ICES SGAFV Report 2006

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

25–26 March 2006

Hobart, Tasmania

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

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Contents

Executive summary

The ICES Study Group on Collection of Acoustic Data from Fishing Vessels (SGAFV) held its third and final annual meeting at the CSIRO Marine Laboratory, Hobart, Tasmania, Australia on 25–26 March 2006, prior to the 2006 meeting of the Working Group on Fisheries Acoustic Science & Technology (WGFAST). The meeting was chaired by Dr. W. Karp (USA). Mr. T. Ryan (Australia) acted as Rapporteur. The Chair opened the meeting by thanking CSIRO 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 draft chapters for the final SGAFV report (to be published as an ICES Cooperative Research Report;
- Agree on any necessary changes in the structure and content of the final report; and
- Agree on a schedule for updating chapter text, drafting new material, and completing report editing process.

Reviews of key sections of the final SGAFV report were then conducted.

- Introduction (Lead authors Martin Dorn, USA; Richard O'Driscoll, New Zealand. Presented by Martin Dorn);
- Study requirements (Lead authors Rudy Kloser, Australia and Shale Rosen, USA. Presented by Rudy Kloser);
- Fishing vessels as sampling platforms (Lead authors Ron Mitson, UK and John Dalen, Norway. Presented by John Dalen);
- Instrumentation and remote operation (Lead Authors Gavin Macauley, New Zealand; Atle Totland, Norway; Olav Rune Godø, Norway. Presented by Gavin Macauley);
- Biological sampling (Bill Karp, USA);
- Issues regarding cooperative research with industry (Hector Peña, Norway), and
- Analysis, processing, and data management (Lead authors Gary Melvin, Canada and Tim Ryan, Australia. Presented by Tim Ryan).

Study Group members discussed numerous changes in the text and minor changes in document structure. Agreed-upon changes were documented by the Rapporteur and will be incorporated in the next draft by individual chapter authors.

The chapter originally entitled "analysis, processing, and data management" will be split into two separate chapters entitled "data collection and management" and **"**data processing and analysis". Some sections from the original chapter will be transferred to other sections of the report and some sections from other chapters will be transferred to the new chapters.

The data collection and management chapter will highlight the need for development of an operations manual for each industry acoustics study and provide suggestions for topics to be covered. References and URLs for example documents (such as the Alaska Fisheries Science Center's protocols for industry acoustic data collection or the ICES Planning Group for Herring Surveys (PGHERS) field manual) will be provided.

Chapter titles and order were revised as follows:

- Executive summary
- Introduction
- Study requirements
- Vessels as sampling platforms

- Instrumentation
- Data collection and management
- Biological sampling
- Data processing and analysis
- Cooperative research issues.
- Recommendations*
- Annex 1. Abstracts (or references) for industry acoustics studies presented at the 2003 WGFAST meeting and at the SGAFV Meetings in 2004 and 2005.

* The Study Group discussed various options for including recommendations in individual chapters and/or combining them in separate sections. The Chair agreed to seek guidance on this issue from the ICES Publications Committee.

The Chair emphasized the importance of reaching agreement on a schedule for submitted a complete, edited manuscript to the ICES Publication Committee. All present agreed to adhere to the following schedule:

- Chapter authors will incorporate agreed-upon changes and update chapters by 15 May 2006
- Chair will review updated chapters and distribute edited comprehensive draft to authors by 30 June 2006
- Lead authors will review full document and suggest final changes and edits to the Chair by 30 July 2006
- Chair will submit complete final draft to ICES Publications Committee by 30 August 2006

The Chair agreed to seek guidance from the Publications Committee on style, format, and timing and to keep authors informed on these issues.

Finally, SGAFV members discussed the importance of maintaining focus on industry acoustics among community members. Suggestions included proposing a theme session at a future ICES ASC and/or including a theme session on this topic at the 2008 ICES Symposium on Fisheries Acoustics, Science and Technology. Rudy Kloser, an SGAFV member who is also a member of the steering committee for the 2008 Symposium, suggested that papers on use of fishing vessels for collection of acoustic data would be solicited for the session on alternate platforms that will be included in the symposium schedule.

