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How the race to achieve Aichi Target 11 could jeopardize the effective conservation of biodiversity in Canada and beyond

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ABSTRACT

In 2010 Parties to the United Nations (UN) Convention on Biological Diversity (CBD) agreed to reduce the rate of biodiversity loss within a decade by achieving 20 objectives that are commonly known as the Aichi Targets. This article explores aspects of Canada's work on one of the few quantified targets (Target 11), which is intended to improve the status of biodiversity through protected areas (PAs) and a new type of designation, "other effective area-based conservation measures" (OECMs). In a faltering attempt to reach its Aichi Target 11 commitments by 2020, some Canadian jurisdictions have elected to focus more on coverage (quantity) and less on ecological integrity (quality), which has significant ramifications for long-term success of biodiversity conservation. For example, a jurisdiction responsible for marine conservation has re-designated regulated fishery closures as 'marine refuges' under the auspices of an OECM designation, which brings into question the real intent of Canada's commitment to the CBD and its own Biodiversity Strategy. Ambiguous language used to define and prescribe application of OECMs is being used as the basis for a revisionist paradigm that promises to undermine national and international conservation standards, fracture partnerships, and jeopardize the integrity of Canada's PA network. Canada must reject half measures that will result in ineffective or unintended perverse conservation outcomes, and focus on a post-2020 agenda that prioritizes conservation outcomes, management effectiveness, and the implementation of accountability measures within and between jurisdictions and by the Secretariat of the CBD.

1. Introduction

Human proclivity for unsustainable behaviour was the driving force behind the creation of the United Nations (UN) *Convention on Biological Diversity* (CBD) in 1993 and the *Strategic Plan for Biodiversity 2011–2020* [1]. The *Strategic Plan* is based on achievement of five interrelated strategic goals comprised of 20 Biodiversity Targets (Aichi Targets) to be met by 2020. To date, however, national responses have been insufficient, and it is likely that many countries will fail to meet most, if not all, of their targets [2,3]. This sluggish response may in part result from the target statements themselves, replete with redundancies, ambiguous language, and with a few exceptions (e.g., Targets 5, 15, and 11) unquantified objectives [4–7].

Target 11 (under Strategic Goal C of the *Strategic Plan*) is of particular interest to political leaders, practitioners, scientists, the media, and the general public because the quantified target's focus on conserved area has (mostly positive) implications for the other 19 targets. Specifically, Target 11 requires that biodiversity conservation be based

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on measures of ecological integrity that result from an ecosystem approach to management. In addition, many of the other targets must be met in order for a jurisdiction to meet the standards required for Aichi Target 11 areas, such as sustainable fisheries management. Target 11 stipulates that:

"By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes." [1]

The statement contains two spatial targets (quantity) with at least seven qualifying characteristics that contribute to the ecological integrity (quality) of the candidate area. The statement also introduces a new type of designation, "other effective area-based conservation measures" (OECMs), which allows the Parties to include areas other than formal PAs that also contribute to in-situ biodiversity conservation.[1]

In the years following implementation of the CBD's *Strategic Plan* in 2010, the Canadian Council on Ecological Areas (CCEA) and many practitioners and scholars reminded the Parties that both coverage and ecosystem/habitat quality are necessary and complementary requirements of Target 11 [4,8–12]. These practitioners and scholars warned about the potential risk of disparate interpretations of Target 11 in the absence of a clearly articulated criteria-based decision-making process and the potential for such interpretations to lead to unintended or even perverse conservation outcomes. For example, a jurisdiction could elect to identify and count existing management areas with little conservation value, rather than protecting areas that would help stop the loss of biodiversity [9]. While some privately-owned PAs and Indigenous and Community Conserved Areas (ICCAs) do conserve biodiversity and should qualify as OECMs in certain circumstances, absent of making clear contributions to biodiversity protection it is questionable whether area-based measures created for other means (e.g., resource management) such as fisheries closures, areas temporarily protected as part of forest management regimes, and municipal water-supply protection areas meet the intent of Strategic Goal C and Target 11 [13].

Drawing on the results of the Nagoya negotiations and observations based on the experiences of Canadian jurisdictions, this article identifies and discusses some of the benefits and consequences associated with the use and misuse of the OECM designation. The case studies illustrate how jurisdictional interpretation of language and adoption of international and national guidelines can generate results that conflict with the intent of Target 11, particularly as it relates to systematic conservation planning, reporting, government accountability and, ultimately, protected area effectiveness in conserving biodiversity. While discussed in a Canadian context, the implications are framed broadly with practical lessons learned that are highly relevant to the international conservation community.

2. Sleepwalking in Nagoya: The Aichi Biodiversity Target negotiations

The Aichi Biodiversity Targets were developed during *"protracted and tortuous"* negotiations at the tenth meeting of the Conference of the Parties (COP) to the CBD (COP 10) held in Nagoya, Aichi Prefecture, Japan [14]. Of the 20 targets, Target 11 was one of the most contentious [15] in part because it locks the Parties into meeting measurable commitments by 2020. The text for Target 11 presented to the Parties in the provisional agenda prior to COP 10 in July 2010, stated that:

"By 2020, at least [15%][20%] of terrestrial, inland-water and [X%] of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through comprehensive, ecologically representative and well-connected systems of effectively managed protected areas and other means, and integrated into the wider land- and seascape" [16]

The language clearly indicated that the initial intent of Target 11 was focused on increasing protected area coverage in terrestrial/inland water and coastal/marine ecosystems with high ecological integrity under the auspices of an ecosystem approach to management (e.g., representation and connectivity). This is important because a commitment to effectiveness is tantamount to a commitment to implementing an ecosystem approach to management, which also has implications for the protection of natural assets on the intervening landscapes and waterscapes between formally established PAs and OECMs (see [17]).

While the concept of "other means" of protection was recognized in the provisional agenda for COP 10, the draft language provided little guidance to decision-makers. The technical rationale did note, however, that these sites would be typically managed outside the realm of traditional, formal national authority (e.g., the high seas, where no one country can establish PAs) [16]. The draft technical rationale noted that progress on Target 11 would be measured through protected area coverage and the connectivity of ecosystems [16]. Measuring progress was focused entirely on PAs, and there was no mention on how or whether "other means" would be measured. The language used in the technical rationale was encouraging because it explicitly stated that Parties were expected to add areas that were demonstrably important to and effectively managed for biodiversity conservation.

Based on available proceedings and scientific literature pertaining to COP 10, it is difficult to discern with certainty how the Target 11 language was re-negotiated and how OECMs were added to the target. According to [15], while negotiators generally accepted the need to recognize "other means", some were concerned that the "*net not be cast too broadly*". Adroitly, some Parties and observers questioned the legitimacy of other means (beyond formal protected areas) and the scientific basis for the percentages used in establishing Target 11. For example, Conservation International argued that the percentage target should be higher if properties managed by "other means" were included as Target 11 areas [15]. The end result was a negotiation that concluded without a definition or clear understanding of the implications of designating OECMs to jurisdictional policy and more importantly to in-situ biodiversity conservation.

Given the importance of Target 11 to biodiversity conservation and the implications for national reporting to the CBD, the CCEA initiated a science-based protected area and OECM screening tool for potential and candidate Target 11 areas in 2012. The CCEA convened three national workshops between 2013 and 2015 involving 65 practitioners and scientists representing 30 agencies, NGOs, and Indigenous organizations from across Canada. A consensus-based approach was used to (1) operationalize OECMs in the Canadian context, consistent with IUCN intent, and (2) develop a decision-screening tool to assess the quality of proposed sites and associated management regimes for inclusion in Canada's Aichi Target 11 commitment. Results were subsequently published in a workshop report [8] and a peer-reviewed journal article [9]. As an important principle, it was concluded that inclusion of OECMs as Target 11 areas should be consistent with the overall intent of PAs, with the exception that they may be governed by regimes not previously recognized by jurisdictions. It was also recommended that key management objectives should include commitments to conserve nature, be long-term, generate effective nature conservation outcomes,

[1] In-situ conservation is detailed under Article 8 of the Convention on Biological Diversity (CBD) (https://www.cbd.int/convention/articles/default.shtml?a=cbd-08). The CBD defines in-situ conservation as "the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated and cultivated species, in the surroundings where they have developed their specific properties" (Article 2, CBD, 1992). In contrast to the mechanisms of *ex-situ* conservation, in-situ conservation maintains the interactions that underlie environmental services and regulate ecological processes.

and employ governance regimes that ensure effective management [9]. During subsequent workshops in 2016 and 2017, the screening tool was refined to reflect the results of global discussions whereby biodiversity conservation does not need to be a key objective of OECMs as long as effective, long-term in-situ conservation of biodiversity is achieved ([18] and see [13]).

The CBD's Target 11 'technical rationale' explicitly recognized the importance of management effectiveness in the establishment of new areas [16]. The CCEA integrated effectiveness into its screening tool in two ways. First, two criteria are employed to help practitioners measure the strength of the management mechanism(s) and the degree to which the management authority is compelled to act. Second, the effectiveness of the collective contribution of the 11 management criteria that practitioners evaluate with a colour coded (green-yellow-red) ranking system based on key statements to determine biodiversity conservation thresholds is used to identify 'candidate' or 'interim' OECMs.

In response to the issues confronting practitioners working to apply the OECM concept, the IUCN-World Commission on Protected Areas (WCPA) Task Force on Other Effective Area-based Conservation Measures (OECMs) was established in 2015. The process adopted by the Task Force considered the results of the work completed by the CCEA to develop guidance on OECMs [13]. In fact, a recent study by Gray et al. determined that the CCEA's tool faithfully integrated IUCN guidance and provides additional details to help practitioners address unique 'in-country' social and ecological conditions. [19] Three international workshops were convened by the Task Force during 2016 and 2017 and numerous presentations were provided at key international meetings. Several consultation drafts were widely circulated for review, along with a draft compendium of potential OECM case studies. The current *Draft Guidelines for Recognizing and Reporting OECMs* defines an OECM as:

"A geographically defined space, not recognized as a protected area, which is governed and managed over the long-term in ways that deliver the effective and enduring in-situ conservation of biodiversity, with associated ecosystem services and cultural and spiritual values" [13].

