COUNTY: Island

Grant Number: SEANWS-2021-IsCoPH-00001

PROJECT TITLE: Island County Marine Resources Committee Operations and Projects

TASK NUMBER: 2.4 - Summary report on year two bull kelp monitoring activities

PERIOD COVERED: Oct 2021-Sep 2022

DATE SUBMITTED: 10/11/2022

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Bull Kelp Monitoring 2021-2022:
Island County Marine Resources Committee

Clockwise, from upper left: Gayle Austin at Possession Point (Ron Beier). Harbor seal at Possession Point (Ron Beier). Lowell Point team (Don Engblom). Carter Webb at Possession (R. Beier).

Report submitted in partial fulfillment of WA Department of Ecology grant SEANWS-2021-IsCoPH-00001, Task 2.0 (Monitoring: Kelp)
Project period: October 2021 – September 2022
Report date: October 8, 2022
Project leads: Ron Beier (MRC)

Summary and Observations for 2022

- All beds from 2021 were fully surveyed in 2022.
- New MRC Coordinator transitioned in
- MRC lead transitioned out
- 20 volunteers reported 407.25 hours
- Beds located in Saratoga Passage are smaller than in the previous year
- Temperature logging for multiple depths was conducted at all sites.

Introduction

Kelp forests represent significant habitat for a wide variety of invertebrate and vertebrate animals and have influence on and are influenced by other submerged aquatic vegetation. In addition to providing structural habitat, primary productivities are very high, and they are a significant store of carbon, ultimately distributing that to deep and nearshore environments. In Washington State, two species of kelp are dominant: giant kelp (*Macrocystis integrifolia*) and bull kelp (*Nereocystis luetkeana*). While both species occur along Washington's outer coast and coastal Strait of Juan de Fuca, bull kelp is the species found along shorelines of the inner Salish Sea.

Bull kelp is intertwined with Salish Sea ecosystems, native culture, fishing, and recreation. It is the most visible and charismatic of the regional algaes and has been subject of multiple environment and human interest stories. A recent example (An Amazon Rainforest of the sea fights for survival beneath Puget Sound) underscores the importance of this work.

Following a state-wide moratorium of commercial harvest of wild kelp and seaweeds in 1988, Washington State Department of Natural Resources (WDNR) initiated annual aerial surveys of coastal aquatic vegetation from Port Townsend Bay to the Columbia River. These surveys have continued for nearly every year, and in 2010, surveys were extended to include the resources of the Smith and Minor Island Aquatic Reserve (SMIAR), which is contained entirely within Island County. In the latest analysis of coastal kelp from 2013 to 2014 (excluding SMIAR), decline in planimeter area of bull kelp around Port Townsend was ~14%, and range-wide decline in planimeter area of both kelps was 38% (Van Wagenen 2015).

Focused *in situ* surveys of bull kelp beds in South Puget Sound have uncovered disturbing trends of progressive shrinkage of bed areas (Berry, 2017; Berry, 2019). In addition to loss of canopy area, maximum depth for beds decreased and condition of individual kelp appeared poor, with an abundance of epiphytes, endophytes, and kelp crab. Whether these disturbing patterns occur in other parts of Puget Sound is unknown but does raise concerns about the status of bull kelp throughout the region.

The earliest comprehensive evaluation of kelp resources was conducted in 1911, where over half of the total tonnage of bull kelp in the American portion of the Salish Sea was estimated to be located within the jurisdiction of modern Island County (Rigg 1915). Uncertainty about the distribution of bull kelp in areas not monitored by WDNR overlaid by anticipated changes in marine conditions attributable to climate are motivations to conduct an inventory and assessment of this resource in Island County. The Island County Marine Resources Committee (MRC) considered this an important activity to conduct under its sponsorship. Efforts were initiated in 2015 to select kelp beds and test a kayak-based survey protocol. Those efforts were expanded in 2016 and have continued through 2022.

Scope and Objectives

This report describes the project for fiscal year 2022. Surveys occur from June through September. Due to the co-incidence of the end of the field season and the report deadline, not all of the 2022 data is included in this report.

