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Report of the Study Group on Collection of Acoustic Data from Commercial Vessels (SGAFV)

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International Council for the Exploration of the Sea

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1 Executive Summary

The Study Group on Collection of Acoustic Data from Commercial Vessels (SGAFV) held its first meeting at the Sea Fisheries Institute (SFI), Gdynia, Poland, prior to the 2004 meetings of ICES Fisheries Technology Committee Working Groups, WGFAST and WGFTFB. The meeting was Chaired by Dr. W. Karp (USA). Dr. Alex De Robertis (USA) acted as Rapporteur. Twenty-five scientists from six ICES member countries and three observer countries attended the meeting. The Chair opened the meeting by thanking SFI and introducing those present. The Study Group then reviewed the agenda and discussed the goals of the meeting.

Major agenda items and meeting goals were agreed upon as follows:

- Review Terms of Reference (TORs),
- Review developments in the field,
- Develop outline for final report,
- Assign initial authorship responsibilities,
- Reach agreement on work to be completed before the next meeting of the Study Group,
- Recommend changes in the Terms of Reference if appropriate, and
- Identify major agenda items for 2005 meeting of SGAFV.

The TORs for the Study Group were reviewed and discussed. Guidance provided for the SG includes the following summaries of the TORs;

- Review and evaluate recent and current research which involves collection of scientific acoustic data from commercial vessels (TOR a),
- Develop standardized methods and protocols for collection of acoustic data to address specific ecosystem monitoring, stock assessment and management objectives including: acoustic system calibration and performance monitoring, characterization of radiated vessel noise, comparability of results, survey design, biological sampling, data interpretation and analysis, and data storage and management (TOR b), and
- Prepare background material, guidelines, methods and protocols for possible publication in the *Cooperative Research Report* series (TOR c).

The SG proceeded to address TOR a. The Chair first provided an overview of presentations made on this subject during the 2003 meeting of WGFAST in Bergen Norway. This was followed by 10 presentations by SG attendees. These presentations addressed a broad range of topics germane to the SGAFV and each presentation was followed by stimulating discussions.

TORs b and c were then considered. The Chair initiated the process by presenting a draft outline for the final report of the SG. This provided a basis for extended discussions of the topics to be considered by SGAFV, the structure of the final report, SG member authorship responsibilities, and schedules for completing draft report chapters.

The SG reached agreement on the initial detailed outline of the final report, recognizing that changes would likely be made as the work proceeds. Lead authors were identified for most chapters and contributing authors were also identified for several chapters. It was agreed that lead authors would provide first drafts of chapters in advance of the 2005 meeting of the SG so that review and discussion could take place at the 2005 meeting. The Chair agreed to encourage SG members not present at the meeting to accept writing assignments.

After this discussion, SGAFV again reviewed the TORs and recommended minor changes to improve clarity.

SGAFV identified the following agenda items for its 2005 meeting:

- Discuss recent developments in the field
- Review status of final report
- Review and recommend any necessary changes in the TORs
- Report to WGFAST and FTFB on progress and status

2 Meeting Agenda and Appointment of Rapporteur

Dr. W. Karp (Chair, USA) opened the meeting and reviewed the agenda. The Study Group adopted the agenda as drafted. Dr. Alex De Robertis (USA) agreed to act as Rapporteur.

3 Terms of Reference

3.1 ToR a) Review and evaluate recent and current research which involves collection of scientific acoustic data from commercial vessels

Collection of acoustic data in support of ecosystem monitoring, stock assessment and other scientific objectives has traditionally been carried out with calibrated scientific instruments aboard research vessels. Demands for this type of information have continued to expand and, in many cases, now exceed the capacity of national research vessel fleets. At the same time, improvements in technology have made instruments capable of collecting scientific-quality acoustic data more widely available, and these types of instruments are being installed on many commercial fishing vessels. Scientists have taken advantage of this opportunity to collect data in support of a range of research and assessment objectives.

