Collaborative Research: Innovations and Challenges for Fisheries Management in New Zealand

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Collaborative research initiatives between New Zealand's fisheries management agencies and commercial fisher organisations are commonplace. This can be attributed to a combination of fisheries management institutions and processes that on the one hand create incentives for commercial fishers to take increasing responsibility for fisheries research and on the other hand provide for governance structures that ensure the transparency and integrity of industry-led research. Nevertheless the full potential of collaborative research initiatives has yet to be realised. Collaborative research has been an indirect outcome of New Zealand's rights-based fisheries management framework and until recently there has been little effort to explicitly provide for it in Government policy. The financial and management capacity of commercial fisher organisations must also be developed if collaborative research is to become a core function of these organisations. High expectations have been created for collaborative research and failure to address key issues will undermine the potential and hence legitimacy of collaborative research involving commercial fishers and other fisheries stakeholders.

Key Words: Collaborative research, commercial fisher organisations, management capacity.

1. INTRODUCTION

The seafood industry is an intensive generator and user of knowledge about the sustainable utilisation of fisheries resources in New Zealand's exclusive economic zone. Approximately four per cent of the value of seafood landings is spent on sustainability-related research to:

- Increase knowledge of fish species and the response of fish populations to fishing.
- Increase understanding of marine ecosystems and their functioning.
- Improve the ability to cost-effectively assess and manage the levels of fishstocks.
- Improve the ability to cost-effectively assess and manage the impacts of fishing on the marine environment.

The seafood industry believes that this research confers a comparative advantage on New Zealand's seafood industry in international markets. It contributes to the sustainable use of fisheries and other marine resources helping to ensure a continued supply of seafood and related products to key markets and gives the industry increased certainty to invest in the seafood sector long-term.

Underpinning sustainability research in New Zealand's fisheries are a set of institutional arrangements and statutory and non-statutory processes that provide incentives for, and define, a collaborative programme of research across all sectors of the seafood industry. This collaborative approach to research confers a number of benefits:

- It is inclusive of all interests including commercial, recreational and indigenous Maori fishers, and environmental non-governmental organisations.
- Public and private interests in the sustainability of fisheries resources are debated and provided for.
- Research providers, fishers and private and public sector fisheries managers' work together to plan, implement and interpret the results of research programmes.
- Stakeholders contribute to and generally accept priorities for research.

In this paper collaborative research is defined as research that at some stage – initiation, conduct, and/or review – involves multiple stakeholders. As collaborative research evolves the efforts of stock assessment scientists, fisheries managers and fishers are increasingly better co-ordinated. For example adaptive management regimes integrating management and research are being used for many stocks to obtain fisheries dependent information. Assessments of a number of major stocks utilise fishery-independent information obtained by scientists from commercial vessels, thus maximising the efficiency of the use of these vessels.

Collaborative research is relatively new with no significant history before the early to mid 1990 and has its challenges. Even today there is no explicit Government policy to promote or facilitate such research. Collaborative research

has arisen spontaneously in response to incentives contained within New Zealand's fisheries management regime.

Traditional negative attitudes about the integrity of industry-led research are still held by many in government, research institutions and environmental non-governmental organisations. Equally, some players in the seafood industry still regard research as a cost and issues such as impacts of fishing on benthic communities and biodiversity as environmentalist plots to close fisheries. Attitude aside, significant institutional, process and capacity issues also remain to be addressed if the potential for collaborative research in New Zealand is to be fulfilled.

The remainder of this paper describes and gives examples of the institutions, processes and capacity issues associated with collaborative research in New Zealand. It highlights both positive and negative influences on collaborative research. A key lesson is that research issues cannot be separated from wider fisheries management issues. New Zealand's experiences should prove illuminating for other jurisdictions currently engaged in or considering collaborative research initiatives.

2. RESEARCH PROFILE

Expenditure on sustainability-related research is a significant component of the seafood industry's investment strategy. In 1999/2000 the industry is funding through the cost recovery levies about $NZ 13 million of the approximately $NZ 17 million spent on "fisheries information and monitoring". An additional $NZ1.1 million is recovered from the industry by the Department of Conservation through the Conservation Services Levy. It is proposed that this figure raise to 2.1 million for the 2000/01 fishing year.

The seafood industry also invests a considerable amount in research on sustainable fisheries management independently of government-driven research processes. Although it is difficult to obtain a precise estimate of these costs preliminary estimates suggest direct expenditure is in excess of $NZ 5 million and research services provided by way of vessel time and crew worth another $NZ 10 to $15 million.

