Effects of host starvation on parasitic behavior of the sea anemone, *Edwardsiella lineata*

Very polished looking presentation!

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Parasites Importance

- *parasites as pollution indicators - Mackenzie, Marine Pollution Bulletin 1999*

Very good background--from general to specific--over the next several slides.

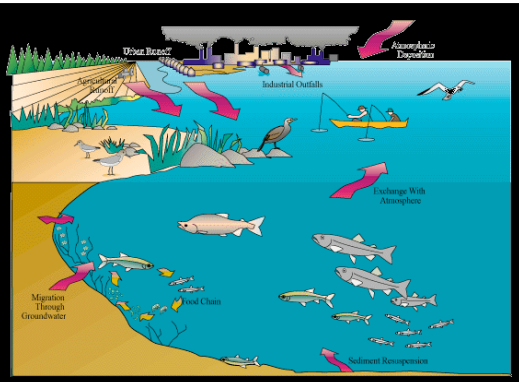

Image credit: www.lakehuron.on.ca

Parasites Importance

- *parasites as pollution indicators - Mackenzie, Marine Pollution Bulletin 1999*
- *negative impact on fisheries and aquaculture*

It looks like the isopod is wearing a fish-head helmet!

Image credit: www.earthfirst.com

Parasites Importance

- *parasites as pollution indicators - Mackenzie, Marine Pollution Bulletin 1999*
- *negative impact on fisheries and aquaculture*
- *very important in controlling invasive species*

Image credit: Adam Reitzel

Parasites Importance

- *parasites as pollution indicators - Mackenzie, Marine Pollution Bulletin 1999*
- *negative impact on fisheries and aquaculture*
- *very important in controlling invasive species*

- *the effects of parasites on host fitness has been widely studied in vertebrates*
- *information on invertebrate host-parasite interactions are scarce*

Need for a good experimental model!

A good Invertebrate Host - Parasite Model: *Mnemiopsis leidyi* & *Edwardsiella lineata*

Mnemiopsis leidyi

- *Mnemiopsis l. is a ctenophore that feeds on zooplankton*

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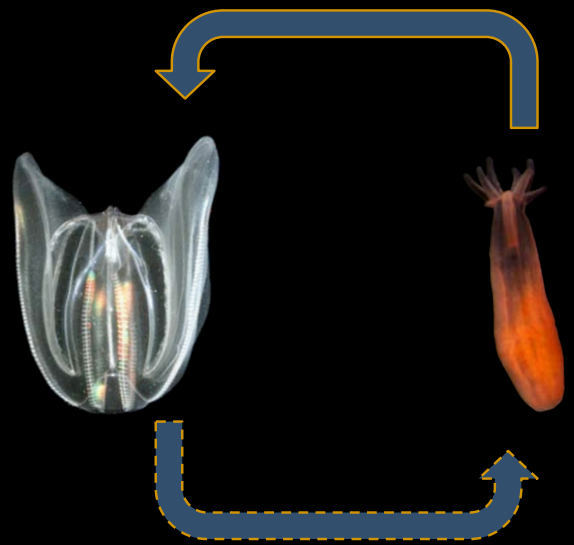
Mnemiopsis leidyi

- *Mnemiopsis l.* **is a ctenophore that feeds on zooplankton**
- **very tolerant species, both eurythermic and euryhaline**
- **periodically infested with the parasitic stage of** *Edwardsiella l.*

Edwardsiella lineata

- *Edwardsiella l.* **can be collected from infected ctenophores**
- **once outside the host, it assumes a typical planula larva form**
- **parasitic choice in** *Edwardsiella l.* **is <u>likely</u> influenced by feeding state of its host -** *Reitzel et al., J. Parasitology 2007*



Objectives of this Study

Quantify the effects of the host feeding state on:

- ***Average number of*** *Edwardsiella* ***entering the host per day***
- ***Percentage of*** *Edwardsiella* ***exiting the host***

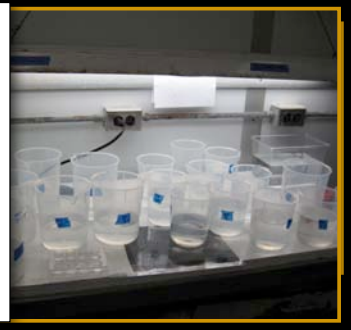
… also: settlement success of *Edwardsiella* ***after exiting the host***

- ***Success of lateral transfer between hosts***

Point out that lateral transfer between hosts has never been demonstrated.