1 Opening of the meeting

The ICES Study Group on Collection of Acoustic Data from Fishing Vessels (SGAFV) held its third and final annual meeting at the CSIRO Marine Laboratory, Hobart, Tasmania, Australia on March 25 and 26, 2006, prior to the 2006 meeting of WGFAST. The meeting was chaired by Dr. W. Karp (USA). Mr. T. Ryan (Australia) acted as Rapporteur. The Chair opened the meeting by thanking CSIRO and introducing those present.

2 Adoption of the agenda

Following a brief discussion, SGAFV adopted the proposed agenda without change. The Chair asked those present to bear in mind the primary tasks to be accomplished at this meeting:

- Review draft chapters for the final SGAFV report;
- Agree on any necessary changes in the structure and content of the final report; and
- Agree on a schedule for updating chapter text, drafting new material, and completing report editing process.

3 Terms of reference

The Chair reviewed the 2006 terms of reference for SGAFV:

a) update, summarize and report on 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 publication in the Cooperative Research Report series.

4 Review of draft chapters

4.1 Introduction and summary of relevant work (M. Dorn/R. O'Driscoll)

During the meeting, SGAFV agreed that the introduction section of the final report would be quite brief. The current draft for this text follows below.

In the last half of the previous century, there was rapid and parallel development of acoustic instruments for both scientific and fishing applications. The general requirement of both groups of users is the same – to visualize biological objects in the water column well beyond the range of human vision. Fishers use the information from their sonars and echosounders to catch fish more effectively, while fisheries scientists use similar acoustic information to study fish distribution and estimate stock abundance. The major difference between fishing and scientific applications of acoustics is in the quality and level of interpretation of the acoustic data. Quantitative interpretation of acoustic returns is required for most scientific work, but is not essential when acoustics is used by fishers as sensing tool. Consequently, scientific acoustic instruments have historically been of higher quality, with more stable electrical components, settings that allow the instrument to be calibrated to known standards, and providing electronic access to data outputs.

Recently, top-end commercial echosounders have become more similar in quality and capacity to scientific echosounders. This convergence has taken place because of several technological developments. The first key development is the adoption of a common PC platform for both commercial and scientific echosounders. Software and applications developed for scientific work can be easily be adapted for commercial echosounders. A second technological advance is the ongoing development of portable data storage devices. These devices enable reliable collection of large quantities of data in both supervised and unsupervised situations. Another final major advance is the widespread availability and integration of the global positioning system (GPS), which allows the acoustic information to be evaluated in a spatial context.

As these modern instruments have been installed on commercial fishing vessels, fisheries scientists in many countries have taken advantage of the opportunity to collect acoustic data from commercial vessels in support of a range of ecosystem monitoring and stock management objectives. Many fishers and vessel owners will also voluntarily collect acoustic data if they believe that the information they provide will be useful for assessment and management of their fishery. The shift towards increasing use of commercial vessels as platforms for acoustic data collection has occurred as part of the evolution of fisheries resource management science towards a more vital exchange of information between fishers and scientists. Cooperative research programs benefit both fishers and researchers. Fisherman can play a more active role in the science that affects their livelihoods, and researchers can access the extensive empirical knowledge of fish behaviour that fishers gain from years of experience.

Despite widespread and increasing use of commercial vessels for acoustic data collection, standardized methods and protocols do not exist. 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 received significant attention by the Working Group for Fisheries Acoustics Science and Technology (WGFAST) and the broader scientific community. While commercial vessels and commercial echosounders 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. There is 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 the Fisheries Technology Committee. A Study Group on Collection of Acoustic Data from Commercial Vessels (SGAFV), chaired by Dr. W. Karp (USA), was formed to address the following terms of reference.

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

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.

c) Prepare background material, guidelines, methods and protocols for publication in the Cooperative Research Report series.

The Study Group was active from 2004 to 2006 and met three times:

Gdynia, Poland, 16–17 April 2004

Rome, Italy, 17–18 April 2005

Hobart, Australia, 25–26 March 2006

4.2 Study requirements (R. Kloser)

The motivation to collect acoustic data from industry vessel platforms can be considered under two main headings:

- data used to address a species specific fishery (single species stock assessment);
- data used in the ecosystem approach to fisheries management.