This research has led to the modelling of 26 fish stocks being representing 52 percent of total landed value of New Zealand's commercial catch. Of these assessed stocks 93 per cent of the volume and 96 per cent of the value came from stocks considered to be above the target of the biomass that produces maximum sustainable yield as mandated by New Zealand's Fisheries Act 1996. In addition to the 26 stocks modelled, sustainable yields have been estimated for another 21 stocks bring the landed value of stocks assessed to approximately 60 percent of total catch.

Significant research effort has reduced non-target bycatch and seabird and marine mammal bycatch. Lesser but increasing effort is now on investigating the impacts of fishing and the mitigation of these impacts on benthic communities. Such research is complicated by issues of public versus private interest and how to proportion the cost of research between the seafood industry and the Government on behalf of the public interest.

2.1 Chatham Rise Hoki Catch Sampling Programme: An Example of Industry-led Research

The catch in New Zealand's Chatham Rise hoki fishery has expanded rapidly since the mid 1990s but there has not been a corresponding increase in government observer coverage or management-related information. The Hoki Management Company and NZ Seafood Industry Council initiated a sampling programme with the primary objective of improving the characterisation of the catch to ensure that the resource is properly assessed and managed. The programme involves all the vessels currently operating in the fishery (including foreign joint venture vessels). Vessel crew members are trained to New Zealand Qualification Authority standards to undertake the sampling themselves - a method which is more effective and efficient than using observers on all vessels. The training aspect of the programme has the added advantage of building sampling capacity within the industry. The sampling involves measuring and sexing the fish and assessing the condition of the gonads. By the end of the 1999/2000 fishing year around 150,000 fish will have been sampled.. The scale of this sampling is orders of magnitude bigger than previous government-run sampling programmes and the coverage of the vessels and the fishing season is far more comprehensive, resulting in a more robust data set that enables analysis to occur with greater confidence about the results. Similar industry-driven initiatives are underway in deepwater and rock-lobster fisheries.

3. FISHERIES MANAGEMENT INSTITUTIONS

New Zealand's rights-based management system by design and circumstance has led to the establishment of institutions and management approaches that establish communicative and collaborative processes that:

- Contribute to widely supported sustainability measures.
- Identify who participates and in what way.
- Establish how debate is to be structured.
- Consider how conflicts of interest are to be addressed.

- Establish mechanisms for reaching agreement between fisheries management collaborators.

Collaborative research is but one positive outcome of the New Zealand's rights-based management system. Collaborative research is fostered by the potential of such systems for co-management. Co-management means that resource users become directly involved in fisheries management through the formal and informal delegations of management functions to fisher organisations, or to organisers where fishers share collective management authority (Jentoft 2000a). Such management systems are held to be more legitimate and hence more robust than centralised government focussed management systems (Jentoft 200b). It is this legitimacy that creates the incentive for industry to invest in and support costly sustainability-related fisheries research.

3.1 A Brief History of Rights-based Fisheries Management in New Zealand

By declaring a 200-mile exclusive economic zone (EEZ) in 1978 the government expanded the range of fish and stocks under national control. Foreign operators previously exploited deep-sea fisheries with few controls placed on their harvest. The government had to develop policies to manage the fish resource of a very large and unfamiliar area. Initially, the EEZ and inshore fisheries were managed separately. Subsequently, the government applied a policy of limited domestic expansion, joint venture arrangements, and licensing of foreign fleets to the zone outside 12 miles.

In 1983 the government introduced an economically oriented management system based on individual transferable quota for seven species in the new 200-mile zone. This quota management system served later as a model for inshore stocks, and its existence offshore made it easier to persuade fishers of the effectiveness of such a system.

In 1986 a comprehensive rights-based management system was put in place by introducing the quota management system for 21 inshore species and providing for its broader application to the offshore fisheries. The offshore fisheries quota granted in 1983 were transformed, along with the newly introduced individual transferable quota (ITQ), to tradable entitlements in perpetuity.

The seven founding aims of the quota management system (QMS) (Luxton 1997) were to:

- Rebuild inshore fisheries where required.
- Ensure that catches are limited to levels that can be sustained over the long term.
- Ensure that catches are harvested efficiently with maximum benefit to the industry and to New Zealand.
- Allocate catch entitlements equitably based on an individual permit holder's commitment to the fishery.
- Integrate management of inshore and offshore fisheries.
- Develop a management system that can be applied both nationally and regionally.
- Enhance the recreational fishery.