3.2 ToR b) develop standardized methods and protocols for collection of acoustic data to address specific ecosystem monitoring, stock assessment and management objectives including: acoustic system calibration and performance monitoring, characterization of radiated vessel noise, comparability of results, survey design, biological sampling, data interpretation and analysis, and data storage and management

Standardized methods and protocols have been developed for routine acoustic surveys aboard research vessels, and concerns regarding research vessel radiated noise impacts on fish behaviour have received significant attention by WGFAST and the broader scientific community. However, standardized methods, protocols and guidelines for collection of acoustic data from commercial vessels do not exist, and objective criteria for matching data collection procedures with research objectives or for evaluating data quality are lacking. While commercial vessels equipped with calibrated commercial sounders are suitable for collecting data in support of some specific research and survey objectives, use of these platforms and instruments will not always be appropriate. Research vessels and calibrated scientific acoustic systems will be preferred in most situations but will not always be available.

3.3 ToR c) prepare background material, guidelines, methods and protocols for possible publication in the *Cooperative Research Report* series

There is a demanding need to develop this international standardization of methods and protocols and have them published in an easily accessible report.

4 Review and evaluate recent and current research which involves collection of scientific acoustic data from commercial vessels (Term of Reference a)

4.1 Introduction and review of discussions from 2003 WGFAST meeting (W. Karp, USA)

The Chair reviewed the terms of reference of the Study Group with particular emphasis on the justification for the Study Group, and the group's primary objectives. He provided background on the potential of acoustic data collections from

fishing vessels, which have recently become accessible to fishery scientists due to developments in acoustic technology. He called for increased input from scientists with expertise in stock assessment, as collaboration with assessment scientists will ultimately determine how acoustic records collected from fishing vessels will be applied in the management of commercial fisheries. He reviewed highlights of presentations on the subject of acoustic surveys performed on fishing vessels made at the 2003 WGFAST meeting. The Chair made an appeal for careful matching of "methodology with objectives", and underscored the point that definition of objectives prior to data collection and study design is critical to the success of the use of acoustic data collected from fishing vessels.

4.2 Presentation of new information

4.2.1 Acoustic data collections made from fishing vessels in the Gulf of Maine (W. Michaels, USA)

The presentation described a program collecting acoustic data from fishing vessels targeting herring in the Gulf of Maine, USA, over the past 6–7 years. The presentation emphasized the objectives and design of the program. This study has been designed to measure the abundance and distribution of inshore spawning populations of herring in the Gulf of Maine, which are not part of an established acoustic survey of Georges Bank. The study has evolved from unattended logging of acoustic data from vessels during routine fishing operations to a combined program of unattended recording during normal fishing operations and a systematic survey using chartered fishing vessels following a pre-planned cruise track. Instrumentation has been changed from commercial to scientific echosounders. The information collected during fishing operations has been used to design the timing and spatial extent of the systematic survey. Current work is focused on development of methods for the analysis of acoustic records made during fishing operations, as fishing vessels tend to spend the most time in areas of high fish abundance

D. Demer: Asked about the potential for application of geostatistics to the analysis of records made during fishing operations rather than breaking vessel tracks into transects.

W. Michaels: We have conducted workshops investigating the potential for geostatistics for this application in the past and continue to consider the approach. He also raised the point that the type of fishing vessel comes into play. Their experience is that acoustic records from seiners and trawlers differ substantially as seiners encircle herring aggregations, while trawlers move through the center of aggregations during fishing operations.

H. Peña: Solicited advice for others considering measuring fish abundance from fishing vessel platforms.

W. Michaels: One should focus resources on meeting one's objectives. For example, one might focus data collection when fish distribution is stationary. Information collected during fishing operations can be used to define the spatial extent and timing of systematic surveys.

A. De Robertis: Asked about amount of time required for post-processing of data.

W. Michaels: Currently approximately 1 hour of post-processing time is required for 1 hour of data collection. New methods are reducing processing time, but we currently analyze a small subset of data collections obtained during fishing.

4.2.2 Fisheries surveys with autonomous and remotely controlled echosounder systems (D. Demer, USA)

Presented recent developments in autonomous multi-instrumented packages for use on moored buoys and modification of echosounders for use on ships of opportunity. A pole-mounted echosounder based on a scientific EK60 echosounder has been developed that can be rapidly attached and removed from the deck of small fishing vessels. The transducer can be removed from the water, which allows the vessel to move between regions of interest at high speeds.

