# Effects of environmental conditions on estuarine organism genetics: protein expression

Daphne Pariser
Kassandra Ferguson
Terri Seron

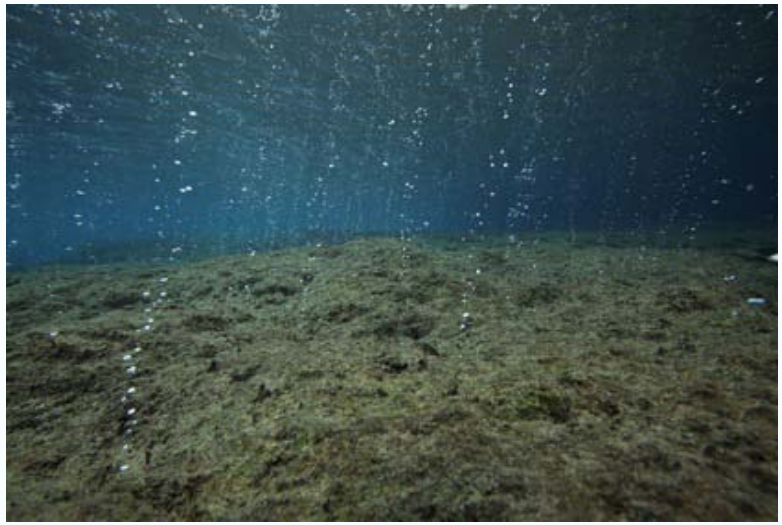
# Research Topics:

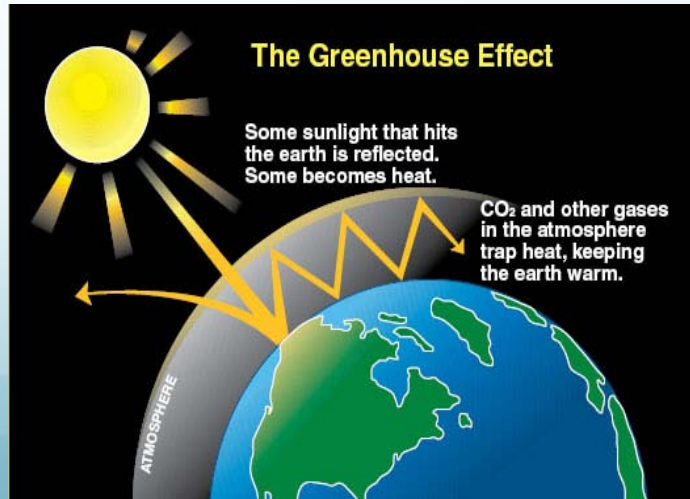
- 1st: The effects of exposing fish to differing levels of salinity
- 2nd: Protein profiles of crabs
- 3rd: Future Studies

# Why?

- In 2011 preliminary data was collected
- The data showed unique protein profiles for both mud snails and green crabs
- These results were unexpected and novel
- The follow up research was to establish baseline data on local species

