A WORKSHOP TO INVESTIGATE THE DEVELOPMENT OF TRAINING AND ACCREDITATION PROCEDURES FOR THE PROVISION OF SCIENTIFIC DATA BY THE FISHING INDUSTRY

CSIRO
MARINE RESEARCH

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NON-TECHNICAL SUMMARY

2000/304 A workshop to investigate the development of training and accreditation procedures for provision of scientific data by the fishing industry

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Objectives

To discuss and scope ideas for developing industry capabilities for scientific data collection.

Planned outcomes

A full proposal for submission to FRDC, if supported by the workshop

The "Workshop to Investigate the Development of training and Accreditation Procedures for Provision of Scientific Data by the Fishing Industry" was held on Wednesday 23rd and Thursday 24th August 2000, at SARDI, West Beach, South Australia. Invitations were sent to stakeholders nationally and there were participants from all States, the Commonwealth, and the Northern Territory, including representation from fishing industry associations, fisheries scientists (government and non-government), fisheries training agencies, resource and environmental management agencies, and non-governmental groups.

The workshop was held in response to an emerging view that it would be cost-effective to have industry provide more of the basic data needs of the stock assessment process, and broader environmental monitoring, provided that a range of quality control issues can be addressed. At the moment there is no formal process in Australia for training and accrediting fishers for these activities. However, there are already several precedents for industry involvement in scientific and other data collection in Australia. During the workshop a number of examples were discussed, including industry monitoring activities in the Lakes and Coorong in SA, scientific and industry monitoring in the Northern Prawn Fishery, industry monitoring in the South East Fishery, and at-sea monitoring of the Rock Lobster fishery in South Australia.

The workshop discussed and scoped ideas for developing industry capability for scientific data collection, and associated training issues. Fishers have a broad range of knowledge about the species and environments in which they fish, and this knowledge can be very useful to scientists and fisheries managers. However, the information comes in a number of "formats", from quantitative, through qualitative, to anecdotal, and there

are currently problems in deciding how to evaluate, use and integrate this information. Important issues discussed during the workshop included: what data should be collected; how it could be collected (technology); how it should be managed (database management); and how its quality could be assured.

The workshop also provided the opportunity to discuss a wide range of training issues. Greg Lydon from New Zealand Seafood Industry Council Ltd. outlined the New Zealand experience of industry-based catch sampling, and development of training and accreditation procedures. Paul McShane and Ross Ord outlined the capabilities and process in Australia. A significant outcome from the workshop was that Ross Ord from Seafood Training Australia was asked to develop a funding proposal to the Australian National Training Authority for the development of a training and accreditation package for fishers to collect scientific data.

Seafood Training Australia's Training Package has been under revision, and includes units for fisheries data management, collection and observation. The draft units have been completed and a revised training package will be developed and endorsed in December 2003.

Keywords
Training, accreditation, data collection, data management, data quality, data analysis, fishing industry.

A WORKSHOP TO INVESTIGATE THE DEVELOPMENT OF TRAINING AND ACCREDITATION PROCEDURES FOR PROVISION OF SCIENTIFIC DATA BY THE FISHING INDUSTRY

Background

Most fisheries in Australia are managed under some form of cost recovery. This includes the costs of management and the costs of research and monitoring in support of management. There is an emerging view that it would be cost-effective to have industry provide more of the basic data needs of the assessment process, provided that a range of quality control issues can be addressed. Such an approach would also help to deal with some current concerns that industry views are not taken seriously in the stock assessment process. Much of the problem there stems from trying to deal simultaneously with "hard" scientific data and "opinion" often unsupported by quantitative evidence.

There are already a number of precedents for industry involvement in scientific and other data collection. Logbooks are an obvious example. In the South East Fishery, for example, industry vessels are often used for surveys, industry scientists actually run some surveys (e.g. eastern gemfish), industry are directly involved in some tagging programs, and there is discussion of use of acoustic surveys and fixed station trawl surveys using industry vessels.

Provision of data for stock assessment purposes is not the only area where industry could contribute data. Other areas include monitoring of habitat, provision of "ground truth" data for remote sensing, and monitoring in and around marine parks.

Need

There would be many advantages in having the fishing industry collect some of the basic data needed for stock assessment and environmental monitoring. The need is to develop a program for this to occur in an efficient, effective and accountable manner. The first task was to bring together key stakeholders who would be involved if such a program were to be developed. A workshop to discuss and scope the issues was held on 23rd and 24th August 2000 at SARDI, West Beach, South Australia.

Objectives

The aim of the workshop was to discuss and scope ideas for developing industry capability for scientific data collection, and associated training issues.

The workshop aimed to address the following issues:

- Review of current activities;
- Range of data and monitoring needs;
- Training issues;
- Quality control and assurance; and a
- Program for future development.

Methods

Invitations were sent nationally and participation at the workshop came from all States, the Commonwealth, and the Northern Territory. Stakeholder participation included the fishing industry associations, fisheries scientists (government and non-government), fisheries training agencies, resource and environmental management agencies, and non-governmental groups.

The workshop was held over two days and included presentations and discussions. Presentations on the first day included an introduction and overview, and review of current experience. This was followed by a discussion of needs and methods. Day two presentations and discussion focused on training and certification issues. The final session discussed the way forward.

Workshop Agenda

Day 1: Wednesday 23 August 2000

Introduction and Overview

Introduction	Tony Smith, CSIRO
Industry overview	Terry Moran, Seafood Council (SA)
Conservation overview	Margie Prideau, Conservation

Current Experience

Monitoring catch structure and discards	Ian Knuckey, MAFRI
Monitoring relative abundance for aggregating species	Jeremy Prince, Biospherics
Lakes & Coorong monitoring activities	Henry Jones, Southern Fishermen's Assoc.
Comparing scientific and industry monitoring in the Northern Prawn Fishery	David Brewer, CSIRO

Collecting ecological data for the GAB Marine Park	Roger Edwards, SA Rock Lobster Advisory Council
Evaluating nine years of data collected by rock lobster fishers	Jim Prescott, SARDI
Understanding and using fishers knowledge	Pascale Baelde, University of Canberra
Discussion of Needs and Methods	

Day 2: Thursday 24 August 2000

Training and Certification Issues	
National Industry Strategy training	Ross Ord, Seafood Training Australia
Training issues	Paul McShane, Australian Maritime College
The New Zealand experience	Greg Lydon, NZ Seafood Industry Council Ltd
Discussion of Training and Accreditation	
Further Discussions: the way forward	Tony Smith, CSIRO and Peter Dundas Smith, FRDC

Results and Discussion

Introduction and Overview

Introduction

Tony Smith welcomed participants to the workshop and outlined the background and aims. He noted two key drivers for this initiative. The first is the widespread move to cost recovery in Australian fisheries, and the potential cost-effectiveness of having industry collect much of the data needed, both for stock assessment and for wider environmental monitoring. The second driver is the increasing frustration of fishers involved in the stock assessment process of "not being listened to" when they bring observations and data to the table. He likened this problem to the idea of "admissible evidence" in a court of law, and noted that there was a mismatch between what scientists and industry saw as admissible evidence. The potential solution to both these problems is to train and accredit fishers to collect valuable scientific data, since they are in the best position to do so in a cost-effective manner, provided data quality and assurance issues can be addressed.

Industry Overview

Terry Moran noted that the collection of scientific data by the fishing industry is a resource that is currently being under-utilized, and offers a cost effective method for data collection. Fishers also have a broad range of fisheries knowledge and experience, which could be very valuable to scientists and fisheries managers.

Fishers have a broad interest in helping to manage the marine environment and fisheries in a sustainable manner. It is generally understood that for fisheries to remain economically viable now and in the future requires an integrated management approach. This means developing initiatives; participating in planning, management and decision making processes; and consulting and being involved with a wide range of stakeholders.

Conservation Overview

Margie Prideau noted that the fishing industry and the conservation sector have similar interests with regard to the sustainable management of the marine environment. However she also stressed that the conservation sector has a spectrum of views about almost all issues. Therefore it is important that the fishing industry talk to a wide cross section of people and organizations to obtain a representative view from the conservation sector.

The conservation movement is interested in fisheries issues but has limited resources. It would like to see the fishing industry approach the conservation sector in order to make progress and move the process forward. Communication between the two sectors is important, and there is a need to build trust, confidence and transparency when

addressing issues. She endorsed the intent behind the process being discussed at the workshop.

Current Experience

Monitoring Catch Structure and Discards

Ian Knuckey, MAFRI

Background
Fishery information is already being used in managing Commonwealth and State fisheries. The type of information required is dependent upon the fishery, and management needs. The information may be used for compliance and monitoring purposes, and for biological research.

The types of data that are or could be collected include:

- Size composition is core data used in most fishery assessments. It requires minimal equipment but specialized skills. It is relatively easy to collect, with on-board collection providing the only way to measure discards, and port monitoring providing landed catch information. The potential benefits from industry collection are a wider spatial and temporal coverage, together with a cost effective approach. The most important long-term issue is the need for robust and consistent data.
- Catch composition is being more widely used to understand impacts on by-catch species. It requires many specialized skills such as the ability to correctly sub-sample, to accurately estimate catch weights and numbers, and to identify species.
- Ageing and other biological data; collection of these data requires high-level skills and the use of specific equipment, and would require significant training. It is also a time consuming task.
- Environmental information such as weather, temperature, and other descriptive information are useful when analyzing and interpreting other data.

Broad issues to be considered:

- Data coordination, entry and validation issues. This would be best managed by central and regional agencies, as it requires good coordination, and continual feedback with data collectors (correction and validation), and an understanding of management (collection of raw data) and users requirements (analysis and useful summaries).
- Cost issues. Less money is available for fishery science, so there is a need to ensure effective and efficient use of funds. It will be important to identify which data will be more cost effective for industry to collect, and those which should be left to trained scientists. There is a cost to industry in collecting the information, so how will this be reflected in incentives.
- Compliance issues. There are implications from fisheries legislation with regard to retaining undersized animals, sampling in closed areas, use of restricted gear, and

reporting on quota levels, and protected and endangered species. Industry needs to be able to report accurately without fear of prosecution.
- Other issues discussed included science and fishery assumptions, data collection and time issues, and the role of science and fishers.

