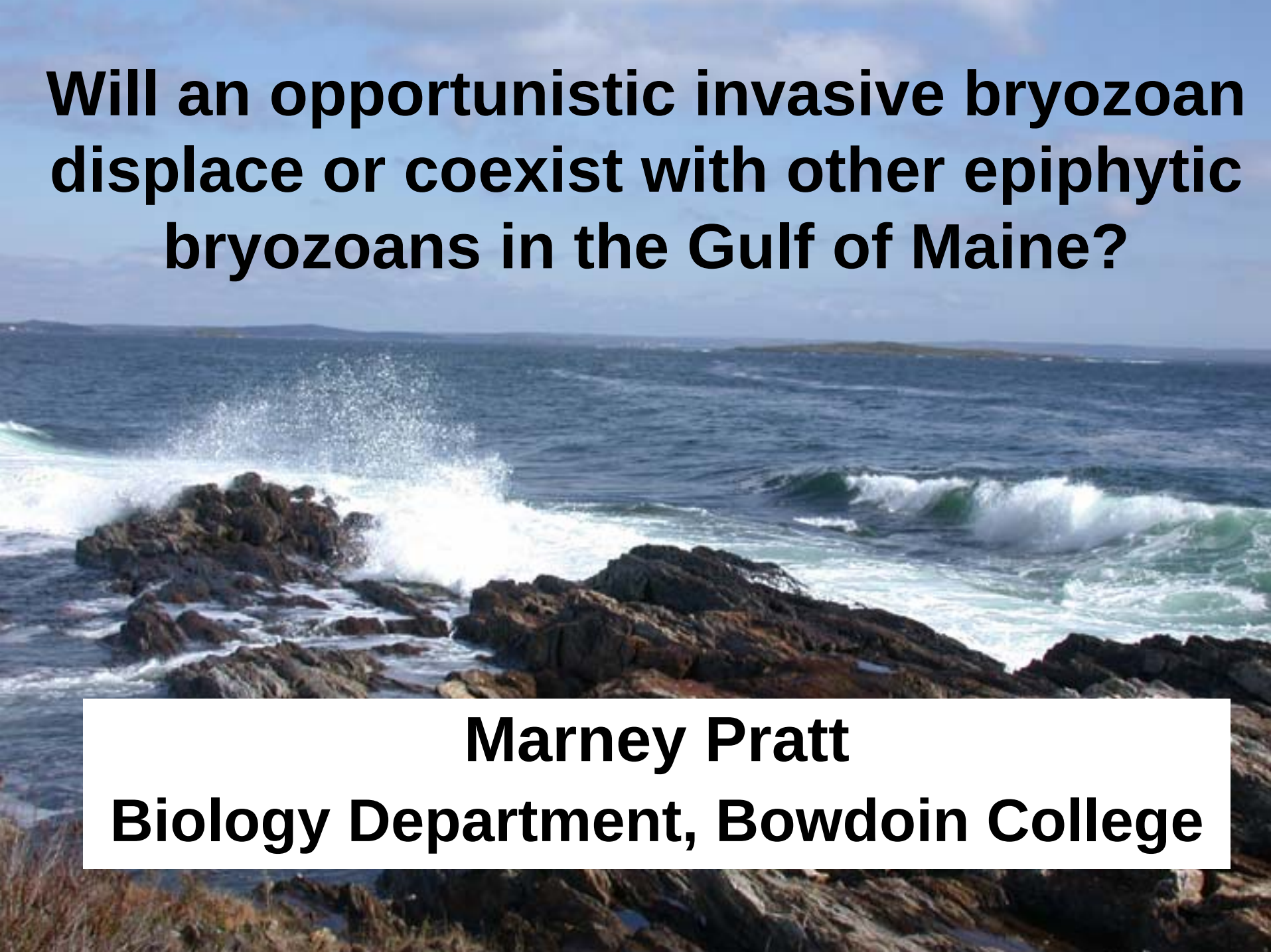
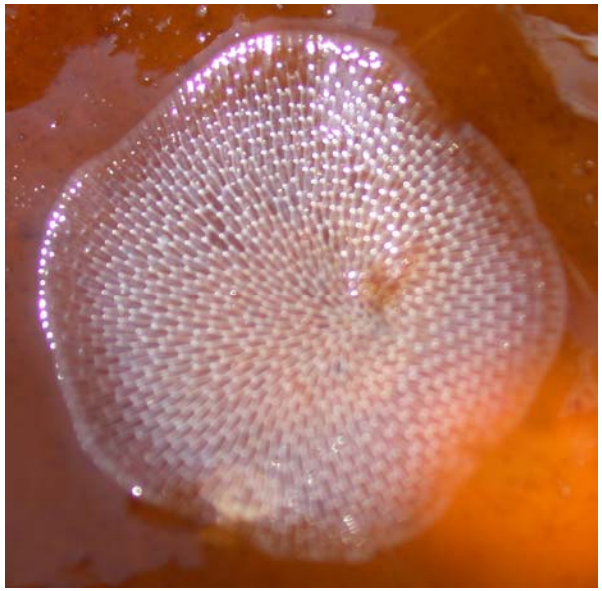
Will an opportunistic invasive bryozoan displace or coexist with other epiphytic bryozoans in the Gulf of Maine?



