

Strategic Framework for Fishery Monitoring and Catch Reporting in the Pacific Fisheries

DRAFT

A DISCUSSION PAPER

Fisheries and Oceans Canada
Pacific Region
Fisheries and Aquaculture Management

November 2010

Table of Contents

1. Introduction	1
Policy context	1
Key drivers for change	2
The current status of monitoring and reporting	4
A risk-based strategic framework	6
2. Goal and Guiding Principles	7
Goal	8
Principle 1: Sustainability and conservation	8
Principle 2: Consistency and transparency	9
Principle 3: Tailored requirements	9
Principle 4: Shared accountability and access	10
Principle 5: Cost-effectiveness	10
3. Challenges and Opportunities	11
4. Strategic Approach	12
Strategy 1: Monitoring and reporting requirements	12
Strategy 2: Monitoring and reporting programs	16
Strategy 3: Data management	17
Strategy 4: Other program support	18
Strategy 5: Monitoring and reporting plans	18
Strategy 6: Continual improvement	18
5. Summary and Next Steps	19
References	20

1. Introduction

Faced with a myriad of challenges, including climate change, declining fish stocks, reduced economic viability, an evolving global marketplace, and heightened competition for aquatic resources, Canada's Pacific fisheries are undergoing reform. Demands for sustainable management that considers the larger ecosystem, engages resource users in decision-making, respects Aboriginal rights and finds solutions to allocate scarce resources are putting pressure on governments and fishery interests alike. Perhaps nowhere is the situation more critical than in our salmon fisheries, where distrust of reported catch data has helped to fuel conflicts between harvesting groups.

Reliable, timely and accessible fisheries information is the foundation of sustainable management. While the importance of good catch data is certainly not new to the Pacific Region, the worldwide trend towards sustainable fisheries and supporting management practices is calling for improvements in monitoring and reporting. In this environment, it is vital that our fisheries have a consistent approach to determining information requirements and monitoring programs—one that inspires confidence and cooperation among harvesters, global consumers and the Canadian public.

This discussion paper sets out a strategic framework to guide Pacific fishery monitoring and catch reporting into the future. The framework was developed by the Department of Fisheries and Oceans (DFO) in consultation with First Nations, commercial and recreational harvesters and other stakeholders. It is intended to serve as one of the tools within the Sustainable Fisheries Framework of DFO's overarching Fisheries Renewal agenda.

Policy context

Fisheries Renewal is the Department's national initiative to achieve sustainable fisheries, economic prosperity and improved governance that ensures greater stability, transparency and accountability in fisheries management.¹ Central to this initiative is the Sustainable Fisheries Framework (SFF) established in 2009 to consolidate existing and new fisheries sustainable development policies and tools.² The SFF embodies a precautionary, ecosystem-based approach to management and seeks to stabilize fishery allocations through new sharing arrangements between harvesting sectors. This move to defined shares, in turn, requires enhanced catch accountability for each sector to ensure that all removals of target species and bycatch are properly considered.

Important policies and tools of the evolving SFF include:

Precautionary Approach Policy – All fisheries will be subject to a formalized decision-making framework that incorporates the precautionary principle. For key stocks in a given fishery, upper and lower reference points will be determined to define zones of stock status (critical, cautious and healthy). Harvest decision rules will then be developed and applied for each zone linked to these reference points.

Integrated Fisheries Management Plans (IFMPs) – IFMPs are the primary tool for balancing the ecosystem, social and economic dimensions of fishery decisions. All of the new SFF policies and tools will be implemented through existing IFMP processes. The new IFMP template will contain better guidance on socio-economic analysis of the fishery.

¹ DFO (2009), *Fisheries Renewal Statement: Working Draft*.

² DFO (2008), *Fisheries Renewal – Resource Management Sustainable Development Framework (RMSDF)*.

Fishery Checklists – Every fishery will have a checklist completed to monitor progress and identify gaps in meeting conservation goals and sustainability standards. This self-diagnostic tool is also to be used for data collection and input into performance reporting. The Fishery Checklist encompasses information on target stocks, non-target species (bycatch), habitat and ecosystem effects, and management systems.³

Fishery monitoring and catch reporting requirements must support these and other SFF components—for example, the Sensitive Benthic Areas Policy, Forage Species Policy and Bycatch Catch Policy—as they are finalized and implemented.

Key drivers for change

In recent years, developments at the regional, national and international levels have created the impetus for better monitoring and reporting:

Sustainability and public confidence – Canadians expect their fisheries to be managed in a precautionary way that conserves the resource and allows sustainable use. They are demanding more transparency and accountability in resource decision-making. Public confidence is increasingly important for the Pacific fisheries, providing a social license to operate in the marine environment where there are many competing uses.⁴ Building that confidence requires clear evidence, through sound catch reporting data, that fisheries are indeed environmentally, socially and economically sustainable.

Collaborative management – Globally over the past decade, new models of fisheries governance have emerged that recognize local stewardship and shared responsibility for resource decisions. Co-management with First Nations and other fishing interests is a major component of Pacific fisheries reform.⁵ DFO is pursuing collaborative strategies through its harvest advisory processes, Aboriginal fisheries initiatives and integrated oceans management. To succeed, co-management must be backed by high-quality fisheries information that can support greater confidence and mutual trust among harvesters and other participants in decision-making.

Aboriginal rights, treaties and other agreements – The First Nations Food, Social, Ceremonial (FSC) fishery is unique, having developed over many years through a blend of legislation, case law and negotiation. FSC fisheries have priority access to the resource, second only to conservation needs. Evolving Aboriginal rights require accurate and comprehensive monitoring of fisheries to ensure that these rights are respected. Existing and future First Nations Treaties and other domestic and international obligations, such as the Pacific Salmon Treaty and various UN agreements,⁶ also necessitate higher standards of fishery monitoring and catch reporting.

An ecosystem perspective – International commitments, along with the *Oceans Act* and *Species at Risk Act*, compel the Department to adopt a broader ecosystem approach to resource management. Integrated ecosystem-based management (EBM) looks beyond a

³ DFO (2009), *Fishery Checklist 2009*, Version 3.0.

⁴ Gislason (2007), *Commercial Catch Monitoring: Gatekeeper to Sustainability and Public Confidence in Pacific Canada*.

⁵ DFO (2005), *A Discussion Paper on the Implementation of Pacific Fisheries Reform*, pp. 7 and 19.

⁶ In particular, a series of international agreements have enshrined the use of a precautionary, ecosystem approach to fishery management, including the 1992 *United Nations Convention on Biological Diversity*, 1995 *Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks*, and 2002 Johannesburg commitment to achieve Maximum Sustainable Yield by 2015.

single species, sector or activity to examine the cumulative impacts of all human actions on the ecosystem. In the fisheries case, this means managing not just for stock productivity, but also for biodiversity and habitat integrity.⁷

The global push for integrated EBM is expanding the scope and complexity of monitoring systems. Aside from basic catch and biological sampling data on the target stock, information requirements may now encompass bycatch of non-targeted fish, birds and marine mammals; regulated releases of target and non-target species; encounters with species that are not captured; and impacts of the fishing operation on critical habitat.

