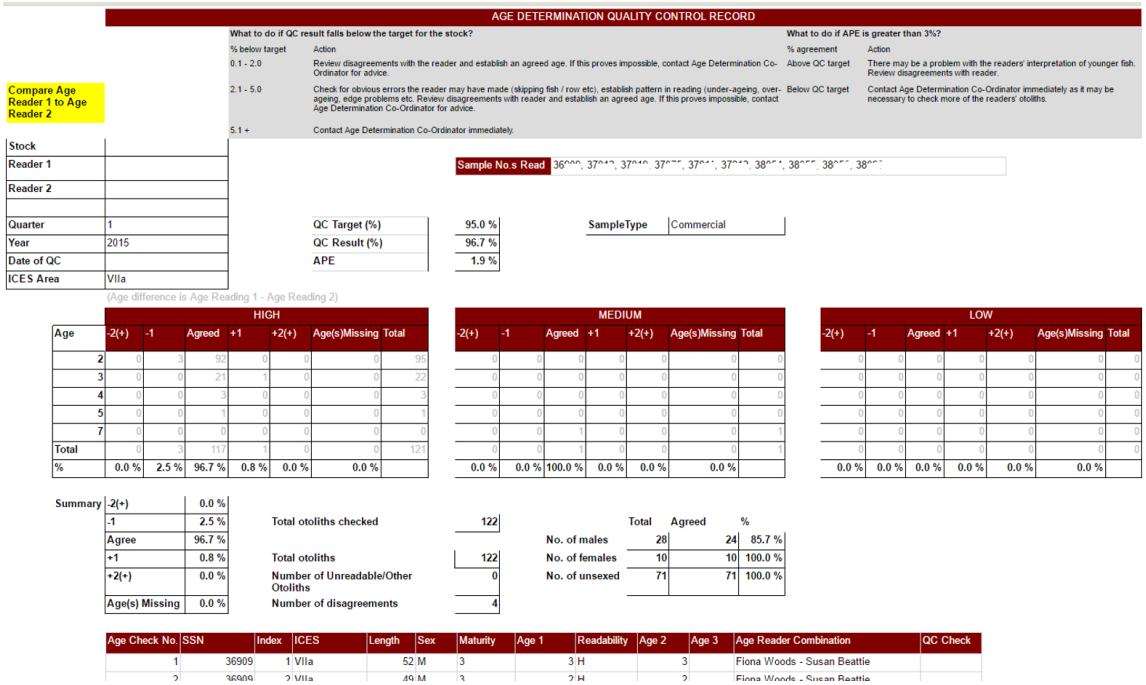


Figure 3.8: The QC Details tab in the Aging QC page in Stockman.

3.3.1 *Aging Timelines*

A data collection overview timeline is illustrated in Fig 3.9. Demersal, nephrops and inshore data collection is year round, while pelagic data collection is carried out in Q1 and Q4.

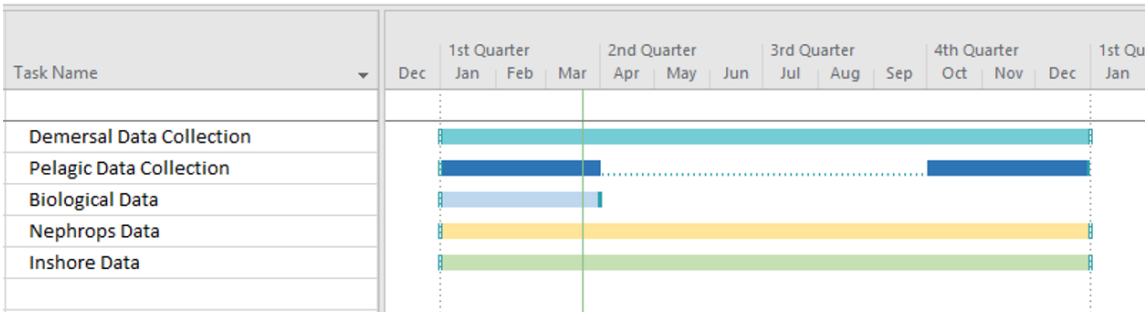


Figure 3.9: Data collection overview, FEAS, MI

A more detailed overview of data collection is shown in Fig 3.10 for demersal samples collected in the month of January. The timeline estimates the period taken for data entry and data QC as well as the aging process from lab receipt to aging QC. Extended time periods are due to priorities of some species over others depending on time and resources available and the complexity of the reading and QC process for some species.