In 1990 individual transferable quota was changed from a specified tonnage of a total allowable commercial catch, which could be repurchased by government, to a proportion of the total allowable commercial catch that varies as the total allowable commercial catch varies. The change reflected the reality that the process of government buying and selling quota to change levels of total allowable commercial catch was cumbersome and costly.

Today there are over 250 fish stocks present in New Zealand's QMS covering 40 species (out of 100 species caught commercially). This represents over 85 per cent of the total fish catch in the EEZ. Owners of individual transferable quota have a large incentive to invest resources into the sustainability of the fishery because any lowering of catch limits reduces the value of their investment in the fishery. As Jentoft *et al* (1998) suggest, the private nature of QMS rights has given a more accurate indication of who the users are than under previous management regimes. Importantly, a clearly defined set of holders of exclusive rights makes it easier to assign responsibility for devolved and/or decentralised management of a fishery.

3.2 Government's role in fisheries management

The New Zealand Fisheries Act 1996 outlines the role of central government in New Zealand as providing for the "utilisation of fisheries resources while ensuring sustainability". In practice this means:

- Establishing the rules and regulations that enable successful and sustainable fishing activity.
- Ensuring that fisheries harvesting rights are clear, appropriate and enforceable.
- Facilitating responsible fisheries management by rightsholders.
- Ensuring fisheries research necessary to achieve the purpose and principles of fisheries legislation is carried out.
- Co-ordinating the collection and provision of information to fisheries stakeholders.
- Ensuring the effectiveness of management frameworks and systems, including:
  - setting standards for fisheries management plans,

  - monitoring and auditing the performance of fisheries management plans.
- Prosecuting offenders who break fisheries law.

3.3 Fisher-based Management Institutions

Responding to the productive incentive structures of the quota management system, New Zealand's quota owners/leasees are organising themselves into management associations based on functional and/or territorial communities. Depending on the fishery, these associations have a number of purposes including (Harte and Bess. 2000):

- To facilitate the collection of funds to finance fisheries management activities such as research or reseeding and to manage the delivery of such services.
- To make fisheries management rules and to impose sanctions on non-compliance of company shareholders.
- To represent the interests of shareholders in government processes that involve consultation – such as determining (government required) fisheries management services and the setting of total allowable commercial catches.
- To defend against erosion of harvesting rights and to promote the expansion and development of management rights.

The umbrella organisation for these associations is the New Zealand Seafood Industry Council. Its role is to represent the generic interests of the seafood industry. The Council is a limited liability company owned by commercial fisher organisations and provides policy, advocacy, information, scientific, training and advocacy services to the seafood industry. It's science unit employs its own internationally recognised fisheries scientists and has a number of collaborative research programmes with New Zealand and international research providers.

3.3.1 New Zealand Rock Lobster Industry Council

At last count there were some 30 commercial stakeholder organisations in New Zealand. The New Zealand Rock Lobster Industry Council (RLIC) is a successful example of the potential these organisations have to succeed in a number of fields of fisheries management including research.

RLIC is an umbrella organisation for nine commercial stakeholder organisations operating in each of the rock lobster management areas of New Zealand (Sykes 2000). These organisations have been established as incorporated societies or limited liability companies and are known as CRAMACs.

Membership of CRAMACs comprises quota owners, processors, exporters, and fishermen (owner-operators and lease holders) in each region. Governance is based on a two-tiered voting procedure that gives priority to quota ownership on issues affecting total allowable commercial catch decisions, levy setting, and certain government consultation processes. All nine CRAMACs hold a majority mandate of crayfish quota holders in the regions. CRAMACs are shareholders in RLIC and appoint the nine person board of directors, one from each CRAMAC.

Strong support and active participation in the multi-stakeholder National Rock Lobster Management Group (NRLMG) has come from RLIC since it was established. Membership of the NRLMG comprises government agencies, commercial, recreational and indigenous fisher representatives, environmental non-governmental representatives and science advisers. Recognised as a primary source of advice to Ministers on all matters pertaining to rock lobster fisheries, the NRLMG is resourced by industry by way of provision of an independent chairman, meeting venues, catering, and an administrative support role shared with the Ministry of Fisheries. The marriage of the practical working knowledge of rock lobster fishers, the research and management experience of government agencies, and expectations of other sector groups has been a successful and productive one.