The chapter explores the study requirements from calibrated or uncalibrated acoustic data obtained from directed surveys or undirected data collection in both these areas. In order to maximise the utility of the information obtained from the acoustic data the chapter emphasises the need to match the study requirements with the tools and level of direction required. Important in this process is an evaluation of the cost of the study to the impact the data will have in either addressing a specific management need, ecological indicator or understanding the functioning and dynamics of the marine ecosystem. Specifically the chapter concentrates on the fisheries management needs but also includes a section on the data needs for the ecosystem approach to fisheries management.

The section headings for the chapter are as follows:

- Introduction
- Single species stock assessment
    - Use of acoustic data for an absolute estimate of abundance
    - Use of acoustic data to provide a time series
- Ecosystem approach to fisheries
- Example sampling strategies
- Summary.

In summary, acoustic data from fisheries vessels needs to be placed in context with the overall objectives of the study and its impact on the management of the fishery and the overall input to the ecosystem approach to fisheries management. Ideally there needs to be clear objectives of the data collection and an assessment of the precision and accuracy required of any quantitative metrics derived. The utility of qualitative metrics should also consider and how these could assists in general understanding of stock dynamics and ecosystem function.

A major conclusion thus far is that monitoring in fisheries using acoustics should include a qualitative or quantitative evaluation of monitoring needs through a monitoring strategy within a harvest strategy to explore all methods of data collection including industry platforms.

4.3 Fishing vessels as sampling platforms (J. Dalen)

SGAFV was established to assist in enabling new and innovative approaches to the collection of acoustic data and to take advantage of opportunities for collecting this kind of data from fishing vessels. But commercial fishing vessels differ from research vessels in a number of important ways. These factors may impact the ability of researchers to collect scientifically useful acoustic data or may constrain the quality of data that can be collected, thus potentially restricting the extent to which inference can be drawn.

Selection of a suitable vessel and appropriate operation of that vessel may be critical to the success of a field research project, which involves acquisition of acoustic data. Our goal is to help the reader understand the tradeoffs associated with selection of vessels and vessel operating parameters. Another goal is to encourage choices that do not compromise an investigator’s ability to collect data of the quality necessary to address his or her research objectives.

Noise-reduced vessels are not, however, always available. Administrators and investigators may be asked to decide which surveys or research studies should be conducted only from CRR 209[1]-compliant platforms, or to determine if research and survey objectives can be met through use of non CRR 209-compliant research vessels or commercial vessels. As has been pointed out, "The low–frequency noise specification depends on the species to be surveyed, its hearing capability, reaction behaviour, and depth distribution."[2]

Some fish species can detect ship noise at long distances when the ambient noise levels are low and where homogeneous propagation conditions exist, but they are unlikely to react unless the noise level is relatively high, typically when the distance is a few hundred metres or less. The reaction level of the fish is not a constant because biological and physiological factors, ambient noise and sound transmission anomalies have the potential to cause significant variations.

Abnormally high ambient noise levels in an area may effectively mask vessel noise or preclude fish from extracting directional information that might influence behavioural response. This confounding factor may be of particular concern in shallower waters. Factors such as the biological and physiological states of the fish (e.g. spawning and feeding states, migration states) or physical environmental conditions (e.g. water temperature, prevailing light levels, (or vessel lights at night)) may also influence the type and magnitude of any reaction. It should also be noted that fish may habituate to external stimuli so and, therefore, behavioural responses may lessen or cease after prolonged exposure.

It is difficult to predict fish behaviour in response to vessel noise and it may be necessary to take into account the sensitivity of the species and the characteristics of the physical environment, which supports a cautious approach to the selection of vessels as research platforms. The CRR 209 information should be especially helpful in developing criteria for suitable research platforms.