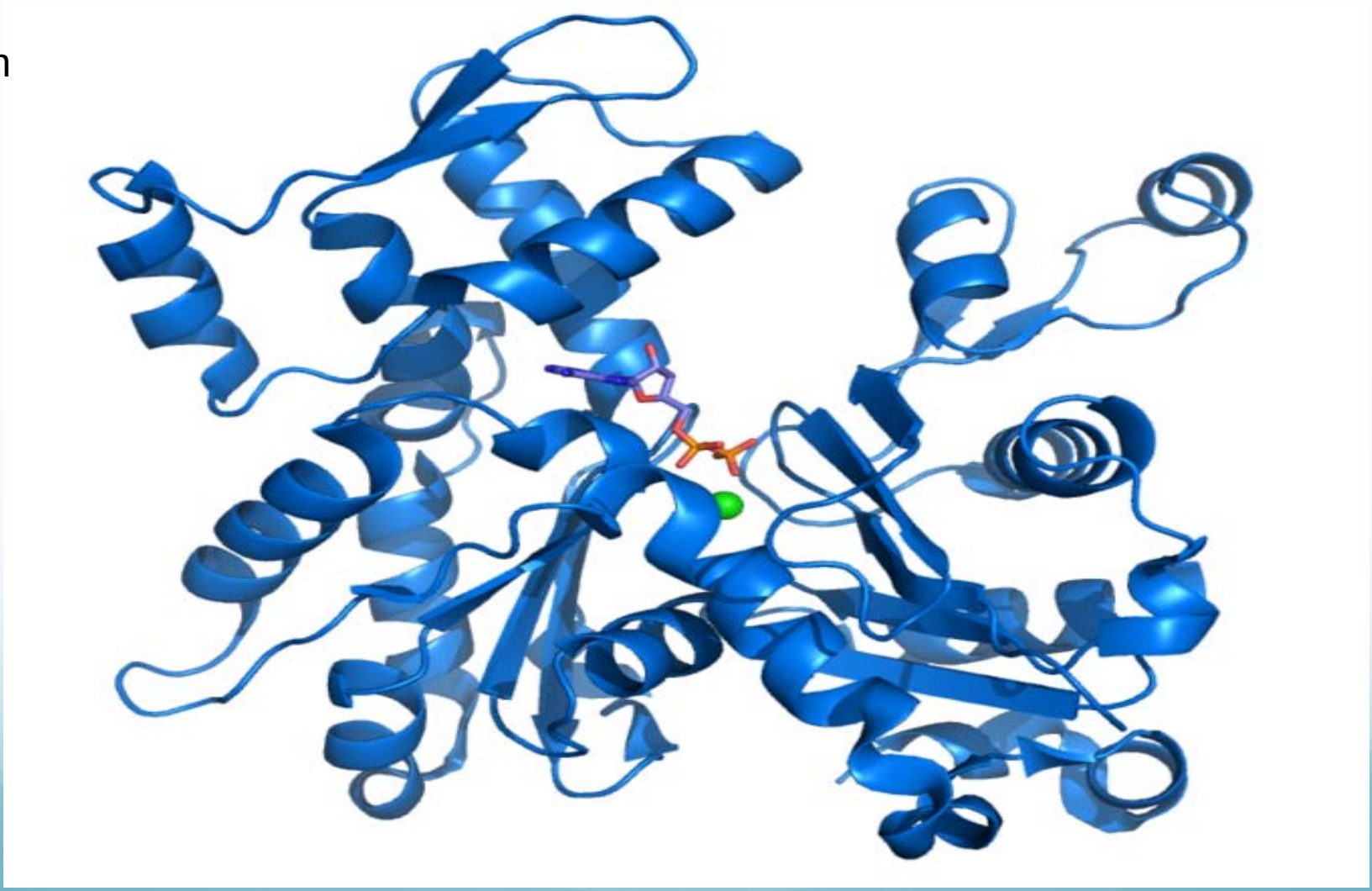
# What's the issue?



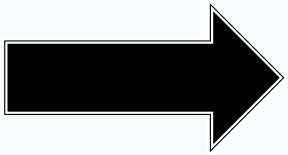


# Proteins

Actin



# Protein Expression



# Research Questions?

- Will environmental fluctuation due to global climate change influence protein expression?
- Do estuarine fish express specific proteins to tolerate different salinities?
- What sorts of proteins are certain crab species expressing?

# Test Subjects

Sheepshead minnow (*Cyprinodon variegatus*)

Longnose Kilifish (*Fundulus similis)*

# Fish Collection

# Methods

Killifish and Sheepshead Minnow

Tank salinities: 0ppt, 12ppt, 25ppt, 35ppt

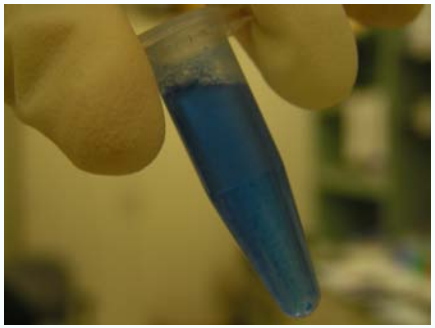
# Methods

- Used for analysis of profile proteins:
  - Protein quantification
  - Gel Electrophoresis
- Proteins migrate down the gel based on size and charge

