

# Towards a more ecosystem approach of fish surveys: report of a brainstorm

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# Summary

Within ICES and the EU, there is a wish for a wider ecosystem approach to fish surveys. However, it is unclear which way to go. For this, WGISUR (working group on integrative surveys) will meet in April 2010. As a start, the project team on seagoing surveys at IMARES made an overview of the possibilities for additional sampling during the current standard IMARES legal task seagoing surveys to achieve a broader approach. In this document, only surveys on board Tridens are taken into account.

On March 1, 2010 a meeting was organised to study the possibilities of a more ecosystem approach of fisheries management for the legal task surveys. The meeting was attended by Ingeborg de Boois, Bram Couperus, Cindy van Damme, Sascha Fässler and Henk Heessen.

This reports presents an overview of work currently done on board during the legal task seagoing surveys, the possibilities to do additional work on the current surveys, including costs (extra survey time, extra lab time needed, financial costs) needed to carry out the extra activities.

# 1 Introduction and background

Within ICES and the EU, there is a wish for a wider ecosystem approach to fish surveys. However, it is unclear which way to go. For this, WGISUR (working group on integrative surveys) will meet in April 2010. As a start, the project team on seagoing surveys at IMARES made an overview of the possibilities for additional sampling during the current standard IMARES legal task seagoing surveys to achieve a broader approach. In this document, only surveys on board Tridens are taken into account.

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The agenda of the meeting was:

1. prepare an overview of the possibilities to do additional work on the current surveys, including costs (extra survey time, extra lab time needed, financial costs) needed to carry out the extra activities
2. create a view on a survey which might be ideal to fulfill the goals of an ecosystem approach to fisheries management

This report covers the first agenda-item. Due to limited time, the second point was not covered yet.

As a follow-up, at least a meeting on the legal task surveys on board Isis, Stern and Schollebaar will be planned. Furthermore, the study has to be extended with a view on the optimal ecosystem survey. This will be done in later meetings and be dependent on the WGISUR 2010 output.

Chapter 2 describes the data currently collected during the seagoing surveys, chapter 3 shows the options for additional data-collection during the current surveys and chapter 4 is about future developments.

## 2 IMARES fish surveys

Currently, the following types of fish surveys are carried out at IMARES:

Acoustic fish surveys (figure 2.1):

- Blue whiting (March): 2004-present (figure 2.1A)
- Herring (July): 1991-present (figure 2.1B)

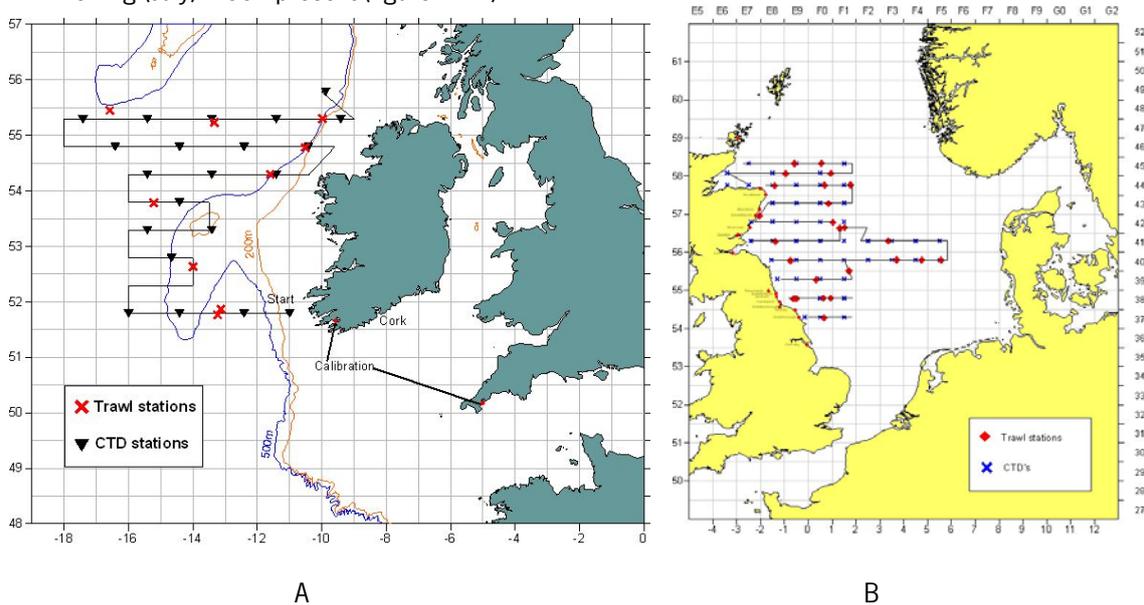


Figure 2.1 Geographical distribution of acoustic surveys

Ichthyoplankton surveys using Gulf VII planktontorpedo (figure 2.2):

