DO NOW (5 MIN.)

Using the PRJA given you, write down the following in your research journals:

- Authors of article
- Year it was **published**
- Title of article
- Name of Journal
- Page numbers of article

ANNOUNCEMENTS

Interviews today after 8th period for the sMBRP.

- Make sure you have a resume and cover letter for the interview if you want to apply for the stipend.

Friday interviews.

- Schedule an appointment.

sMBRP applications are due March 16th. No Exceptions.

Wednesday, I'm meeting with fish and bacteria project researchers.

MLP03 3 interviews will be graded***

HW

Mark up a figure or table of the PRJA you will choose for the symposium

If you still don’t have ***the one PRJA***, mark up one that you have.

HOW CAN I INTERPRET PRJA FIGURES AND TABLES?

Mr. M. Gonzalez
Marine Biologist

OBJECTIVES

I can examine the role of figures in PRJAs.

I can use figures to gain access to PRJAs.

I can connect course content to ongoing scientific research.

VOCABULARY

Supralittoral

Perwinkle

Microhabitats

Spatial distribution

Dessication

Persistence

Monolithic Rock

Thermal Stress

Mobility

Temporal

Diurnal

Manifest

Longevity

VOCABULARY

Supralittoral – high shore

Perwinkle - snail

Microhabitats – tiny habitats

Spatial distribution – where live

Dessication – dry up

Persistence – stay in a spot

Monolithic Rock – large boulder

Thermal Stress – over heating

Mobility – movement

Temporal – related to time

Diurnal – during day

Manifest – show

Longevity – live long

WHEN READING A PEER-REVIEWED JOURNAL ARTICLE - ALWAYS KEEP THE **PROBLEM** IN MIND!

http://www.writeawriting.com/wp-content/uploads/2011/10/research-design-desinition-types-explained.jpg

WHAT'S THE PROBLEM OF THIS PRJA?

Journal of Experimental Marine Biology and Ecology 369 (2009) 148–154

Contents lists available at ScienceDirect

Journal of Experimental Marine Biology and Ecology

journal homepage: www.elsevier.com/locate/jembe

Life in the Supralittoral Fringe: Microhabitat Choice, Mobility and Growth in the Tropical Perwinkle *Cenchritis* (=*Tectarius*) *muricatus* (Linneaus, 1758)

Michael L. Judge [a,*], Rachel Duell [b], Laura Burriesci [a], Wassem Moarsi [a]

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ARTICLE INFO

Article history:
Received 28 July 2008
Received in revised form 13 November 2008
Accepted 17 November 2008

Keywords:
Age
Growth
Littorinid
Microhabitat
Supralittoral

ABSTRACT

The littorinid snail, *Cenchritis muricatus*, inhabits supralittoral vertical rocky walls along Caribbean shores, at times surpassing 14 meters above mean sea level. As the sole macrofaunal representative of this habitat, this marine gastropod presumably experiences extraordinary conditions of thermal load and desiccation. In order to understand the effect of behavioral choices on periwinkle survivorship and growth, snail distribution, microhabitat utilization, and crawling speed were documented in St John (US Virgin Islands). In general, snails rarely inhabited open surfaces; instead, periwinkles were commonly observed in microhabitats that may reduce water and heat stresses (e.g., >75% in crevices and depressions). Snails found on occasional buttonwood trees (*Conocarpus erectus*) were larger than elsewhere. Although typically found in repose, *C. muricatus* crawling speed on moist, shaded, and smooth substrata averaged more than 3 cm·min^{-1}, but did not vary with slope. Repeated mark-recapture of tagged periwinkles exhibited high recovery rates (ca. 35% after 4 yr), absence of mortality, and a projected cessation of growth at 16.5 mm (shell height). Nearly 10% of marked individuals were recaptured every year. Dead, tagged snails were never noted; indeed, seven individuals were only recovered once, a full 4 yrs after release. Site-specific growth rates were absent. Projections using von Bertalanffy growth functions (VBGF) suggest that periwinkles will require 15+ years to achieve the maximum shell height. These VBGF models cannot address extraordinary individuals reaching 22 mm. *C. muricatus*'s remarkable supralittoral distribution may be explained by physiological tolerance, selection of microhabitats, lack of predators and long lifespan.