R. Kloser: At which speeds can the system be used? Small boats tend to move at high speeds of up to 20–25 knots.

D. Demer: Currently, we use the instrument at speeds of 7–8 knots, but the transducer can be raised to allow for rapid transit.

D. Reid: Do you experience high vessel generated noise with these fairly shallow transducer arrangements.

D. Demer: Bubbles are introduced when rolling in rough weather, but small boats are generally not used in elevated sea states. Propeller noise can be a more persistent problem, but when the transducer is mounted well away from the propeller, this becomes less of a major concern. Bubble noise is more of a concern than propeller noise in this application.

4.2.3 Experience gained in use of ES60 and EK60 echosounders on commercial vessels (R Kloser and T. Ryan, Australia)

The authors described a combined approach to orange roughy and hoki acoustic surveys based on undirected monitoring of acoustic data during commercial fishing operations and standard directed acoustic surveys using commercial vessels. They made the case that work must be focused on how acoustic information fits into the management cycle. Even if the work is of high quality, the exercise will not be successful if it does not interface well with management. They made the point that seemingly simple questions such as the order of magnitude of population biomass or presence at a given location can be valuable to managers, and should not be overlooked. They discussed potential for vessel noise effects and called for measurement of vessel noise signature of commercial vessels.

A. Totland: How do you manage large amount of acoustic data that is collected during fishing operations?

R. Kloser: We currently analyze a small subset (~ 1%) of acoustic data that is carefully chosen to fulfil management objectives.

W. Karp: Have you conducted any intercomparisons of acoustic records between vessels to quantify the potential for avoidance of noisy vessels?

R. Kloser: We have not, but we have an interest in measuring noise signatures of vessels. It remains difficult to measure fish avoidance of vessels.

G. Macaulay: In New Zealand, fishers have recognized that vessel noise affects fish.

D. Reid: I have seen claims that fish are not distributed only in a restricted survey area, but have been found elsewhere. If you don't have a broad spatial context you lose something. Traditional acoustic surveys measure the lows as well as the highs over a broad area.

R. Kloser: In the current project, we are still evaluating how information will be used. If all that can be extracted is a minimum biomass, then that will be the advice to managers. In the Australian context, industry now has the burden of proof for increased quotas.

4.2.4 Analysis and visualization of opportunistically collected echo sounder data (M. Dorn and S. Barbeaux, USA)

The authors reported on the development of methods for analysis of acoustic records collected from factory trawlers targeting pollock in the Bering Sea. The goal is to understand the dynamics of pollock aggregations over short time scales. This interest has been motivated by the possibility that fishing activity results in local depletion of prey resources for endangered Steller sea lions. They have designed a logging system for fishing vessels and have collected large amounts of good quality data. They presented a comparison of records from 2 vessels, and have focused on areas where vessels have crossed within a few days. They report that backscatter recorded by vessels is similar. They have conducted a spatial analysis of a subset of the data, and report that backscatter is spatially correlated at scales of ~ 9 km, but not at 1 km. These results may reflect the scale of movement of pollock over periods of up to several days.

W. Michaels: Are there any effects of vessel speed on acoustic observations?

M. Dorn: When the vessels reach the fishing grounds, speed remains fairly constant. Vessels move at about 4 knots whether trawling or not.

T. Ryan: Are there issues related to ownership of this acoustic data?

M. Dorn: We have not experienced any problems. In this fishery, there are no secret fishing areas, and the movements of the fleet are well known.

W. Karp: Once NOAA has ownership of the data, the law may require the agency to make it available upon request to interested parties. This could become a concern for these types of studies.

W. Karp: Do you see a role in stock assessment for this data?

M. Dorn: Not in this current form. We have a way to go for something that can be used for stock assessment.

4.2.5 Possibilities of using operational statistics from commercial vessels for fish stock monitoring. (S. Kasatkina and V. Ivanova, Russian Federation)

This presentation described a method for estimating stock biomass on the basis of catch and effort statistics. Given estimates of catch, effort, and catchability of a trawl, the biomass in a given region can be determined. This approach has been applied to the Russian 1988–1990 krill fishery in the Antarctic. The authors report that krill biomass estimated based on this method agree well with those of an annual acoustic survey.