Marney Pratt

Biology Department, Bowdoin College

Do They Compete?



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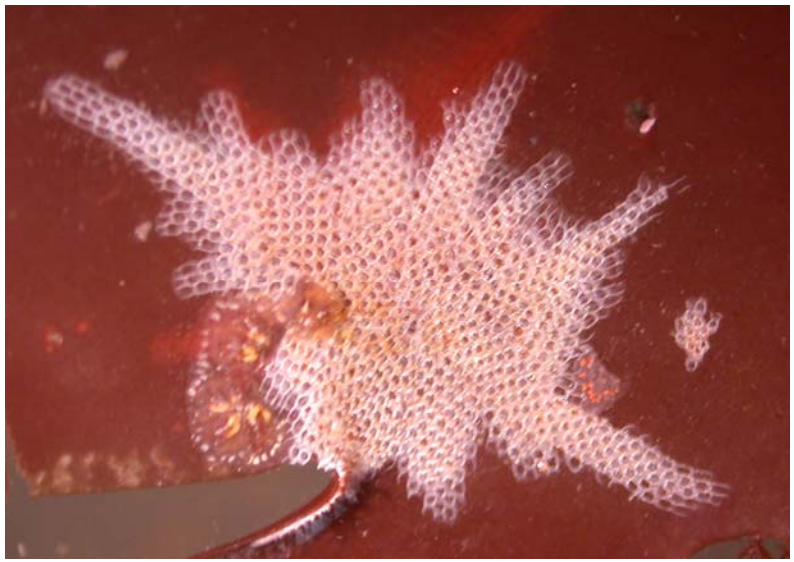


Membranipora membranacea

Electra pilosa

- Competition:
  - *Membranipora* > settlement and/or growth in summer
- Trade off?
  - Higher winter survival vs. faster summer growth?

Are Invaders “Biologically Superior”?

- Better competitors
- Better defense against enemies
- Higher reproduction
- Higher metabolism
- Grow faster
- Larger

