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Tending the meadows of the sea: A disturbance experiment based on traditional indigenous harvesting of *Zostera marina* L. (Zosteraceae) the southern region of Canada's west coast

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ABSTRACT

Indigenous Peoples of the Northwest Coast Cultural Area of North America managed plant populations of many of the 100–200 species used for food and other purposes, through cultivation and selective harvesting. Eelgrass (*Zostera marina*, L.; Zosteraceae) was one of these species. The Kwakwaka'wakw harvested its sweet rhizomes in the springtime. Directed by the traditional knowledge of Clan Chief Adam Dick, whose hereditary name is *K^{w}axsistalla*, of the Tsawataineuk First Nation of Kingcome Inlet (one of the many communities of Kwakwaka'wakw, or Kwak'wala speaking Indigenous peoples of the West Coast of British Columbia), we investigated the protocols of traditional harvesting and tending on typical *Z. marina* populations in the Discovery Islands area. We interviewed 18 Kwakwaka'wakw knowledge holders and conducted six harvesting demonstrations to determine traditional harvesting protocols. Based on traditional protocols and traditional *Z. marina* management inferences, we developed an *in situ*, subtidal, Complete Randomized Block Design removal experiment in an eelgrass meadow on Quadra Island, BC. In a first exploratory study, we removed *Z. marina* shoots at three different intensities using SCUBA in defined quadrats in the springtime. Shoots were counted at the end of summer to examine shoot recruitment post treatment over the growing season. Our preliminary results showed no significant difference between treatments. However, with more replicates, we might have strengthened the tendency of more shoots in the harvested quadrats. Here our main intention is to describe our unique study of a marine plant resource harvested in traditional times by Kwakwaka'wakw peoples and to outline a new experimental methodology to examine ecological rationale behind traditional knowledge. We hope to stimulate new and important avenues of research on this topic.

1. Introduction

1.1. Northwest coast first nations' plant cultivation

Indigenous Peoples in the Northwest Coast culture area — the islands and coastal lands west of the Coast mountains between the Copper River and the Southern Oregon Coast (Suttles and Sturtevant, 1990), managed and enhanced plant populations of many of the 100–200 species used for food and other purposes, through selective harvesting, burning, pruning, coppicing, thinning and weeding (Turner, 2005; Turner and Peacock, 2005; Deur and Turner, 2005; Turner and Lepofsky, 2013). This practice can be referred to as "tending" — making various modifications to the environment and/or to particular species, to encourage optimal growth and productivity of plants used as food, medicine and in technology (Deur and Turner, 2005; Deur 2002).

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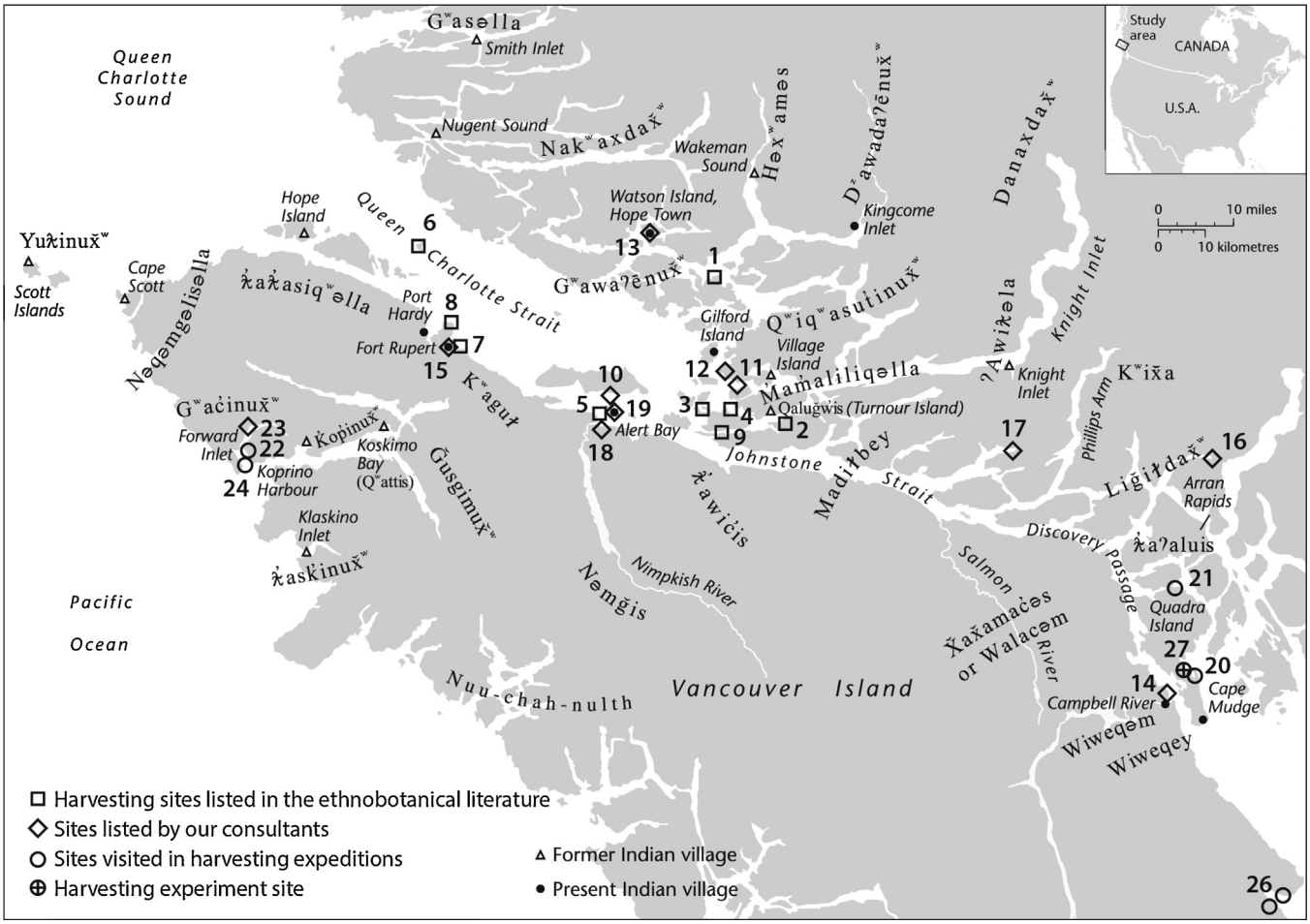

