

# Comparing sea star species with varying susceptibility to sea star wasting disease



Grace Crandall *she/her*

PhD Student

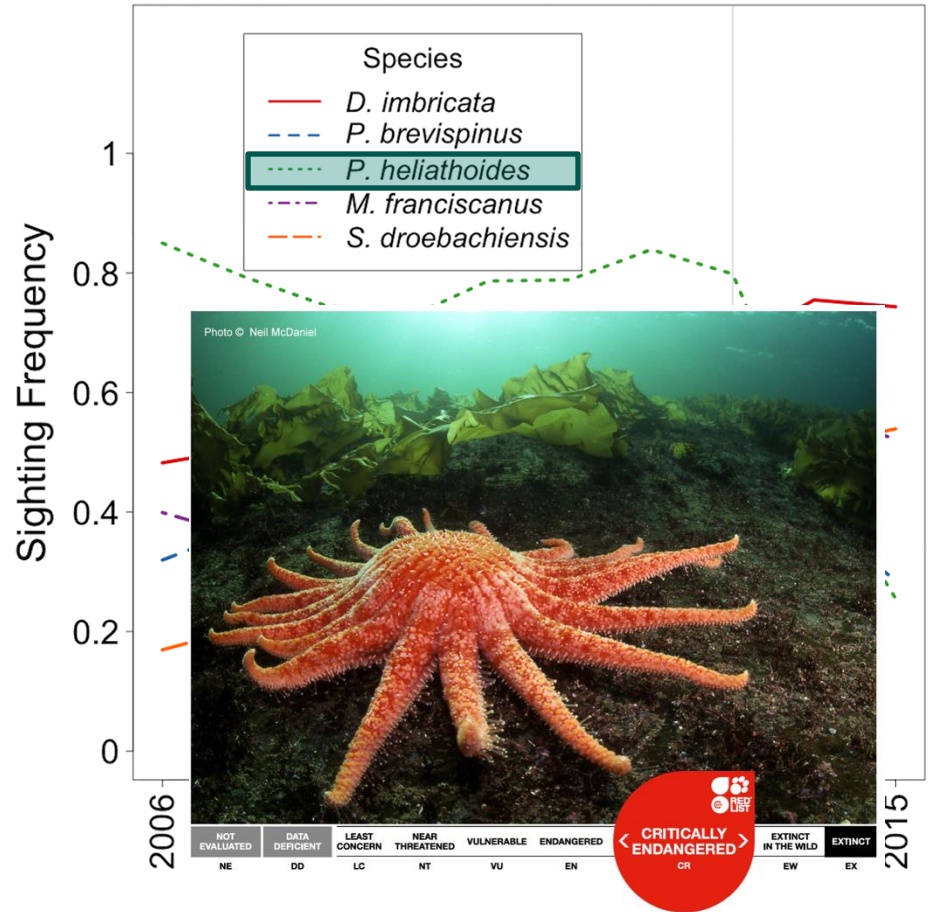
University of Washington

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Sciences



# Sea Star Wasting Disease

- 2013 – present
- 20+ species; billions of sea stars lost
  - Some species harder hit than others



- Does what causes disease in *Pycnopodia helianthoides* cause disease in other species?
- If disease does transfer between species, does it do so evenly, or do some species have some resistance?
- What can resistance inform us about recovery efforts for *Pycnopodia helianthoides*?