# Protein Profiling
## (SDS-PAGE)

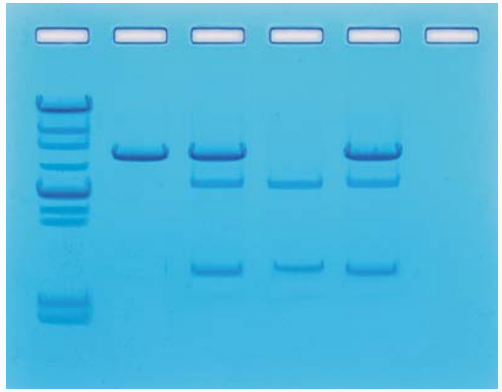
Protein extracted from muscle

Solution

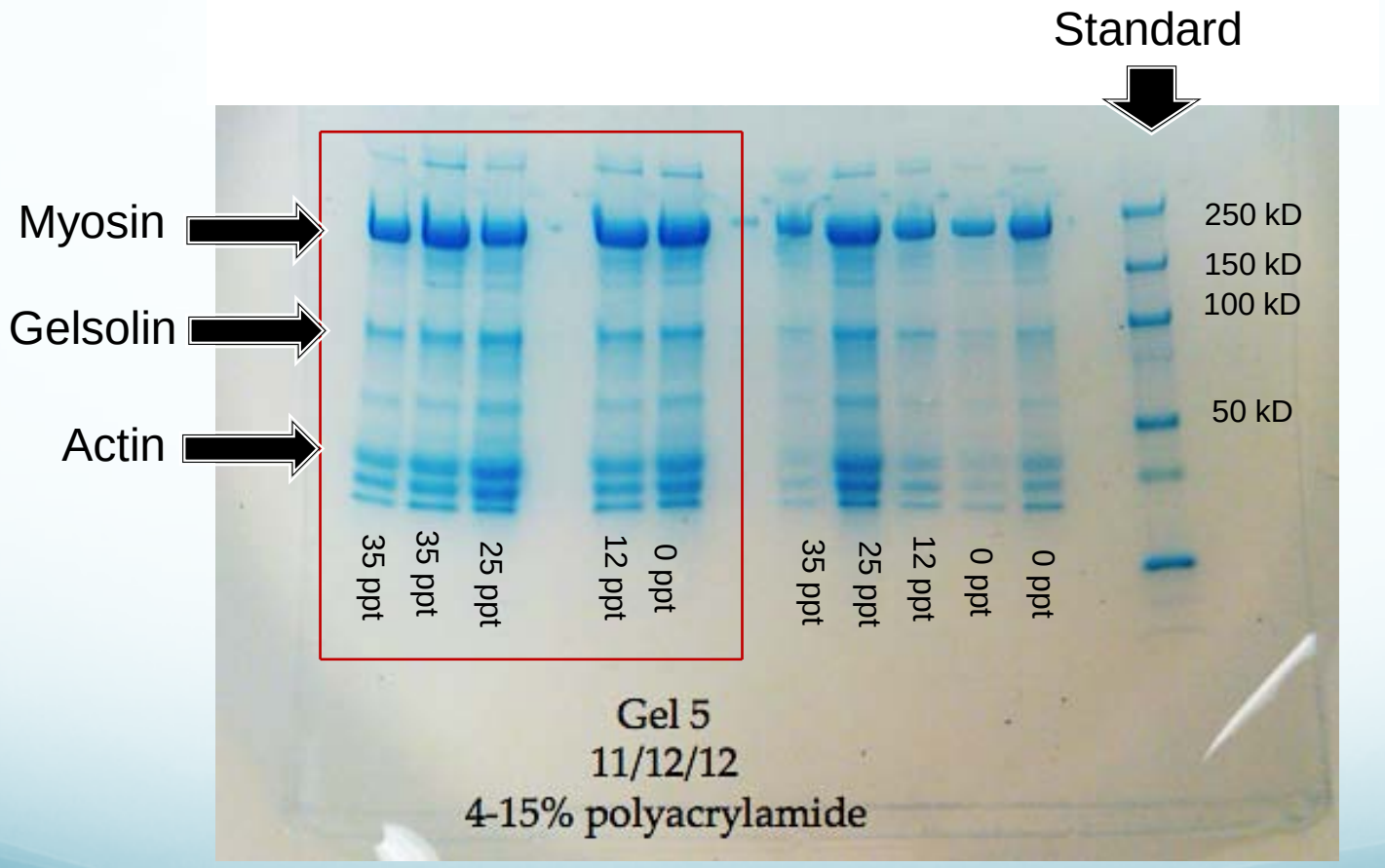


Gives proteins a negative charge

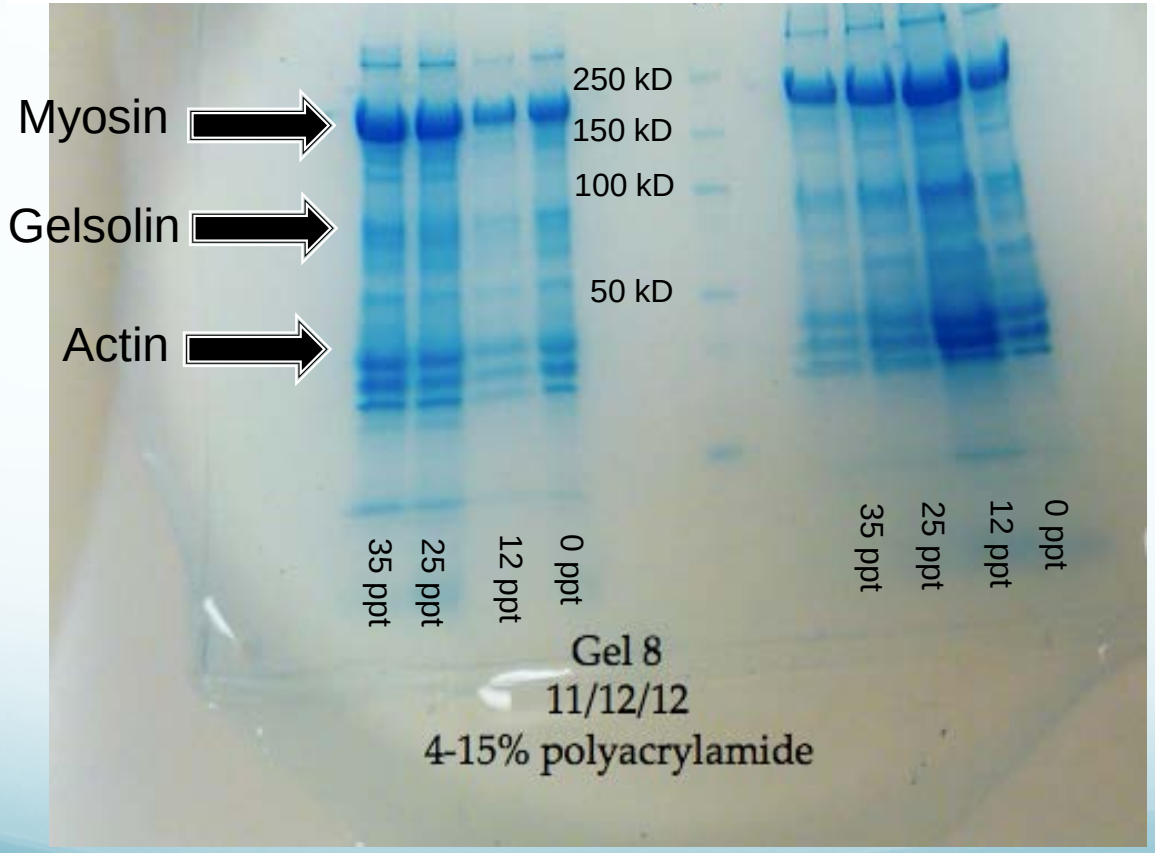
Gel for protein profiling