Share-based fisheries – To remain viable at a time of increased competition, more and more fisheries around the world are being managed by defined shares or established quotas. In DFO Pacific Region, quota systems have been implemented for the commercial groundfish and roe herring fisheries as well as for several shellfish fisheries (e.g., geoducks). Commercial salmon fishing is testing share-based management.

These management regimes, by their nature, demand accurate, timely and verifiable fisheries data to confirm that catch limits are being met. Indeed, one of the primary benefits of share-based systems is that they bring greater accountability to fisheries through enhanced monitoring and catch reporting. Evidence for the Pacific fisheries suggests that, better monitoring and management has led to the maintenance of total catch levels although the costs to harvesters are higher, fleet rationalization and improved economic performance, as well as greater sustainability and conservation.⁸

Selective fishing – Mark-selective fisheries allow fishing opportunities for hatchery-raised salmon when a fishery might otherwise be closed to protect wild salmon. Similarly, selective fishing techniques (e.g., fish wheels, traps, weirs, dip-nets) can be used to harvest more abundant fish stocks or species while protecting stocks/species of concern. These selective fisheries entail more intensive monitoring, to retrieve coded wire tags (CWT) or other information from tagged fish and/or to determine compliance, bycatch levels and specific release rates.

What is Fishery Monitoring and Catch Reporting?

Fishery monitoring means observing and understanding the fishery and its dynamics [DFO(2002)]. It includes observation and examination of the catching and landing of fish and any related activities, such as counting of vessels and gear and sampling of any fish caught. Monitoring is carried out by harvesters, First Nations and, increasingly, third party observers designated by DFO. Departmental staff including fishery officers, fishery guardians, fishery managers, biologists and scientists also conduct monitoring activities.

Catch reporting means providing information either verbally, in writing or electronically on the catch and other essential details related to the fishing activity (location, gear type, etc.). Reporting is performed by harvesters or by fish buyers, off-loaders or contracted third party dockside monitors/observers (also RDG-designated) on behalf of harvesters.

Other activities associated with monitoring and reporting include the specification of information and biological sampling requirements, auditing of collected data for accuracy and completeness, information management, compliance enforcement of catch reporting regulations and licence conditions, summarizing and analysis of catch and fisheries monitoring data, and the internal communication and public reporting of catch estimates and other information. All of these activities are the Department's responsibility.

⁷ DFO (2009), *Putting ecosystem-based management to work*.

⁸ See for example Gislason (2007), *Commercial Catch Monitoring: Gatekeeper to Sustainability and Public Confidence in Pacific Canada*; and Fraser (2008), *A Preliminary Review of the Groundfish Integration Pilot Program*.

Eco-certification and traceability requirements – A changing world marketplace also has expectations for enhanced accountability on the part of fisheries and seafood suppliers. In particular, consumer and ENGO demands for certified sustainably harvested seafood products and the development of traceability programs to address food safety concerns both require more rigorous monitoring and reporting procedures.

The Pacific halibut, hake, sockeye salmon and albacore tuna fisheries have all been certified by the Marine Stewardship Council (MSC), with four other species still in the MSC assessment process. DFO has been working with harvesters and the BC government on a traceability system to comply with new implemented EU regulations. These certification and traceability requirements, in turn, can increase market access and add value for Pacific fishery products.

The current status of monitoring and reporting

Fishery monitoring and catch reporting in the Pacific fisheries has evolved since its inception more than a half-century ago.⁹ Today, the level of information gathering ranges from no monitoring in some fisheries, such as remote recreational and First Nations shellfish harvesting, to enhanced monitoring requirements, as exemplified by the integrated commercial groundfish fishery. Not surprisingly, the extent and intensity of monitoring efforts vary significantly with the fishery's size and location, particular management risks and information challenges, and other factors.

Over the years, outside reviewers including the Auditor General of Canada and the Pacific Fisheries Resource Conservation Council have identified shortcomings in fishery monitoring and catch reporting. In response, DFO committed to pursue shared accountability and the development of "basic standards for monitoring and reporting" in consultation with all harvesting groups.¹⁰ In 2002, the Department released a *Pacific Region Fishery Monitoring and Reporting Framework* setting out principles with which to review and improve fishery monitoring and catch reporting systems. The framework also identified a number of fishery attributes (geographic scope, number of species, fishing power, etc.) for consideration when deciding on specific monitoring and reporting strategies.

Building that work, since 2002, selected measures have been taken to improve monitoring and reporting in various fisheries. Under the pilot Integrated Groundfish Program launched in 2006, 100 per cent at-sea video monitoring was implemented for all commercial groundfish hook and line and trap vessels.¹¹ A preliminary program review in 2008 found that more timely and comprehensive information on fish catch, including releases, was being collected for all seven groundfish fisheries.¹²

Other recent monitoring developments include:

- Several commercial demonstration salmon fisheries, such as the Area F troll fishery on the North Coast, have adopted enhanced monitoring to verify all catch in a pilot quota fishery; as well, all gear types have been testing electronic logs (e-logs) to enable faster, more accurate data reporting.

⁹ See for example DFO (2002), *Pacific Region Fishery Monitoring and Reporting Framework*; Beaith et al., *Summary of Catch Monitoring Programs for Commercial Salmon Fisheries in Southern B.C., 1998-2002*, pp. 1-2; and DFO (2009), *Revisions to the Official DFO Commercial Pacific Salmon Catch Estimates for 1996-2004*, p. 2.

¹⁰ DFO (1999), *An Allocation Policy for Pacific Salmon*.

¹¹ This change filled a monitoring and reporting gap for the commercial groundfish fisheries, which already had 100 per cent on-board observer coverage for the trawl fleet and 100 per cent dockside monitoring across all fisheries. Prior to the program, the trap/hook and line fleet was subject to only partial (10 to 15 per cent) on-board observer coverage.

¹² Fraser (2008), *A Preliminary Review of the Groundfish Integration Pilot Program*.

- E-logs have also been piloted by sport fishing guides, some commercial fleets, and lodges and recreational creel surveys have expanded to include halibut and other groundfish information.
- In FSC fisheries, a new role (data management advisor) to coordinate data collection for several First Nations has been successfully piloted on the Central Coast; further, catch calendars and customized data systems have been adapted in many communities to collect and forward local catch data.

Despite such improvements, deficiencies remain in information gathering, in terms of coverage of the fisheries, missing or unreliable data, reporting delays and other issues. In a recent analysis, Pacific Region resource managers were asked to rate the current level of monitoring and reporting for their fisheries using three indicators—target catch, bycatch and fishing effort—and then to suggest what the appropriate level should be in each case.¹³ Based on this partial assessment, many existing monitoring programs were found to provide the necessary information. However, in every species group and harvesting sector, there were also many fisheries in need of better monitoring and reporting. Consequently, for these and all other Pacific fisheries going forward, a systematic approach must be applied for determining fishery information requirements and how best to meet them.

A Look Back at Pacific Fishery Monitoring Programs

Commercial sector: In 1951, catch reporting began for the commercial salmon fisheries with the submission of sales slips generated at time of landing showing the quantity, value and species of the catch. As fisheries developed, this approach became increasingly flawed due to its failure to account for releases/discards, time lags between fishing and catch deliveries, non-compliance and other problems. In 1998, as part of *A New Direction for Canada's Pacific Salmon Fisheries*, logbooks and on-board observers were introduced to address some of these deficiencies. Harvesters record their kept and released catch and report the results by telephone and mail. In addition to fisher-supplied data, for most commercial salmon fisheries trained and DFO-certified observers collect detailed data on the harvest and bycatch as well as biological samples (e.g., lengths, weights, tissue for DNA analysis).

