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Second Interim Report of the Working Group on Integrating Surveys for the Ecosystem Approach (WGISUR)

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Executive summary

The meeting of the Working Group on Integrating Surveys for the Ecosystem Approach (WGISUR) took place from 27–29 January 2015 in Copenhagen. The group was attended by 10 people representing nine countries and was chaired by Ingeborg de Boois, Netherlands. Four ICES survey planning groups were represented, and representing a range of different survey types (ecosystem, acoustic, ichthyoplankton, and fish trawl (beam and otter trawl)).

Presentations were given on a number of ecosystem surveys, and on adding tasks to current surveys.

The group discussed if and how ecosystem monitoring plans could be set up. Although some challenges arise with respect to collaboration (inter)nationally and between expertise fields, these should not block the initiatives for ecosystem monitoring. A holistic monitoring plan will not appear by itself, however, and should be created by a diverse group of people. Limiting the spatial and temporal scale of the integrated survey will make the task easier. WGISUR proposes a workshop to create an integrated monitoring survey of the North Sea in the 3rd quarter, beginning by building upon the existing survey objectives and utilizing the currently available survey resources.

Staff exchange is being investigated between the Barents Sea ecosystem survey (Norway/Russia) and the Nova Scotia shelf ecosystem survey (Canada).

1 Administrative details

Working Group name

Working Group on Integrating Surveys for the Ecosystem Approach (WGISUR)

Year of Appointment

2015

Reporting year within current cycle (1, 2 or 3)

2

Chair(s)

Ingeborg de Boois, Netherlands

Meeting venue

Copenhagen, Denmark

Meeting dates

27–29 January 2015

The group was attended by 10 people representing nine countries (see Annex 1 for nationalities and contact information). Four ICES survey planning groups were represented, and representing a range of different survey types (ecosystem, acoustic, ichthyoplankton, and fish trawl (beam and otter trawl)).



L-R: Elena Eriksen, Sven Kupshus, David Demer, Donald Clark, Jens Ulleweit, Kai Wieland, Ingeborg de Boois, Kelle Moreau, Ana Moreno, and Larry Hufnagle;

2 Terms of Reference a) – d)

Table 2.1 WGISUR terms of reference

ToR	DESCRIPTION	BACKGROUND	SCIENCE PLAN	DURATION	EXPECTED DELIVERABLES
			TOPICS ADDRESSED		
A	Provide guidance on the adaptation of existing surveys to provide ecosystem data	a) Science Requirements b) Advisory Requirements c) Requirements from other EGs	1.2, 1.4, 1.5, 1.7, 2.1, 2.4, 2.5	3 years	CRR
B	Provide guidance on the development of an ICES ecosystem survey approach	a) Science Requirements b) Advisory Requirements	1.2, 1.4, 1.5, 1.7, 2.1, 2.4, 2.5	Year 2	CRR
C	Identify issues common to all surveys, set up workshops and manage them as appropriate	a) Science Requirements c) Requirements from other EGs	1.2, 1.4, 1.5, 1.7, 2.1, 2.4, 2.5	yearly	Workshop Report
D	Liaise with IEA groups, and others as appropriate (e.g. CWGMSFD), over data product needs and specification	a) Science Requirements b) Advisory Requirements c) Requirements from other EGs	1.2, 1.4, 1.5, 1.7, 2.1, 2.4, 2.5	yearly	List of data product needs

3 Summary of Work plan

Table 3.1 Summary of WGISUR work plan

Year 1	Workshop report, identify next workshop
Year 2	Workshop report, Provide data product needs
Year 3	Completion of CRR

4 List of Outcomes and Achievements of the WG in 2015

- 1) The [flow diagram](#) for development of an ecosystem survey was refined, resulting in the Table in Annex 5.1;
- 2) The list of ship characteristics for ecosystem monitoring (ICES, 2014) was used by some participants and will be updated according to the comments;
- 3) A workshop is proposed on the development of a third quarter integrated ecosystem survey, building upon the objectives and beginning with the currently available resources of the current 3rd quarter North Sea IBTS;
- 4) An outline was prepared for a document on 'Adding tasks to current surveys.' Intersessionally in 2015, the group will add text to this document.
- 5) A joint ASC session with WGFAST was proposed and approved. At least one presentation and one poster will be submitted on behalf of WGISUR.

5 Progress report on ToRs and workplan

During the 2015 ASC, WGISUR results will be presented on poster(s) and in a presentation. The poster(s) and presentation cannot be put under a specific ToR, as they are related to all.