This definition shares many similarities with the IUCN definition of a protected area:

"A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values." [20]

In addition to the two definitions quoted above, the UN CBD SBSTTA organized two technical expert workshops to provide scientific and technical advice on definition, management approaches, and identification of OECMs and their role in achieving Aichi Biodiversity Target 11, including coastal and marine ecosystems. Workshop participants created the following OECM definition:

"Other effective area-based conservation measure" means "A geographically defined area other than a Protected Area, which is governed and managed in ways that achieve positive and sustained outcomes for the in situ conservation of biodiversity, with associated ecosystem services and cultural and spiritual values". [21]

Even though the OECM guidance document provided by the SBSTTA [21] applies to all ecosystems, the marine/coastal areas component places greater emphasis on sustainable use, risk-based approaches, and shorter-term measures. Perhaps a more important concern is the ambiguous language used to frame the scope of the objectives and anticipated outcomes. For example, the guidance document references an abridged use of *"…key features of the area to evaluate specific applications of an area-based conservation/management measure"* such as *"… ecological components of special conservation concern…"*. While the spatial context for this provision includes *"…both the specific area and the larger region…"*, and there is another provision that identifies the need to address the *"…extent to which the measure was developed within the ecosystem approach…"*, a focus on a limited number of ecological components should not be construed as an avenue for jurisdictions electing to designate partially protected areas as OECMs.

Like the CCEA guidelines, the IUCN-WCPA Task Force [13] emphasizes that the governance and management of OECMs is expected to be long-term in intent (i.e., considered to be ongoing and without any end-point, in ways that deliver the effective in-situ conservation of biodiversity) and that short-term management strategies such as temporary commercial fishing closures do not qualify an area as an OECM.[2] The *Draft Guidelines* emphasize that the probability of the conservation outcome being sustained through legal or other effective means should be maintained in the long-term [13]. This differentiates between conservation efforts that can and cannot be reversed easily. Only two years away from the deadline set by the *Strategic Plan for Biodiversity*, there still is no globally approved definition for OECMs. Consequently, use of this new designation remains open to interpretation and susceptible to misapplication as Parties prepare to report on their progress to the CBD.

3. Canada and the Aichi Biodiversity Targets fallout

Instead of simply adopting the negotiated 20 Aichi Targets, like many other Parties to the CBD, Canada[3] developed its own suite of goals and targets to meet its Aichi commitment. After considerable delay, the *2020 Biodiversity Goals and Targets for Canada* were released in 2016, adding a new layer of bureaucracy and creating unnecessary confusion caused by the repackaging of the 20 Aichi Targets into 19 Canadian targets [22]. The Canadian targets were crafted with virtually no involvement from outside experts and the government only consulted after concerted intervention by the conservation community [23]. Even though Canada is required to give due notice of intent with a direct invitation to Indigenous Peoples to participate in a meaningful consultation process on the development of any statute, strategy, or course of action that may affect them,[4] the federal government neither invited nor consulted Indigenous Peoples about the *Proposed 2020 Biodiversity Goals and Targets for Canada*, which was first promulgated on August 15, 2012 [23].

As a result of repackaging, Aichi Target 11 was modified and labeled Canada Target 1 and, despite agreed-upon language five years earlier at COP 10, several original Aichi Targets were excluded outright from Canada's strategy. For example, the final version released in 2015 omitted Strategic Goal A of the CBD *Strategic Plan for Biodiversity* (aiming to address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society). Furthermore, there are no obvious links to five CBD targets, including Target 17 (aiming to commence implementation of an effective, participatory and updated national biodiversity plan), Target 20 (aiming to mobilize financial resources for effectively implementing the *Strategic Plan for Biodiversity 2011–2020*), and Target 3 (aiming to eliminate perverse incentives including subsidies harmful to biodiversity).

Perhaps most notably is that Canada's Target 1 omitted several important elements of the CBD's Target 11, including science-based spatial planning measures. From the original 62 words in Aichi Target 11 that prescribed a quantitative target for areas with ecological integrity, Canada crafted a 33 word commitment focused on coverage targets:

"By 2020, at least 17% of terrestrial areas and inland water, and 10% of coastal and marine areas, are conserved through networks of protected areas and other effective area-based conservation measures" [22].

This abbreviated definition fails to acknowledge the significance of

[2] See [13].

[3] The *Convention on Biological Diversity* (CBD) was opened for signature at the United Nations Conference on Environment and Development on June 5, 1992. Canada was the first industrialized country to sign and ratify the CBD, affixing its signature on June 11 and ratifying it on December 4 of the same year.

[4] As per Subsection 35(1) of *The Constitution Act*, 1982.

ensuring that OECMs be “areas of particular importance for biodiversity”, “representative”, “well-connected systems” and “integrated into the wider land- and seascape”, and instead relegates them to white noise.

As the CBD *Strategic Plan for Biodiversity 2010–2020* deadline draws near, Canada has yet to formally clarify the full meaning and intent of Canada Target 1, its relationship with Aichi Target 11, and how progress on the coverage and efficacy of the national network of protected areas and OECMs can be tracked. In April 2016, federal, provincial, and territorial deputy ministers for parks agreed to establish a working group to develop a plan that outlines how jurisdictions could collaboratively achieve Canada Target 1. Coined “Canada Pathway to Target 1”, its primary objective is to encourage governments and land management partners to contribute to Canada's Target 1, including conserving at least 17% of terrestrial areas and inland waters by 2020 through PAs, Indigenous protected and conserved areas (IPCAs), and OECMs.[5] The Pathway project is organized around the work of a National Advisory Panel (NAP), an Indigenous Circle of Experts (ICE), and a National Steering Committee.

The ICE released their report and recommendations “*We Rise Together*” in March 2018, which speaks to how Indigenous Conserved and Protected Areas (IPCAs) can help contribute to Target 1 in the spirit and practice of reconciliation [24]. The NAP also released their report *“Canada's Conservation Vision”* in June 2018 [25]. Furthermore, on a promising note, the Federal government has declared that $1.3 billion will be allocated to support commitments to biodiversity conservation targets. It was stated that the funds allocated were to support Indigenous involvement in decision-making, in line with reconciliation objectives [26].

Unfortunately, the results of the Canada Pathway to Target 1 project will be limited because it includes terrestrial/inland waters but not marine/coastal areas. In June 2016, OECMs in the marine environment were unilaterally defined by Fisheries and Oceans Canada (DFO) in *Operational Guidance for Identifying ‘Other-Effective Area Based Conservation Measures’ in Canada's Marine Environment* [27]. It is unclear how the DFO initiative will be consolidated with the ‘Canada Pathway to Target 1′ process, though further review and refinement is planned to incorporate the results of ongoing global discussions through consultation with the Canadian Council of Fisheries and Aquaculture Ministers’ Oceans Task Group, and the 2017 report to Ministers on Canada's Network of Marine Protected Areas [28]. That said, DFO's operational guidance does state that "Fisheries and Oceans Canada's operational guidance on OEABCMs has been, and will continue to be, informed by international and domestic discussions taking place through the International Union for Conservation of Nature (IUCN) Task Group on OEABCMs, the CBD's Subsidiary Body on Scientific, Technical and Technological Advice, and the Canadian Council of Ecological Areas to define the term" [27].

Many Parties to the CBD, including Canada, have made *de-facto* progress on Target 11, including the declaration of new terrestrial and marine PAs and marine OECMs (see also [29]). Canada reports that as of January 2018, 8123 areas are considered protected across the country and collectively encompass about 10.6% of its terrestrial area and 3.0% of its marine area [30]. Compared to 2010, when the Aichi Targets were adopted by the Parties, these numbers represent increases of about 0.06% and 2.0%, respectively. However, even in the absence of a globally-sanctioned definition of OECMs and a publicly scrutinized national process for defining OECMs, in January 2018 Canada reported 4.78% of its marine area as OECMs in the Conservation Areas Reporting and Tracking System (CARTS). In this regard, it is important to note that the CCEA has developed guidance for reporting, but adherence to it is at the discretion of the reporting agency and there is no public review or audit process of data submitted by agencies to CARTS.

3.1. Fisheries and Oceans Canada (DFO) and the declaration of Canada's first OECMs

The establishment of PAs is a recognized and tested means of biodiversity conservation that is potentially strengthened by the addition of OECMs to the protected area estate under Aichi Target 11. To this end, Canada [31] has elected to establish “*…complementary and ecologically linked marine protected areas, consisting of a broad spectrum of marine protected areas established and managed within a sustainable ocean management planning framework and linked to transboundary global and terrestrial protected areas networks*”. Canadian agencies employ a variety of designations and associated measures to protect marine ecosystems or elements of ecosystems collectively referred to as Marine Protected Areas (MPAs) (generic use of the term). For example, the provinces care for 694 MPAs (e.g., provincial parks and ecological reserves), Parks Canada manages 16 MPAs in National Marine Conservation Areas and the marine portions of National Parks, the Canadian Wildlife Service cares for 61 MPAs in National Wildlife Areas and Migratory Bird Sanctuaries, and the DFO manages 11 MPAs under the *Oceans Act* [28]. In 2017, the DFO created a new designation, the ‘marine refuge’ OECM, under the *Fisheries Act*.

Prior to the establishment of marine refuge OECMs in 2017, MPAs encompassed only 5.75 million km^2 or 0.90% of Canada's marine estate [32], which falls well short of Canada's 10% commitment under Aichi Target 11. In fact, from 2011 to 2015 Canada's MPA network increased only 0.02%. In response, DFO published a five-point strategic plan to increase the area of territorial waters protected by MPAs from 1% to 10% in less than three years.[6] The strategic actions include: (1) finishing what was started (i.e., finalizing the creation of eight MPAs still at the Area of Interest (AOI) stage), (2) protecting large areas, (3) protecting areas under pressure, (4) advancing OECMs, and (5) establishing MPAs faster and more effectively.

A DFO managed MPA is *“…established to protect and conserve important fish and marine mammal habitats, endangered marine species, unique features and areas of high biological productivity or biodiversity*” [33]. Therefore, under the *Oceans Act*, Canada establishes MPAs to achieve long-term conservation of nature in areas of sea that form part of the internal waters of Canada, the territorial sea of Canada, or the exclusive economic zone of Canada. Potential *Oceans Act* MPAs are first identified as AOI that are subsequently evaluated as candidates for protection. Unfortunately, MPA protection standards are arguably low because there are few restrictions on fishing and industrial activities (e.g., shipping traffic and cable installation), oil and gas extraction is not explicitly prohibited, ministerial exemptions from prohibited activities are common, and management plans for many areas remain outstanding [34]. In addition, it is unlikely that Canada will meet its Aichi Target 11 commitment with the establishment of new MPAs because the designation process takes years to decades and there are no provisions for the development and enforcement of interim protection measures.

In response to strategic action #4 noted above (advancing OECMs), the DFO has elected to declare marine refuges as OECMs to meet Canada's Aichi Target commitments by 2020. Unlike the arduous MPA process under the *Oceans Act*, a marine refuge under the *Fisheries Act* can be established very quickly with minimal consultation. The DFO's operational guidance employs five criteria to identify marine refuge OECMs [27], as follows:

- Criterion #1: Clearly defined geographical location.
- Criterion #2: Conservation or stock management objectives.
- Criterion #3: Presence of ecological components of interest.
- Criterion #4: Long-term duration of implementation.
- Criterion #5: The ecological components of interest are effectively conserved.