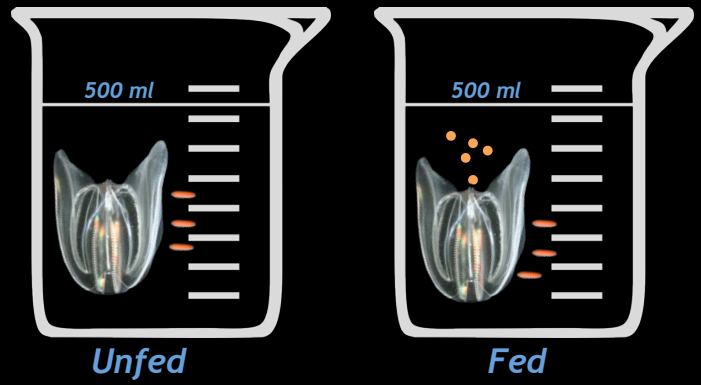
Collection and housing of experimental animals

You deserve credit for the great care you took in caring for the ctenophores. Your protocols will influence any future studies on Mnemiopsis in the class.



- *ctenophores were measured and transferred into individual 500 ml beakers*
- *Temperature regime: 14°C; Salinity: 35‰*
- *fed Artemia*

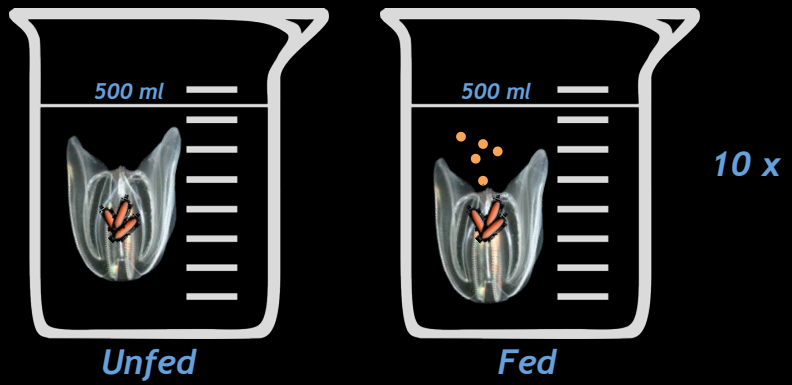
Does the feeding state of the host affect the parasitic choices of *Edwardsiella*?



1

I like the comb-jelly in the beaker graphic!

Does *Edwardsiella* exit depending on the feeding state of the host?