5.1 A) Provide guidance on the adaptation of existing surveys to provide ecosystem data

5.1.1 Modification of single-species surveys to integrated surveys

David Demer presented some programs run by National Oceanic and Atmospheric Administration's National Marine Fisheries Service that are currently challenged to modify and expand single-species surveys into integrated surveys, to manage fish stocks with an ecosystem perspective. This objective requires an understanding of the effects of the environment and fishing on all major ecosystem components.

For example, in large upwelling systems like the California Current Ecosystem (CCE), natural cycles in the oceanographic and atmospheric conditions appear to drive large fluctuations in the distributions and relative abundances of coastal pelagic fish species (CPS), for example, sardine, anchovy, mackerels, and herring. These changes may be accelerated or delayed by changes in mortality due to fishing or predation of larger fish, marine mammals, and seabirds. We suggest that the data necessary to manage CPS with an ecosystem perspective may be obtained from frequent surveys of multiple CPS and their biotic and abiotic environment. We show that this is practical with surveys based on a combination of acoustic and trawl sampling coupled with complementary measures from numerous other sensors. Such acoustic-trawl-method (ATM) surveys of the CCE were conducted during the spring and summer of 2012 and 2013. The results of these surveys were presented, including the seasonal distributions and abundances of multiples of the most ecological and economically important CPS. These data hint at the ultimate potential of periodic surveys using ATM sampling augmented with physical oceanographic, zooplankton, ichthyoplankton, fish, seabird, and mammal investigations to characterize the ecosystems. (references: Demer and Zwolinski, 2012, 2014a, 2014b; Demer *et al.*, 2012, 2013; Zwolinski and Demer, 2012, 2013a, 2013b; Zwolinski *et al.*, 2011, 2012, 2014).

5.1.2 Combining data from multiple sources for ecosystem monitoring in the Canadian Maritimes Region

Donald Clark presented the state-of-the-art of the data integration in the Canadian Maritimes Region. A variety of ecosystem monitoring data are collected on the DFO surveys on the Scotian Shelf and Georges Bank, including bottom-trawl catch data, hydrographic and plankton data and data on seabirds and marine mammals. While there is some coordination in the collection of these data, the storage is in several separate datasets and there is little integration of reporting or analysis of these data. In addition, these surveys overlap spatially with similar surveys conducted by the National Marine Fisheries Service (NMFS) of the United States and with a DFO *Nephrops* trawl survey targeting Snow Crab. While these surveys all have similar objectives, they are not coordinated together.

Plans for harmonizing survey procedures, where possible, were presented. This includes the establishing of a working group to consider integrating data storage and reporting among the groups currently collaborating on the DFO surveys and to review

the data collection objectives and protocols for DFO surveys. A second working group will be established to review the opportunities for coordinating data collection among surveys to increase the efficiency of this work and free-up time to expand the range of ecosystem research and monitoring objectives which can be pursued. WGISUR has produced documents providing guidance on the adaptation of existing surveys to provide ecosystem data and these will be used to assist in decision-making.

As this is the start of the data integration, some challenges arise:

- RV survey and Crab survey are on the same computer but in different databases. Data could be “imaged” in similar format to simplify extraction for combined analysis.
- Hydrography and plankton data are both stored at DFO but in different institutes. Some data are copied into “fish” database, most is not.
- Birds and surface animal data are the responsibility of a different Govt. Department.
- Canadian and US surveys are not conducted in coordination. The data are however available through the same software/portal.
- Integration of data to inform development of MPA’s is occurring through GIS layers. These are data products rather than raw data. “Library” of layers is now being developed which uses analytical strength from each organization but limits what can be done.

5.1.3 Adding tasks to Dutch IBTS and beam trawl survey

Ingeborg de Boois presented the additional tasks carried out during the 2014 and 2015 fish trawl surveys on board of ‘Tridens’. During IBTS and beam trawl survey, all fish and benthos from the trawl is sorted, as well as litter. A vertical CTD profile is taken at each fish station. During the beam trawl survey additional tows with a two meter beam trawl are carried out. Additionally, over the past few years some experiments have been carried out to investigate the amount of time additional sampling would take. For example, some boxcorer samples were taken on the beam trawl survey in 2014 and IBTS in 2015. It appeared that it is possible to take the samples without too much additional time when the grabs are combined with the CTD measurement. Additional personnel will be needed to sieve the sample on board. During the beam trawl survey the Cefas owned [SPI camera](#) was used to collect sediment profile images, and to investigate if a ship without dynamic positioning control (DP) could operate the gear effectively.