Scientific Issues: must understand assumptions and limitations of both fishery dependent and fishery independent sampling.

FISHERY INDEPENDENT	FISHERY DEPENDENT
Sampling strategy (e.g. random)	Dedicated fishers
Try to minimise bias	Potential bias
Limited coverage	Extensive coverage
Long term funding	Long term and consistent input
Fishery validation	Scientific validation

Time issues: how will data collection fit in with normal fishing?

DATA COLLECTION	NORMAL FISHING
Sorting discards	Clearing the deck
Measuring catch	Icing down the fish
Filling out data sheets	Taking watch
Collecting otoliths	Other duties

Role issues: there must be a balance between the roles and not all roles will suit all people.

SCIENTISTS	FISHERMEN
Enjoy fishing	Enjoy fishing
Benefit from understanding fishing	Benefit from understanding science
Can help fishing	Can help science

Conclusion

Historically, scientists have collected fisheries monitoring data using standard (scientific) collection techniques. There is a need to find more efficient and cost effective methods to collect these data. This will require science and industry to work together in a cooperative and innovative manner to ensure the information needs and practicalities of both are met.

Monitoring Relative Abundance for Aggregating Species: too much environment to manage … and not enough tax payers to fund it!

Jeremy Prince, Biospherics

As background to the talk, Dr Prince outlined the case of abalone monitoring. These species have highly spatially structured populations, and there are too many "stocks" to monitor for government scientists. However industry can monitor local populations using relatively simple measures – spatially explicit lengths and catch rates. Special software for data capture and data analysis is also available, such as Abasim.

A second case involves monitoring for management of orange roughy in southeastern Australia. This is a large and valuable fishery by Australian standards, and could presumably support "big" science. Dr Prince pointed out that a scientific acoustic survey of a single aggregation could cost as much as $1 million, and then went on to list many other types of data that are needed to interpret the acoustic data and develop a stock assessment. Given the number of aggregations being fished and the overall value of the fishery, he argued that a more cost effective way to monitor orange roughy needed to be found.

A third example discussed was the southern shark fishery. This is a $12 million per year fishery with potential survey and management costs of $4 million per year. Dr Prince suggested that 35 well trained owner operators could service the data needs of the fishery for the cost of two days poor fishing each per year. A fourth example discussed was eastern gemfish, where industry scientists have been collecting both survey and environmental data for several years. This example also highlighted the advantages of listening to "fisher lore", and of having on the water liaison with the fishing industry.

Summing up the data needs for management in the South East Fishery, a $56 million per year fishery with 250 species to monitor and manage, Dr Prince outlined a plan for industry monitoring including:

- A spatially distributed set of standard trawl shots around the fishery;
- Industry vessel surveys with multiple survey techniques, including catch rates, temperature and depth recording, acoustic surveys and under-water video; and
- Electronic capture and storage of data.

Clearly, training and accreditation will be required to implement such a plan, as will resources for industry development along the lines seen in New Zealand.

Lakes and Coorong Monitoring Activities

Henry Jones, Southern Fishermen's Association

Voluntary Environmental Data from Commercial Fisheries: The Southern Fishermen's Association's Experience 1998 - 2000
Henry Jones and Bryan E Pierce

Introduction
Although mandatory commercial fishery data supports the management of most major world fisheries, relatively little effort has been made to maximize the quantity, quality and value of environmental and other non-catch related data from this data collection platform. The voluntary environmental data collection system implemented by the Southern Fishermen's Association (SFA) as part of its Environmental Management Plan is assessed relative to experiences, process, and improvement. General observational data collected on an ongoing basis and specialist targeted research collected over an intense period to address specific hypotheses were the two frames considered. Even without high participation rates, initial results demonstrate high value returns on either data collection investment. The time burden of data logging has been reduced to about one minute per day per fisher. The total annual value of data provided from the fisheries considered is not explicitly included in the production value reported, but in one case the South Australian River Fishery Association (SARFA), the information/data value of a fishery may exceed the market value of its products.

Background
Circa 1996, the members of the Southern Fishermen's Association (SFA) in association with the South Australian River Fishery Association (SARFA) began to develop their own voluntary environmental data collection system to add value to their existing mandatory catch return data. Under threat from habitat mismanagement and incorrect community perceptions regarding the Lakes and Coorong fishery, SFA members began to work together to codify their fishing and other operations within an Environmental Management System framework. Fishers realized that, being on the water every day, their observations could be structured and standardized to provide key environmental management data at a level of resolution un-affordable to scientists and managers, and may form a model for other fisheries.

Methods
The SFA has therefore sought to utilize fisheries science to design statistically valid data collection designs, train fishers as necessary to minimum competencies, and undertake fishery independent surveys to benchmark commercially derived results (where necessary).

Within the environmental management system development process, the SFA first wrote to a broad spectrum of regional community groups and stakeholders as well as to government agencies seeking input as to information needs that they might require in future. In practice, relatively few replied (less than one third), and most replies indicated support, but little in the way of concrete, or quantitative information needs.

Fishers were also asked what they felt they would be able to contribute/most like to know. Again, replies provided minimal guidance. Therefore, a subset of fishers who were most actively involved in the management process met with scientists to focus on the problems that required solution, rather than on particular data/variables. Based on a broad delineation of desired outcomes, draft input data types were developed within the constraints of time efficiency and spartan specialist gear availability limiting most on-water fishers.

Three broad types of commercial-sourced data were evident:

- Existing catch-effort data (mandatory);
- General daily observational data; and
- Targeted research data meeting specialist needs.

Being physically on the water daily, the majority of fishers saw regular standardized observations as the best initial contribution, which could be supported by the membership. To meet specialist community or research needs, individual fishers have regularly volunteered to assist in the collection of targeted data. Typically, such work is of short duration, undertaken under close scientific supervision, involves specialist training (and possibly specialist equipment), and is designed to test specific hypotheses. In this situation, commercial fishers essentially undertake the role of technical scientific officers.

Results

The SFA has learned much from initiating its voluntary data collection system, including results regarding the process (which may assist other fisheries in avoiding pitfalls), as well as product (actual management/stakeholder relevant information).

During the process, we learned that:

- Writing to stakeholders and agencies was probably good consultation, but provided almost no useful guidance for structuring the data collection system. It did, however, identify interested users of (unspecified) results.

- Fishers don't initially realize their own data collection value and potential, beyond reporting unusual fish/organisms and diseased animals. Once feedback on initial results begins, fishers quickly grasp potential benefits, ways of improving the system, and new reporting possibilities.

- Fishers prefer a logbook style system so that they can keep a copy of their own results for reference. Many forms were not filled in on the water, but at the end of fishing along with the mandatory catch-effort reports.

- Individual fishers often have special interests and knowledge (e.g. migratory wading birds, small fish, etc.). Tailored data collection forms can be readily developed to allow at least interim collection of such information to determine its potential value.

- It has become clear that initial collection forms and processes should be viewed as pilots within a continuous improvement process that may take several years to stabilize. While the SFA now has sufficient information in the form of feedback from fishers, and in terms of data range and variability, final feedback from end users and the community is likely to require further iterations in the process.

Quantitative results from the first 18 months of operation of the voluntary daily data collection system initiated by the SFA are in preparation for publication in the peer reviewed literature to validate their credibility and ensure ongoing public access. Indicative results include:

- Voluntary commercial fishery environmental data is not something, which may happen in the future, it is currently happening now.

- The time burden imposed by the current form initially was estimated by participants at around 5 minutes per day. As the reporting became habitual, this burden dropped to less than 1 minute per day. Clearly, documentation of commercial fishers observations need not be an excessive time commitment.

- One of the most valuable innovations to date has been the provision of single use, waterproof cameras to all fishers. Fishers have then been able to record, using a simple, robust unit easily carried on vessel, photographic records of unusual events, organisms, and activity. Photographic evidence has also been used to validate training of fishers. Fishers have been asked to photograph, for example, fish in particular reproductive stages to validate data being collected. Such records are relatively permanent, transportable, and do not require expensive field visits by scientific support staff to confirm accuracy of interpretations by participants.

- One of the most obvious successes of the Environmental Data Collection system was development of a network of fishers to report unusual observations and collect specimens not previously known from this system. Since the introduction of the Environmental Management Plan, no less than five new species for the Coorong fish fauna have been discovered and reported by Lakes and Coorong fishers. Monitoring of exotic aquatic organisms such as the introduced European shore crab (*Carcinus meanas)* has also been a feature of the "sentinel" component of this undertaking – and has recently (2/2000) demonstrated that this species is reproducing and slowly increasing its range and abundance in the Coorong aquatic ecosystem.

- Evidence is accumulating through daily observation of barrage outflow management patterns. It is likely to be possible to manage such outflows to effectively enhance food availability for migratory waders within the more productive northern Coorong lagoon – an opportunity and a feeding site that has previously been poorly quantified and understood by other researchers. Protection of these wading birds was a primary reason for declaration of the Coorong as a RAMSAR Wetland of International Importance.

Discussion and Recommendations

Most recommendations regarding environmental data collection process improvements are self-evident from the above results. Two key suggestions are that:

- Starting the collection system is the most difficult component, as sharing of information is not intrinsic within the fishing culture. Use of an independent data entry/warehouse/analysis group is important to maximizing fisher involvement.

- Original data must remain the property of, and copyright to, the data providers/association. This not only ensures that fishers retain "credit" for the work that they are undertaking, but many of the highest quality data sources (individuals) indicated that they would not choose to provide the same level of support if the reporting was mandatory and unrecognized. In this regard, the data collection process was seen as a utilitarian (i.e. a "deal" with the community to provide information in return for continued access) as opposed to a coercive arrangement (i.e. provide the data or be punished). Quality control issues are much easier to resolve within a utilitarian structure with perceived mutual benefits.

