REVIEW / SYNTHÈSE

Is Canada fulfilling its obligations to sustain marine biodiversity? A summary review, conclusions, and recommendations[1]

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Abstract: Canada has made numerous national and international commitments to sustain marine biodiversity. Given current and potential threats to biodiversity from climate change, fisheries, and aquaculture, we provide a summary review of Canada's progress in fulfilling its obligations to protect, conserve, recover, and responsibly exploit marine biodiversity. We conclude that Canada has made little substantive progress, when compared to most developed nations, in meeting its biodiversity commitments. Much of Canada's policy and rhetoric has not been operationalised, leaving many of the country's national and international obligations unfulfilled in some key areas, such as the establishment of marine protected areas and incorporation of the precautionary approach to fisheries management. We conclude that regulatory conflict within Canada's Department of Fisheries and Oceans (DFO) and the absolute discretion exercised by the national Minister of Fisheries and Oceans contribute significantly to an unduly slow rate of policy and statute implementation. We recommend new approaches and measures to sustain Canadian marine biodiversity and new research initiatives to support scientific advice to decision-makers. Many recommendations focus on management actions required to meet existing commitments to biodiversity conservation. Overall, we conclude that the most effective strategy is to protect existing biological diversity and to rebuild depleted populations and species to restore natural diversity. By improving and protecting the biodiversity in Canada's oceans, such a strategy will restore the natural resilience of Canada's ocean ecosystems to adapt to the challenges posed by climate change and other anthropogenic activities with consequent long-term benefits for food security and social and economic well-being.

Key words: policy, statute, fisheries, marine protected area, precautionary approach.

Résumé : Le Canada a pris de nombreux engagements nationaux et internationaux pour assurer la biodiversité marine. Compte tenu des menaces actuelles et potentielles pour la biodiversité provenant du changement climatique, de la pêche et de l'aquaculture, les auteurs présentent une revue sommaire des progrès du Canada pour respecter ses engagements à protéger, conserver, réhabiliter et exploiter de façon responsable la biodiversité marine. Les auteurs concluent que le Canada a fait peu de progrès substantiel, comparativement à la plupart des pays développés, dans l'atteinte de ses engagements envers la biodiversité. Une bonne partie de la politique et de la rhétorique canadienne n'a pas été mise en pratique, ne remplissant pas plusieurs de ses obligations nationales et internationales dans plusieurs champs importants

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comme l'établissement de sites marins protégés et l'incorporation de l'approche par précaution dans l'aménagement des pêcheries. Les auteurs concluent que le conflit règlementaire au sein du Département des pêcheries et océans (DPO) et la discrétion absolue exercée par le Ministère des pêcheries et océans, contribuent significativement au rythme lamentablement ralenti d'application des politiques et des statuts. Ils recommandent de nouvelles approches et mesures pour supporter la biodiversité marine du Canada et de nouvelles initiatives de recherche pour supporter les avis scientifiques adressés aux décideurs. Plusieurs recommandations mettent l'accent sur les activités d'aménagement nécessaires pour rencontrer les engagements actuels sur la conservation de la biodiversité. Dans l'ensemble, ils concluent que la stratégie la plus efficace consiste à protéger la biodiversité existante et à reconstruire les populations et les espèces afin de restaurer la diversité naturelle, en améliorant et protégeant la biodiversité dans les océans du Canada. Une telle stratégie rétablira la résilience des écosystèmes marins du Canada afin de s'adapter aux défis posés par le changement climatique et autres activités anthropogènes et d'assurer des bénéfices à long terme pour la sécurité alimentaire et le bien-être socio-économique.

Mots-clés : politique, statut, pêcheries, zones marines protégées, approche par précaution.

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1. Introduction

Canada faces substantive challenges in its efforts to sustain marine biodiversity. Climate change, fisheries, and aquaculture are among the key threats to ocean life, albeit operating at different temporal and spatial scales (Hutchings et al. 2012). The temporal scale of biodiversity effects resulting from climate change is on the order of tens to hundreds of years and the spatial scale of effect is global. The temporal and spatial effects of fisheries are typically on the order of decades and tens to hundreds of km^2, respectively. Aquaculture can influence areas tens to hundreds of km^2 with biodiversity consequences lasting from years to potentially decades. In response to these and other challenges to conserving biodiversity, Canada has established national statutes and policies and entered into a variety of international agreements. VanderZwaag et al. (2012) focused on some of the most important of Canada's commitments, drawing considerably on approaches undertaken elsewhere as a means of evaluating what can and might be done.