5.1.4 Guidance on adding ecosystem data collection to current surveys

WGISUR worked on the collation of experiences and tools developed by WGISUR, institutes, and individuals to provide ecosystem data on existing surveys not designed to monitor the ecosystem; in most cases surveys designed to support fish stock assessment.

The ultimate objective of taking on additional ecosystem data collection is to increase efficiency of the survey and maximize the use of survey data products. Expansion of data collection on current surveys will never result in a synoptic single-platform ecosystem survey, but provides value by contributing to ecosystem monitoring. Guidelines for planning the expansion of activities, anticipating where these might require

additional expertise or personnel, and facilitating the integration of ecosystem analyses are provided.

The group works on a document, which provides guidance and tools for (a) identifying opportunities for taking on additional ecosystem data collection, (b) conduct impact assessment of added activities on current priorities, (c) reviewing survey design so that all planned activities can be incorporated, as well as (d) coordination of sampling, data storage and analysis.

ICES Survey planning groups (WGIPS, WGBIFS, WGMEGS, IBTSWG, WGBEAM, WGACEGG) will be asked to provide feedback to the first version of this document before September 2015.

The group took the 'Additional task table' developed by WGISUR/WKCATDAT in 2010 and 2011 (ICES, 2010) as a starting point, and used WGISUR discussions as well as other sources to feed into the CRR.

5.2 B) Provide guidance on the development of an ICES ecosystem survey approach

5.2.1 Review checklist ship characteristics

In response to the plans of several countries to build a new research vessel or conduct a refit of an existing vessel, WGISUR 2014 composed a checklist for the development of platforms suitable for ecosystem monitoring and research (ICES, 2014). The intention was that scientists responsible for their national surveys approach ship owners and builders with this checklist, and go through it in the earliest possible phase when practically planning a new build or adaption of an existing research vessel, making sure that the future vessels will not only be useful in the context of their current main objectives but also in the context of integrated ecosystem monitoring and research.

In Belgium, the ship owner (Federal Government) spontaneously took the initiative to initiate a consultation process, and invited all users of the current RV to be involved in the discussions. A table was provided for completion by all user institutes, covering all aspects mentioned in the WGISUR checklist (scientific motivation/needs, objectives, geographic area, ship time – amount and frequency, technical specifications of the vessel, scientific equipment, specifications of labs, safety and environmental requirements, personal facilities). Therefore, the actual WGISUR checklist was unfortunately not used.

In the Netherlands, the checklist was used selectively, as one of the ships is being refitted. The main discussions focused on the noise levels allowed in acoustic research. The ICES CRR on underwater noise is the best source of information.

5.2.2 Integrated surveys in the Southern Ocean and California Current

David Demer presented the long-term integrated surveys and investigations conducted by the Commission for the Conservation of Antarctic Marine Living Resource (www.ccamlr.org) and the California Cooperative Fisheries and Oceanographic Investigations (www.calcofi.org). Both have long-demonstrated programs for conducting integrated surveys with standard protocols, archiving and serving the data, metadata, and data products, conducting cross-disciplinary and inter-agency analyses, and coordinating dissemination of the results for use in science and management. From their beginnings, these programs were designed as integrated investigations. For example, see [survey reports](#) from the US Antarctic Marine Living Resources Program.

5.2.3 How to develop integrated ecosystem monitoring?

5.2.3.1 WKRISCO outcomes and difficulties to develop integrated ecosystem monitoring

Mark Dickey-Collas (ICES) presented the results of the ICES Workshop Regional Seas Commissions and Integrated Ecosystem Assessment Scoping (WKRISCO). WKRISCO collated the commonalities and differences across ICES IEA groups (linked to challenges and opportunities), and the issues around the governance and legal context in the development of IEA methods in the ICES area. It explores uncertainty, credibility and legitimacy when making qualitative decisions and the knowledge requirements for the ecosystem approach of OSPAR and HELCOM. It is clear that both OSPAR and HELCOM are keen to engage with the IEA process. WGISUR was asked to answer the following question: 'What are the barriers to progress for moving to integrated surveys?'

WGISUR discussed the potential barriers (listed below), and the way forward, as the group is convinced that integrated surveys and monitoring is within reach.

