



* THE CHANGING OCEAN

Lecture 12 - Nov 30th, 2015

Intro to Marine Science

Instructor: Lauren Bell

*Final Exam

150 points

Cumulative, with emphasis on new material

Similar format to midterm

POSSIBLE TESTING PERIOD

(i.e., YOU MUST TAKE YOUR EXAM WITHIN THIS WINDOW)

Start: **MONDAY, DECEMBER 7, 2015** at **8:00 am**

End: **WEDNESDAY, DECEMBER 9, 2015** at **11:59pm**

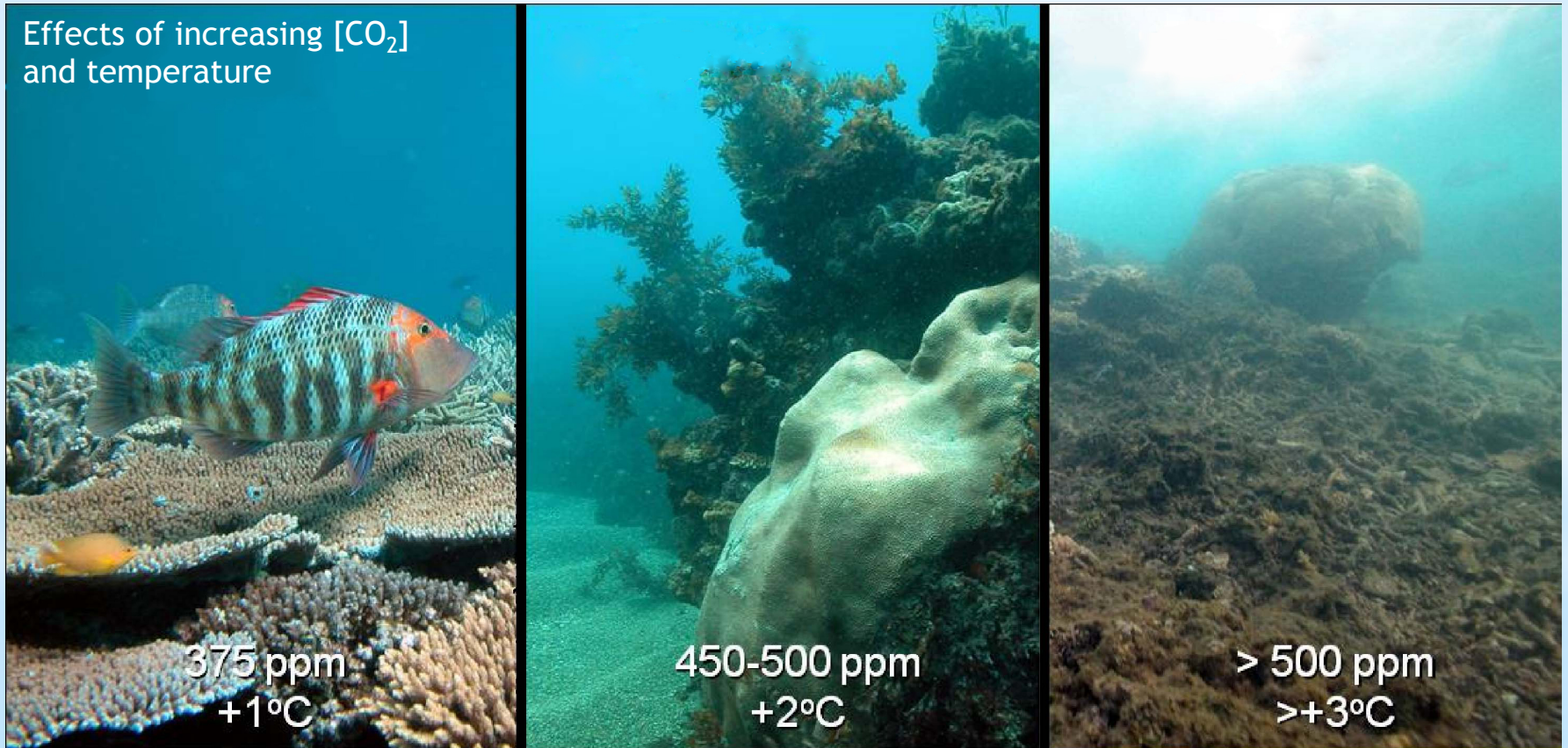
- Be sure to arrange with Emy if your proctor situation has changed
- No notes, no scratch paper, no internet
- You have 5 hours to take the exam, which should be more than sufficient

