



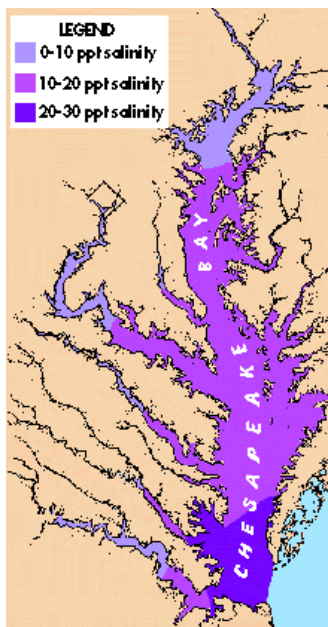
## Blue Crab



spawns in the ocean  
matures in the estuary  
how does it get where it needs to be?

<http://www.esva.net/~tomthumbworkshps/emailtrav.htm>  
<http://www.naturalvisions.co.uk/pictures/>

## Chesapeake Bay



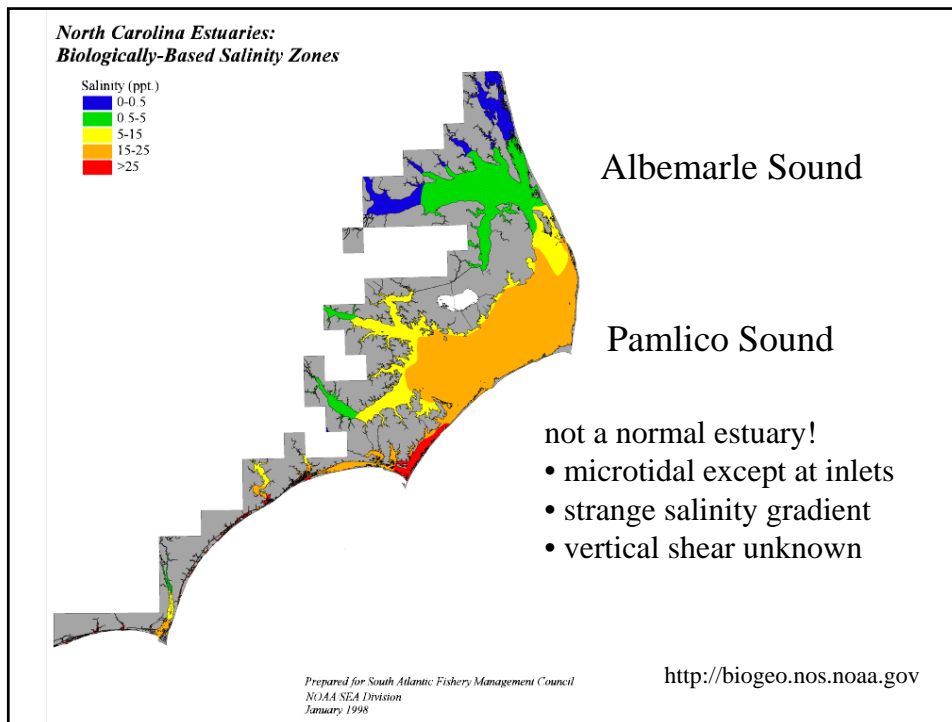
### Flood Tide Transport (FTT)

- surface on flood, bottom on ebb
- net motion up-estuary

### Assumptions

- significant tides
- along-estuary salinity gradient
- flood strongest at surface

<http://www.mdsg.umd.edu/CBEEC/toxicrpt/workshop.html>



## Blue Crab Larvae, Prior Studies

### Lab studies of vertical migration (fast)

(Tankersley et al, '94, '95, '98, '02)

- negative phototaxis
- swim when salinity increases
- swim when pressure increase >> tidal

### Field studies of settlement at Beaufort (slow)

(Forward et al, '04)

- high during neap tide
- high when flood ends after midnight

## **Nathalie Reyns, PhD thesis**

### **Observations:**

- counted crabs over large part of Pamlico Sound
- very good spatial coverage
- temporal resolution day/night, not flood/ebb
- found postlarvae at surface at night
- found postlarvae in western part of Sound

... not a demonstration of FTT ...

