



# ***A Pilot Field Study of Circulation Patterns in Muscongus Bay***

**Preliminary Report To  
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**Executive Summary**

The Cobscook Bay Resource Center conducted a pilot field drifter study of circulation patterns in Muscongus Bay. Five Seimac drifters with GPS and satellite transmitter capabilities were deployed to track surface currents. A Gonio 400 ARGOS Direction Finder was used to detect the signal that the drifters emit and from the signal determine the bearing of the drifter, allowing efficient retrieval of the deployed drifters.

Drifters were deployed and tracked from a lobster boat operated by Capt. Richard Nelson. Drifters were released near Gangway Ledge in a cluster. The deployment was initiated at the beginning of a flood tide stage. The drift trial was short term, consisting of a half tide cycle or approximately six hours.

After the trial was completed, data was downloaded directly from the drifters to a computer at the Cobscook Bay Resource Center. After data processing was completed the tabulated data and a map layout for the trial was provided to QLF staff.

**Methods**

*Equipment*

Five Seimac CAST (Convertible Accurate Surface Tracker) drifters with ARGOS and GPS capability were deployed to track surface currents. The drifter design consists of a floating blue barrel with holes in the sides to allow filling and emptying of water. The onboard electronics are housed in an orange PVC pipe positioned in the top of the barrel. Ballast is provided by chain inside the bottom of the barrel and flotation by styrofoam in the top. The position of the drifter is recorded in two ways; first, by an onboard GPS receiver from which positional coordinates can be downloaded directly; second, by a satellite transmitter called a Smart Cat PTT (platform transmitter terminal). The transmitter sends signals to the ARGOS satellite system, which in turn transmits the drifter's position to a ground station. Users can access the data at the ground station through the ARGOS website.



The electronics inside the CAST drifters are powered by 28 alkaline “D” cell batteries configured into one shrink-wrapped power pack.

A Gonio 400 ARGOS Direction Finder was used to allow efficient retrieval of the deployed drifters. This piece of electronics detects the ARGOS signal that the drifters emit and from the signal determines the bearing of the drifter. Each drifter has a unique ID number which can be programmed into the Gonio. When the Gonio receives a signal from a particular drifter, it displays the bearing of the drifter in relation to the bow of the boat. The Gonio determines bearings to within 30° plus or minus of the direction displayed. When the Gonio is receiving a signal from a drifter, it indicates signal strength as well as the bearing. This lets the user know how close the Gonio is to the drifter. Signals are received by an antenna mounted on the bow of the boat and connected to the Gonio by a cable. The antenna must be mounted on the wheelhouse of the boat and programmed to work with the Gonio each time the drifters are deployed.



### *Pre-deployment Procedures*

Conversations with resource users in Muscongus Bay regarding potential deployment sites for this initial pilot run were discussed among the study team in conference calls. The area near Gangway Ledge was selected for deployment on the incoming tide. This location offered several possible drifter pathways including passing east of Otter Island, moving through Otter Island Passage or drifting west past Black Island Ledge.

The US Coast Guard station in Rockland was notified of the drift study date and duration prior to deployment of gear.

### *Deployment Procedures*

Drifters are released from pre-determined sites in one of three configurations: transects, clusters or timed release. All deployments are initiated at the beginning of a tide stage, i.e. at low water or at high water. Drift trials are short term, consisting of a half tide cycle or approximately six hours. The short duration of drift trials has been chosen to reduce the likelihood of retrieving drifters from offshore waters, which would require a move to larger boats and increased staff time. Also, anything left in the water for longer than six hours tends to run aground in the near shore area.



Each individual drifter is allowed to follow the currents without interference during the entire 6 hour trial. If a drifter runs aground at any time during the trial, the drifter is retrieved and that track is ended.

Drifter deployment and tracking was conducted from a lobster boat operated by Capt. Richard Nelson. Diane Cowan of the Lobster Conservancy provided assistance from her skiff. Five drifters were released near Gangway Ledge in a cluster at about 9:45AM on Thursday, August 13, 2009. The flood tide began at about 10:18AM. All drifters were recovered by 4:15PM.

### *Data Processing*

After each drifter trial is complete, data is downloaded directly from the data storage unit within the drifter to a computer at the Cobscook Bay Resource Center. The GPS unit inside the drifter is connected to the computer through a serial cable. Using software called ULogger, the user is able to interface with the GPS unit. Through ULogger an ASCII file of data is generated and stored in a .log file. The .log file is converted to a text file and brought into Excel. In Excel, the data is converted to a comma delimited file. The comma delimited text file is brought into ArcView and used to create an Event Theme. This process converts the latitude/longitude coordinates of the positions collected by the drifter's GPS unit into points on a map.

Because the drifters are collecting data points from the time they are turned on when loaded on the boat until they are turned off upon return to the wharf, the actual deployment track positions must be filtered out of the entire file of points created. Data from each drifter for each trial is divided into three separate files: pre-trial data, showing the track followed to the deployment point; the deployment track, showing the actual pathway from deployment to recovery; and post-trial data, from recovery point to the wharf. The deployment tracks are displayed on maps as lines depicting the direction the drifter traveled during a particular trial.

## **Results**

After data processing was completed the tabulated data and a map layout for the trial was provided to QLF staff. Raw GPS data for each individual drifter was presented in comma separated tables. Each table included all data collected from the time the drifter was turned on at the dock in the morning until the drifter was turned off at the dock in the afternoon.

Shapefiles were created for each drifter for use in ArcView mapping software. Files were organized by drifter ID number. For example, in the file 30684 within the Muscongus Bay shapefiles folder the data is associated with four shapefiles:

- 30684all - All GPS points recorded by that drifter.
- prettrial - All GPS points collected once the drifter was turned on in the morning until it was deployed in the water.
- posttrial - All GPS points collected once the drifter was brought aboard the boat until it was shut off at the dock.
- track - All GPS points collected once the drifter was placed in the water until it was hauled back on the boat. Outlier GPS points have been removed from this file. This is the shapefile used to create the map layout.

Note: Drifter 30696 did not collect data throughout the entire run and therefore does not have as many shapefiles. While the drifter battery was found to have an acceptable voltage level when checked prior to deployment, the battery evidently did not hold enough of a charge to operate throughout the entire day. The drifter collected points from the time it was turned on until sometime during the boat trip out to the deployment location. It also collected some intermittent points during the trial, but not enough for a complete track.

As the map below illustrates, the drifters moved westward in a tight grouping, passing between Harbor and Black Islands before turning more northerly; not beginning to separate from each other until near the end of the flood tide. A future deployment in the same area along a transect, rather than in a cluster, might reveal a very different pattern of activity.



# Muscongus Bay Drift Study

## Drifter ID

- 30684
- 30694
- 30696 (incomplete)
- 30699
- 30701