SCIENTIFIC PROBLEM

General:

- What's the supra-littoral distribution of the Periwinkle?

Specific:

- Is the Periwinkle more commonly found in microhabitats that provide a spatial refuge from desiccation and thermal stresses?
- Is snail mobility sufficient to grant a temporal refuge via diurnal migrations to the sea?
- Are the consequences of behavioral choices manifested in snail growth and survivorship differences among rock wall sites?

SCIENTIFIC PROBLEM – TRANSLATE!

General:

- What's the supra-littoral distribution of the Periwinkle?

Specific:

- Is the Periwinkle more commonly found in microhabitats that provide a spatial refuge from desiccation and thermal stresses?
- Is snail mobility sufficient to grant a temporal refuge via diurnal migrations to the sea?
- Are the consequences of behavioral choices manifested in snail growth and survivorship differences among rock wall sites?

SCIENTIFIC PROBLEM (TRANSLATION)

General:

- Where on the shore is the periwinkle found?

Specific:

- Is the Periwinkle mostly found in tiny habitats that prevent them from drying up?
- Can snails move fast enough to find shelter during the day outside the sea?
- Can you connect the choices snails make with their growth and survivorship along different rock wall sites?

KEEPING THE **PROBLEM** IN MIND, WHAT'S THE **HYPOTHESIS**?

http://www.writeawriting.com/wp-content/uploads/2011/10/research-design-desinition-types-explained.jpg

DEFINE HYPOTHESIS

(Britton, 1992). Knobby periwinkles are generally inactive by day and dry nights, but can move up to 4 m overnight under favorable conditions (Emson et al., 2002). These snails are opportunistic grazers and adults may exhibit growth pulses during the rainy season (Burgett et al., 1987).

In order to evaluate the unique supralittoral distribution of the knobby periwinkle, we sought to address three biological responses to sustained aerial exposure: microhabitat utilization, crawling speed, and individual growth rate. First, is *Cenchritis muricatus* more commonly found in microhabitats that provide a spatial refuge from desiccation and thermal stresses? Second, is snail mobility sufficient to grant a temporal refuge via diurnal migrations to the sea? Third, are the consequences of behavioral choices manifested in snail growth and survivorship differences among rock wall sites? In this study, we show that the knobby periwinkle's persistence in the high-shore area may lie in its longevity.

2. Materials and methods

2.1. Study site

The study site was located along the southern shore of St John (United States Virgin Islands) within the Virgin Islands National Park

"In this study, we show that the knobby perwinkle's persistence in the high-shore area may lie in its longevity."

HOW IS A HYPOTHESIS TESTED?

HOW IS A HYPOTHESIS TESTED?