W. Karp: Are estimated exploitation rates consistent with expectations of fishing mortality?

S. Kasatkina: Yes, they are quite close.

4.2.6 Acoustic assessment of jack mackerel in central Chile using commercial vessels equipped with Simrad EK60 echosounders (H. Peña, Chile)

This presentation reported on a Chilean industry-based acoustic survey of the jack mackerel stock. This work consists of two distinct phases. The first is the mapping of the spatial distribution of jack mackerel by 17 vessels over a large area. Each vessel mapped the presence of jack mackerel based on qualitative echo-sounder observations over several pre-planned transects. Vessels were allowed a subset of this time to explore higher density areas in the same manner that they would during normal fishing operations. All transects were completed over a period of ~1 week. Based on the results of this survey, a systematic survey was designed, and fishing vessels equipped with EK60 scientific echosounders were used to conduct an acoustic survey. Incorporating the first phase results allowed for an improved survey design in the second phase, which revealed for the first time that about 50% of the stock is distributed outside of the EEZ.

D. Reid: How good is the agreement between the phase 1 and 2 survey distributions?

H. Peña: We observed very good agreement in jack mackerel distribution between the 2 surveys.

S. Rosen: How did you incorporate the "fishing search" conducted by the skippers?

H. Peña: We have not incorporated this part of the survey yet, we feel that we do not have a high enough sample size to allow for this comparison, but hope to do this in the future.

S. Rosen: Why are fishing vessels equipped with scientific echosounders?

H. Peña: The fishing vessels purchased them in order to be more competitive for scientific charters.

4.2.7 "LIBAS" – a commercial trawler/purse seiner equipped for fisheries research. (A. Totland, Norway)

The presentation described a new vessel under construction by the Lie. Group fishing company in Norway. This vessel was designed in collaboration with the Institute of Marine Research. The intent was to construct a vessel that scientific institutions would preferentially charter. The 94 m vessel is equipped with diesel-electric propulsion, and has additional features designed to reduce radiated noise. The vessel is also equipped with a retractable keel, dedicated scientific space, and a 5 frequency scientific echosounder.

W. Karp: When will the vessel be completed? At what additional cost?

A. Totland: My understanding is that the vessel is almost completed. I'm not sure about the additional cost, but the intention is that that the vessel will be economically beneficial to both the owners and the scientific users.

4.2.8 Automated biological sampling of fishing catches (A. Totland, Norway)

A new system allowing automated processing of fishing catches is being developed by collaboration between the University of Aberdeen and the company Matcom. Scantrol will collaborate with these companies in order to bring a commercial product to market. The system is based on species recognition from optical imaging of fish and a system of conveyor belts, which move the catch past the camera. The system has been designed for 98% correct species recognition and can measure volume, length, weight, and projected area of specimens. The system is also able to put aside specimens for further analysis at a later time.

D. Reid: When was work started on this project and when will it be completed?

A. Totland: A commercial product is still a way off, but there is active work in this area.

S. Rosen: How rapidly can fish be processed?

D. Reid: In the original system, fish were processed at a rate of one specimen every 2–3 seconds.

4.2.9 Acoustic surveying from commercial vessels. North Sea Herring as a case study. (D. Reid, UK)

The aim of this project is to study the movement and fishing activities of the Scottish North Sea herring fleet in the context of the distribution of herring measured in traditional acoustic surveys conducted by a fisheries research vessel. The goals of the project are to understand which schools are taken and why. The project may help managers understand the relationship between catch and effort, which will allow managers to evaluate the utility of catch per unit effort statistics for management of this fishery. Acoustic loggers have been deployed on 6 pelagic vessels, and in a pilot study, a vessel has been equipped with an ES60 echosounder.

T. Pauly: Have you considered how you will analyze behaviour of fishing vessels?

D. Reid: This is the next step, and we intend to use observers to report why skippers decide to fish on some schools and not on others.

4.2.10 Vessel noise and its effects (Ron Mitson, UK, presented by W. Karp)

This presentation focused on the potential for radiated vessel noise to influence survey results. Survey vessels must be matched to research tasks, and it is important to have a consistent sampling platform. ICES noise limits have been designed to minimize fish avoidance of survey vessels. A new generation of low-noise research vessels conforming to this guideline has been constructed. However, most fishing vessels will not conform to these standards, which may affect survey results. The author suggests that when selecting commercial vessels for charter or other scientific data collection activities, one should avoid vessels with a controllable pitch propeller, measure noise signatures of vessels, and then calculate probable fish reaction distances from this information. In addition, one can quantify echo sounder performance by performing self-noise measurements.

