ICES SGFOT REPORT 2008

ICES Fisheries Technology Committee

ICES CM 2008/FTC:05

Report of the Study Group on Fisheries Optical Technologies (SGFOT)

14-15 June 2008

Bergen, Norway

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

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Executive summary

The Study Group on Fisheries Optical Technologies (SGFOT) held its second meeting at the Institute of Marine Research (IMR) in Bergen, Norway from 14–15 June 2008. Eirik Tenningen (Norway) was Chair and Terje Torkelsen (Norway) was Rapporteur. There were 14 participants from Canada, Denmark, Germany, New Zealand, Norway, Sweden and USA.

The main focus was to review the *ICES Cooperative Research Report* outline produced at the 2007 meeting. The chapter headings are:

- Introduction
- Optical Technologies
- Integration
- Data Processing
- Application
- Recommendations
- Glossary
- Suppliers
- References

Responsible authors for all the chapters and sub sections have been appointed. Terms of Reference for 2009 are given.

1 Terms of Reference

2007/2/FTC05 The **Study Group on Fisheries Optical Technologies** [SGFOT] (Chair: E. Tenningen, Norway) will meet in Bergen, Norway from 14–15 June 2008 to:

a) Evaluate progress of the review of optical technology as agreed on the 2007 SGFOT meeting and finalize Cooperative Research Report structure;

b) Review the outcome of the recent relevant conferences (e.g. Oceans 2007);

c) Discuss recommendations for future work within optical technology to service the ecosystem approach for fisheries management.

SGFOT will report by 31 July 2008 for the attention of the Fisheries Technology Committee.

2 Introduction

The Study Group on Fisheries Optical Technologies (SGFOT) held its second meeting at the Institute of Marine Research (IMR) in Bergen, Norway from 14–15 June 2008. Eirik Tenningen (Norway) was Chair and Terje Torkelsen (Norway) was Rapporteur. Eirik Tenningen opened the meeting and reviewed the agenda.

3 Evaluation of progress of the review of optical technology and finalizing of Cooperative Research Report structure

To address the Terms of Reference a), the group reviewed the Cooperative Research Report outline produced at the 2007 meeting and evaluated the writing process. To ensure the desired progress of the report writing a time schedule was agreed.

The revised Cooperative Research Report outline is given in section 3.1. Eirik Tenningen (Norway) and James H. Churnside (USA) will be report editors and a chapter coordinator for each chapter is appointed. The chapter coordinator will be responsible for writing an introduction and synthesis for each chapter as well as supervising the writing of each section in the chapter. One or two responsible authors are appointed for each section.

There has been a discussion in the group on how to limit the size of the Cooperative Research Report. The group agreed to leave out certain topics, including satellite measurements, bulk optical measures and only briefly discuss habitat classification. A justification for this will be given in the introduction chapter.

3.1 Cooperative Research Report outline

Executive summary

Introduction

Optical Technologies

Cameras
Lidar
External lighting
Optical counters
Didson sonar
Laser line scanning
Range gated lasers

Holography
Hyperspectral imaging

Integration

Platforms
Cables
Power sources
Electronics
Ancillary sensors
Control and display software
Synchronisation
Recording media
Geo location

Data Processing

Stereo cameras
Image analysis
Image interpretation
Data compression and file formats
Data management
Meta data
Calibration
Measurement uncertainty

Applications

Optical surveys
Fishing gear performance
Lidar surveys
Supporting acoustic measurements
Behaviour
Fishery observation
Outreach
Catch sampling
Habitat classification

Recommendations

Glossary

Suppliers

References

3.2 SGFOT time schedule

01.12.2008	The responsible authors of each section send their section drafts to the chapter coordinators
01.02.2009	The chapter coordinators send their chapter drafts to the editors
15.04.2009	The report draft is distributed among the members for review
16–17.05.2009	SGFOT meeting in Ancona, Italy
Dec 2009	The Cooperative Research Report is finished

4 Review of the outcome of recent relevant conferences

In order to find relevant topics and authors for the Cooperative Research Report (terms of reference b), a review of some recent conferences is given below.

4.1 Review of optical technologies presented at SEAFACTS

The International Symposium on Ecosystem Approach with Fisheries Acoustics and Complementary Technologies (SEAFACTS) was hosted in Bergen, Norway during 16–20 June 2008. Five major topic groups were used to categorize the presentations and posters:

- Ecosystem and Fisheries Monitoring (1)
- Remote Classification (2)
- Target Strength (3)
- Animal Behaviour (4)
- Data Quality and Integration (5).

Because the symposium was focused on acoustics as the primary instrumentation, only three posters were presented in the Remote Classification topic group that had optical technology as their primary instrumentation. These investigations used LIDAR to observe and monitor near-surface aggregations of fish and planktonic layers and correlate LIDAR with acoustic measurements. There were a significant number of presentations and posters that utilized optical technologies to augment acoustic observations. The most common optical technologies were still or video cameras in single and stereo configurations. LIDAR and other technologies, such as transmissometers and fluorometers were also reported.

