

## Eelgrass Monitoring in Port Mouton Bay

Sea grasses such as eelgrass (*Zostera marina*) provide key ecological services and have been referred to as “coastal canaries” which serve as sentinels of increasing negative influences in coastal ecosystems. Among several important ecological services, eelgrass provides feeding and nursery habitat for juvenile stages of fish and invertebrates such as lobster and crab. (Orth et al., 2006.) Eelgrass has been recently recognized as an Essential Ecological Species (DFO, 2009). These features make eelgrass an appropriate indicator of marine ecosystem health.

Stressors such as open net finfish aquaculture cause eelgrass declines due to eutrophication effects from increased sediment and nutrient supply with resulting turbidity and plankton blooms which reduce light levels in the water column (Orth et al. 2006).

A trout/salmon fish farm was active in this Spectacle Island area between 1994 and 2009. The farm was fallowed between July 2009 and May 2012 and re-stocked with trout in June 2012.

Friends of Port Mouton Bay (FPMB) began diver-assisted surveys of eelgrass beds in Port Mouton Bay in 2010. Eelgrass re-appeared after many years absence in Spectacle Harbour approximately 300 - 400 m from the farm site in the summer of 2010 after one year of fish farm fallow. Quantitative surveys of area extent of eelgrass beds and measurements of eelgrass condition were done in August 2011, August 2012 and August and October of 2013

Measurements of eelgrass condition included:

- Percent cover – eelgrass density within a 0.25m<sup>2</sup> quadrant.
- Shoot or canopy height - distance from the sediment to the top of 80% of the grass shoots after first ignoring the tallest 20% of the leaves.
- Epiphyte index - nutrient enrichment causes overgrowth of epiphytes (algae, bacteria, fungi, protozoa) on leaves which interferes with light penetration for photosynthesis.
- Eelgrass wasting disease - results from infection by the marine slime mould *Labyrinthula zostera*.
- Percent grazing - grazing due to animals that consume eelgrass (including eelgrass seeds) and animals that eat the epiphytes on the eelgrass blades

Eelgrass surveys in Port Mouton Bay focused on the area west of Spectacle Island in the inner bay and on a reference area approximately 3 km distant to the east which was adjacent to Jackies Island in the outer bay (Figure 1). Near Spectacle Island, area extent was surveyed at four eel grass beds in August of 2011 and repeated in August 2013; only three eel grass beds were surveyed in August 2012. The areal extent of the eel

grass bed near Jackies Island was included in each survey. Measurements of eelgrass condition along three transects were completed at Spectacle Harbour (SI-2) and at Jackie's Island in August of 2011 and 2012 and October of 2013. The 3-month lag in observations in October 2013 likely provided a seasonal effect which would have been reflected in poorer eelgrass condition than August measurements.



Figure 1. Location of eelgrass surveys near Spectacle Island and Jackies Island, Port Mouton Bay, 2011, 2012 and 2013.

Data are summarized in Table 1 and Figure 2. In 2012 declines in bed area from 2011 at the Spectacle Island sites at SI-2, SI-1 and SI-4 are indicated. Areal surveys did not encompass the total area of the eelgrass beds at Jackies Island in 2012 or at any of the locations in 2013. Areal extent is not as useful a measure as eelgrass condition.

Average percent cover at SI-2 increased between 2011 and 2013 while at Jackies Island, it decreased from the higher 2011 levels.

Average shoot height decreased at both SI-2 and Jackies Island between 2011 and 2013.

Average percent epiphyte load remained relatively low at SI-2 and Jackies Island between 2011 and 2012. In 2013, epiphyte load was 360% higher than in 2012 at SI-2 and relatively unchanged at Jackies Island. Increase of eelgrass epiphyte load has been associated with increased nutrient load in coastal embayments. Since epiphytes may compete with eelgrass for light and water column nutrients, excessive epiphyte fouling could have serious consequences for eelgrass growth (Montfrans et al. 1984).

Eelgrass Wasting Disease Index was at low levels at both SI-2 and Jackies Island sites in 2011, increased moderately in 2012 and was not surveyed during August area surveys in 2013<sup>2</sup>.

Grazing of eelgrass was at similar levels at both SI-2 and Jackies Island in 2013.

Table 1. Eelgrass Bed Area 2011-13.