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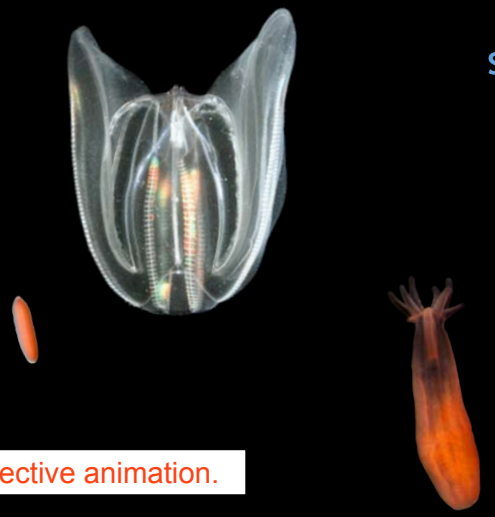
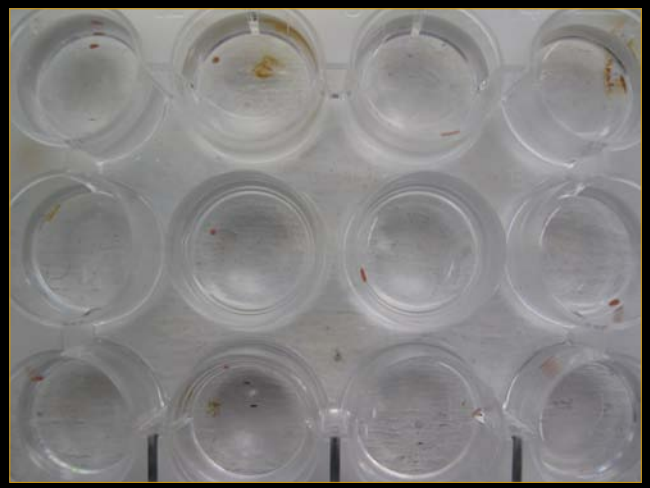
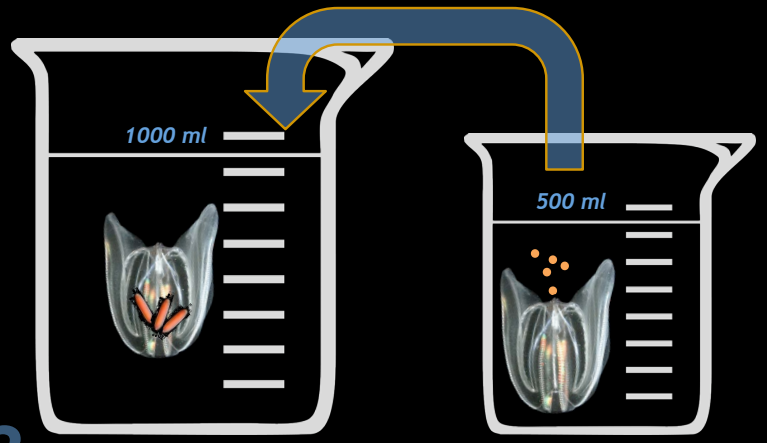
Scenario 2



Effective animation.



Does *Edwardsiella* transfer to a fed host when in a starving host?



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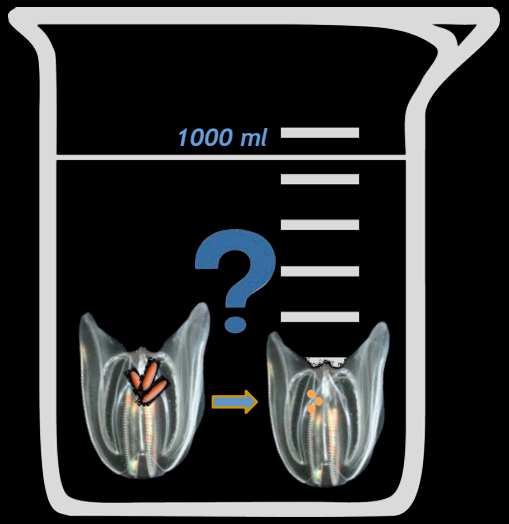
Unfed

Fed



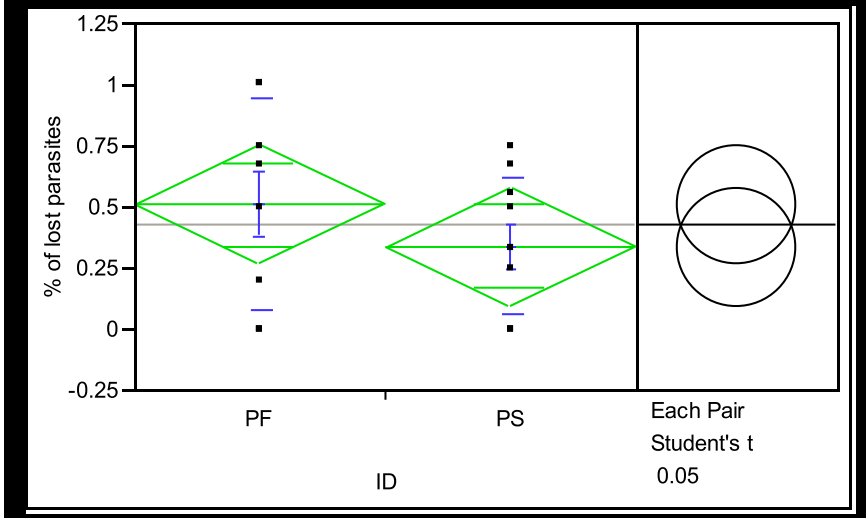
10 x

Average survival of *M. leidyi* with respects to being fed or starved.