# Species Studied



*Dermasterias  
imbricata*  
Leather Star



*Pisaster  
ochraceus*  
Ochre Star



*Pycnopodia  
helianthoides*  
Sunflower Star

More resistant



Least resistant

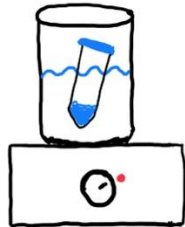




# Experimental Design



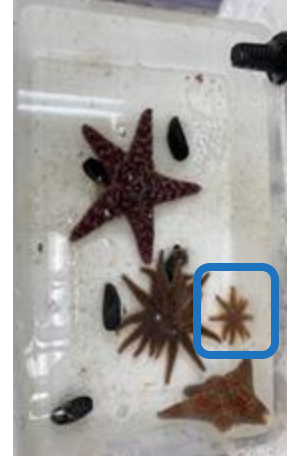
Wasting adult  
*P. helianthoides*



Focal disease  
agent



Focal control  
agent



# Experimental Design



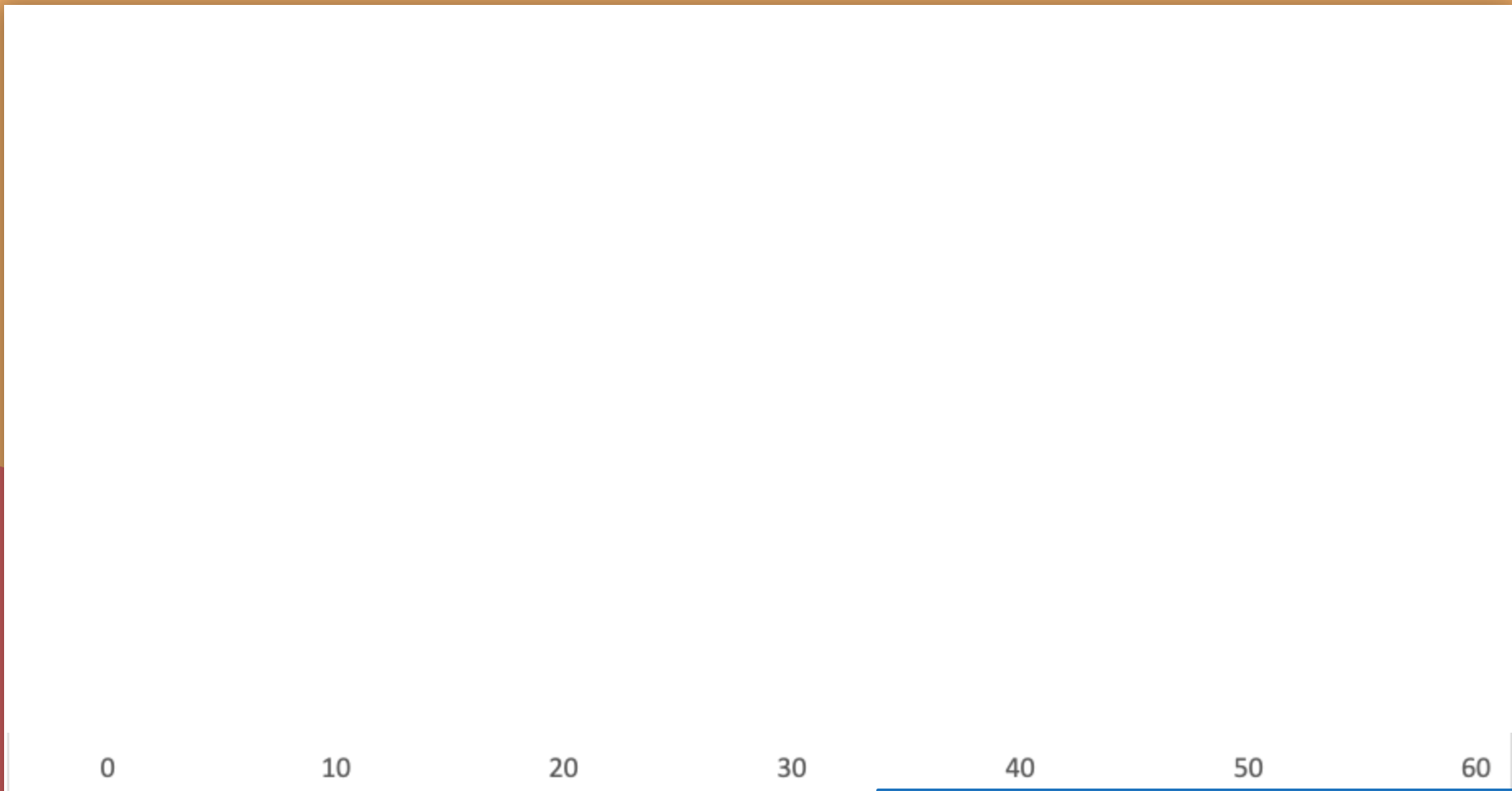