- a. Blocks outside ICES:
 - There are national and cross-border limitations for other monitoring programs than the fish surveys
 - Some institutes do not have the facilities (e.g. money, space on the ship) to collect more data than needed for the primary objective(s)
 - For EU countries money is only available for data collection supporting fish stock assessment, and not for MSFD requirements
- b. Blocks within ICES.
 - Fish stock assessment groups using survey time-series strongly resist to any change to surveys. Time-series are assumed to be created from a standard design, meaning that nothing can be changed in order to maintain constant catchability. In reality, unexpected events often take place during the surveys, such as stations that cannot be sampled due to the presence of wind-farms, bad weather conditions or technical problems, etc. WGISUR recommends that WGISDAA investigate methodologies that can evaluate the effects on time-series of changing survey designs.
 - Guidance from IEA groups on the data to be collected (or at least information on the data IEA groups use in their IEA's) is needed.
 - Indicator development is based on current data collection, and/or independent monitoring programs. New developments/survey designs are not taken into account. This means that surveys designs cannot be optimized to provide more effective data collection as this will perpetuate the resistance to changing survey designs already alluded to with respect to the stock assessment working groups. Indicator gaps will then require additional surveys at considerable additional cost.

5.2.3.2 Moving towards integrated ecosystem surveys and monitoring

It is possible to move towards integrated surveys/monitoring programs for a number of reasons:

- a) Integrated surveys are already carried out by a number of countries (e.g. see ICES, 2012a, presentation David Demer section 5.2.2)
- b) In a number of cases, large part of the data collection is coordinated, and only the last step has to be taken which is to collaborate on and integrate the data storage (databases) and analysis. In the end, this will lead to a more integrated data collection and analysis.

We should however see the move towards integrated ecosystem surveys as a process, not as a finite step. Development of an integrated ecosystem monitoring needs careful re-evaluation, especially after the first few years. One should not expect that the first attempt to carry out an integrated monitoring - even if it is based on a well-considered plan - is perfect, nor can we expect that the policy drivers will remain the same so focus may have to shift.

WGISUR concluded that although barriers exist (see 5.2.3.1), those reasons should not block the integration of surveys. As a result, WGISUR discussed a potential transformation of the 3rd quarter IBTS in the North Sea into an ecosystem monitoring, to specify the flow diagram as created by WGISUR 2012 (ICES, 2012). Ultimately, there should be a full-integrated ecosystem assessment for the North Sea based on integrated monitoring (Figure 5.2.3.1.). Annex 5.1 and 5.2 contain the detailed steps needed for the integrated monitoring plan.

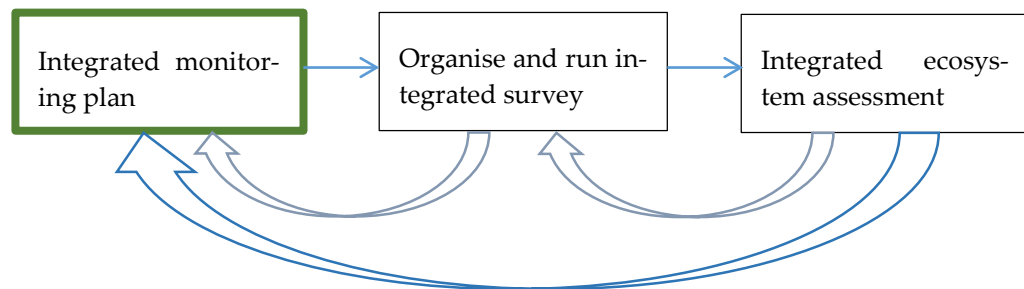


Figure 5.2.3.1. Process from monitoring plan to integrated ecosystem assessment.

WGISUR collated experiences and tools developed by WGISUR, institutes, and individuals to provide guidance on the development of an ICES ecosystem survey approach. The group took the flow diagram developed by WGISUR 2012 (ICES, 2012b) as a starting point, elaborating on the specific responsibilities of the different roles involved in monitoring. It is recommended that a specified version of this table be used by the workshop as proposed in 5.3.2.

5.3 C) Identify issues common to all surveys, set up workshops and manage them as appropriate

5.3.1 Issues common to all surveys

5.3.1.1 Combine data from different databases

ICES Data Centre presented the ICES Data Portal. The group decided that this is a useful tool. The data portal is an easy facility to investigate which data are available in areas of interest, and data can be selected either using the data portal or one of the underlying ICES databases. WGISUR phrased two requests for which request forms will be sent to the ICES Data Centre:

- Link hydrographical data to data in DATRAS, based on spatial and temporal overlap.
- Link hydrographical data to data in the eggs and larvae database, based on spatial and temporal overlap.

5.3.1.2 Staff exchange

The potential for staff exchange is being investigated between Norway (Barents Sea ecosystem survey) and Canada (Nova Scotia shelf ecosystem survey). The reports of the exchange will be presented in WGISUR.

