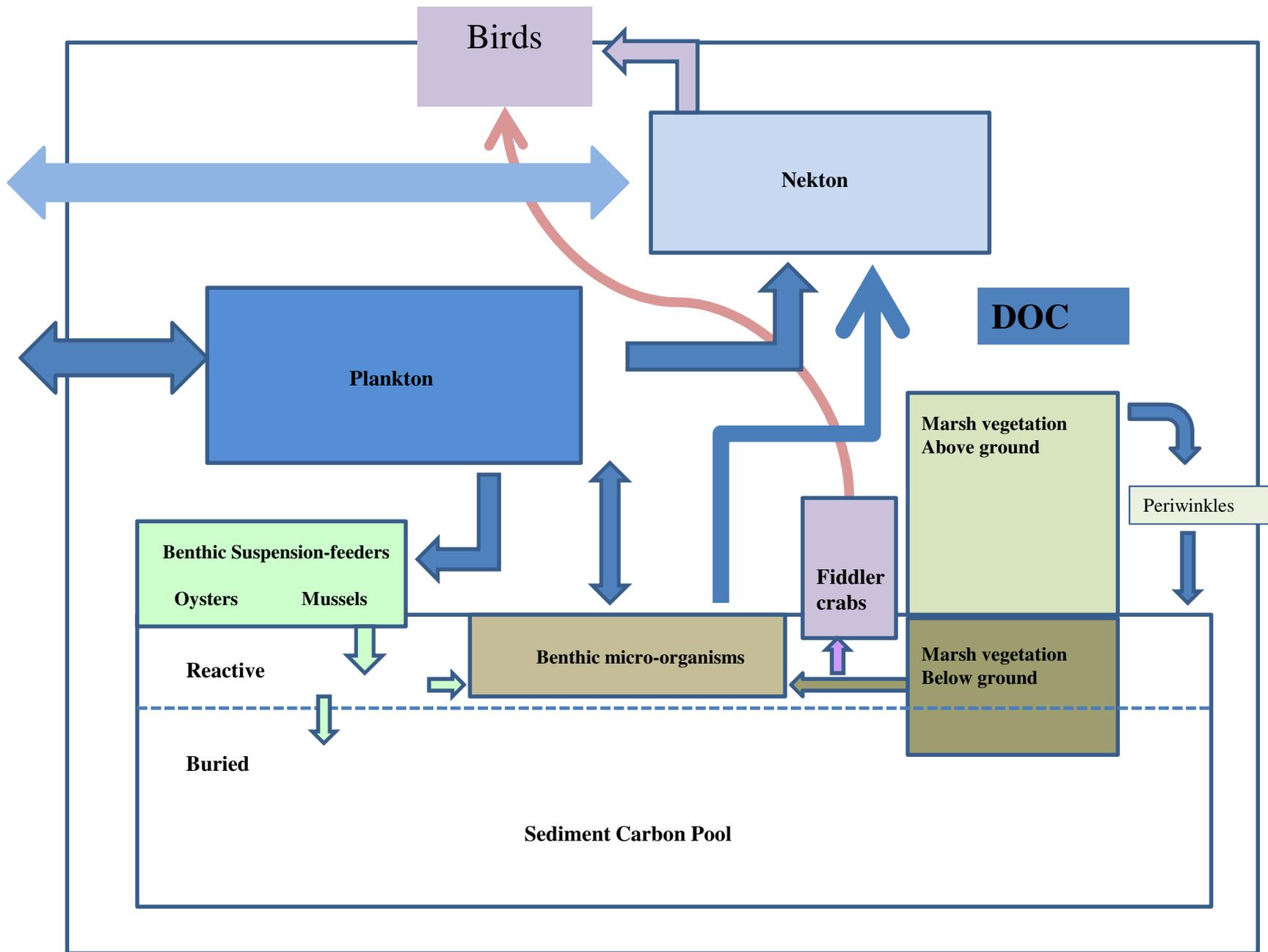


The Role of Shorebirds Carbon Flux in a Saltmarsh

Mark Luckenbach



Objectives

1. To quantify the species composition and abundance of shorebirds foraging on the marsh.
2. To estimate the carbon removed from the study area by the birds.

