

A Nearshore Marine Habitat Assessment Report of Boat Anchoring Sites within Four Gulf Islands Marine Provincial Parks

Submitted March, 2022 to Ministry of Environment and Climate Change Strategy SeaChange Marine Conservation Society nikki@seachangelife.org

Acknowledgements

SeaChange gratefully acknowledges the Coast Salish Nations for the privilege of working and living in their territories.

We also acknowledge with gratitude the long term work and successes of Cynthia Durance, R.P.Bio for enabling eelgrass conservation work to move forward within coastal communities of B.C.

Cover photo: Coastal Photography Studio

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Introduction

In 2022, SeaChange Marine Conservation Society contracted with the Ministry of Environment and Climate Change Strategy to survey native eelgrass (*Zostera marina*) and the presence of *Sargassum* (introduced Japanese wire weed) in four Provincial Marine Parks within the Gulf Islands The Marine Parks included Princess Cove and Conover Cove on Wallace Island, Montague Harbour on Galiano Island and Pirates Cove on De Courcy Island.

Stern tie and boat mooring locations were to be mapped and spatial maps to be created and distributed to the Islands Trust and the Ministry of Environment and Climate Change Strategy. Recommendations are included in this Report for improved eelgrass habitat protection, including suggestions for alternative locations for boat mooring and stern tie locations (the terms *stern ties* and *shore ties* are used interchangeably in this Report). A report on shore ties and recommendations for site locations can be found in Appendix B.

This work is intended to reduce impacts from recreational boating and further improve conservation and protection of marine nearshore habitats within the Gulf Islands.

SeaChange suggests conservation efforts recommended in this Report within Provincial Marine Parks be pursued in concert with community groups, such as Marine Parks Forever Society, First Nations, local conservancies, and other local organizations

Mapping Methodology

Eelgrass surveys were conducted over several days in February and March of 2022. The eelgrass inventory for this project entailed determining the presence or absence of *Zostera marina* with an underwater towed camera and a hand-held Garmin GPS MAP 64SX0 unit. The mapping platform was the deck of the SeaChange 24' dive boat, *Klanawa*.

Small eelgrass beds were traversed back and forth in order to record their approximate extent and edges. Large meadows (i.e., Montague Harbour on Galiano Island and Pirates Cove on De Courcy Island) were mapped using transects approximately 20 m apart perpendicular to the shore. The presence of *Sargassum* was noted every time it appeared on the video screen. Several videos were created and are embedded in the digital spatial maps to document eelgrass meadows and presence of *Sargassum*, as well as debris tossed from boats.

Terms that are used to characterize eelgrass habitats in this report are the following:

Distribution

The distribution of eelgrass within an eelgrass bed is described for this inventory as either patchy or continuous. Patchy beds are those that contain isolated groups or patches of plants. Beds which are not patchy are classified as continuous; a bed that contains bare patches surrounded by eelgrass is classified as continuous. The boundary of a bed is determined by a shoot density of less than 1 shoot per square meter (Durance, 2002).

Form

There are two basic forms of eelgrass beds in the Pacific Northwest: fringing beds that occur as relatively narrow bands usually on gentle slopes, and more expansive beds that cover large areas such as tidal flats known as "flat" beds (Durance, 2002). Interannual variation of densities within a bed is not well known, but appears to be less than ten percent (Dowty et al, 2005). Fringing beds are generally linear. Flat beds are areas of large eelgrass beds in embayments that extend deeper than fringing and more linear beds found along shorelines (Dowty et al. 2005). Distribution is often, but not solely, determined by aspect to dominant winds.

Eelgrass distribution across a bathymetric gradient is limited at the upper boundary by the degree of exposure at low tide (desiccation) and by light limitations at the lower boundary. Overall, this inventory is an indication of the presence or absence of eelgrass habitat and does not represent maps of the outer or shoreward edges of each bed.

Ecotype

There are three ecotypes, or ecospecies of *Z. marina* that describes a genetically distinct geographic variety adapted to specific environmental conditions. These ecotypes can be identified by their morphological variation (Beckman 1984).

