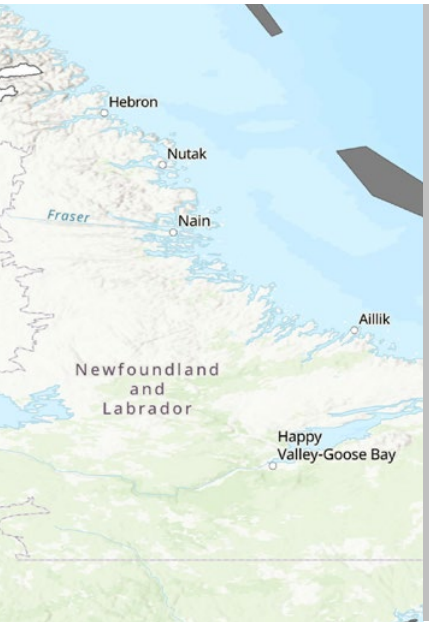


FRAGMENTED DATA, FRAGMENTED OCEANS: HOW REPORTING DISCREPANCIES UNDERMINE CANADA'S MARINE CONSERVATION COMMITMENTS

Leila Vaziri Zanjani, Christine Grossutti and Monica Mulrennan

* Corresponding author: lil.vaziri@gmail.com

ABSTRACT

Canada's ability to fulfil international marine conservation commitments, notably Aichi Target 11, depends on transparent, consistent and inclusive monitoring of marine protected areas (MPAs). This study identifies persistent discrepancies between the Canadian Protected and Conserved Areas Database (CPCAD), World Database on Protected Areas (WDPA) and Oceans Act MPAs despite recent efforts to establish a national baseline for coastal protected and conserved areas. Using spatial overlay analysis and a Decision Support Tool (DST) framework, we show how fragmented governance and inconsistent reporting hinder assessment of coverage targets, particularly at the land–sea interface. Findings highlight underrepresentation of Indigenous-led protected and conserved areas and the need for harmonised terrestrial-marine reporting, clearer procedures for overlapping designations, and Indigenous-led pathways to recognise Indigenous Protected and Conserved Areas (IPCAs) in national and international databases.

Key words: marine protected areas, conserved areas, land-sea interface, fragmentation, reporting

INTRODUCTION

Jurisdictional fragmentation at the land–sea interface remains a critical but often overlooked barrier to effective conservation governance (Pittman & Armitage, 2016). Terrestrial and marine environments are typically governed by separate authorities, a division reinforced by global frameworks. Instruments such as the United Nations Convention on the Law of the Sea (UNCLOS) and the World Database on Protected Areas (WDPA) institutionalise boundaries that treat land and ocean as distinct, perpetuating colonial cartographic traditions rather than recognising ecologically interconnected and culturally continuous coastal spaces (Jay et al., 2016; Todd, 2016). Governance arrangements, often developed without the meaningful participation of Indigenous Peoples, tend to reflect worldviews that fragment land-seascapes and overlook customary systems of stewardship (Ban et al., 2018; Mulrennan & Scott, 2000; Smith, 2021). This exclusion has contributed to inconsistencies in how marine and terrestrial protected areas are designated, reported and governed. These mismatches undermine biodiversity representation, Indigenous rights recognition, and coherent national conservation efforts (Artelle et al., 2019).

The designation and recognition of Marine Protected Areas (MPAs) are central to Canada's efforts to meet national and international biodiversity targets. However, effective governance is often undermined by jurisdictional fragmentation and inconsistent data reporting across agencies and databases. A significant milestone in global conservation policy was marked by the adoption of the Aichi Targets, during the 10th Conference of the Parties (COP10) to the Convention on Biological Diversity (CBD). These targets introduced the first comprehensive global framework for biodiversity conservation, with reporting mechanisms and indicators. Aichi Target 11 committed signatory countries, including Canada, to conserving at least 10 per cent of its coastal and marine areas through effective, equitable and representative management by 2020. The Aichi framework marked a global conservation milestone by explicitly acknowledging Indigenous Peoples' rights to their lands, territories and traditional knowledge within the CBD. The Aichi Targets have since been succeeded by

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the Kunming-Montreal Global Biodiversity Framework (GBF), adopted at COP15 in 2022.

To advance Aichi Target 11, Canada launched the Pathway to Canada Target 1 initiative in 2015 and established the Indigenous Circle of Experts in 2016. Its 2018 *We Rise Together* report introduced Indigenous Protected and Conserved Areas (IPCAs) and called for shared governance of protected and conserved areas and formal recognition of Indigenous rights and responsibilities in their territories (Indigenous Circle of Experts, 2018).

Co-led by Environment and Climate Change Canada (ECCC) and the Assembly of First Nations (AFN), the Pathway to Canada Target 1 initiative focused on terrestrial and inland waters. In 2021, it released Pan-Canadian Standards for Protected Areas (PAs) and Other Effective Area-based Conservation Measures (OECMS), with a Decision Support Tool (DST) for Indigenous Nations, governments, NGOs and other decision-makers to evaluate areas against the criteria.

Because Fisheries and Oceans Canada leads the coastal and marine dimensions of Canada Target 1, MPAs are qualified and reported through separate processes. As of 2024, 12 MPAs were formally included in the Canadian Protected and Conserved Areas Database (CPCAD) (ECCC, 2024), compared with more than 9,000 terrestrial Protected Areas since the Pan-Canadian Standards were operationalised. This disparity reflects challenges in how governing authority is identified and operationalised across the Pan-Canadian Standards, the Oceans Act and CPCAD.