http://abvsolutionsltd.com/wp-content/uploads/2013/10/project-managment.jpg

PROJECTS > DATA

http://media.licdn.com/mpr/mpr/p/6/000/259/003/39cb377.jpg

ORGANIZED DATA = **RESULTS**

M.L. Judge et al. / Journal of Experimental Mari

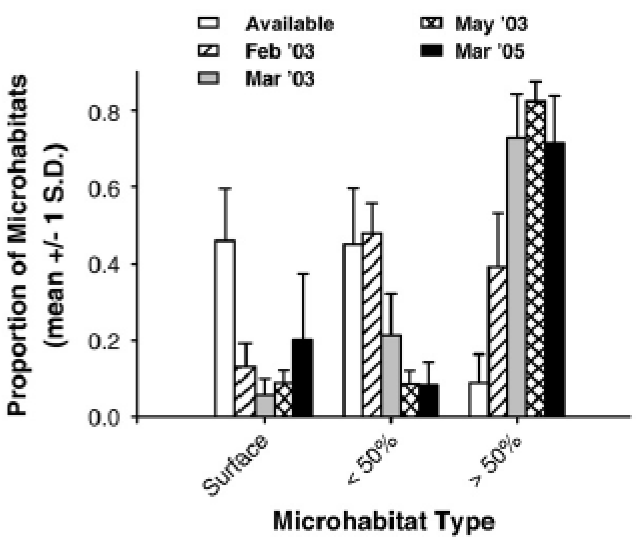
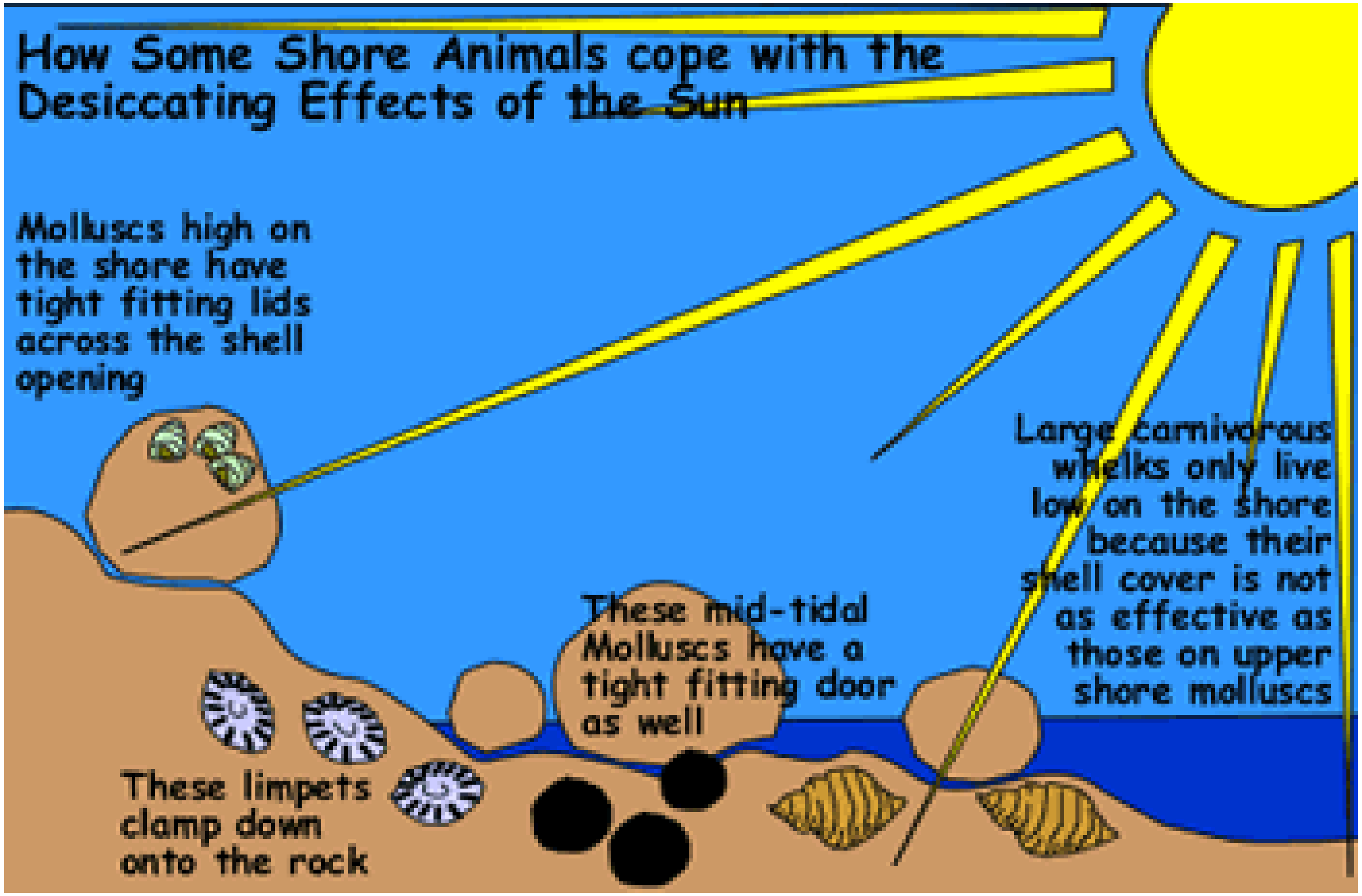