Table 1. The habitat and morphological attributes associated with the three ecotypes of Zosteramarina common in British Columbia. (adapted from Beckman, 1984)

Ecotype	Relative leaf size	Leaf width (mm)	Depth range (m)	Seasonal variation in size	Current tolerance
typica	narrow	2 to 5	primarily intertidal	small variation	low
phillipsi	intermediate	4 to15	0 to - 4	large, plant length reduced in winter	moderate
latifolia	large	12 to 20	-0.5 to -10	minimal variation	strongest

2022 Survey Findings

Princess Cove (Wallace Island)

(Survey date: Feb 16, 2022)

The seabed at Princess Cove is mostly sandy with little sea life observed at the time of the survey, with the exception of an abundance of shellfish siphons in the sediment. Anthropogenic debris was present throughout the bay.

The western side of the Cove is used for stern tying. No eelgrass was observed in this area. *Sargassum* is present on boulders and rocks primarily along this side of the Cove (indicated by the white dots on the Google map).

A small fringing continuous eelgrass meadow is present on the eastern side of the Cove with a narrow depth range of - 4.07m to - 4.7m. A short distance south of this bed is another larger meadow that is continuous and patchy. Depth range is – .8m to –



7.8 m. Some eelgrass blades are over 90cm in height, most likely the ecotype *Z. marina latifolia*.



The beds appear to be healthy. Placement of stern ties into this area is not recommended in order to prevent shading of the current meadow.

Recommendations:

- 1. The Cove could benefit from a Voluntary Eelgrass Protection Zone with marked buoys to protect existing eelgrass habitat.
- 2. Install mid-line mooring systems for boats using stern ties.
- 3. Install eelgrass signage at public access points designating location of eelgrass habitats in the Cove and asking for cooperation with debris removal.
- 4. Conduct underwater debris removal.

Conover Cove (Wallace Island)

(Survey date: Feb 17, 2022)

Sediment in the Cove is primarily sandy. Oyster beds are present along the rocky shore. Eelgrass distribution (*Z. marina phillipsi*) to the north and south of the entrance to the Cove is continuous, flat and more dense and extensive than the patchy areas of eelgrass within the Cove.

Sargassum is growing on rocky substrates in the eastern intertidal area. A dense population is located at the western entrance to the Cove, on boulders adjacent to the eelgrass meadow there (see Transect video).

This site could benefit from debris removal. Bottles, rope, metal pipes, cans and tires were observed near the dock. There is a sunken dinghy in the northeastern area of the Cove at - 6.5m, depth suitable for eelgrass growth.



Based on previous observations during eelgrass transplant monitoring events at this



site, eelgrass was present throughout the Cove, especially in front of the shore ties. It is highly likely that shading by boats and anchoring in depths suitable for eelgrass growth are disturbing seagrass productivity in this bay. Depth gradients (- 4.2m was the lowest point in the centre of the bay) and sediment characteristics are suitable for more productive eelgrass habitats if boat anchoring and moorage are controlled.

Recommendations:

- 1. Remove debris from areas surrounding the dock.
- 2. Install signage on the dock re eelgrass presence and its importance with words of encouragement to dispose of garbage appropriately.
- 3. Install mid-line moorage systems for boats using stern ties.

- 4. Re-locate stern ties where conditions for eelgrass growth are not suitable (i.e. depth is beyond 4m).
- 5. Transplant eelgrass using donor plants from healthy beds within the Cove once the number of boats is controlled.

South Bay. Montague Harbour

(Survey date: Feb 17-18, 2022)



Thirty-nine mooring buoys and three shore ties were observed in this bay at the time of the survey. There are two flat areas of very patchy eelgrass (Z.marina philippsi) growing in sandy/shell hash sediment in front of the sandy shore, with tufted red algae distributed through the site. The larger bed lies east of the dock and measures approximately 330m² at a depth range of – 3.5m to – 4.6m. A smaller area of patchy eelgrass, approximately 150m² lies west of the dock at a depth between - 0.9m to -2.1m. The eelgrass shoots appear healthy, though very scarce. The conditions for eelgrass productivity are present on the western side of the dock but presently not suitable for eelgrass restoration, as boat anchoring is predominant in this area.

Two very small patches are growing on the eastern shore of the bay on the north and south side of the 3 stern tie locations. This side of the

harbour appears to be suitable for stern tying as the seabed drops off suddenly (see Navionics chart below).