Study Area



Barrier island-salt marsh-lagoon system in coastal Virginia.

Semi-diurnal tide; range ~ 1.75 m

Saltmarsh dominated by *Spartina alterniflora* with some *S. patens* .

Watershed area = 38.5 hectares
= 385,477 m²

S. alterniflora area = 11.4 hectares
(Data from Spears and Enriquez)

Methods

Observed birds foraging on the marsh and tidal creeks from a platform located at the mouth of the tidal creek.

Observations were made during daytime low tides on two consecutive days (5/28 & 5/29/2010)

Beginning at the time the marsh surface was first exposed I scanned the entire study area using 9X binoculars at 30 min intervals and counted and identified all of the shorebirds within the *S. alterniflora* zone, muddy creek banks and water's edge. (< 5 min)

I then selected individual birds and observed them for 5 min, counting the number and type of prey species captured in a 5 min period. Observed up to 4 individual birds per 30 min period.

Methods

To estimate the amount of carbon removed from the marsh by each bird species that I observed during the 2-day study period I computed the following:

Total prey captured = # prey caught $\text{hr}^{-1} \text{bird}^{-1}$ x aver. # birds hr^{-1} x Time
where Time = # daylight hours that the marsh was exposed
= 14.9 hrs (Data provided by Enriquez and Spears).

Carbon ingested = Total prey captured x prey carbon content

Fiddler crabs: Carbon = 750 mg/crab
(Data for fiddler crabs provided by Bucci, Bryant & Richardson)

Fish: Carbon = 3.1 g/fish
(Data for fish provided by Lopez and White for mummichogs)

Carbon composition of birds

Adult Common Heron = Whole body weight 3.4 kg
= 212 g C/bird
(from Ellis and Gabirelsen 1981)

Adult Laughing Gull = Whole body weight 980 kg
= 61 g C/bird
(from Hammer, Schrieber and Burger 1980)

Results

Common Egret



Laughing Gull



Results



Total observation time: 5 hrs

Total # birds observed:

CE – 72

LG – 34

Mean # birds hr⁻¹

CE – 4.4

LG – 6.8

Mean bird carbon

CE – 933 g

LG – 415 g

Mean # prey captured hr⁻¹ bird⁻¹

CE – 9.3

LG – 28.6

Total # prey captured in 14.9 hrs

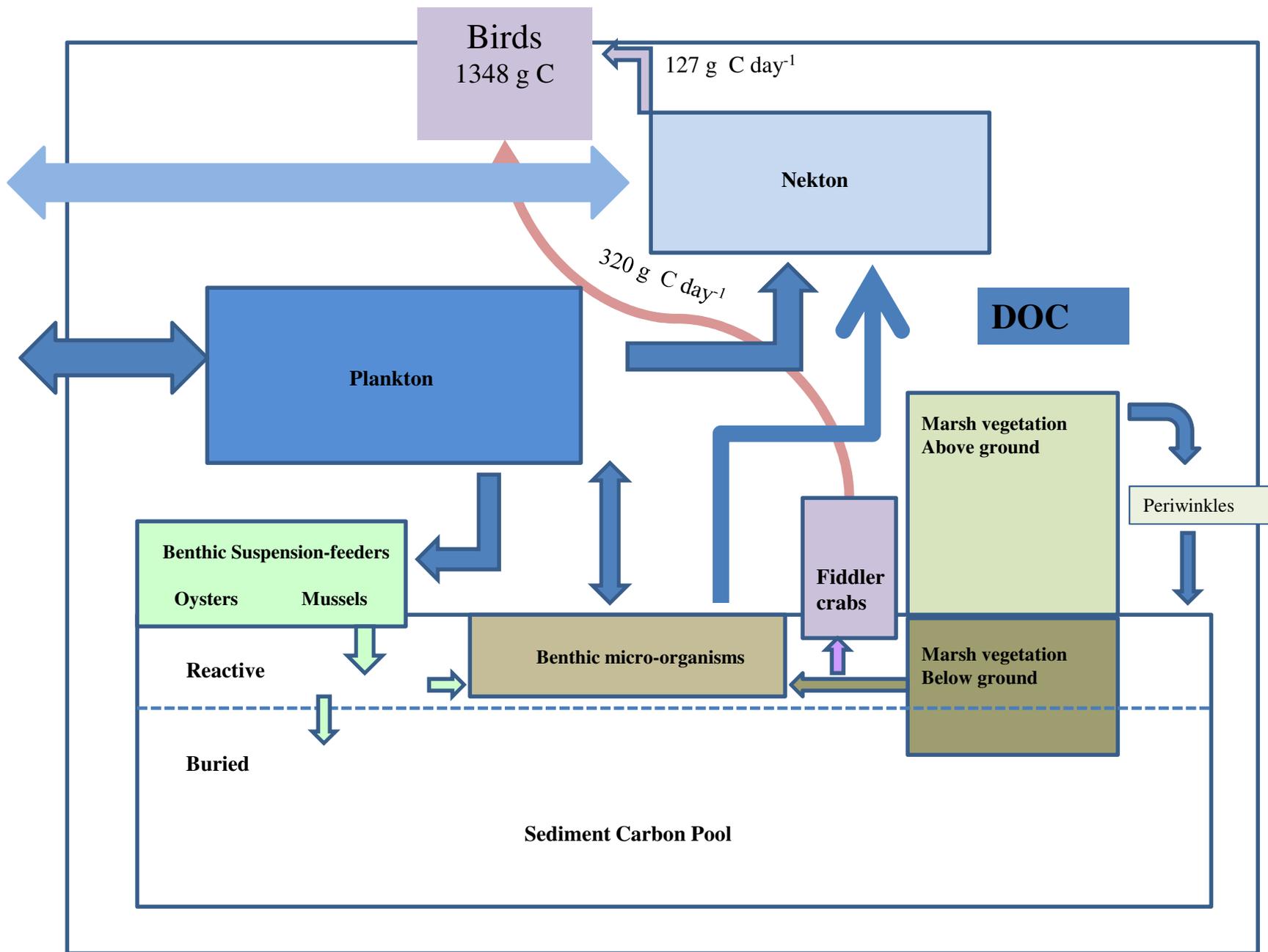
CE – 40.9

LG – 194.5

Carbon ingested in 14.9 hrs

CE – 126.8 g

LG – 319.6 g



Conclusions

Foraging by shorebirds represented only a small flux of carbon from the marsh during the course of this study.

However, shorebirds may play an important ecological role by preferentially removing large, conspicuous male fiddler crabs and large mummichogs.

Most, especially the Common Egrets, that I observed were > 50 m from the platform, suggesting that my presence may have biased the results by scaring birds away.

Because of the highly variable use of the marsh by birds in both time and space, more observations over more days would be needed to obtain a more accurate estimate of the role of birds in carbon flux.

Caveats and Limitations

Several factors likely resulted in biasing the flux estimates.

1. It is likely that I did not observe all of the Laughing Gulls or their prey captures during the observation periods.
2. Common Egrets are capable of capturing larger items than I observed here and thus removing more carbon.
3. I was unable to account for the biomass or feeding of clapper rails or other avian predators
4. Where birds foraged within the marsh was clearly affected by my presence on the observation platform.
5. The species composition and abundance shorebirds varies seasonally and only a few of the species that forage on the marsh were present during my study. Some species like the glossy ibis, which often forage in the large flocks, were not present.
6. I did not include any estimates of the amount of carbon that the birds return to the marsh via excretion, egg laying, or carcasses.

Project Grading

Development of ideas – 25 points

Implementation – 25 points

Interpretation/Presentation/Questions – 50 points