While specific results are largely relevant to the Lakes and Coorong Region of South Australia, several broad observations appear to apply:

- The time cost to fishers of data collection is trivial, once the process becomes habitual.

- The ability to undertake tailored, highly specific research through individual fishers should be explored far more extensively.

- Fisheries scientific research can be effectively value added by focusing upon design, quality control, and benchmarking of commercial (and potentially recreational) derived datasets through long term partnerships between scientists and fishers. Stand-alone fisheries science is likely to become increasingly cost-prohibitive in future based on funding trends, so adaptation to take greater advantage of such a symbiotic relationship should enhance the survival of both fisheries and fisheries science.

- Primary investment needs are in training of individual fishers through a formal process resulting in defensible certification of skill/identification levels.

- The value of the contribution of commercial fisheries information is largely ignored by the community and within the management process. Current catch-effort data is largely seen as being a product of Government, rather than of the fishery and fishers. Further, as a costly commodity, the benefits derived from such data (whether mandatory or voluntary) need to be explicitly "value added" to maximize the returns to society, the environment, and the fishery. The use of "production value" only reports of the value of a fishery significantly

> underestimate the true economic return to society by excluding the "information return" on society's investment in allowing access to its resources.

Based on SFA and SARFA experiences, it is clear that providing demonstrable, quantitative environmental benefits to the community goes a very long way to remove the perception of commercial fishers as pillagers of fish stocks. SFA members view the environmental data collection system as a major "win" within their Environmental Management Planning process, although this certainly hasn't meant that even a majority of fishers will contribute full-time. As the data series becomes longer, as participation increases, and as the sampling framework continues to be refined, it is hoped that all stakeholders will increasingly rely upon this information source as a key input into management. In this way, the SFA (and other fisheries) can build themselves into the future as an essential source of environmental management feedback, as well as quality fish products.

Comparing Scientific and Industry Monitoring in the Northern Prawn Fishery

David Brewer, CSIRO

Introduction
International standards (such as the Marine Stewardship Council and the International Organisation for Standardisation) and national legislation increasingly require fisheries managers to manage ecosystems. Recent legislation changes require managers to demonstrate ongoing sustainability of all species. Previously fisheries management focused on target species. In the case of the northern prawn fishery this means that there is pressure to monitor all species groups, characteristics of the fishery, turtles, by-catch species, and endangered species.

In the case of the northern prawn fishery, this is a big undertaking. This is due to certain characteristics of the fishery:

- It is a large fishery;
- It is a remote fishery covering a large geographic area;
- It has a diverse range of species that may be impacted; and
- By-catch is a significant issue. Recorded by-catch includes 400 species of fish, 47 elasmobranchs, 234 invertebrates, 13 sea snakes and 6 turtles. Added to this, most species are rare or very rare.

Methods for monitoring prawn trawl by-catch
By-catch is important to managers in achieving compliance with international standards and national legislation. Increasingly, customers also require that the product comes from a sustainable supply. The main objective is to develop cost-effective, accurate and feasible methods for describing and monitoring prawn by-catch that would be acceptable to all stakeholders. Three methods have been identified:

1. Skippers and crews
2. Observers on fishing vessels
3. Dedicated scientific charters.

In choosing a method, a number of issues need to be considered. These include:

- Cost of sample collection and processing;
- Data reliability and data collection feasibility; and
- Stakeholder acceptance.

A summary of the performance of methods relative to the above criteria is presented in the table below.

Choosing a Method					
Method	Relative cost (to detect a 50% change)	Data reliability	Data feasibility	Industry acceptance	Stakeholder acceptance
Fisher collections	Medium	Medium	High	Low/Med	Low/Med
Observer collections	Med/High	Med/High	High	Med/High	Medium
Scientific surveys	High	High	Low	Medium	High

Costs are based on one region only

Other issues

To develop this approach further, a number of other issues need to be addressed. These include:

- Whether to assess all species or just indicator species;
- Whether to use surrogate regions for the whole fishery; and
- How often to sample communities.

Collecting Ecological Data for the GAB Marine Park

Roger Edwards, S.A. Rock Lobster Advisory Council

Establishing a Working Model of Multiple Use in the Great Australian Bight Marine Park. A joint venture between the SA Rock Lobster Advisory Council Inc, Seafood Council (SA) Ltd., Environment Australia, and Primary Industries and Resources South Australia (PIRSA).

Purpose
The purpose of this project is to establish innovative mechanisms by which the South Australian fishing industry can:

- Make a pro-active contribution to the multiple use management of the Great Australian Bight Marine Park (GABMP). The lead up to the declaration of both the Commonwealth and State components of the GABMP generated considerable conflict and tension between government, community and the fishing industry;
- Assist relevant agencies in the design and evaluation of a working model of multiple use marine protected areas; and
- Industry firmly believes that multiple objectives in Marine Protected Areas can only genuinely be achieved if affected stakeholders are involved in their design.

Benefits
The benefits of this approach include:

- Enhanced management, monitoring and enforcement of the GABMP through the utilisation of industry knowledge, skills and their physical presence;
- Enhanced commitment to the protection of GABMP values through the promotion, within the fishing industry, of a culture of involvement and 'ownership';
- Cost savings to government for management and enforcement of the GABMP;
- The refinement of multiple use principles;
- Establishing working precedents for other multiple use MPAs;
- Innovative solutions to fisheries/conservation related problems or conflict;
- Improvements in MPA development processes;
- Potential improvements in sustainable fishing practices through enhanced awareness of conservation objectives, threats and issues; and
- Promotion for the fishing industry's environmental credentials and role in conservation initiatives.

Objectives
The objectives of the project are:

1. To work with government to ensure that biodiversity objectives of the GABMP are met through the establishment of mechanisms for industry engagement in management, monitoring, enforcement and research associated with the GABMP.
2. To establish an effective communication regime between EA, DEHAA, PIRSA and the SA fishing industry, that reflects a new era of cooperation, with respect to the development and implementation of the GABMP plan of management.
3. To identify key social/historical perspective's (as they relate to the fishing industry) which may be incorporated into the overall values of the GABMP.
4. To raise awareness among the fishing industry of the principles of ecosystem management and its relationship to fisheries in South Australia.
5. To jointly investigate with EA, PIRSA and DEHAA the prospects of benchmarking a model of cross-sectoral cooperation in multiple use MPA management.

Progress towards project outcomes include:

OBJECTIVES	PROGRESS
Objective 1 Agreements on mutually agreed initiatives, including as appropriate industry codes of practice, management, enforcement, monitoring and research	$ for monitoring committed by industry. Fishers geared for data gathering. Fishers open to other tasks.
Objective 2 A communication strategy between EA, PIRSA, DEHAA and the SA fishing industry regarding the management of the GABMP.	Liaison Officer in place. Open communication between all players. Officer receives a constant beating from all sides. Tools being developed – newsletter, web page, fax network.
Objective 3 Description of social/historical values of the GABMP and suggestions for interpretive materials in the Commonwealth management plan.	SA Maritime Museum engaged. Interviews and data gathering well under way.
Objective 4 Workshops run by EA to enhance the fishing industry's awareness of the implications of the Oceans Policy, Regional Marine Planning and ecosystem management.	Fisher presentations made by liaison officer.
Objective 5 Agreement between the SA fishing industry, EA, PIRSA and DEHAA on key issues (based on mechanisms established for the GABMP), which could contribute to multiple use benchmarks and or models.	

Project Outcomes
Experiences and outcomes being collated include:

- Clear objectives are required to drive the research plan;
- A research plan is needed to drive data requirements;
- Data requirements are needed before we engage the fishers;
- Collecting data for no obvious purpose or without an objective that is communicated to the industry and in particular those doing the work;
- Training fishers will be required;
- Feedback to those doing the doing is important;
- Funding needs to be established;
- Industry will pay and play and wants a say; and
- Existing industry networks are key entry points.

What Can Industry Do?
Information industry could collect:

Fishery:
- Catch, effort, dead, undersized, by-catch;
- Tagging – location, sex, size, colour, damage reproductive status; and
- Catch sampling – location, sex, size, colour, damage, and reproductive status.

Environmental observations/recording:
- Birds, whales, dolphins, other important flora & fauna;
- Debris, oily substances;
- Unusual occurrences – fish kills, algal blooms, law breaking; and
- Water quality, wind etc.

Fee for service:
- Location-specific samples in non-core fishing grounds;
- Placement and retrieval of monitoring devices; and
- Scientist transport.

What Can You Do To Help?
Support us to design and trial a pilot course with the view of establishing ongoing training and accreditation nationally.

Stage 1: Design a half day pilot course to include:

- Importance of data gathering
- Equipment familiarisation
- Observation
- Training in measurement: the theory – tricks and traps

- Training in observation: tricks and traps
- Data handling procedures
- Audit processes
- Practical – measuring, recording
- Accreditation: theory, practical equipment use.

Stage 2: Trial Pilot with GAB participants (maybe look at the trawl fishery as well?)

Stage 3: On Water Evaluation

Stage 4: Report Outcomes and Recommend Structure of ongoing training and accreditation

Funding Required: Say $20k-$30k

Suggested Project Team Participants:

- Seafood Council Martin Smallridge
- GAB EA Liaison Officer Bob Lewis
- Finders University Prof. Stephen Hall
- CSIRO Tony Smith
- AMC Dr Paul McShane
- AFA Grant Carnie
- SARDI Jim Prescott

Evaluating Nine Years of Data Collected by Fishers

Jim Prescott, SARDI

Introduction
This talk is based on nine years experience with a volunteer-based data collection program in the South Australia Lobster Fishery.