Fig. 1. Microhabitat utilization by *Cenchritis muricatus* on rock substrata on Yawzi Point, St John (USVI). Availability of microhabitats [flat or convex (**Surface**), shallow concavity (< **50%** snail shell enclosed), or deep concavity (> **50%** snail enclosed)] were similar among three sites, with the fourth site only different for surface and <50% microhabitats. On each sampling date, individually tagged snails were scored for microhabitat chosen. Data were pooled among sites because utilization patterns did not differ.

In order to find the solution to the scientific problem **data** are needed

Organized **data** are called RESULTS

PROBLEM: What is the supralittoral distribution of the periwinkle?



PROBLEM: What is the supralittoral distribution of the periwinkle?

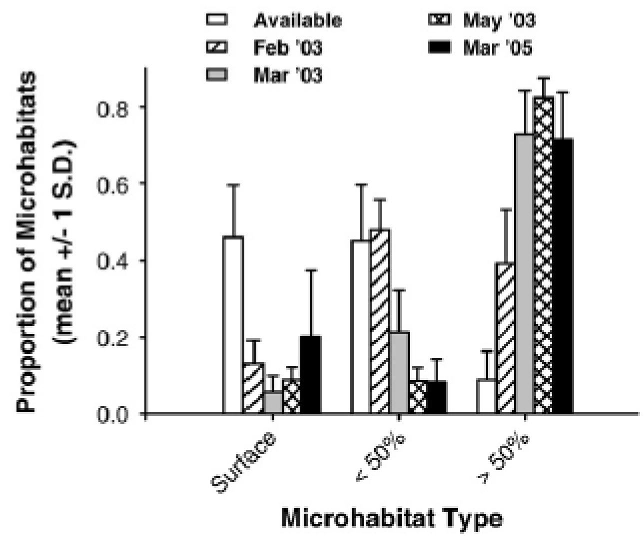
http://www.marinebio.net/marinescience/03ecology/flimg/01101per8171.jpg

INTERPRETING RESULTS OF A PRJA

Acceptable to not know meaning of every word

Use context and diagrams to gain general understanding of Results

M.L. Judge et al. / Journal of Experimental Mari



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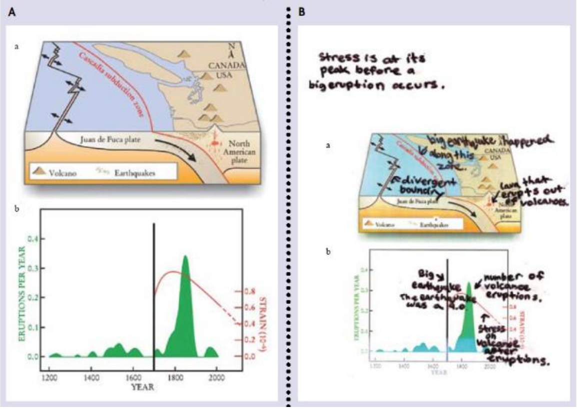
TECHNIQUES FOR INTERPRETING RESULTS - 01

