Gulf Islands National Park Reserve

Eelgrass Monitoring

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parkscanada.gc.ca/gulfislands
1-866-944-1744

Eelgrass monitoring began in Gulf Islands National Park Reserve in 2004 and is now in its eleventh year. It is a major component of the park reserve's long-term Ecological Integrity (EI) Monitoring Program, intended to assess the status and condition of the park ecosystem. EI monitoring focuses on a number of indicators ecosystems and a series of measures that combine to provide an overall picture of the state of the park.

Monitoring eelgrass meadows provides insight into the dynamics of eelgrass fish communities as well as factors which influence the growth and distribution of eelgrass in intertidal and subtidal ecosystems, both part of the **coastal/marine** indicator for the park reserve.

Eelgrass meadows are important for sediment deposition and stabilization, which provide substrate for epiphytic algae and microinvertebrates. They also provide important habitat used by shellfish, fish and birds as nurseries and foraging grounds. Although eelgrass abundance varies naturally between seasons (e.g., winter die-off and summer growth), annual variation in eelgrass abundance is influenced by direct physical and chemical damage, light and nutrient availability, and water quality parameters such as temperature, turbidity and salinity.

The primary objective of eelgrass monitoring is to detect trends and changes over time in eelgrass fish communities and environmental factors which influence eelgrass growth and distribution. A secondary objective that was piloted in 2010 involves mapping eelgrass extent to assess changes in eelgrass distribution over time in relation to changes in environmental factors as well as the influence of boating and anchoring activity.

Figure 1: Beach seining in an eelgrass meadow.

Annual monitoring of eelgrass meadows involves tracking and reporting on seven fish community metrics and six environmental metrics. Fish community metrics include species richness, fish abundance and group abundance as well as a series of measures that assess fish community stability and persistence. Environmental metrics include sea surface temperature (SST), sea surface salinity (SSS), nitrates, fluorescence, eelgrass biomass and eelgrass epiphyte load.

Methods

Sampling involves repeated beach seining of eelgrass meadows in 12 core sites to assess fish species composition and abundance. Sample sites include Beaumont, Cabbage Island, Irish Bay, James Bay, James Island, Lyall Harbour, Moresby East, Reynard Point, Saturna Beach, Selby Cove, Sidney Spit and Tumbo East. A series of environmental and eelgrass measures are collected at each site along with eelgrass plant and water samples.

Results

Monitoring during the baseline period (2006-2013) has shown that annual variation in eelgrass meadows can be quite high. As an example, total fish sampled annually has ranged from 3800 to 16400 fish and varied substantially between sites, however the composition of fish communities has not been significantly different between years.

Sixty one different species of fish have been recorded since the program began however twenty fish species consistently comprise 99% of the all fish sampled in a year. Shiner Perch are the most abundant and the most frequently occurring fish species common to all sample sites (Figure 2). Saddleback Gunnel, Threespine Stickleback, Penpoint Gunnel, and Crescent GunnelTadpole Sculpin, Tubesnouts and Snake Prickleback were the next most common and abundant species in 2013.

When fish were grouped ecologically, abundance of the six primary groups including eel-like fish, flatfish, greenlings, plated fish, sculpins and seaperch was not significantly different between years for any group. Measures of fish community stability and persistence, evenness and taxonomic breadth suggest eelgrass fish communities in this area are relatively stable and persistent.

Environmental metrics including temperature and salinity were also not significantly different in 2011 compared to the baseline period, showing a strong environmental gradient relative to proximity to the Strait of Georgia (ie. sea surface temperature increasing the closer a sample site was to the Strait of Georgia). An environmental gradient was also observed with salinity measurements recorded at eelgrass sample sites in 2011 however the trend is opposite to that observed for temperature as salinity decreases the closer a sample site is to the Strait of Georgia. These gradients are likely attributable to the influence of the Fraser River which is responsible for large influxes of fresh water into the Strait of Georgia.

Figure 2: Female Shiner perch.

Next Steps

Annual sampling of eelgrass meadows and their associated fish communities will continue to be a key aspect of Gulf Island's Ecological Integrity Monitoring Program. Future efforts may also focus on mapping eelgrass extent and exploring the relationship between boating and anchoring activities and the condition of eelgrass in the park reserve and adjacent areas.