Evidence that fish audiograms and vessel noise have similar low-frequency spectra suggests that the vessel avoidance behaviour of fish is due to such noise radiated from the propeller and hull. Detailed features of the vessel noise spectrum depend on the type of machinery used, the vessel speed and the propeller loading. Although propeller noise contributes to the full frequency spectrum, the predominant variations in amplitude at low frequencies are due to machinery. Above about 1 kHz, principally the propeller is the noise source.

Controllable pitch propellers normally cavitate to some extent throughout the full set of operating conditions with the lowest levels at maximum blade pitch. Any change of propeller shaft speed can have a significant effect on noise levels. For fixed-blade propellers cavitation may start suddenly at a critical speed or loading, typically between 9 and 12 kt for the type of vessel we are concerned with. Because of this it is necessary to run at a speed below the occurrence of full cavitation. Fixed pitch propellers are highly recommended, especially for assessment of hearing sensitive species at close range. Special attention has to be made for vessels having controllable pitch propellers due to the high variability and levels of radiated noise they produce, particularly transients.

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1 Mitson, R.B. (ed). 1995. Underwater Noise of Research Vessels: Review and Recommendations. ICES Cooperative Research Report No 209, 61 pp.

2 Simmonds, J. and MacLennan, D. 2005. Fisheries acoustics, theory and practice. Second Edition. Blackwell Publishing, Oxford. 437 pp.

The sea state resulting from wind induced waves and swells can have a significant impact on the quality of the backscatter signal received by an echo sounder and subsequent biomass estimates. Two factors combine to contribute to the degradation of the acoustic signal; vessel motion and air bubbles in the surface waters (depths less than 30 m). When weather conditions are medium to poor, hull mounted echo sounder transducers suffer from aeration and noise due to wind generated air bubbles and bubbles being trapped beneath the hull. Modern survey vessels are often equipped with a protruding keel, or a section of the keel that protrudes below the maximum depth of the hull line. Transducers mounted in these structures can operate at depths of 2–3 m below the hull and, therefore, below the most severe bubble layer. This capability is unlikely to be available on most fishing vessels but hull-mounted transducer placement may be an important factor in determining the suitability of a commercial vessel for collecting acoustic data, and the range of operating and weather conditions within which useful data can be collected.

Almost all of the noise measurements of research vessels have been at naval ranges where certain procedures are used. The radiated “noise signature” of a vessel can be obtained on certain ranges within given frequency limits. Third octave band measurements are normally made, then converted to a 1Hz band. Narrow band measurements are necessary to identify any tones. Port and starboard measurements are taken separately but simultaneously and later combined to give an average result. If weather and oceanographic conditions are exceptionally favourable it may be possible to use a portable noise range set-up.

Documentation of noise signatures would assist in the selection process of vessels suitable for surveys. The vessel whose signature is closest to the ICES CRR 209 recommended levels and not exceeding them by more than 20 dB at frequencies up to 1 kHz should be preferred. A minimal and low level tonal content is desirable.

4.4 Instrumentation and remote operation (G. Macauley)

A wide variety of equipment (acoustic and non-acoustic) is found on fishing vessels, and which can be used to collect data that is of value for fisheries research and stock assessment. The main instruments of interest are the acoustic type, and these include conventional echosounders, sonars, multibeam echosounders and acoustic Doppler current profilers (ADCP, also known as acoustic Doppler logs). Acoustic equipment can be placed in three categories – unstable uncalibrated, stable uncalibrated, and stable calibrated. Each category has some use as a survey tool, ranging from basic scouting, distribution estimation, distribution estimation with improved comparability over time, through to abundance estimation of scientific quality.

A non acoustic sensor that is essential in almost all cases is the GPS receiver as it allows the acoustic data to be spatially located. Other sensors include vessel motion sensors (tilt, roll, heave, heading, and speed), which provide additional contextual information on the physical motion of the vessel and hence the transducer. The tilt and roll, in particular, can be used to improve the quality of the acoustic data by correcting for motion of the acoustic transducers.

Meteorological and oceanographic instruments can also provide contextual information that aids the interpretation of the acoustic data. Such instruments include sensors to measure wind speed and direction, light intensity, air temperature and pressure, water conductivity and temperature. Fish behaviour can depend on such conditions and the uses to which the various instruments can be put are discussed.