5.3.1.3 Development of new sampling techniques

The group concluded that it is difficult to keep track of all technical developments in sampling techniques, especially outside the personal field of expertise. It was therefore decided to open a WGISUR Forum where the group can exchange information on the latest techniques. If others are interested, the Forum might be opened up to a wider range of people.

A WGISUR Discussion Forum will be installed to inform members about new techniques.

5.3.2 Set up workshops

Based on the discussion described in section 5.2, WGISUR proposes that a workshop is organized to create a monitoring plan for the North Sea taking the 3rd quarter IBTS as a starting point. The first draft of the plan is in Annex 5.2.

The workshop should be attended by representatives from WGINOSE, HAWG, WGNSSK, EU-DGMARE, EU-DGENV, OSPAR, and experts in fish trawl surveys, acoustic data collection, (ichthyo-, zoo-, phyto-) plankton, benthic data collection, hydrographical data collection including water samples and others when necessary.

The aim of the workshop is integrating monitoring for fisheries management including the monitoring of changes in productivity of the ecosystem and the impact of fisheries on the ecosystem. The final survey objectives should represent ecosystem function as well as the regulatory needs and the prioritization should be a process that addresses function and also societal relevance.

The terms of reference for the workshop are in Annex 4.

5.4 D) Liaise with IEA groups, and others as appropriate, over data product needs and specification

Elena Eriksen presented the results of Working Group on Integrated Assessments of the Barents Sea (WGIBAR) to inform group members about the WGIBAR aims, plans and results. The WGIBAR started in 2013, and the first meeting held during 24-28 March 2014, Kirkenes, Norway. WGIBAR agreed to work on ecosystem considerations relevant to the assessment WGs for the Barents Sea stocks and to report on ecosystem status. During the meeting, dataseries were compiled. An analysis including time-series from 1986-2013 showed that the last 8-10 years have been exceptional. This is related to warming and reduced ice, and increased bio-mass of several, mostly boreal species. A status report on the Barents Sea ecosystem components is available on the [website](#). A closer cooperation between WGIBAR other ICES groups, including WGISUR is suggested.

In general, it is still difficult to liaise with IEA groups, as the groups still seem to be searching for the best approach to develop IEA's for the respective areas. The only way to bring this forward is actually sit around the table to work out specific examples (see 5.3.2). It is important to realize that there are differences in the priorities, objectives, and available expertise between the ICES IEA groups (ICES, 2015).

WGISUR discussed if an ASC session proposal could be drafted for 2016. There is a wish for a session on 'How to feed (ecosystem) survey data into (stock and ecosystem) assessments?' focusing on successes and clear examples. The proposal should be drafted together with SSGIEA and BSG.

6 Revisions to the work plan and justification

No changes to ToRs were made. The collated information for ToR a and b might not be published as two (2) CRRs as in both cases a different format might fit better to the needs. They both might be turned into 'guidance documents', providing the ICES community tools, guidance and suggestions to support the design of ecosystem monitoring.

7 Next meeting

The next WGISUR meeting will take place 26–28 January 2016 (Tuesday-Thursday) in Hamburg, Germany. This is the last meeting in the three-year cycle. The group will review its current terms of reference, and adapt where necessary.

A subgroup meeting will take place on Monday 25 January 2016, to review documents (e.g. ship checklist, collate information for guidance on adding tasks to current surveys).

Terms of reference for next meeting:

ToR	DESCRIPTION	BACKGROUND	SCIENCE PLAN		EXPECTED DELIVERABLES
			TOPICS ADDRESSED	DURATION	
A	Provide guidance on the adaptation of existing surveys to provide ecosystem data	a) Science Requirements b) Advisory Requirements c) Requirements from other EGs	1.2, 1.4, 1.5, 1.7, 2.1, 2.4, 2.5	3 years	CRR
B	Provide guidance on the development of an ICES ecosystem survey approach	a) Science Requirements b) Advisory Requirements	1.2, 1.4, 1.5, 1.7, 2.1, 2.4, 2.5	Year 2	CRR
C	Identify issues common to all surveys, set up workshops and manage them as appropriate	a) Science Requirements c) Requirements from other EGs	1.2, 1.4, 1.5, 1.7, 2.1, 2.4, 2.5	yearly	Workshop Report

D	Liaise with IEA groups, and others as appropriate (e.g. CWGMSFD), over data product needs and specification	a) Science Requirements b) Advisory Requirements c) Requirements from other EGs	1.2, 1.4, 1.5, 1.7, 2.1, 2.4, 2.5	yearly	List of data product needs
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Annex 1: List of participants