# Sheepshead Minnow (*Cyprinodon variegatus*)



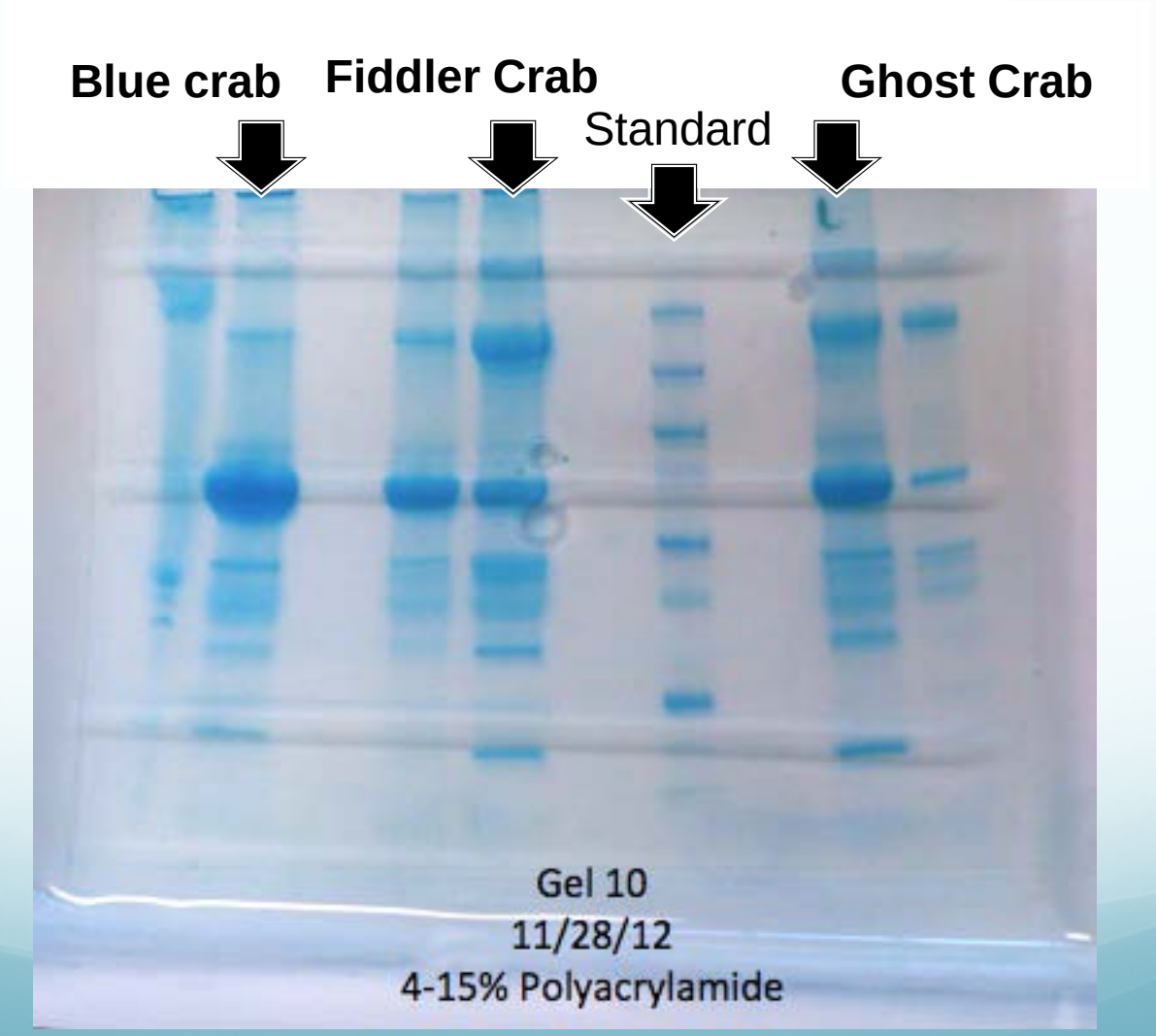
# Longnose Killifish (*Fundulus similis*)