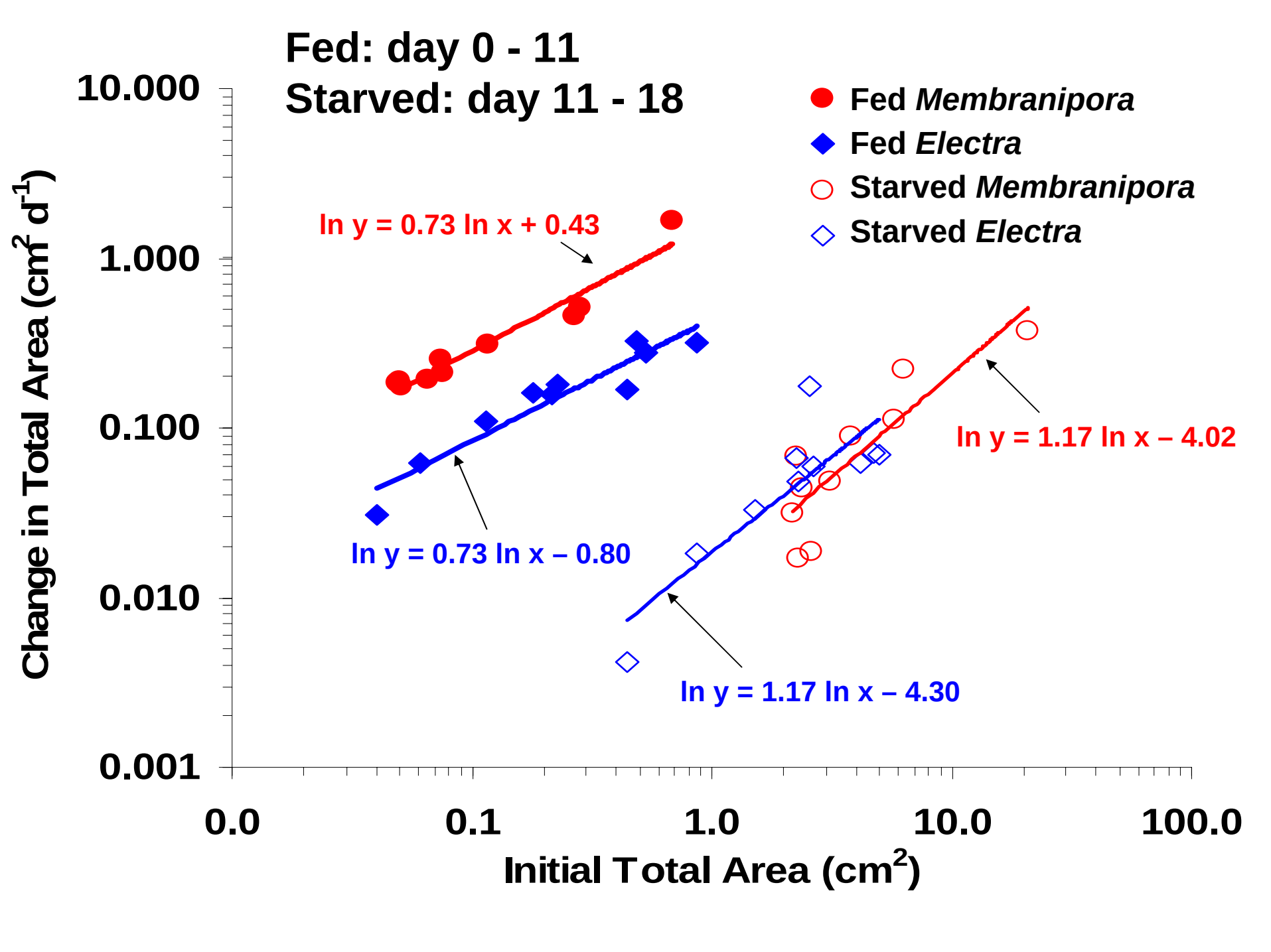
(Vermeij 1991, 1999; Grosholz and Ruiz 2003)

Physiological Performance

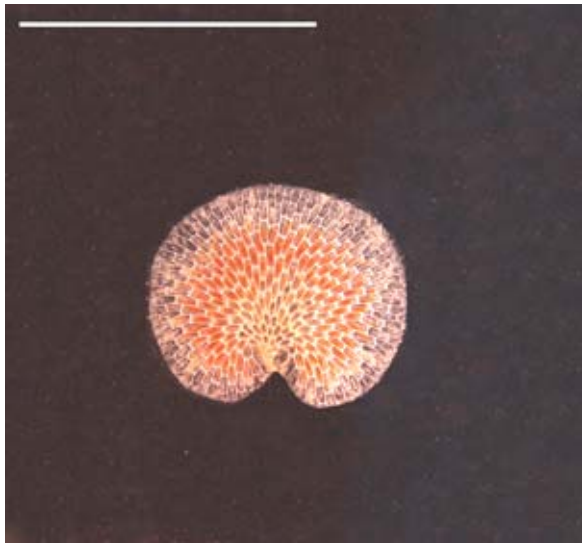
- Growth Rate
- Feeding Rate
- Respiration Rate

Growth Predictions

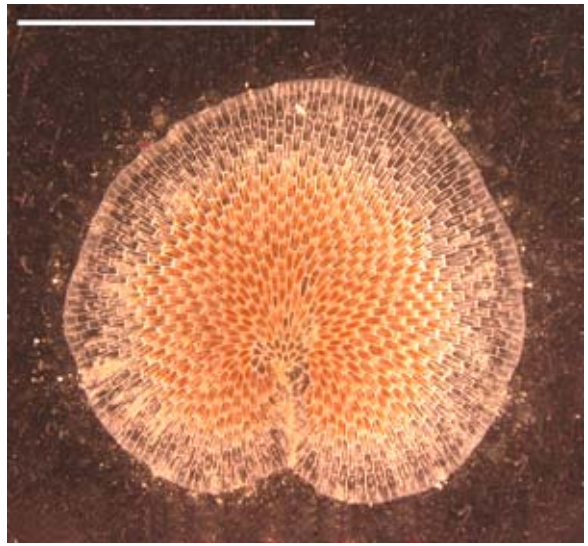
- High Food Conditions
  - *Membranipora* will grow faster
- Low Food Conditions
  - *Electra* will survive better