Installing scientific equipment on a vessel is an option when the required equipment is not available or not suitable. The various ways in which this can be achieved are discussed, as are the advantages and disadvantages.

The potential for acoustic interference between acoustic equipment can degrade the quality of the acoustic data, but can be eliminated by synchronizing the equipment. Techniques and procedures for achieving this are discussed, as are items of importance for subsequent analysis of the data (e.g. time synchronization between data from different instruments).

The recommendations for this chapter are that:

- GPS data should always be collected (and in a manner that links it to the acoustic data).
- Calibration of acoustic systems are required for quantitative use of acoustic data
- Appropriate echosounder settings are of particular importance (e.g. transmit power, pulse length), and a procedure should be put in place to periodically record or check that the settings are as required.
- The utility of data from additional sensors should be placed in the context of the effort required to collect the data, and the usefulness of the data.

4.5 Biological sampling (B. Karp)

In most situations, identification and characterization of backscatter is required to meet research objectives. This is generally achieved through direct sampling. Information on biological characteristics is necessary to address two distinct but interrelated concerns. First, mean target strength estimates are required to scale absolute or relative biomass estimates. Second, for many studies it is important to partition biomass by size, age, and/or other biological characteristics.

While an important goal of direct sampling during scientific surveys is to minimize selectivity, this is not normally the case in commercial fishing.

Sampling effectiveness does not depend only on gear selectivity. Avoidance may also be important. Modern fishing vessels and research vessels are equipped with a range of sonars which may provide evidence of sampling gear avoidance. The vertical echosounders used for fishing and scientific operations may also be useful in this context.

Approaches for collecting biological data

1) Types of Sampling:

- Commercial and Research Fishing
  - Biological sampling data cannot be collected (e.g. when the vessel is transiting to or from the fishing grounds or if the vessel's gear is unsuitable for sampling echo traces encountered during all or part of the deployment).
  - Biological data is provided from commercial gear directed to sample only aggregations of commercial interest (normal commercial fishing)
  - Only unmodified commercial gear is available, but vessel operators are willing to collect additional samples in accordance with agree-upon protocols
  - Some modification of commercial gear is possible to reduce selectivity (e.g. a trawl net modified with a codend liner) and/or the vessel is willing to deploy sampling gear in accordance with agreed-upon protocols
  - Concurrently collected scientific sampling data is available (e.g. from research surveys conducted in the same location during the same time period), or echo trace composition can be inferred from other research activities.
- Catch Processing
  - At-Sea Observers
  - Training of Vessel Personnel
  - Port Sampling

2) Implications for Data Processing
3) Other Considerations

Chapter recommendations:

- Define biological data needs appropriate to study objectives
- Quality control required for sampling by industry personnel
- It is important to consider the influence of selectivity of commercial gear
- Development of biological sampling protocols is essential

4.6 Analysis, processing and data management (T. Ryan)

The section on data management notes the importance of this topic as data volumes can be very high from industry vessels, especially when multiple vessels are involved. Under the data management section, data logging, calibration, survey settings and when to log data are discussed. The hardware section discusses components of echosounders and various configuration possibilities, such as frequencies.

Available software is discussed and it is noted that most packages are tied to hardware from the same company. The exception is Echoview, which is a generalised package that can handle data from many of the commercially available echosounders.

The metadata section discuses metadata recorded as part of the acoustic record and that recorded in relation to other data sets (e.g. CTD, trawl information, biological measures etc. Several methods for recording metadata are available, ranging from paper records through to multi-table databases. The HAC format is a generic format to allow exchange of digital data from various different acoustic systems.

The section on logistical issues covers retrieval of data (e.g. removable IDE drives, external USB, CD/DVD, ftp). It also covers the logistics of calibration (water depth required, personnel, time needed). Maintenance of systems across dispersed fleets is challenging and highlights the need to have procedures in place to check data so that problems can be identified and remedied.

The processing section works through procedures of validating, screening and filtering data in preparation for specific analysis. Files can be divided into 3 categories – files that are specific to survey objectives, files that may be useful for analysis, and files that are of no value. Filtering of data can occur internally within echosounders prior to output (e.g. data compressions, thresholding, Simrad triangle wave error) or as user initiated filtering such as thresholding to reduce data volume.