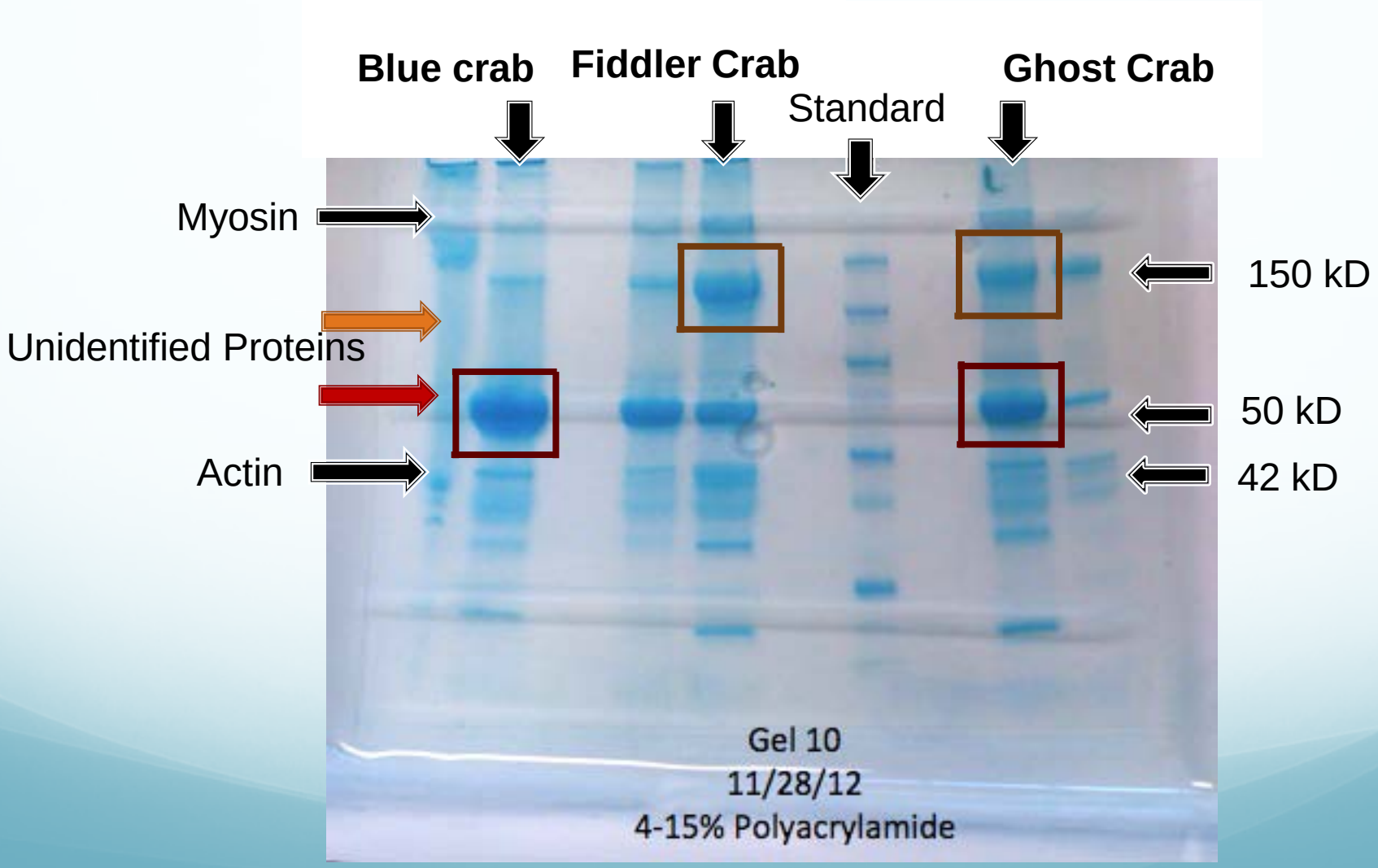

Ppt= Parts per thousand

# Methods for Crabs

# Comparison of Crab Species



# Comparison of Crab Species



# Conclusion

- Sheepshead minnow and Longnose killifish showed no new proteins in the range from freshwater to saltwater
  - Need to use protein quantification
  - Expose them to higher levels of salinity at greater lengths of time
- Crabs showed unique protein dominance at 150kD and 50kD, which is novel
  - Need more crabs to be significant

