

## Cruise plan for 6th BITMAX cruise, October 7-15, 2002

Based on predicted tides for October 2002

This cruise will be a highly interdisciplinary cooperative effort between the R/V Cape Henlopen (Univ. of Delaware) working primarily the channel of upper Chesapeake Bay, the R/V Coot (VIMS) working primarily the lateral shoals, and the R/V Orion (UMCES) working primarily the lateral shoals. The Cape Henlopen will generally work around the clock. The Coot will work only daylight hours. The Coot will put into the Worton Creek Marina, and VIMS personnel will stay at the Chestertown Comfort Suites (410-810-0555). The Orion will work primarily late afternoon and night hours, and will put into Great Oaks (410-778-2100). On occasion, scientific crew will need to exchange between the vessels or shuttle to and from shore. Cape Henlopen direct shore exchanges, if necessary, will take place using the Cape Henlopen NAZ at a place to be determined.

### Science Crew -

Henlopen:

Oct 7-15: Elizabeth North (Chief Scientist), Steve Suttles, Patrick Dickhudt, Scott Lloyd, Angela Padeletti, Adam Spear

Oct 7-12: Toby Auth, John Bichy, Suzi Jones, Ed Martino

Oct 10 daytime only: Heidi Romine, Marissa Yates, Larry Sanford

Oct 10-15 Carey McGilliard

Coot: C. Friedrichs, W. Reisner, G. Battisto, H. Romine, J. Brubaker, L. Brasseur, ..., changing out personnel as needed

Orion: Oct 12-15: Toby Auth, John Bichy, Suzi Jones, Ed Martino (except for Oct 13-14 24 hr survey)

Oct 13-14 night: John Bichy, Ed Martino, Suzi Jones, Xinsheng Zhang

Oct 14 day: Toby Auth, Patrick Campfield, ? Connelly, Jun Shoji, Mike Roman

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Vessel Key - H = R/V Cape Henlopen, C = R/V Coot, O = R/V Orion

### Day 0 (Sunday, Oct 6)

1900-2100 H load HPL gear in Cambridge

C transit to upper Bay

### Day 1 (Monday, Oct 7)

0600 H depart Cambridge for Solomons

0900-1000 H load Houde equipment, depart for upper Bay

1400-1830 H carry out quick axial hydrographic survey of upper Bay to establish approximate location of ETM (waning ebb tide); basic CTD measurements only

1830-0630 H axial mid-water trawling

C sediment sampling, set lateral ADP mooring at end of day

### Day 2 (Tuesday, Oct 8)

0700-0900 H establish physical moorings at Howell Pt.

0900-1100 H transit to Bay Bridge vicinity

1100-1730 H&C thorough hydrographic/zooplankton/particle survey of upper Bay, working

from S- N, centered on strong ebb tide. H occupies channel stations and C occupies lateral transects. Observations will include ADCP, CTD, turbidity, LISST, fluorescence, TAPS, selected suspended sediment and zooplankton pump samples, and selected plankton tows. C to use mini-CTD/LISST/OBS-profiler.

- 1800- H begin 1st 26 hr. underway time series survey of ETM region
- begin at slack before strong flood (sunset), followed by strong ebb (sunrise at slack), followed by weak flood and moderate ebb
  - transit up and down ETM channel, 5 CTD stations going up, Tucker trawls going down (only at night), cycling every 1.5 (without TT) or 3 hrs (with TT), locations fixed
  - Observations to include ADCP, CTD, turbidity, fluorescence, TAPS, pump samples, LISST, selected Tucker trawls during night

#### Day 3 (Wednesday, Oct 9)

0800-1800 H set up DIFIK Profiler

1900 H finish 1<sup>st</sup> 26 hr. survey

0730-1800 C carry out repeated lateral transects at center of H survey pattern

1900-0630 H Axial Tucker trawling

#### Day 4 (Thursday, Oct 10)

0630-0730 H prepare for turbulence anchor station

0715 H pick up Heidi Romine, Marissa Yates, Carey McGilliard, and Larry Sanford from C

0730-1830 H&C carry out intensive turbulence observations, concentrating on turbulence structure relative to thermohaline stratification and particle characteristics. Methods include DIFIK profiles from H at anchor, ADCP profiles from H, Owen tube casts from H, C drifting with SCAMP microstructure profiler, mini-profiler, ADCP