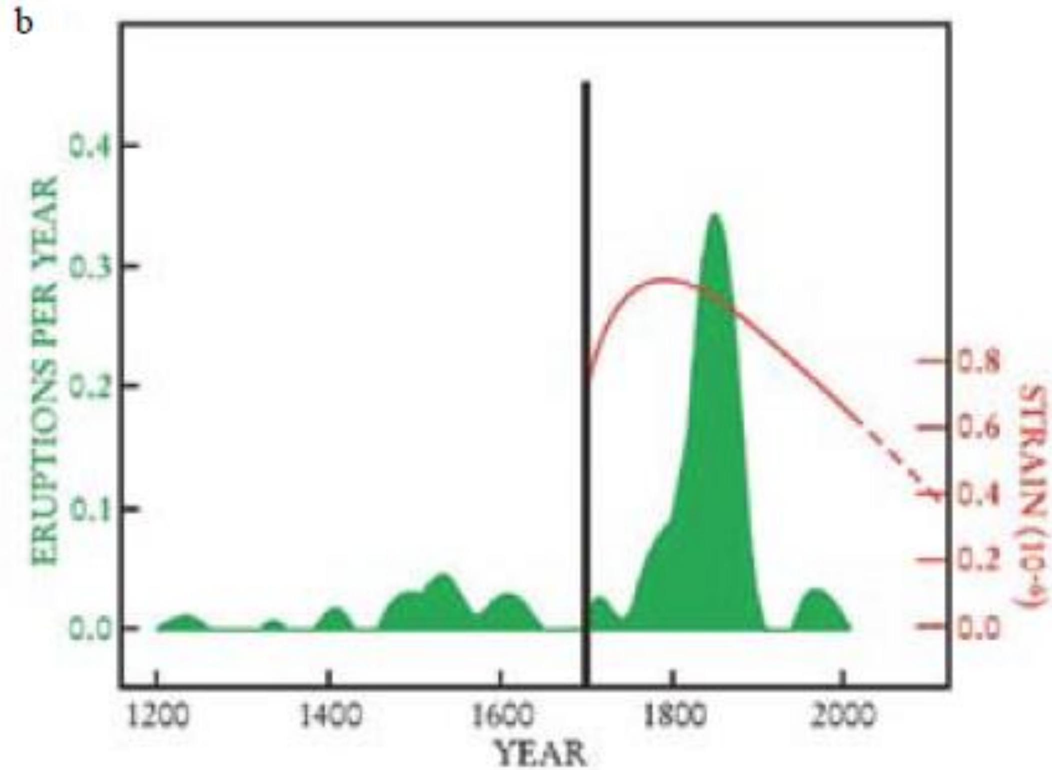
Mark up figures

Describe most important things *you* see

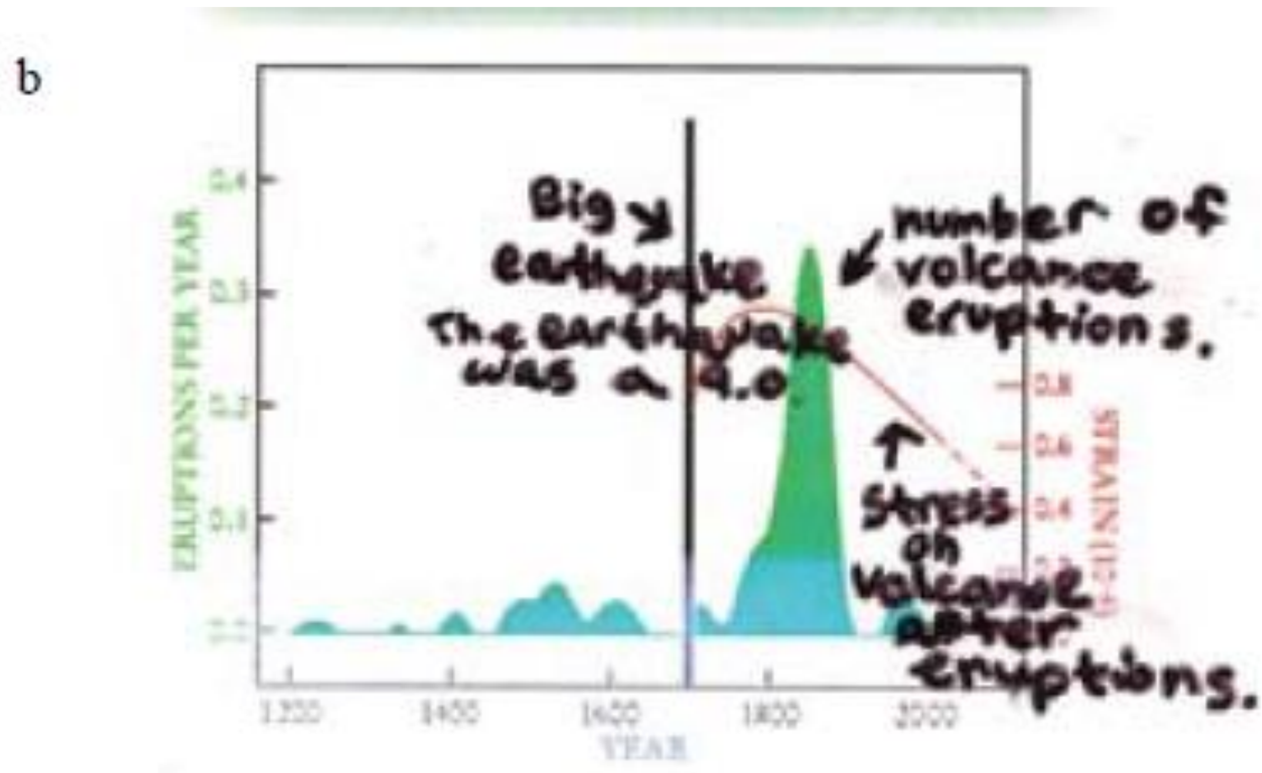