	Jackies Island			Spectacle Harbour			SI-1			SI-4		
	2011	2012	2013	2011	2012	2013	2011	2012	2013	2011	2012	2013
Bed Area (m <sup>2</sup> )	881	≥616 <sup>1</sup>	627 <sup>1</sup>	1622	992	1221 <sup>1</sup>	190	129	188 <sup>1</sup>	219	231	167 <sup>1</sup>

Table 2. Average Measures of Eelgrass Condition 2011-13.

	Jackies Island			Spectacle Harbour SI-2		
	2011	2012	2013	2011	2012	2013
% Cover	97	71	77	47	44	70
Shoot height (cm)	142	61	55	63	43	47
% Epiphyte load	11	10	11	8	10	36
% Grazing			61			63
Wasting disease (index)	9	16	No data <sup>2</sup>	8	21	No data <sup>2</sup>

❖ <sup>1</sup>survey incomplete

❖ <sup>2</sup>EWD not surveyed as observations later in season are difficult to distinguish from seasonal die-off

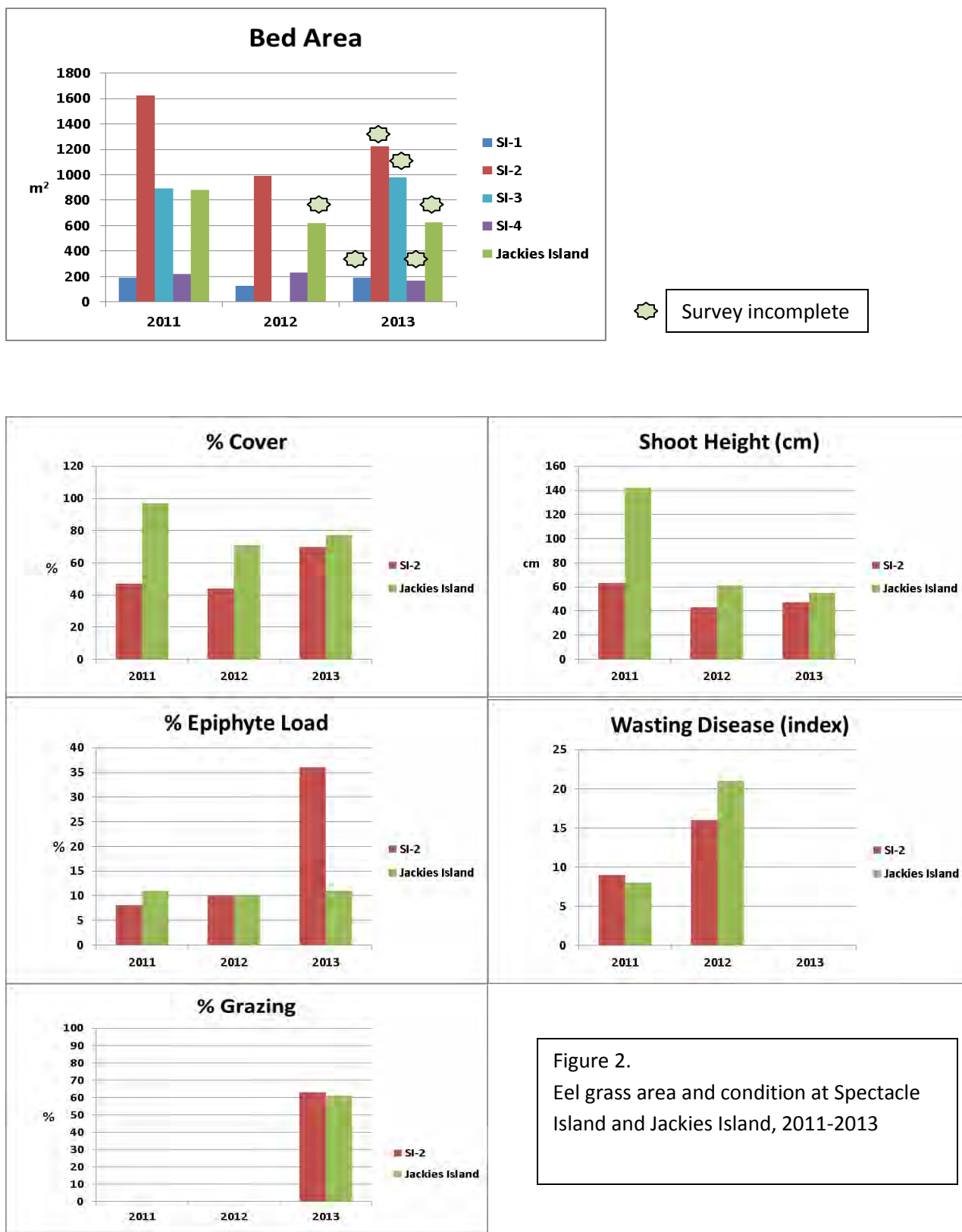


Figure 2.  
Eel grass area and condition at Spectacle Island and Jackies Island, 2011-2013

Figure 2. Charts showing eel grass area and condition at Spectacle Island and Jackies Island ( 2011 – 2013) .

