Report on Seabed Particle Trajectories in Port Mouton Bay

Background

This is a report on some 'particle' trajectories from the proposed salmon aquaculture site near Port Mouton Island. Friends of Port Mouton Bay have wanted to test the hypothesis that dissolved, suspended or floating material from the Spectacle Island salmon aquaculture site and from the proposed site off Port Mouton Island could reach nearby shores as a result of wind-drift. Experienced fishermen advised us that both sites are depositional areas except in times of strong winds, and that northeast winds would be most effective for transporting accumulated material. In an earlier report we presented near-surface drogue tracks over a semi-diurnal tidal cycle on a day of light winds which showed that current speeds were low and the waters re-circulated – supporting the hypothesis of deposition in Port Mouton Bay. This report relates to the transport of particles under persistent northeast winds.

Approach

Our experimental design was aligned with the fishermen's experience in Port Mouton Bay, and used seabed drifters. Seabed drifters are small, parachute-shaped plastic objects, weighted to sink, rest lightly on the bottom, and move with the currents there. A fishing boat crew was ready to release seabed drifters and record GPS lat/long coordinates when northeast winds were expected . After drifters were released, members of the community would patrol the shores, preferably each day, looking for these drifters or other debris. With just twenty-nine drifters available to us, we assessed the likelihood of recovering any as low but worth the effort which would be expended. This activity began in early December, 2006.

Results

Not until January 8th 2007 were northeasterly winds forecast. The fishermen released twelve of the twenty-nine seabed drifters at the proposed Port Mouton Island aquaculture site, and the shore patrols began. Inaccessible shores, e.g., on the islands, were scanned from the water by fishermen with binoculars. On this occasion northeast winds did not materialize.

The patrols continued, but no seabed drifters were found in January. Late in January, when northeasterly winds were again forecast, ten drifters were released - seven at the proposed Port Mouton Island site and three at the existing Spectacle Island site. Again northeast winds did not materialize. Through all of February, the shore patrollers reported no finds. On March 13th, a day of light winds when we were working from a fishing boat tracking near-surface drifters to test for conditions of deposition of particulates and re-circulating tidal trajectories, we released the remaining seven seabed drifters near the Spectacle Island site.

For the period, December 2006 to March 2007, northeast wind events were rare, and no seabed drifters were found. Seal carcasses, dead of a bullet, in all likelihood from the existing aquaculture operation near Spectacle Island, were found on Carter's and Wobamkek beaches. On March 21st, a seabed drifter was found on Little Joli Beach in Kejimikujik National Park, Seaside Adjunct. However on examination it was determined *not* to be one of our releases. It carried no identification and was made of a different color plastic. We have been seeking information about where and when it might have been released but have found nothing to date.

On April 13th a short period of NE winds occurred. Unusual brown oily debris was photographed on Carter's Beach (Friends of Port Mouton Bay Contribution #07). During the period of April 16th to 19th,

persistent northeast winds were experienced. Hourly winds as high as 56, 44 and 30 km/h were recorded at Western Head on April 16th, 17th and 18th, respectively. With spring tides occurring as well, there was a lot of energy in the water column. A ~3m x 3m floating dock from the Spectacle Island aquaculture site, as well as part of a fish-cage structure, washed up on Carter's Beach.

On April 19th a shore-patroller found one of our drifters. It carried one of our identification numbers and was washed up on the shore beyond Bull Point, within 200 m of the Park boundary post. The likelihood is that it had been newly stranded, since that shore had been patrolled recently. It had been released from the proposed aquaculture site near Port Mouton Island on January 8th , more than 100 days earlier.

On April 20th, a second of our drifters was found, this one further south along the shore of the National Park, about 1 km inside the Park (Figures 1 and 2). This drifter had been also been released at the proposed aquaculture site near Port Mouton Island, but in late January.

On April 23rd a third seabed drifter was retrieved – ashore at Mouton Head, also released by us in late January at the proposed site near Port Mouton Island. Retrieving this drifter involved a 6 km return hike over rocky shoreline (Figure 3). Patrolling continues for other drifters that may have been transported to shore during the recent northeasterly wind event. Any drifter that became buried in seaweed windrows may become visible later as the seaweed decomposes.