The use of at-sea observers in the groundfish fisheries dates back to the late 1980s. Mandatory 100% observer coverage was implemented for the groundfish trawl fleet in 1996. By 1994, most of the fleet also had compulsory dockside monitoring in place, where DFO-approved monitors documented the harvest at designated landing sites. While all groundfish fisheries now require 100% dockside monitoring, this approach is used only periodically in the salmon fisheries, e.g., for the commercial salmon demonstration projects and the lower Fraser River pilot sales fishery.

Other techniques including on-ground hauls, charter patrols and aerial over-flights have also been used to provide gear counts, location and timing of fishing and additional information. The recent emergence of video monitoring and electronic vessel tracking systems offers potential cost efficiencies and more timely data reporting.

Recreational sector: From the mid-1950s through the 1970s, DFO estimates of catch and effort in the sport fishery relied on subjective assessments by fishery officers and small-scale creel surveys. The need for greater rigour and consistency led to the launch in 1980 of a major creel survey program focused on salmon for the Strait of Georgia. Since then, creel surveys have been added for other coastal areas and in some freshwater systems, as the scope of recreational fishing has expanded geographically and to include other species. To conduct these surveys, aerial over-flights estimate effort and fishery technicians visit marinas, boat ramps and river locations to interview anglers about their catch and take biological samples where needed.

First Nations fisheries: For many years, FSC fisheries, like sport fishing, were monitored on an ad hoc basis by fishery officers. Currently, methods such as census programs, roving or access point surveys and mandatory landing sites for pilot sales fisheries are being implemented in cooperation with First Nations.

¹³ The monitoring and reporting level was rated as "unmonitored," "low," "moderate," and "enhanced." See Appendix 1 (to be prepared) for a summary of the analysis results.

A risk-based strategic framework

In July 2007, a five-year Pacific Integrated Commercial Fishery Initiative (PICFI) was announced to support environmentally sustainable and economically viable commercial fisheries. Among the PICFI elements were Co-management and Enhanced Accountability Measures to strengthen fishery monitoring, catch reporting and enforcement. This second element promised consistent, transparent standards for monitoring and reporting in the commercial sector, with the proviso that enhanced information requirements might also be needed in the recreational and FSC fisheries.¹⁴

Out of the Integrated Salmon Dialogue Forum, a multi-stakeholder Monitoring and Compliance (M&C) Panel was formed in 2008 to examine ways to improve monitoring, catch reporting and compliance in the salmon fisheries. This independent panel of representatives from First Nations, commercial, recreational and conservation interests has been working with the Department to “map a better pathway for monitoring and compliance.”¹⁵

Under the PICFI Enhanced Accountability work plan, DFO Fisheries and the M&C Panel have collaborated on the development of a strategic framework for fishery monitoring and catch reporting.¹⁶ During this time, the Department also prepared some draft interim standards for monitoring and reporting in the commercial salmon fisheries, as well as a discussion paper on First Nation FSC catch monitoring.¹⁷ In addition, work proceeded to define internal accountabilities for fishery monitoring and reporting (through an Accountabilities Working Group) and to prepare the infrastructure for the better provision and accessing of fisheries data.¹⁸

The strategic framework outlined below is meant to develop an improved monitoring and reporting system that balances the biological (ecosystem), socioeconomic, management and other risks for Pacific fisheries. The framework draws on the structure and content of the SFF Fishery Checklist template. In keeping with the 2002 policy guidance on catch monitoring and reporting, it applies consistent risk assessment criteria to each fishery, but allows for final monitoring and reporting requirements that reflect the fishery’s unique characteristics (see Figure 1).

¹⁴ DFO (2007), *Pacific Integrated Commercial Fisheries Initiative (PICFI): Enhanced Accountability Measures*.

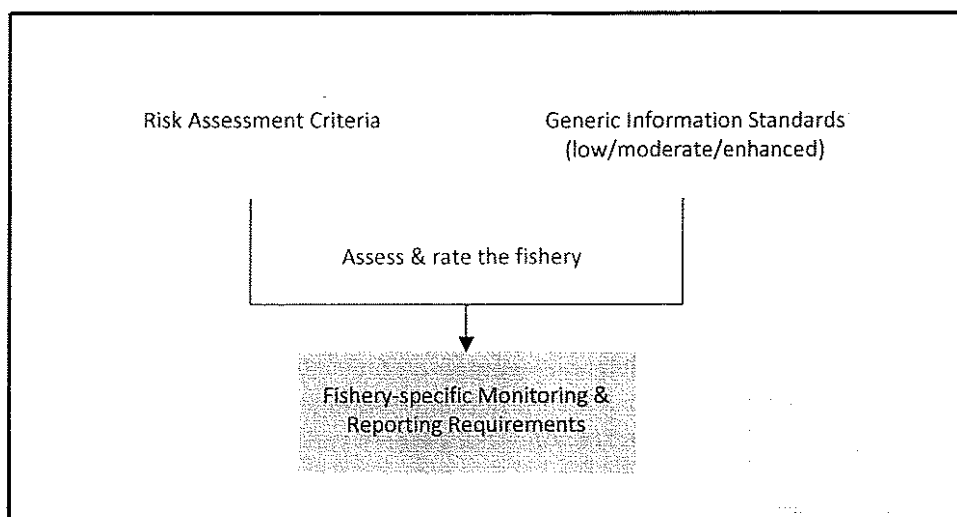
¹⁵ Integrated Salmon Dialogue Forum M&C Panel (2010), *Fishery Monitoring in the Pacific Region – Charting our Course: A Strategy for Improved Confidence and Support*, p. 1. The Forum itself was created as a means to bring together the various interests to work towards a sustainable salmon fishery.

¹⁶ See *ibid.*

¹⁷ See DFO (2008), *Interim Fishery Monitoring and Catch Reporting Standards for Commercial Salmon Fisheries* (Draft for Discussion); and Lightly and Masson (2009), *First Nation FSC Catch Monitoring and Reporting: Preliminary Considerations, Standards and Recommendations* (Draft for Discussion). The draft interim commercial salmon fishery standards were developed for discussion purposes and were never applied; instead, some ad hoc improvements were made through commercial demonstration salmon fisheries, as noted above. The FSC fisheries discussion paper will inform upcoming consultations with First Nations.

¹⁸ See further under Sections 4 and 5.

Figure 1: Approach for Monitoring and Reporting Standards



2. Goal and Guiding Principles

Improvements in fishery monitoring and catch reporting can contribute significantly to all three of the objectives for Fisheries Renewal.¹⁹

Long-term sustainability – A comprehensive, efficient catch monitoring network is a vital tool for evaluating and reporting on a fishery’s progress towards long-term sustainability. Broadening the scope of information collected to discards, bycatch, sensitive habitat and other environmental impacts supports the continued application of a precautionary ecosystem approach to fisheries management.