The Pan-Canadian Standards require proposed areas to have clearly defined, mutually agreed boundaries and tenure supporting long-term, legally secure protection. Marine legal authority generally rests with federal and provincial governments through frameworks including the Oceans Act, UNCLOS, and Canada Shipping Act (Table 1). Canada and Quebec also use instruments such as the Fisheries Act (1985, c. F-14), Natural Heritage Conservation Act, and intergovernmental administrative agreements to designate and manage MPAs. These constraints complicate CPCAD recognition of marine spaces, particularly those governed or co-governed by Indigenous Nations.

Indigenous rights and title to marine and freshwater areas are constitutionally protected under Section 35 of the Constitution Act, 1982, affirming Indigenous Peoples' rights to govern, access and steward traditional territories, including aquatic environments. Yet Indigenous-led marine conservation remains largely invisible in official reporting. As of 2024, the only marine IPCA listed in CPCAD is the Gwaxdlala/Nalaxdlala (Lull/Hoeya) Marine Refuge, classified as an OECM and formally designated under federal ownership. This reflects recognition frameworks that prioritise state-defined legal mechanisms over Indigenous governance, limiting the visibility and legitimacy of Indigenous-led marine protection in national and international reporting. MPAs are central to Canada's Target 3 commitments under the Kunming-Montreal GBF (Fu et al., 2024; Lemieux et al., 2023; Wilson et al., 2024), but Target 3 requires effective conservation and management, making governance quality, management responsibilities, ecological connectivity, and Indigenous authority essential to credible assessments. Despite increased MPA coverage, challenges in data integration, jurisdictional overlap and fragmentation, and recognition of Indigenous governance persist (Fu et al., 2024; Lemieux et al., 2023; Wilson et al., 2024).

Lemieux et al. (2023) established the first national CPCAD baseline of protected and conserved coastal areas, identifying gaps in representation, data transparency, and spatial coherence. Building on this work, we compare CPCAD, WDPA, and federally designated Oceans Act MPAs to assess convergence

Table 1. Governing authority and legal instruments of Canada's marine territories

Zone	Governing authority	Key instruments
Offshore (12–200 nm)	Federal (Crown)	Oceans Act, UNCLOS
Territorial Sea (0–12 nm)	Federal (Crown)	Oceans Act, Canada Shipping Act
Tidal Waters (e.g. bays, estuaries)	Federal (surface), Provinces (shoreline)	Fisheries Act, Land Acts (legislative frameworks at the federal or provincial level that govern the administration, allocation, tenure, and use of land, often including Crown land, Indigenous lands, and private property such as Federal Real Property and Federal Immovables Act (FRPFIA), Canada National Parks Act and Canada National Marine Conservation Areas Act)
Indigenous Territories	Indigenous + negotiated Crown roles	Treaties and Comprehensive Land Claims, IPCAs, Canadian Constitution (Section 35), United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP)

and divergence across datasets. Using multi-source spatial overlay and governance gap analysis, we evaluate MPA reporting consistency and the implications of overlapping designations and jurisdictional boundaries. We focus on IPCA representation or omission, especially at the land–sea interface where legal, ecological and cultural boundaries intersect.

Our objectives are to: quantify and map governance overlaps and omissions; assess jurisdictional fragmentation and recognition gaps; and advance a framework for harmonised, inclusive marine accounting, with recommendations to improve data integration and recognition of marine and coastal conservation areas in Canada.

METHODS

We used ArcGIS Pro to analyse three national-level MPA datasets: CPCAD (2024 edition), WDPA (UNEP, 2025), and Oceans Act MPAs from Fisheries and Oceans Canada (DFO, 2024; Government of Canada 2025) open data services. After filtering CPCAD and WDPA for marine areas, we used the Union tool to preserve overlapping and non-overlapping input features and associated attributes (ESRI, 2024), then classified polygons by source combination (e.g. CPCAD only, CPCAD + WDPA, All Three). We calculated area in square kilometres and created an 'Overlap Type' attribute for each polygon. Symbolic heat maps and fragmentation scores visualised governance complexity. IPCA data and information were acquired from the IPCA Knowledge Basket and Indigenous data portals, where permitted.

The lead and second authors are directly engaged in supporting the inclusion of protected and conserved areas into the CPCAD by applying the Pan-Canadian criteria for terrestrial and inland waters. The third author has been directly involved in supporting the establishment of IPCAs in Canada, contributing to the foundational proposal for the Wiinipaakw (James Bay) IPCA as a National Marine Conservation Area in the offshore waters of the Eeyou Marine Region (Mulrennan et al., 2019). The first and third authors are members of the Conservation through Reconciliation Partnership and honorary members of the ICCA Consortium. This positionality provides insight into the institutional mechanisms, spatial standards, and procedural constraints shaping recognition and reporting, while grounding our critical examination of DST limitations in engaging Indigenous governance and biocultural conservation approaches.

DATA PROCESSING

All spatial datasets were reprojected to EPSG:3979 for consistent spatial resolution. We used ArcGIS Pro Union and Intersect tools to compare overlapping features across CPCAD, WDPA, and Oceans Act MPA layers. Each resulting polygon was examined to identify whether it was recognised by one, two or all three databases.

We measured fragmentation with a three-point scoring scheme: polygons recognised in one database received a Fragmentation Score of 1 (low integration), those in two databases scored 2, and those in all three scored 3 (high integration), reflecting multi-source agreement and integration.