[5] See: http://www.conservation2020canada.ca/the-pathway/.

[6] See: http://www.dfo-mpo.gc.ca/oceans/conservation/plan-eng.html.

Table 1
DFO OECM criteria compared to the corresponding CCEA [8,9,18] and IUCN-WCPA [13] draft guidance.[7]

Criteria	Description
Geographical Space	There is clear agreement that the site must be spatially defined.
Effectiveness	The CCEA defines effectiveness as a measure of the strength of the management mechanisms to protect biodiversity (Effective Means − 1) and the degree to which the management authority is compelled to act (Effective Means − 2). The CCEA and IUCN-WCPA approaches are based on a definition of biodiversity protection in the context of the whole ecosystem that can involve any number of statutes and associated policies. The DFO approach for marine refuge OECMs only restricts human activities that are incompatible with the conservation of the defined ecological component of interest (e.g., a fish species of regional importance), uses risk-based tools to inform the decision, being basically a type of fishery management planning tool. Partial protection measures created and implemented in the absence of an ecologically meaningful and socially acceptable process such as the one instituted for MPAs, will not meet the standards established for PAs. The *Fisheries Act* is one of a number of statutes/policies that Canada employs to manage ocean assets. In fact, 30 federal agencies are responsible for administering 62 key federal statutes related to oceans [37]. In addition, while *Oceans Act* MPAs are legally established, frequent exceptions to their general provisions for biodiversity protection means that such areas may are not managed to achieve the long-term conservation of nature. Most MPAs permit industrial-scale commercial fisheries in significant portions of their areas. Therefore, the over-reporting of marine protection applies to both *Fisheries Act* 'marine refuges' and *Oceans Act* MPAs (and also others, including Parks Canada's National Marine Conservation Areas (NMCAs), Environment Canada's National Wildlife Areas (NWAs) and Migratory Bird Sanctuaries (MBSs) overlying marine waters, and BC's marine ecological reserves, which provide no restrictions on fishing of any species under DFO's jurisdiction) (see [38–40] for analyses).
Long-Term	The CCEA/IUCN-WCPA approaches require establishment of a site with dedicated protection for the long-term (i.e., in perpetuity). While DFO's approach does not rule out the possibility of protection in perpetuity, the standard only requires application of a policy designed to protect the stock resource for a minimum of 25 years.
Dedication	The CCEA guidelines require management mechanisms that can be over-turned or rescinded only with great difficulty (CCEA 2018) and the IUCN guidelines require mechanisms that ensure the conservation outcome can be sustained. This refers to the *probability* of the conservation *outcome* being sustained through legal or other effective means such as, customary laws or formal agreements with landowners. This test emphasizes the difference between current conservation efforts that can be reversed easily and an OECM that can sustain conservation outcomes over the long-term (IUCN-WCPA, 2018: 25). For example, *Fisheries Act* closures can be quickly removed with Ministerial approval, making them less likely to remain in force over the long-term (e.g., to survive changes in federal governments).
Timing	The CCEA and DFO guidelines emphasize that the mechanism is in effect year-round. The IUCN-WCPA approach emphasizes that short-term or temporary management strategies should not count, and that areas that include seasonal measures as part of their management regime may qualify as OECMs if those measures are part of a long-term overall management regime that results in the year-round in-situ conservation of biodiversity [13].
Objectives-Scope	CCEA and IUCN guidance assert that areas achieving in-situ biodiversity conservation as a whole (rather than selected elements of biodiversity), regardless of their management objectives, may qualify as OECMs as long as the objectives and conscious governance and management of such areas lead to this outcome over the long term. IUCN-WCPA notes [13] that *"… CBD definitions of "biodiversity" and "in-situ conservation" clearly recognize that a single species can only exist in-situ as part of an interconnected web with other species and the abiotic environment. Therefore conservation measures targeting single species or subsets of biodiversity should not allow the broader ecosystem to be compromised."* In contrast, DFO states that at least two elements of biodiversity (a species of regional importance and a habitat that is important to biodiversity conservation) must experience a benefit as a result of the measure.
Objectives-Primacy	For CCEA, the primary objectives must be consistent, and not in conflict, the in-situ biodiversity conservation, consistent with the CBD definitions of those terms. Similarly, IUCN-WCPA states that biodiversity conservation outcomes must have primacy in cases of conflict. DFO states that no human activities incompatible with conservation of the (at least two) ecological components of interest for which the area is being managed may occur or be foreseeable within the area.
Governance	Given the variety of potential partners needed to establish and manage most OECMs, they can be governed under the same range of governance types as PAs, namely: governance by governments (at various levels); shared governance (i.e., governance by various rights-holders and stakeholders together); governance by private individuals, organizations or companies; and governance by indigenous peoples and/or local communities. CCEA guidelines state that all governing authorities should acknowledge and abide by a management regime likely to result in in-situ biodiversity conservation as a whole. The IUCN-WCPA guidelines state that the area must be governed (i.e., deliberately managed in such a way that the biodiversity outcomes are achieved), consciously managed (can include decision to leave area untouched), and the management authorities should have an appreciation of the conservation values of the area, regardless of management objectives. Given that the establishment of 'marine refuge' OECMs is a partial measure of protection limited to DFO's realm of authority (e.g., fishery closures), DFO is the single governing authority. Unfortunately, there are few guarantees that other governing authorities with potential and known conflicting interests (e.g., oil and gas exploration) will acknowledge and subscribe to conservation objectives.
Biodiversity Outcomes	Both the IUCN-WCPA and CCEA recognize the importance of effective in-situ conservation of biodiversity. DFO focuses on the conservation of selected ecological components (at least one habitat and one species). All recognize the importance and support the need to monitor and assess biodiversity outcomes in order to effectively inform ongoing adaptive decision-making.
Subsurface Resource Use	While the CCEA guidance on subsurface resource use is comprehensive, there is only indirect reference to unacceptable subsurface activity in IUCN-WCPA. However, in 2016 IUCN adopted a recommendation [41] against mining and other industrial activities in all categories of PAs and other areas important for the achievement of the Aichi Biodiversity Targets (e.g., OECMs). Application of this recommendation leads to the same conclusion for both CCEA and IUCN: mining and oil and gas activities should not be undertaken in such a way as to have impacts on OECMs. DFO makes no specific reference to subsurface activities in the operational guidance document [27], but notes that *"measures will lose their [OEACM] status if a new activity in the area is incompatible with biodiversity conservation and where the impacts of this new activity are not mitigated."*

A comparison of DFO's [27] operational criteria with those of the CCEA [8] and IUCN-WCPA [13] reveals direct or approximate alignment between some criteria, while others are clearly misaligned or absent (Fig. 2 and Table 1). For example, there is agreement that the site must not have been previously recognized as a PA. By contrast, the DFO Criterion #3 (Presence of Ecological Components of Interest) is not a management criterion used by the IUCN-WCPA [13] because the ecological conditions of an OECM are described through a series of value statements in the text. DFO Criteria #2 and #4 contain more than one element of management direction identified in the CCEA [8] template and the IUCN-WCPA [13] management guidelines. Furthermore, "significant biodiversity" is not currently specified by the CCEA or IUCN-WCPA while the DFO states that areas must have at least two elements of biodiversity - a habitat and a species of regional importance. Finally, while the CCEA and IUCN-WCPA adopt and adhere to the definitions of the CBD (e.g., in-situ conservation, biodiversity), DFO adopts alternative wording or employs a terminology that is either not clear (e.g., "biodiversity conservation benefits") or not defined (e.g., "conservation").

[7] St. Ann's Bank is one exception, where the core protected area is about 75% of the total and is essentially 'no-take' except for Indigenous food, social, and ceremonial fisheries. Most have much smaller highly protected cores, if they have any highly protected zones at all, and the fishing allowed in the remainder is often significantly beyond the scale envisioned even for IUCN category VI protected areas (see [78]).

As well, it is important to note that the five criteria depart from the DFO's internal scientific advice that recommends use of a more encompassing suite of criteria in the screening process, including the size and level of protection of the managed area (i.e., full vs. partial), habitat heterogeneity, and ecological connectivity [27]. For example, DFO scientists stated that *"it is important to consider the full suite of characteristics and factors when determining whether [an area-based management measure] is providing biodiversity conservation benefits"* and that area-based management measures *"should […] not solely [be evaluated] for their ability to maintain a population, species, or community in a state for human use"* [35].

In 2017, the DFO employed its operational guidance to assess more than 1000 area-based management measures currently in force and selected 51 sites for designation as marine refuge OECMs in waters off the Pacific, Atlantic and Arctic coasts. The DFO employs 'closure' to protect selected species populations and their habitats from the impacts of fishing and fishing gear (primarily bottom contact fishing gear). For example, three scallop buffer zones protect juvenile lobster habitat from scallop dredging and seven lobster area closures prohibit all lobster fishing in order to increase lobster spawning and protection. In addition, some closures protect ecosystems such as the offshore Pacific seamounts and vents, and sensitive benthic ecosystems such as corals and/or sponges from bottom-contact gears, which were initially closed under the auspices of a science-based program focused on the protection of 'sensitive benthic areas' (SBAs)[8] created in response to Canada's commitment to the 2006 United Nations' *Sustainable Fisheries Resolution* [36]. While all of these measures have some conservation value, none are managed according to conservation objectives and/or measures that result in the in-situ conservation of all biodiversity in the areas being counted (i.e., protection of the broader ecosystem). In fact, most of the measures are focused on sustainable fisheries management objectives, which is the purpose of Aichi Target 6.

Unfortunately, given that *Fisheries Act* regulations only apply to selected species-specific fishing activities, marine refuge OECMS are only partially protected. Even though these measures meet the DFO's internal OECM criteria, they do not protect biodiversity from the many other activities that occur in ocean ecosystems, including shipping traffic, subsurface exploration and mining, and in some cases industrial-scale commercial fishing of species not deemed to be the "species of regional importance" [27] for which the specific conservation measure has been implemented.

There is no publicly available information to show that these sites were evaluated using a vetted screening technique such as the consensus-based guidelines developed by the CCEA [9] or the IUCN-WCPA [13]. Even though it is clear that many marine refuges will not qualify as OECMs, the DFO claims it has added 4.78% of marine territory towards Aichi Target 11, which increased the total portion of Canadian waters reported as protected from about 1–8% (in a single announcement).