Figure 1. Drifter 195 in Kejimikujik National Park.

Figure 2. Entering the National Park to retrieve Drifter 195.

Figure 3. Drifter 189 ashore at Mouton Head in Kejimikujik National Park

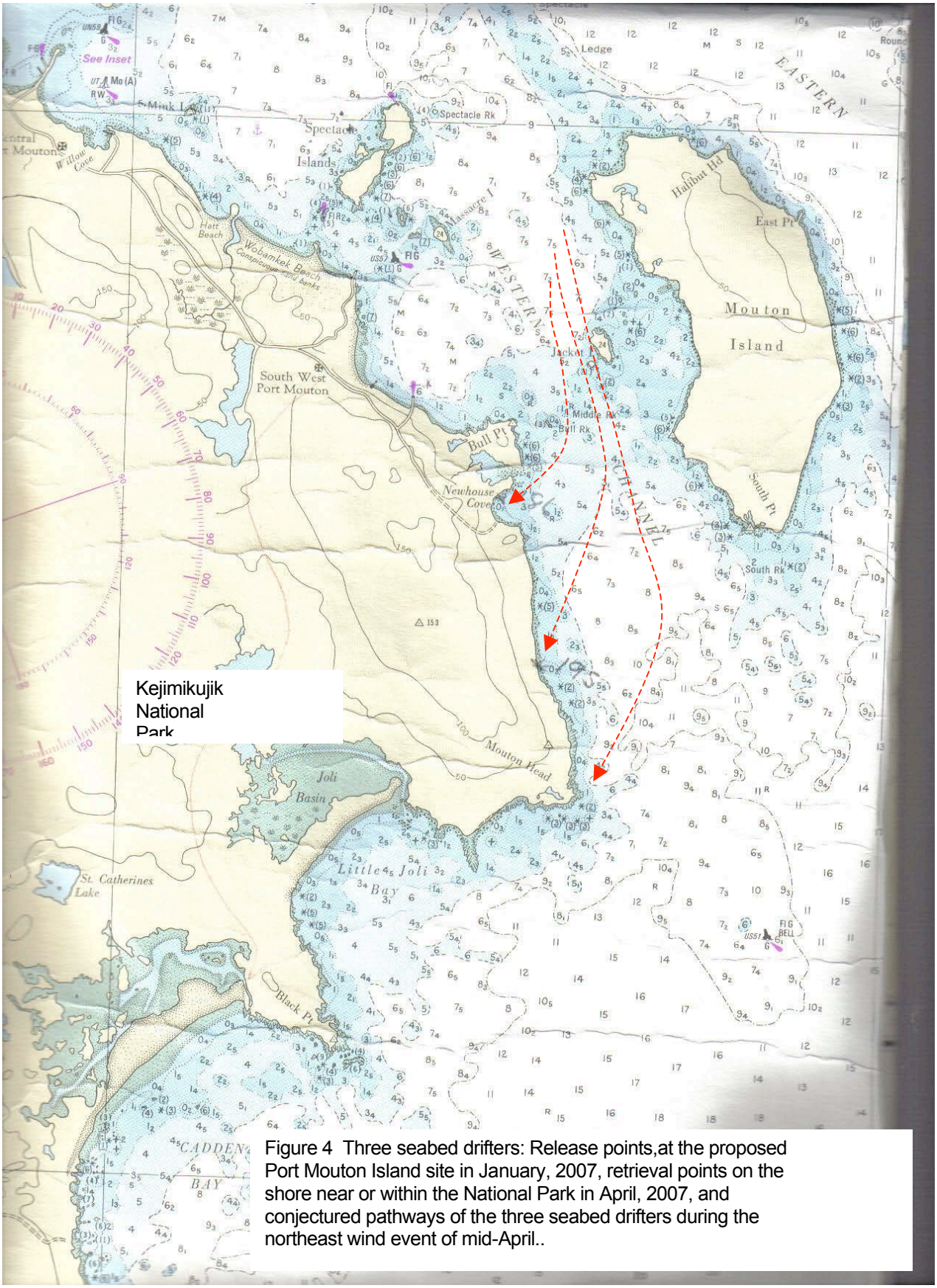

Figure 4 Three seabed drifters: Release points,at the proposed Port Mouton Island site in January, 2007, retrieval points on the shore near or within the National Park in April, 2007, and conjectured pathways of the three seabed drifters during the northeast wind event of mid-April..