This approach has several limitations. First, overlapping geometries required manual inspection to retain attributes accurately across differing dataset schemas. Second, near-identical extents with inconsistent attributes (e.g. name or designation type) created ambiguity in overlap categories. Third, mutually exclusive CPCAD and WDPA biome tags (terrestrial vs. marine) sometimes disrupted land–sea spatial continuity, complicating classification of estuarine and coastal protected and conserved areas. We summarised area (km²) by overlap type, visualised governance complexity with a fragmentation heat map, mapped unique or omitted MPAs separately, and analysed CPCAD recognition gaps for IPCAs using overlay and attribute comparisons.

RESULTS

We found 78.7 per cent of MPAs in all three databases (Figure 1). The WDPA includes several sites missing from the CPCAD and Oceans Act datasets, while the CPCAD includes areas with no representation in the WDPA. Oceans Act MPAs are legally established and are consistently reflected in the CPCAD. Several IPCAs are absent from all three federal datasets. As of December 2024, CPCAD reports that 15.5 per cent of national marine environments are under some form of official recognition. We found that information is not clearly communicated between national agencies and international organisations as the total area under conservation is reported by the WDPA as 9.18 per cent (Table 2).

Spatial overlap analysis indicates that jurisdictional fragmentation is pronounced in coastal regions of British Columbia (BC) and Atlantic Canada. The union of CPCAD, WDPA and Oceans Act MPA layers reveals complex overlaps in these regions. Areas with high *Fragmentation Score* values (2 or 3) are concentrated in BC's fjords and the bays of Nova Scotia. These zones

Table 2. Comparison between CPCAD and WDPA conservation coverage data as of August 2025

	Total area of MPAS and OECMS (km²)	Total percentage of baseline area
CPCAD	893,437	15.5
WDPA	526,161	9.18

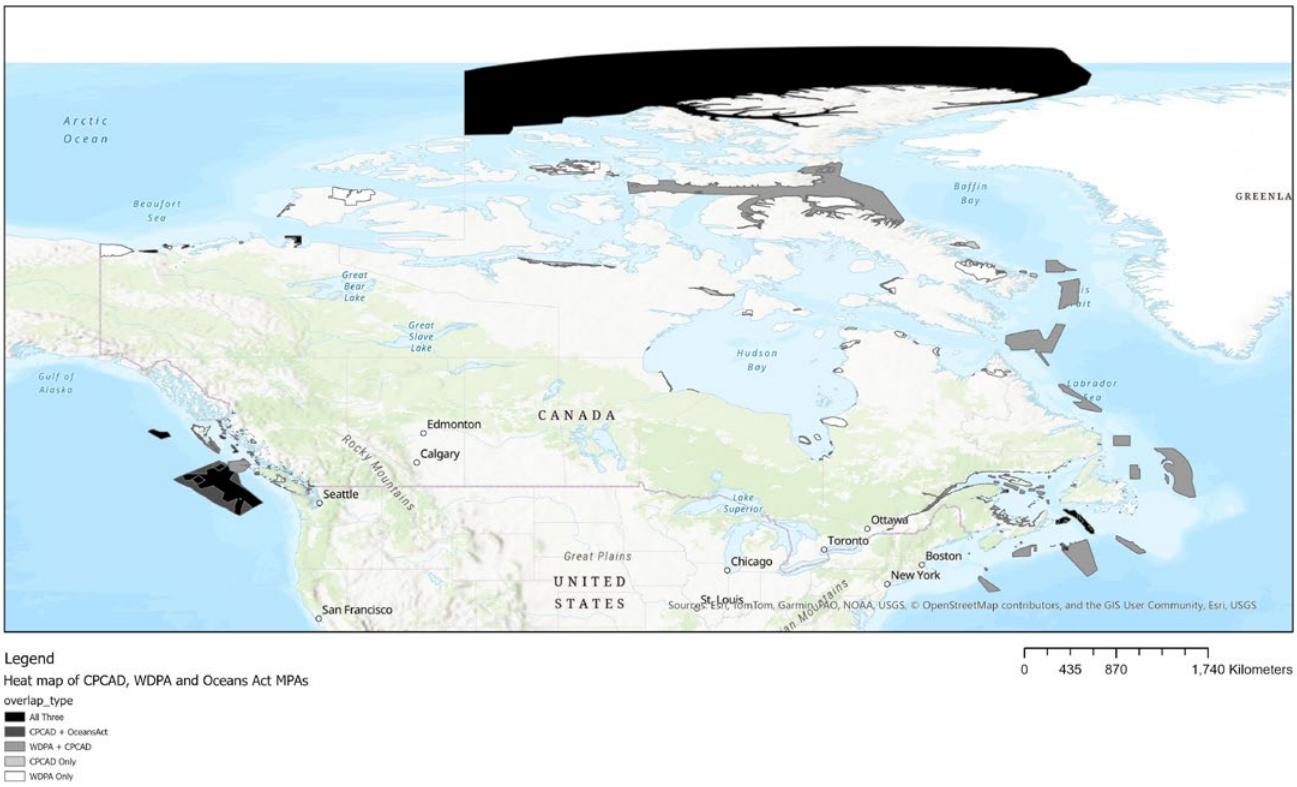


Figure 1. Overlap type map of MPAs recorded in CPCAD, WDPA and Oceans Act

illustrate complex governance landscapes, where multiple layers of protection and management intersect. Overlaps include federal fisheries closures, provincial or territorial parks, IPCAs and MPAs reported under international frameworks. Each of these designations may be governed by distinct authorities, reported through different frameworks, and guided by varying objectives and criteria for protection. The result is a mosaic of jurisdictions that can lead to opportunities for collaborative management and challenges related to coordination, accountability, and clarity of purpose. Inconsistencies in reporting can compound these challenges. For example, some MPA polygons reported to the WDPA for BC's coast are absent from the CPCAD, while certain Oceans Act MPAs in Atlantic Canada appear in the CPCAD but have no corresponding entries in the WDPA.