Extending the work by Hutchings et al. (2012) and VanderZwaag et al. (2012), our primary purpose here is to address the question: To what extent is Canada fulfilling its national and international obligations to sustain marine biodiversity? We begin by providing a summary review of what Canada has and has not achieved in its efforts to sustain marine biodiversity, focussing in particular on: (*i*) Canada's contention that it is "a world leader in oceans and marine resources management" (*Oceans Act*); (*ii*) the establishment of marine protected areas (MPAs); and (*iii*) incorporation of the precautionary approach (PA) in the management of marine fisheries. We then identify new approaches, measures, and initiatives that could be adopted by Canada to assist it in its national and international efforts to sustain marine biodiversity.

2. Canada's approach to sustaining marine biodiversity

2.1. Some strengths

Internationally, Canada's compliance in certain areas might be viewed positively, given the general and minimal nature of some commitments, such as the basic requirement to list internationally important wetlands under the Ramsar Convention (VanderZwaag et al. 2012). For example, in its report to the 10th Meeting of the Conference of the Parties to the Convention on Wetlands of International Importance in 2008, Canada was able to substantiate progress in designating 37 wetlands of international importance, with sites having a total surface area of more than 13 million hectares. As well, Canada has completed national wetland inventory mapping for approximately 10% of the country (Government of Canada 2008). Canada has also listed six cultural and nine natural properties on the World Heritage List. Although no specific marine sites have been listed, properties do include some coastal waters, specifically, Newfoundland's Gros Morne National Park and the transboundary Kluane/Wrangell–St. Ellias/Glacier Bay/Tautshenshini–Alsek region, which straddles the northwestern Canada–US border.

Canada has contributed significantly to fisheries management reform in international waters. One example of this is the country's efforts to encourage the Northwest Atlantic Fisheries Organization (NAFO) to adopt harvest control rules and to implement reference points in NAFO's efforts to manage fish stocks in the shared waters of the Northwest Atlantic. As a member of the United Nations, Canada continues to urge countries to strengthen international efforts to prevent, deter, and eliminate illegal, unreported, or unregulated fishing and to support efforts within the Food and Agriculture Organization (FAO) to develop flag-state performance criteria (United Nations General Assembly 2010*a*).

Of national importance, but with global significance, the *Oceans Act* was, from an ecosystem-based management perspective, a landmark statute. In addition to providing a strong and clearly articulated legislative foundation for marine conservation (objectives absent from the preceding *Fisheries Act*), the Act appeared to signal an intent by Canada to afford a level of protection to its oceans similar to that afforded to its terrestrial environments. As well, the federal government's passage of the *Species at Risk Act* met one of Canada's obligations under the *Convention on Biological Diversity* (United Nations 1992) to develop legislation for the protection of threatened species. Canada has also developed potentially effective policies in support of its efforts

to sustain marine biodiversity. In this regard, good examples include policies for the conservation of wild Pacific and Atlantic salmon, and policies developed under the *Sustainable Fisheries Framework* (VanderZwaag et al. 2012).

One of the strengths underlying Canada's efforts to meet its commitments lies in the excellence and rigor associated with the advice provided by Department of Fisheries and Oceans (DFO) scientists in support of management decisions and issues related to sustaining marine biodiversity. Since the 1990s, for example, DFO scientists have worked to develop methods for the identification of target and limit reference points for some fisheries, in support of Canada's commitments to apply the PA to fisheries management. In 2006, scientific advice to fisheries managers and to the Minister was clear and direct. DFO's Science Sector National Working Group on the Precautionary Approach concluded that, to be compliant with the PA, Canadian policy statements, and international fisheries agreements, Canadian fishery management plans must include harvest control rules that incorporate target and limit reference points (DFO 2006).