Sargassum was observed on boulders and rocks on the shores surrounding the bay with an especially dense population at the southwestern tip. Oyster beds are present along the rocky shores, mainly on the western shore.

Recommendations:

- 1. Replace the moorings in the shallow areas of the bay with mid-line moorage systems.
- Install multi-boat mooring system in the harbour to accommodate the capacity of the bay to sustain itself and restrict number of boats anchoring out with a Voluntary Eelgrass Protection Zone surrounding the eelgrass habitat in front of the beach.
- 3. Replace ad hoc shore ties with formalized shore ties.
- 4. Install eelgrass signage on the dock, requesting no anchoring in water less than -7m and designating locations of eelgrass beds.

North Bay, Montague Harbour

(Survey date: Feb 18, 2022)

On the northeast end of this bay, eelgrass is fringing and patchy at three sites close to shore. Dense *Sargassum* is located in the intertidal and shallow subtidal areas nearby (see video). The rocky substrate in this area most likely is limiting more continuous eelgrass growth.

Dense eelgrass in flat continuous beds is present slightly south of this patchy habitat, forming two distinct polygons. The first polygon ranges from -0.6m to -3.4m and is approximately 290m². A dense population of *Sargassum* was found on the northern



end of the larger second bed. Depth range for eelgrass growing in this more southern part of the bay is -0.3m to -3.5m; the bed is approximately $550m^2$.

There is a boat launch at this side of the park (123.4074496 48.9000748), which might impact the edges of the two existing beds as boats using the dock traverse a pathway through the bay. However, this bay overall appears less used for anchoring and the ecosystem appears heathy.

Recommendations:

- 1. Install informational buoys from the boat launch to the middle of the bay to guide boat traffic in order to avoid damage to existing eelgrass beds at low tide.
- 2. Install eelgrass signage if possible on the dock.

Pirates Cove, De Courcy Island

(Survey date: March 3, 2022)

An extensive, dense, continuous and shallow eelgrass bed, approximately $8,670m^2$ in area, is located in the northwest area, just south of the entrance to the Cove. Depth range is between - 0.1m to - 0.5m.

A smaller patch of eelgrass (approximately $165m^2$) east of this bed is directly in front of the northernmost shore-tying sites, and might be impacted by dragging chains from these stern ties during low tides. Depth range for this habitat is -0.5m to -0.7m.

Both beds have shorter shoots and are most likely *Z. marina phillipisi* ecotype because of the shallower depth in which they are situated. There might be predation by Canada geese, as they were observed during the survey and at low tide periods these birds would have access to



the shoots. As well, due to the shallow depths of this area, boat traffic might be causing damage to the eelgrass, especially during low tides.

The seabed in the Cove is sandy and is void of vegetation. Anemones were highly abundant in the area. Numerous oyster beds can be found along the rocky shores in the southern part of the Cove. *Sargassum* is omnipresent in the Cove, growing on rocky boulder substrates. An



extensive eelgrass meadow was also observed the bay south of the Cove. However, detailed mapping was not conducted because the area is not within B.C. Park's jurisdiction. As there are no moorings, the eelgrass meadow is most likely being disturbed by boat anchoring in this bay (anchored boats can be observed on Google Earth satellite pictures).

Recommendations:

- 1. Install a Voluntary Eelgrass Protection Zone to protect the existing shallow eelgrass habitat on the northwestern side of the Cove.
- 2. Install eelgrass signage at the two dinghy docks with maps designating existing eelgrass habitats.
- 3. Install marker buoys to guide boat traffic to and from entrance to Cove to avoid damaging eelgrass during low tides.

References

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Appendix A

Maps









Appendix B

Report on Shore Ties

Shore Tie Notes March 2022

The shoreline of the subject areas was searched by boat for locations of standard shore ties and for ad hoc evidence of boaters tying to boulders or trees in four Provincial Marine Park anchorage sites. The position of each shore tie was recorded on a handheld GPS as close to the iron pin as possible, and a digital image was taken from the water. The estimated position error reading on the GPS unit was less than 3 m for all the records.