The spatial distribution of the *Fragmentation Score* values vary across Canada's marine and coastal zones (Figure 2). Darker colours indicate higher scores (greater integration across CPCAD, WDPA and Oceans Act datasets). Three-way overlap (score = 3) is concentrated in parts of the high Arctic – particularly around Lancaster Sound – and in sections of coastal BC and the Cabot Strait where federal and provincial jurisdictions have historically coordinated protection. Large stretches of Atlantic Canada, particularly the Gulf of St. Lawrence and parts of Nova Scotia, display lower scores (1–2), reflecting gaps in WDPA or CPCAD reporting. Several coastal and estuarine areas that are known to have local or Indigenous protections are absent from the composite layer, indicating that these sites are missing from one or more datasets.

Nearly 27 per cent of MPAs appear solely in the WDPA. This discrepancy reflects technical classification issues and institutional fragmentation across federal conservation mandates. In Canada, responsibility for marine and coastal environments lies with the DFO, while terrestrial and inland water areas are tracked through a process managed by ECCC. CPCAD's reporting structure categorises sites by a single biome – either *terrestrial* or *marine* – resulting in many coastal or interface-spanning protected areas appearing as discontinuous. The WDPA reporting structure allows

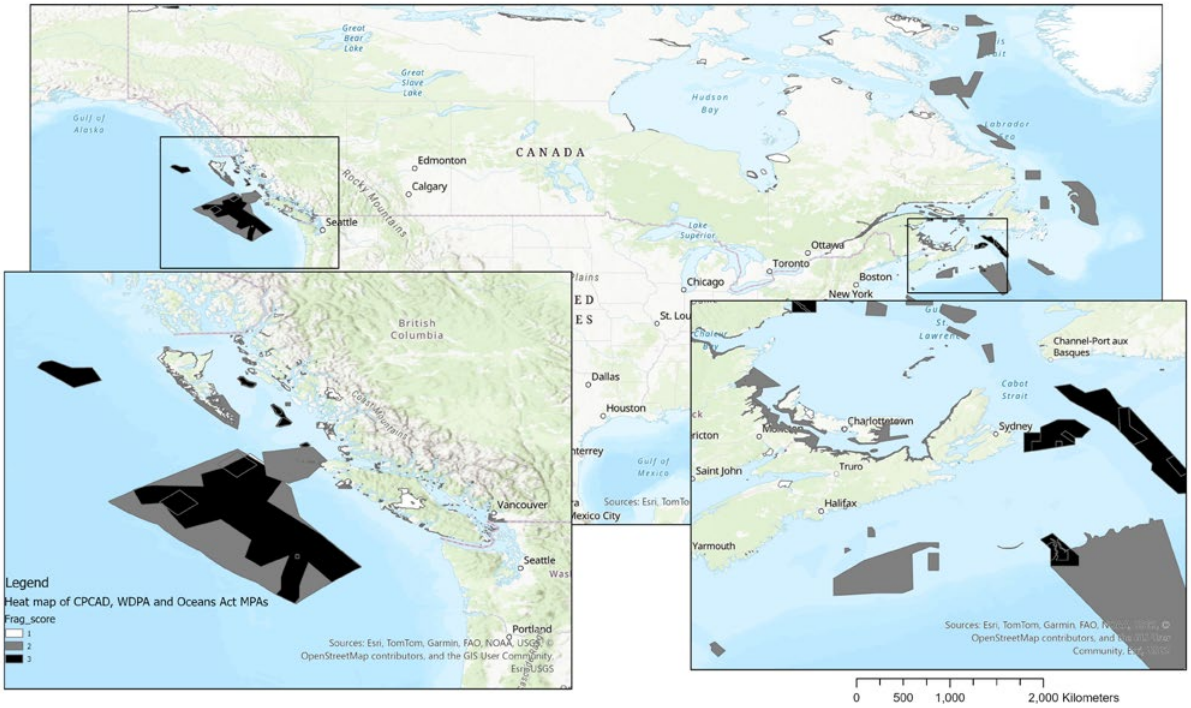


Figure 2. Fragmentation scoring between the WDPA, CPCAD and Ocean Act layers

for one contiguous area to be reported with both terrestrial and marine components. The 17per cent share of WDPA-only marine designations illustrates this misalignment and highlights how institutional silos and biome-based classification reinforce spatial and jurisdictional fragmentation at the land–sea interface. 3.9 per cent of MPAs appear only in the CPCAD database and all fall under national (ECCC and Parks Canada) or provincial governance.

Marine representation along the land–sea interface is patchy, with some estuaries and fjords fragmented into terrestrial and marine components due to classification rules such as biome type, which limits visibility of truly integrated coastal conservation (Figure 2). Jurisdictional fragmentation is highest at ecotones, including estuaries, inlets and fjords where federal, provincial and Indigenous jurisdictions converge.