Divers reported good visibility at Jackies Island in 2011 and 2012 but poor visibility at SI-2 in 2011 and very poor visibility there in 2012. In 2013 there was much sediment suspension when disturbed at SI-2 and brown water color at Jackies Island due to previous rainy conditions.

Diver field observations in August 2013 indicated poorer eelgrass condition at SI-3 and SI-4 than at SI-2 (T. Ball, personal communication).

Photographic evidence is provided at the end of this report.

## **Conclusions**

The eelgrass bed at Spectacle Harbour exhibited partial recovery in area in 2011 but was in poorer condition than the Jackies Island reference site.

In 2012, both locations declined in condition but overall condition remained better at Jackies Island.

In 2013 the Spectacle Island location improved in percent cover and shoot height condition but showed a considerable increase in epiphyte load. In 2013 Jackies Island showed little change in condition from 2012 and overall condition remained better at Jackies Island in 2013.

Further surveys including all eelgrass beds in the Spectacle island area will provide more comparative information.

## **References**

DFO. 2009. Does eelgrass (*Zostera marina*) meet the criteria as an ecologically significant species? DFO Can. Sci. Advis. Sec. Sci. Rep. 2009/018.

Montfrans, J., R. L. Wetzel and R. J. Orth. 1984. Epiphyte-Grazer Relationships in Seagrass Meadows: Consequences for Seagrass Growth and Production. Estuaries Vol.7, No.4, Part A: Faunal Relationships in Seagrass and Marsh Ecosystems, 289-309.

Orth, R. J., T. J.B. Carruthers, W.C. Dennison, C.M. Duarte, J.W. Fourqurean, K.L. Heck Jr., A.R. Hughes, G.A. Kendrick, W.J. Kenworthy, S. Olyarnik, F.T. Short, M. Waycott and S. L. Williams. 2006. A Global Crisis for Seagrass Ecosystems. Bioscience. December 2006 / Vol. 56 No. 12, 987-996.

## **Acknowledgements**

FPMB gratefully acknowledge the diving and photography by Oliver Woods and Megan Symington in 2011 and 2012, by Dalhousie University students, Tori Ball and Sonya Lee and Dalhousie University dive master, John Lindley in 2013 and the technical advice and support from Parks Canada. FPMB members Clyde Fisher facilitated the field surveys, Capt. Richard Broome and Capt. Donaldson Fisher provided their fishing boats.



**Jackies Island 2011**

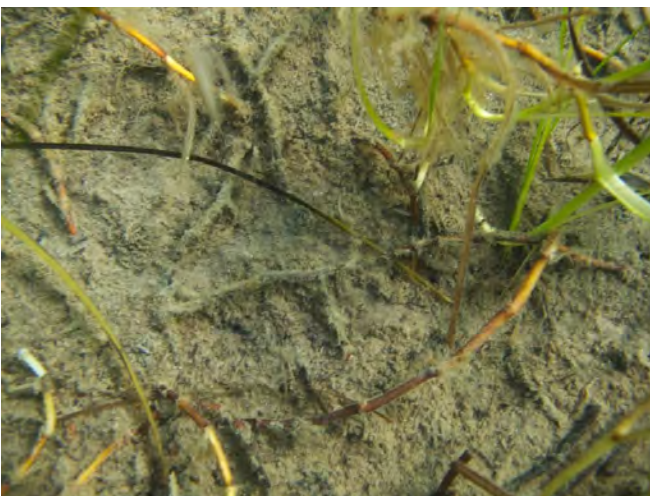
**3000m from farm site, August**



**Spectacle Harbour 2011**

**300m from farm site, August**

Photos Woods and Symington





## Jackies Island, August 2012

## Spectacle Harbour, August 2012

Photos Woods and Symington