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Annex 2: Recommendations

Recommendation	Adressed to
1. Agree on using the NS IBTS Q3 survey as a starting point for a North Sea wide Q3 ecosystem survey	IBTSWG
2. Investigate methodologies that can evaluate the effects on time-series of changing survey designs	WGISDAA

Annex 3: Actions

Action	Adressed to	Action before	Status
1. Hand in request form for linking hydrographical data to data in DATRAS, based on spatial and temporal overlap	Kai Wieland	1 April 2015	Completed
2. Hand in request form for linking hydrographical data to data in the eggs and larvae database, based on spatial and temporal overlap	Jens Ulleweit (in collaboration with WGMEGS, WGALES, WGIELS)	1 May 2015	
3. Ask ICES Survey planning groups (WGIPS, WGBIFS, WGMEGS, IBTSWG, WGBEAM, WGACEGG) to provide feedback on the guidance document about adding activities to current surveys to collect ecosystem data.	Ingeborg de Boois	1 April 2015, feedback before 1 September 2015	
4. Initiate a workshop to develop an integrated monitoring plan based on the current resources of the NS-IBTS Q3 survey, without losing the current primary objectives	Ingeborg de Boois	Depends on outcome recommendation 1; if yes then proposal ready before 8 April 2015	
5. Create WGISUR Discussion Forum to share information on new/developing sampling techniques	Ingeborg de Boois, Claire Welling	1 April 2015	Completed
6. Discuss ASC 2016 theme session proposal with SSIEA and BSG chairs (Dave Reid, Carmen Frenandez, Jörn Schmidt) and with WGIBAR	Ingeborg de Boois, Elena Eriksen (WGIBAR)	1 March 2015	In progress
7. Write abstracts for presentation and poster(s) for ASC 2015 theme sessions C	Ingeborg de Boois (lead), Kelle Moreau, Elena Eriksen, Donald Clarke	1 March 2015	In progress
8. Evaluate if there is a ship effect in the IBTS data	Kai Wieland, Sven Kupschus	1 March 2015	

Annex 4: Workshop proposal

The **Workshop to Plan and Integrate Monitoring Program in the North Sea in the 3rd quarter** (WKPIMP), chaired by Andrew Kenny (UK) and Ingeborg de Boois (Netherlands), will meet at ICES Headquarters, Copenhagen, Denmark, in 1st quarter of 2016.

The aim of the workshop is integrating monitoring for fisheries management including the monitoring of changes in productivity of the ecosystem and the impact of fisheries on the ecosystem. The final survey objectives should represent ecosystem function as well as the regulatory needs and the prioritization follows from both ecosystem function and societal relevance.

The workshop will create a framework for an integrated monitoring program in the North Sea in the 3rd quarter to address the monitoring and assessment requirements for fisheries, changes in ecosystem productivity and the impact of fisheries on the environment by:

- a) Using the current NS-IBTS conditions as a starting point (ship time, temporal and spatial coverage);
- b) Taking the current NS-IBTS 3rd quarter obligations (provide information for fish stock assessment) into account;
- c) Taking the needs as defined by other bodies (EU, ICES groups, OSPAR) into account;
- d) Following stepwise approach as described in Annex 5 of WGISUR report 2015
- e) Highlight the important principles that have been discovered through this process as guidance for other areas and surveys.

Representation:

The following ICES groups should be represented in the workshop: WGISUR, IBTSWG, WGINOSE, HAWG, WGNSSK, WGEF, WGSDAA.

It is furthermore relevant that a variety of ecological expertise fields is represented, such as acoustic data collection, (ichthyo-, zoo-, phyto-) plankton, benthic data collection, hydrographical data collection including water samples, North Sea ecosystem understanding, and others if needed.

The **preparation** that should take place before WKPIMP is:

- Overview of current sampling in North Sea during Q3 –may be based on outcomes EU Project ‘Towards a Joint Monitoring Program in the North Sea and Celtic Sea’ (JMP NS/CS)
- Define the important ecosystem components/processes that should be taken into account in the ecosystem survey, characterize the important habitats, and describe important trophic interactions in the North Sea in Q3 (WGINOSE)
- Provide information on the current output needed from NS-IBTS Q3, and the constraints (WGNSSK, HAWG, WGEF)
- Overview of all current sampling activities undertaken during NS-IBTS Q3 (IBTSWG)
- Evaluate if current sampling can be made more efficient without affecting the current output (=indices for stock assessment; WGSDAA)
- Investigate if there is a ship effect in the current IBTS (WGSDAA)

WKPIMP will report by XXXX to the attention of WGISUR, WGINOSE, ACOM and SCICOM.