In 1997 RLIC became an accredited research provider to the Minister of Fisheries, and since then has successfully tendered for, and executed, three rock lobster stock assessment contracts. A fourth contestable tender is currently in preparation.

Research contracts are undertaken in collaboration with national science providers and internationally recognised stock assessment consultants contracted to RLIC. RLIC also uses accredited technicians employed by science providers and by CRAMACs to undertake an extensive stock-monitoring programme.

3.4 The Future of Management Institutions and Devolution of Management Roles to Fisher Organisations

Unless government and its officials can be convinced of the desire and ability of fishers to manage research themselves, little progress will be made on the transfer of management and research functions to commercial fisher organisations. New Zealand's fishers need to be able to demonstrate a high level of organisational management focused on delivering fisheries management outcomes that provide for the utilisation of fishery resources while ensuring sustainability.

Commercial fishers and the Ministry of Fisheries see fisher organisations becoming increasingly responsible for developing fisheries plans that:

- Set management objectives and performance measures.
- Specify rules for management and governance.
- Define necessary services including:
  - research
  - administration
  - monitoring and compliance
  - establishing funding arrangements.

After developing a fisheries plan, commercial fisher organisations become responsible for:

- Managing decision-making processes.
- Purchasing research services.
- Administering access.
- Monitoring fishing activity.
- Providing information/education services.
- Enforcing non-criminal rules.
- Collecting levies to fund management activities.

The exercise of these functions is subject to standards and specifications developed by he Ministry of Fisheries.

The extent and speed of devolution of research and management responsibilities will depend on the capabilities of commercial fisher organisations to handle management functions. All fisheries stakeholders, government officials and scientists will need to continue to work together to evaluate fisheries management performance in a devolved environment.

The government needs assurance that such management systems provide for sustainability. Organisations such as the Rock Lobster Industry Council needs a clear framework in which to formulate the details of research and management practices. Successful integrated and collaborative management of fisheries resources will increase innovation, reduce conflict between stakeholder groups, reduce transactions costs, and provide for the utilisation of fisheries resources while ensuring sustainability.

4. PROCESSES FOR ACCOUNTABLE AND TRANSPARENT FISHERIES RESEARCH

Commercial, recreational and customary fishers, environmental organisations and Government agencies engage in several interrelated consultative processes related to sustainability research. These are:

- Research planning.
- Stock Assessment.
- Cost recovery of research project costs.

These processes are important because it the success or failure attributed to them by participants that influences the degree of legitimacy conferred on fisheries research institutions. If the outcomes of these processes fail to meet expectations and cause disappointment there is a loss of legitimacy for the management systems.

4.1 Research planning

The Ministry of Fisheries research planning framework is widely regarded as a successful example of a collaborative consultation process. The process is structured around research planning groups. Some of the groups focus on individual of groups of fish species and others focus on more general issues such as recreational fishing, marine environmental research, and socio-economic research. Each group discusses, evaluates and makes recommendations about research activities. Membership of the groups includes Ministry of Fisheries staff, research providers, environmental organisations, customary Maori, recreational, and commercial fishing interests.

The groups receive input from regional fisheries liaison committees on general fisheries research needs and more specific information on research needs from stock assessment working groups. The research planning groups are guided in their activities by strategic and medium term research plans and in term input to the review of these plans.

Proposals from the research planning groups are considered by the research co-ordinating committee, made up of Ministry of Fisheries staff, environmental organisations, customary Maori, recreational, and commercial fishing interests. The research co-ordinating committee considers the recommendations of the planning groups and makes a final recommendation for operational research to the Ministry of Fisheries. The final research proposals are integrated into the nature and extent of fisheries services for cost recovery purposes.

4.2 Stock assessment groups and sustainability measures

Eight stock assessment working groups cover inshore, mid-water and deepwater fish stocks. The main task of the groups is to estimate the level of sustainable harvest for each fish stock and to determine whether or not current total allowable catches and total allowable commercial catches are sustainable. Each group consists of Ministry of Fisheries staff and representatives from commercial, customary Maori, and recreational fishing sectors and environmental organisations. Three other working groups cover recreational, socioeconomic and aquatic environment issues.

The groups assemble the information available and prepare a fishery assessment report for each stock in the quota management system. If new information indicates a change in the stock and a need to change harvest levels, this is referred to the fishery assessment plenary for further consideration and consultation. If further research is required this is referred to the research planning groups described previously.