N=6

**CONTROL**

N=6



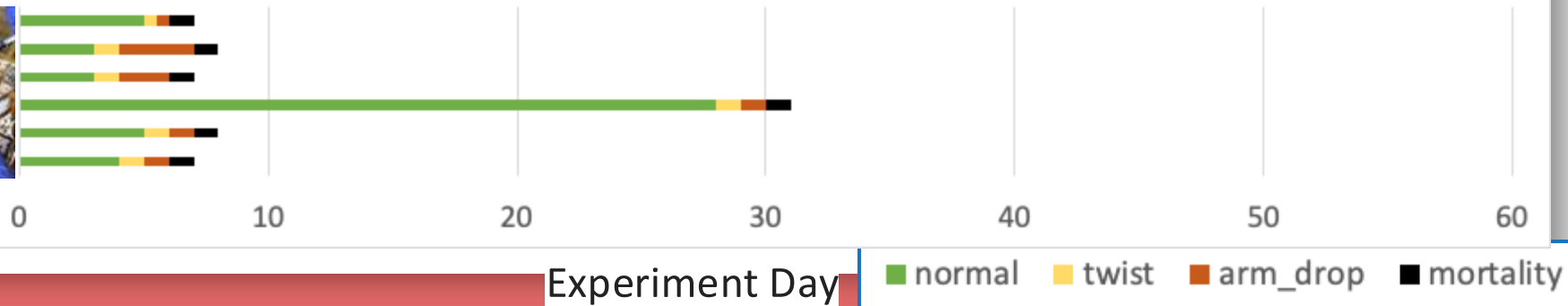
**EXPOSED**

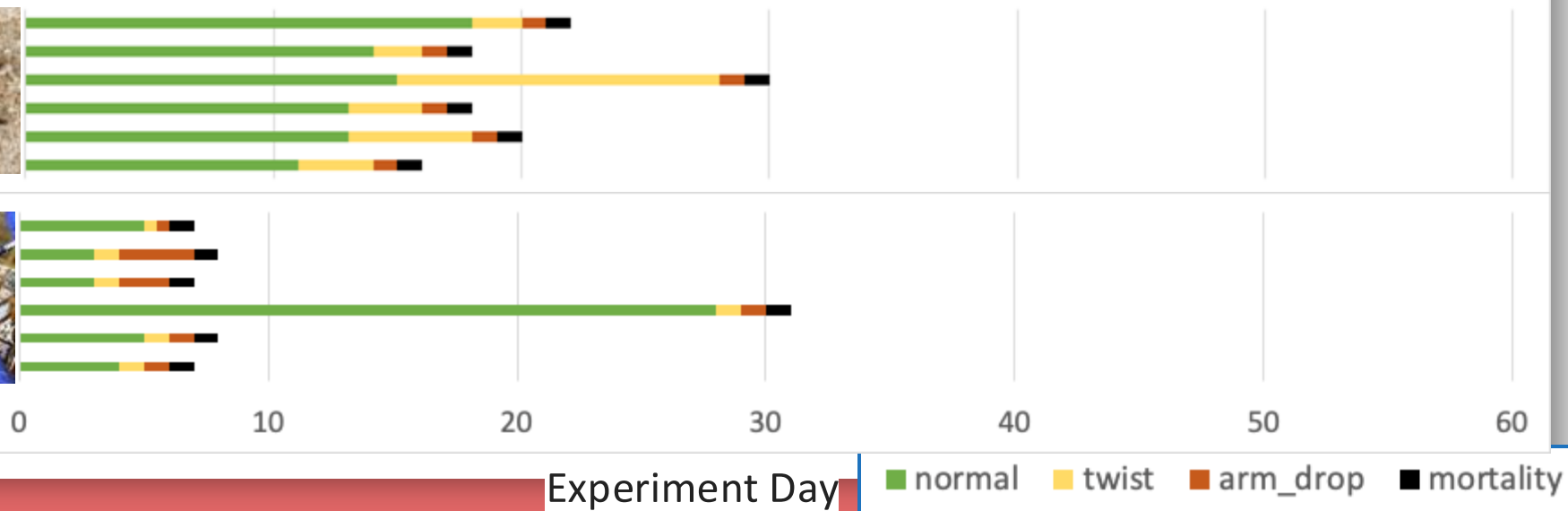


Experiment Day

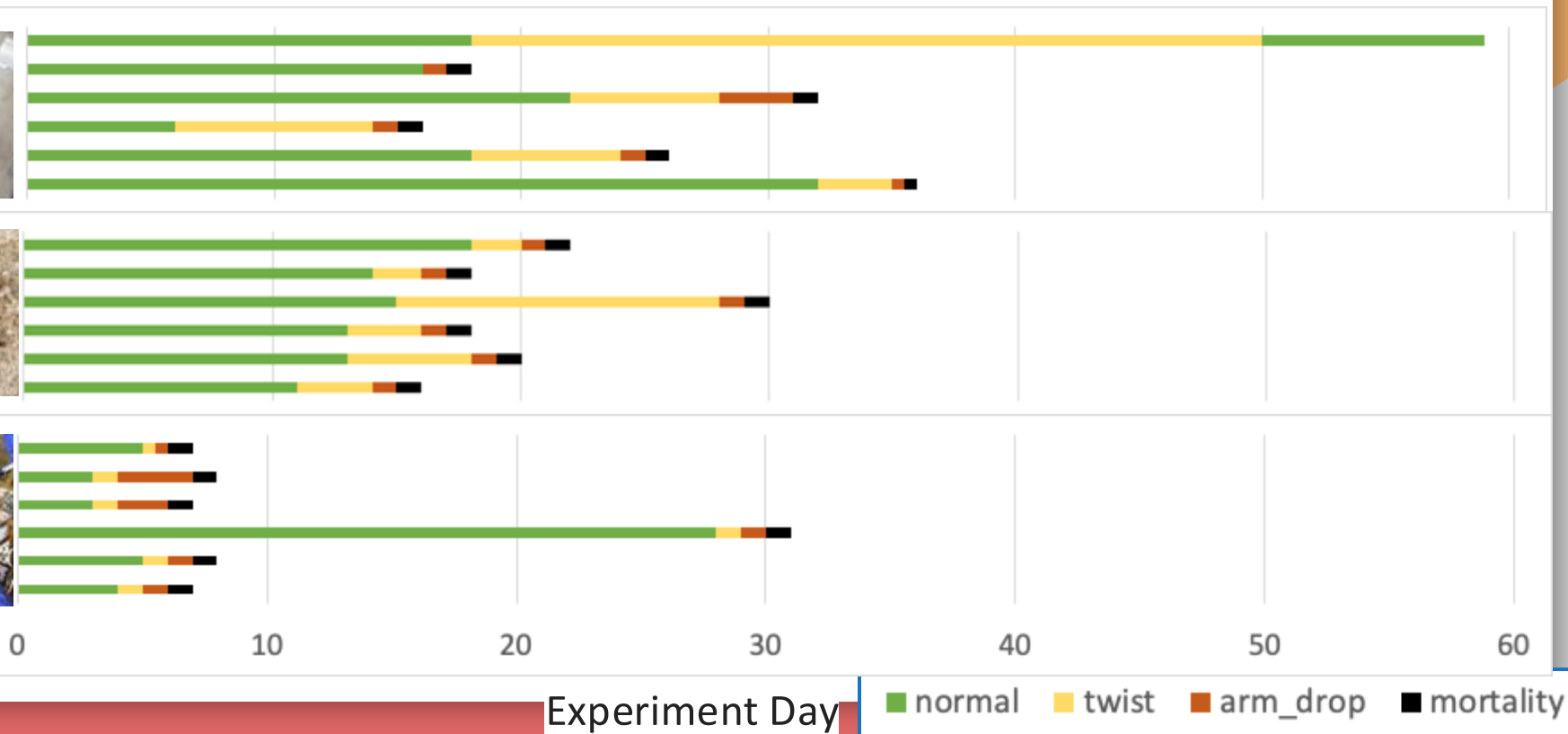
■ normal ■ twist ■ arm\_drop ■ mortality