Look for patterns of interest



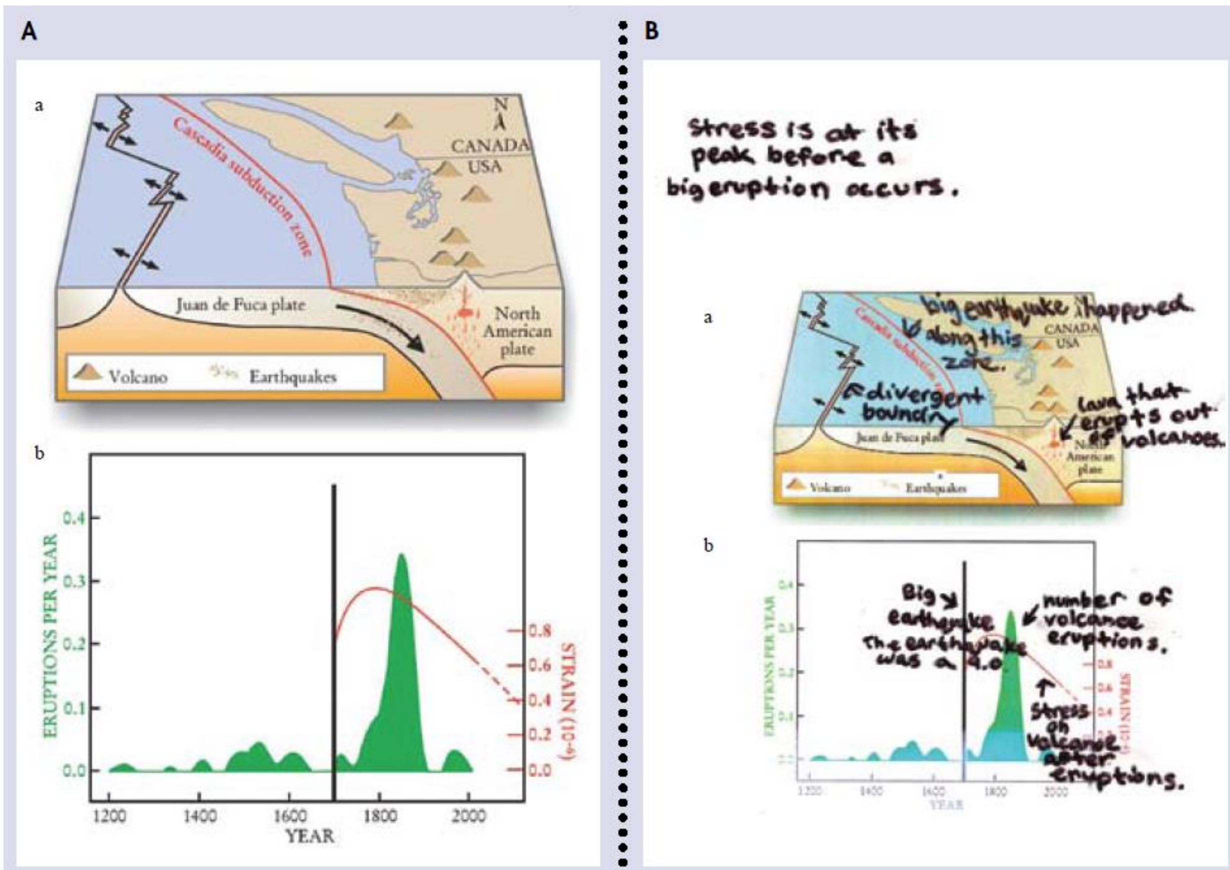
WHAT DO YOU SEE IN VOLCANO FIGURE?



