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A Partnership Approach to the Study of Canada's Oceans and Coasts

U. Rashid Sumaila, Derek Armitage, Megan Bailey, and William W.L. Cheung

Canada is a maritime nation, bordered by the Arctic, Atlantic, and Pacific Oceans. With the world's longest coastline, the surface area of Canada's exclusive economic zones covers approximately 5.75 million km^2. Canada's oceans and the marine living resources within them are inextricably linked to the socio-cultural and economic well-being of Canadians across the country. Oceans help to regulate the climate, support diverse cultural practices and recreational activities, and are a source of food and nutritional security for tens of millions of people worldwide, including millions of Canadians (Srinivasan et al. 2010; Teh and Sumaila 2013; Hicks et al. 2019).

The Canadian economy remains closely tied to our oceans and coasts: industries working in, on, and around the oceans directly employ about 315,000 Canadians and contribute over $26 billion a year to the nation's wealth (DFO 2009). Specifically, gross revenues from Canadian ocean fisheries are estimated at about US$3.7 billion in 2018 (DFO 2018), generating economic and household income impacts throughout the Canadian economy of about US$9.1 billion and US$2.9 billion per year, respectively (Dyck and Sumaila 2010). Many coastal communities, and especially Indigenous communities, rely heavily on fish for food and employment as well as cultural and ceremonial uses (Berkes et al. 2005; Turner and Berkes 2006; Ommer 2007; Cisneros-Montemayor et al. 2016; Gibson and Sumaila 2017). Canada, therefore, has a huge responsibility to manage its oceans and coasts sustainably for the benefit of all generations of Canadians (DFO 2009; Sumaila 2021).

Despite the diverse and significant benefits that the ocean brings, humans continue subjecting the ocean and the life it holds to multiple threats, including from overfishing (Pauly et al. 2002), pollution such as greenhouse gas (GHG) emissions (Sumaila and Tai 2020), oil spills, ocean plastic), and coastal development (Tilman et al. 1994; AMAP 2002; Halpern et al. 2008; IPBES 2019; Bindoff et al. 2019; Sumaila et al. 2012; Lau et al. 2020). Specifically, climate-induced stressors, such as ocean warming, ocean acidification, hypoxia, and sea-level rise, are impacting Canada's marine life and its ocean-coastal social-ecological systems (SESs) (Parry et al. 2007; Cheung et al. 2010; Denman et al. 2011; Bryndum-Buchholz et al. 2020). For example, ocean temperatures have been increasing in the last four decades and are expected to continue rising in the coming decades. In the Arctic Ocean, summer sea ice has declined to the lowest level on record. Mean sea levels along Canadian coasts are projected to rise by as much as 0.59, 0.75, and 0.96 m relative to 2010 in some parts of Pacific, Arctic, and Atlantic Canada, respectively, by the end of the 21st century under the "no mitigation" scenario (Han, Ma, and Slangen 2020).

In addition, concerns about the ecological and socio-economic consequences of ocean acidification through fisheries are growing rapidly (Denman et al. 2011; Steiner et al. 2018). These changes will exacerbate many current