Concomitant with these efforts was a significant maturing of the means and the transparency by which scientific advice on the status of exploited marine species was communicated to fisheries managers. In addition to numerous publications in scientific journals, the high quality of the contributions by DFO scientists to research on both the state of ocean ecosystems and various facets of marine biodiversity is evident in the multiple publication series produced by the Canadian Science Advisory Secretariat (DFO 2010*a*).

As noted by VanderZwaag et al. (2012), counter-balancing these strengths is compelling evidence that, with some exceptions, Canada has not operationalized and fulfilled its national and international commitments to sustain marine biodiversity either in spirit or in practice. Canada's progress has been unduly slow in both an absolute sense (some commitments still having not been met almost two decades after they were agreed upon) and in a comparative sense, noting that substantive progress has been achieved by other western industrialized nations in meeting, and often exceeding, their national and international commitments to sustain marine biodiversity.

2.2. World leader in oceans and marine resources management?

In the preamble to the *Oceans Act*, Parliament wished "to reaffirm Canada's role as a world leader in oceans and marine resources management", implying that Canada was, in 1996, a "world leader" in this regard. This was a rather confident assertion, made only four years after the collapse of the northern cod fishery, which resulted in the greatest single layoff in Canadian history (30 000–40 000 people; Bavington 2010), the expenditure of $2–$3 billion in social and economic financial aid (CEC 2001), and one of the greatest numerical losses of a vertebrate in Canadian history (Hutchings and Rangeley 2011). Government's characterization of Canada as an international oceans leader persists today, as evidenced by statements that "Canada is among the world leaders in sustainable management of fisheries and aquaculture" (DFO 2009) (it is unclear what is meant by "sustainable management").

In contrast to these self-identified ocean leadership aspirations, comparative analyses of Canada's marine conservation and management initiatives have been less than complimentary. One such analysis is represented by the efforts of researchers at Yale and Columbia universities to construct an Environmental Performance Index and to use this to rank 163 countries on 25 performance indicators, tracked across 10 policy categories encompassing environmental public health and ecosystem vitality (Yale University 2010). In this analysis, Canada was ranked 125th of 127 countries in terms of fisheries conservation. In a recent separate analysis, Canada was ranked 70th of 228 countries in the establishment of MPAs (DFO 2010*b*).

Although one can always identify interpretive limitations in ranking exercises such as those listed above, they are consistent with the conclusion that Canada has yet to fulfil many of its most important marine biodiversity commitments. Among these commitments, two prominent shortcomings, from among those identified by VanderZwaag et al. (2012), serve to illustrate the conclusion that Canada has failed to fulfil commitments associated with sustaining marine biodiversity. The two examples are the establishment of MPAs and the incorporation of the PA into fisheries management.

2.3. Marine protected areas

One of the key provisions of the *Oceans Act* was the commitment to develop and implement "a national system of marine protected areas on behalf of the Government of Canada". Yet, between 1996 and 2009, while the areal extent of *terrestrial* protected areas increased by 400 000 km^2 from ~540 000 to ~940 000 km^2, the areal extent of MPAs increased by just 24 000 km^2 from 22 000 to 46 000 km^2 (Environment Canada 2010). It is also noteworthy that few, if any, of Canada's MPAs are entirely free of human activity. For example, fishing activity is reported to be permitted in 160 of 161 MPAs off Canada's Pacific coast (Robb et al. 2011).

Canada has not developed a network of MPAs, despite multiple commitments to do so, beginning 20 years ago when the country was signatory to the 1992 Convention of Biological Diversity (CBD). In 1995, the Canadian Biodiversity Strategy (Government of Canada 1995) pledged the federal, provincial, and territorial governments to accelerate the protection of areas that are representative of marine natural regions, to establish reserves to conserve aquatic biodiversity, and to contribute to a network of national and international protected areas. The Strategic Plan for North American Cooperation in the Conservation of Biodiversity (CEC 2003) articulated Canada's commitment to developing a North American MPA network. In 2005, a subsidiary body of the CBD set a global target (to which Canada agreed) of protecting 10% of all marine and coastal ecoregions by 2012. Canada's Oceans Action Plan (Government of Canada 2005) committed Canada to promote the development of a network of MPAs by 2012. Canada voted in favour of The Law of the Sea Resolution (UNGA 2010*b*) that urged States to establish a network of representative MPAs by 2012. In October 2010, at the 10th meeting of the Conference of the Parties of the CBD in Nagoya, Aichi Prefecture, Japan, Canada committed to the Aichi Biodiversity Target to conserve, by 2020, at least 10% of coastal and marine areas through the establishment of well-connected systems of protected areas. Interestingly, in October 2011, as part of its national submission to the Rio+20 UN Conference on Sustainable

Development, Canada identified "networks of marine protected areas" as an outcome of its Integrated Oceans Management Programme (www.uncsd2012.org; accessed 22–11–2011).