EXAMPLE OF A MARK UP



EXAMPLE OF A MARK UP



PRACTICE MARKING THIS TABLE

Substrate Type	Tidal Height (m)	Slope	Density (±S.D.)
Monolithic rock	1	50°	5.5 (6.74)
Monolithic rock	2	75°	4.0 (3.02)
Monolithic rock	3	45-65°	8.4 (9.88)
Monolithic rock	5	45-65°	5.2 (5.35)
Sedimentary rock	1	75°	0.5 (1.41)
Sedimentary rock	2	75°	1.0 (1.85)
Boulder field beach	1	20°	5.5 (6.74)
Pebble / shell beach	1	10°	0.0 (0.00)
Tree (*Conocarpus erectus*)	1	90°	8.0 (8.00)

Replicate (8-10) 50 × 50 cm quadrats were sampled for each substrate type. Tidal heights are expressed relative to mean low water (MLW).

Define major headings

Look for familiar words and simplify

Look for obvious patterns (highs, lows)

SHARE MARKS

Table 1
Density ($\# \cdot m^{-2}$) of *Cenchritis muricatus* populations on various substrates along southern shore of St John, USVI (Spring 2003)

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Replicate (8-10) 50 × 50 cm quadrats were sampled for each substrate type. Tidal heights are expressed relative to mean low water (MLW).

Substrate – habitat or, more specifically, floor type

Monolithic rock – Unbroken large rock – boulder-like

Sedimentary rock – soft rock

Tidal height – height of water

SHARE MARKS

What did you mark up?

Table 1

Density ($\#\cdot m^{-2}$) of *Cenchritis muricatus* populations on various substrates along southern shore of St John, USVI (Spring 2003)

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Replicate (8-10) 50×50 cm quadrats were sampled for each substrate type. Tidal heights are expressed relative to mean low water (MLW).

Slope – angle

Density - # of snails in a square meter.

CONCLUSIONS

What can we conclude from this table?

Table 1
Density (#·m^{-2}) of *Cenchritis muricatus* populations on various substrates along southern shore of St John, USVI (Spring 2003)

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Replicate (8-10) 50 × 50 cm quadrats were sampled for each substrate type. Tidal heights are expressed relative to mean low water (MLW).