Fisheries Act regulations do contribute to biodiversity conservation. Unless already designated as a PA, attainment of one or a few of the other Aichi Targets (e.g., Target 6 on sustainable management of fisheries or Target 7 on sustainable agriculture and forestry) does not qualify an area as a candidate PA or an OECM, a point the IUCN-WCPA [13] is clear on. For instance, the following areas and management regimes are unlikely to qualify as OECMs:

- Fishery closures, temporary set-asides or gear restriction areas with a single species, species-group, or habitat focus, that may be subject to periodic exploitation and/or be defined for stock management purposes, and that do not deliver in-situ conservation of the associated ecosystems, habitats and species with which target species are associated. Such areas should be considered for contributing to Aichi Target 6.
- Conservation measures that apply to a single species or group of species, over a wide geographical range such as hunting regulations or whale-watching rules; these are better considered as being part of wider species conservation measures (Targets 5, 6, 7 and/or 12).

While closures will not qualify an area as a PA or OECM they do help jurisdictions mitigate biodiversity loss in the intervening oceanscapes between PAs and OECMs.

The IUCN-WCPA [13] draft OECM guidelines are organized and illustrated to help practitioners determine if the proposed measures qualify an area for designation as a Target 11 OECM or alternatively for designation as another type of Aichi Target, which may in fact contribute to an OECM designation (Fig. 1). Most important is that no matter the path taken, the jurisdiction must demonstrate that the site will qualify as 'protected' at some point based on a process that results in the conservation of whole systems (i.e., ecosystems and multi-species habitats).

One unfortunate outcome of the misalignment in OECM criteria is that Canada's recent progress toward Aichi Target 11 has mostly been supported by the renaming of fishery management areas and critical habitats as 'marine refuge OECMs' (15 of which were established before 2010, and as far back as 1981) (Fig. 3). Despite DFO's claims, these renamed areas do not qualify as protected and do little to mitigate the increasing risks to Canada's ocean ecosystems of which biodiversity is an integral part. In fact, they are examples of DFO's tendency to use MPAs in support of commercial fishing interests, struggling to refocus the use of MPAs as a tool to conserve sites of high biodiversity more generally. OECMs need effective outcomes, which should be achieved through effective governance and management (not simply accidentally or temporarily), and they should have objectives that are compatible with, but not necessarily intended to achieve, biodiversity conservation.

4. Discussion

4.1. Conservation on a slippery slope?

Since the adoption of the CBD *Strategic Plan for Biodiversity* in 2010, few proposed OECMs have been added to Canada's marine and terrestrial protected area networks. The vast majority of new additions to the Aichi Target 11/Canada Target 1 commitments resulted from a 2017 DFO declaration of 51 'marine refuges' that were not subjected to a screening process consistent with IUCN guidance. To date, no Canadian jurisdiction has declared any terrestrial OECMs.

While some of DFO's declared marine refuge OECMs have legitimate conservation value, particularly in the intervening oceanscapes between PAs, many do not meet the standards prescribed in the guidelines developed by the IUCN-WCPA [13] or the CCEA [8,9] for Target 11. Both guidelines state that OECMs should provide long-term benefits to ecosystems as a whole, not just selected elements such as single species and their habitats. The fact that DFO recognizes that these *"Measures will lose their [OECM] status if a new activity in the area is incompatible with biodiversity conservation and if the impacts of this new activity are not mitigated"* underscores the fact that establishment of a marine refuge is not a commitment to the long-term conservation of biodiversity [27]. As a case in point, in early 2018 just months after DFO's declaration of 51 marine refuge OECMs, the Government of Newfoundland and Labrador issued a call for bids for oil and gas exploration within the boundary of the Northeast Newfoundland Slope Closure OECM [37]. This will require that Canada exclude that portion of the marine refuge subjected to oil and gas exploration from its tally of areas that Canada proposes to count towards its Aichi Target 11 commitment. However, this is a moot point given that the Northeast Newfoundland Slope Closure does not qualify as an OECM in the first place. The absence of a mechanism to ensure long-term conservation of *Fisheries Act* OECMs

[8] See: http://www.dfo-mpo.gc.ca/reports-rapports/regs/sff-cpd/benthi-back-fiche-eng.htm.

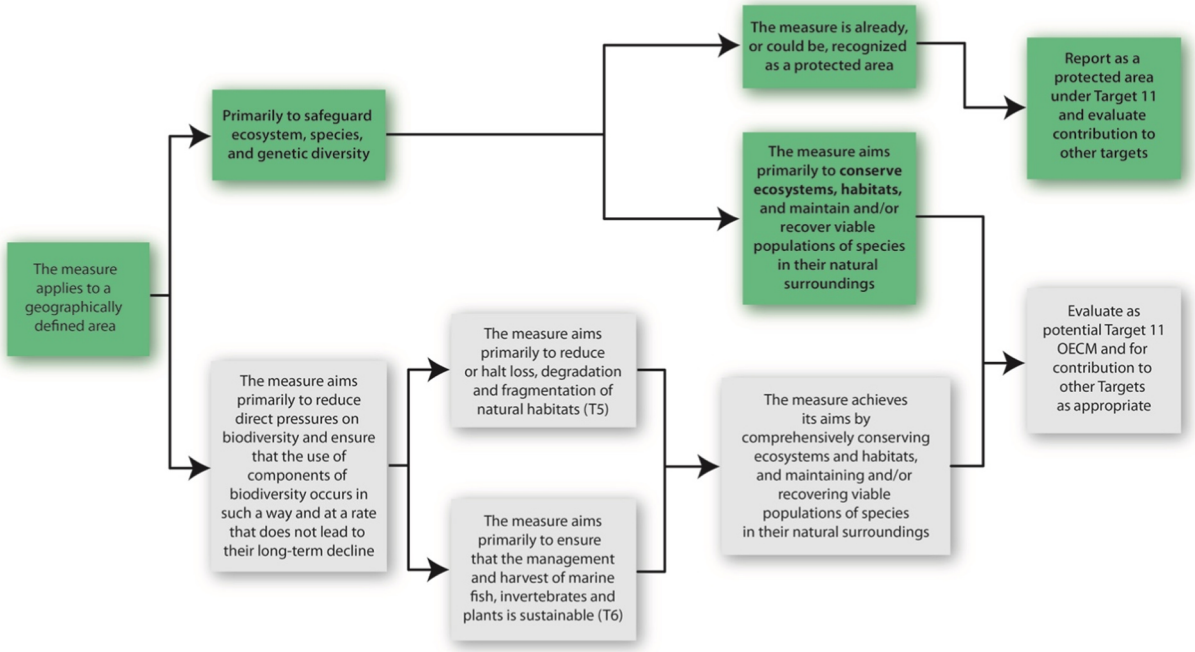

Fig. 1. An excerpt from Appendix 3 in IUCN-WCPA [13] illustrating how some measures such as Aichi Target 6 can contribute to an area's protection, but do not qualify an area for consideration as a PA in the absence of other measures that collectively serve to conserve whole systems such as ecosystems and multi-species habitats.

points to a significant incompatibility between DFO OECMs and IUCN guidelines, going against DFO's declaration that their operational guidance *"…has been, and will continue to be, informed by international and domestic discussions taking place through the International Union for Conservation of Nature (IUCN) Task Group on OEABCMs, the CBD's Subsidiary Body on Scientific, Technical and Technological Advice, and the Canadian Council of Ecological Areas to define the term."* [27]

Furthermore, the fact that these areas have been proclaimed as OECMs suggests that DFO does not subscribe to a collaborative approach to national conservation planning assessments and implementation strategies, nor in the need to employ science and consultative processes characteristic of countries that ascribe to the principles of biodiversity conservation under the *Convention on Biological Diversity*. DFO's focus on quantity over quality (i.e., ecological integrity) jeopardizes the future of biodiversity conservation in Canada's coastal/marine and terrestrial/inland water ecosystems in several ways:

1. **It contravenes the philosophical and scientific intent of the CBD Aichi Targets and Canada's *Biodiversity Strategy* targets.** Introduction of the 'marine refuge' contradicts the spirit and intent of Aichi Target 11 because the OECM (initially referred to as 'other means' in the draft pre-COP 10 Aichi Targets) was introduced in the language of Target 11 to recognize areas beyond national jurisdiction such as Indigenous territory, privately protected lands, and other regions that meet or exceed biodiversity conservation goals but are not formally recognized. The CCEA's consensus-based approach generated a similar conclusion, noting that OECMs should be consistent with the overall intent of a PA, even though they may be governed by regimes not previously recognized by reporting agencies [9].
2. **It undercuts the work of partners.** Adoption of a designation that is semantically misleading and does not protect biodiversity in-situ jeopardizes Canada's reputation as an honest and progressive member of the CBD, and adds a new layer of bureaucratic complexity that will reduce the coherence of its national and international conservation response to the CBD. The federal government's acceptance of the DFO approach suggests that Canada's other government agencies will be permitted to follow suit with a slate of lower protection standards. Similar to findings in Australia by Edgar [38], the resulting system of conserved areas will *"encompass a confused mixture of apples and lemons"*.
3. **It creates confusion about the definition and application of sustainable management initiatives in the intervening oceanscapes between MPAs.** While MPAs comprise a class of long-term measures that protect biodiversity, marine refuges do not and at best contribute to sustainable management practices in the intervening oceanscapes. The measures have been implemented to restore degraded (or even collapsed) fisheries and/or prohibit the use of gear to protect the seafloor, while allowing many types of industrial-scale, commercial fisheries to continue, effectively preventing the intent of Target 11 from being achieved in those areas. In some regards, the declaration of such areas would be akin to declaring a terrestrial OECM after it has been logged (clear cut) (i.e., remedial measures for poor past management).
4. **It highlights the concern that the designation of these types of OECMs will degrade conservation standards by allowing Parties to artificially attain Aichi Target 11 commitments by sacrificing quality over quantity** [9] **(see also** [39]**).** Biodiversity conservation science tells us that well-governed and effectively managed PAs safeguard biodiversity in the context of the ecosystem [11,40–44]. For example, MPAs are most effective when the areas are large, old, and isolated, all fishing is prohibited (or fully p*rotected from all development), and enforcement is strong* [42,45]. *As Claudet* [46] *states, "… without enforcement it has little to no chance of meeting the desired outcomes."* In contrast, areas like DFO's marine refuges have limited conservation benefit in the absence of long-term biodiversity conservation goals, including legal or other