Although the 2020 target is consistent with past rhetoric, it is highly unlikely that Canada will meet it, given that Canada had protected only 0.8% of its oceans by 2011. To meet the 2020 target of protecting at least 10% of its waters as MPAs, Canada will have to increase its areal extent of MPAs from approximately 61 000 km^2 in 2011 (estimated from Government of Canada 2010) to approximately 710 000 km^2 in nine years. To place this in perspective, the average annual rate of MPA protection required to meet the 2020 target would have to be ~72 000 km^2 per year, an annual rate greater than the sum total of MPAs in Canada in 2011. Put another way, the rate of MPA production would have to be five times greater than the average annual rate of adding terrestrial protected areas in Canada between 1965 (285 000 km^2) and 2009 (941 418 km^2) (Environment Canada 2010).

2.4. Precautionary approach

The second example of Canada's disappointing achievement related to biodiversity deals with implementation of the PA. As a Party to the 1995 UN Agreement on Straddling and Highly Migratory Fish Stocks (UNGA 1995) and an endorser of the FAO Code of Conduct for Responsible Fisheries (FAO 1995), Canada agreed to apply the PA to the management of its marine fisheries, a commitment entirely consistent with the objectives of the *Oceans Act*. The PA can be defined as an approach that recognizes that the absence of full scientific certainty shall not be used as a reason for postponing decisions where there is a chance of serious or irreversible harm. Thus, if one is to apply the PA, one needs to identify conditions under which serious or irreversible harm is likely to occur, and to have a clearly articulated strategy either for avoiding those conditions or for returning to conditions in which such harm is unlikely. In this regard, the UN Fish Stocks Agreement stipulated that, when implementing the PA, States shall determine stock-specific target and limit reference points for exploited fish stocks and shall identify the action to be taken if the reference points are exceeded (VanderZwaag et al. 2012). The FAO Guidelines accompanying the FAO Code of Conduct provide even more specific guidance, recommending that reference points for fishing mortality (a measure of exploitation pressure) and stock size (a measure of fish population abundance) be established to identify overfishing, to guide rebuilding plans, and to develop harvest control rules.

The logical necessity of establishing target and limit reference points and associated harvest control rules cannot be overstated. Put simply, if there are no recovery targets or timelines for recovery (there are neither for Canadian Atlantic cod, *Gadus morhua*), there is, in essence, no recovery plan. In the absence of targets or harvest control rules, neither society nor industry can inquire as to whether a proposed catch level for a particular stock is consistent with the objective of achieving a particular target within a predefined period. In the absence of reference points or control rules, there is no means to audit the effectiveness, or to track the record, of fisheries management actions. But as the Supreme Court of Canada ruled, it is the Minister of Fisheries and Oceans' duty to manage, conserve, and develop the fisheries on behalf of Canadians and in the public interest (Supreme Court of Canada 1997). In effect, the Minister is responsible for investing (in biological reproductive capacity) and spending (exploiting) the marine biological capital held by *all* Canadians. A "budget" for spending this capital, complete with quantitative objectives or targets, is as necessary for the Minister as it is of a financial manager responsible for managing an investment portfolio.

In the absence of reference points or control rules, there is no accountability and there is no transparency in the political and fisheries management decisions that ultimately determine the effectiveness with which Canada sustains its marine fish populations, which are part of Canada's marine biodiversity. The resultant ad hoc nature of many of Canada's fisheries management decisions is not, however, permitted in countries for which transparency and accountability are deemed to be integral to sustaining marine biodiversity. Reference points and harvest control rules are standard components of fisheries management plans in the USA, Australia, New Zealand, increasingly so in Norway, and in international bodies such as the EU and NAFO. As noted in 2007, any harmonization of the criteria used by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) to assess the status of marine fishes with criteria used to assess the status of commercially exploited fishes is moot in the absence of reference points (DFO 2007).