Supporting Information

Priority	Integrated monitoring and ecosystem assessment is one of the priorities in the ICES Strategic Plan. The EU needs information for the Marine Strategy Framework Directive.
Scientific justification	Integrated monitoring plans will not be developed spontaneously. It will only happen when
Resource requirements	None
Participants	The workshop can be attended by 25-30 members and guests.
Secretariat facilities	None.
Financial implications	None
Linkages to advisory committees	There are linkages to both SCICOM and ACOM.
Linkages to other committees or groups	There are linkages to all groups currently using survey information from the North Sea like WGISUR, WGINOSE, WGNSSK, HAWG, and to other groups like BEWG, WGZE, WGOOFE, MCWG, WGSPEC
Linkages to other organizations	EU DGMARE, EU DGENV, OSPAR

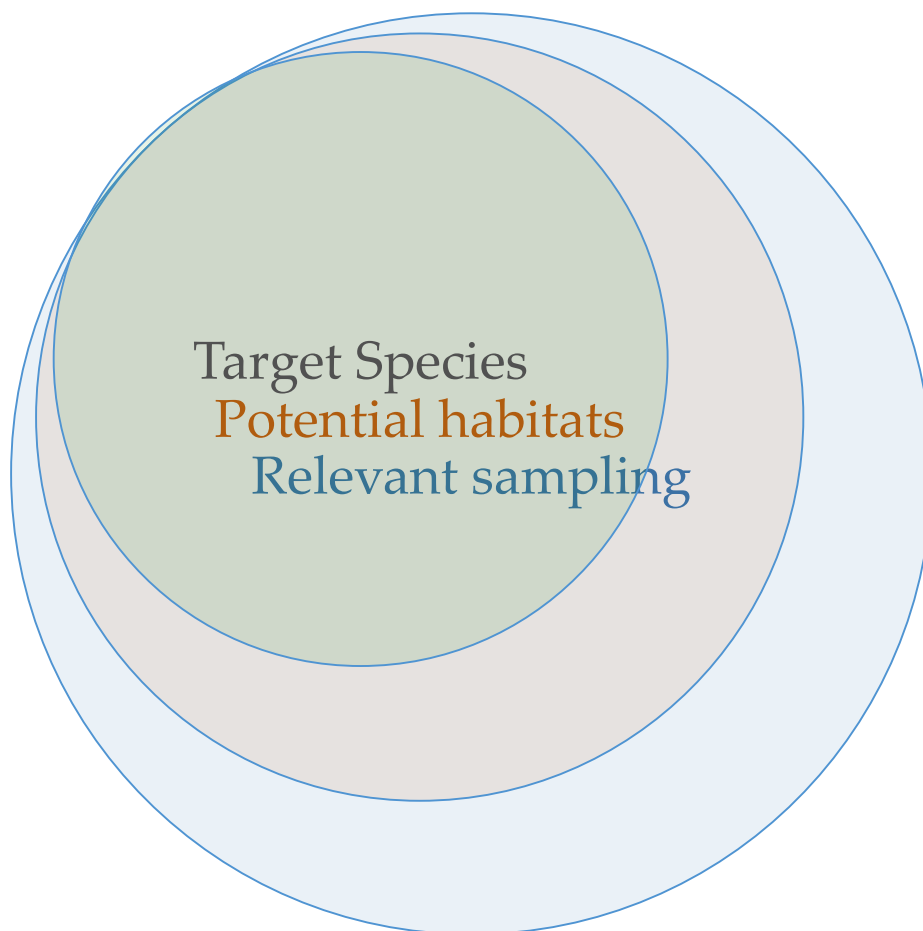
Annex 5: Stepwise plan for development of ecosystem monitoring

Annex 5.1: Guidance for a holistic monitoring program

A holistic monitoring program will not be developed with a single effort. Although the table below suggests that the workflow is linear, it should be clear that the creation of a plan, conducting the survey, and the use of data should be considered as an iterative process.

Spatial-temporal domains in holistic monitoring

To facilitate accurate and efficient measurements, the relevant sampling is constrained to span the management focus, e.g. the potential habitats of the target species (see figure below).