Results

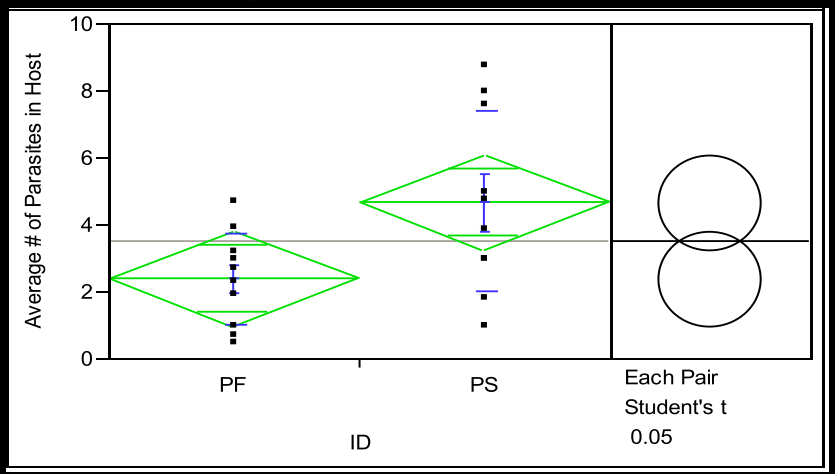
- Parasitized *M. leidyi* and *E. lineata* exits
  - H_o: The nutrition of the *M. leidyi* does not affect the rate *E. lineata* exits its host
  - H_a: Starving *M. leidyi* will promote *E. Lineata exits from its host more than in fed hosts*

One-way Analysis of % of lost parasites By ID



The mean percentage of parasites exiting its host (95% confidence interval, p=0.05) shows there was not a significant difference in parasites exiting their host.

One-way Analysis of Average # of Parasites in Host By ID

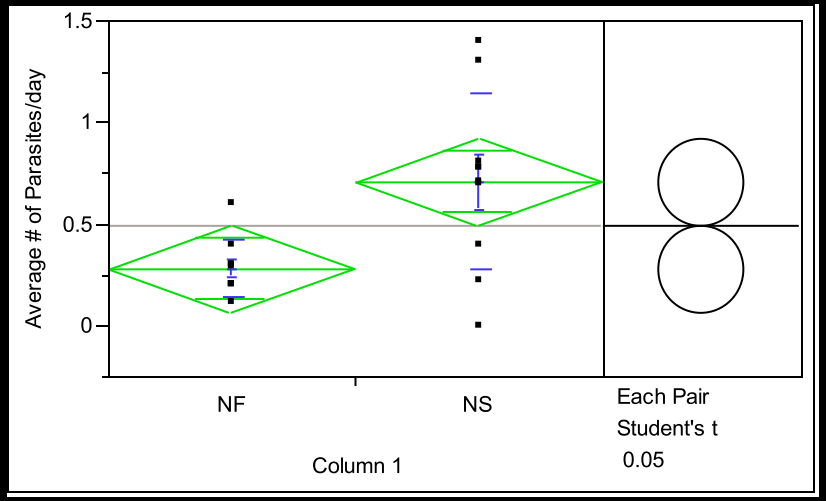


The average difference in number of parasites/day in *M. leidyi* was slightly significant (at 95% CI, and p=0.05) indicating that there are more parasites in starved *M. leidyi* than fed ones

Results

- Non-Parasitized *M. leidyi* with introduced *E. lineata*
  - H_o: The nutrition of *M. leidyi* does not affect the rate of infection by *E. lineata*
  - H_a: The *M. leidyi* being starved will have a higher rate of infect by *E. lineata*

One-way Analysis of Average # of Parasites/day



The difference in mean of the number of parasites infecting non-parasitized fed and starved *M. leidyi* is significant (at 95% CI and when p=0.05), implying that starved ones are more vulnerable to being infected by *E. lineata*.