The manual procedures section considers the manual activities operators carry out – segmentation of files, editing of bad data, noise, dropouts etc. Identification and classification is the most subjective of the manual procedures. Groundtruthing of acoustic data is necessary but problematic due to sampling biases in net systems. Once echograms are classified, there is usually a manual process of defining polyregions on the echogram around the classified echogram features.

Automation is in its infancy but rapidly developing. Areas of automation include target identification, species classification, school detection and seabed classification. Other areas of automation discussed are target detection, echo counting and target tracking. Multifrequency methods are also touched on in this section. Future direction will include linkages with other data sets (environmental, biological samples, bottom type etc).

Analysis typically follows 7 steps:

1) Identify portion of acoustic data to analyse

2) Apply corrections for sound speed and absorption
3) Calibration corrections for Sv and/or TS gain
4) Other corrections (e.g. motion or deadzone)
5) Data quality control (e.g. bottom pick, bad data)
6) Interpretation
7) Echointegration

The importance of working under a standard survey design is stressed if quantitative results are required. Indices of abundance usually require 5–10 years for use as relative measures of stock size.

Geostatistical methods explore the inherent spatial structure of the data and are particularly applicable to opportunistic/ad hoc data typical of many industry-acoustic data sets. A brief overview of geostatisitcs is given.

Visualisation and integration of data streams is looked at. Examples include colour coding vessel track with along track information (e.g. backscatter values), 3d visualisation of single and multibeam data.

Industry data in many cases is now of suitable quality to be used in stock assessment provided the survey design is sound. Conversely, data from standard fishing operations is difficult to incorporate. Somewhere in between formal surveys and fishing operation data are opportunistic surveys collected following some pre-defined guidelines. Such data has potential for quantitative analysis and incorporation into assessments.

An number of fisheries have need for in-season management decisions. An example from the Bay of Fundy/Nova Scotia herring fishery is given to demonstrate how industry acoustic data has been used for in-season management.

4.7 Issues regarding cooperative research with industry (H. Peña)

Cooperation with the fishing industry to undertake scientific research is not new, although there is an increasing trend in the degree of the involvement, especially in the major fishing nations.

There are two main categories in which commercial vessels are used for scientific purposes: science-dependent and independent platforms. The first when the fishing vessel is dedicated to a specific scientific, technical or administrative (management) purposes. In this case the ship is under the direct supervision of scientist staff during the survey, and undertakes activities necessary to meet the scientific requirements defined by a survey design or sampling protocol. The second category implies the use of scientific tools, designed to operate in a completely autonomous way, which are installed aboard the fishing and set for continuous operation or at the captain’s discretion.

One of the main advantages in the use of commercial fishing vessels as acoustic platforms for scientific purposes is the potential for rapid coverage of a survey area by using several fishing vessels simultaneously, improving the normal coverage of the research platforms. Economic benefits may also be important because under most situations the operational and charter costs of a fishing vessel are much lower than a research vessel.. Commercial vessels are also generally more readily available and provide flexibility in timing. Employing fishing vessels to undertake scientific data collection provides a mechanism for dialog and education of both parties, increasing the understanding and the level of trust between the fishing industry and the scientific community.

In contrast, uses of commercial vessels may be limited by a lack of scientific equipment onboard, making it difficult to obtain quantitative acoustic data from commercial fishing echo sounders, although this situation has improved in recent years. The noise vessel of commercial vessels is usually unknown and hard to measure, introducing an important potential for bias in acoustic sampling.. On many commercial vessels calibration is difficult, especially if the transducer is single beam or the location of the transducer on the hull is uncertain. Intercalibration is a critical point when more than one vessel is used, either during multiple ship surveys or by chartering a different vessel each time. The availability of commercial vessels could be low especially during the peak fishing season. Finally, the use of a fishing vessel for research may introduce feeling of inequality among fishermen if one competitor is advantaged through access to scientific information, quotas, using unauthorised fishing gear, etc.