Fed: day 0 - 11
Starved: day 11 - 18
Fed Membranipora
Fed Electra
Starved Membranipora
Starved Electra
ln y = 0.73 ln x + 0.43
ln y = 0.73 ln x – 0.80
ln y = 1.17 ln x – 4.02
ln y = 1.17 ln x – 4.30
Change in Total Area (cm2 d-1)
Initial Total Area (cm2)
10.000
1.000
0.100
0.010
0.001
0.0
0.1
1.0
10.0
100.0

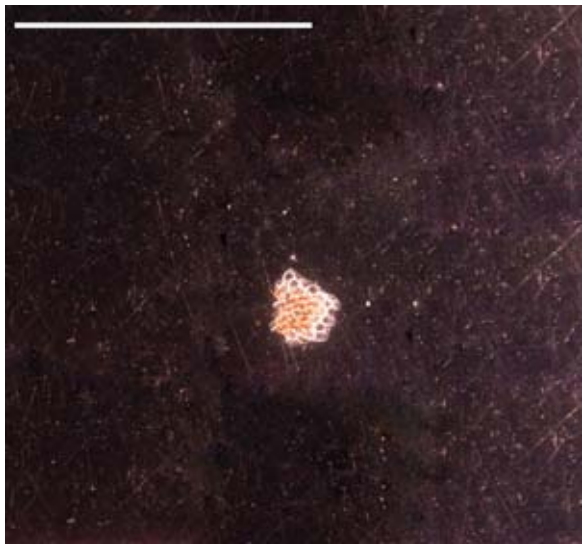
Day 0



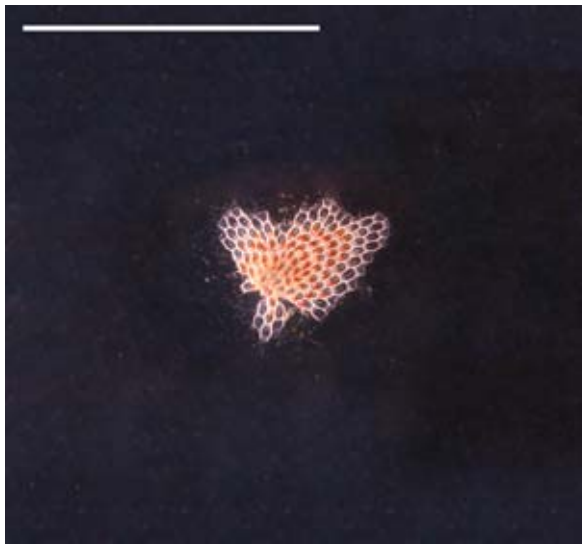
Day 7