Fishers in many fisheries have time to participate in sampling programs, and provided they have the motivation can certainly do a lot of work. Personal experience has taught me that not all fisheries are as relaxed as the SA Lobster Fishery and expectations need to be realistic for each fishery.

During the past nine years we have run a number of specific programs in which fishers provided much or most of the data. These include the following examples:

- The longest is a catch sampling program in which fishers measure all lobsters in one or more "sample" pots, and record environmental and physical data relevant to that sample.

- We also conducted a large tagging study where many fishers participated in the tagging. In fact they tagged and released approximately 60% of the lobsters (about 36,000 of the 62,000 lobsters released). Analyses showed the accuracy of the volunteers was as good as trained researchers in most cases.

- Recaptures were made by the majority of fishers. Analyses of these data indicated that there were differences in the accuracy of the data between volunteer taggers and those who only provided recaptures. But most data were of an acceptable standard - more than 21,000 recaptures were reported.

- A temperature monitoring program was also run. Fishers were given alcohol thermometers in PVC containers with which to measure bottom and surface temperatures and did this each fishing day during the season for a period of 4-5 years. Since then we have replaced their efforts with temperature loggers.

- For several years, fishers in the northern zone carried out monthly checks on artificial substrates used for monitoring the relative abundance of post larval lobsters.

- Little or no settlement was recorded at most sites, which I believe reflects the low rates of post-larval recruitment in the northern zone. Unfortunately fishers did not appreciate the value of zero catches and interest in the program was quick to wane. It would have been interesting to have had the program going when the post larvae that contributed to recent high recruitment levels in the fishery settled.

- Lobster fishers provided some of the first reports of pilchards dying during the last two well-publicized pilchard kills. It was possible to piece together much of the

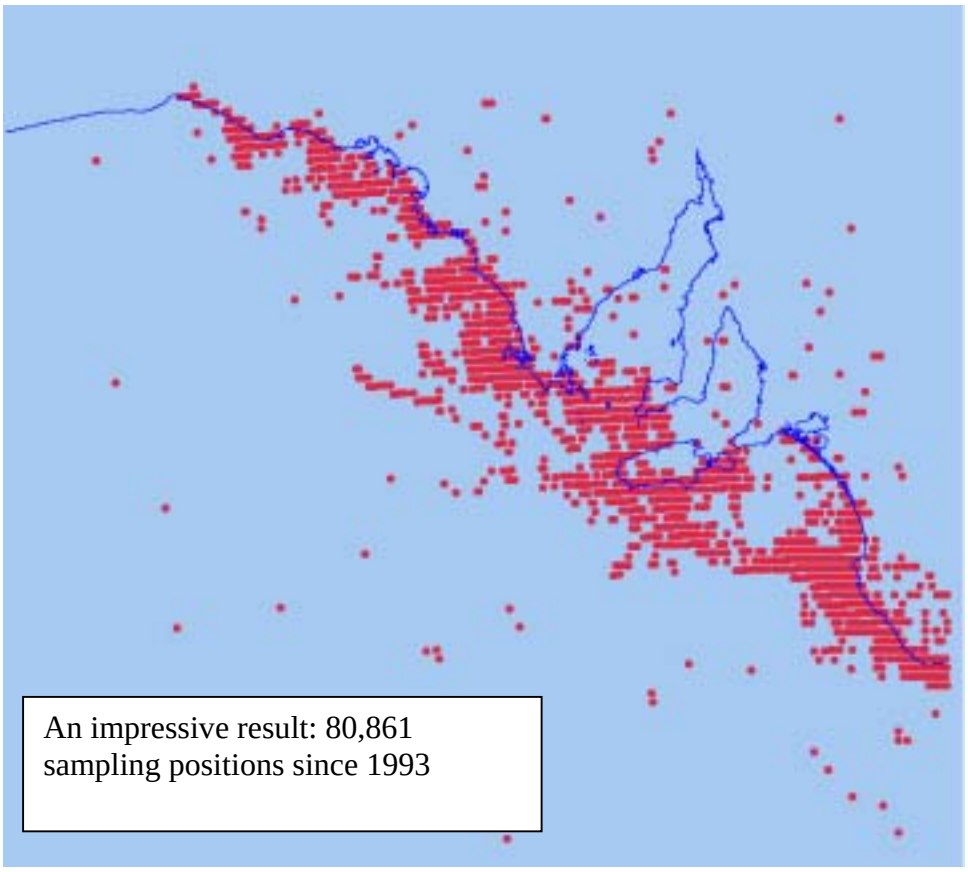
spread of the kill using their reports. This was a very good example of the potential of having so many pairs of eyes on the water in so many places at one time.

Examples of data collection

Catch Sampling Statistics			
Season	**Licences**	**Posts Sampled**	**Lobsters Sampled**
1991	50	22718	48686
1992	59	27962	55162
1993	73	17791	16197
1994	22	8720	7109
1995	97	12905	23012
1996	95	12408	26262
1997	93	14991	32850
1998	70	11291	26957
1999	104	11457	31316
TOTAL		140243	267551

These are the sampling statistics from the Volunteer Program. You can see that during the first two years of the project more samples were taken, albeit by fewer fishers. This followed a period of many years when there had been little research done on the fishery and fishers were keen to know more - it was also a time of what most fishers saw as threatening management changes.

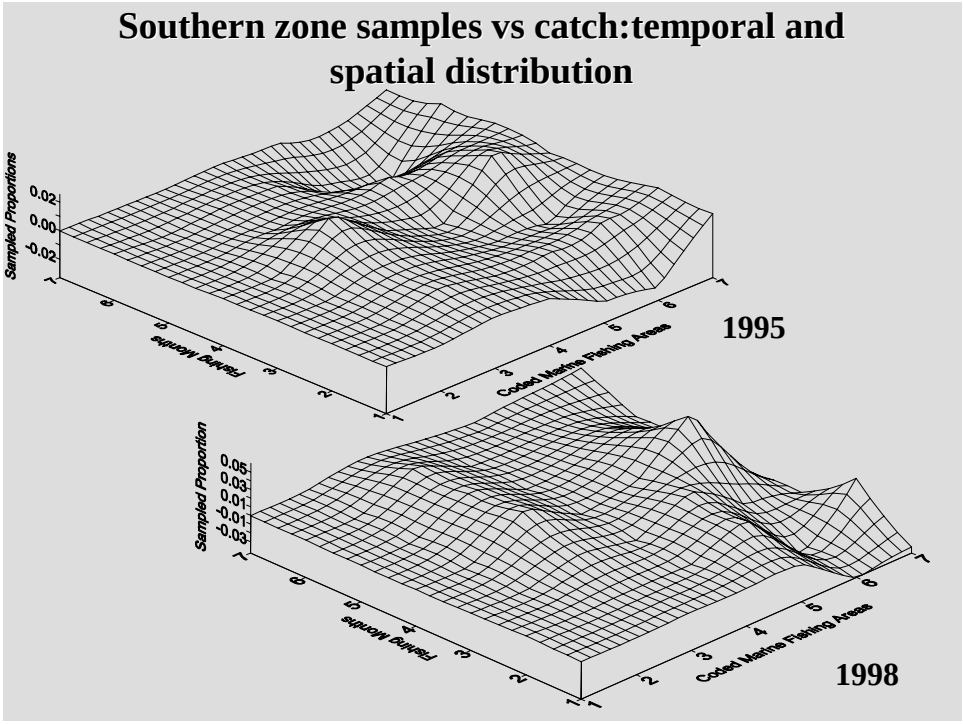
As perceived threats were realized and later forgotten, interest waned. Despite greater human resources it has been a hard slog to keep the program alive despite its growing relevance as length based models are developed for assessing the fishery.



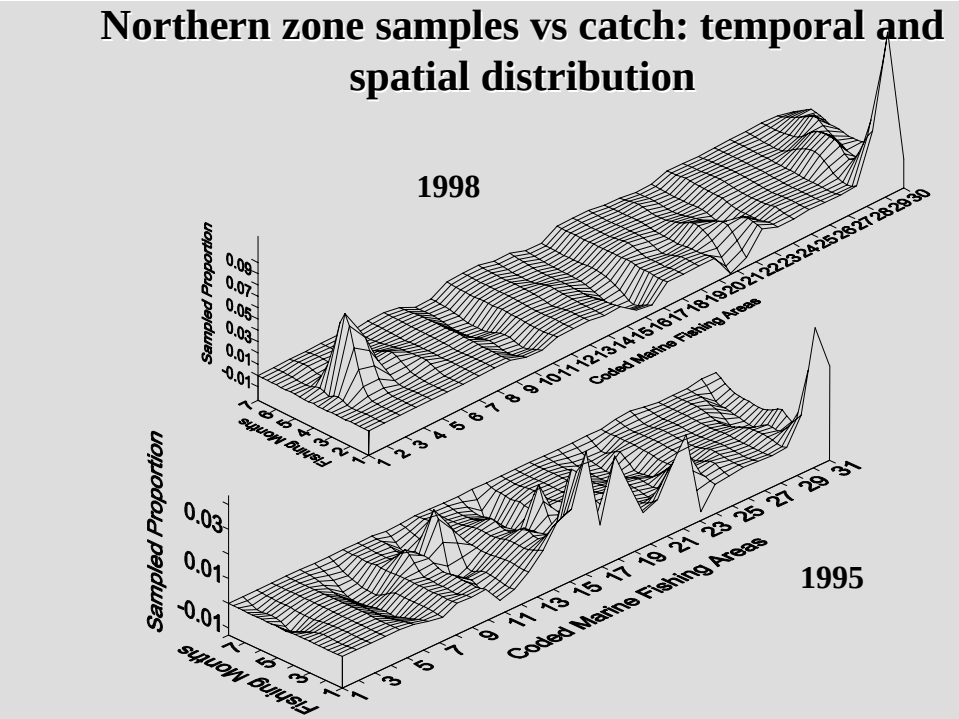
The above diagram shows the spatial coverage of sampling since 1993. It records "approximate" positions of more than 80,000 pots. It also demonstrates rather nicely how technology can further improve sampling, a point I'll come back to later. Just in case you're trying to list any of these positions in your mind - they include many pots with zero catches.