The outcome of the fishery assessment plenary is released as an advice paper to the Minister and Ministry of Fisheries and forms the basis for adjusting harvest levels through the sustainability measures process. The stock assessment recommendations are augmented during sustainability measures consultation by social, economic, cultural and environmental considerations.

Research planning and stock assessment consultations tend to be characterised by a significant degree of collaboration between Ministry of Fisheries staff, seafood sector representatives and other interests. Though deserving of more detailed analysis, several general observations can be made:

- They both have clear purposes – analysis of research needs and the health of fish stocks – that are not disputed by participants.
- They are based on scientific assessment or the need for scientific assessment and hence that tend to be relatively objectives, independent and generally free of inherent stakeholder bias. All stakeholders have a commitment to the scientific basis of fisheries management.
- Participants in both processes tend to be experts or well versed in the science of fisheries management. They share similar backgrounds and training and hence have a common understanding of issues being debated and the range of solutions available.
- The outcomes of both consultation processes are subject to further consultation. Disputes between stakeholders can be put off to a subsequent stage of consultation. For example issues or positions that do not find general support in the Stock Assessment Working Groups or at the Stock Assessment Plenary can be raised again during consultation on sustainability measures. Because the Minister makes the final sustainability and nature and extent decisions both processes tend to be political and subject to lobbying by all stakeholders.

4.3 Recovery of Fisheries Management Costs

Cost recovery was introduced in 1994 as a method of funding services legally required by fisheries legislation. These services include:

- The management of fisheries resources, fishing and fish farming.
- The enforcement of the provisions relating to fisheries resources, fishing and fish farming.
- Research relating to fisheries resources, fishing and fish farming.

Cost recovery for these services allows the Ministry of Fisheries to recover a large proportion of its operating costs. Cost recovery charges are divided between the Crown and fishing industry, either jointly or separately, with industry's share recovered through a levy system. Since its introduction the levy system has been subject to much debate, giving rise to questions such as to what costs should be levied on industry for these service, who should supply them, and how these levies should be applied to individual fishers and quota holders.

The Ministry of Fisheries, on behalf of the Minister, releases a "White Paper" outlining the nature and extent of services required for the following fiscal year. The Ministry consults with stakeholders with the Minister subsequently deciding the nature and extent of services. Fisheries stakeholders participate in the process because they wish to have input into the manner in which fisheries service will be supplied, where the effort should be spread and at what level it is provided. The commercial industry is also keen to ensure that fisheries services are delivered efficiently and at least cost to the Crown and industry.

The Minister, through the Ministry must also consult with the fishing industry on the method of sharing service costs and the level of levies to recover the costs of fisheries services. Only commercial fishers are consulted because the issue is restricted to the distribution of costs between commercial fishers.

The Fisheries Act 1996 also requires consultation by the Minister of Conservation on conservation services and the recovery of costs for those services. Conservation services are those services required for the performance of statutory duties related to the adverse effects of commercial fishing on protected species. Conservation services include:

- Research relating to fishing effects on endangered species.
- Research into measures to mitigate effects on endangered species.
- Development of population management plans.

The Department of Conservation consults on these services separately from the Ministry of Fisheries' nature and extent consultation, producing its own white paper. Nevertheless the Ministry of Fisheries carries out the consultation on how conservation services levies will be collected from

commercial levy payers in conjunction with consultation on the distribution of fisheries services cost.

4.4 Direct Purchase of Fisheries Research

Until recently there was little prospect of the responsibility for carrying out required fisheries research being delegated to commercial fisher organisations. Although all stakeholders were and remain free to purchase or carryout their own independent research, the purchase of research deemed to be a required service arising from the research planning consultations was considered to be core responsibility of government and too important to be trusted to fishery stakeholders.

In a few instances industry organisations such as the Rock Lobster Industry Council and the Seafood Industry Council have put together research proposals and tendered for and won contracts for the delivery of required services. The motivations for this action include:

- A desire for closer involvement in research work.
- Introducing new stock assessment and research methodologies such as the use of Bayesian stock assessment models.
- Better control of research costs from the tender phase through project delivery.

In these situations industry organisations are providers of research services and are contracted to the Ministry of Fisheries. They are not the purchasers of the research. Industry members still pay Ministry levies that are then used to pay the industry organisation delivering the research

An amendment to fisheries legislation allowing the direct purchase of required fisheries services by stakeholder organisations has improved the situation for commercial fisher organisations wishing to purchase rather than provide required research. Instead of the Ministry of Fisheries tendering out required research projects and then levying the seafood industry, an fisher organisation, subject to meeting appropriate standards and specifications, is now able to purchase and fund the research directly. Directly purchased research is still determined by the research planning process and the Chief Executive of the Ministry of Fisheries remains accountable to the Minister of Fisheries for the satisfactory performance of the research contract.