Economic prosperity – By providing the data needed for sustainable fisheries management, better monitoring and reporting systems can help to maintain or improve access to fishing opportunities and the resulting benefits for harvesters, coastal communities and other stakeholders. Reliable catch data are essential to enabling defined shares that are expected to bring greater flexibility, stability and fairness to the salmon fishery, and to achieving other economic priorities such as increased Aboriginal participation in the commercial sector.

Improved governance – An enhanced role for harvesters in assuming the responsibilities and costs for fishery monitoring and reporting is part of the move to shared stewardship and accountability for resource decisions. Decisions will also be more transparent through the use of a standardized process to determine monitoring and reporting requirements.

DFO’s vision is of a monitoring and catch reporting system across all Pacific fisheries that inspires increased confidence and fosters collaborative management. This vision is embodied in an overarching goal and set of guiding principles, which are closely aligned with the broader Fisheries Renewal Vision.²⁰

¹⁹ DFO (2009), *Fisheries Renewal Statement: Working Draft*, pp. 10-14.

²⁰ *Ibid.*, pp. 7-8.

Goal

To have accurate, timely and accessible fisheries data, such that there is sufficient information and public confidence for all Pacific fisheries to be managed sustainably and to meet other reporting obligations and objectives.

An effective fisheries management regime requires “close collaboration with resource users and stakeholders based on shared stewardship.”²¹ For that collaboration to happen, resource managers, harvesters, First Nations and other stakeholders must all be satisfactorily assured on the amount, depth and quality of fishery monitoring and catch reporting data. The public, in turn, is more likely to have confidence in management decisions and their successful implementation if there is a broad-based understanding and acceptance of the information behind these decisions.

In addition to serving the needs of sustainable management, monitoring programs must be adequate to meet the provisions of domestic and international agreements, First Nations treaties, harvest allocation arrangements, fishery certification requirements and any other reporting obligations.

Principle 1: Conservation and sustainable use

Fishery monitoring and catch reporting must provide the right information to support prosperous, sustainable fisheries that ensure the protection of fish populations, their habitat and the broader ecosystem.

Sustainable fisheries based on the conservation of resources are the ultimate objective of better monitoring and reporting systems. Sustainability means that fish stocks are harvested in a way that meets today’s needs without compromising the ability of future generations to satisfy their own requirements. Pacific fisheries must be able to clearly demonstrate their sustainability, in environmental and socioeconomic terms, if they are to be viable for the long term.

Information necessary to sustain and protect fishery resources and their habitat is the first priority of monitoring and reporting. For many fisheries, this includes gathering the data to manage to

The Uses for Fisheries Information

Fishery monitoring and catch reporting provides information of value to the Department, other government agencies at the local, provincial, federal and international levels, First Nations and stakeholder groups. Monitoring programs serve a variety of purposes.

Resource managers use data on the quantity, timing and location of catch and bycatch as well as vessel and gear details to make in-season management decisions, e.g., opening and closing fisheries. This information also guides pre-season fisheries planning and post-season evaluations. Scientists need data on fishing mortality and various biological characteristics (e.g., size, age, sex, feeding behaviour) to conduct their stocks assessments and research. Fishery officers require catch and other data for to carry out compliance and enforcement with respect to catch and bycatch limits, gear restrictions, area closures, seasonal restrictions and other regulations and licence conditions.

Government planners and policymakers use fisheries information for socioeconomic analyses (e.g., to assess the employment and income impacts of different harvest regimes) and administration of programs including employment insurance and workers compensation. In addition, data must be provided to meet the specific reporting provisions of domestic and international treaties and agreements, such as the Nisga’a Treaty, regulations by the International Pacific Halibut Commission and UN fisheries agreements.

²¹ DFO (2009), *Fisheries and Oceans 2009-2012 – Departmental Plan for Transfer Payment Programs*.

identified limits. For others, it means acquiring sufficient information to evaluate the success of the chosen management strategy.

Depending on the fishery, monitoring may encompass not only the target fish stock(s) and related habitat, but also other species incidentally caught or affected as well as further components of the ecosystem. Key examples include species at risk and critical habitat such as estuaries and sponge reefs. Where a fishery has significant ecosystem impacts, these impacts must be adequately assessed and tracked over time.

Principle 2: Consistency and transparency

While monitoring and reporting requirements will vary by fishery, they will apply equally to all harvesters and will be determined based on consistent criteria and in a transparent manner that allows information to be easily accessed and understood by resource managers, other data users and the general public.

Different fisheries require different levels of information, in view of their individual characteristics and risks (see Principle 3). However, it is vital that a standardized approach be used when determining the appropriate information level for each fishery. In every case, fishery managers must clearly explain the requirements for monitoring and catch reporting, and how they were derived, to harvesters, other stakeholders and the public.

A consistent set of criteria will guide the determination of monitoring and reporting requirements for all Pacific fisheries. These criteria will consider the status of target stocks, habitat and ecosystem impacts, the value of the fishery, allocation arrangements and other factors. For any given fishery, the resulting requirements will apply across the board to all harvesters; no one harvesting group will be unduly targeted for monitoring and reporting responsibility.

Information management systems must provide timely access to monitoring and catch reporting data to serve fisheries management and other uses. The information should be of defined quality and in a consistent format that enables various kinds of data (e.g., fishing effort and catch, catch from different fisheries in the same area) to be integrated. It will be stored in centralized data systems that balance the need for access by all users with the protection of proprietary information.

Principle 3: Tailored requirements

Information requirements will depend on the nature and scope of the fishery, reflecting the particular risks and management regime; further, they may change over time.

The level of fishery monitoring and catch reporting has to respond appropriately to the complexity and degree of risk associated with each fishery. Such flexibility is consistent with the precautionary approach, which requires increased risk avoidance—in this case, enhanced information gathering—where there is greater uncertainty or risk of serious or irreversible harm.

Information requirements will vary by fishery with certain key characteristics, risk factors and reporting obligations, including:

- Single stock or single species fishery versus multi-stock or multi-species fishery;
- Abundant, healthy target stock versus stock or species of concern;
- Extent of bycatch and other ecosystem impacts;
- Economic and socio-cultural value of the fishery;
- Fishing power and exploitation rate; and
- Open fishery versus quotas or defined shares.

If the fishery is more complex, the biological, socioeconomic and other risks are higher, or there are specific reporting needs to be met, then monitoring and catch reporting will be more intensive. This enhanced requirement will be expressed in terms of information attributes, for example, greater detail in the fishery data collected, a higher frequency of reporting, or more precision and accuracy of estimates derived from the data.

Monitoring and reporting requirements may evolve with changes in the nature and intensity of the fishery as well as in the management approach. For instance, some management measures may allow the information level to be reduced while maintaining an acceptable degree of risk (e.g., by modifying the harvest area or gear after monitoring programs have identified high-risk factors).

Principle 4: Shared accountability and access

Everyone involved in monitoring and reporting—harvesters, DFO and third parties—must be committed to providing timely, accurate fisheries information. Continued access to the resource and its benefits is contingent on all harvesting groups fulfilling their roles in data provision, which in turn demands a clear assignment of responsibilities and accountabilities.

Harvesters are individually and collectively responsible for the provision of fishery monitoring and catch reporting data. The Department's responsibilities include compiling, analyzing and auditing the information, integrating it into established databases, and publicly reporting the data as required. Third parties (e.g., observers) play a role in assisting with data collection and verification.