Some of the samples by individual fishers describe their catch length distribution in the area they fish very well. Others describe neither well. Some fishers start sampling and for one reason or another stop and never re-start.

Data were also collected on length and maturity. In one area there was sufficient sampling to describe the relationship between lengths and female sexual maturity. In the other there was less sampling and/or greater spatial variability in the relationship so it is not so well described.



It is important that sampling broadly represents the spatial and temporal characteristics in catch if there is variation in the population through space and time - and there certainly is in our lobster fishery. So how do we do in this regard? In these graphs the proportion of our samples - the proportion of the landed catch during the seven month season across the seven fishing areas in the southern zone is shown. Peaks are relatively over sampled and troughs relatively under sampled. In the Southern zone we don't seem to have done too badly.



In the Northern zone we don't do so well. Some areas are proportionately over-sampled early in the season. This is a result of fleet movement and the fact that the participants are probably not random within the fleet. It also reflects sampling done by researchers on boats. GAB sample during 1998 is a case in point.

In 1994 we tried to marry the sampling program with the tagging program because we were getting too few samples, and not enough legal size lobsters tagged. We allocated extra quota so fishers could at no expense measure, tag and release all lobsters from three designated pots. The results were disastrous. The samples were biased as fishers in many cases must have not recorded and tagged all lobsters. In our database we have a column in the table describing the pot sampling as True or False. We had to change it from T to F and most of the season's sampling was lost.

Issues

Most fisheries research needs continuity in the sampling programs to understand the dynamics of the population as many of aspects of the dynamics may be happening on time scales of decades or more. Therefore to maintain useful fisher based programs we need to maintain motivation to participate in them over a long period.

Accreditation might help by providing education, training, and use of technology.

Education:

- Better to equip fishers to understand the socio-political environment in which they operate;
- Opportunities and threats become clear;
- Need for good research becomes more obvious;

- Principals of good research; and
    - a basic understanding of variance
    - an appreciation of sampling design
    - develop a greater understanding of uncertainty and its consequences
- Demonstrate clear linkages between the specific research and its intended outcome(s).

Training:

- Fishers need to be trained to collect fisheries data
    - biological characteristics eg. reproductive condition
    - physical characteristics eg length (how to read a set of callipers)
    - eliminating ‘ambiguity’ (should the blank space be null or zero? -reporting both tags if two are present on one animal).

Technology:

- Technology can eliminate errors, misunderstanding and omissions;
- Logging the time, place, and depth is possible on many fishing vessels by adding a computer and database;
- Digital (digitised) images might replace measurements;
- Technological solutions may be incentives;
- Using new technology can be ‘exciting’;
- Making the job simpler and faster is good; and
- Fewer mistakes and questions about quality data is important.

Conclusion:

- Resources are limited;
- Education and training requires human and financial resources that are beyond the scope of many present programs;
- Energy - there is only so much that staff can do;
- Skills - not all people have the necessary skills; and
- A dedicated program might lift some of these constraints.

Understanding and Using Fishers' Knowledge

Pascale Baelde, University of Canberra

Introduction

The partnership between scientists and fishers is important. From a scientific point of view, there have been and are many perceived 'problems' with fishers knowledge. It is often described as too anecdotal, qualitative, or subjective. However, this information can be very useful in analyzing and interpreting data. The problem could therefore be viewed as not so much with the nature of fishers knowledge but with the lack of true dialogue and partnership between scientists and fishers. To overcome this lack of dialogue would require dedicated time and resources to work on an adequate protocol for the collection, processing and validation of fishers' information. This in turn would help better integrate fishers' knowledge with scientific knowledge.

There is one fundamental condition for successful partnership that has often been overlooked, and that is the need to understand and recognize people's motives when choosing to engage in a partnership. What are people's interests in engaging with industry data collection? The most obvious reasons have been mentioned already - industry is keen to do it and it would be cheaper. We are not talking here about scientists using fishers as cheap labour, and in any case fishers and scientists would have very different professional interests in participating. Before we start thinking about the design of accreditation mechanisms, we need to think seriously about why we would want the fishing industry to collect data in the first place.

Fishers Interests and Motives

This workshop was, at least initially, very much an industry initiative. This shows how eager some fishers in the industry are to get more involved in resource assessment and management. Fishers have contributed to scientific research for a long time and in various ways, often on a voluntary basis and in good faith. Good relationships between individual fishers and scientists have developed from this, albeit in an *ad hoc* manner. However, fishers interest in science has now become increasingly driven by pressures from fisheries management and environment protection agencies, which require fishers to demonstrate the resource is being managed in a sustainable manner. Fishers are interested in taking on a more formal role in the collection of scientific data. This is a logical and legitimate step in the evolution of fisheries, especially for fisheries under co-management and cost recovery systems. It is also a legitimate and pro-active step for an industry under increasing pressure to demonstrate that fishing is compatible with biodiversity conservation. We should not forget that the decision for the fishing industry to collect scientific data is not an academic pursuit but a business decision, with expected costs and benefits.

The Context in which the Fishing Industry Operates

The fishing industry is operating under changing and more difficult conditions. These include:

- Access to fish resources is being challenged by several environmental laws and policies (EPBC Act, Schedule 4, regional planning, marine protected areas);
- A strong focus on biodiversity conservation in the management of natural resources; and
- An increased reliance on the precautionary principle when scientific data are not available.

Fisheries and conservation policies tend to conflict with each other. The role of the fishing industry in the management of resource use, and the value of property rights in fisheries are becoming very uncertain. Fisheries science and management are changing towards an ecosystem approach in order to address today's demand for biodiversity conservation.

Scientists Interests and Motives

It is often perceived that most scientists feel more comfortable with fisheries independent data. However, funding for research is getting scarce and industry data collection would give scientists the data they need to carry out their stock assessment work. Industry data collection would be different to that of the past (ad hoc), requiring an organized, possibly industry-wide, program using trained and certified fishers. Fishers that become involved with this type of industry data collection will in turn be more likely to change their expectations about science. This implies that the success of such a venture will rely on scientists readiness to change and adapt the 'belief system' they operate from and the methodology they use.

Where To From Here?

An industry data collection program would need not only to collect high quality data in scientific terms, but also to collect data that are relevant to today's industry (and community) concerns. Again, most fishers today are legitimately concerned about losing access to fish resources and this is what drives their motivation to engage more with science.

In developing such a program, scientists and fishers would be faced with some serious challenges. For example, fisheries science cannot devote itself to single-species stock assessments any more, and an industry data collection program would need to:

- Be relevant to community concerns about biodiversity conservation and actively address recent national environmental legislation (e.g. the Environment Protection and Biodiversity Conservation (EPBC) Act 1999);
- Be more ecosystem oriented (i.e. information on habitat, by-catch, etc.) and include assessment of fishing impact and identification of other threats to the marine environment;

- Adopt the ecological sustainable development (ESD) indicators currently being defined at the national level; and
- Take account of the ESD socio-economic component (ecological issues cannot be reached without social objectives).

So, what would be fishers and scientists roles and responsibilities in this?

Challenges for Fishers

The biggest challenge for fishers is to reach some unity within their industry. A collective approach would allow industry to develop a consistent and agreed position, and this would better demonstrate industry's commitment to address national environmental concerns (more a responsibility for industry peak bodies).

From a policy/political point of view, an accreditation program must be developed as a national initiative and should come from an 'in principle' industry-wide agreement. From an operational point of view, the accreditation process itself may provoke further divisions within the industry. Within a fishery, not all fishers could possibly and practically be accredited; some would 'fail' while others will not be interested in the process. This could exaggerate some existing conflicts between fishers, or even create new ones. In the end, scientific results could be challenged on the ground that accredited fishers 'fished in a different way'. It would therefore be important for an accreditation process to ensure that there is a level of approval and confidence within a fishery on who is accredited.

Another challenge for fishers would be to have to deal more closely with the uncertainty inherent to science. Fishers better understanding of the limitations of science should help improve the debate on how to manage natural resources in a sustainable way when scientific knowledge is limited or uncertain.

Challenges for Scientists

It would not be enough to train and educate fishers on how to collect high quality data for scientists. Scientists would also need to do some adjusting to new working conditions. The challenges for scientists are two-fold. They must adapt their scientific techniques to the ecosystem approach, and at the same time engage in dialogue with fishers on scientific matters, and thus open scientific practice to greater scrutiny.

Conclusions

The accreditation of industry to collect data would probably have to be fisheries-specific and, at least initially, project-specific. However, guidelines would be necessary and should be developed collaboratively by scientists and fishers to assist with the accreditation on a case by case basis. An (accredited) industry data collection program should clearly include:

- Identification of participants (fishers and scientists), their interests in the fishery and their roles in the data collection;

- Objectives of the research project for which data are being collected;
- Participants' commitments (financial, technical, crew time, etc.);
- Measure of acceptance/confidence within the fishery (i.e. by non-participant fishers);
- Performance indicators for the collection and scientific use of data;
- Feed-back to non-participant fishers; and
- Conflict resolution mechanisms (e.g. what to do when industry knowledge conflicts with scientific knowledge).

Discussion of needs and methods

Following the presentations, the workshop discussed the important messages arising from the day's discussions. The needs, scope and issues were discussed in turn, and summarized as dot points, as follows:

Needs

- Clear objectives for data collection;
- Broad range of types of data collected;
- Cost effective data collection;
- Consistent and rigorous data collection;
- Efficient methods to collect and manage data;
- Fill gaps in existing knowledge;
- Information to meet new challenges;
- Also tackle land based issues that affect the marine environment;
- Information collected by fishers needs to be accepted by all users and stakeholders;
- Trust of and support from industry (avoid using fishing industry data against them); and
- Involvement of stakeholders in development of education and training.