Communication is critical when using fishing vessels for research purposes. The goals, objectives, responsibilities, data access authorization and the methods of information dissemination need to be understood by all stakeholders. Agreements between both parties are essential and should provide for defined terminology, methods for the dissemination of results and confidentiality information collected.

Special quota allocations for vessels involved in cooperative research offer an obvious motivation for participation by industry. In recent a number of fishing companies have become involved in cooperative research due to their long term concerns for the viability of the resources they harvest. .

Several mechanisms are available to ensure that the responsibilities of government and industry partners are clearly understood by all participants.. A detailed contract between both parties should be signed before the start of the project, specifying the activities that the vessel must complete and also the responsibilities of the research institute that leads the project. In the case where additional quota is used as an incentive, non-compliance with the terms could result in the loss of the research quota.

5 Consideration of US (Alaska Fisheries Science Center) draft protocols for collection of acoustic data from fishing vessels

SGAFV reviewed the US protocols document and considered it to be a good example of a field manual for collection of acoustic data from fishing vessels. It was agreed, however, that the manual was too specific to be included as an appendix to the SGAFV final report. The study group discussed the need to provide guidance on the preparation of a field manual. It was suggested that chapter heading from the US manual could be included or, if the manual itself is published on the internet, the appropriate URL would be included in the data collection and management chapter. It was also agreed that instructions developed by ICES for acoustic assessment of herring (PGHERS) would be useful and that the URL for this document would also be included.

6 ICES Cooperative Research Report structure and chapter content

Chapter titles and order were revised as follows:

- Executive summary
- Introduction
- Study requirements
- Vessels as sampling platforms
- Instrumentation
- Data collection and management

- Biological sampling
- Data processing and analysis
- Cooperative research issues.
- Recommendations*
- Annex 1. Abstracts (or references) for industry acoustics studies presented at the 2003 WGFAST meeting and at the SGAFV Meetings in 2004 and 2005.

*The Study Group discussed various options for including recommendations in individual chapters and/or combining them in separate sections. The Chair agreed to seek guidance on this issue from the ICES Publications Committee.

7 Schedule for completion of draft ICES Cooperative Research Report

The Chair emphasized the importance of reaching agreement on a schedule for submitted a complete, edited manuscript to the ICES Publication Committee. All present agreed to adhere to the following schedule:

- Chapter authors will incorporate agreed-upon changes and update chapters by 15 May 2006;
- Chair will review updated chapters and distribute edited comprehensive draft to authors by 30 June 2006;
- Lead authors will review full document and suggest final changes and edits to the Chair by 30 July 2006;
- Chair will submit complete final draft to ICES Publications Committee by 30 August 2006.

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Annex 2: Agenda

1) Introductions, agenda and appointment of Rapporteur
   - Local Organization
   - Review Terms of Reference
   - Review Draft Agenda
   - Appointment of Rapporteur
2) Review draft report chapters and authorship
   - Fishing Vessels as Sampling Platforms (J. Dalen)
   - Instrumentation and Remote Operation (G. Macauley)
   - Biological Sampling (B. Karp)
   - Analysis, Processing and Data Management (T. Ryan)
   - Issues Regarding Cooperative Research with Industry (H. Peña)
   - Study Requirements (R. Kloser)
   - Introduction and Summary of Relevant Work (M. Dorn/R. O'Driscoll)
3) Consider US (NMFS – AFSC) Draft protocols for collection of acoustic data from fishing vessels

   Develop draft recommendations for final report
4) Update and finalize draft report structure, chapter and authorship
5) Develop schedule for preparation and review of final draft
6) Adoption of meeting report
7) Other business

Annex 3: Recommendations

SGAFV members discussed the importance of maintaining focus on industry acoustics among community members. Suggestions included proposing a theme sessions at a future ICES ASC and/or including a theme session on this topic at the 2008 ICES acoustics conference. Rudy Kloser, an SGAFV member who is also a member of the steering committee for the 2008 symposium, suggested that papers on use of fishing vessels for collection of acoustic data would be solicited for the session on alternate platforms that will be included in the symposium schedule.