The most common use of still and video images was to verify the species composition of the acoustic backscatter. Nearly 1/3 of the papers in the Target Strength topic group (approximately 29%) used optical technologies to verify the acoustic targets or observe target behaviour. (Note; these percentages are approximate and are based on observations of the presentations and posters and where they directly reported optical technologies). Interestingly, only about 11% and 13% of the papers in the Remote Classification and Animal Behaviour groups, respectively, reported to use optical technologies. The Ecosystem and Fisheries Monitoring and Data Quality and Integration topic groups utilized optical technologies in about 17% of the presentations and posters. The uses of optical technologies in these last two topic groups included benthic habitat observations, observations of primary and secondary trophic levels, and other remote sensing technologies.

4.2 Review of the 24th Laser radar conference

This conference included about 300 papers on various aspects of atmospheric lidars, and five related to ICES interests.

1) Yellowstone Lake, in the United States' oldest national park, is contaminated with a non-native species of trout. Airborne lidar was used to find spawning aggregations of these fish so they could be caught by the park service.

2) A space-based lidar (CALIPSO) has been measuring atmospheric aerosols for about two years. A global map of the subsurface oceanic return from this lidar shows a good correlation with plankton phytoplankton concentrations from space-based ocean-colour measurements.

3) A fluorescence lidar is being developed in Japan to measure profiles of chlorophyll concentration from above the surface. It has been tested from a ship and from a helicopter, with profiles extending from the surface to about 20 m.

4) A simplified theory of polarized lidar was presented that should prove useful in interpreting airborne lidar data. This theory was shown to agree well with data collected over a turbid river plume, productive coastal water, and clear oceanic water.

5) A lidar has been operated from a pier in a California bay to monitor blooms of red algae in the bay. These occur in layers in the bay as a result of tidal effects on density gradients, and the profile information provided by the lidar is critical to understanding the formation processes of these blooms.

4.3 Review of the OCEANS 2007 conference

The Oceans 2007 conference in Aberdeen hosted several sessions of interest to SGFOT, e.g. Challenges in Coastal and Deep water Technology, Challenges of Light in the sea: Marine Optics and Vision, Ocean Observing Platforms, Systems and Instrumentation, Remote Sensing, and Sonar Signal/Image Processing and Communication. Some of the authors are already associated with SGFOT whereas others will be invited to contribute on the Cooperative Research Report. To access more information on sessions, papers and authors go to: http://www.oceans07ieeeaberdeen.org/tracks.cfm.

5 Discussion

The group discussed various topics relevant to terms of reference c) during the Bergen meeting.

The group encourages the use of optical technologies on the ocean observing nodes operated by the ESONET network. One of the nodes to be placed close to the coral reefs outside Vesterålen in Norway was presented at the meeting.

The group also discussed the use optical technologies to study the characterization of fish behavior, avoidance and to estimate bycatches.

Visualization and automated processing of data are very important for the ecosystem management and the group discussed how to improve this.

The group encourages research on the use of multiple wavelengths in laser line scanning for the identification of fish.

Annex 1: List of participants

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Annex 2: SGFOT terms of reference for the next meeting

The **Study Group on Fisheries Optical Technologies** [SGFOT] (Chair: E. Tenningen, Norway) will meet in Ancona, Italy from 16–17 May 2009 to:

a) Review and finalize the Cooperative Research Report draft on optical technology as agreed at the 2008 SGFOT meeting;

b) Finalise recommendations for future work within optical technology to service the ecosystem approach for fisheries management.

SGFOT will report by 30 June 2009 for the attention of the Fisheries Technology Committee.

Supporting Information

Priority:	The current activities of this Group will lead ICES into improved techniques for surveying marine living resources and methods for improving existing survey strategies. Consequently, these activities are considered to have very high priority.
Scientific justification and relation to action plan:	The group's work is of relevance to the ICES Action Plan 1.2, 1.10, 1.12, 1.13 and 1.14. Terms of reference a): The group will continue to review the state-of-the-art in fisheries optical technologies. The Cooperative Research Report structure will be finalized for the completion of the report by 2009. Terms of reference b): Optical technologies for surveying fisheries resources, improving other techniques for surveying fisheries resources, and or characterizing fish behaviour are increasing in their accessibility, popularity, and value to to fisheries management. The group will discuss recommendations within this field for future work.
Resource requirements:	The research programmes which provide the main input to this group are already underway, and resources are already committed. The additional resource required to undertake additional activities in the framework of this group is negligible.
Participants:	The Group is normally attended by some 15–25 members and guests.
Secretariat facilities:	None.
Financial:	No financial implications. Having overlap with other meetings of expert groups of FTC increases efficiency and reduces travel costs.
Linkages to advisory committees:	There are no obvious direct linkages with the advisory committees.
Linkages to other committees or groups:	There is a close working relationship with WGFAST and WGFTFB.
Linkages to other organizations:	None.