The Panel agrees with recommendations made in a Canadian Science Advisory Secretariat (CSAS) document (DFO 2007) that DFO needs to identify target and limit reference points in accordance with the existing PA framework. The DFO should also ensure that these reference points have a sound biological basis, and that target reference points are set at levels above which the best available scientific evidence suggests recovery would be both rapid and very likely in response to management actions. The CSAS document also recommends that DFO develop, adopt, test, and implement fisheries management strategies that respect these conservation reference points and that their effectiveness be evaluated on a regular basis (DFO 2007).

3. New approaches, measures, and initiatives

3.1. Introduction

The lack of significant progress by Canada in fulfilling its national and international obligations to sustain marine biodiversity underscores a need to identify new approaches and measures to promote the sustainability of Canadian marine biodiversity and new research initiatives to support scientific advice given to decision-makers. Although many of the recommendations below focus on the management actions required to meet existing national and international commitments to biodiversity conservation, we also consider how science can be used to strengthen the quality of Canada's strategies to sustain marine biodiversity, such as might be achieved by monitoring programmes, a national marine habitat mapping initiative, and research on the effects of climate change on Canada's marine biodiversity. We identify seven overarching recommendations, the strategic basis for each recommendation, and some associated key actions required to fulfil these recommendations.

3.2. Recommendation 1: That the Government of Canada identify international leadership in oceans stewardship and biodiversity conservation as a top government priority

3.2.1. Strategic basis

Canada has multiple international leadership and stewardship responsibilities generated by the geographical realities of the length of its coastline and the size of its seas. Canada has not kept pace with international efforts to sustain marine biodiversity when compared with the successful marine biodiversity initiatives and precautionary management approaches exercised by many other jurisdictions, such as Australia, New Zealand, USA, and Norway. This can be explained by a lack of strong institutional leadership, societal ambivalence, and minimal incentives to move from well-intentioned rhetoric to meaningful action. The responsibility for fulfilling Recommendation 1 currently rests with the Prime Minister (who can lead this initiative), the Minister of Fisheries and Oceans (who can catalyse progress by implementing the recommendations identified here), and all sectors of society, including industry (who can help fulfil the country's oceans leadership aspirations by increasing their awareness of the government's due diligence).

3.2.2. Key actions

- The Government of Canada should fully implement existing statutory and policy commitments to sustain marine biodiversity.
- The Government of Canada should enhance transboundary and international governance arrangements by extending integrated management planning efforts across national maritime boundaries.
- The Government of Canada should increase Canada's formal membership to international agreements that pertain to the sustaining of marine biodiversity, such as the *Convention on the Conservation of Migratory Species of Wild Animals*.
- The Government of Canada should support research initiatives to strengthen scientific advice and ensure renewal of retiring scientific and managerial staff who have expertise in decision-making in the presence of complexity, trade-offs, uncertainties, and risks.
- The Government of Canada should fully support the provision and implementation of a management framework that maximizes opportunities for fisheries to achieve third-party certification of sustainability.
- The Auditor General of Canada could undertake a full financial, statutory, and policy audit of Canada's progress in meeting its international marine biodiversity obligations.

3.3. Recommendation 2: That the Government of Canada resolve regulatory conflicts of interest affecting Canada's progress in fulfilling obligations to sustain marine biodiversity

3.3.1. Strategic basis

Regulatory conflict impedes Canada's progress in fulfilling national and international commitments to sustain marine biodiversity. The Government of Canada has responsibilities to conserve and protect biodiversity as well as to promote the exploitation of biodiversity, either directly through commercial fisheries or indirectly through the deployment of aquaculture operations. As noted by the Auditor General of Canada (CESD 2011), the risk that fishing activity will endanger the long-term ecological sustainability of fish stocks can be reduced when there exists an effective framework of clear roles and responsibilities built on accountability and transparency. Without effective mechanisms to ensure that all parts of Government are accountable for supporting policies on the conservation of biodiversity during decision making, progress towards fulfilling Canada's national and international obligations to sustain biodiversity is impeded. Each stakeholder (the public, fishing industry, nongovernmental organizations, coastal communities, aquaculture operators) is placed in the position of having to ask, with respect to each regulatory decision, whether its own interests have been unduly compromised by the interests of others.