* Learning objectives

After this lesson, you will be able to:

- Identify some of the modern research efforts to understand and mitigate threats to the world's oceans
- List some ways that marine science is rapidly changing (technology, approach, etc.) and discuss the consequences of these changes on the future of marine research

*Research in the face of global change



Where do we even begin?

*Start small

Focus on controlled, small scale experiments

PROS

- Reduced # variables
- High power of detecting cause and effect

CONS

- Not “realistic”
- Hard to extrapolate results

Marine Drugs
OPEN ACCESS
ISSN 1660-3397
www.mdpi.com/journal/marinedrugs

Mar. Drugs 2010, 8, 2318-2339; doi:10.3390/md8082318

Article
Impact of Ocean Acidification on Energy Metabolism of Oyster, *Crassostrea gigas*—Changes in Metabolic Pathways and Thermal Response
Gisela Lannig^{1,*}, Silke Eilers¹, Hans O. Pörtner¹, Inna M. Sokolova² and Christian Bock¹

Molluscan Research 30(3): 125–130
<http://www.mapress.com/mr/>

MARINE ECOLOGY PROGRESS SERIES
Mar Ecol Prog Ser

Vol. 417: 159–170, 2010
doi: 10.3354/meps08807

Published November 4

Effects of ocean acidification and warming on the larval development of the spider crab *Hyas araneus* from different latitudes (54° vs. 79° N)
Kathleen Walther^{1,*}, Klaus Anger², Hans O. Pörtner¹

ISSN 1323-5818
Magnolia Press

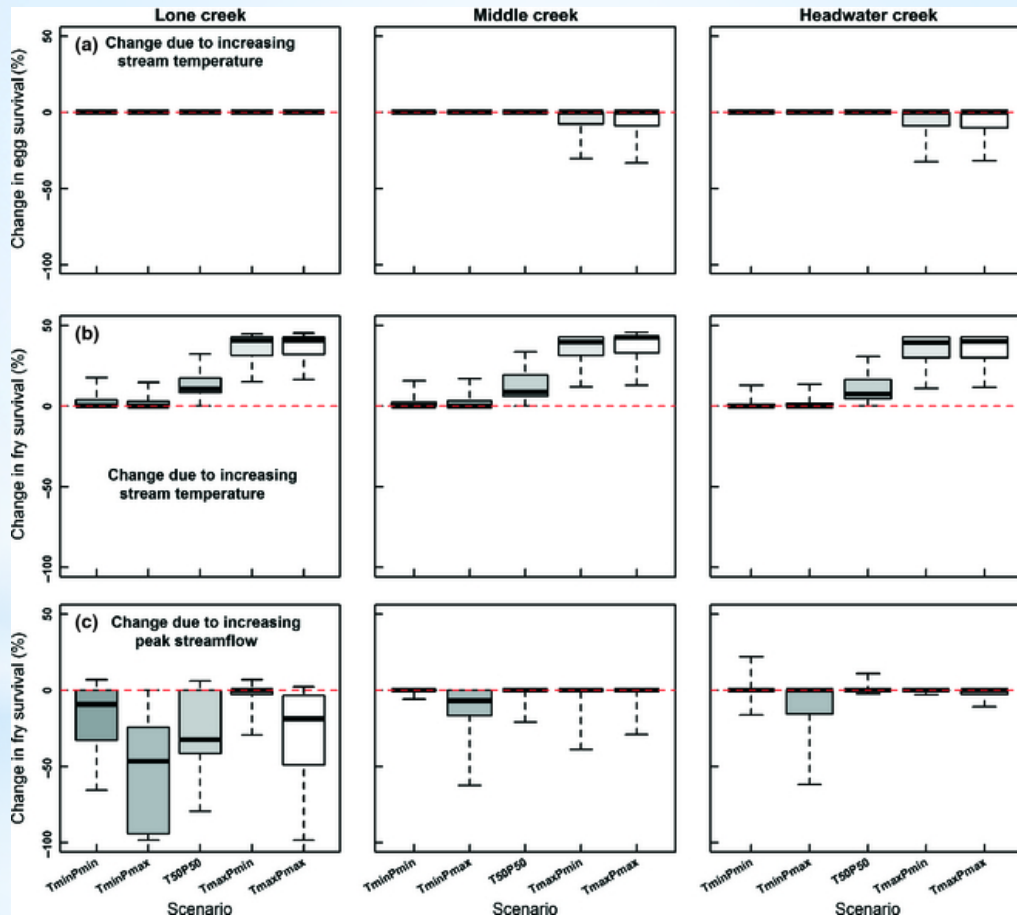
The effects of exposure to near-future levels of ocean acidification on shell characteristics of *Pinctada fucata* (Bivalvia: Pteriidae)