M. Dorn: Have there been comparisons between new, quiet vessels and the previous generation of noisy research vessels.

D. Reid: To my knowledge, there have been no adjustments to acoustic time series indices based on the introduction of noise-quieted vessels.

W. Karp: Has the Institute of Marine Research conducted any vessel intercomparisons?

A. Totland: Vessel intercomparisons have been conducted, but analysis is not complete.

T. Pauly: Noise ranging of vessel noise is a point measure. How do you know how much variation occurs in noise spectra over time?

W. Karp: We need a protocol to measure vessel noise.

D. Demer: Suggested the use of hull mounted broadband hydrophones, which would allow for convenient measurement of noise spectra. These measurements are not equivalent to what is measured at noise ranges, but near field measurements from these hydrophones should be correlated in some way to far field measurements made in noise ranges.

Editor's note -R. Mitson reports that several publications show that noise rangings carried out on the same vessel after a gap of many years indicate very little change Mr Mitson also comments that hydrophones have been used by the

on the French vessel *R/V Thalassa* and has been tried by others. The results are rather crude and difficult to interpret so they are considered unlikely to lead to a satisfactory assessment of vessel noise and fish avoidance behaviour.

D. Demer: Made a general call for presentations on effectiveness of noise-reduced platforms. Called on scientists with information on this issue to present their results to the scientific community.

D. Demer: Made a general call for presentations on effectiveness of noise-reduced platforms. Called on scientists with information on this issue to present their results to the scientific community.

5 Develop standardized methods and protocols for collection

Develop standardized methods and protocols for collection of acoustic data to address specific ecosystem monitoring, stock assessment and management objectives including: acoustic system calibration and performance monitoring, characterization of radiated vessel noise, comparability of results, survey design, biological sampling, data interpretation and analysis, and data storage and management, and prepare background material, guidelines, methods and protocols for possible publication in the *Cooperative Research Report* series (Terms of reference b and c)

The Study Group engaged in extensive discussions regarding the outline of the final report, topics to be covered, the amount of detail that should be included under each topic heading, and responsibilities for preparation of draft materials.

Agreement was reached on the following draft final report outline, although it was understood that changes would likely be made as the work of the Study Group proceeds

5.1 Draft report outline

1) Introduction

- a) Problem statement (Terms of reference)
- b) Objectives
- c) Summary of relevant work. (what has been done)
  - i) Using fishing vessels as platforms for formal acoustic surveys using scientific or commercial echosounders
  - ii) Using commercial echosounders for informal surveys
  - iii) Unsupervised data collection
  - iv) Collecting acoustic data on other vessels of opportunity
- d) Potential applications
  - i) Habitat characterization
  - ii) Abundance indices and estimates
  - iii) Fish behaviour
  - iv) Fleet behaviour
  - v) Ecosystem monitoring
  - vi) Fishing effort determination
  - vii) Pilot surveys

2) Tools

- a) Vessel
  - i) Radiated noise
  - ii) SNR (selection of "best" speed/pitch)
    - 1) Crosstalk
    - 2) Frequency selection
  - iii) Weather susceptibility

iv) Power and grounding

v) Transducer location

1) Bubble and movement susceptibility

2) Multifrequency considerations

b) Instrumentation

i) Acoustic Instruments

ii) Conventional

iii) Sonars

iv) ADCP

v) Calibration

vi) Performance

c) Other instruments

i) GPS/VMS

ii) Vessel motion characterization/monitoring

iii) Meteorological instruments

iv) CTD and other sensors

v) Equipment integration/synchronization

vi) Time synchronization/event logging

d) Installing scientific equipment on commercial vessels

i) Towed bodies

ii) Pole mounts

iii) Hull mounts

iv) Transmitting through the hull

v) Using vessel's transducers

vi) Electronics

e) Remote operation

i) Remote instrument control

ii) Data transmission to and from shore

f) Biological sampling

i) Use of vessel's fishing gear

ii) Use of scientific sampling gear

iii) Gear instrumentation (performance monitoring)