In summary, what is needed is a strategic approach and clearly stated objectives that identify what information is to be collected and how to collect it.

Scope

- The scope is potentially the full breadth of ecological sustainable development (ESD). The aim should be to help industry demonstrate that they are meeting ESD objectives;
- The scope also potentially includes ecosystem management. The objectives, performance indicators, and data requirements for this approach need better definition;
- Risk assessment should be used on a case by case basis to identify what needs to be done to demonstrate that management is meeting ESD objectives;
- Some data needs will apply to all fisheries, others will be fishery specific; and
- The scope could embrace both scientific information and compliance information needs.

In summary, the scope should be broadly defined but tailored to the needs of each fishery.

Issues

Data:

- First identify what data needs to be collected and who can collect it;
- Fishers may be able to collect data not previously collected;
- Industry needs to work together so that data relevant to them is also collected;
- Data validation and quality control need to be considered from the outset;
- Better use of anecdotal data should still be considered (e.g. identify new hypotheses);
- A common language and standardized tools need to be developed for data collection;
- Log books need to be reviewed to include new data collected;
- Capture important fishers information and get it recorded in format that can be used;
- Data management costs include collecting and managing data, in maintaining and updating databases, training in how to use small databases and meta data;
- Collect information industry can use, and that management may use later; and
- In the past, the reason for collecting information was narrowly focused on stock assessment. With the extension to an ecosystem management approach, fishers information can be very useful in building a wider understanding of ecosystems.

Science and industry working together

- Scientists also need training to understand the fishing industry better. This can be improved by spending time with the industry;
- This initiative should improve the flow of information needs between science and industry;
- Fishers are powerful observers of their environment, and can help identify important scientific questions and issues. Scientists stand to benefit from the interaction;
- Industry, management and science need to agree on what information to collect, and the best way to do it;
- Science can help fishers to demonstrate that industry is addressing sustainability issues. Education of fishers is also important, so that industry accepts this is what is needed and fishers and scientists can work together;
- Education will help fishers to participate in analysis of data and sampling design;
- Highlight examples of where industry and science has worked well together; and
- There is frustration and distrust on both sides (scientist/fishers) over a number of issues. This needs to be overcome.

Other Issues

- It can be difficult to obtain information from government departments, and some information is not publicly available. This situation makes decision making difficult;
- Need to recognize vested interests and deal openly with the issues;
- Industry should also influence the process (logbook design, additional scientific data, “grey” information);
- A transparent auditing and quality control system will be important;
- Accreditation will be good for market share (national and international);
- Deckhands likely to be collecting data so education important;
- How to measure achievement of stated goals and objectives; and

- New technology is available and should be used to collect ESD data.

Day 2: Training and Certification Issues

National Industry Strategy Training

Ross Ord, Seafood Training Australia

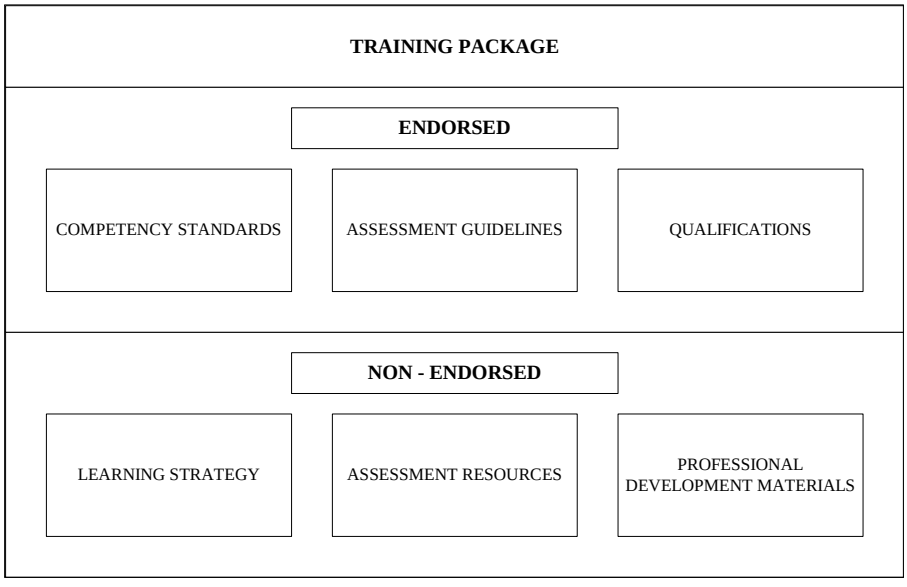
Introduction
Seafood Training Australia (STA) is not a government agency, nor a training provider. The role of STA is to provide advice on training priorities and to develop training structures and products. Funding for the organization is provided by Australian National Training Authority (ANTA), and by industry (mostly in kind).

STA is based on two premises. Firstly training is important as it can lead to an increase in value, competitiveness, and improve the bottom line. Competency Based Training (CBT) is the preferred training option as it has the advantage of having portable qualifications, consistency in training outcomes, and provides career pathways. It is not important where people achieve their skills, and over what time frame. The emphasis is on workplace training and assessment.

There are a number of sectors already covered by STA under the Seafood Industry Training Package (SITP). These include:

- Aquaculture
- Fishing
- Fishing charter
- Fisheries compliance
- Seafood sales, distribution and marketing
- Seafood processing

The seafood industry training package has three components as shown below:



An Example of a Unit

Assemble and repair damaged netting.

This involves repairing various types of damage to netting material used for fish or prawn trawl purse seines, beach seines or gill nets.

The unit covers:

- Preparing netting for repair;
- Mending holes and rips using twine; and
- Mending large scale damage using netting material.

The training package maps skills and knowledge required to perform the work. It provides direction and guidance to ensure fair and complete assessment. Assessment guidelines provide for:

- Recognition of skills held;
- Assessment on and off the job;
- Flexibility as to who can assess; and
- Some mandatory requirements before you can confirm competency.

SITP already includes a unit ‘Collect and manage data’. It also outlines vocational qualifications that may be acquired.

Proposed Vocational Qualifications

Qualification	Certificate 1	Certificate 2	Certificate 3	Certificate 4	Diploma	Advanced Diploma
Aquaculture	*	*	*	*	*	
Fishing Operation	*	*	*	*	*	
Fishing Charter			*		*	
Fisheries Compliance			*	*	*	
Seafood Processing	*	*	*			
Sales and Distribution		*	*	*		

Endorsement and Assessment

Two quality assurance points in Vocational Education Training (VET) are firstly the endorsement of the training package, and secondly the assessment. Assessment may be carried out by an individual assessor, partnership or panel, or workplace supervisor providing evidence of competency, and the final assessment made by an external (qualified) assessor.

How can STA assist with data collection?
STA can work with industry to map (capture) the skills required to collect and mange data. This will ensure consistent outcomes of training, through performance criteria and other requirements in drafting and approving units of competency. There should not be any compulsory requirement for anyone to train. The package must be voluntary as some will be interested (career opportunities), and others not. The end product will be combined with already existing units that make up SITP. This provides a building block approach to qualifications by allowing a choice of units, without the need to gain full vocational qualifications.

Resources will be needed to set up a pilot training package.

Scientific Data Gathering - Training Issues

Paul McShane, Australian Maritime College

Introduction

An opportunity exists to develop a more effective working relationship between science and the fishing industry by encouraging greater participation by industry representatives in the science data gathering process. By empowering the fishing industry to participate in beneficial research, scientists are more likely to convince industry participants of the benefits of science and increase the demand for scientific services.

The fishing industry has always been involved in some way in the science of assessing fish stocks. The provision of catch and effort data has traditionally underpinned the assessment of fish stocks worldwide. More recently, scientific programs have involved industry-based participants to assist in tag and release, fish measurement, by-catch identification and quantification, and larval settlement monitoring. A close working relationship between science and industry is exemplified by programs currently operating with the cooperation of the rock lobster fishing industries and science agencies of South Australia and New Zealand.

There is also an opportunity for technology transfer. For example, satellite communication technology currently available as vessel monitoring systems (VMS) can be extended to provide for data transfer. Thus, global positioning systems (GPS) can be linked to VMS technology to transfer real time data on position (latitude and longitude), sea surface temperature, and depth using instruments usually available on modern fishing vessels.

The Australian Maritime College

The Australian Maritime College (AMC) was established to provide training and educational services to the fishing and shipping industries of Australia. More recently it has extended this charter to include environmental management and services targeted to the seafood industry (e.g. seafood technology). For example, with support from the South Australian Rock Lobster Industry, the AMC is developing supply chain management protocols to align with certifiable standards with particular regard to environmental/ecological management. This project will involve JAS-ANZ (Joint Accreditation System of Australia and New Zealand) in accrediting auditable work practices aligned with internationally recognized standards relating to ecological impact, fisheries sustainability, food safety, and animal welfare. This example is relevant in the context of accrediting industry participants in science data gathering as described below.

Through the expertise and resources available at the AMC, there is substantial capacity to develop and extend training in science data gathering. From courses aligned to Vocational Education Training (VET) through to degree level courses in applied fisheries science, the AMC offers curricula in sampling, data recording, marine biology, oceanography, and information technology relevant to industry training needs.

Training in Science Data Gathering

Of necessity, training in science data gathering will be sector specific, reflecting the different needs of different fisheries. This not withstanding, there will be common elements to any course in science data gathering. These include:

- The role of science in fisheries management;
- Basic sampling theory;
- Cost/benefit analysis in sampling;
- Measurement techniques (principles of accuracy and precision);
- Observation techniques and recording;
- Data recording and handling; and
- Information technology.

There is a need to translate these generic concepts into plain language, accessible information. Perhaps more importantly, there is a need to have a practical real world emphasis reflecting the fact that fishing vessels can be difficult work platforms and that there can be conflicting demands on the time of industry participants.