HEATHER M. WELLADSEN^{1,2*}, PAUL C. SOUTHGATE² & KIRSTEN HEIMANN³

* Add variables (with caution)

Linking climate change projections for an Alaskan watershed to future coho salmon production

Common to test “multiple scenarios” to predict future impacts



* Long-term monitoring

PROS

- Best, most accurate way to monitor change
- Once in place, can ‘catch’ other results
- Small to large scale designs

CONS

- Not “sexy” in the short term
- Scale limited by available time, effort, and \$\$
- May not see anything!!



Exxon Valdez Oil Spill Trustee Council
Monitoring the GOA in response to the
1989 Exxon Valdez spill



Multi-Agency Rocky Intertidal Network
Standardized protocols for sampling in
the rocky intertidal so that data can be
compared across time and space



Coastal Resilience
Kelp Forests and Pinto Abalone
in Sitka Sound

* Citizen Science!

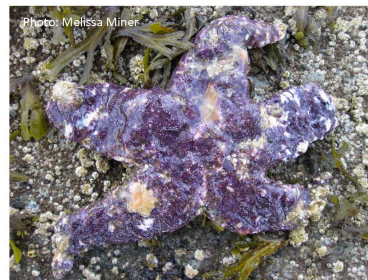
PROS

- Widest spatial coverage possible
- Taps into peoples' "sense of place"
- Invests locals in local change

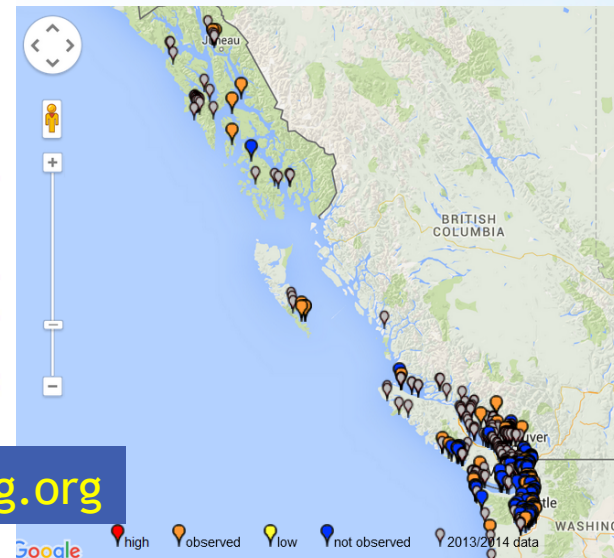
CONS

- Limited in what can realistically ask of people
- Data still needs 'vetting' by trained scientists
- Honest mistakes