Standard Shore Tie

Ad Hoc Shore Tie

Wallace Island Princess Cove

Ten standard shore ties were found on the southwest side of Princess Cove. There are 6 pins south of the dingy dock and 4 north. No evidence was found of ad hoc shore ties, although a vessel can be seen on the GoogleEarth imagery ad hoc tied further in the bay from WP1. The average distance between pins in the 2 clusters is 24 metres. Some pins are considerably further apart than 25 metres though no obvious reason was observed for this.

Recommendations:

- 1. Install mid-line mooring buoys for each shore tie.
- 2. No anchoring or shore ties south WP1.
- 3. Establish Voluntary Eelgrass Protection Zone for that portion of the Cove lying south of WP1 and for the eastern shoreline up to the private property.
- 4. Install shore ties between WP1 and WP2, the dingy dock and WP7 and then beyond WP9.

Wallace Island Conover Cove

Three standard shore ties were found on the northeast shore of Conover Cove. No evidence was found of ad hoc shore ties, although a vessel can be seen on the GoogleEarth imagery with an ad hoc tied to the southwest shore and another anchored in eelgrass habitat.

Careful consideration is needed to manage recreational boating while conserving eelgrass in Conover Cove. The existing dock and shore ties may be all the Cove can support, if ad hoc anchoring is prohibited.

Recommendation:

 Along with Voluntary Eelgrass Protection Zones and mid-line moorings it may be appropriate to install two shore ties on the southwest shoreline just inside the Cove in the location where a vessel can be seen in the GoogleEarth image. Ideally vessels would pick up a mooring, then tie back to a shore tie to limit swing.

DeCourcy Island Pirates Cove

Twenty- seven standard shore ties were found in Pirates Cove. One ad hoc shore tie consisting of a rope around a tree was found just inside the northwest boundary of the Park, next to the private marina. As this Cove is very protected, shore ties are closely spaced and of sufficient number to cover all practical tie-ups.

Recommendations:

- 1. There are no opportunities for more shore ties in Pirates Cove.
- 2. WP17 needs a longer chain. Park patrols should watch for and remove ad hoc shore ties.

Galiano Island Montague Harbour

There are no BC Parks standard shore ties in Montague Harbour Marine Park. Three ad hoc shore ties were found along the southeast shoreline just inside the Park boundary (under the transmission lines). These ad hoc ties are around boulders along the natural boundary. The GoogleEarth imagery confirms that boaters are using this area for shore tying.

This shoreline is dominated by side cast boulders from upland road work which may make establishing permanent shore tie points a bit tricky. The north bay of the park is too exposed for vessels to tie back to shore - no ad hoc shore ties were found in this location.

Recommendation:

1. Consider formalizing shore ties along the southeast shore of the south bay. Care should be given to site shore ties to protect eelgrass to the north and south of this location.

Appendix C

Voluntary Eelgrass Protection Zones and A Proposal for Consideration



Voluntary Eelgrass Protection Zones

Anchoring in eelgrass habitat creates gaps and fragmentation of critical salmon nearshore rearing areas, causing damage to continuous eelgrass habitat. Vessels are also at risk when anchoring in loose sediment, providing greater opportunity for them to go adrift or aground.

To reduce these cumulative impacts to eelgrass habitat and increase the safety of mooring vessels, "Voluntary Eelgrass Protection Zones" signage can be used to encourage positive behavioral change. The signage design used for the marker buoys is the same for both Puget Sound and the Salish Sea, so that logo recognition will be easier for boaters traveling across the U.S./Canadian border.

A Voluntary Eelgrass Protection Zone has been initiated in Port Townsend, Washington since 2004. It has a compliance of 98%, protecting 52 acres of eelgrass.

Signage buoys have been installed thus far (since 2021) in Canadian waters in Mannion Bay, Bowen Island, and is about to be installed in Gibsons Harbour and Cowichan Bay. When these buoys are associated with educational signage on nearby docks, a surge of awareness and positive behavioral change can occur, increasing stewardship of vital nearshore habitats.

Following is a poster used in Mannion Bay to educate the public about the newly installed Voluntary Eelgrass Protection Zone, which occurred because of collaboration and support from the Municipality of Bowen Island and SeaChange.

Have you seen these marker buoys in Mannion/Deep Bay/Kwil'akm?