Interpretation

The pattern recognized by fishermen at the proposed site off Port Mouton Island – periods of collection and deposition of materials there, interrupted by episodes of transport and dispersal away from the site associated with northeasterly winds - is supported by at least three sets of data. The AquaFish 2002 current meter data showed low average speeds consistent with deposition. The drogue tidal cycle study which we conducted on March 13th, 2007 indicated low speeds and recirculation through a tidal cycle rather than exchange of waters. These seabed drifter results suggest accumulation of non-buoyant materials at the site for an extended period, then mobilization and transport during northeast winds. This is the pattern described by the fishermen. The situation at the proposed Port Mouton Island salmon aquaculture site and at the existing Spectacle Island site appears to be this: periods of deposition - of salmon aquaculture particulates - interrupted sporadically by wind-drift events which transport material to nearby shores. The deposition model DEPOMOD typically predicts drifts of one to three kilometres for materials resuspended (e.g., by storm waves) from salmon farms (B. Hargrave, pers. comm.). In this case such materials could reach shores, as these seabed drifters did (Figure 4).

Conclusion

Based on the pattern observed by fishermen over long experience, on our analysis of the 2002 moored current meter data as well as on our March 2007 near-surface tidal-cycle drogue observations, and now the January 2007 to April 2007 seabed drifter results to date, it is concluded that fish farm wastes would be deposited in the area of these farm sites during much of the time and that the potential is there for this settled waste material and nutrients to be resuspended and transported at least a few kilometres from the site to nearby parks and protected areas.

References

Current Measurements in Port Mouton Bay, March 23, 2007. Friends of Port Mouton Bay.

Appendix

Seabed Drifter #	Release Point, Latitude	Longitude	Date and Location of Retreival
Release on January 8th, 2007 near Port Mouton Island site			
169	43° 54.417'	64° 47.348'	
168	43° 54.446'	64° 47.321'	
162	43° 54.480'	64° 47.294'	
165	43° 54.500'	64° 47.239'	

176	43° 54.371’	64° 47.200’	
166	43° 54.366’	64° 47.238’	
164	43° 54.352’	64° 47.289’	
163	43° 54.358’	64° 47.335’	
190	43° 54.245’	64° 47.278’	
161	43° 54.262’	64° 47.256’	
184	43° 54.292’	64° 47.218’	
186	43° 54.317’	64° 47.184’	April 19th, New House Cove, just south of Bull Point.
Release around January 29th			
191	43° 54.647’	64° 47.192’	
200	43° 54.610’	64° 47.178’	
194	43° 54.580’	64° 47.165’	
195	43° 54.555’	64° 47.162’	April 20th, 1 km north of Mouton Head in Kejimikujik National Park
196	43° 54.502’	64° 47.188’	
189	43° 54.484’	64° 47.173’	April 23rd, Mouton Head in Kejimikujik National Park
198	43° 54.465’	64° 47.162’	
192 Spectacle	43° 54.888’	64° 48.837’	
197 Spectacle	43° 54.908’	64° 48.791’	
193 Spectacle	43° 54.959’	64° 48.723’	
Release on March 13th, 2007 near Spectacle Island site			
199	43° 54.747’	64° 49.071’	
168	43° 54.738’	64° 49.025’	

185	43° 54.711’	64° 48.995’	
181	43° 54.684’	64° 48.960’	
182	43° 54.655’	64° 48.938’	
183	43° 54.637’	64° 48.916’	
187	43° 54.606’	64° 48.889’	