As with any industry/science participation and consistent with any working relationship, feedback among the participants is important. This acts to reinforce the value to industry of science data gathering as participants can see how such information is used in the management or assessment process. Feedback creates shared ownership of research outcomes and is vital in maintaining enthusiasm and support for industry participation programs.

Industry Specific Applications

Beyond the generic course content identified above, there will be training in science data gathering that will specifically apply to individual fisheries. Some examples are included below.

Abalone

Abalone fisheries are unique in that fishers collect abalone directly from their natural habitat. Participants are therefore well placed to record information relating to habitat structure and general abundance patterns of abalone.

Abalone fisheries are difficult to assess because they are composed of a large number of sub-stocks all with differing biological characteristics. There is a mismatch between the scale that abalone fisheries are managed (large zones covering sometimes 1000 km or more) and fished (reef complexes covering a few hundred meters). Thus, catch and effort statistics collected for a zone or sub-zone do not necessarily reflect the response of individual reefs to fishing. Abalone divers are well placed to record reef-specific information and translate specific underwater observations (e.g. relative sea urchin abundance) into useful scientific information. A simple cost-effective daily logbook would lend itself to such data recording and training targeted accordingly.

Prawns

The prawn industries of Australia have been actively involved in developing technology to limit the capture of by-catch, particularly those species such as turtles considered endangered by standard trawling practices. Organizations such as the Australian Maritime College have been assisting in the development and application of by-catch reduction devices (BRDs) or turtle exclusion devices (TEDs) and these have been successfully applied in various prawn fisheries around Australia.

In South Australia, the Spencer Gulf prawn fishery has a close working relationship with scientists from the South Australian Research and Development Institute (SARDI). The relationship extends to development and application of BRDs but also includes science data gathering aboard commercial vessels. Data on catch rate and size composition are collected by industry participants trained by the principal scientist in measurement and recording techniques. More recently, this has been extended to juvenile sampling and by-catch collection and recording.

A current research activity is the exploration of the potential of satellite communication technology for the benefit of science and the fishing industry. Such technology including vessel monitoring systems (VMSs) is used primarily for compliance purposes allowing regulatory authorities to monitor the location of vessels fishing in Commonwealth waters. However, in South Australia, the technology is being used to develop real time spatial management strategies linked to on-board industry data gatherers. Thus, regular updates recorded on on-board computers can provide fishers with access to spatial information on catch rates, size composition, and current market price/demand (by size grade). This technology transfer exemplifies an effective and successful working relationship between scientists and the fishing industry.

Rock Lobster

The Rock Lobster fishing industry of South Australia has had a very successful industry participation in assessing its rock lobster stocks (Walters et al. 1998). In particular, fishers were involved with scientists in an extensive tag and recapture study yielding valuable information on the state of South Australian rock lobster populations. This industry/science participation has since been extended to include on-board catch sampling. Given the development of satellite communication technology and the availability of modern navigation, depth, and water temperature recording equipment on most rock lobster vessels, an opportunity exists to apply this technology in the recording of data relevant to marine environmental assessment. Thus, such equipment and technology could be linked via satellite to a shore-based data inventory to record sea-surface temperature and depth, in real time and with accurate position information. Furthermore, as rock lobster fishers cover nearly the entire South Australian inshore coastal environment, they could prove useful in recording other information relevant to coastal ecosystem assessment. For example, fishers could be trained to record marine mammal frequency (particularly whales) with training in species identification. This would assist in evaluating the effectiveness of the marine mammal sanctuary recently proclaimed for the Great Australian Bight. Thus, current training could be extended to include observational techniques.

A Pilot Course for Industry

Given the practical examples summarized above and current industry/science research collaboration, a pilot study could be designed to train industry participants in science data gathering. Although the course would be targeted to specific industry applications, generic elements would apply as indicated above. A particular emphasis would be on competency-based training utilizing industry vessels and training in-situ. The course would include both theoretical and practical components with accreditation to an appropriate standard. Consideration could be given to aligning the science data gathering course to the national seafood-training package though modules on fishing operations. This provides a formal and uniform training standard applicable to the fishing industry.

The pilot course could be evaluated by both science and industry participants before formal development of a science gathering training module. To begin with, the pilot course might include a half-day theoretical session followed by a half day practical. This would precede vessel-based evaluation in core competencies (measurement techniques, data recording, species identification, observation techniques) by both industry and science mentors.

Accreditation would follow an independent audit of science data gathering training. This is seen as an important prerequisite to ensuring independence and robustness of information collected by participants. Thus, accreditation of the course content would follow the pilot and the development of the science data gathering training module. Accreditation could be delivered by training authorities such as the Australian National Training Authority (ANTA) or by training providers such as the Australian Maritime College. Further to this, independent audit of the effectiveness of training outcomes could be undertaken by independent assessors that would audit industry participants in situ. Such procedures are more likely to provide confidence to stakeholders currently wary of the efficacy of fisheries-dependent data than is presently the case.

Reference

Walters, C., Prescott, J. H., McGarvey, R., and Prince, J. (1998). Management options for the South Australian rock lobster (Jasus edwardsii) fishery: a case study of co-operative assessment and policy design by fishers and biologists. In Proceedings of the North Pacific Symposium on Invertebrate Stock Assessment and Management. Edited by G. S. Jamieson and A. Campbell. Canadian Special Publication Fisheries and Aquatic Science 125 pp. 377–383.

The NZ Experience

Greg Lydon, NZ Seafood Industry Council Ltd

New Zealand Seafood Industry - Catch Sampling Programmes

Introduction

This paper introduces the New Zealand experience of catch sampling and the development of training and accreditation procedures for the provision of scientific data by the seafood industry. It outlines the role of SeaFIC and why we have seafood industry catch sampling in New Zealand, and then looks at how we train, reward, and assess samplers.

SeaFIC

The New Zealand Seafood Industry Council Ltd (SeaFIC) represents the seafood industry by providing the following services:

- Policy advice
- Trade representation
- Food safety
- Information and communication
- Monthly seafood magazine
- Quality science research
- Seafood industry training

The Science and Policy section of SeaFIC manages quality science research and is involved with seafood industry training for catch sampling. The Seafood Industry data collection programmes that it currently manages are:

- The line fisheries for ling and bluenose (deep-sea trevalla);
- Setnet fisheries targeted at rig (gummy shark), school shark and elephant fish; and
- Trawl fisheries for hoki, oreo and orange roughy.

New Zealand Seafood Industry Involvement in Data Collection

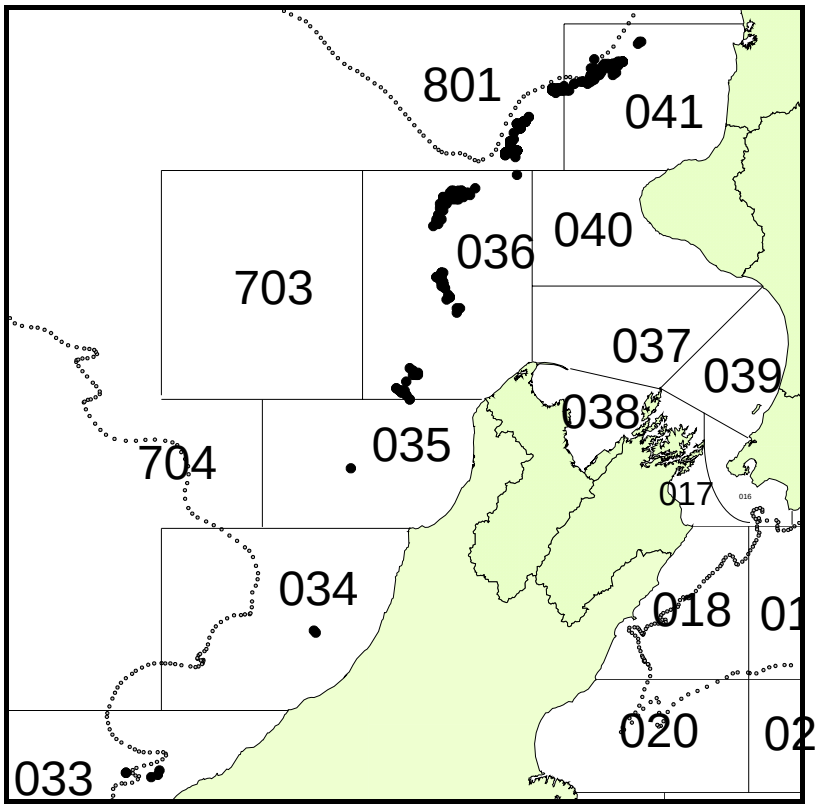
The New Zealand Seafood Industry initiated data collection programmes because the New Zealand Ministry of Fisheries reporting regimes were collecting catch and effort data that was too broad for precise analysis. Also the Government observer and research programs were not able to reliably determine the composition of the catch from some of the major commercial species.

The Government could not provide detailed fisheries information for the following three reasons:

1. Often it was not cost effective and smaller inshore fisheries in particular cannot justify the expense of a dedicated resource survey or are not able to be monitored by standard survey techniques.

2. It was realized that the seafood industry could provide a more comprehensive sampling coverage than the New Zealand Government Scientific Observer Programme (SOP). The seafood industry has the ability to collect a large number of samples in proportion to the level of fishing effort over the entire season and geographic range of the fishery concerned. An example from a fishing industry logbook programme is given in Figure 1.

Figure 1: Location of bluenose target logbook sets from the BNS 7 and BNS 8 fishery 1994 to 1998



(n=486). The dotted line represents the 1000m depth contour.

3. The third reason was one of Autonomy. The New Zealand Government believes that successful management of fish stocks depends on the involvement, co-operation and support of all those with an interest in the fishery. So the resource users became directly involved in research and monitoring for their fisheries management.

The objectives of the SeaFIC data collection programmes are:

- To collect accurate data for fisheries stock assessment;
- To provide good sampling coverage of fisheries in a cost-effective way;
- To collect data of a high standard to enable the credible long-term monitoring and analysis of selected fish stocks; and
- To cause the least interference possible to fishing operations.