The chart also indicates age entry deadlines for demersal and pelagic species in the year following collection.

Figure 3.10: Estimated timeline for demersal samples collected in Jan.

4

DATA EXTRACTION

Data is extracted from Marine Institute databases using SQL Server - a structured query language (SQL). The nature of the queries depend on what the data is required for but will usually involve some level of data cleaning and data fixing.

4.1 DATA CLEANING

Data Cleaning is the process of identifying inaccurate records in a database and either correcting the inaccuracy by replacing or modifying the data, or removing the inaccuracy totally by deletion of the data.

Good quality control during data entry - both on the datasheets and into Stockman2015 - is vitally important to reduce time spent on identifying and dealing with issues at the data extraction stage, which may be months or years after initial data input. To this end, analysts are trained in QC processes both at the data entry stage and immediately after data entry, when reviewing data against historical trends. See section *3.2 Data Quality Control*.

4.2 DATA FIXES

Data Fixes are specific to the data call being dealt with and are employed to facilitate analysis. For example parameters may change slightly within a certain criteria - metiers, species codes, port codes, time-lines etc. The code within the query will then need to be amended to satisfy the data call.

An example is a data call looking for information from area **'6a'**. Database entries may have been inputted under '6a', '6a north' or '6a south'. However in order to satisfy

the datacall requirement, all of the information attached to the more detailed entries are extracted under the more general '6a' description heading.

4.3 DATA MANIPULATION USING R

Summary descriptions of the more widely used packages in R for data manipulation are in Table 4. For more details on all of these packagees, a review is available at the analytics website [1] with more detail for each package found at The Comprehensive R Archive Network (CRAN) website [2].

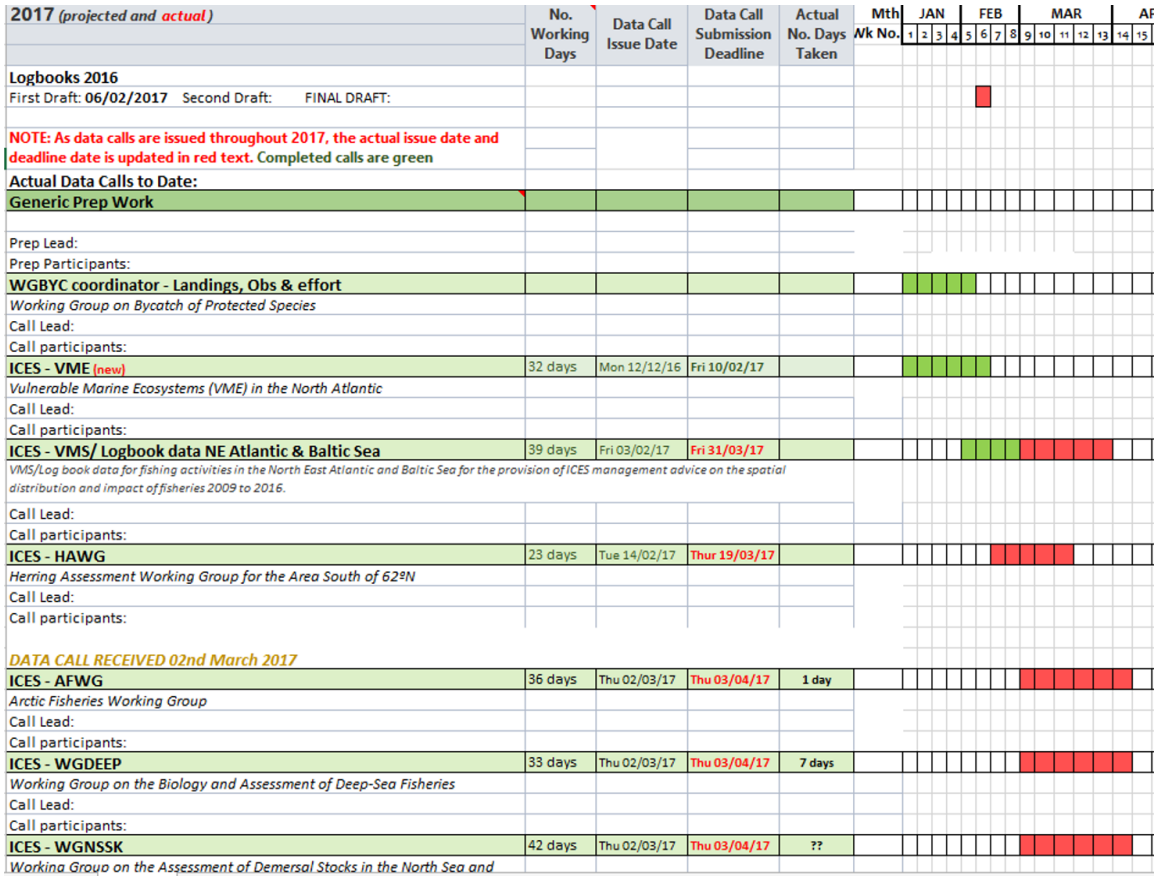
Table 4: Table summarising the more commonly used R packages for data manipulation