Our primary interest is from the point of view of how regulatory conflict can compromise the integrity of regulatory science and decision making, as well as public perception of that integrity. The more that DFO is, or is perceived to be, a promoter of the exploitation of marine biodiversity and ocean life, the more they undermine public trust in their ability to regulate the conservation and protection of that biodiversity in the public interest.

3.3.2. Key actions

- The Government of Canada should develop processes and, if necessary, amend institutional structures to limit or eliminate real and perceived regulatory conflicts of interest.
- The Government of Canada should develop processes and, if necessary, amend institutional structures to ensure that Ministers are fully and transparently accountable for policy commitments to the use and conservation of marine biodiversity.

3.4. Recommendation 3: That the Government of Canada reduce the discretionary power in fisheries management decisions exercised by the Minister of Fisheries and Oceans

3.4.1. Strategic basis

Canada's progress in meeting its obligations to sustain marine biodiversity has been impeded by the absolute discretion afforded to the Minister of Fisheries and Oceans. The *Fisheries Act* reflects a period of time in Canadian history when Ministers were afforded "czar-like" powers to approve, deny, or otherwise change proposals affecting activities coming under their aegis. In contrast, in the USA, the *Magnuson–Stevens Fishery Conservation and Management Act* (MSFCMA) has facilitated a curtailment of discretionary decision-making authority, an increase in accountability, and a strengthening of links between policy and science in fisheries management. USA regional fishery management councils are now required to adhere to binding scientific advice (from their scientific and statistical committees) on catch limits, overfishing prevention, and rebuilding of overfished stocks (Sale et al. 2008). The MSFCMA is prescriptive in that it does not provide the US Secretary of Commerce with absolute discretion in fisheries exploitation decisions. Unlike the *Fisheries Act* and the *Oceans Act*, neither of which is prescriptive, the MSFCMA specifies actions that the Secretary shall or must take if certain circumstances arise (Hutchings and Rangeley 2011). The

Auditor General of Canada (CESD 2011) has identified leadership and well-defined accountability as key elements to sustainable fisheries.

3.4.2. Key actions

- The Government of Canada should enact prescriptive legislation containing primary objectives to: (*i*) prevent overfishing; (*ii*) rebuild depleted fish stocks; (*iii*) formalize the explicit use of reference points and harvest control rules; and (*iv*) ensure transparency and accountability in fisheries management plans, including those relating to aquaculture.
- The Government of Canada should consider the establishment of independent, arms-length advisory or decision-making bodies on matters pertaining to the use and conservation of marine biodiversity, including catch allocations, licensing, and environmental impact assessments.
- The Prime Minister (PM) should use a mandate letter (which outlines the PM's expectations and policy goals) to increase ministerial accountability within DFO; the letter could be used to provide the Minister of Fisheries and Oceans a mandate to respond to the Expert Panel's recommendations; the mandate letter should be publicly available.

3.5. Recommendation 4: That Fisheries and Oceans Canada (DFO) rapidly increase its rate of statutory and policy implementation

3.5.1. Strategic basis

The current pace of statutory and policy implementation by DFO is impeding Canada's efforts to fulfil national and international obligations to sustain marine biodiversity, a deficiency increasingly magnified by the pressing need to adapt to and mitigate climate change. The slow pace of implementation has prevented Canada from incorporating the PA into the management of most of its commercial fisheries and from making good progress towards targets for the establishment of MPAs. As one example, quantitative recovery targets still do not exist for Canada's depleted cod stocks, 20 years after their demise, even though DFO has experience with establishing recovery targets for other fishes and some marine mammals. As concluded recently by the Auditor General of Canada (CESD 2011), "Canadians have the right to know how well fisheries are being managed", something that cannot be achieved in the absence of fishery reference points, recovery targets, and rebuilding timelines.