All participants need to appreciate that their responsibility will be heightened where a higher standard of information is required to manage biological and socioeconomic risks, or to satisfy other management objectives. Harvesters may experience greater access to fishing and additional resource benefits if the right data are available to properly address these elevated risks and other objectives. Conversely, a failure to comply with monitoring and reporting requirements may lead to restrictions on fishery openings and future fishing opportunities.

Because harvesters share in the accountability for fisheries data, they should also take part in the development of monitoring and reporting programs. This participation includes helping to select the appropriate techniques for data gathering and delivery, and to clarify the roles and responsibilities of the different players. DFO will work with harvesters on planning and implementing the specific monitoring and reporting programs for individual fisheries.

Principle 5: Cost-effectiveness

Fishery monitoring and catch reporting programs will ensure that the information requirements are achieved as cost-effectively as possible.

Increasingly in Pacific fisheries, harvesters have been assuming responsibility for the costs of monitoring and reporting. Over the long term, all harvesting groups in every fishery are expected to bear their full share of costs to meet the information requirements.

Self-funding of fishery monitoring and reporting may mean considerable expense for harvesters. Various tools and methods are available for collecting and transmitting data, each with its own costs and benefits. The challenge for resource managers and harvesters is to agree on a monitoring program that balances rigour, affordability and practicality of implementation. This is not to say that programs will sacrifice accuracy and thoroughness of information gathering for lower harvester costs. In cases where an enhanced monitoring program is not affordable, a more conservative

harvest regime (e.g., by controlling area, time, effort or gear type) may be required to adequately manage the risks.

3. Challenges and Opportunities

There are considerable challenges to achieving the regional goal for fishery monitoring and catch reporting. At the same time, greater collaboration on information gathering and fishery management in general can bring long-term benefits to the Department and harvesters alike. Key challenges and opportunities include:

Building trust – To arrive at a common awareness and understanding of the need for improved monitoring among all resource users and the public is no trivial feat. The challenge is especially daunting for the Pacific salmon fisheries, given the current level of distrust between and within harvesting sectors. Nonetheless, the application of consistent standards for monitoring and reporting through a transparent process could go a long way towards restoring confidence in fisheries information and resource management.

Linking accountability and access – In the Integrated Groundfish Program, commercial harvesters know that if they want access to the resource they must pay for monitoring and reporting. The notion of resource user responsibility for these costs is not so prevalent elsewhere. Linking harvester accountability with continued access to fishing opportunities is meant to provide a positive incentive for compliance, as opposed to the use of penalties. With time, harvesters are more likely to accept their responsibilities if monitoring and reporting costs are fair and fully accepted by every harvest group in every fishery.

Funding constraints – DFO and harvesters are both challenged to pay their respective shares of monitoring and reporting costs. In addition, the recreational sector currently has no functioning mechanism for collecting the funds to cover these costs. The Department must work with sector representatives to develop and implement a practical self-funding mechanism for cost recovery. More generally, where harvester contributions are limited by the reduced economic viability of a fishery, an alternative harvest regime or other management options may be needed to ensure an acceptable degree of risk.

Capacity development – An effective monitoring and reporting program requires not only sufficient funding but also the appropriate skills for information gathering and management. Individual harvesters may lack the knowledge necessary (e.g., the ability to identify different species) to conduct fishery monitoring and catch reporting on their own. Adequate resources must be provided for the training and certification of First Nations and third party on-board observers and dockside monitors, as well as for equipment and other support.

Clarifying responsibilities – For shared accountability to work, there has to be a clear statement of roles and responsibilities at all stages in the monitoring and reporting process. Within DFO, this means clarifying who is accountable and what the dependencies are for a variety of functions, including monitoring and reporting standards, training and certification requirements, auditing plans, data provision, information management, catch estimation, public reporting and enforcement. These internal accountabilities and relationships must be carefully ironed out, and any significant gaps identified and filled, if the right information is to flow efficiently between harvesters, third parties and the Department.

Communicating the benefits – While continued access to fishing is the intended incentive, in fact harvesters may be more motivated to participate in information gathering out of a

concern that their fishing privileges will be hampered or withdrawn. DFO needs to actively communicate the long-term benefits of co-management and improved monitoring and catch reporting, in terms of more sustainable fisheries and ecosystem protection. This communication effort should target the recreational and commercial sectors, First Nations, other stakeholder groups and the general public.

Work is already under way to address some of these issues. Over the past few years, the Accountabilities Working Group has documented the accountabilities and relationships for DFO's data services and information management functions. A sub-committee of the M&C Panel is preparing a discussion paper on the relative merits of different kinds of incentives to motivate monitoring and reporting compliance. As well, discussions have begun between the Sport Fishing Advisory Board (SFAB) and a departmental Monitoring Technical Committee on a cost recovery mechanism for the recreational sector.

4. Strategic Approach

Since 2007, DFO Pacific Region has pursued a coordinated strategy to improve fishery monitoring and catch reporting in support of sustainable management and other objectives. This strategic approach as part of the PICFI Enhanced Accountability element has seen significant progress on the development of a monitoring and reporting framework. In particular, with the help of the M&C Panel, a number of tasks have been completed or initiated:

- A preliminary analysis of the adequacy of current monitoring and reporting levels in Pacific fisheries (Appendix 1 to be prepared);
- Preparation of assessment criteria and generic information standards for determining fishery-specific monitoring and reporting requirements;
- Development of a comprehensive information management system to collect and disseminate fisheries data; and
- An Accountabilities Business Model that identifies fishery data services, their interdependencies and new regional coordination functions.

Now the Department needs to finalize and implement this framework for all Pacific fisheries. The remaining work involves six basic strategies (see Figure 2):

- 1) Determine fishery-specific monitoring and reporting requirements;
- 2) Prepare monitoring and reporting programs to meet the requirements;
- 3) Complete the information management system ("PacFish");
- 4) Provide funding mechanisms, capacity building and other support;
- 5) Develop monitoring and reporting plans that specify roles and responsibilities; and
- 6) Continually improve monitoring and reporting requirements, best practices and technologies.

Strategy 1: Monitoring and Reporting Requirements

DFO resource managers will use consistent criteria to assess the information level needed for each fishery and develop tailored requirements for fishery monitoring and catch reporting.

A series of risk assessment criteria have been prepared to guide the determination of monitoring and reporting standards (Table 1). These criteria are distilled from, and build on, the more extensive list of questions in the Fishery Checklist template.²² Resource managers will apply the assessment

²² See DFO (2009), *Fishery Checklist 2009*, Version 3.0 for further elaboration on target stock status zones, bycatch potential, habitat and ecosystem effects, and other items in Table 1.