To further investigate discrepancies between the designation of protected areas, we compared the Decision Support Tool (DST) of the terrestrial-oriented Pan-Canadian Standards for Protected and Conserved Areas with the DFO Oceans Act MPA designation process (Table 3). The CPCAD's rigid requirement to classify protected areas as either 'terrestrial' or 'marine' – and to submit appropriately categorised shapefiles – is ill-suited to conservation initiatives that span the land–sea interface, leading to systematic underrepresentation of coastal and transitional ecosystems. The DFO process (pre-planning → feasibility and policy → regulatory development → management) is structured to include ecological, socio-cultural, and traditional knowledge inputs during coastal and marine planning. However, in practice, the "lack of policy direction around IPCAs and DFO's role in supporting their establishment" constrains the operational capacity for new area designations (Heidt & Jones, 2023; Hubert & Gray, 2020; Warrior et al., 2022). For example, in Atlantic Canada, Mi'kmaq perspectives were consulted during the DFO Oceans Act MPA process, yet Warrior et al. (2022) found that these perspectives were not systematically incorporated into governance structures.

DISCUSSION

The Assembly of First Nations (AFN) report on marine conservation in Canada (Heidt & Jones, 2023) sets out 21 short- and long-term policy recommendations to strengthen the operationalisation of IPCAs by DFO. The report calls for enhanced data coordination and transparency across jurisdictions and between Indigenous and Crown governments, and closer collaboration with ECCC and Parks Canada to facilitate the formal inclusion of IPCAs in national reporting frameworks. Our analysis supports these recommendations by showing that technical and legal silos, including CPCAD's biome restrictions and the separation of terrestrial and marine reporting pathways, can exclude or obscure Indigenous-led marine conservation even where areas are ecologically and culturally significant. The resulting gaps are not just accounting problems; they can weaken coordination, accountability,

Table 3. Comparison of Oceans Act new MPA establishment with the ECCC's reporting process

Feature	Pan-Canadian Standards for PAs and OECMS for Terrestrial and Inland Waters	DFO Oceans Act MPA process
Scope / biome	Designed primarily for **terrestrial and inland-water protected areas**; requires specification of biome (marine vs. terrestrial) and GIS shapefile submission.	Focused exclusively on **marine environments**; includes coast, territorial sea, and EEZ.
Spatial data requirement	Requires **GIS boundaries** and **marine/terrestrial category**; cross-interface areas may be split or omitted if not properly defined.	Area of Interest (AOI) defined via scoping stage; boundaries refined in step-by-step process with consultation and science input.
Governance typology	Uses WDPA-based governance categories (e.g. national, sub-national, Indigenous, NGOs) standardised through 2022 Data Schema.	Advisory committees include interested parties, input phases, but governance types not codified as rigid categories.
Regulatory pathway	Uses administrative data submission; designation depends on concordance with Pan-Canadian criteria and data provider.	Formal regulatory pathway: pre-planning → feasibility/policy → regulation → management, published in *Canada Gazette*.
Engagement of Indigenous/traditional knowledge	Optional or dependent on submission; inclusion may require Indigenous bodies to adapt to tool's technical standards.	Indigenous/traditional knowledge is required in feasibility assessments and consultations (e.g. in AOI, advisory committees).
Integration across land–sea interface	Biome dichotomy may exclude cross-interface features unless specifically submitted; no coastal integrative logic.	Spatial process considers ecological, biophysical, social, cultural, risk data across coastal/marine zones in AOI phase.
Transparency and reporting	Data aggregated in CPCAD for national and international reporting; inclusion depends on data provider.	DFO follows a structured, phased process with public comment, gazettal notice, management planning; data is public via DFO portals.

and management clarity, affecting achievement of conservation objectives. The AFN's call for co-developed legal recognition pathways is central to improved reporting and effective, rights-based marine conservation.

Our analysis reveals systemic challenges in MPA recognition and data integration. The CPCAD prioritises legal designation and enforcement over Indigenous governance and biocultural values (Mansuy et al., 2023; Mullen, 2022). The current tracking framework does not account for place-based protection led by Indigenous nations. We propose that federal datasets include self-declared IPCAs, provincial marine areas, and harmonise reporting with WDPA standards. Further, the CPCAD's data schema should be restructured to include Indigenous indicators and flexible governance models.

The classification of the only marine IPCA as an OECM under federal governance reinforces a prevailing limitation in Canadian conservation accounting: Indigenous governance is frequently recorded through the lens of federal designation rather than an autonomous governance authority. The Kluskap IPCA, led by the Mi'kmaq Nation in Unama'ki (Cape Breton Island), is an example of an Indigenous-led conservation initiative that is currently unrecognised in Canada's official conservation datasets. Although formal negotiations began in early 2023 between the Province of Nova Scotia and Mi'kmaq representatives to co-govern the Kluskap Wilderness Area – the first agreement of its kind in the province's history – this IPCA has not yet been included in national or international spatial inventories (Government of Nova Scotia, 2023). Encompassing both terrestrial and marine ecosystems and rooted in Mi'kmaw cultural principles such as *Netukulimk* and *Etuaptmumk* (Two-Eyed Seeing), the site remains absent from CPCAD due to requirements for state-endorsed designation, GIS shapefile submission, and a governance typology that continues to privilege colonial categories (Nova Scotia Environmental Network, 2021; Gunasinghe, 2022). This omission is concerning given Nova Scotia's pledge to protect 20 per cent of its land and water by 2030, a target that will be difficult to meet without the formal recognition of Indigenous-led conservation efforts (Nova Scotia Environmental Network, 2023). Other IPCAs declared under Indigenous law and absent from all databases include the Hada (Bond Sound) & Kakweikan (Thompson Sound) by the K̲wik̲wa̲sut'inux̲w̲ Ha̲xwa'mis First Nation (KHFN), (K̲wik̲wa̲sut'inux̲w̲ Ha̲xwa'mis First Nation, 2021).