3.5.2. Key actions

- DFO should fully implement the *Oceans Act* to: (*i*) identify biodiversity hotspots and vulnerable biological habitats; (*ii*) establish a comprehensive and biologically meaningful network of MPAs; and (*iii*) develop marine spatial planning with clear geographical priorities, explicit timelines, and transparent measures for public reporting.
- DFO should fully implement the *Species at Risk Act* for marine fishes by including endangered and threatened species on the national legal list and by affording them the full benefits of recovery strategies, including the identification of recovery targets, rebuilding timelines, and (when possible) limited directed harvests.
- DFO should fully implement existing policies on marine biodiversity use and conservation, such as those included within the *Sustainable Fisheries Framework*.

3.6. Recommendation 5: The Panel recommends that Canada implement statutory renewal to fulfil national and international commitments to sustain marine biodiversity

3.6.1. Strategic basis

Canada has not kept pace with international efforts to sustain marine biodiversity, compared with the successful initiatives and precautionary management approaches exercised by many other countries. At a minimum, Canadian statutes and associated regulations require revision that will allow Canada to remove impediments to the timely implementation of policy and legislation pertaining to the sustainability of Canadian marine biodiversity. However, revising the *Fisheries Act*, promulgated in 1868 when Canada's post-Confederation concept of democracy was quite limited (neither women nor aboriginal peoples could vote), has proven to be complex and difficult. Thus, new legislation, such as that suggested under the aegis of Recommendation 3, might be necessary.

3.6.2. Key actions

- Draft and enact a modernized *Fisheries Act*, or a new statute, that: (*i*) identifies full implementation of the PA as an over-arching objective; (*ii*) provides legislative requirements and guidance on fully implementing the *Sustainable Fisheries Framework*; and (*iii*) identifies conservation of biodiversity as a core consideration in the development of fisheries management plans.
- Draft and enact federal aquaculture legislation that specifies requirements and guidance on national objectives and procedures for all aquaculture operations and that requires a principled approach to aquaculture operations, to ensure the protection of biodiversity.
- Consider enacting comprehensive biodiversity legislation similar to that existing in Australia and Norway to set legally binding requirements for biodiversity protection.
- Consider amending the *Oceans Act* to clarify integrated management procedures and responsibilities and to provide a firm legal foundation for implementing completed management plans.
- Strengthen the *Species at Risk Act* through key amendments that would: (*i*) establish a transparent evaluation and consultation process for decisions not to list a species at risk, including external review of supporting listing-decision analyses; (*ii*) clarify the procedure and process for developing recovery strategies and action plans; and (*iii*) restrict discretion to exempt activities from SARA's prohibitions and incidental permitting requirements.

3.7. Recommendation 6: That the Government of Canada establish national operational objectives, indicators, and targets for marine biodiversity

3.7.1. Strategic basis

Many of Canada's policy commitments to sustain marine biodiversity have yet to be translated into operational objectives that apply at the appropriate scales of impacts and management actions. Ideally, policies would establish a framework of required outcomes, specified as operational objectives that are consistent with national and international biodiversity commitments. Indicators and targets would be used to track progress in relation to these objectives and to support reporting. One approach to prior-

itization of issues for which operational objectives need to be identified is Australia's Ecological Risk Assessment for the Effects of Fishing (VanderZwaag et al. 2012). Biodiversity reporting would be strengthened by the issuance of annual reports that clearly document performance in relation to operational objectives. Key actions associated with this recommendation should be initiated by the Government of Canada, but general reporting on biodiversity trends in relation to the targets and efforts to assess changes in biodiversity more widely should also be supported by one or more groups, including the Government of Canada, nongovernmental organizations, and academic scientists.

3.7.2. Key actions

- The Government of Canada should establish operational objectives that relate to existing commitments to biodiversity conservation and formally integrate them in oceans and fisheries management; highest priority should be assigned to objectives pertaining to those impacts most likely to compromise national and international commitments to sustain marine biodiversity.
- DFO should establish biodiversity indicators and targets to assess progress towards meeting operational objectives, and annually report the status and trends of marine biodiversity (using indicators), as well as national progress in attaining policy objectives.