Objectives for 2022 included:

1. Collect data from previously surveyed kelp beds by boat-based surveys to extend historical observations.
2. Transition to new MRC staff and orientation of new volunteers.
3. Utilize temperature loggers for measuring temperatures at multiple depths.

Lowell Point Team (Don Engblom)

Project Progress

Bull kelp is distributed widely in Island County (Figure 1) with most on the West side of Whidbey Island.

Figure 1. Map of Island County with associated bull kelp beds (highlighted in red) in 2019.

In 2019, the estimate of the amount of shoreline with associated bull kelp was ~ 12.7 miles, which is approximately 6.5% of Island County's shoreline.

The MRC-surveyed sites, surveys are conducted within the five most prominent bull kelp beds on Whidbey and Camano Islands. Those beds (Figure 2) provide coverage for all sides of Whidbey Island with two locations in Saratoga Passage. Descriptions of each site are provided later in this report.

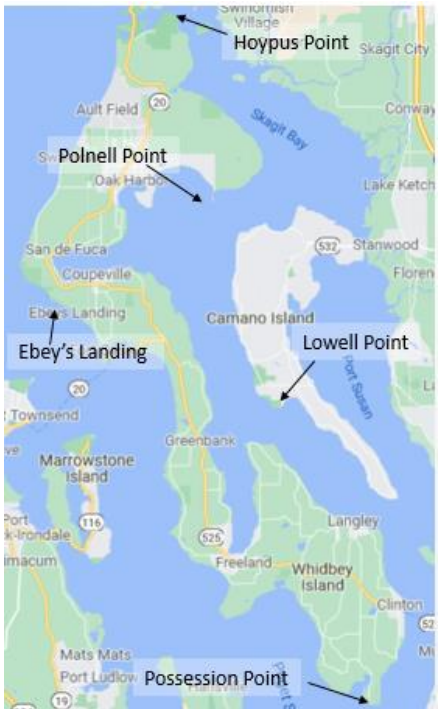

Figure 2. Locations of kelp beds surveyed in 2022

Survey Summary

Five sites were surveyed in the 2022 season (Figure 3). The primary objective is to determine surface area (SA) of the bed throughout the season and maximum SA for the year. Maximum SA usually occurs in August, hence that month is a priority. Water temperature, depth throughout the bed, reproductive status of the plants, and occurrence of animals associated with the bed are also recorded.

year	2022							
month	6		7		8		9	
	Temp	SA	Temp	SA	Temp	SA	Temp	SA
Hoypus Point	14.5		12.8	16.0	12.6		13	
Ebey's Landing					12.3	159.0		
Polnell Point					16	57.3	13.1	68.6
Possession Point	15	116.0	15	286.0	16.5	329.4	14	358.0
Lowell Point			10		17.8	36.6		

Key:			sampled in month
		15	Temp - surface temperature C - outer edge
		122	SA - area of bed (units of 1000 m2)

Figure 3. 2022 Sampling months (green) overlaid with temperature and surface area for Island County bull kelp sites. Please note that, due to timing with reporting, not all data is available.

Historical Trends

The primary goal of this work is to understand the long-term dynamics of these beds and enable the integration of Island County data into the regional picture in collaboration with other MRCs and government agencies. Annual snapshot surveys allow for the compilation of data over time to observe status and trends.

The historical summary since program inception in 2015 (Figure 4) is updated through 2022 and clear trends in SA are evident. Detailed interpretation of these and regional data is out of scope for this annual report but is available on the WDNR's bull kelp monitoring page.

Location	Site	2015	2016	2017	2018	2019	2020	2021	2022
N Whidbey	Hoypus Point		16.3	14.6	30.3			8.6	16.0
CW Whidbey	Ebey's Landing	80	82.5	91.8	86.1	165.1	162.4	150	159.0
CE Whidbey	Polnell Point		145	110.9	300	191.3	166.1	147.3	68.6
SE Whidbey	Possession Point			86.9	148	262.2	203.4	270	329.4
CW Camano	Lowell Point		72.8	55.6			25.4	93.4	36.6

72.8	Sampled in year and max Surface Area (1000's of m2)

Figure 4. Program view of summary sampling and maximum Surface Area for Island County bull kelp sites.