Category 4



Seastarwasting.org

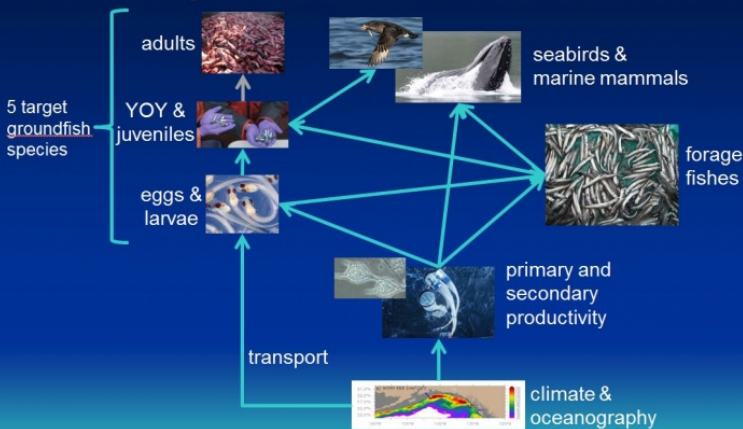


* Ecosystem Initiatives

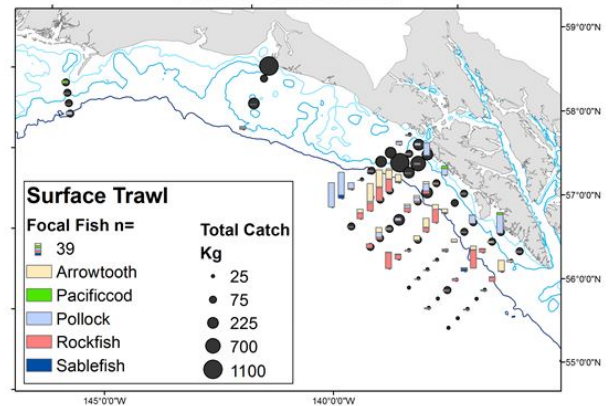
- Movement away from single species management
- Harder to pinpoint cause and effect, but more realistic view of interconnected processes



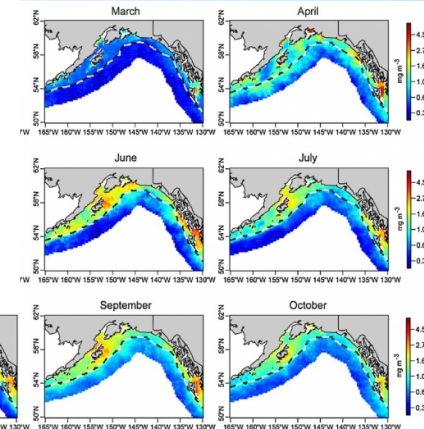
Project conceptual model



GOAIERP 2012 Summer



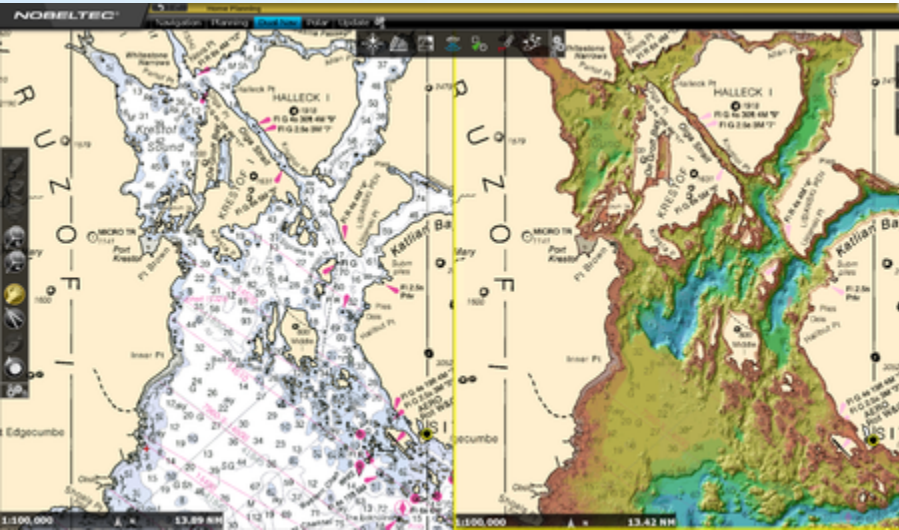
Measuring indices, looking for correlation