3.8. Recommendation 7: That Canada establish strategic research initiatives to strengthen scientific advice on sustaining marine biodiversity

3.8.1. Strategic basis

Canada's lack of significant progress in fulfilling marine biodiversity commitments cannot be attributed to inadequate scientific knowledge or advice. Nevertheless, there are research initiatives that will better support future scientific advice on the biodiversity consequences of climate change, fisheries, and aquaculture, thus contributing to the implementation of policy to sustain marine biodiversity. These initiatives will supplement current knowledge and allow managers and decision-makers to achieve their objectives more efficiently and effectively and across greater geographical scales than at present. New research is required to forecast the effects of climate change on appropriate regional spatial scales and to evaluate the degree to which changes to Canadian ecosystems are likely to be positive or negative. The only means of determining whether marine biodiversity is being sustained, and whether key stressors on biodiversity at broad and local scales are changing in intensity, is by monitoring spatiotemporal changes in those stressors as well as physical and biological properties of the oceans.

3.8.2. Key actions

- Federal government departments (e.g., DFO, Natural Resources Canada, Environment Canada) should maintain, improve, and (or) develop new long-term environmental monitoring programmes, especially for the Arctic, that would include the monitoring of key biodiversity sites ("hotspots") and functional changes at all levels of the marine food web.
- DFO should establish a nationally consistent programme for mapping ocean habitat and biological use of marine habitat (e.g., near-shore macrophytes, spawning grounds, migration corridors) to better inform decisions on integrated spatial management plans, identification of critical habitat (in the sense of the *Species At Risk Act*), location of MPAs, and environmental risk assessments of human activities, including aquaculture operations.
- The Government of Canada should promote and strengthen basic, discovery-oriented research on physical and biological oceanographic patterns, process, and function, as they affect or regulate marine ecosystems and biodiversity in Canada's Extended Economic Zone.
- The Government of Canada should develop a comprehensive research programme to forecast changes in Canadian marine biodiversity resulting from ongoing and projected climate-related changes to Canada's oceans.

4. Conclusion

Based on the review undertaken by VanderZwaag et al. (2012) and the summary review provided here, we conclude that Canada has made little substantive progress, when compared to most developed nations, in meeting its commitments to sustain marine biodiversity. For example, many targets and obligations to conserve and to sustainably use biodiversity have not been met by Canada. Much of Canada's policy and rhetoric has not been operationalized, leaving many of the country's national and international obligations unfulfilled. Setting further law and policy coordinates to support the sustainability of Canadian marine biodiversity is complicated by the array of issues beckoning attention. They include, among others: the adequacy of climate change mitigation and adaptation measures (Government of Canada n.d.b; CESD 2010); lack of a national energy strategy (Council of Canadians n.d.); and the sufficiency of environmental assessment legislation for ensuring that project proposals fully assess their potential impacts on climate change (Hazell 2010).

There are several reasons why Canada has fallen short of the progress made by most developed nations in fulfilling national and international commitments to sustain marine biodiversity. Lack of progress can be attributed to an unduly slow pace of statutory and policy implementation. Progress is further impeded by conflicting regulatory responsibilities within DFO to promote industrial and economic activity while conserving marine life and ocean health. Delegation of absolute discretion to the Minister of Fisheries and Oceans serves as an additional impediment to meaningful progress in operationalizing and thus fulfilling Canada's commitments to marine biodiversity. Canada's lack of significant progress cannot be attributed to a lack of relevant policy on international fisheries or marine conservation issues, insufficient scientific knowledge, or inadequate scientific advice.

Canada faces significant challenges in its efforts to conserve and sustain marine biodiversity in light of climate change, fisheries, and aquaculture. Among these three factors, human-induced climate change represents the greatest challenge primarily because its effects on marine biodiversity will not be readily reversed. Some might argue for complacency on the basis that little can be done to mitigate the effects of climate change. Based on the work presented here and elsewhere (Hutchings et al. 2012; VanderZwaag et al. 2012), we assert otherwise.

The simplest and best strategy to deal with climate change, fisheries, and aquaculture is to protect existing diversity and to rebuild depleted populations and species to restore natural diversity. The challenge then is to sustain them at levels at which Canada's marine biodiversity is able to optimize the ecosystem services that the oceans provide in support of Canadian society and in support of the welfare of the global community. By improving and protecting the health of Canada's oceans, such a strategy will restore the natural resilience of Canada's ocean ecosystems to adapt in response to the challenges posed by climate change and other anthropogenic activities.

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