## **Nathalie Reyns, PhD thesis, Part II**

### **Model:**

- hindcast using R. Luettich wind-driven model
- assume crabs swam < 5 days
- wind model: start crabs at inlets
- wind/tide model: start crabs 1 tidal excursion landward

### **Results:**

- wind alone: crabs along eastern sound
- wind/tide: crabs to western sound

... suggests importance of FTT

## **New Biological Questions**

### **Do blue crab postlarvae in Pamlico Sound ...**

- swim more on flood than ebb?
- swim at the depth of maximum current?
- respond to increasing salinity on flood?

### **To Answer ...**

- need temporal and vertical resolution
- focus on one location



## **New Physical Questions**

### **Currents in Pamlico sound**

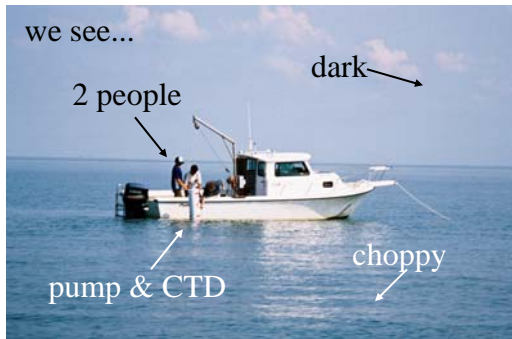
- actually stronger at the surface on flood?
- more night floods on spring or neap?

### **Salinity in Pamlico Sound**

- actually increase on flood?
- respond to currents or wind?

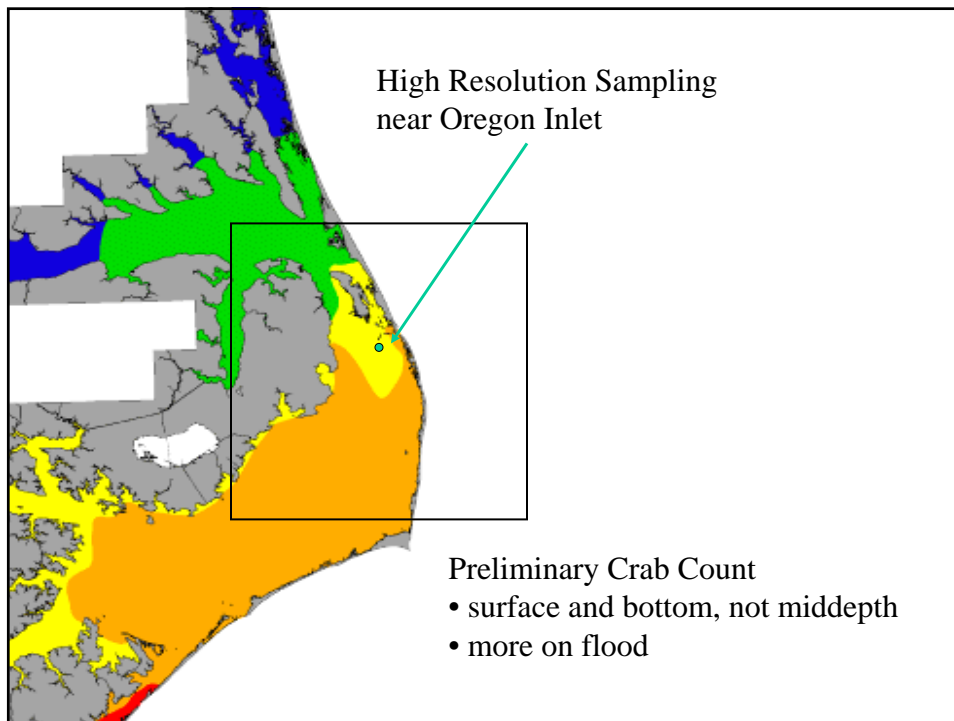
**ADCP**

- bottom mounted
- upward looking
- currents all depths
- 3 month timeseries
- CTD attached