	CCEA	DFO
GEOGRAPHICAL SPACE	Site must be spatially defined	Site must be spatially defined
EFFECTIVE MEANS-1 Measure of Strength of Management Mechanisms	Full protection of area/ecosystem whereby the management mechanism has the power to exclude, control, and manage all activities within the area	Partial protection by restricting human activities that are incompatible with selected ecological components of interest
EFFECTIVE MEANS-2 Degree to which Management Authority is Compelled to Act	Full protection of area/ecosystem whereby the mechanism compels the authority to prohibit activities that are incompatible with in-situ biodiversity conservation	Once an OEABCM is identified, future management of that OEABCM will have to adhere to these criteria, or the OEABCM status will be revoked in future reporting
LONG-TERM	Area protected in perpetuity	Area protected for a minimum of 25 years or longer (underlying aim is to be in effect indefinitely or in perpetuity)
DEDICATED	The mechanism can be reversed only with great difficulty such as a change in legislation	Closures under the *Fisheries Act* can be repealed with Ministerial approval
TIMING	Year-round protection	Year-round protection
SCOPE OF CONSERVATION OBJECTIVE	*Area/ecosystem objectives are consistent with, whether intentionally or otherwise, in-situ biodiversity conservation*	At least two elements of biodiversity must experience a benefit (e.g., a species of regional importance and a habitat)
PRIMACY OF NATURE CONSERVATION OBJECTIVES	Primary objectives must be consistent, and not in conflict, with in-situ biodiversity conservation	No human activities incompatible with the conservation of at least two ecological components of interest being managed
GOVERNING AUTHORITIES	Governing authorities abide by the management regime (e.g., various combinations of governments, private individuals, companies, organizations, Indigenous peoples, and/or local communities)	DFO is the single governance authority
BIODIVERSITY CONSERVATION OUTCOMES	Evidence that *in-situ* biodiversity conservation is being achieved 1. Focused on whole system biodiversity conservation 2. Recognizes importance of monitoring and assessment	Evidence that *in-situ* biodiversity conservation is being achieved 1. Focused on conservation of selected ecological components 2. Recognizes importance of monitoring and assessment
SUBSURFACE RESOURCE USE	Comprehensive treatment of subsurface resource activity	No reference to management of subsurface resource activities

Fig. 2. Comparison of CCEA [8] and DFO [27] management criteria with respect to OECMs.

effective arrangements that prevent development and exploitation threats within their boundaries [9]. The recently released Final Report of the National Advisory Panel on Marine Protected Area Standards, submitted to Canada's Minister of Fisheries, Oceans and the Canadian Coast Guard, similarly concluded that "quality matters" and that "delivering meaningful biodiversity protection is more important than hitting numerical targets" [81].[9]

Expanding on #2 above (undercutting the work of partners), Quebec is the only Canadian province to publicly address their position on OECMs. Although DFO states that the recent creation of marine refuge OECMs in the Quebec portion of the Gulf of St. Lawrence means that Canada will likely meet its Aichi Target 11/Canada Target 1 commitments to protect marine ecosystems, Quebec will not accept these areas as protected and will not claim them as part of their response to the targets [47]. Instead, Quebec has elected to create a network of MPAs (generic use of the term) according to the criteria and standards recognized by the IUCN. In a recent media statement, the Quebec government differentiated between MPAs and OECMs designated by DFO, stating that while MPAs are clearly defined protection measures according to strict IUCN rules, and recognized by Parties to the CBD, including Canada, this is not the case with DFO's new marine refuge OECMs [47].

It is likely that Canada will fall short of its biodiversity conservation goals and commitments irrespective of its declared area-based achievements. As Pressey et al. [48] emphasize, focusing solely on the extent of area conserved risks *"…misdirecting conservation actions towards areas of low impact and misleading decision-makers and the public about conservation progress."* Furthermore, implicit in the Aichi Target logic is that the targets are interdependent – but Canada is ignoring how this will happen. Our findings support those of a recent performance audit by the Office of the Auditor General of Canada [49] that concluded *"…Environment and Climate Change Canada (the national focal point for CBD reporting in Canada) did not provide effective national leadership and coordination of actions required to meet the 2020 targets to conserve Canada's biodiversity."* Achievement of the other 18 targets to which Canada has committed will depend largely on biodiversity conservation outcomes.

[9] The Final Report goes on to state that "It is expensive to establish and manage MPAs properly; therefore resources must be targeted to areas of high ecological value. Furthermore, quality planning and management processes that enable real collaborationbetween the Crown and Indigenous peoples, and that provide for meaningful engagement of stakeholders, cannot be rushed. The Panel's aim has been to ensure that up-front investments in good MPA planning and design are ultimately repaid in more effective and durable outcomes.

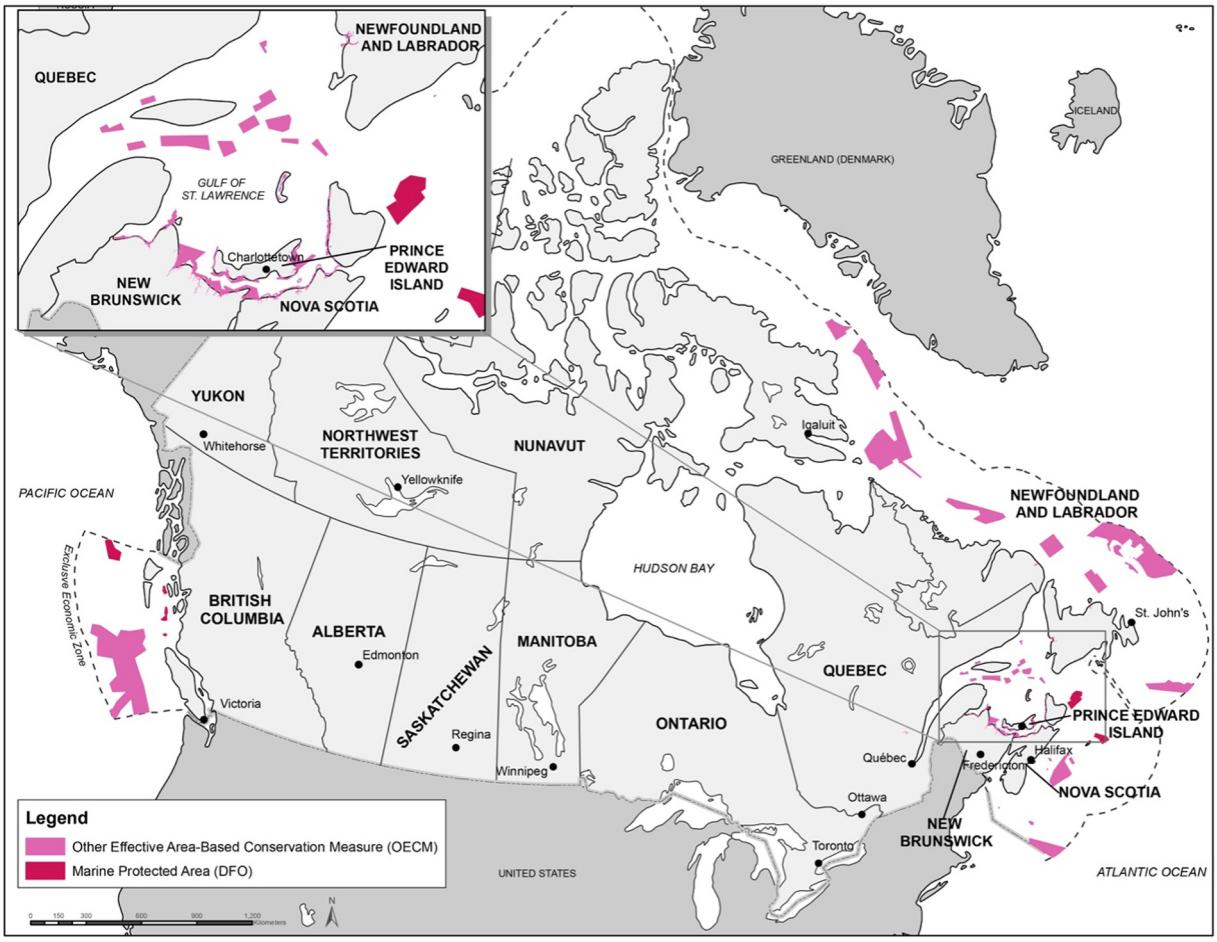

Fig. 3. Map illustrating Canada's MPAs and OECMs declared by DFO, with inset map of the Gulf of St. Lawrence (data source: [30]) (map by: Trina King, Wilfrid Laurier University).

4.2. Standing at the edge of the precipice: alternative considerations for Canada

DFO's revisionist accounting approach exemplifies a Canadian jurisdiction that has implemented a policy initiative that circumvents the intent of Target 11 by allowing its practitioners and managers to focus on coverage and to undervalue measures of conservation success. This approach also ignores the CBD's desired basis for decision-making, as detailed in the CBD's *Strategic Plan for Biodiversity 2010–2020,* which recognizes the need for decision-making *"…based on sound science and the precautionary approach."* [50] DFO's revisionist and unilateral approach raises legitimate concerns about the potential for degradation of conservation standards and conservation partnerships in Canada. Consequently, achievements toward Target 11/Canada Target 1 may be more difficult than initially envisioned by some governments, and many are further away than the CBD's *Global Biodiversity Outlook 4* suggests [29,51].

Conceptually, the path to resolving these issues is relatively straightforward. First, Canada would be better served by falling short of the Aichi Target 11/Canada Target 1 and renewing its commitment as part of a post-2020 agenda focused on correcting the imbalance between fully protected MPAs and areas declared as protected but in reality are open to some form of fishing or development. Focus should be placed on completing the establishment of currently proposed PAs and on initiating the process of establishing a greatly expanded network of effective, fully protected MPAs, that adhere to sound conservation science. This may also include retracting OECM declarations toward Aichi Target 11/Canada Target 1 and reassigning them as (more appropriate) measures in support of ecosystem management (e.g., Aichi Target 6). Consistent application of a decision-making process through the application of sound criteria is needed to validate the identification of PAs and OECMs. For example, the identification of such areas should be assisted by tools such as systematic conservation planning and the global standard for Key Biodiversity Areas (KBAs) [52]. Canada can improve its chances of successfully employing an ecosystem approach to management through systematic conservation planning [53] with which scientists and practitioners can explore the effectiveness and efficiency of optional configurations of protected areas at the seascape-level of planning (e.g., [54,55]. On a positive note, many DFO regions are developing MPA network plans that are informed by systematic conservation planning methods, which should become the centre of DFO future conservation efforts.

Second, more focused efforts on the contribution of Aichi Target 11 elements, such as representivity and connectivity, could result in significantly greater long-term conservation outcomes than 'minimum standard' OECM coverage alone. Only one-third of jurisdictions in Canada (6 of 16) claim sufficient representation in their terrestrial ecological regions [32] and, unfortunately, representation is ignored in Canada's Target 1 and is not currently a reason for which a MPA can be established by DFO under section 35(1) of the *Oceans Act*. This leaves a primary international (and national) theme and commitment for PAs in Canada orphaned in the marine setting (although some *Oceans Act* MPAs achieve it incidentally). Officially, it seems that the federal mandate for marine representation is deferred to Parks Canada, but Parks Canada has no control over fishing without the approval of the Minister of Fisheries [56], and has so far achieved a poor 4.7% no-take

across its entire national marine conservation areas (NMCA) portfolio.[10] NMCAs are intended to be primarily exemplars of ecologically sustainable use [56]; however, they often allow levels of consumptive use that make representation objectives impossible to achieve [57,58]. Overall, including federally and provincially designated areas in the marine environment, only 0.11% of Canada's ocean estate is fully protected from all extractive uses [34].