Fig. 1. Traditional territories of Kwakwaka'wakw sub-groups. The southern edge of the territory is from Klaskino Inlet on the westcoast of Vancouver Island across to Cape Mudge on Quadra Island and then upwards on the mainland until Smith Inlet. Adapted with permission from Paddling to Where I Stand (Reid and Sewid-Smith 2004, xviii). Cartography by Eric Leinberger.

1.2. The Kwakwaka'wakw and ts'áts'ayem

Kwakwaka'wakw territory on the Southwest coast of Canada, is in British Columbia on the northern part of Vancouver Island and across to the inlets of the opposite mainland (Fig. 1). Kwakwaka'wakwmeans 'Kwak'wala speaking peoples' (Powell, 1994), including speakers of nine different dialects within the Kwak'wala language (Sewid-Smith, 1992). These peoples shared resources and cultural traditions over a diverse territory, yet have different origin histories, and were and are separate, politically autonomous groups (Reid and Sewid-Smith, 2004). Living in well populated communities, they have developed prudent resource management practices to sustain and enhance food from the ecosystems of their territories (Turner and Lepofsky, 2013).

Ts'áts'ayem (pronounced ts'AH-ts'AH-yem), is the Kwak'wala word for *Zostera marina* (eelgrass). Its rhizomes were an important springtime food enjoyed by Kwakwaka'wakw peoples in traditional times (Boas and Hunt, 1921; Turner 1995; Kuhnlein Harriet and Turner, 1991). Sucrose was very rare in the Kwakwaka'wakw traditional diet, only found in small amounts in the bulbs of yellow Avalanche Lily and Camas, in root vegetables of the tidal marsh gardens, in the inner bark of trees, and in berries and fruits (Lieberman, 2003). While the eelgrass harvesting season was brief, generally confined to the month of May, eating eelgrass rhizomes gave an important sugar boost at this time of the year:rhizome Non structural Carbohydrate reserves have been found to be 82–97% sucrose (Vichkovitten et al., 2007), and 50% dry weight as sucrose (Kikuchi et al., 2001). These plants also provided fresh nutrients and vitamins to the Kwakwaka'wakw, and was a coveted, sweet and fresh treat after the winter season diet of dried foods (Fig. 2, Cullis-Suzuki, 2007).

Fig. 2. A plate of peeled *ts'*áts'ayem ready to eat. Port MacNeil, May 29, 2006. (Cullis-Suzuki, 2006). In traditional times only the four youngest internodes were eaten.

An important record of the harvesting protocols and importance of eelgrass to the Kwakwaka'wakw is in the Boas and Hunt *Ethnology of the Kwakiutl*, 1921 (see Appendix A for a summary). This description was an important text for building interview ques-