- Mackerel and horse mackerel egg (May/June) using 280  $\mu\text{m}$  mesh size (figure 2.2A):
  - North Sea: (1968-1995 irregularly) 1996, 1999, 2002, 2005, 2008
  - Atlantic: 1989, 1992, 1995, 1998, 2001, 2004, 2007, 2010
- Herring larvae (December/January (Southern North Sea and Channel), September (Buchan and central North Sea) using 500  $\mu\text{m}$  mesh size: 1972-present (figure 2.2B)
- Plaice and Cod egg surveys (Southern North Sea): 2004, 2009 (no figure)

Ichthyoplankton surveys using other gear:

- MIK survey (herring and sprat larvae during IBTS) (figure 2.2C)

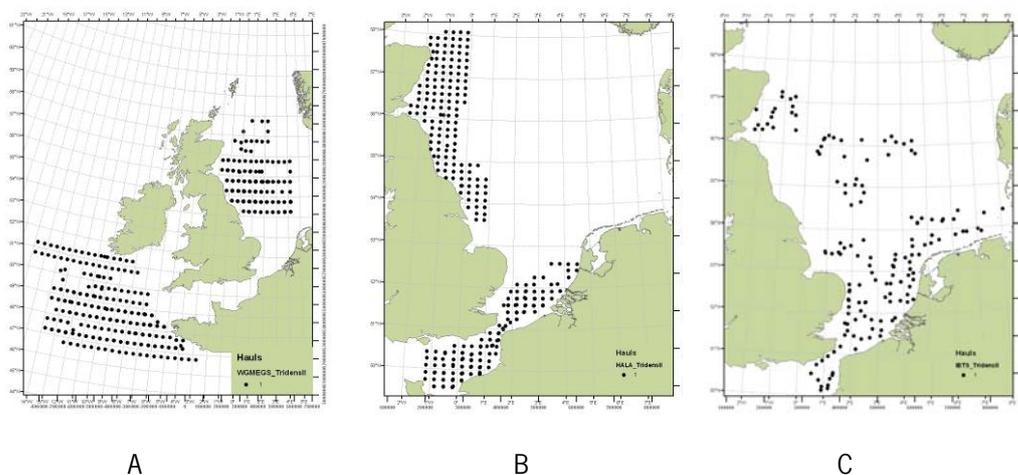


Figure 2.2 Geographical distribution of ichthyoplankton surveys

Fish trawl surveys Tridens (figure 2.3):

- International Bottom Trawl Survey (IBTS, February): 1965-present (figure 2.3A)
- Beam Trawl Survey (BTS August/September): 1996-present (Central North Sea, Tridens) (figure 2.3B, black dots)

Other vessels (not taken into account in this document):

- Beam Trawl Survey (BTS August/September) (figure 2.3B, green dots):
  - 1985-present (Southern North Sea, Isis)
- Sole Net Survey (SNS):
  - 1969-1989 (April) (no figure)
  - 1969-present (September, Isis) (figure 2.3C)
- Demersal young Fish Survey (DFS):
  - 1970-1989 (April) (no figure)
  - 1970-present (September-October, Wadden Sea Stern, Dutch coastal zone Isis, Scheldt estuary Schollebaar) (figure 2.3D)