**Dave and Gayle**

- 7 nights in September
- hourly crab counts, 4 depths
- 1/2 hourly CTD profiles



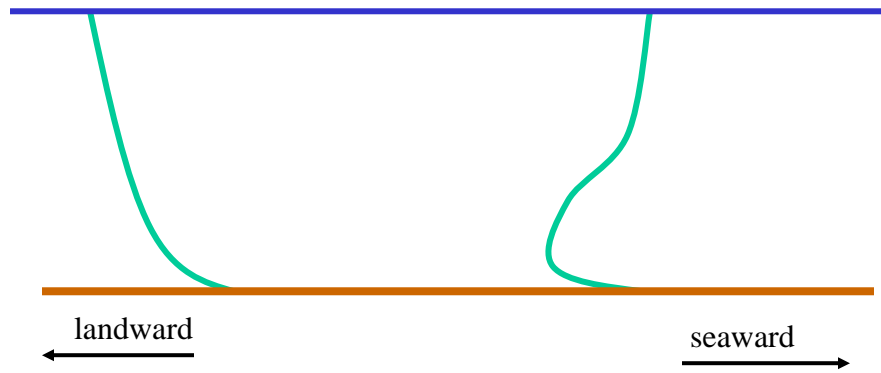
## Flood Currents: 2 Models

### friction dominated

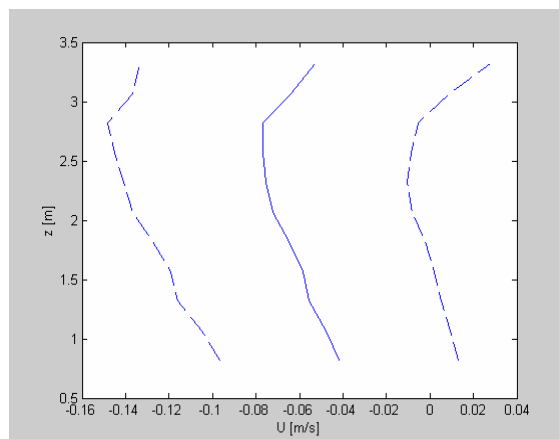
- fast at surface
- shallow, unstratified