Marine conservation should be the authority of a single federal agency that is not burdened with multiple, incompatible mandates that can enable unacceptable trade-offs. This could be, for example, Parks Canada (managed under a new or updated legislation that includes ecological integrity as the primary mandate) or an entirely new entity that has a primary mandate to conserve nature. This recommendation is supported in the findings of the NAP's "Canada's Conservation Vision". [25]

Representation of naturally functioning ecosystems as called for under Target 11 cannot be achieved without high levels of protection [57–59], which eludes DFO's, Parks Canada's, and Environment and Climate Change Canada's current approaches to conservation in the marine and Great Lakes environments [see [60]). Many areas of importance for biodiversity remain unprotected as biases towards the least useful areas are evident in DFO's efforts to avoid conflicts among users (e.g., shipping and resource extraction), a phenomenon called 'residual' MPAs that has been criticized in the literature [61]. For example, a recent study by Harris et al. [62] concluded that existing marine PAs in the Arctic Ocean offer little or no protection to many habitats and deep seafloor features that coincide spatially with areas likely to be of interest to industry.

The importance of protecting the right places cannot be overstated. Many of Canada's MPAs and OECMs are located in areas remote from populated coasts, and are concentrated in the St. Lawrence estuary and East coast (Fig. 3). The current distribution of MPAs and OECMs is far from comprehensive or representative, and protection levels are, for the most part, inadequate to protect naturally functioning ecosystems or provide some of the key social benefits that effectively managed PAs offer [57]. In this regard, Aichi Target 11 requires that PAs and OECMs be part of a connected system, integrated into wider landscapes and oceanscapes. Providing connectivity through a mosaic of PAs and OECMs will be crucial for immigration/emigration, the movement of genes (evolutionary flow), and unhindered flow of ecosystem functions, especially in a context of climate change [63]. However, half of Canada's PA jurisdictions recently identified a lack of tools for connectivity between existing PAs as a significant constraint to planning [32]. Jurisdictions also reported "incompatible use outside of PAs" and "climate change" as serious threats to the ecological integrity of PAs [32]. Failure to address these issues will ultimately limit the effectiveness of in-situ conservation of biodiversity and ecosystem-based management goals.

Finally, inadequate capacity for the effective management of PAs remains widespread at many levels of decision-making in Canada's protected areas sector [49,64–66]. It is important to note that all agencies will be monitored by public accountability offices and science-based non-governmental organizations, and ultimately held accountable by their respective publics. Engagement and accountability have been identified as lacking in Canada's conservation efforts [64]. The case study on the DFO detailed above underscores the need for improved accountability in Canada and also by the Secretariat of the CBD to ensure that the spirit and intent of meeting the Aichi Targets is being met by Parties. This, in part, results from the Secretariat to the CBD's laissez-faire approach to national implementation and reporting, which allows Parties to decide how to respond to CBD goals and targets without the guidance of a formal review process or clear definition of the meaning of OECM with only two years remaining in the *Strategic Plan*. This bureaucratic malaise could be somewhat mitigated through enhanced and transparent measures to 1) engage a broad range of institutions and stakeholders, 2) design and introduce a review process as part of national reporting, and 3) introduce ongoing third-party auditing of reports.

In addition to providing Parties with clear and consistent guidelines, a re-invigorated and robust monitoring and reporting system will enhance opportunities for collaborative learning, to reach conservation targets in a more coherent and timely manner, and to inform the post-2020 agenda. However, none of this will amount to anything significant in the absence of a concerted political commitment by the Parties to improve the operational capacity of the CBD Secretariat.

The rate of national report submissions by Parties to the CBD has been consistently low [67]. This is indicative of an ineffective policy instrument that fails to compel the Parties to install bureaucratic processes that enable compliance [68,69]. Some countries like Canada unnecessarily complicate the process by creating a different reporting framework based on strategies and targets that only approximate, are completely different, or completely ignore strategies or targets in the CBD agreement. Furthermore, policy led by area-based targets alone *"…will not be adequate to safeguard the important ecosystem processes and services that marine ecosystems underpin"* [70]. Given that Canada's plan is significantly different from the CBD *Strategic Plan*, it only serves to add confusion for policy analysts and practitioners who are responsible for managing and integrating the domestic and international commitment statements and policy agendas. As the gatekeeper for national reporting on CBD progress that is accountable to Parliament and Canadians, it is incumbent on Environment and Climate Change Canada to resolve these issues in a timely manner, particularly given its lack of progress towards achieving the 19 Canadian and 20 Aichi Targets [49].

5. Conclusions

Parties to international environmental agreements commonly fail to meet commitments and/or deadlines [71]. In fact, it occurs on such a regular basis that it is now considered the norm. Despite this, the UN CBD represents one of the most important environmental commitments in the history of international cooperation on global issues affecting the ecosphere, and highlights the important role of PAs as a key strategy for biodiversity conservation and sustainable development. PAs remain the most important contribution to achieving these commitments. As Woodley et al. [4] emphasize, *"[p]rotected areas are a tried and tested approach to nature conservation"*. However, biodiversity conservation cannot be confined to PAs; the sustainable management of natural assets on the intervening landscapes and oceanscapes is also necessary and critically important to the health and well-being of the ecosphere and the people who depend on it for life [72].

Canada has fallen behind in biodiversity conservation achievements over the last two decades primarily because PA establishment in both terrestrial and marine areas has stalled [25,73]. Despite the ambitions of the CBD, the clock is winding down on initiatives to establish new PAs under the current CBD *Strategic Plan* is narrowing and future opportunities to protect high integrity terrestrial/inland water and marine/costal ecosystems will continue to disappear as the human population grows and the demand for access to natural resources escalates. Under this scenario, Parties will be increasingly required to select PAs with compromised ecological integrity and to devote significant resources to the restoration of ecological function on degraded sites. Relatedly, it will be important to assess the outcomes of prescribed approaches to protection based on the standards developed and advanced by the IUCN and CCEA in order to recalibrate and realign biodiversity conservation objectives and targets as necessary (see [74]).

[10] Fathom Five National Marine Park: 112 km2 – 0% no-take; Lake Superior National Marine Conservation Area: 10,000 km2 – 0% no-take; Gwaii Haanas National Marine Conservation Area Reserve: 1500 km2 – 3% no-take; Saguenay-St. Lawrence Marine Park: 1246 km2 – 45% no-take. Sources: [76–79].

With two years remaining, it is not clear how the CBD's goals and targets will lead to the expected benefits for nature. Canada's strategy to reach Target 11 threatens the expected effectiveness of both terrestrial and marine conservation in Canada and are inconsistent with a global vision of *"Living in Harmony with Nature"* and with the overall intent of Target 11. These actions are also inconsistent with what Canadians want and expect from their government. Results of a recent national conservation survey indicates that the majority of Canadians (87%) support increasing the proportion of lands protected from development from the current level of 10% to at least 17% by 2020, and half (49%) feel their government is not a world leader on conservation (but should be) and should do more to protect wildlife [75]. As one of the countries with the largest remaining contiguous regions of low human footprint and particularly high concentration of connectivity [80], Canada could and should assume a global responsibility to not only meet but exceed the spirit and intent of Aichi Target 11 and Canada Target 1.

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Declarations of interest

None.

References

[1] (UNEP) United Nations Environment Programme Conference of the Parties (COP) to the UN Convention on Biological Diversity (CBD), Decision Adopted by the Conference of the Parties to the Convention on Biological Diversity at its Tenth Meeting, 2010. ⟨https://www.cbd.int/doc/decisions/cop-10/cop-10-dec-02-en.doc⟩.

[2] (SBSTTA) CBD Subsidiary Body on Scientific Technical and Technological Advice, Examination of the Outcome-oriented Goals and Targets (and associated indicators) and Consideration of their Possible Adjustment for the Period Beyond 2010, 2010. ⟨https://www.cbd.int/doc/meetings/sbstta/sbstta-14/official/sbstta-14-10-en.pdf⟩.

[3] Secretariat of the Convention on Biological Diversity, Global Biodiversity Outlook 4: A mid-term assessment of progress towards the implementation of the Strategic Plan for Biodiversity, 2011 - 2020, Glob. Biodivers. Outlook 4 (2014), https://doi.org/10.2143/KAR.25.0.504988.

[4] S. Woodley, B. Bertzky, N. Crawhall, Meeting Aichi Target 11: what does success look like for protected area systems?, Parks., 2012. doi: 10.2305/IUCN.CH.2012.PARKS-18-1.en.

[5] A. Marques, H.M. Pereira, C. Krug, P.W. Leadley, P. Visconti, S.R. Januchowski-Hartley, R.M. Krug, R. Alkemade, C. Bellard, W.W.L. Cheung, V. Christensen, H.D. Cooper, T. Hirsch, R. Hoft, J. van Kolck, T. Newbold, K. Noonan-Mooney, E.C. Regan, C. Rondinini, U.R. Sumaila, L.S.L. Teh, M. Walpole, A framework to identify enabling and urgent actions for the 2020 Aichi Targets, Basic Appl. Ecol. (2014), https://doi.org/10.1016/j.baae.2014.09.004.

[6] R. Hill, G.A. Dyer, L.M. Lozada-Ellison, A. Gimona, J. Martin-Ortega, J. Munoz-Rojas, I.J. Gordon, A social-ecological systems analysis of impediments to delivery of the Aichi 2020 Targets and potentially more effective pathways to the conservation of biodiversity, Glob, Environ. Chang (2015), https://doi.org/10.1016/j.gloenvcha.2015.04.005.

[7] S.H.M. Butchart, M. Clarke, R.J. Smith, R.E. Sykes, J.P.W. Scharlemann, M. Harfoot, G.M. Buchanan, A. Angulo, A. Balmford, B. Bertzky, T.M. Brooks, K.E. Carpenter, M.T. Comeros-Raynal, J. Cornell, G.F. Ficetola, L.D.C. Fishpool, R.A. Fuller, J. Geldmann, H. Harwell, C. Hilton-Taylor, M. Hoffmann, A. Joolia, L. Joppa, N. Kingston, I. May, A. Milam, B. Polidoro, G. Ralph, N. Richman, C. Rondinini, D.B. Segan, B. Skolnik, M.D. Spalding, S.N. Stuart, A. Symes, J. Taylor, P. Visconti, J.E.M. Watson, L. Wood, N.D. Burgess, Shortfalls and solutions for meeting national and global conservation area targets, Conserv. Lett. (2015), https://doi.org/10.1111/conl.12158.