A similar dynamic is visible in the Nunatsiavut Government's Imappivut ('Our Oceans') initiative, which seeks to develop a marine management plan for the Labrador Inuit Settlement Area marine zone, including

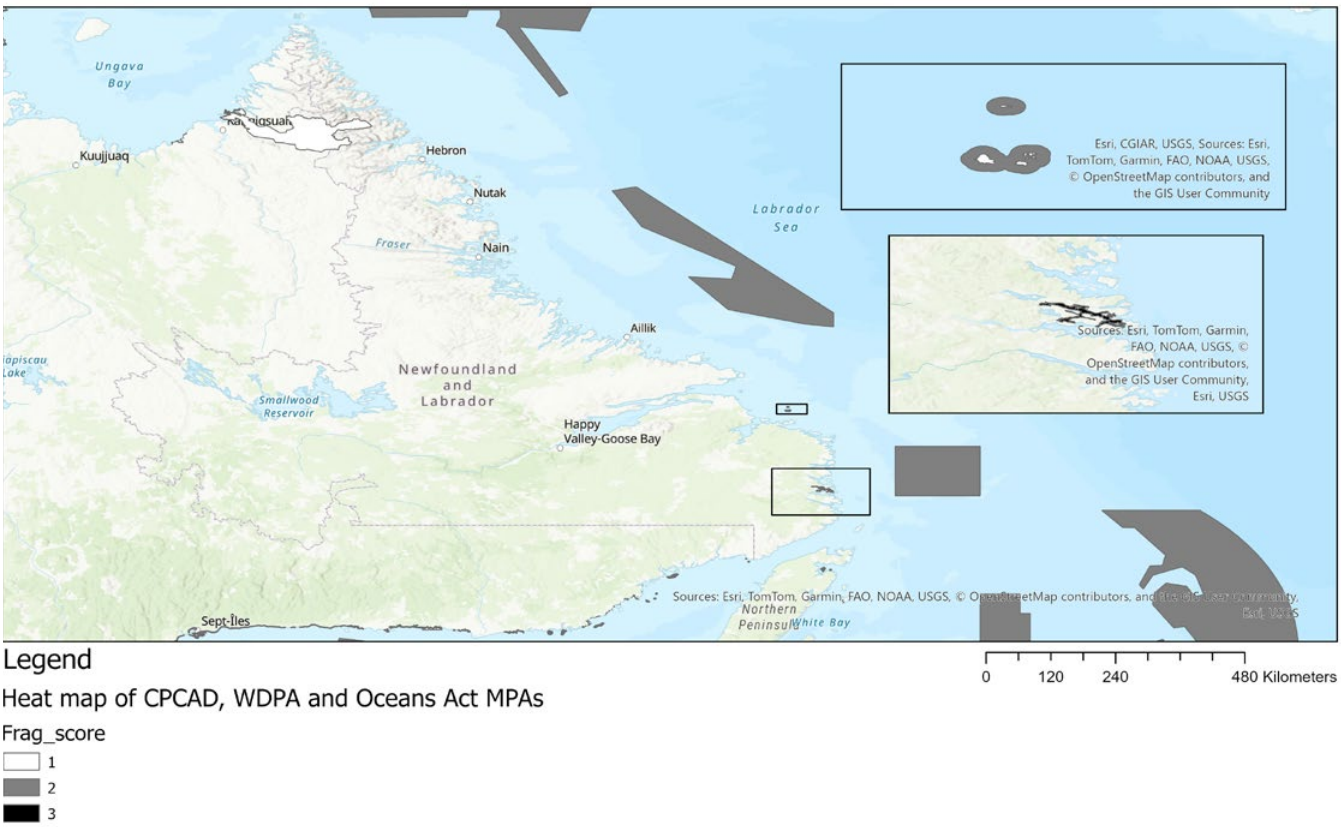


Figure 3. Gilbert Bay Marine Protected Area (rectangle A) and Gannet Islands Ecological Reserve (rectangle B) are the only two protected areas on the coastline of Newfoundland and Labrador. The former appears in all databases and the latter in CPCAD and WDPA respectively. The offshore areas are OECMs under DFO governance designated through the Fisheries Act

consideration of future Indigenous-led protected areas (Nunatsiavut Government, n.d.). Under the Labrador Inuit Land Claims Agreement (LILCA), however, clause 6.2.2 excludes National Parks and other federally designated protected areas from the Agreement's co-management provisions (Government of Canada, Crown-Indigenous Relations and Northern Affairs Canada, 2005). If an Imappivut-designated conservation zone were to be established through the Oceans Act MPA process, governance authority would rest primarily with the DFO, with Inuit participation limited to advisory or consultative roles as defined by federal policy. Any National Marine Conservation Area designation would be led by Parks Canada, again operating outside LILCA's co-management framework. Conversely, areas protected through Fisheries Act measures, such as Marine Refuges, or through provincial coastal mechanisms could fall more squarely within LILCA's governance scope, enabling greater Inuit authority in management decisions. Given that the coastline of Newfoundland and Labrador has only two protected areas (Figure 3), the Imappivut initiative offers a unique opportunity for advancing Inuit governance over their traditional marine territories.

The CPCAD has adopted the same governance types as the WDPA-defined categories, including 'National Government', 'Sub-national Government', 'Government-delegated Management' and 'Indigenous Peoples'. In practice, however, many Indigenous communities do not submit their IPCAs to the CPCAD. This may be due to the requirement to clearly define geographic boundaries using GIS shapefiles, limited resources to comply with CPCAD's technical protocols, lack of incentives or benefits to reporting, and reluctance to fit Indigenous conservation practices into a federal framework that can overlook relational land–sea continuities or customary stewardship systems. It is also shaped by historical distrust and disengagement from environmental decision-making processes (Boyd & Lorefice, 2018).