The data collected depends on the individual programme but can cover:

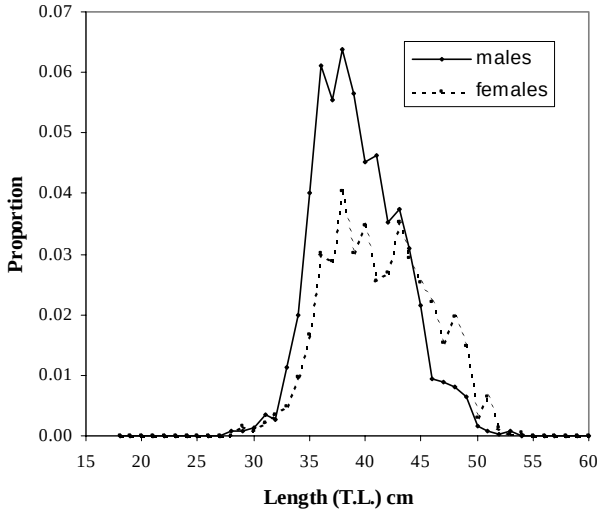
- Catch and effort;
- Length frequency;
- Biological information i.e. sex, age and female gonad stage; and
- Observations of seabird bycatch and marine mammal sightings.

The information collected by the SeaFIC data collection programmes is used to:

- Monitor trends in stock size using detailed catch per unit effort data;
- Determine the geographical extent of fisheries;
- Monitor trends in fishery performance;
- Determine the length at maturity for males and females;
- Determine the timing and duration of spawning period; and
- Address specific management issues in fisheries.

An example of scaled length distribution is given in Figure 2 from sub Antarctic samples of Smooth Oreo.

Figure 2: Length Distribution of 1998 Smooth Oreo Catch sampled from the Auckland Islands fishery



The number of tows sampled = 24, number of fish measured = 2,485.

New Zealand Training and Accreditation Procedures
The SeaFIC Science and Policy team and the Seafood Industry Training Organisation (SITO) have developed a 'New Zealand Qualifications Authority' (NZQA)[1] approved Unit Standard to formally recognise the skills attained by the fishing crews involved in the sampling programme. It is NZQA Unit No: 16675, Seafood Vessel Operations, and its title is "Conduct Biological Sampling from the Catch on a Commercial Fishing Vessel".

People credited with this unit standard are able to:

- Describe the purpose and requirements of a catch sampling programme on a commercial fishing vessel;
- Collect biological samples from the catch of important fish species on a commercial fishing vessel; and
- Record biological sampling data.

The Unit Standard provides:

1. A structured framework for the training and assessment of crew involved in sampling.

2. Formal recognition of the skills and experience gained by participants in the sampling programme.

The SeaFIC Science team manages the sampling programmes. They provide training and on-going support for the crew members conducting the sampling and also analyze the data collected by the programmes. Training is a partnership between the employer, the employee and the SeaFIC Science team. The specifications and guidelines for sampling are set out in individual SeaFIC instruction manuals for each programme.

The process for fishing crews involved in the sampling programmes is:

1. They attend a training seminar, which consists of the SeaFIC Science Officer describing the sampling programme, assessment and demonstrating the correct procedures for selecting the sample, analyzing the sample and recording data.

2. The trained crew sample fish and record data during commercial fishing trips.

3. The data sheets are posted to the SeaFIC Science Officer who checks them.

4. The Science Officer debriefs the crew.

5. Trained Crew apply for NZQA Unit No: 16675.

[1] The New Zealand Qualifications Authority co-ordinates qualifications in secondary schools and in post-school education and training, maintains national standards, ensures recognition of overseas qualifications and administers national secondary and tertiary examinations.

6. The assessor and sampler plan the assessment i.e. the standards, when, where and what they have to show for the assessment.

7. A Candidates Assessment Checklist is signed by the sampler and assessor.

8. Assessment takes place – the candidate provides evidence of what they can do by showing completed samples and answering questions.

9. A trained accreditor in that Unit Standard assesses them and decides whether all requirements were met. If there are parts of the unit standard that needs to be improved on, they are explained to the candidate and a time for reassessment is made.

Providers of training programmes must be accredited by the NZQA before they can offer education and training assessed against unit standards. Assessment is valid, fair, open and consistent. Assessment involves:

- Collecting evidence by observation, knowledge tests, documentation;
- Measuring what a candidate knows and can do;
- Making judgements about competence; and
- Deciding if a candidate meets national industry standards.

Conclusion

The New Zealand Seafood Industry data collection programmes have been successful. They are recognized by the NZ Ministry of Fisheries as the best available information from the particular fisheries they are concerned with. There is now a high level of sampling coverage in some fisheries, which is vastly superior to that collected by the Government Scientific Observer Programme. By providing an improved understanding of the fisheries involved, the data collected is now used in stock assessments.

Data Collection programmes require constant review, and monitoring of participation needs to be undertaken to ensure that the fishers have 'bought into' each programme and that the data collected is of high quality. In the future there are two pathways that data collection could take:

1. Either survey fatigue could creep in with data quality suffering; or
2. Sampling becomes an 'institution' and therefore part of the everyday fishing routine.

We aim to encourage the latter. The success of seafood industry data collection is largely dependent on the commitment of fishers to the programmes. We need to constantly encourage, reward and motivate participants. We also need to communicate effectively and frequently with the participants – providing feedback and the results of analysis undertaken.

Discussion of Training and Accreditation

If fishers are to collect scientific information there needs to be confidence in the data collected. It is therefore important that collection of data is undertaken by accredited fishers. The workshop provided the opportunity to discuss a wide range of training issues. The New Zealand experience of catch sampling and development of training and accreditation procedures was seen as particularly useful. There is clearly an urgent need to develop training packages and get people accredited. The needs, scope and issues were discussed in turn, and summarised as dot points, as follows:

Needs

- There is a growing need for observers;
- The best observers are those with boat skills;
- Need flexibility of unit choice in training;
- Need strong foundation and rigorous system, take a long term view;
- Need to identify data sets required, then identify skills and competencies;
- Develop training modules using case studies. Some training will be generic, some industry and fishery specific;
- Note NZ experience: a manual for each fishery (but still some generic elements); and
- Training needs to be broad based with mechanism to provide fishery specific training.

Scope

- Review the NZ experience, which is industry driven. Government role includes collection of “fishery independent” information and validation;
- Build on current activities and experience to develop training process, communicate with crew why training is important and how data are used;
- Draft training proposal then develop pilot program;
- Develop training culture in the industry (example NZ more receptive, training accepted), How to facilitate this;
- Educating fishers regarding the bigger picture, ecological and environmental impacts and interactions. People need to be aware of why they are collecting information
- Talk to fishers who are already sampling;
- Develop training package, but first review what already being done;
- Link data collection into research program needs;
- Identify representative reference group of stakeholders, include consultation in drafting competencies, then test and validate (may include pilot field testing); and
- Stakeholders reference group: industry (commercial, recreational, traditional), science, management, training provider, NGOs, fisheries and environmental management.

Issues

- Timeframe for process;
- Data needs for specific fisheries;
- Different training process for skippers and crew?
- Likely need for logbook changes as initiative develops;
- Units of competency in data collection, industry must have confidence data used properly and is accessible to them;
- Validation mechanisms are available to use data, could cross check against other collected data, parallel system;
- Identify goals and protocols;
- Objectives for the project; identify problem and then data to be collected;
- Fisheries at different stages of development;
- Timeframe; research program funding (Environment Australia Feb 2001);
- Cost/benefit analysis of training; who benefits? (E.g. fishers initiative in Lakes and Coorong);
- Cultural change: some individuals will be interested, others not; and
- Some projects (e.g. turtles in Northern Prawn Fishery) already include training element to cover costs.

Other Issues

- SeaNet provides information on environmental issues and can offer services; and
- Data priorities: initial focus on stock assessment needs (relative abundance, catch composition), by-catch, and environmental data.

Further Discussions: the way forward

The meeting endorsed the need for a submission to develop a training program. Ross Ord from Seafood Training Australia undertook to lead this, and requested letters of support from key stakeholders. A suggestion was made to set up a reference group and list of contacts, including the workshop participants. Maintaining strong links with New Zealand was seen as highly desirable.

The meeting also discussed more immediate applications through targeted case studies. Suggested case studies included lobster, shark, and trawl fisheries, mainly in southeastern Australia. The aims of pilot studies were discussed at some length – field testing general methods and approaches for widespread use, or solving immediate fishery-specific problems.

A case study that received the most discussion and support was for a pilot program in the Great Australian Bight (GAB). By-catch is a major issue in the GAB trawl fishery and monitoring in the recently established marine park is a priority for Environment Australia. Although the meeting as a whole was unable to endorse a single case study, a number of workshop participants undertook to follow up the GAB case study.

Outcomes

The main outcome from the workshop was that Ross Ord from Seafood Training Australia was asked to develop a funding proposal to the Australian National Training Authority for the development of a training and accreditation package for fishers to collect scientific data.

A recent follow up outcome is that Seafood Training Australia's Training Package has been under revision, and includes units for fisheries data management, collection and observation. The draft units have been completed and a revised training package will be developed and endorsed in December 2003.

Benefits

All industry groups around Australia should benefit from development of appropriate training programs, through cheaper data collection and an ability to have a greater involvement in assessments.

Further Development

Further development will be pursued through training programs and individual case studies.

APPENDIX A: INTELLECTUAL PROPERTY

There was no intellectual property arising from this project.

APPENDIX B: PROJECT STAFF

Tony Smith	CSIRO
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APPENDIX C: INVITATION AND WORKSHOP PARTICIPANTS LIST

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Peter	Neville	QFMA
John	Newby	WAFIC
Garth	Newman	VIC Fisheries Research Advisory Committee
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