Figure 2: Monitoring and Reporting Process for Pacific Fisheries

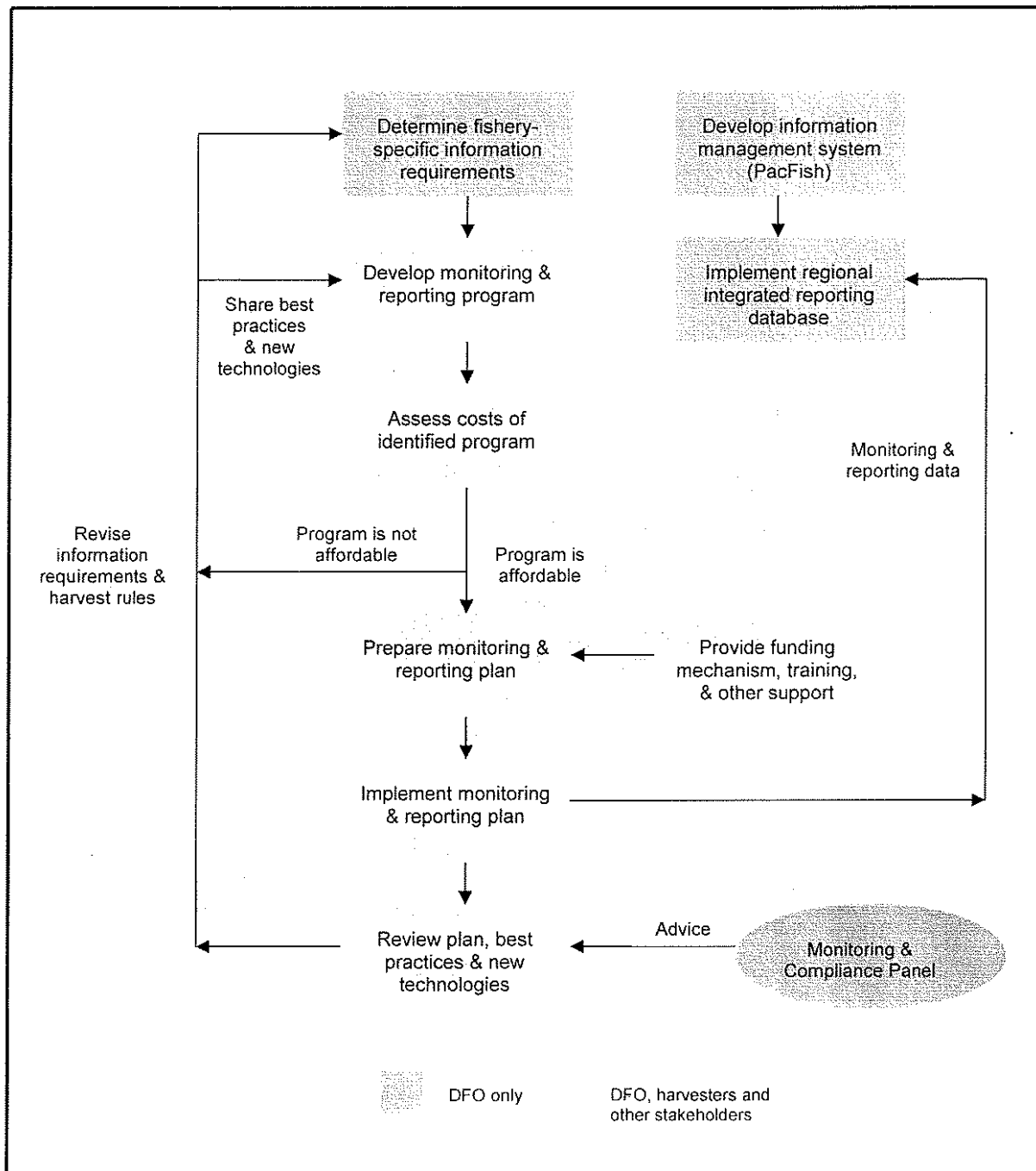


Table 1: Assessment Criteria for Monitoring and Reporting Standards

Assessment category/criterion
<p>BIOLOGICAL/ECOSYSTEM</p> <p>Is the status of the target species/stock: (1) Stable; in the green zone (2) cautious in the yellow zone (3) critical in the red zone (4) endangered, threatened or of special concern, as assessed by COSEWIC or (5) SARA listed?</p> <p>Is there a significant catch potential of (1) non-target species and/or (2) non-target species that are endangered, threatened or of special concern?</p> <p>Is there risk of serious or irreversible harm to marine habitat?</p> <p>Are there further ecosystem impacts (e.g., other species interactions, disruption to predator/prey relationships) to consider?</p>
<p>FISHERY OPERATIONS</p> <p>Is it a multiple stock/species fishery versus a single stock/species fishery?</p> <p>Is there a high fishing power (number of harvesters/vessels, gear efficiency, etc.) and/or high exploitation rate?</p> <p>Is the harvesting capacity (scope or number and/or gear capacity) highly uncertain?</p>
<p>SOCIOECONOMICS</p> <p>Does the fishery have a relatively high economic value?</p> <p>Does the fishery make an important socio-cultural contribution to the community or region?</p> <p>Is there a potential negative impact on a local FSC fishery?</p> <p>Are there adverse effects on the fishery from other industry/activities that require tracking?</p>
<p>RESOURCE MANAGEMENT</p> <p>Is the fishery based on quotas, defined shares or a specific effort level that must be accurately measured?</p> <p>Is the fishery for scientific or research purposes such as a test fishery or selective fishery?</p> <p>Does the fishery serve a special management objective, such as an indicator stock for assessment purposes or a pilot/demonstration fishery?</p> <p>Does the fishery pose a moderate to high future risk from lost fishing gear?</p> <p>Is there a history of unsatisfactory harvester compliance with reporting requirements?</p>
<p>OTHER INSTITUTIONAL</p> <p>Are there specific information needs to meet domestic or international agreements, treaties or other reporting obligations?</p> <p>Is the fishery subject to or scheduled for eco-certification or traceability requirements?</p>

Note: A "yes" answer to one or more of the above questions, depending on the particular criteria, will move the monitoring and reporting standard to an "enhanced" information level.

Information Levels for Monitoring and Reporting: Some Examples

Enhanced: Under their ITQ management regimes, all Pacific commercial groundfish fisheries have 100% dockside monitoring of landings that is conducted by independent third parties. Given the significant bycatch issues, there is also 100% at-sea monitoring of catch and discards either through observers or video electronic monitoring. These fisheries are cooperating to identify and address habitat and ecosystem impacts. For example, they have been working with the Canadian Wildlife Service on assessment of the threat to seabird populations and the development of measures for mitigating seabird bycatch.

Moderate: Most of the First Nations salmon fisheries require a moderate level of monitoring and reporting and many will need improvements to achieve that level. This standard will apply to FSC fisheries in watersheds where the fishing effort is moderate and reasonably predictable, the conservation risk is significant but manageable, and bycatch and other ecosystem impacts are known and fairly limited. In this case, information must be adequate to quantify annual effort, catch, catch-related mortality and ecosystem impacts across years, with some coverage (up to 20%) by independent verification.

A moderate standard will not be suitable in other cases. Several of the larger FSC fisheries in major watersheds and those coordinated fisheries using commercial gear already have enhanced monitoring. On the other hand, only a low or basic level of monitoring and reporting may be required for a terminal fishery harvesting a stable salmon stock with low-impact (selective) gear and relatively low effort.

Low: A basic information level would apply to a small recreational intertidal clam fishery that had no significant ecosystem impacts and did not interfere with an FSC fishery. In this situation, less accurate data on effort, catch and mortality (e.g., number of buckets versus an accurate clam count) would be acceptable and the timeliness of reporting could be relaxed (e.g., monthly or end of season). No independent verification would likely be stipulated for this fishery.

criteria to: (1) rate their particular fisheries according to the necessary information level (low, moderate and enhanced), and (2) create fishery-specific requirements based on the data content, resolution, format and other attributes.