These buoys outline a **Voluntary No-Anchor Zone** to protect eelgrass health in the Salish Sea

- Vhy is eelgrass itnportant? Eelgrass meadows pro,-ide home and shelter to hundreds of marine creatures in the Salish Sea, including Dungeness crab, juvenile salmon, and Pacific herring. These lush tmderwater meadows can also provide services to humans, including playing a role in fighting climate cliange by sequestering carbon in their roots, and reducing erosion by stabilizing sediments
- Vhat is the state of eelgrass? Unfortunately eel£rass meadows are one of the fastest declining habitats worldwide: since the 1880s, eelgrass beds have declined Gy 301/'o. In the Salish Sea, eelgrass has decreased in area by 22-45% o, er the past 30 years (Beaty and Sanford, 2019)
- H ow do humans itnpact eelgrass? One human activity that threatens eelgrass is "-hen docks, mooring buoys, and boat anchoring occurs, Yithin and fragments eelgrass meadows. Tiiis fragmentation can be,-isualized by aerial images that show halos around moorit;B: buoy s, where the anchors and chain scour the seafloor and rip out the surrounding plants (see photo below from Kelly et al. 2019)
- Vhy should Bowen care? TI1e eelgrass meadows it11.fa111iion Bay are some of the largest on Bowen Island, and pro, ide critical habitat to forage fish that visit and may spawn in the bay, as "•ell as salmon that migrate out from Terminal creek



TI1 is is why the Bowen Island Municipality and SeaChange Marine Conservation Society partnered to create

a voluntary no-anchor zone in Mannion / Deep Bay / Kwil'akm

TI1e marker buoys that outline this zone ask boaters who visit tl1e bay to proactively anchor outside of tl1e eelgrass habitat

- >" Tiiis itmovatiw and grassroots stewardsliip itiitiati,-e is the first of its kind in the Canadian side of the Salish Sea, and builds upon a successful model implemented in the State of \asliington
- r Importantly, the no-anchor zone is voluntary. This means that the successful protection of ilarniion Bay's eelgrass relies upon the support and collaboration of Bm., en Island community members and frequent visitors to the Bay! See the next page for actions you can take to protect eelgrass health in the Salish Sea

A Proposal for a Citizens Science Initiative by Birds Canada and SeaChange for Further Consideration

James Casey, Fraser River Specialist, Birds Canada

Birdwatching is an outdoor activity growing in popularity across North America. British Columbia's Provincial Parks provide an opportunity for people to experience this activity in a natural setting. Eelgrass and other intertidal habitats found in bays are often highly productive ecosystems that attract foraging birds. Unfortunately these birds are sensitive to disturbance from human activities. The noise, light and wake actions of motorboats can be a source of disturbance in British Columbia's coastal setting.¹ Buffers have been recommended for protecting roost and nesting sites² and boat based disturbance is known to disrupt foraging behavior of at risk species such as Marbled Murrelet.³ The recommended Volunteer Eelgrass Protection Zones may reduce boat traffic within these highly productive ecosystems and therefore lead to more bird utilization of these sites.

To test the hypothesis that creating no anchoring locations may lead to increased bird usage implementing a pre/post treatment study of bird usage could inform BC Parks whether the treatment of volunteer anchor exclusion is benefiting multiple park values.

In British Columbia Birds Canada has maintained a citizen science coastal bird monitoring program for over 20 years.⁴ Much of the coastline in proximity to populated areas has volunteer monitoring taking place based on standardized protocols once a month between September and April.⁵ This provides a valuable baseline of pre-treatment data. This does not Cover the summer months but sites can be selected where volunteers carry forward their surveys or where eBird records allow an understanding of pre-treatment bird populations. If a test site can be selected within an existing BC Coastal Waterbird Survey route, then we can approach the volunteers about collecting year-round data as part of the study to document whether birds do indeed increase in number after a treatment of implementing a Voluntary Eelgrass Protection Zone.