Program Leadership Changes

Ron Beier has continued in his role as the lead volunteer for this project. He has done a phenomenal job being a resource for all of our volunteers and for the new MRC staff. Hannah Liss needed to step down from the MRC but is still involved in monitoring the Bull kelp bed at Hoypus Point.

Terrific Volunteers

It takes a special sort of person to volunteer for this work, and we cannot be prouder of the volunteers committed to seeing the work done well and with enthusiasm. Beyond the scientific skills to record quality data in a dynamic, wet, and often windy environment, it takes a certain level of enthusiasm, grace, and curiosity to be effective. We are very lucky to have a great group of volunteers.

Many of our volunteers came from Sound Water Stewards, and we are very appreciative of their partnership and help. It has truly been a collaborative effort.

Project participants
Project lead: Ron Beier, Kelly Zupich (MRC Staff)

Kayak surveys: Elaine Andrews, Gayle Austin, Ron Beier, Barbara Bennett, Theo Brandon, Vernon Brisley, Barbara Brock, Ken Collins, David Davis, Debbie Engblom, Don Engblom, Barbara Hardman, Nancy Hotter, Bill Meyer, Hannah Liss, Bill Meyer, Linda Rhodes, Jenny Roman, Ellyn Thoreen, Carter Webb.

This report is based on previous annual reports authored by Linda Rhodes.

Temperature logger surveys: All sites adopted taking regular temperature readings at different depths.

Discussion

Temperature loggers and protocols to measure surface, mid-water, and bottom temperatures were developed in 2020 and are now used for all sites.

Sites found in Saratoga Passage appear to have smaller surface area this year. The Polnell Point bed is less than 50% of the maximum annual bed area since 2016. This is the first significant decrease observed at this site.

Looking Forward

As we think through better understanding drivers of bull kelp abundance and density, a number of areas for more detailed and systematic surveys come to mind. We will work with the Northwest Straits Commission (NWSC) and stakeholders to plan and test what we can apply in the 2023 season.

1. Improved temperature logging. We anticipate the need for better accuracy, ease of use, and consistency of protocol. With temperature assumed to be a key driver, we would like to develop a more systematic and consistent strategy for our surveys.

Site Descriptions

Hoypus Point

"Small but influential" may be the best description for the Hoypus Point bed. Located 0.5 km east of Hoypus Point (Figure 5), this bed sits on the boundary of the funnel of water flowing in and out of Saratoga Passage through Deception Pass.

Figure 5. Undated image of the Hoypus Point kelp bed. (Google Earth)

The bed sits adjacent to large sand bars and what appear to be shallow beds of sugar kelp. The bed reached maximum expression on the surface in August. With tremendous mixing of "fresh" ocean water from Deception Pass and large amounts of fresh water from the east,

and high currents, we looked forward to a bed that may be a “hybrid” personality between the western and eastern sides of Whidbey Island.

Ebey’s Landing

The Ebey's Landing bed is located in Admiralty Inlet and receives full marine influence from the Strait of Juan de Fuca.

Figure 6. Near infra-red image of Ebey's Landing bull kelp bed in August 2019. (G. Ridder and V. Brisley)

Surface temperatures at the Ebey's Landing bed tend to be relatively low and consistent across the months, probably due to the strong marine influence from the Strait of Juan de Fuca. The maximum annual bed area for the Ebey’s Landing bed is very similar in 2022 as over the past 8 years.

Polnell Point

The Polnell Point bed is located at the head of Saratoga Passage, between Whidbey and Camano Islands, at the eastern end of Crescent Harbor and approximately 13 km from the south fork of the Skagit River. The bed is within the influence of this large freshwater influx.

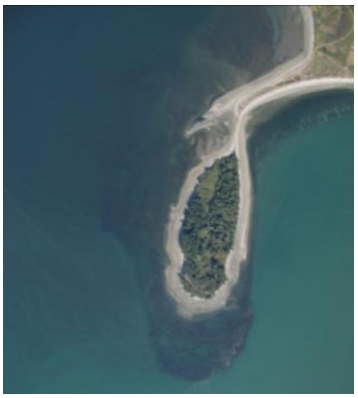

Figure 7. Polnell Point bull kelp bed on August 28, 2019, showing the large area of the bed. (G. Ridder and V. Brisley)

Aerial images and surveys over time indicate this bed is strongly expressed at the surface by the end of August (Figure 7). Because of this, the bed is not surveyed in June or July.