[8] (CCEA) Canadian Council on Ecological Areas, Interpreting Aichi Biodiversity Target 11 in the Canadian Context: Towards Consensus on 'Other Effective Areas-based Conservation Measures, Ottawa, 2013. ⟨http://www.ccea.org/wp-content/uploads/2014/05/CCEA_Aichi_Target_11_WorkshopReport_OCT16_2013.pdf⟩.

[9] D. MacKinnon, C.J. Lemieux, K. Beazley, S. Woodley, R. Helie, J. Perron, J. Elliott, C. Haas, J. Langlois, H. Lazaruk, T. Beechey, P. Gray, Canada and Aichi Biodiversity Target 11: understanding 'other effective area-based conservation measures' in the context of the broader target, Biodivers. Conserv. (2015), https://doi.org/10.1007/s10531-015-1018-1.

[10] H.D. Jonas, V. Barbuto, Jonas, A. Kothari, F. Nelson, New steps of change: Looking beyond protected areas to Consider other effective area-based conservation measures, PARKS (2014), https://doi.org/10.2305/IUCN.CH.2014.PARKS-20-2.HDJ.en.

[11] D. Juffe-Bignoli, I. Harrison, S.H.M. Butchart, R. Flitcroft, V. Hermoso, H. Jonas, A. Lukasiewicz, M. Thieme, E. Turak, H. Bingham, J. Dalton, W. Darwall, M. Deguignet, N. Dudley, R. Gardner, J. Higgins, R. Kumar, S. Linke, G.R. Milton, J. Pittock, K.G. Smith, A. van Soesbergen, Achieving Aichi Biodiversity Target 11 to improve the performance of protected areas and conserve freshwater biodiversity, Aquat. Conserv. Mar. Freshw. Ecosyst. (2016), https://doi.org/10.1002/aqc.2638.

[12] T. Agardy, J. Claudet, J.C. Day, Dangerous Targets' revisited: old dangers in new contexts plague marine protected areas, Aquat. Conserv. Mar. Freshw. Ecosyst. (2016), https://doi.org/10.1002/aqc.2675.

[13] I.U.C.N. WCPA, Guidelines for Recognising and reporting other effective 28 area-based conservation measures. IUCN, Switzerland. Version 1, Int. J. Prot. Areas Conserv. Issue (2018), https://doi.org/10.2305/IUCN.CH.2017.PARKS-23-1.en.

[14] S.L. Maxwell, E.J. Milner-Gulland, J.P.G. Jones, A.T. Knight, N. Bunnefeld, A. Nuno, P. Bal, S. Earle, J.E.M. Watson, J.R. Rhodes, Being smart about SMART environmental targets, Sci. (80-.) (2015), https://doi.org/10.1126/science.aaa1451.

[15] L.M. Campbell, C. Corson, N.J. Gray, K.I. MacDonald, J.P. Brosius, Studying Global Environmental Meetings to Understand Global Environmental Governance: Collaborative Event Ethnography at the Tenth Conference of the Parties to the Convention on Biological Diversity, Glob. Environ. Polit., 2014. doi: 10.1162/GLEP_e_00236.

[16] (UNEP) United Nations Environment Programme Conference of the Parties (COP) to the UN Convention on Biological Diversity (CBD), Revised and Updated Strategic Plan: Technical Rationale and Suggested Milestones and Indicators, 2010. ⟨https://www.cbd.int/doc/meetings/cop/cop-10/official/cop-10-09-en.pdf⟩.

[17] D. Diz, D. Johnson, M. Riddell, S. Rees, J. Battle, K. Gjerde, S. Hennige, J.M. Roberts, Mainstreaming marine biodiversity into the SDGs: the role of other effective area-based conservation measures (SDG 14.5), Mar. Policy (2017), https://doi.org/10.1016/j.marpol.2017.08.019.

[18] (CCEA) Canadian Council on Ecological Areas, Protected Areas and Other Effective Area Based Conservation Measures in Canada: a Guidebook for Their Identification and for the Application of IUCN Protected Area Categories (DRAFT-Version 1), 2018. ⟨http://www.ccea.org/wp-content/uploads/2018/05/CCEA-Guidebook_CONSULTATION-DRAFT_V1_May-2018.pdf⟩.

[19] P.A. Gray, D. Cheriton, N. Gaetz, P. Lehman, J. Sherwood, T.J. Beechey, C.J. Lemieux, Comparing screening tools for assessment of potential "other effective area-based conservation measures" in Ontario, Canada, Park. Int. J. Prot. Areas Conserv. 24 (2018) 31–48.

[20] N. Dudley, Guidelines for Protected Area Management Categories, 2008. doi: 10.2305/IUCN.CH.2008.PAPS.2.en.

[21] (SBSTTA) CBD Subsidiary Body on Scientific Technical and Technological Advice, Protected Areas and Other Effective Area-based Conservation Measures, 2018. ⟨https://www.cbd.int/doc/c/36f1/d6e8/90a68e516b0c5e8aa3f5a0eb/sbstta-22-06-en.pdf⟩.

[22] Environment and Climate Change Canada, 2020 Biodiversity Goals and Targets for Canada, Gatineau, 2016. ⟨http://publications.gc.ca/collections/collection_2016/eccc/CW66-524-2016-eng.pdf⟩.

[23] R. Hunka, J. McNeely, 2020 Biodiversity Goals & Targets for Canada are Deficient: Aboriginal Peoples Perspectives on Canada's National 2020 Biodiversity Goals & Targets Prepared for the 11th Meeting of the Conference of the Parties to the Convention on Biological Diversity Hyd, 2012. ⟨https://www.budget.gc.ca/2018/docs/plan/budget-2018-en.pdf⟩.

[24] Indigenous Circles of Experts, We Rise Together: Achieving Pathway to Canada Target 1 through the creation of Indigenous Protected and Conserved Areas in the Spirit of Practice of Reconciliation. The Indigenous Circle of Experts' Report and Recommendations., 2018. ⟨http://www.conservation2020canada.ca/⟩.

[25] National Advisory Panel, Canada's Conservation Vision: A Report of the National Advisory Panel, 2018. ⟨https://static1.squarespace.com/static/57e007452e69cf9a7af0a033/t/5b23dce1562fa7bac7ea095a/1529076973600/NAP_REPORT_EN_June+5_ACC.pdf⟩.

[26] Government of Canada, Equality + Growth = A Strong Middle Class. Budget 2018, Ottawa, 2018.

[27] Fisheries and Oceans Canada, Operational Guidance for Identifying 'Other Effective Area-Based Conservation Measures' in Canada's Marine Environment, Ottawa, 2017. ⟨http://www.dfo-mpo.gc.ca/oceans/documents/publications/oeabcm-amcepz/OEABCM_operational_guidance_EN.pdf⟩.

[28] Fisheries and Oceans Canada, Report on Canada's Network of Marine Protected Areas June 2017, Ottawa, 2017. ⟨http://publications.gc.ca/collections/collection_2018/mpo-dfo/Fs23-610-2017-eng.pdf⟩.

[29] Secretariat of the Convention on Biological Diversity, Global Biodiversity Outlook 4, 2014. doi:10.2143/KAR.25.0.504988.

[30] (CCEA) Canadian Council on Ecological Areas, Conservation Areas and Reporting Tracking System: Canada's Protected Areas Network, Canada's Prot. Areas Netw. (2018). ⟨http://www.ccea.org/download-carts-data/⟩.

[31] Government of Canada, Canada's Federal Marine Protected Areas Strategy, Ottawa, 2005. ⟨http://waves-vagues.dfo-mpo.gc.ca/Library/315822e.pdf⟩.

[32] Environment and Climate Change Canada, Canadian Protected Areas Status Report 2012–2015, Gatineau, 2016. ⟨https://www.ec.gc.ca/ap-pa/default.asp?Lang=En&n=C711CAB1-&printfullpage=true#TOClink⟩.

[33] Government of Canada, National Framework for Canada's Network of Marine Protected Areas, 2011.

[34] J. Jessen, S. Morgan, L. Bezaury-Creel, Dare to be Deep: sea States Report on North America's Marine Protected Areas (MPAs), Seattle, and México City, Ottawa, 2016〈http://cpaws.org/uploads/CPAWS-Oceans-Report-2016.pdf〉.

[35] Fisheries and Oceans Canada, Guidance on Identifying Other Effective Area- Base Conservation Measures in Canadian Coastal and Marine Waters, 2016.

[36] E. Kenchington, S. McLean, J.C. Rice, Considerations for Identification of Effective Area-based Conservation Measures, Ottawa, n.d. 〈http://publications.gc.ca/collections/collection_2016/mpo-dfo/Fs70-5-2016-020-eng.pdf〉.

[37] E. Matveev, "Perfectly reasonable" to drill for oil in area closed to fishery, Liberal MP says, CBC News. (2018). 〈http://www.cbc.ca/news/canada/newfoundland-labrador/nick-whalen-protected-areas-1.4641252〉.

[38] G.J. Edgar, Marine protected areas need accountability not wasted dollars, Aquat. Conserv. Mar. Freshw. Ecosyst. (2017), https://doi.org/10.1002/aqc.2745.

[39] M.D. Spalding, I. Meliane, N.J. Bennett, P. Dearden, P.G. Patil, R.D. Brumbaugh, Building towards the marine conservation end-game: consolidating the role of MPAs in a future ocean, Aquat. Conserv. Mar. Freshw. Ecosyst. (2016), https://doi.org/10.1002/aqc.2686.

[40] J.A. Hutchings, I.M. Côté, J.J. Dodson, I.A. Fleming, S. Jennings, N.J. Mantua, R.M. Peterman, B.E. Riddell, A.J. Weaver, D. VanderZwaag, Is Canada fulfilling its obligations to sustain marine biodiversity? A summary review, conclusions, and recommendations, Environ. Rev. (2012), https://doi.org/10.1139/a2012-011.

[41] J. Geldmann, M. Barnes, L. Coad, I.D. Craigie, M. Hockings, N.D. Burgess, Effectiveness of terrestrial protected areas in reducing habitat loss and population declines, Biol. Conserv. (2013), https://doi.org/10.1016/j.biocon.2013.02.018.

[42] G.J. Edgar, R.D. Stuart-Smith, T.J. Willis, S. Kininmonth, S.C. Baker, S. Banks, N.S. Barrett, M.A. Becerro, A.T.F. Bernard, J. Berkhout, C.D. Buxton, S.J. Campbell, A.T. Cooper, M. Davey, S.C. Edgar, G. Försterra, D.E. Galván, A.J. Irigoyen, D.J. Kushner, R. Moura, P.E. Parnell, N.T. Shears, G. Soler, E.M.A. Strain, R.J. Thomson, Global conservation outcomes depend on marine protected areas with five key features, Nature (2014), https://doi.org/10.1038/nature13022.