iv) Data recording/catch sampling

v) Use of samples collected by other vessels (temporal and spatial concerns)

vi) Georeferencing

3) Analysis, processing and data management

a) Data management

i) Data logging

ii) Hardware

iii) Software

iv) Metadata

v) Logistical issues

b) Processing

i) Filtering (interference, triangle wave, etc)

ii) Manual procedures

iii) Automation

c) Analysis

i) Obtaining indices of abundance

ii) Geostatistics/spatial analysis

iii) Visualization and integration of data streams

iv) Provision of data for stock assessments

v) Provision of information for in season management

4) Issues regarding cooperative research with industry

a) Benefits/limitations of industry participation

b) Communication

c) Motivation and incentives for industry participants

5) Study Requirements (matching objectives with tools)

a) Advantages and limitations of using fishing vessels for acoustics

i) Advantages

1) Cost and benefits

2) Opportunities for collecting information at different spatial/temporal scales than possible with expensive single-vessel scientific surveys

ii) Limitations

1) Radiated vessel noise

2) Limitations of commercial echosounders

3) Signal to noise ratio

4) Interference

5) System stability

6) Limitations of "groundtruthing" from commercial catches

7) Other

b) Resolution and scale (Tradeoffs between data quality and spatial/temporal scales of acoustic data collection)

6) Recommendations

a) Future research – Potential topics:

i) Field trials to evaluate the comparability of acoustic data from fishing vessels with survey vessels. (inter-vessel comparisons)

ii) Collection and integration of other types of data

iii) Converting data into information (synthesis)

iv) Incorporation of new types of information into assessment and management

7) Annexes

i) Checklists

ii) Vessel/instrument characteristics

iii) Monograph for industry

5.2 Initial writing assignments

Writing assignments were discussed and initial assignments agreed upon. Those present further agreed that membership of teams assigned to write chapters and groups of chapters would likely evolve and that Study Group members not present at the meeting would be encouraged to accept writing responsibilities. The following initial responsibilities were noted:

Introduction and Summary of Relevant Work (M. Dorn and W. Michaels)
Tools
    Vessel (J. Dalen, R. Mitson)
    Instrumentation and Remote operation (G. Macauley, IMR)
    Biological sampling (W. Karp)
Analysis, processing and data management (D. Reid, M. Dorn)
Issues regarding cooperative research with industry (H. Peña)
Study Requirements (matching objectives with tools) (R. Kloser, S. Rosen)
Recommendations (W. Karp, R. Kloser)
Annexes
Other interested authors include R. O'Driscoll, F. Gerlotto, M. Gutierrez

5.3 Preparation and review of draft text

It was agreed that text would be drafted in preparation for the 2005 meeting of SGAFV. Writing teams and lead responsibilities would first be finalized by email and authors would be encouraged to provide initial drafts for review by Study Group members by October, 2004. Overall, the goal is for lead authors to assemble comprehensive drafts in advance of the 2005 meeting to facilitate effective development of the manuscript during that meeting.

6 Recommendations

The Study Group reviewed the terms of reference and recommended the several changes. These recommendations are documented in the following table.

The Study Group on Collection of Acoustic Data from Fishing Vessels [SGAFV] (Chair: W. Karp, USA) will meet in Rome, Italy, from 17–18 April 2005 to:

a) Update and summarize information on research which involves collection of scientific acoustic data from commercial vessels;
b) develop recommendations for methods and guidelines for collection of acoustic data to address specific ecosystem monitoring, stock assessment and management objectives including: acoustic system calibration and performance monitoring, characterization of radiated vessel noise, comparability of results, survey design, biological sampling, data interpretation and analysis, and data storage and management, and
c) prepare background material, guidelines, methods and recommendations for possible publication in the *Cooperative Research Report* series.

The Study Group will report by 31 May 2005 for the attention of the Fisheries Technology Committee.

