**Paper Outline**

**Working title:** “The saga of *Mesodinium rubrum* and its cryptophyte prey: investigating the mystery behind a unique algal relationship”

**Introduction/Background**

The common coastal ciliate, *Mesodinium* *ruburm,* is among the marine mixotrophic microzooplankton that have been observed to harbor the plastids of their prey, which allows these predators to function as autotrophs. Though mixotrophic microzooplankton are now understood to be important primary producers in coastal systems, little is known about the specifics of these predator-prey relationships. The precise nature of the association between *M. rubrum* and its cryptophyte prey, in particular, has been highly debated, resulting in a number of recent papers investigating this model mixotroph pair in both laboratory experiments, as well as in field studies.

(Lohmann, 1908) (Jankowski, 1976)- *Mesodinium rubrum* vs. *Myrionecta rubra*

(Crawford, 1989)

(Lindholm, 1985)- red water

**What is the exact nature of the *M. rubrum*/cryptophyte relationship?**

The specifics of *M. rubrum’s* ability to photosynthesize, and whether it is conferred from an algal symbiont, stolen chloroplasts, or even something in-between, remain highly controversial.

(Gustafson et al., 2000)- first to culture, pro-kleptoplasty

(Hansen & Fenchel, 2006) (Hansen et al., 2012)- pro-endosymbiont

(Johnson et al., 2005)- pro-kleptoplasty

(Johnson et al., 2007)- pro-karyoklepty, discuss radness of this paper, case closed???

(Garcia-Cuetos et al., 2012) (Herfort et al., 2011)- “species complex”, different haplotypes could explain other observed differences

(Myung et al., 2013)- can keep plastids for up to 80 days

**Case study- Chesapeake Bay**

*M. rubrum*, though a common feature of the plankton communities in the Chesapeake Bay, rarely forms blooms within this estuary. Because of the quantity of historic observational data on the M. rubrum and cryptophyte populations in the Chesapeake, this estuary can be seen as a model system for investigating predator-prey dynamics *in situ*.

(Johnson et al., 2013)- 22 years of data

(Li et al., 2009)

(Dolan & Coats, 1990)- focus used to be on only heterotrophic ciliates

(Adolf et al., 2006)

**Case study- Columbia River Estuary**

In contrast to the Chesapeake Bay, the *M. rubrum* found in the Columbia River Estuary forms impressive yearly red-tide blooms. And though this estuarine system lacks the amount of observational data as has been collected in the Chesapeake, a number of studies have been recently published on *M. rubrum* in the Columbia River Estuary.

(Herfort et al., 2011a)- biogeochemistry

(Herfort et al., 2011b)- awesome study identifying 5 genetic variants, further evidence of a species complex and functional differences among haplotypes

(Herfort et al., 2012)- bloom initiation

(Peterson et al., 2012)- prey gathering

**Future Directions/Conclusion**

The possibility that genetic differences among the *M. rubrum* species complex haplotypes may result in variations in prey capture and other behaviors is emerging as a potential explanation as to the controversy surrounding studies of this predator-prey pair.