0730-1830 H TAPS and zooplankton pump profiles while anchored

1830 H transfer Heidi Romine, Larry Sanford, and Marissa Yates to C

1900-0630 H axial mid-water trawling in ETM vicinity

#### Day 5 (Friday, Oct 11)

0630-0830 H transit to Bay Bridge

0830-1500 H thorough hydrographic/zooplankton/particle survey of upper Bay, working from S- N, centered on weak flood tide. Observations will include ADCP, CTD, turbidity, LISST, fluorescence, TAPS, selected suspended sediment and zooplankton pump samples, and selected plankton tows.

1800-0630 H axial mid-water trawling

0800- C recover VIMS moorings, steam for Gloucester Point

#### Day 6 (Saturday, Oct 12)

0700-0830 H steam to Tolchester vicinity

0900-1130 H collect cores for erosion experiments at Tolchester and Grove Pt using multicorer

1000-1600 O steam up-Bay

1130-1900 H anchor and carry out erosion experiments, collect pumped samples for particles and zooplankton

1600-1700 O meet with H to transfer personnel, using Henlopen NAZ if necessary

1700-0300 O carry out axial mid-water trawling over shoals

1900-2100 H re-establish location of ETM center  
2100- H begin 2<sup>nd</sup> 25 hr. underway time series survey of ETM region, beginning at slack before strong flood, followed by strong ebb (sunrise at max ebb), followed by weak flood and moderate ebb, same protocols as 1st survey except no nighttime Tucker trawling, and including zooplankton pump samples

Day 7 (Sunday, Oct 13)

2200 H finish 2<sup>nd</sup> 25 hr. survey, anchor for several hours  
1900-0630 O carry out first 12 hours of 24 hour survey, Tucker trawling and zooplankton sampling near ETM

Day 8 (Monday, Oct 14)

0230-0500 H steam for Bay Bridge  
0500-1130 H thorough daytime hydrographic survey of upper Bay, S-N, centered on strong ebb  
0630 O steam to Great Oaks for crew change  
0730-1900 O carry out second 12 hours of 24 hour survey  
1430-1700 H steam for Bay Bridge  
1700-2330 H thorough evening hydrographic survey of upper Bay, S-N, centered on weak ebb  
1900 O steam to Great Oaks for crew change  
2000-0400 O carry out axial mid-water trawling over shoals

Day 9 (Tuesday, Oct 15)

0400-0900 O steam to CBL or Sandy Point – end of cruise  
0700-0900 H pick up physical moorings at ETM center  
0900 H transit to Cambridge and Solomons, unload, then transit to Lewes

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### **Description of Houde group activities and equipment**

We will use a 1 m<sup>2</sup> Tucker trawl with 280 micron meshes, deployed at selected stations to sample ichthyoplankton and zooplankton near bottom, at middle depths, and near surface. Plankton samples will be preserved in ethanol. An 18 m<sup>2</sup> mouth-opening midwater trawl, with 6 mm codend liner will be towed for 20 minutes in 2-min stepped oblique segments from surface to bottom to collect pelagic and benthopelagic fishes. Fishes will be measured and aggregated species biomasses will be determined at each sampled station. Selected samples of fish for stomach analysis and otolith-aging analysis will be frozen or preserved in ethanol. We will need 8-9 feet of bench space in the dry lab on Henlopen and storage space in cabinets/drawers, and under the benches of the dry lab. We will request a CTD cast before each of our Tucker trawl or midwater trawl tows. Time requirements are: Tucker trawl, approx 30 min; midwater trawl tow, approx 1 hour. Net-towing activities on Henlopen are restricted to the channel in the upper Bay.

For the Orion work on the shoals, we will need winch, pump, wash-down hoses, depth sounders, navigation/tide stage information, AC power. Operations will include Tucker trawl, midwater trawl, CTD casts, pumping water with pump attached to CTD frame, and probable deployments of small plankton nets.