Using the assessment criteria, some generic standards have been developed that define low, moderate and enhanced monitoring and reporting (Appendix 2 to be prepared). These standards outline requirements for quantitative versus qualitative information on catch, effort and ecosystem impacts, as well as for statistical quality (i.e., precision/accuracy and independent verification).

Most Pacific fisheries are likely to require a moderate level of catch and other data, but some may demand an enhanced standard and a few may need only a low or basic information level (see box for examples). The generic moderate standard will serve as the default or starting point for monitoring and catch reporting. Depending on how a fishery is assessed against the criteria, it may then move to either a low or enhanced standard.²³ Over time, changing circumstances will more often raise information requirements to the enhanced level.

A number of the assessment criteria are interrelated. For example, fisheries that are high-value will tend to create a stronger incentive for misreporting of catch information. Moreover, the interaction of criteria can determine the information level; e.g., monitoring will be enhanced when target stocks are at or near conservation limits *and* fishing power and/or exploitation rates are high.

²³ The questions in Table 1 have been phrased in such a way that an affirmative response signals a move to enhanced reporting. However, a low information standard can also be inferred from the questions. For example, this standard could apply to a terminal (single stock) fishery with low conservation risk, no anticipated ecosystem impacts and limited fishing effort.

Once resource managers have designated the appropriate generic information standard, they still must develop specific monitoring and reporting requirements for their fishery consistent with the standard. Table 2 shows the information attributes that will be used to express these fishery-specific requirements.

Table 2: Information Attributes for Expressing Standards

Attribute/Description	Sample Components
Content – type of data to be collected	<p>Catch – number and/or weight, kept and released, location and time</p> <p>Fishing effort – number of harvesters and/or units of gear, gear type/details, location and length of time fished</p> <p>Biological characteristics – stock, age, sex, length/weight, flesh colour, marks/tags, etc.</p> <p>Ecosystem impacts – amount of bycatch, kept and released, condition of releases, number and nature of other species encounters, extent and nature of habitat and other ecosystem impacts</p> <p>Socioeconomics – e.g., landed price/value, value of fishing experience, interactions with other fisheries and industry (e.g., FSC fishery, aquaculture operations)</p>
Resolution – level of detail	By species/stock, gear type, area/sub-area/specific location, etc.
Statistical Quality – precision and accuracy	<p>Estimates within x% of the true value, x% of the time (e.g., +/-5%, 9 times out of 10)</p> <p>Percentage coverage by independent verification</p>
Timeliness – frequency and response time of monitoring and reporting	<p>Frequency – annually, monthly, daily, every half-day, after every set</p> <p>Response time – e.g., within 24 hours of harvest, post-season by a certain date</p>
Data Format and Delivery	<p>Format – uniform data coding, standardized reporting formats</p> <p>Delivery methods – electronic, mail, telephone/radio, etc. (see Table 3)</p>

Strategy 2: Monitoring and reporting programs (to be précised for external version)

The Department will work with harvesters and others to identify and implement a cost-effective package of monitoring and reporting measures to meet the specified information requirements.

The tools and methods commonly used for fishery monitoring and catch reporting are listed in Table 3. There are two broad categories of activity that can be combined in various ways to provide the necessary level and attributes of monitoring and catch information:

- **Fisher dependent** techniques rely on individual harvesters or groups of harvesters to monitor and report on their own catch. In reality, no one is better positioned to monitor the fishery and associated catches than the participants themselves. Given positive engagement, adequate training and the appropriate reporting technologies, this type of information gathering can be very cost-effective.

On the other hand, a fisher dependent approach has limitations. For example, it can be hindered by non-compliance, a lack of key information (e.g., releases, bycatch) and unreliable data communication. Independent verification can remove or reduce many of these problems.

- **Fisher independent** monitoring and reporting is typically carried out by regulatory authorities (i.e., DFO fishery officers, managers, scientists and other staff) and designated third party observers. This type of approach is preferred where conservation risks are high, catch quotas or defined shares must be confirmed, or there are other circumstances that demand greater objectivity and certainty of information.

Independent monitoring techniques vary considerably in the kinds of data they can collect. As with any sampling program, they also have their own inherent biases. In general, these tools and methods are often expensive and it can be problematic extrapolating the data to the entire fishery.

Table 3: Monitoring and Reporting Tools and Methods

Data Gathering Tool		Data Delivery Method
Fisher Dependent	Fisher Independent	
Commercial sales slips Logbooks (paper/electronic) Fisher hail-ins/hail-outs Harvester/creel surveys Fisher collected biological samples	Aerial gear counts (over-flights) On-water gear counts (charter patrols) On-board observers Camera systems (video monitoring) Dockside monitoring Post-season buyer/supplier surveys	Mail Internet/intranet/e-mail Telephone/radio In-person interviews Real-time vessel monitoring

For each fishery, resource managers and harvesters will come together to decide on the appropriate combination of measures for meeting the information requirements from Strategy 1. They will begin by reviewing the current monitoring and reporting program to determine its adequacy and identify any required improvements. Where changes are necessary, the participants will review the options and develop a mutually agreeable monitoring and reporting program.

The costs of the identified program must then be estimated. If the program is affordable, it can be implemented; if not, the level of information requirements may be relaxed in exchange for a more conservative harvest opportunity or management regime (e.g., a pooled fishery). In this way, the process can be iterative, whereby discussions on the monitoring measures and costs lead back to a re-examination of the standards themselves.

In order to gain efficiencies, the potential for coordinated monitoring and reporting measures across fisheries must be explored. The joint collection of biological data and the use of dockside monitoring programs for multiple fisheries are examples of such efficiencies. Fisheries should also share information on best management practices and take advantage of cost-effective technological advances as much as possible (see Strategy 6).

Strategy 3: Data management

DFO will complete its major information management project, PacFish, to facilitate access to Pacific fisheries data for resource managers and all other users.

The Pacific Region has a multi-year project under way to develop an information management framework for Pacific fisheries. PacFish aims to provide the human resources, data and technology for enabling the effective management and use of fisheries data. When completed, the project will ensure that:

- Users of fisheries information have easy and secure access to timely, complete and consistent data of defined quality;
- The data collected serve both local and broader (integrated) needs;
- Data and technology management has clear accountabilities and is cost-efficient and service-oriented; and
- A comprehensive framework is in place to guide the future evolution of Pacific fisheries data and associated systems.

Under the framework, information from monitoring and reporting programs will enter a data exchange portal that sets common data standards and provides validation. Within DFO, a regional data group will be responsible for determining standards, guidelines, accountabilities and processes for data collection and management. This central unit will coordinate the work of various sub-groups organized by species grouping and/or harvesting sector. All of the fisheries information will be consolidated in a regional integrated reporting database, which will interface with user applications.

At a total investment of \$2 million over four years, PacFish accounts for the largest share of PICFI's Enhanced Accountability funding. The framework structure has been approved and detailed design work is largely done on the data systems, applications and use of new technologies. PacFish is now being built, with completion of the integrated reporting database scheduled for the end of 2011/12.