¹Bellefleur D, Lee P, Ronconi RA. (2009). The impact of recreational boat traffic on Marbled Murrelets (Brachyramphus marmoratus). J Environ Manage. (1):531-8. doi: 10.1016/j.jenvman.2007.12.002. Epub 2008 Jan 28. PMID: 18222029. , Drever, Mark & Beasley, Barbara & Zharikov, Yuri & Lemon, Moira & Levesque, Paul & Boyd, Michael & Dorst, Adrian. (2016). Monitoring Migrating Shorebirds at the Tofino Mudflats in British Columbia, Canada: is Disturbance a Concern?. Waterbirds. 39. 125-135. 10.1675/063.039.0203. and Chatwin, Trudy & Joy, Ruth & Burger, Alan. (2013). Set-Back Distances to Protect Nesting and Roosting Seabirds Off Vancouver Island from Boat Disturbance. Waterbirds. 36. 43-52. 10.1675/063.036.0108.

²Chatwin, Trudy et al.

³Bellefleur D, Lee et al.

⁴ Ethier, D., P. Davidson, G. H. Sorenson, K. L. Barry, K. Devitt, C. B. Jardine, D. Lepage, and D. W. Bradley. 2020. Twenty years of coastal waterbird trends suggest regional patterns of environmental pressure in British Columbia, Canada. *Avian Conservation and Ecology* 15(2):20. https://doi.org/10.5751/ACE-01711-150220

⁵ BC Coastal Waterbird Survey Protocol; Instructions for Participants. Online at: BC Coastal Waterbird Survey Protocol Instructions for Participants

Most BC Coastal Waterbird survey volunteers are committed to multiple years of survey effort, so designing a survey across multiple years should be possible, if desired by BC Parks. The biggest source of uncertainty will come from survey efforts in the summer months. Because we don't have extensive summer survey effort spatial and temporal variability will be harder to address. However longer periods of survey effort in combination with other existing baseline information can help detect changes in localized utilization.

Over longer time frames, if the treatment of volunteer exclusion zones are successful to removing anthropogenic impacts of anchoring on eelgrass habitats, there may also be a positive impact on condition and productivity of these eelgrass habitats.

Birds can also be an indicator of environmental conditions. In this context, the BC Coastal Waterbird focus on overwintering birds could help inform recovery success of eelgrass beds in response to reduced impacts from anchoring.

The actions being proposed by SeaChange have the potential to benefit birds and other components of the ecosystem. Birds Canada has supported a long term citizen science monitoring effort in the coastal setting where these actions are being recommended. With careful study design and engagement with the volunteers it should be possible to build off these monitoring efforts to understand potential co-benefits to birds and the wider ecosystem.

Appendix D

Mid-line Mooring Systems

Mid-line Mooring Systems

One of the major impacts of traditional mooring systems with chains attached to cement blocks or large re-purposed steel as anchors is the seabed being scoured by chain dragging on the bottom as the boat above moves around from tidal and wave action. The scouring causes gaps in an otherwise contiguous seagrass bed.

'Seagrass-friendly' moorings have been developed to address the mechanical disturbance and decline in seagrass that boat moorings cause worldwide. Installing these mooring systems in areas that have previously been damaged can support the natural recovery of these habitats to return to a functioning ecosystem.



Scouring of eelgrass habitats by boat chains

Mooring damage to eelgrass beds can be prevented through the use of mooring systems by a buoy float that holds buoyant rope rather than chain. Replacing existing moorings that are permanently moored in eelgrass habitats can provide the opportunity for eelgrass to recolonize the site, and provide greater habitat connectivity for marine life. Those boats that are temporarily anchored will be encouraged to anchor in deeper waters (-7m) with signage placed on shore.



Novel boat mooring system that allows rope and chain to float above the eelgrass, eliminating scouring and degradation of this habitat.

Increasingly SeaChange staff has noticed an upsurge of interest in ocean stewardship, with increasing numbers of peoples asking "What can we do to lessen our footprint on the ocean in the age of climate changes?" Our message has been the more we can lessen our cumulative footprints, the higher the opportunities are for nearshore marine habitats, such as eelgrass, to maintain resiliency and withstand an overall regime change in their form and function as critical marine life refugia.

Our hope is to inspire boaters with a greater appreciation of the habitats they co-exist with, and to further appreciate working together as a community doing "the right thing".

Appendix E

Eelgrass Signage



This design was used for eelgrass signage for a five year Coastal Restoration DFO

funded project Forty-eight signs were installed in four regions of the Salish Sea.