## **Description of Roman group activities and equipment**

We will have our team stand watches (3 people on 4 h watches plus Scott) so that someone will always be able to run the TAPS (which we are intending to leave on the CTD). The TAPS will be hard-wired to the surface for power and to give real-time output. If there are cases when rapid CTDs are needed without TAPS - we will remove the cable and insert a dummy plug into the case. On TAPS casts we record on the upcast which has to have a SLOW retrieval rate (1 m/min). We will use a high-volume (550 liters/min) bellows pump to collect zooplankton to compare to the TAPS measurements. The outflow water will be pumped through a 64-um mesh plankton net suspended over the side of the ship. We would like to do these collections when time permits -but also get samples over the day and night and in/out of the ETM region.

Scott Lloyd (with help from others) will be collecting samples to determine egg production rates. Egg production collections will be conducted in water at different depths and tidal stages in the ETM and in water "up-stream" and "downstream" of the ETM. Water will be collected from Niskin bottles; zooplankton from net tows off the starboard-quarter davit. Water samples will be filtered for: seston weight, chlorophyll, carbon, nitrogen, protein, carbohydrate, lipid, free- and attached-bacteria.

We will also collect water with Niskin bottles for copepod nauplii counts. Entire Niskin bottles (10L) will be drained through 35um-mesh screens and the samples preserved in 5% formalin. I think the best time to collect these samples is in association with the Tucker Trawls that Houde collects so that we can relate the 2 measurements. Periodically throughout the cruise we will filter samples for chlorophyll-a determination so that we can convert the fluorometer reading on the CTD (uvolts) to chl-equivalents.

On the Orion work on the shoals we will filter water (likely 20 liters) from the surface/middle and bottom using a submersible well pump; filter the water through 35 um-mesh for counting nauplii and small zooplankton. If the samples are highly turbid we will use 64um-mesh.

## **Description of Sanford group activities and equipment**

We will use a variety of instruments and equipment to measure physical properties of the water column and sediments of the upper Bay. The Henlopen CTD, with several auxiliary instruments attached, will be a primary platform. The auxiliary instruments include a transmissometer, an OBS, and a LISST-100 particle sizer. We will also utilize data collected with the new RDI 600 KHz hull-mounted ADCP, both in standard mode at all stations and in special turbulence mode on Day 5. We will use 2-3 laptop computers in the laboratory for data downloading and processing, and will need a serial connection with the Henlopen GPS feed. The Henlopen multicorer will be needed on day 6. An in-house profiling rig (aluminum frame approx. 7 ft tall by 2 ft wide by 5 ft. long) will be utilized on day 4. An Owen settling tube will be used on day 4 as well. Three moorings will be placed adjacent to each other in the lee of the channel marker buoy at Howell Point on day 2, and will be recovered before returning to port on day 9. These moorings will consist of a lighted yellow surface buoy, a subsurface taut-wire mooring, and a bottom-mounted tripod. The location of these moorings has been submitted to the USCG for inclusion in the Notice to Mariners.

## **Description of Friedrichs group activities and equipment**

For our bottom sampling on the first day of the cruise we will use a “Smith-Mack” bottom sampler, which collects 20 cm deep surface grabs which preserve the sediment-water interface. We will collect grabs at selected stations along a main channel axis transect and 1 lateral transect. Three subcores approximately 9 cm in internal diameter will be taken from each grab as well as a rectangular x-ray core. These subcores will analyzed for profiles of water content, grain size, Eh, organic content and Beryllium activity. At the end of the first day of coring, we will deploy an upwarding looking ADP on the shoals in the vicinity of the ETM. During the remainder of the first week of the experiment we will collect water column observations using either our mini-profiler or our large profiler. Both profilers support a CTD, OBS, LISST and pump intake. The larger profiler also supports an ADV. Because of its ease of operation, especially under rough conditions, the mini-profiler will be used during full upper Bay transects and when supporting the SCAMP. The large profiler will be used only during lateral transects in order to document differences in bed stress between the channel and the shoals. If weather is rough during lateral transects, we will switch back to the mini-profiler. The SCAMP will be used on day 4 in coordinated study of turbulence with the Henlopen.