*Technology & research

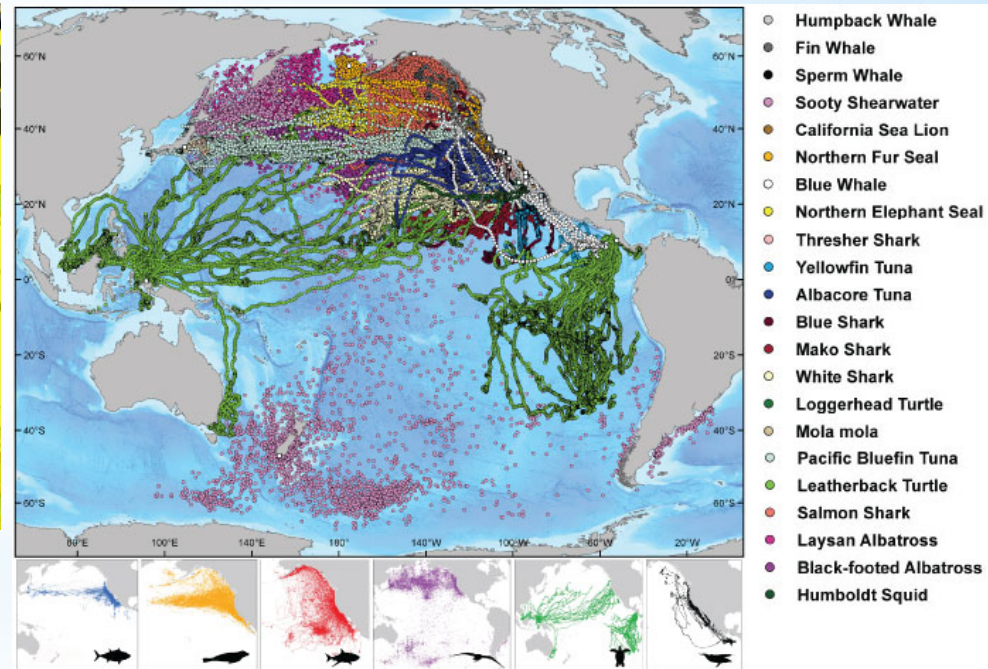
- Rapid pace of technology often moving faster than we can keep up
- Overall, enhancing our research capabilities

Alaska Longline Fishermen's Association Bathymetric & Bycatch mapping



- Improved mapping, shared amongst users
- Fishermen better able to avoid high-bycatch areas, focus on high target catch areas

Tagging of Pacific Predators (ToPP) Where do they all go?



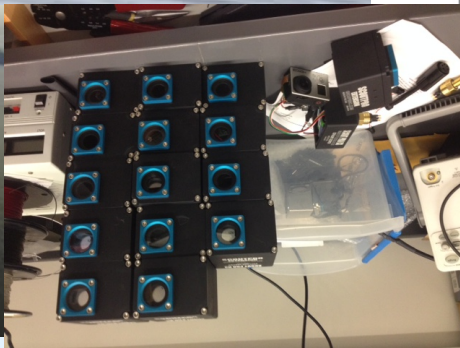
- Better understanding of pelagic “hotspots”
- Critical for establishment of protected areas that can benefit multiple species

*Technology & research

South East Alaska Sperm Whale Avoidance Program Cooperation between scientists and fishermen



- Sperm whales have learned to steal sablefish off of longliner sets
- Longliners unhappy about this
- Scientists tag naughty sperm whales so fishermen can avoid
- Scientists work with fishermen to test deterrent measures
- Goal to reduce depredation and lessen long-term behavior establishment



d) Trel=63s



e) Trel=66s



f) Trel=70s



*Research funding concerns



Abandoned drilling plans
= less research \$\$\$



Statoil

*Leaders in PacNW research



Despite funding concerns, Alaska remains centerpiece for marine research in our changing world





* **GOOD WORK!**

Great class - good luck on final!

Enjoy the holidays, and hope to see you all
again through fish tech