The benefits of directly purchased research are:

- Gains in economic efficiency due to lower transaction costs associated with stakeholder organisation directly running and funding their own research projects.
- Enhancement of commercial fishers stewardship ethic because they are directly involved in the purchase and execution of sustainability research rather than being indirectly involved through centrally run consultative processes.

Progress on direct purchase of required research services by stakeholder organisations has however been impeded by a number of factors:

- Opposition by environmental non-governmental organisations and some scientists who:
  - Believe sustainability research is a core responsibility of government since fisheries are a public resource.
  - Claim that industry has a strong incentive to distort the results of research or pressure contracted providers for short-term gain.
- A change in Government and a new Minister unfamiliar with fisheries issues.
- A perception by some segments of the fishing industry that direct purchase means devolution of management responsibility rather than the more simple delegation of the Ministry of Fisheries research purchasing functions. This led them to oppose being accountable to the Ministry for the delivery of required research services.
- An overestimation of the capacity of many commercial fisher organisations to fund and manage fisheries research projects orders of magnitude more complex than their existing log book or catch sampling programmes.
- An under-resourcing of the Ministry of Fisheries to develop necessary standards and specification, establish an effective monitoring and auditing regime, and manage the risks to government associated with the direct purchase of research.
- Insufficient collaboration between the fishing industry and the Ministry of Fisheries over the development of the direct purchasing regime.

None of these problems is insurmountable. Yet the direct purchase debate has created many expectations that have not been met. As a consequence the legitimacy of the concept for all parties involved has been severely undermined. This situation could have been avoided. Institutional and capacity issues associated with ensuring the accountability of organisations involved in direct purchasing research and the integrity of the research itself needed more consideration by industry and government at the outset.

New processes such as the direct purchase of research or even collaborative research will always be contested by some because they affect the distribution of political influence. Tension will always exist between the desire of stakeholders to maximise their own advantages and the desire to engage in collaborative research programmes to address shared outcomes such as sustainability. Tensions are exacerbated when institutions such as those needed for collaborative research must be founded on open communication and

participation. This makes protecting individual interests difficult.

5. CAPACITY ISSUES FOR COLLABORATIVE RESEARCH

Fisheries research is expensive, requires specialist skill and knowledge and must be well managed to ensure project goals, budgets and timelines are met. Fisheries research will not be devolved or delegated to a stakeholder organisation unless the Government is confident that the organisation has the financial and management capability to undertake and/or fisheries research. Making fisheries research management more complex is the uncertainty inherent in marine ecosystems. It is not unusual for expectations regarding the outcome of a research programme to be unfulfilled despite the best efforts of the research manager. Costs associated with purchasing scientific advice, or in some case having representation at meetings, also makes it difficult for many stakeholder organisations to fully participate in collaborative research processes.

5.1 Funding Fisheries Research

Funding and managing fisheries research is complex task. Retaining or contracting specialist science staff is often costly. Few commercial, recreational customary or environmental stakeholder organisations have the financial capacity to support this expertise.

There is no public subsidy of fisheries research in New Zealand. Research costs make up approximately 30% of the Ministry of Fisheries annual budget. Recovery of the majority of costs from industry (some environmental projects are 50 per cent Government funded and recreational and customary Maori projects are fully funded by the Government) means that research projects are carefully scrutinised for necessity and cost on a project by project basis during cost recovery consultations. Government research grants are not available from funding agencies for stock assessment work or other "operational" fisheries research.

In contrast to the cost recovery powers of Government, commercial fishing organisations must rely on a different set of funding mechanisms that vary in complexity and utility. These include:

- Direct voluntary funding of research
- Membership fees
- Call on shareholder funds
- Compulsory funding under the Commodities Levy Act
- Second tier levy funding under the Fishing Industry Board Act.

Voluntary funding and funding through membership dues do not generally provide the necessary security of funding for Government delegation of research or the independent purchase of large-scale research services. Organisations could also use civil contracts to collect funds for research and management from members. Enforcing this contract can be costly if members decide to default. Equally difficult is the incentive for free riding since members cannot be made to sign a civil contract or make a voluntary contribution. Nevertheless, voluntary funding for research and management has been successful in New Zealand's high value and/or high volume fisheries dominated by a few large quota owners with significant financial resources. Southern Rock Lobster, Hoki and Orange Roughy fisheries are examples.