The Polnell Point bed is less than 50% of the maximum annual bed area since 2016. This is the first significant decrease observed at this site

Lowell Point

Lowell Point is located in Saratoga Passage, along the western shore of Camano Island immediately south of Camano Island State Park. This bed receives freshwater from the Skagit, Skykomish, and Snohomish Rivers. Due to the proximity of the State Park, crabbing and fishing are common activities near the bed, and there is frequent small boat traffic. The bed is comma-shaped, following the shallower underwater shelf around the point (Figure 8).

Figure 8. Lowell Point and bull kelp bed. (Google Maps)

Possession Point

The Possession Point bed is located at the confluence of Admiralty Inlet, Possession Sound, and the Central Basin of Puget Sound. It receives both marine and riverine influences, as well as potential anthropogenic effects from the Central Basin. Possession Point is an extremely popular fishing location and diving area, which may be due in part to its kelp bed and nearby artificial reef.

Although aerial assessment has identified kelp beds on either side of the Cultus Bay outflow, the surveyed bed is located to the east of the outflow and bounded by a stationary aid to navigation (Figure 9).

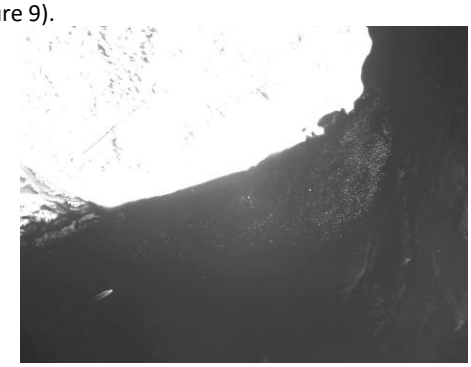

Figure 9. Near infra-red image of the Possession Point bull kelp bed on August 28, 2019. (G. Ridder and V. Brisley)

Surface temperatures at the Possession Point bed are typically higher than the Ebey's Landing bed. Temperature and salinity fluctuate in a manner consistent with Possession Point receiving freshwater from river sources (e.g., Snohomish River) that are warmer in summer months.

References

Berry, H. 2017. Assessment of Bull Kelp at Squaxin Island in 2013, 2014 and 2016. Washington State Department of Natural Resources. https://www.dnr.wa.gov/publications/aqr_nrsh_squaxin_bullkelp_1217.pdf?83ofk2

Berry, H., M. Calloway, J. Ledbetter. 2019. Bull Kelp Monitoring in South Puget Sound in 2017 and 2018. Washington State Department of Natural Resources. https://www.dnr.wa.gov/publications/aqr_nrsh_bullkelp_sps_2019.pdf?c5eyo9

Rigg, G.B. 1915. The kelp beds of Puget Sound. IN: Potash from Kelp. F.K. Cameron, ed. U.S. Department of Agriculture report no. 100. April 10, 1915.

Van Wagenen, R.F. 2015. Washington Coastal Kelp Resources: Port Townsend to the Columbia River, Summer 2014. Contract report to Washington Department of Natural Resources, Nearshore Habitat Program. Last accessed September 5, 2016. URL: http://file.dnr.wa.gov/publications/aqr_nrsh_vanwagenen_2015_kelp_tables.pdf

Additional Resources

Graham, M.H., J.A. Vasquez, A.H. Bushmann. 2007. Global ecology of the giant kelp Macrocystis: from ecotypes to ecosystems. Ocean. Mar. Biol Ann. Rev. 45:39-88.

Mumford, T.F. 2007. Kelp and eelgrass in Puget Sound. Puget Sound Nearshore Partnership Report No. 2007-05. Seattle District, U.S. Army Corps of Engineers, Seattle, WA. Last accessed September 5, 2016. URL: http://www.pugetsoundnearshore.org/technical_papers/kelp.pdf

Commented [1]: I don't believe either of these were referenced in the text. If we'd like to still include them as helpful info, maybe we could add an "Additional Resources" section.