Strategy 4: Other program support

The Department will work with harvesters and others to clarify accountabilities, develop funding mechanisms, identify and address capacity needs, and provide further support for monitoring and reporting programs, as required.

The Accountabilities Working Group will proceed with its next task to clarify internal responsibilities for generating catch estimates by fishery. Where fisheries do not have self-funding mechanisms in place to recover monitoring and reporting costs, DFO will consult with harvesting groups on options for these mechanisms and a suitable schedule for their implementation. The Department will also coordinate a needs assessment for training, certifying and equipping fishery monitors to conduct the programs identified in Strategy 2.

Strategy 5: Monitoring and reporting plans

A formal monitoring and reporting plan will be prepared and implemented for each fishery that will specify the roles and responsibilities of harvesters, DFO and third parties.

This plan will document the fishery-specific information standards, the monitoring and reporting program, and the duties and accountabilities of the various participants. In addition, it will include provisions for reviewing performance on implementation of the program and for determining harvester compliance.

Monitoring and reporting plans will be developed through the harvest advisory processes and in collaboration with First Nations. The plans and their requirements, in turn, will be summarized in IFMPs.

Strategy 6: Continual improvement

Regular reviews will be conducted to update standards and monitoring and reporting programs and evaluate progress; as well, best management practices and new technologies will be identified.

Information standards and monitoring and reporting methods must be revised over time in response to natural shifts in the resource and ecosystems, changes in fishing power, the impact of management measures and other factors. The process of reviewing existing standards against the assessment criteria and developing monitoring and reporting programs and plans will be repeated periodically and revisions will be made, as needed. These regular reviews will also provide a means to communicate new policy priorities and evaluate overall success in improving the information required for sustainable management and other objectives.

To promote cost-effective, state-of-the-art monitoring and reporting, it is important to take advantage of best practices and new and emerging technologies for information gathering and management. A collaborative process such as the M&C Panel can be used to identify these opportunities. Additionally, the Panel can have an ongoing role in looking for ways to coordinate efforts across fisheries and tracking region-wide progress on monitoring and reporting.

5. Summary and Next Steps

To support sustainable fisheries management and other regional priorities, fishery monitoring and catch reporting must be improved in all harvest sectors across the majority of Pacific fisheries. This discussion paper has described a risk-based strategic framework for determining fishery-specific information requirements and monitoring and reporting programs on a consistent, transparent basis. The ultimate objective is to build trust in Pacific fisheries and their management by enabling accurate, timely and accessible information in which harvesters, other fishery interests and the public can have confidence.

Implementing the strategic framework will involve a multi-year process with harvesters and other partners, the details of which will have to be decided. Important next steps for finalizing the framework and proceeding with implementation are:

- Submit this framework document for review to obtain feedback on:
 - Framework goal, principles and strategies;
 - Potential gaps and policy issues;
 - Readiness for broader consultation;
 - Appropriate content for external documentation;
- Develop and implement an annual risk assessment process for prioritizing catch monitoring efforts and allocation of resources.
- Prepare follow-up documents and conduct consultations with First Nations and commercial and recreational harvesting groups (through the existing harvest advisory processes and SFAB); and
- Complete ongoing work under PICFI to implement PacFish and prepare proposals for decisions on accountability.

References

- Beaith, B., Hop Wo, L., Kearey, L., Bennet, W.R., and A. Federenko. 2004 *Summary of Catch Monitoring Programs for Commercial Salmon Fisheries in Southern B.C., 1998-2002*. Canadian Manuscript Report of Fisheries and Aquatic Sciences 2697. Nanaimo: DFO. Available at: <http://www.dfo-mpo.gc.ca/libraries-bibliotheques/manu-eng.htm>.
- Fisheries and Oceans Canada. 2009. *Fisheries Renewal – Resource Management Sustainable Development Framework (RMSDF)*. Internal Presentation. Vancouver: Pacific Region, November.
- _____. 2009. *Fisheries and Oceans 2009-2012 – Departmental Plan for Transfer Payment Programs*. Ottawa: DFO, July. Available at: <http://www.dfo-mpo.gc.ca/reports-rapports/tpp-ppt-eng.htm>.
- _____. 2009. *Putting Ecosystem-based Management to Work*. Ottawa: Science, May. Available at: <http://www.dfo-mpo.gc.ca/science/Publications/article/2008/21-01-2008-eng.htm>.
- _____. 2008. *Fisheries Renewal Statement: Working Draft*. Ottawa: DFO, January.
- _____. 2008. *Interim Fishery Monitoring and Catch Reporting Standards for Commercial Salmon Fisheries*. Vancouver: DFO, Fisheries and Aquaculture Management, January. (Draft for Discussion)
- _____. 2007. *Pacific Integrated Commercial Fisheries Initiative (PICFI): Enhanced Accountability Measures*. PICFI Element Backgrounder. Vancouver: DFO, July. Available at: <http://www.pac.dfo-mpo.gc.ca/fm-gp/picfi-ipcip/elements-eng.htm>.
- _____. 2005. *A Discussion Paper on the Implementation of Pacific Fisheries Reform*. Vancouver: DFO, September. Available at: http://www-comm.pac.dfo-mpo.gc.ca/pages/consultations/consultation2005/reform_e.htm.
- _____. 2002. *Pacific Region Monitoring and Reporting Framework*. Vancouver: Fisheries Management, January. Available at: <http://www.pac.dfo-mpo.gc.ca/consultation/fisheries-peche/ground-fond/intdial/mr-sd-fwk/index-eng.htm>.
- _____. 1999. *An Allocation Policy for Pacific Salmon*. New Direction Paper No. 4. Vancouver: DFO, October. Available at: <http://www.pac.dfo-mpo.gc.ca/fm-gp/species-especies/salmon-saumon/pol/index-eng.htm>.
- Fraser, G.A. 2008. *A Preliminary Review of the Groundfish Integration Pilot Program*. Report Prepared for DFO Pacific Region, Fisheries and Aquaculture Management. Victoria: Fraser and Associates, Economic and Business Consulting Services, August. Available at: <http://www.pac.dfo-mpo.gc.ca/fm-gp/commercial/ground-fond/index-eng.htm>.
- Gislason, G. 2007. *Commercial Catch Monitoring: Gatekeeper to Sustainability and Public Confidence in Pacific Canada*. Paper Presented to the 5th International Observer Conference, Victoria, BC, May 15-18. Vancouver: GSGislason & Associates Ltd.
- Integrated Salmon Dialogue Forum. Monitoring and Compliance Panel. 2010. *Fishery Monitoring in the Pacific Region – Charting our Course; A Strategy for Improved Confidence and Support*. Vancouver: M&C Panel, January. (Draft for Discussion)

Karp, W.A., and H. McElderry. 1999. "Catch monitoring by fisheries observers in the United States and Canada." In C.P. Nolan, ed., *Proceedings of the International Conference on Integrated Fisheries Monitoring*, Sydney, Australia, February 1-5. Rome: Food and Agriculture Organization. Available at:
http://www.fao.org/docrep/x3900e/x3900e13.htm#p854_92342.

Lightly, D., and C. Masson. 2009. *First Nation FSC Catch Monitoring and Reporting: Preliminary Considerations, Standards and Recommendations*. Vancouver: DFO, Fisheries and Aquaculture Management, November. (Draft for Discussion)