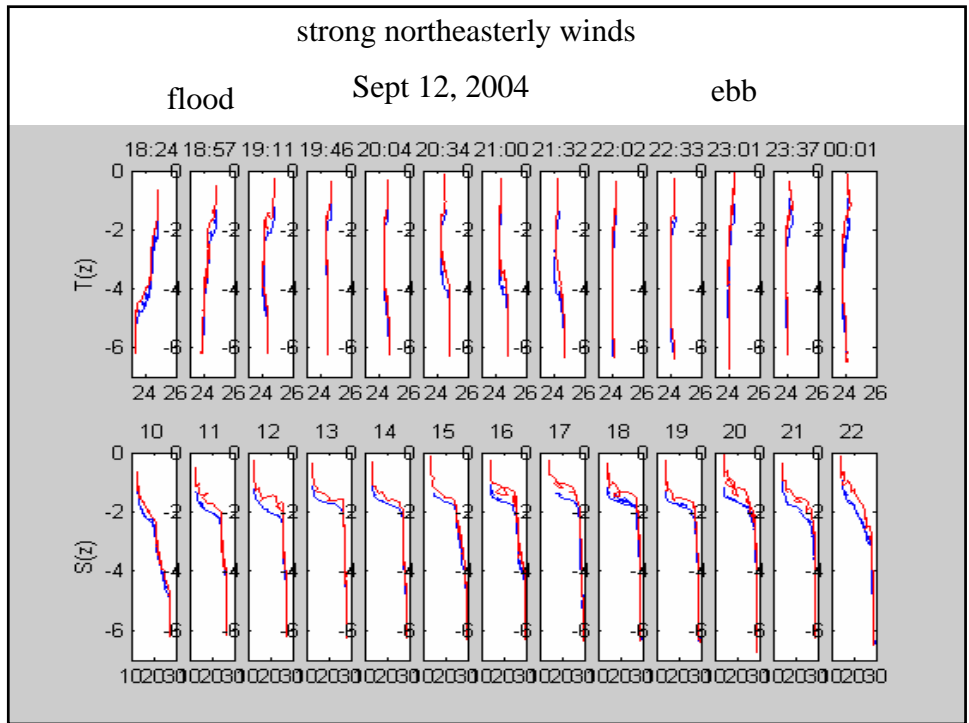
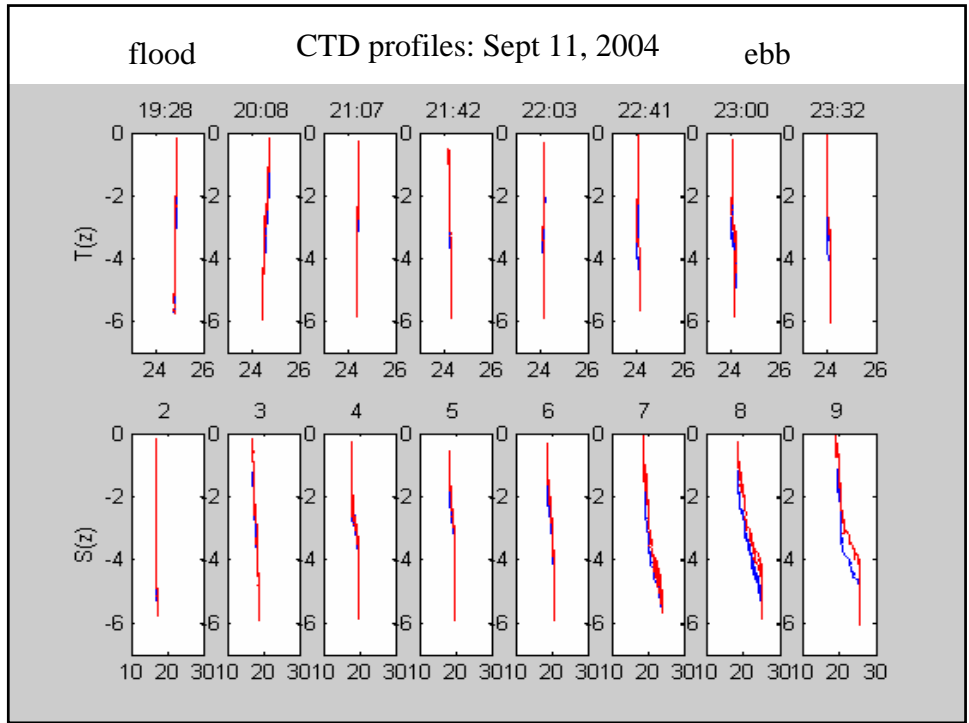
### baroclinic

- fast at bottom
- deep, stratified



- find U along principal axis of variability (SW-NE)
- bandpass for tidal periods (4-40h)
- average profile for  $\langle U \rangle < 0$  (flood)
- strongest current slightly below surface





## Preliminary Results

### Salinity Profiles

- three sources (Albemarle, Pamlico, Ocean)
- wind and tidal forcing
- thermocline may respond to tide
- bottom salinity may *not* increase on flood

### Summary most recent work:

- crabs at surface on night floods
- flood currents strongest below surface
- salinity cue unlikely

### Future directions:

- critter flux (concentration x speed)
- analyze 3-month salinity time series
- statistics on night floods
- ... ideas ...??