A deeper problem lies in how governance fragmentation is normalised within the CPCAD classification system. For example, CPCAD requires that each protected or conserved area (PCA) be designated as either a 'marine' or 'terrestrial' biome. This split fails to accommodate biocultural spaces spanning the land–sea interface. When a PCA spans both marine and terrestrial environments, it can be submitted to the CPCAD with only a single biome indicated in its GIS metadata. This

means the other component is either omitted from the federal dataset or classified solely as either marine or terrestrial, contributing to underreporting of spatial extent and complexity. By contrast, the WDPA metadata structure allows a protected area to include one or both biomes.

Pan-Canadian criteria as applied to the DST process often privilege legal mechanisms such as fee-simple ownership by land-trusts, not-for-profit organisations, and government delegated governance and state forms of tenure. While the DST nominally includes Indigenous Peoples among its governance types, the recognition of this category is contingent on alignment with government-defined standards. In effect, customary law and Indigenous stewardship regimes – particularly those outside modern land claims agreements – are subordinated to Crown or provincial governance systems. This reinforces spatial and jurisdictional fragmentation and inhibits progress towards inclusive, rights-based conservation reporting under Target 3 of the Kunming-Montreal GBF.

DFO protected area designation vs ECCC's pan-Canadian Standards decision support tool

The CPCAD enforces a standardised governance typology based on WDPA categories, which tends to reify colonial administrative models and places Indigenous governance on par only if communities submit to state-defined definitions. The DFO approach includes advisory committees and feasibility assessments where Indigenous and local knowledge can be incorporated, but this is not guaranteed nor uniformly applied, and outcomes depend on local political will, staff capacity, and pre-existing relationships (Durand, 2020; Hubert & Gray, 2020). Together, these differences perpetuate fragmentation: areas managed through marine-specific processes, such as those under the Fisheries Act or designated as Marine Refuges, are often excluded from terrestrial databases, and vice versa, reinforcing artificial divisions at the land–sea interface. This structural misalignment compromises holistic conservation accounting and undermines Canada's ability to meet Target 3 commitments, unless tools like the data requirements of the CPCAD are adapted to support cross-ecosystem inclusion and recognition of Indigenous governance systems (Boyd & Lorefice, 2018).

To clarify how these differing processes and governance pathways influence Canada's progress towards the GBF Target 3, Table 4 summarises the principal mechanisms available for the designation of MPAs in Canada. The table distinguishes between Oceans Act MPAs, Fisheries Act measures (including Marine Refuges), National Marine Conservation Areas (NMCAs), and other federal or provincial designations, indicating their legal basis, lead authority, and whether they are currently counted towards Target 3.

In addition to the Oceans Act, DFO employs other legal and policy tools such as the Fisheries Act and the designation of Marine Refuges (OECMs) to protect marine habitats. These mechanisms can be implemented more rapidly than Oceans Act MPAs and can address specific ecological features, but their establishment and reporting do not consistently centre Indigenous governance or knowledge systems (Hubert & Gray, 2020). For instance, while Central Coast First Nations in Pacific Canada developed marine use plans combining Indigenous and scientific knowledge, Reid et al. (2022) report that these plans were only partially reflected in formal federal protections. The absence of a national framework for bringing Indigenous and Western knowledge systems into equitable relation in MPA or OECM designation means that some areas under strong Indigenous stewardship remain invisible in the CPCAD and the WDPA, even when they are functionally protected (Jessen et al., 2011).

Table 4. Principal mechanisms available for the designation of MPAs in Canada

Mechanism	Legal status	Used by DFO?	Counts towards Target 3?
Oceans Act MPAs	Legally designated	Yes	Yes
Fisheries Act – Fishing Area Closures	Legally designated (regulatory)	Yes	Sometimes (if meets OECM criteria)
Marine Refuges (Other Effective Area-Based Conservation Measures – OECMs)	Policy-based; not legislated but recognised	Yes	Yes (if meets DFO's science criteria)
Canada National Marine Conservation Areas Act (NMCAs)	Legally designated	No (led by Parks Canada)	Yes

From fragmented accounting to effective and inclusive conservation outcomes

Although this paper focuses primarily on spatial accounting and reporting, the fragmentation, duplication and omissions identified have implications for conservation outcomes. Fragmented reporting systems can obscure gaps in ecological representation, mask inconsistencies in management authority, and create uncertainty about who is responsible for implementing, monitoring and enforcing conservation objectives (Dudley & Parish, 2006). Overlapping mandates may produce duplication on paper while leaving practical responsibilities unresolved on the ground or water (Ardito et al., 2023).

These challenges are especially important in relation to Target 3 of the Kunming-Montreal Global Biodiversity Framework, which calls for expanded spatial coverage and for areas to be effectively conserved and managed (Fu et al., 2024). A reporting system that prioritises designation and spatial extent without adequately capturing governance quality, management responsibilities, ecological connectivity, and Indigenous governance may overstate progress towards conservation targets (Borrini-Feyerabend et al., 2013). Conversely, the omission or under-recognition of IPCAs, Indigenous-led stewardship, and culturally significant land–sea relationships may understate existing conservation contributions while reinforcing colonial distinctions between state-designated protection and Indigenous systems of care, responsibility and authority (Heidt & Jones, 2023).