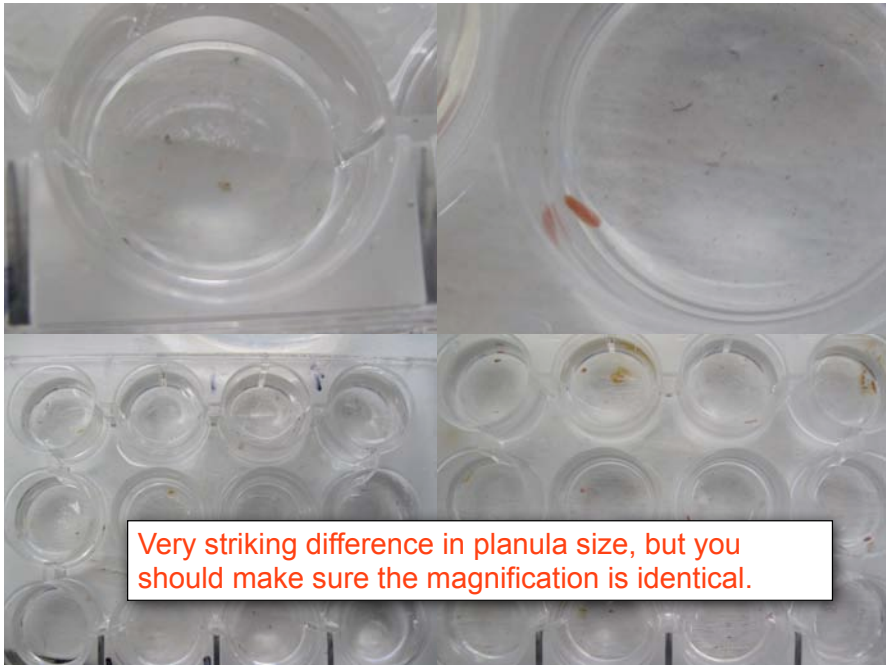
On introducing non-parasitized to parasitized M. leidyi, a large percentage of the parasitized lost at least one parasite (70%),but only 10% of the non-parasitized were infected.

Discussion

- There was a significant difference in number of infections by *E. lineata* on *M. leidyi* when it comes to difference in nutrition. These were not the preliminary expectations but would definitely coincide with the effects of starvation and vulnerability of host after starvation

Discussion Con't

- Parasitized fed and starved *M.leidyi* had no significant difference in *E. Lineata* exiting the host, this might be attributed to parasites:
  - Getting adequate nutrition and ready to leave their host or
  - Experiencing harsh conditions and decide to leave host and take a chance to move to the next stage of their life phase



Discussion Con't

- The reason there was a slight significance difference in the number of parasites/day in the *M.leidyi* might be attributed to the fact that there were different number of parasites on different *M.leidyi* and that would lead to variations in parasites in host.

Discussion Con't

- In the case of the non-parasitized *M.leidyi* (Fed) exposed to the parasitized *M.leidyi,* more time and less space might have promoted a higher degree of *E.lineata* transfer between subjects

Conclusion

- Starvation (health) of the host could have significant effects on the parasite's behaviour
- and infection may also have effects on the host's health
- Conclusion will be more accurate with further sampling

Limitations

- Water quality was one of the major issues in keeping the Ctenophores alive. Suspended particles and temperature could significantly affect the health of the subjects

Limitations

- Constant water exchange could positively affect the health of the Ctenophores
- Artimia might not be the adequate food source for the long term for the subjects, it might add to the BOD and indirectly affect the health of the subjects.

Acknowledgments

- Professor John
- Tristan and D-Rock
- Kaufman and Lobel lab grad students
- Justin
- Fellow classmates

Thank you. Questions?