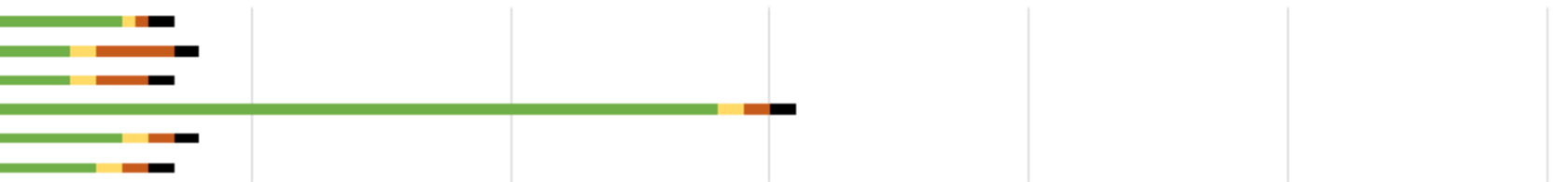
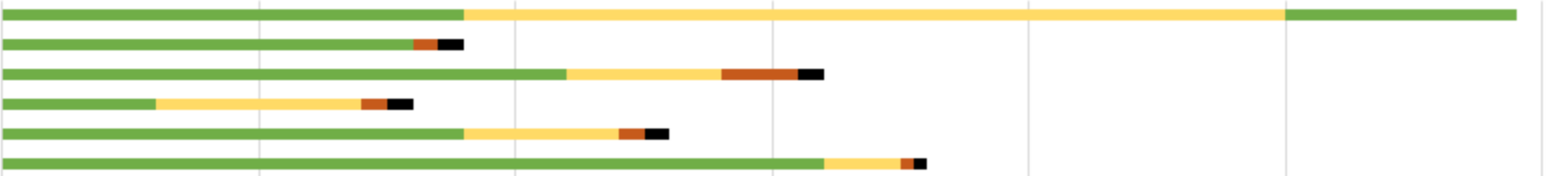
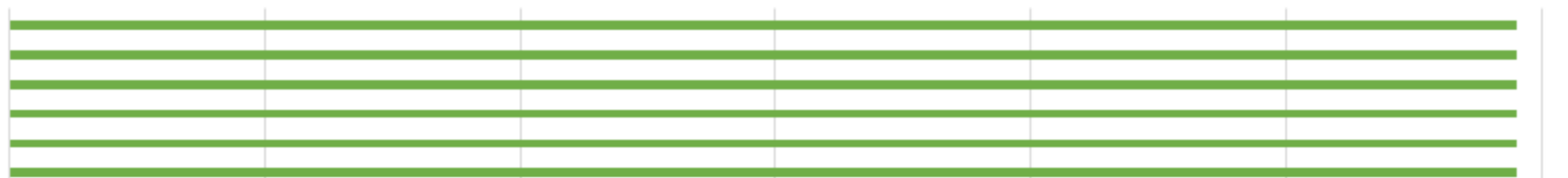