While this analysis is grounded in the Canadian context, the issues it identifies are not unique to Canada. Many countries face similar challenges where administrative divisions between land and sea, fragmented jurisdictional authority, and inadequate recognition of Indigenous and community-led conservation shape how progress towards global biodiversity targets is reported (Ban et al., 2018; Jonas et al., 2024; Pittman & Armitage, 2016; Singh et al., 2021). The Canadian case therefore offers a useful example of how spatial accounting can reveal deeper governance questions. Similar assessments in other national contexts could help determine whether reported progress towards area-based conservation targets reflects meaningful, effectively governed, and socially legitimate conservation outcomes.

CONCLUSION

Canada's current MPA accounting system is hampered by jurisdictional fragmentation, inconsistent data integration, and statutory exclusions that undermine comprehensive reporting and may weaken conservation effectiveness (Lemieux et al., 2023). CPCAD's strict biome classification can result in artificial division of coastal and estuarine conservation areas by separating terrestrial and marine components and excluding terrestrial portions of sites recorded as marine. These technical challenges intersect with broader institutional silos, as conservation measures established under the Oceans Act MPAs, Fisheries Act Marine Refuges, and NMCAs are administered by different agencies and reported through distinct pathways to the CPCAD and the WDPA (Hubert & Gray, 2020). Indigenous-led designations such as IPCAs remain largely excluded from national reporting frameworks because they are required to conform to WDPA governance typologies and CPCAD DST data requirements (Boyd & Lorefice, 2018; Durand, 2020). As a result, Canada's official MPA accounting may overstate the coherence of the conservation network while undercounting ecologically significant and culturally important areas, particularly those at the land–sea interface or under Indigenous governance.

Addressing these gaps requires a multi-faceted and actionable approach, including: harmonising terrestrial and marine reporting systems; creating cross-jurisdictional protocols for areas that span land, freshwater, coast and sea; incorporating governance and management-effectiveness attributes into spatial datasets; establishing transparent procedures for addressing duplicate and overlapping designations; and co-developing reporting pathways with Indigenous governments, Nations, and communities. These reforms would help ensure that Canada's contributions to Target 3 reflect not only the spatial extent of designated areas, but also their effectiveness, legitimacy and alignment with Indigenous rights and responsibilities.

While this paper focuses on Canada, the challenges extend well beyond Canada, and the framework developed here may inform comparable assessments in other jurisdictions and contribute to more accurate, inclusive and effective conservation reporting on a global scale.

ABOUT THE AUTHORS

Leila Vaziri Zanjani holds a PhD in Geography, Urban and Environmental Studies from Concordia University. She is the Research Lab Coordinator of the Technoscience Research Unit at the University of Toronto.

Monica Mulrennan is a Full Professor and Graduate Program Director of the Environmental Assessment Program (MEnv) in the Department of Geography, Planning & Environment at Concordia University. She holds a PhD in Geography from University College Dublin, Ireland.

Christine Grossutti is a staff member at the Frontenac Arch Biosphere Network in Lansdowne, Ontario and an adjunct assistant professor at Queen's University in Kingston, Ontario, Canada.

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RESUMEN

La capacidad de Canadá para cumplir sus compromisos internacionales en materia de conservación marina, en particular la Meta 11 de Aichi, depende de un seguimiento transparente, coherente e inclusivo de las áreas marinas protegidas (AMP). Este estudio identifica discrepancias persistentes entre la Base de Datos Canadiense de Áreas Protegidas y Conservadas (CPCAD), la Base de Datos Mundial sobre Áreas Protegidas (WDPA) y las AMP de la Ley de los Océanos, a pesar de los recientes esfuerzos por establecer una referencia nacional para las áreas protegidas y conservadas costeras. Mediante un análisis de superposición espacial y un marco de herramienta de apoyo a la toma de decisiones (DST), mostramos cómo la gobernanza fragmentada y la falta de coherencia en la presentación de informes dificultan la evaluación de los objetivos de cobertura, especialmente en la interfaz entre tierra y mar. Los resultados ponen de relieve la infrarrepresentación de las áreas protegidas y conservadas gestionadas por comunidades indígenas, así como la necesidad de armonizar la presentación de informes terrestres y marinos, establecer procedimientos más claros para las designaciones superpuestas y crear vías impulsadas por las comunidades indígenas para reconocer las Áreas Protegidas y Conservadas Indígenas (IPCA) en las bases de datos nacionales e internacionales.

RÉSUMÉ

La capacité du Canada à respecter ses engagements internationaux en matière de conservation marine, notamment l'objectif 11 d'Aichi, dépend d'un suivi transparent, cohérent et inclusif des aires marines protégées (AMP). Cette étude met en évidence des divergences persistantes entre la base de données canadienne sur les aires protégées et conservées (CPCAD), la base de données mondiale sur les aires protégées (WDPA) et les AMP relevant de la Loi sur les océans, malgré les efforts récents visant à établir une référence nationale pour les aires protégées et conservées côtières. À l'aide d'une analyse de superposition spatiale et d'un cadre d'outil d'aide à la décision (OAD), nous montrons comment une gouvernance fragmentée et des rapports incohérents entravent l'évaluation des objectifs de couverture, en particulier à l'interface terre-mer. Les résultats mettent en évidence la sous-représentation des aires protégées et conservées gérées par les peuples autochtones, ainsi que la nécessité d'harmoniser les rapports terrestres et marins, de clarifier les procédures relatives aux désignations qui se chevauchent et de mettre en place des processus menés par les peuples autochtones pour reconnaître les aires protégées et conservées autochtones (IPCA) dans les bases de données nationales et internationales.

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