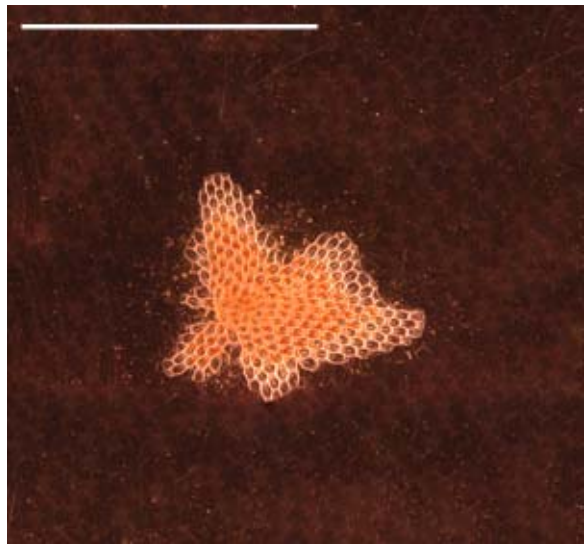
Day 11



Day 0



Day 7



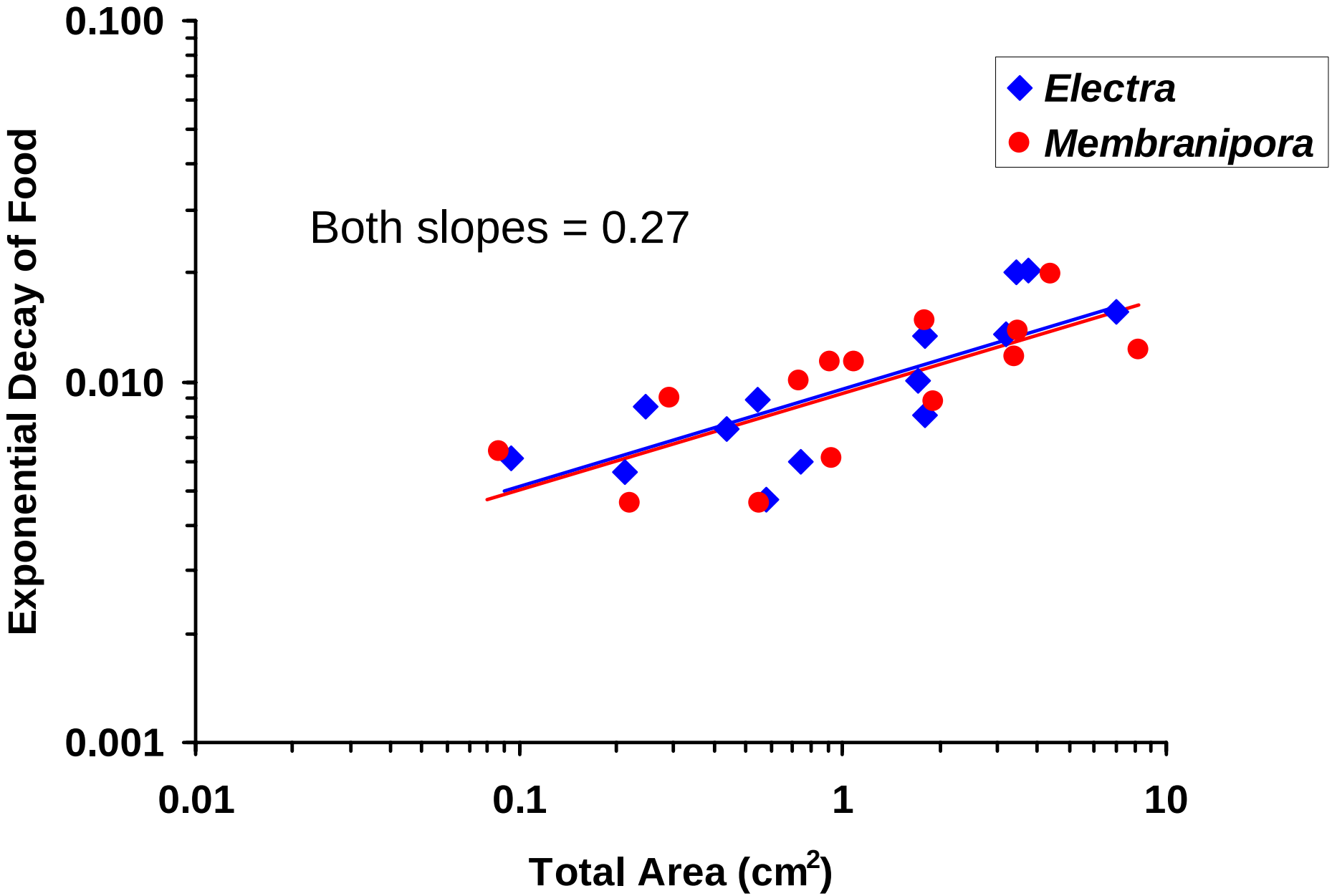
Day 11

Growth Results

- High Food Conditions
  - *Membranipora* does grow faster
- Low Food Conditions
  - *Membranipora* = *Electra*

Feeding Predictions

- *Membranipora* > *Electra*
  - *Membranipora* have larger zooids
    - *Membranipora*: 0.21 mm^2
    - *Electra*: 0.15 mm^2
  - Previous work