[43] B.S. Halpern, Conservation: making marine protected areas work, Nature (2014), https://doi.org/10.1038/nature13053.

[44] J.E.M. Watson, N. Dudley, D.B. Segan, M. Hockings, The performance and potential of protected areas, Nature (2014), https://doi.org/10.1038/nature13947.

[45] G.J. Edgar, T.J. Ward, R.D. Stuart-Smith, Rapid declines across Australian fishery stocks indicate global sustainability targets will not be achieved without an expanded network of "no-fishing" reserves, Aquat. Conserv. Mar. Freshw. Ecosyst. (2018), https://doi.org/10.1002/aqc.2934.

[46] J. Claudet, H. editor: L. Pendleton, Claudet's Final Word, ICES J. Mar. Sci. 75, 2018. 1177. http://dx.doi.org/10.1093/icesjms/fsx140.

[47] A. Shields, Québec ne tiendra pas compte des «refuges marins», Le Devoir, 2018. 〈https://media1.ledevoir.com/societe/environnement/517425/les-refuges-marins-crees-par-le-federal-sont-insuffisants-pour-les-criteres-du-quebec〉.

[48] R.L. Pressey, R. Weeks, G.G. Gurney, From displacement activities to evidence-informed decisions in conservation, Biol. Conserv. 212 (2017) 337–348, https://doi.org/10.1016/j.biocon.2017.06.009.

[49] Office of the Auditor General of Canada, 2018 Spring Reports of the Commissioner of the Environment and Sustainable Development: Report 3—Conserving Biodiversity, Ottawa, 2018. 〈http://www.oag-bvg.gc.ca/internet/English/att_e_43004.html〉.

[50] CDB, Strategic Plan for Biodiversity 2011–2020 and the Aichi Targets Living in Harmony with Nature, Strateg. Plan Biodivers. 2011–2020 – A Ten-Year Framew. Action by All Ctries. Stakeholders to Save Biodivers. Enhanc. Its Benefits People, 2010.

[51] D.P. Tittensor, M. Walpole, S.L.L. Hill, D.G. Boyce, G.L. Britten, N.D. Burgess, S.H.M. Butchart, P.W. Leadley, E.C. Regan, R. Alkemade, R. Baumung, C. Bellard, L. Bouwman, N.J. Bowles-Newark, A.M. Chenery, W.W.L. Cheung, V. Christensen, H.D. Cooper, A.R. Crowther, M.J.R. Dixon, A. Galli, V. Gaveau, R.D. Gregory, N.L. Gutierrez, T.L. Hirsch, R. Höft, S.R. Januchowski-Hartley, M. Karmann, C.B. Krug, F.J. Leverington, J. Loh, R.K. Lojenga, K. Malsch, A. Marques, D.H.W. Morgan, P.J. Mumby, T. Newbold, K. Noonan-Mooney, S.N. Pagad, B.C. Parks, H.M. Pereira, T. Robertson, C. Rondinini, L. Santini, J.P.W. Scharlemann, S. Schindler, U.R. Sumaila, L.S.L. Teh, J. Van Kolck, P. Visconti, Y. Ye, A mid-term analysis of progress toward international biodiversity targets, Sci. (80-.) (2014), https://doi.org/10.1126/science.1257484.

[52] (IUCN) International Union for the Conservation of Nature, A Global Standard for the Identification of Key Biodiversity Areas, Version 1.0., Gland, 2016. 〈https://portals.iucn.org/library/sites/library/files/documents/2016-048.pdf〉.

[53] C.R. Margules, R.L. Pressy, Systematic conservation planning, Nature (2000).

[54] R.L. Pressey, M.C. Bottrill, Approaches to landscape- and seascape-scale conservation planning: convergence, contrasts and challenges, Oryx 43 (2009) 464–475, https://doi.org/10.1017/S0030605309990500.

[55] N.C. Ban, N.J. Bax, K.M. Gjerde, R. Devillers, D.C. Dunn, P.K. Dunstan, A.J. Hobday, S.M. Maxwell, D.M. Kaplan, R.L. Pressey, J.A. Ardron, E.T. Game, P.N. Halpin, Systematic Conservation Planning: a Better Recipe for Managing the High Seas for Biodiversity Conservation and Sustainable Use, Conserv. Lett. 7 (2013) 41–54, https://doi.org/10.1111/conl.12010.

[56] Government of Canada, Canada National Marine Conservation Areas Act, 2002, c. 18, 2002.

[57] J. Rice, K. Houston, Representativity and networks of marine protected areas, Aquat. Conserv. Mar. Freshw. Ecosyst. (2011), https://doi.org/10.1002/aqc.1232.

[58] Fisheries and Oceans Canada, Science Guidance on How to Achieve Representativity in the Design of Marine Protected Area Networks, Ottawa, 2013. 〈http://waves-vagues.dfo-mpo.gc.ca/Library/348478.pdf〉.

[59] E.B. Peterson, N.M. Peterson, D.F.W. Pollard, Some principles and criteria to make Canada's protected area systems representative of the nation's forest diversity, For. Chron. (1995), https://doi.org/10.5558/tfc71497-4.

[60] S.R. Parker, N.E. Mandrak, J.D. Truscott, P.L. Lawrence, D. Kraus, G. Bryan, M. Molnar, Status and extent of aquatic protected areas in the Great lakes, Georg. Wright Forum 34 (2016) 381–393.

[61] R. Devillers, R.L. Pressey, A. Grech, J.N. Kittinger, G.J. Edgar, T. Ward, R. Watson, Reinventing residual reserves in the sea: are we favouring ease of establishment over need for protection? Aquat. Conserv. Mar. Freshw. Ecosyst. (2015), https://doi.org/10.1002/aqc.2445.

[62] P.T. Harris, M. Macmillan-Lawler, L. Kullerud, J.C. Rice, Arctic marine conservation is not prepared for the coming melt, ICES J. Mar. Sci. (2018), https://doi.org/10.1093/icesjms/fsx153.

[63] C.J. Lemieux, T.J. Beechey, P.A. Gray, Prospects for Canada's protected areas in an era of rapid climate change, Land Use Policy (2011), https://doi.org/10.1016/j.landusepol.2011.03.008.

[64] Office of the Auditor General of Canada, 2013 Fall Report of the Commissioner of the Environment and Sustainable Development, 2013. 〈http://www.oag-bvg.gc.ca/internet/English/parl_cesd_201311_e_38658.html〉.

[65] Auditor General of British Columbia, Conservation of Ecological Integrity in B.C. Parks and Protected Areas, Victoria, 2010. http://www.bcauditor.com/sites/default/files/publications/2010/report_3/report/OAGBC_Parks Report_OUT2.pdf.

[66] C.J. Lemieux, M.W. Groulx, S. Bocking, T.J. Beechey, Evidence-based decision-making in Canada's protected areas organizations: implications for management effectiveness, FACETS 3 (2018) 392–414, https://doi.org/10.1139/facets-2017-0107.

[67] A.M. Ulloa, K. Jax, S.I. Karlsson-Vinkhuyzen, Enhancing implementation of the Convention on Biological Diversity: a novel peer-review mechanism aims to promote accountability and mutual learning, Biol. Conserv. (2018), https://doi.org/10.1016/j.biocon.2017.11.006.

[68] E. Morgera, E. Tsioumani, Yesterday, Today, and Tomorrow: looking Afresh at the Convention on Biological Diversity, Conv. Biol. Divers. R. E. C. I. E. L (1994), https://doi.org/10.1093/yiel/yvr003.

[69] S.R. Harrop, D.J. Pritchard, A hard instrument goes soft: the implications of the Convention on Biological Diversity's current trajectory, Glob. Environ. Chang (2011), https://doi.org/10.1016/j.gloenvcha.2011.01.014.

[70] S.E. Rees, N.L. Foster, O. Langmead, S. Pittman, D.E. Johnson, Defining the qualitative elements of Aichi Biodiversity Target 11 with regard to the marine and coastal environment in order to strengthen global efforts for marine biodiversity conservation outlined in the United Nations Sustainable Development Goal 14, Mar. Policy (2016), https://doi.org/10.1016/j.marpol.2017.05.016.

[71] R.B. Mitchell, Problem structure, institutional design, and the relative effectiveness of international environmental agreements, Glob. Environ. Polit. (2006), https://doi.org/10.1162/glep.2006.6.3.72.

[72] N. Lopoukhine, B.F. de S. Dias, What does Target 11 really mean?, Park. Int. J. Prot. Areas Conserv., 2012.

[73] P. Canessa, R. Dearden, Marine protected areas, in: M. Dearden, P. Rollins, R. Needham (Eds.), Park. Prot. Areas Canada Plan. Manag, Fourth ed., Oxford University Press, Toronto, 2016, pp. 321–354.

[74] R.L. Pressey, P. Visconti, P.J. Ferraro, Making parks make a difference: poor alignment of policy, planning and management with protected-area impact, and ways forward, Philos. Trans. R. Soc. B. 370 (2015) 20140280.

[75] Earnscliffe Study Group, National Conservation Survey: Research Report, 2017. 〈https://earnscliffe.ca/wp-content/uploads/2017/11/National-Conservation-Survey.pdf〉.

[76] P. Canada, Fathom Five National Marine Park Management Plan, Gatineau, 1998. 〈https://www.pc.gc.ca/en/amnc-nmca/on/fathomfive/info/plan〉.

[77] Parks Canada Agency, Lake Superior National Marine Conservation Area Interim Management Plan, Gatineau, 2016. 〈https://www.pc.gc.ca/en/amnc-nmca/on/super/info/index/plan〉.

[78] Parks Canada, Gwaii Haanas National Marine Conservation Area Reserve and Haida Heritage Site Interim Management Plan and Zoning Plan, Gatineau, 2010. 〈https://www.pc.gc.ca/en/pn-np/bc/gwaiihaanas/info/coop/plans〉.

[79] Parks Canada and Government of Quebec, Saguenay–St. Lawrence Marine Park Management Plan, Gatineau, 2010. 〈http://parcmarin.qc.ca/wp-content/uploads/2016/04/Saguenay-St_Lawrence_Marine_Park_Management_Plan_2010-1.pdf〉.

[80] C. Wolf, W.J. Ripple, Rewilding the world's large carnivores, Royal Society open science 5 (3) (2018) 172235.

[81] http://dfo-mpo.gc.ca/oceans/documents/publications/advisorypanel-comiteconseil/2018/finalreport-rapportfinal/Final-Report-of-the-National-Advisory-Panel-on-Marine-Protected-Area-Standards-Eng.