Supporting Information

Priority	Acoustic data is currently being collected from commercial vessels in many countries to address a range of ecosystem monitoring and stock management objectives. Methods, standards, and protocols for this type of data collection activity are lacking, and concerns regarding instrument performance and calibration, fish behaviour in relation to radiated vessel noise, survey design, biological sampling, data interpretation and management, and other factors have arisen. There exists an urgent need to evaluate this work and to develop recommendations for methods and guidelines for appropriate collection and use of acoustic data from commercial vessels. This need has been identified by a number of ICES member countries and observer countries and has been conveyed to WGFAST and FTC.
Scientific Justification and relation to the Action Plan	Action Item 1.10, 1.12.5, 1.14, 3.13 – a Action Item 1.13.1, 1.13.4, 1.13.5 – b Action Item 6.3 - c

	Term of reference a): Collection of acoustic data in support of ecosystem monitoring, stock assessment and other scientific objectives has traditionally been carried out with calibrated scientific instruments aboard research vessels. Demands for this type of information have continued to expand and, in many cases, now exceed the capacity of national research vessel fleets. At the same time, improvements in technology have made instruments capable of collecting scientific-quality acoustic data more widely available, and these types of instruments are being installed on many commercial fishing vessels. Scientists have taken advantage of this opportunity to collect data in support of a range of research and assessment objectives. Term of reference b): Standardized methods and protocols have been developed for routine acoustic surveys aboard research vessels, and concerns regarding research vessel radiated noise impacts on fish behaviour have received significant attention by WGFAST and the broader scientific community. However, recommended methods and guidelines for collection of acoustic data from commercial vessels do not exist, and objective criteria for matching data collection procedures with research objectives, or for evaluating data quality are lacking. While commercial vessels equipped with calibrated commercial sounders are suitable for collecting data in support of some specific research and survey objectives, use of these platforms and instruments will not always be appropriate. Term of reference c): There is a recognized need to develop methods and protocols and publish them in an easily accessible report. WGFAST and FTC continue to recognize the difficulty of addressing these needs during full working group sessions and support the continuation of this Study Group comprised of experts to develop recommended methods and guidelines without delay. This Study Group will meet three times. The second meeting will occur in Rome, Italy in April, 2005.
Resource requirements	No new resources will be required for consideration of these topics at the relevant group meetings. Having overlaps with WGFAST meetings, this SG will draw on a larger resource pool of experts which will increases efficiency in completing the objectives and reducing travel costs.
Participants	Twenty five scientists from six ICES and three observer countries attended the first meeting of the Study Group. At least six additional scientists expressed interest in participating in the work of the Study Group, but were unable to attend the 2004 meeting. Interested fishing industry representatives should be invited to participate.
Secretariat facilities	None.
Financial	No financial implications. Having overlaps with other meetings of expert groups of FTC increases efficiency and reduces travel costs.
Linkages to Advisory Committees	There are no direct linkages to the advisory committees but the work is of relevance to ACFM
Linkages to other organisations	No direct linkages, however, depending on the outcome organizations such as FAO will be interested in the results.
Linkages to other Committees or Groups:	WGFAST. This work should have relevance to many working, groups carrying out stock assessment of many semi-demersal and pelagic species in many ICES countries
Cost Share	ICES 100%

7 List of Participants

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8 Annexes

Annex 1 Proposal from S. Kasatkina

For post-processing methods

1) Haul-by haul data from individual fishing vessel operations (i.e. coordinates of trawl start, time of trawl start, trawl duration, vessel speed during trawling and catch per trawl) can be used to determine the operational statistics of the fishing fleet. Results of acoustic surveys carried out in the areas of fleet operations should be accompanied with such statistical data from commercial fishing activities.

Documentation of distributional patterns of different fish aggregations forms an important part of post-processing acoustic data analysis.

2) Spatial distribution patterns of fish aggregation and acoustic indices of abundance could be analyzed in relation to the operational statistics of fishing fleet located in the surveying area.

The objects of this comparative analysis are:

- studying the commercial significance of different fish aggregation forms;
- understanding the properties of fish aggregations and the significance of this to the fleet;
- understanding the catchability of the fleet and the catchability of different fisheries systems (gear types?);

- understanding the fleet behaviour and individual fishing vessel behaviour in relation to the distribution of fishable biomass;
- preparing proposals for fleet use of acoustic survey results (for example, mapping of potential CPUE distribution).

Future : Development of methodology which uses results of acoustic surveys to identify potential fishing grounds and likely catch rates.