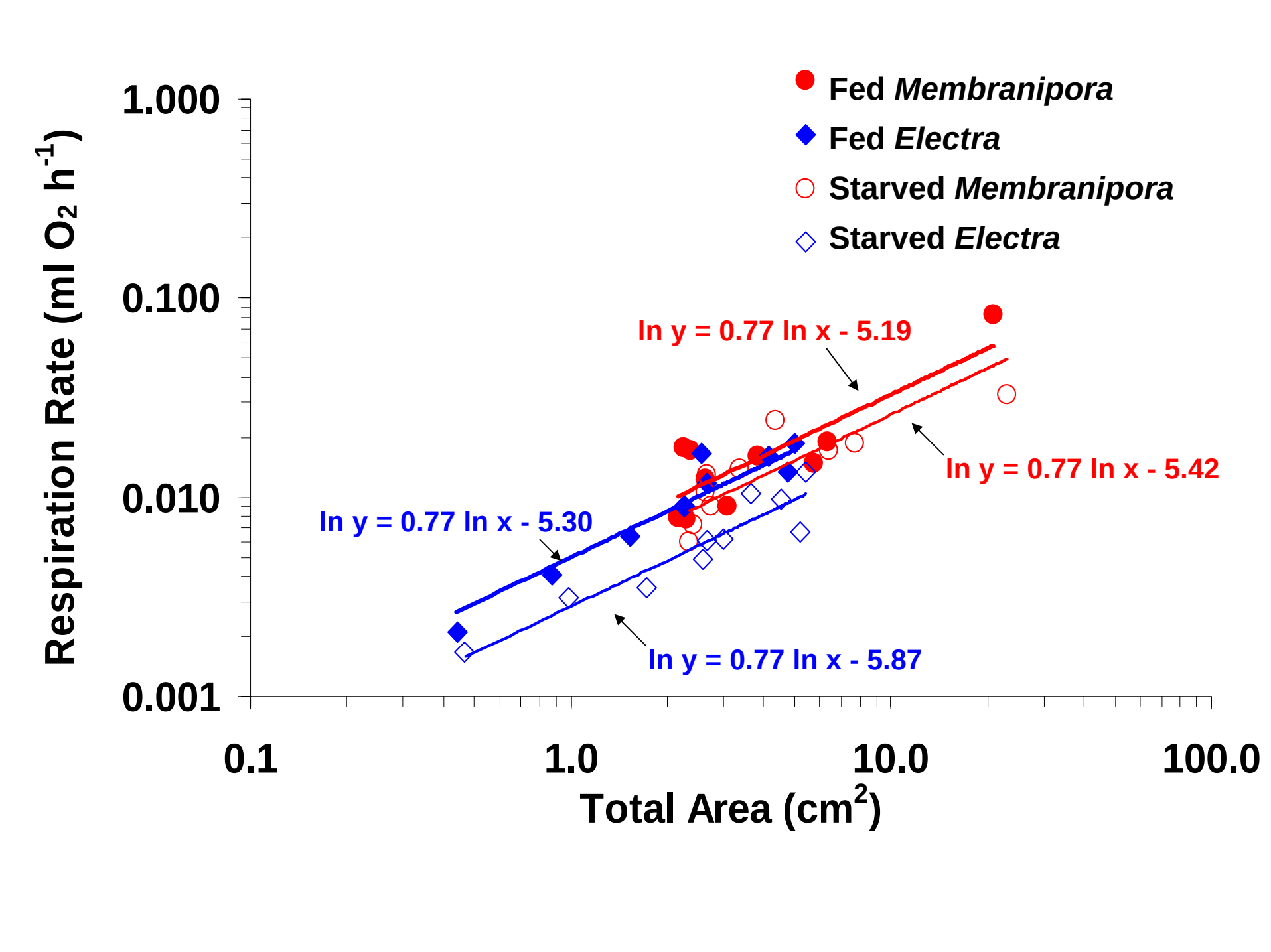

0.100
0.010
0.001
Exponential Decay of Food
0.01
0.1
1
10
Total Area (cm2)
Electra
Membranipora
Both slopes = 0.27

Feeding Results

- *Membranipora* = *Electra*
- *Membranipora* has larger zooids, but *Electra* has more zooids per unit area

Respiration Predictions

- *Membranipora* > *Electra*
  - Vermeij's predictions


Fed Membranipora
Fed Electra
Starved Membranipora
Starved Electra
ln y = 0.77 ln x - 5.19
ln y = 0.77 ln x - 5.42
ln y = 0.77 ln x - 5.30
ln y = 0.77 ln x - 5.87
Respiration Rate (ml O2 h-1)
1.000
0.100
0.010
0.001
0.1
1.0
10.0
100.0
Total Area (cm2)

Respiration Results

- Fed: *Membranipora* = *Electra*
- Starved: *Membranipora* > *Electra*

Why does *Membranipora* have faster growth than *Electra*?

- Same feeding rates
- Same respiration rates (well fed)
- Maybe *Electra* zooids cost more to make

Will *Membranipora* displace or coexist with *Electra* in the Gulf of Maine?

- *Membranipora* will dominate some seaweeds
- *Electra* will persist using refuges
- Future research → Temperature

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