# Future Blue Crab Study

GUANA · TOLOMATO · MATANZAS
NATIONAL ESTUARINE RESEARCH RESERVE

FLAGLER COLLEGE

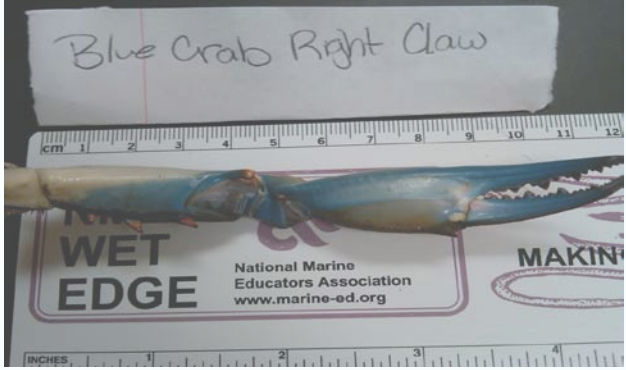
St. Augustine
Alligator Farm
ZOOLOGICAL • PARK
Est. 1893

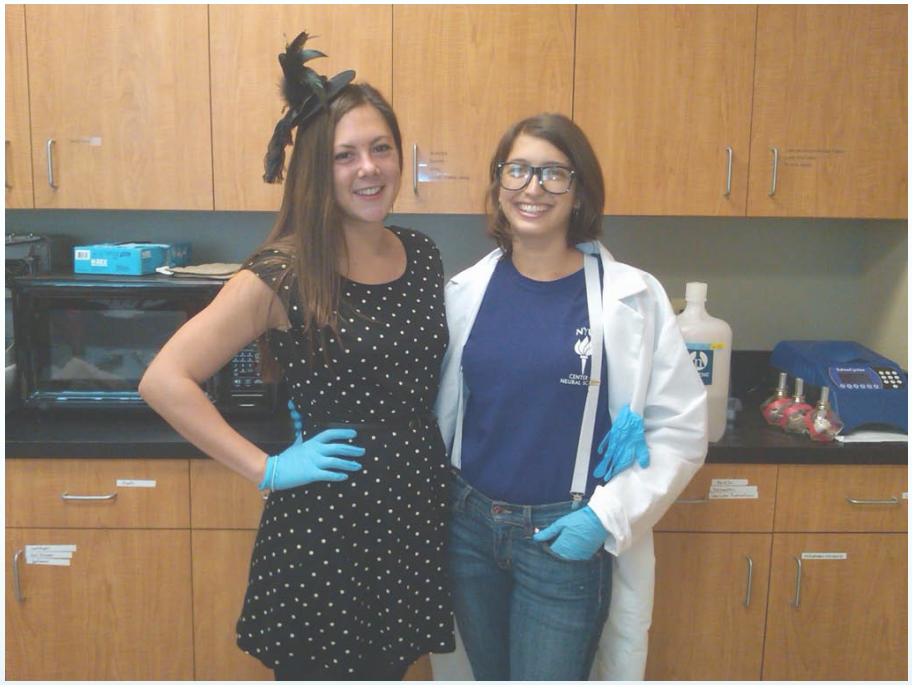
UF UNIVERSITY of FLORIDA

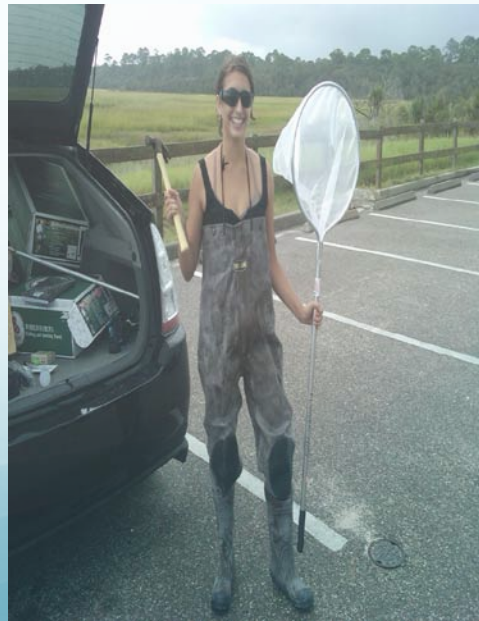
# Acknowledgements


- Kassandra Ferguson
- Dr. Terri Seron
- The GTM-NERR
- Dr. Ed McGinely
- John Wooldridge
- Max Henzler
- James Nifong
- Tom Hardy
- Flagler College
- Dr. Melissa Southwell
- Marti Hammell


# Questions?


Blue Crab Right Claw
WET
EDGE
National Marine
Educators Association
www.marine-ed.org





# References:


- Bachman, P. M., & Rand, G. M. (2008). Effects of salinity on native estuarine fish species in South Florida. [Research Support, U.S. Gov't, Non-P.H.S.]. *Ecotoxicology, 17*(7), 591-597. doi: 10.1007/s10646-008-0244-7
- Bell, G. W., Eggleston, D. B., & Noga, E. J. (2010). Molecular keys unlock the mysteries of variable survival responses of blue crabs to hypoxia. [Research Support, Non- U.S. Gov't Research Support, U.S. Gov't, Non-P.H.S.]. *Oecologia, 163*(1), 57-68. doi: 10.1007/s00442-009-1539-y
- Bielmyer, G. K., Bullington, J. B., Decarlo, C. A., Chalk, S. J., & Smith, K. (2012). The Effects of Salinity on Acute Toxicity of Zinc to Two Euryhaline Species of Fish, Fundulus heteroclitus and Kryptolebias marmoratus. *Integr Comp Biol*. doi: 10.1093/icb/ics045