Guidance for a Holistic Ecosystem Monitoring Program			
Steps	Data Providers	Data Users	Advice Users
Define target species (managed ecosystem components).	Define requisite deliverables (e.g. fishery-independent estimates of biomass), and develop hypotheses		Assure that the stakeholders will receive the necessary advice.
Characterize potential habitats (biotic and abiotic environments and processes).	Define potential habitats using current understanding, research, and models.	Assure regional or international coordination of deliverables.	
Characterize environmental and trophic interactions.	Determine the temporal-spatial importance of ecological processes to target species.		
Sample biologically relevant and optimal (or practical) spatial-temporal scales (see Figure above), with consideration to available methods (e.g. equipment, sensors, sensor platforms, and analysis techniques).	Describe the deliverables, optimal sampling plan, including the itemized cost-deliverable trade-offs (e.g. logistics, ship, personnel, and skills).	Provide the resources necessary to enact the acceptable, optimal sampling plan.	
Evaluate if the improved understanding meets the objectives with the available budget.	Provide quantitative or qualitative assessment of the deliverables.	Evaluate if the deliverables meet the management requirements.	Evaluate if the management objectives would be met.
<i>Refine and accept the plan.</i>	<i>Interactively review and collectively agree.</i>		
Conduct ecosystem monitoring.	Monitor, test hypotheses, and provide deliverables.	Evaluate the deliverables and improved understanding.	Disseminate favourable outcomes.
Periodically evaluate the monitoring program.	Evaluate the current monitoring including the cost and value of samples, collection and analysis methods, and the estimated precisions of outputs.		Consider management and scientific advice and evaluate against targets.
<i>Refine the monitoring program.</i>	<i>Interactively review and collectively agree.</i>		

Annex 5.2: Stepwise approach towards integrated monitoring in the North Sea during 3rd quarter

Before the steps below can be taken into account by WKPIMP, the following decisions have to be taken:

- Agreement by IBTSWG that the NS-IBTS Q3 will be used as a realistic example to modify towards an ecosystem survey, part of a North Sea ecosystem monitoring. (March 2015)
- Timely announcement of WKPIMP, so all experts needed will be able to arrange attendance at WKPIMP

	Steps	Preparation	WKPIMP
Problem identification Set survey objectives	Define target species (managed ecosystem components).	WGINOSE, WGNSSK, HAWG, WGEF	Final decision on target species/ecosystem components based on preparation; clearly defined objectives based on hypotheses. Transformation from hypothesis to objective should be based on 'does anybody care?' (and who) Identify primary and secondary clients
	Characterize potential habitats (biotic and abiotic environments and processes).	WGINOSE, maybe in collaboration with WGECO	Final decision on habitats to be taken into account based on preparation; map with habitats
	Characterize environmental and trophic interactions.	WGINOSE, maybe in collaboration with WGECO	Final decision on interactions to be taken into account based on preparation; list with relevant interactions in Q3 in the North Sea
	<i>Set objectives and parameters</i>		<i>Define which parameters should be measured, and check if data collection meets objectives</i>
Set framework	Define resources and constraints	IBTSWG (current resources), WGNSSK and HAWG (constraints current objectives) WGISDAA (evaluate current sampling in relation to objectives) All: Identify other datasets available for NS Q3 (may be taken from EU overview for MSFD)	<ul style="list-style-type: none"> • Add new objectives, check if current objectives still can be met • Prioritize objectives • Define minimum data requirements and variables for clients, including data quality • Define precision levels for output • Which information can be collected from other monitoring in North Sea in Q3 (seagoing or models, VMS data, satellite data, etc.)
Set framework Set survey objectives	Sample biologically relevant and optimal (or practical)	IBTSWG (describe current sampling, additional to the fish sampling)	<ul style="list-style-type: none"> • Develop survey design (stratification, number of samples per sampling)

Survey design	spatial-temporal scales (see Figure in Annex 5.1), with consideration to available methods (e.g. equipment, sensors, sensor platforms, and analysis techniques).		<p>type, etc.); survey design should be adaptive towards future</p> <ul style="list-style-type: none"> • Create detailed survey plan, including definition of expertise needed, different sampling techniques and their limitations • Make practical arrangements: allocate ship time, get sampling equipment, coordination during the survey, etc. NB: consider that not all ships might have to carry out all sampling types
	Evaluate if the improved understanding meets the objectives with the available budget.		<ul style="list-style-type: none"> • Check if plan can be carried out within the current framework. If not: what should be arranged, or should the plan be modified? • Check if precision levels and accuracy from sampling match the requirements • Check if plan still meets objectives • Define remaining shortcomings
	<i>Refine and accept the plan.</i>		<i>Present plan to IBTSWG, WGINOSE, WGNSSK, HAWG, WGEF, EU-DGENV, EU-DGMARE, ICES Secretariat</i>