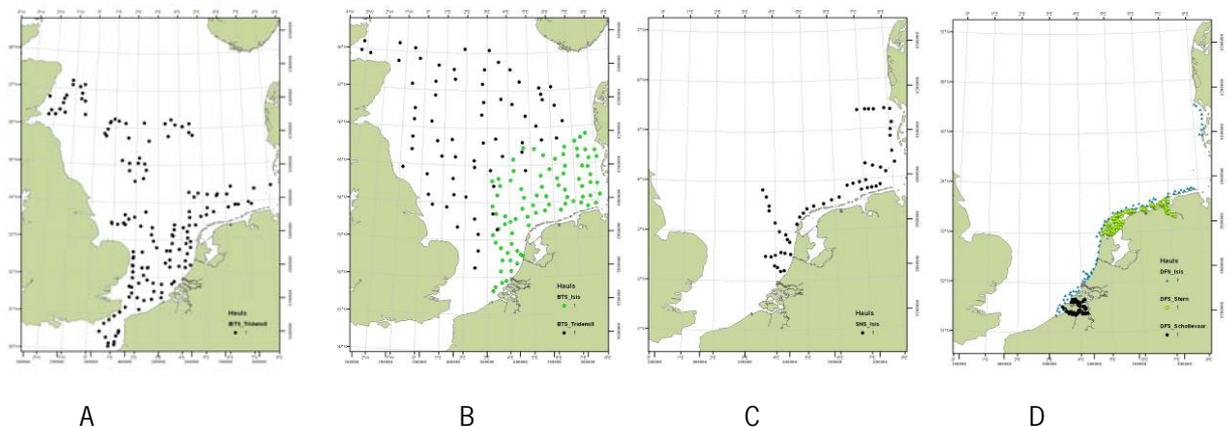


Figure 2.3 Geographical distribution of fish trawl surveys

## 2.1 Data collected

At IMARES, the legal task trawl surveys carried out do report every fish or invertebrate caught. For the ichthyoplankton surveys, the samples are sorted for the target species and the rest of the samples is stored for five years. So, if there is a wish for a study on other planktonic organisms, there are samples available. For the acoustic surveys the acoustic profiles are available, so if there is a wish for studies on other species than the target species, this might be possible.

On all surveys CTD measurements are taken, as a verticals downcast or a continuous track, depending on the survey.

Occasionally, the legal task surveys are used for additional research, e.g. stomach sampling during trawl surveys, towed hydrophone data collection (pilot) during the herring acoustic survey, sea bird and sea mammal counts during the herring acoustic survey, collection of fish for fatty acid analyses (as a part of diet studies).

The data collected during the surveys are entered in the application Billie Turf and imported in the IMARES database Frisbe. Exceptions are the acoustic profiles and the CTD profile data, for which the transition to Frisbe is in progress. The data are digitally available about one month after the end of the survey. The type of data collected are:

(a) Station data, at least:

- Date, time
- Position (lat, lon)
- Water depth
- Water temperature, salinity profiles
- Wind condition
- Trawl duration

(b) Biological data:

Trawl and acoustic surveys:

- Numbers for all species caught (fish & invertebrates)
- Age data for a selection of species
- Length measurements for all fish species

Ichthyoplankton surveys:

- Numbers, development stage and size of eggs/larvae for all species (target species eggs: mackerel, horse mackerel, cod and plaice; larvae: herring).

(c) Other data:

- Acoustic profiles

## 2.2 Data collected but currently not used

Ichthyoplankton surveys

For the ichthyoplankton surveys, the formaldehyde fixed samples are sorted for the fish eggs and larvae (depending on the survey), the remainder of the samples is stored for five years. At the moment only data of the target species are used, and published in IMARES reports. If there is a wish for a study on other planktonic organisms in the North Sea or the Atlantic, samples are readily available.

Acoustic surveys

For the acoustic surveys, acoustic raw data (volume backscatter) are available at 2 frequencies. If there is a desire for studies on species other than the target species, the information has to be extracted from the raw data using, for instance, multi-frequency species identification techniques.

All surveys

On all surveys, CTD measurements are taken, as vertical downcasts or a continuous track, depending on the type of survey. The vertical CTD profiles for the IBTS, blue whiting survey, herring acoustic survey and BTS are sent to ICES and the surface and bottom temperature and salinity are stored in the IMARES database Frisbe. The CTD data for the other surveys are available in text files.

Only part of the data on fish are used, mainly for stock assessment purposes and incidental requests on e.g. marine spatial planning. Fish and benthos data might also be used for better understanding of the ecosystem. This requires a clear question and personnel to work on the project. This might be done by writing a PhD proposal.