Package	Summary
dplyr	used for data exploration and transformation. It's chaining syntax makes it highly adaptive to use. It includes 5 major data manipulation commands:filter, select, arrange, mutate and summarise
ggplot2	A graphical package used in visualising data (distributions, correlations, etc.)
data.table	allows faster manipulation in a data set
tidyr	makes data look 'tidy. Has 4 major functions - *gather()*, *spread()*, *separate()* and *unite()*. Can be used with dplyr.
reshape2	reshapes data. The *melt()* function converts multiple categorical columns into unique rows. The *cast()* function does the reverse to melt().
readr	reads various forms of data into R - delimited files, fixed width files, web log files.
lubridate	makes easy parsing in dates and times

4.4 DATA CALLS

As outlined in Chapter 1, the Marine Institute FEAS, regularly respond to data calls from DG-MARE and ICES. Data calls are also received from other bodies - both national and international.

1 https://www.analyticsvidhya.com/blog/2015/12/faster-data-manipulation-7-packages/
2 https://cran.r-project.org/



2017 *(projected and actual)*	No. Working Days	Data Call Issue Date	Data Call Submission Deadline	Actual No. Days Taken
Logbooks 2016				
First Draft: **06/02/2017** Second Draft: FINAL DRAFT:				
NOTE: As data calls are issued throughout 2017, the actual issue date and deadline date is updated in red text. Completed calls are green				
Actual Data Calls to Date:				
Generic Prep Work				
Prep Lead:				
Prep Participants:				
WGBYC coordinator - Landings, Obs & effort				
Working Group on Bycatch of Protected Species				
Call Lead:				
Call participants:				
ICES - VME (new)	32 days	Mon 12/12/16	**Fri 10/02/17**	
Vulnerable Marine Ecosystems (VME) in the North Atlantic				
Call Lead:				
Call participants:				
ICES - VMS/ Logbook data NE Atlantic & Baltic Sea	39 days	Fri 03/02/17	**Fri 31/03/17**	
VMS/Log book data for fishing activities in the North East Atlantic and Baltic Sea for the provision of ICES management advice on the spatial distribution and impact of fisheries 2009 to 2016.				
Call Lead:				
Call participants:				
ICES - HAWG	23 days	Tue 14/02/17	**Thur 19/03/17**	
Herring Assessment Working Group for the Area South of 62ºN				
Call Lead:				
Call participants:				
DATA CALL RECEIVED 02nd March 2017				
ICES - AFWG	36 days	Thu 02/03/17	**Thu 03/04/17**	**1 day**
Arctic Fisheries Working Group				
Call Lead:				
Call participants:				
ICES - WGDEEP	33 days	Thu 02/03/17	**Thu 03/04/17**	**7 days**
Working Group on the Biology and Assessment of Deep-Sea Fisheries				
Call Lead:				
Call participants:				
ICES - WGNSSK	42 days	Thu 02/03/17	**Thu 03/04/17**	**??**
Working Group on the Assessment of Demersal Stocks in the North Sea and				

Figure 4.1: Summary of expected data calls for 2017 and actual data calls to date

A worksheet "UpdatedDataCalls_2017_ActualDeadlines" contains details of expected and actual data calls for 2017, and is held in the FEAS drive [3] . The expected data calls are projections based on all completed data calls from 2015 and 2016. As data calls are received during 2017, the deadline details are updated. An excerpt of this worksheet is shown in Fig 4.1

3 Z:/DataCollectionRegulation/DataCallCrossTeam