Calling on shareholders funds if the stakeholder organisation is structured as a company has been suggested as possible source of research funding. Its success as a funding mechanism is dependent on the financial security and ability to pay of shareholders. Reliance on this method of funding would be a major disincentive to small fishing companies and independent fishers joining the organisation. This method has yet to be used in New Zealand.

Two mechanisms exist in New Zealand for fisher organisations to raise compulsory levies. The first mechanism is the levy powers contained in the Fishing Industry Board (FIB) Act. Though relatively simple to use, commercial organisations are restricted to a "second tier" levy that has a cap that makes it difficult to raise sufficient funds for medium to large-scale research projects. Nevertheless, this option is remains popular with fishers because of its low transactions costs and familiarity with the levying mechanism

The main use of the FIB Act levy powers is to fund the FIB's purchase of services from the industry umbrella organisation - the Seafood Industry Council. Approximately $NZ 2.5 million is raised per year of which $600,000 is spent on generic research services and advice that benefits all of industry. Another $500,000 of research services directly benefiting stakeholder organisations are purchased from SeaFIC. The future of this funding mechanism depends on the Government's willingness for a private organisation such as SeaFIC to benefit from the compulsory levying powers normally used by a statutory body such as the FIB. The Government has signalled that it prefers an alternative finding mechanism to be found.

The Commodity Levies Act provides an alternative levying mechanism to the FIB Act and is generic across all primary sector producer organisations. It requires a stakeholder organisation to gain greater than 50 percent support from potential levy payers before a compulsory levy can be raised.

Those who voted against the levy must still pay the levy. Having carried out the referendum an application to use the powers of the Act is scrutinised by Government departments and final approval requires a Ministerial decision.

One commercial fisher organisation has so far used this mechanism to fund research activities. A second has completed the referendum stage and is awaiting Government approval. A third is mid-way through the referendum process. Their experience shows the Commodity Levies Act process to be time consuming, taking up to two years for a levy to be implemented. The Act also requires that the levy be spent in the way specified in the referendum. Any major departure in the use of the levy or change in the amount levied requires a new referendum. It also requires enforcement of payment of the levy by the stakeholder organisation.

Larger organisations with staff resources, a united membership, and long term or ongoing research programmes are most able to use the commodity levy mechanism. Smaller organisations with limited staff resources or those wishing to raise funds for "one off" projects are likely to find it too cumbersome and time consuming to feasible as funding mechanism.

5.2 Developing Skills for Collaborative Research

Greater research responsibilities for fisher organisations require a set of skills more commonly found in public agencies and research providers than in fishing companies. Skills required by managers include an understanding of and experience in:

- The business of fishing.
- Public policy.
- Fisheries science and marine ecology.
- Strategic planning.
- Project management.
- Advocacy.
- Public relations.
- General leadership qualities.

Few individuals will have all these skills and if they do, too little time to utilise them all effectively. Such individuals must also be rewarded for their performance in terms of salary and job satisfaction. Fishers must have an appreciation of the need for managers with these skills if they are to support the kind of organisation and level of funding required to successfully utilise the skills.

More practically, if fishers are to actively participate in research projects they require their own set of skills in data collection and biological sampling. To engage effectively in public policy and environmental debate fishers also need to understand such biodiversity and ecosystems and have an appreciation of public policy and resource management theory.

Recognising the need to develop fisheries management and research skills through out the New Zealand seafood industry, the Seafood Industry Training Organisation (SITO) business unit of SeaFIC is developing training programmes that lead to nationally recognised qualifications in fisheries management and related research subjects. These programmes are based on identified capacity gaps or key training needs and develop agreed training unit standards that are offered by a range of training providers.

This has been the case with the training of crew in biological sampling and data collection techniques. Key to the programme is training members of each crew to a standard that allows them to assess and train other crew or company staff. Necessary skills are then rapidly disseminated throughout the industry. Quality standards are maintained by auditing and assessing the training providers and assessors. Biological sampling results and data forms are also checked at the data entry stage and deficiencies identified resulting in additional training or retraining of crews.

Tertiary level training of fisheries managers is a longer-term process. Training needs have to be determined and priorities set. Different training paths are required for managers already employed in the industry and for tertiary students looking for careers in the fishing industry. Also important is attracting the best students to a career in fisheries management and research. The seafood industry competes with other primary sectors and with marine biology for student interest. Information programmes, scholarships and internships are potential ways to address this issue.