### 3 Collection of additional data during the current surveys

Currently, the standard surveys are occasionally used for additional research, mostly on an ad hoc basis. In this chapter, an overview is given of the possibilities for additional research during the fish surveys, including the extra personnel, extra costs and/or extra ship time needed to fulfill the requests (table 3.1).

For each request, the minimum information needed, is:

- Contact person (name, e-mail address)
- Short project description
- Samples needed (number of samples, type of samples)
- Sampling protocol (if relevant)
- Sampling tools (like jars, ethanol, etc.)

It should be clear that if no extra personnel is added to the scientific crew carrying out the survey, there is no guarantee on the execution of the extra requests because the standard programme has priority. If someone joins the cruise with a specific extra task, the extra tasks will be carried out.

When tasks are simple and straightforward, no extra personnel might be needed. This needs to be discussed with the project leader, who will make the final decision if extra personnel is needed for the task. For more complex tasks, however, it is recommended to let extra personnel join the cruise. Sometimes this might be a student or a volunteer, in other cases an expert is required (see table 3.1).

Table 3.1 Possibilities for extra research during fish (trawl, acoustic, plankton) surveys on board Tridens

	Task	Survey	Costs/preparation	During survey		After survey		Comments
				Extra personnel	Extra shiptime	IMARES	External	
	<b>Fish data</b>							
1.	Fish collection (e.g. for contaminants, fatty acids analysis etc.)	All, except herring larvae and plaice and cod egg surveys	-	-	-	depending on project requested for	depending on project requested for	Clear list of species, length classes compulsory. If a large number of commercial fish is needed, it might be worth to get fish from the market sampling
2.	Fish data: stomachs	All, except herring larvae and plaice and cod egg surveys	-	+1 (might be volunteer of student)	-	yes	-	Clear list of numbers of stomachs, fish species and classes sampled compulsory. Processing stomach sampling is time consuming.
3.	Fish data: disease registration (the same applies for liver or gonad weight or additional otolith sampling)	All, except herring larvae and plaice and cod egg surveys	- (training might be needed in case of disease registration)	- (if the amount of samples is large, +1)	-	yes	-	Clear list of species, length classes, numbers of fish to sample compulsory. Reading of otoliths might be time consuming, especially for 'new' species.
4.	Fish data: genetics	All, except herring larvae	-	- (if the amount of samples is large, +1)	-	no	yes	Clear list of species, length classes, numbers of fish to sample and

		and plaice and cod egg surveys						sampling protocol compulsory.
5.	Fish data: fat content	All, except herring larvae and plaice and cod egg surveys	-	-	-	yes	-	Clear list of species, length classes, numbers of fish to sample and sampling protocol compulsory.
	<b>Physical, chemical and phytoplankton sampling</b>							
6.	Nutrient samples, Rosette sampler	IBTS	-	-	- (if the number of stations increases compared to the original plan, extra time is needed)	no	yes	Analysis of the samples might be expensive since there is no in house expertise
7.	Phytoplankton samples, Rosette sampler	all	-	-	- (if the number of stations increases compared to the original plan, extra time is needed)	no	yes	Analysis of the samples might be expensive since there is no in-house expertise
8.	Phytoplankton samples, continuous	all	Needs investment in plankton recording device and	+1	-	no	yes	This sampling needs development if there is a wish to carry it out.

			expertise on use and maintenance. About one year of research needed before starting.					Preparation is very important and there needs to be an in-house specialist for the maintenance of the device.
9.	Continuous CTD measurements	all	Needs investment in self-recording hydrographic device. and expertise on use and maintenance. About one year of research needed before starting.	+1 (hydrographic expert)	-	no	yes	Check if other data sources are available.
	<b>Other animals</b>							
10.	ESAS sampling (birds, sea mammals)	all	Construction at the bridge to host the bird- and mammal watchers	+2 to +4 (experts)	-	yes	-	
11.	Towed hydrophones	all	New winch (already ordered)	+1 (expert)	- (at plankton surveys extra time might be needed due to the tight planning of the surveys)	yes	-	
12.	Recording sea mammals: device installed in bulb	all	This device is still under development and might take	-	-	yes	-	There needs to be an in-house specialist for the maintenance of the

			some years to be ready. Costs for implementing will be high.					device.
	Habitat description/gear operation information							
13.	Camera on the sampling gear	BTS	€10.000,-	-	-	yes	-	
14.	Towed camera	all	€10.000,-	-	yes	?		This device is towed over the sampling ground before the haul and will give information on the habitat that will be sampled.
15.	Side-scan sonar/multi beam echosounder	all	High investment costs and only possible if a drop keel is available.	+1 (expert)	-	yes		Possibilities to increase sampled volume of water several-fold and additionally provide information on sea bed characteristics.
	<b>Other gear deployment</b>							
16.	Deploy other gears than the survey gear	all		Depending on expertise and sample processing time needed	Depending on sampling time needed and sampling frequency			