- Dhillon, R. S., & Schulte, P. M. (2011). Intraspecific variation in the thermal plasticity of mitochondria in killifish. [Comparative Study Research Support, Non-U.S. Gov't]. *J Exp Biol, 214*(Pt 21), 3639-3648. doi: 10.1242/jeb.057737
- Doherty, G. J., & McMahon, H. T. (2008). Mediation, modulation, and consequences of membrane-cytoskeleton interactions. [Review]. *Annu Rev Biophys, 37*, 65-95. doi: 10.1146/annurev.biophys.37.032807.125912
- Durack, P. J., Wijffels, S. E., & Matear, R. J. (2012). Ocean salinities reveal strong global water cycle intensification during 1950 to 2000. [Research Support, Non-U.S. Gov't
- Halliburton, W. D. (1887). On Muscle-Plasma. *J Physiol, 8*(3-4), 133-202. McLean, L., Young., S, I., Doherty., M, K., Robertson., d, H, L., Cossins., A, R., Gracey., A, Y., ... Whitfield., P, D. (2007) *Proteomics,7*, 2667-2681. doi:
- 10.1002/pmic.200601004 Research Support, U.S. Gov't, Non-P.H.S.]. *Science,*
- *336*(6080), 455-458. doi: 10.1126/science.1212222 Straub, F. B., & Feuer, G. (1989). Adenosinetriphosphate. The functional group of actin.
- 1950. [Biography Classical Article Historical Article Research Support, Non-U.S.
- Gov't]. *Biochim Biophys Acta, 1000*, 180-195. Whitehead, A., Roach, J. L., Zhang, S., & Galvez F. (2011). Genomic mechanisms of
- evolved physiological plasticity in killifish distributed along an environmental salinity gradient. *Proceedings of the National Academy of Sciences*. doi:10.1073/pnas.1017542108