A major barrier to tertiary level training in New Zealand is a lack of a co-ordinated programme of courses within any tertiary institution. As a consequence there are no programmes capable of meeting fisheries management training needs. Tertiary institutions though will not offer the necessary courses until there is sufficient demand. This demand will come about only when the seafood industry recognises the importance of this type of training and funds its managers to participate.

Tertiary training needs specific to the seafood industry aspirations for greater management and research responsibilities are therefore filled as best as possible in a piece-meal fashion in New Zealand or met overseas. Overseas training incurs a greater cost to industry in terms of time and money and also increases the risk that management skills are lost offshore. SITO is looking to rectify this situation but prospects of a New Zealand-based

comprehensive training programme in the near future are limited because of there is limited capability to provide the necessary training.

5.3 Fragmentation of Skills and Efforts

Institutions and processes associated with decentralised and collaborative research need to be mindful of the consequences of capacity fragmentation. For example too many fishery or regionally based commercial fishery organisations may mean industry resources – financial and human – are spread thinly. On-going dialogue between fisher organisations and a proactive approach to research co-ordination by an umbrella organisation such as the Seafood Industry Council can minimise skill fragmentation.

Splitting of the operational policy and research among different government agencies is common in New Zealand. Government agencies providing research are structured along commercial lines and are required to generate a commercial rate of return on their assets. Although this means smaller, more commercially minded agencies it can also reduce the capacity of management agencies to deal quickly and efficiently with changing research needs and priorities. Necessary research capacity or skills now reside outside of the primary public agency for fisheries management and must be purchased commercially.

The ability to contract in research can be severely restricted in a cost recovered environment were annual budgets are set a year in advance at the output level. Retrospective changes to levies can be administratively difficult to achieve and are unpopular with levy payers.

Competitive tendering of fisheries research although encouraging innovation and cost-effective research provision may also have its downside. Tendering on a project by project and year to year basis may mean research providers:

- Find it hard to find funding for longer-term projects.
- Be reluctant to hire specialised staff preferring to employ generalist staff and contract in specialist skills as required.

The result can be a loss of skill and expertise leading to a decrease in the quality and hence utility of research for fisheries management. The Rock Lobster Industry Council is negotiating a three year stock assessment research programme to avoid these consequences and achieve better efficiencies

Although these capacity issues has been encountered to varying degrees in New Zealand, they have not been sufficiently severe to impact on the overwhelming positive contribution of collaborative research to ensuring the sustainability of fisheries resources. High levels of industry participation in research planning and stock assessment, the ability to scrutinise research costs because of cost recovery and greater scope and incentives for industry-led research initiatives mean widespread industry support for collaborative research-related institutions and processes.

Potential problems with capacity fragmentation can be overcome by considering these issues at the design stage of institutions and processes for collaborative research. Notwithstanding this, problems may only become apparent after new institutions and processes have been put in place. Also, if collaborative research is an indirect outcome of a wider set of generally successful institutional reforms, research specific issues may be overlooked and responses delayed.

6. CONCLUSION

Successful collaborative research for the management of New Zealand's fisheries is about much more than science. It is about creating institutions, establishing robust processes for determining research needs and integrating results with management actions, and building capacity among commercial fisher organisations and research providers.

Organisations like the Seafood Industry Council, its predecessor the Fishing Industry Board, the Hoki Management Company and the Rock Lobster Industry Council lead the way in industry participation in collaborative fisheries research. It is time, however, for a more coherent and co-ordinated strategy to enable the potential for collaborative research to be fully realised. Such a strategy must be driven equally by industry and management agencies and its objectives must shared by recreational and customary fishers. Participation must also extend to environmental non-governmental organisations. If allowed to dominate the politics of exclusion will ultimately undermine the legitimacy of collaborative research

Fisher participation in collaborative research should not be viewed simply in terms of funding or as an additional source of scientific data. The knowledge held by fishermen and how they apply this knowledge are essential elements of sustainable fisheries management. Collaborative research is fundamentally about creating opportunities to gain knowledge, articulate values, express culture and establish communities based on a shared understandings of fisheries. In the end most fisheries issues will not find resolution on scientist's computers or in policy-makers offices'. They will be solved by the collective actions of fishers on the water, by fishers who are willing to listen learn and are ready to change in response to a continually developing knowledge about the sustainability needs of fisheries.

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