## 4 Collection of 'new' information during the current surveys

### 4.1 Developments

There is a desire for the installation of a drop keel on Tridens. Acoustic transducers would then be mounted on the lower face of the (retractable) keel. This will be an expensive investment but, at the same time, will ease future installation of new research devices. Access to the acoustic equipment would be possible without the need to dry-dock the vessel, since the keel could be lifted clear of the water inside the vessel. During surveys, the keel would be extended to typically 3 m below the fixed part of the vessel keel. Transducers deployed in this way would be well protected from weather-induced bubbles, increasing the quality of the collected acoustic data. Above all, a drop keel will make it possible to have continuous acoustic recordings during all surveys, since no additional man power would be necessary to deploy/retrieve the towed body currently used on Tridens.

### 4.2 Building time-series on 'new' information

During the meeting, there was a discussion on the wish for time-series on the ecological information that might be collected.

#### 4.2.1 Fish data

There is the feeling that time-series on fish diseases and fat content might be useful and might be easily incorporated in the routines of the surveys. Stomach data time-series are useful but since it requires a lot of work, it has to be clear for what purpose the stomachs will be sampled and it is not recommended to incorporate it as a standard activity in the surveys.

#### 4.2.2 Water samples

Until some years ago, nutrient samples collected during the IBTS in February were analysed by the Ministry of transport and public works (RWS). However, since 2009, they stopped this analysis because of the costs involved.

It is however interesting to build a time-series on nutrients, phytoplankton and CTD information, although before restarting with the time-series the already available data (from other sources) has to be worked up to show the need for this research.

#### 4.2.3 Other animals

Time-series on marine mammals and sea birds will be adding to the understanding of the marine ecosystem, especially combined with fish (trawl) information.

#### 4.2.4 Habitat description/gear operation information

For habitat description, mainly the habitat information in relation to the haul and catch data is interesting to build a time-series upon. For less detailed (larger scale) habitat information, other sources are available.

#### 4.2.5 Other gear deployment

It can not be predicted if time-series on sampling with other gear during a fish survey might be interesting as a time-series. This depends on the samples collected and the results of the additional samples. However, it is recommended to discuss the possibility and need for building a time-series at the beginning of new projects that include sampling with other than the standard gears.

### 4.3 Investments needed

Apart from the financial costs, additional sampling with new devices will require expertise on the maintenance of the devices. Since the major developments are foreseen in technical direction, a technician for maintenance and further technical development will be necessary on board during all cruises.

When starting to build time-series, a serious investment has to be made into data checking and data storage possibilities.

To be able to use the planktonic samples for other purposes than the current research, it is important to store the samples for more than 5 years as is the current IMARES policy. Samples fixed in formaldehyde can be stored almost forever and throwing away samples will exclude the opportunity to derive historic information from stores samples.

## 5 Conclusions

Many extra activities might be carried out during the current legal task surveys. It is, however, important to estimate the amount of work to be done before requesting data-collection. In some cases additional data might be collected without extra time (personnel or ship time) or money (personnel or investments) needed, but in many cases at least the work to be done after the survey will need time and effort.

## 6 Quality Assurance

IMARES utilises an ISO 9001:2000 certified quality management system (certificate number: 08602-2004-AQ-ROT-RvA). This certificate is valid until 15 March 2010. The organisation has been certified since 27 February 2001. The certification was issued by DNV Certification B.V. Furthermore, the chemical laboratory of the Environmental Division has NEN-AND-ISO/IEC 17025:2005 accreditation for test laboratories with number L097. This accreditation is valid until 27 March 2013 and was first issued on 27 March 1997. Accreditation was granted by the Council for Accreditation.