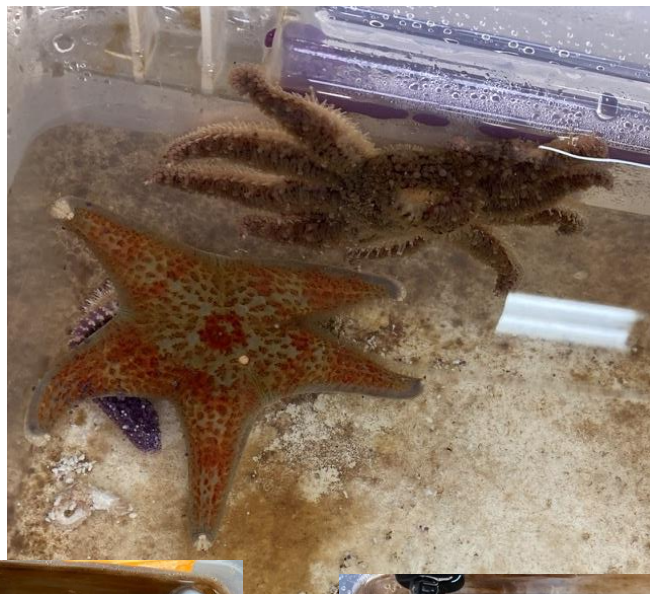


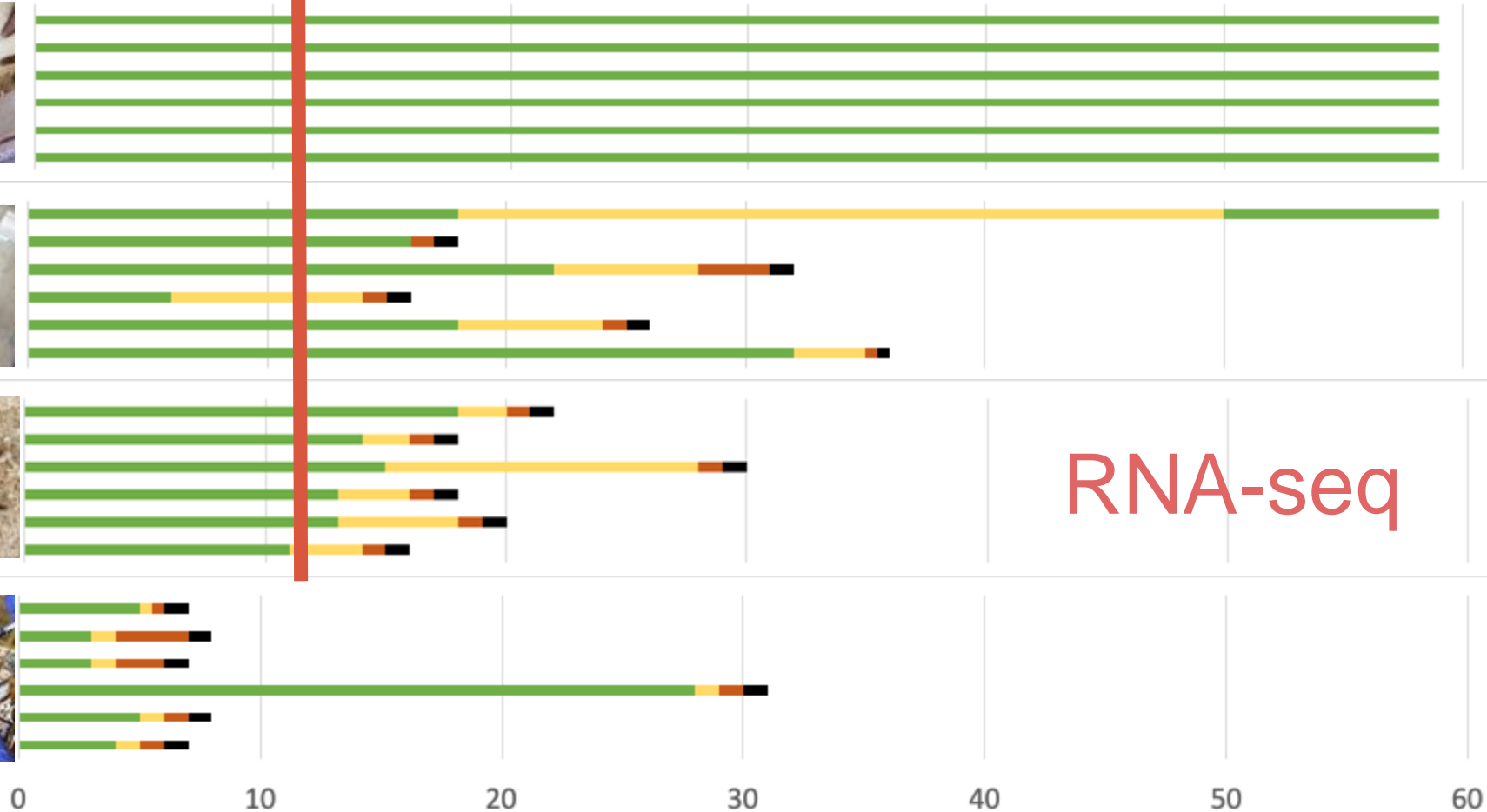


0 10 20 30 40 50 60

Experiment Day

normal twist arm\_drop mortality





Experiment Day

normal twist arm\_drop mortality

Coelomocytes



Coelomocytes



Coelomocytes





# Preliminary Comparison



*Dermasterias  
imbricata*  
Leather Star



*Pycnopodia  
helianthoides*  
Sunflower Star

More resistant



Least resistant





N=6 RNAseq libraries



Assemble transcriptome *de novo*



Annotate with BLAST and  
uniprot/swissprot



Annotate with Gene Ontology (GO)  
and GO Slim Terms



N=6 RNAseq libraries



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# Abundant Biological Processes



Term	Count_Derm	Count_Pycn

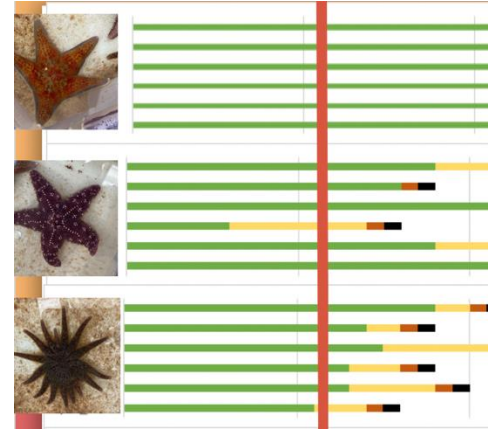
# Abundant Biological Processes



Term	Count_Derm	Count_Pycn
anatomical structure development	2091	2120
cell differentiation	932	941
signaling	908	925
immune system process	554	533
lipid metabolic process	352	331
reproductive process	306	316
transmembrane transport	278	268
carbohydrate derivative metabolic process	275	267
vesicle-mediated transport	264	253
nucleobase-containing small molecule metabolic process	246	244
programmed cell death	227	225
cell motility	214	213

# Exciting Directions

- Find orthologous immune pathways across species
- Examine correlation of expression profile to phenotype
- Look at gene family expansion across species
- Identify divergent genes, unique domains, unique genes
- Characterize non-host sequences and expression levels
- Characterize long non-coding RNAs and expression levels
- Identify genetic variation (SNPs) that could relate to phenotype
- Do we see any tank specific expression patterns
- Characterize diversity of expression patterns within and across species



Any other ideas? Come talk to me!

# Acknowledgements



Washington Department of  
**FISH & WILDLIFE**



**Hakai**  
*Science on the Coastal Margin*

**W** **FRIDAY HARBOR LABORATORIES**

COLLEGE OF THE ENVIRONMENT  
UNIVERSITY of WASHINGTON



Thank you!

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