REVIEW & SHARE IN GROUPS

Connect these words by writing how they are related in your journals:

Problem

Hypothesis

Data

Results

Mark ups

Patterns

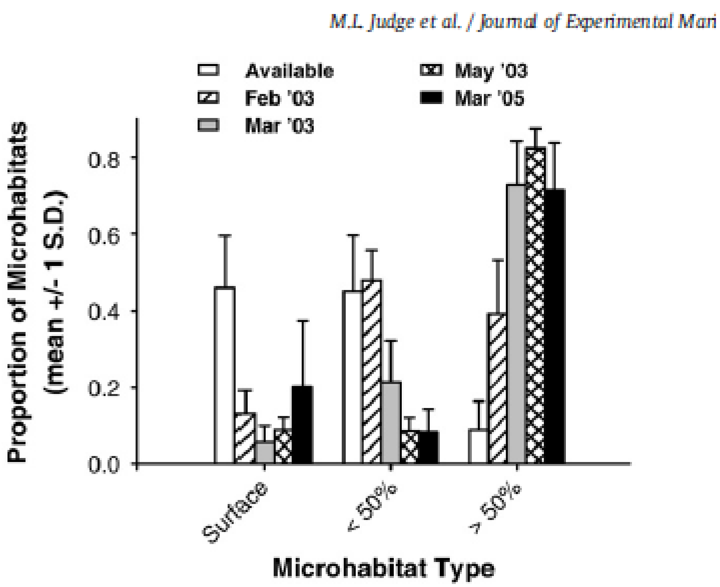
Conclusions

HW

Mark up a figure or table of the PRJA you will choose for the symposium

If you still don’t have ***the one PRJA***, mark up one that you have.

DO NOW (5 MIN.)



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In groups of 2 or 3, share the mark-ups you completed for H.W.

Write down any patterns you missed in your journal notebooks.

H.W.

Continue marking up the figures of your PRJA.

Have them ready for next class to discuss in your small groups.

HOW CAN I INTERPRET PRJA FIGURES AND TABLES?

Mr. M. Gonzalez
Marine Biologist

OBJECTIVES

I can examine the role of figures in PRJAs.

I can use figures to gain access to PRJAs.

I can connect course content to ongoing scientific research.

ANALYZE AS A CLASS…

What does this graph mean?

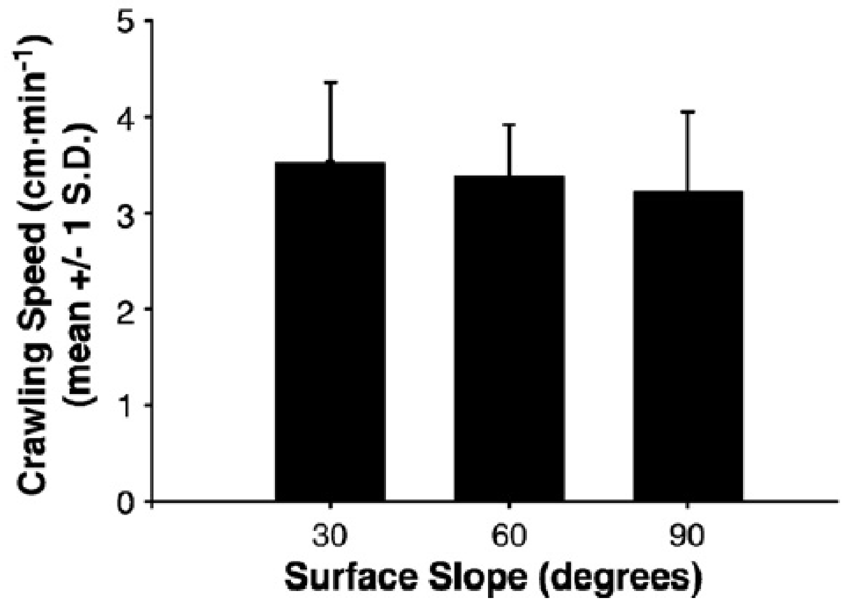


Fig. 2. Crawling speed of *Cenchritis muricatus* under aerial exposure relative to incline angle. Trials were conducted on moist and shaded terra cotta tiles over a distance of 10 cm. Only individuals that moved without stopping and exhibiting positive geotaxis were included in the analysis.

MARK-UP THIS ONE… (10 MIN.)

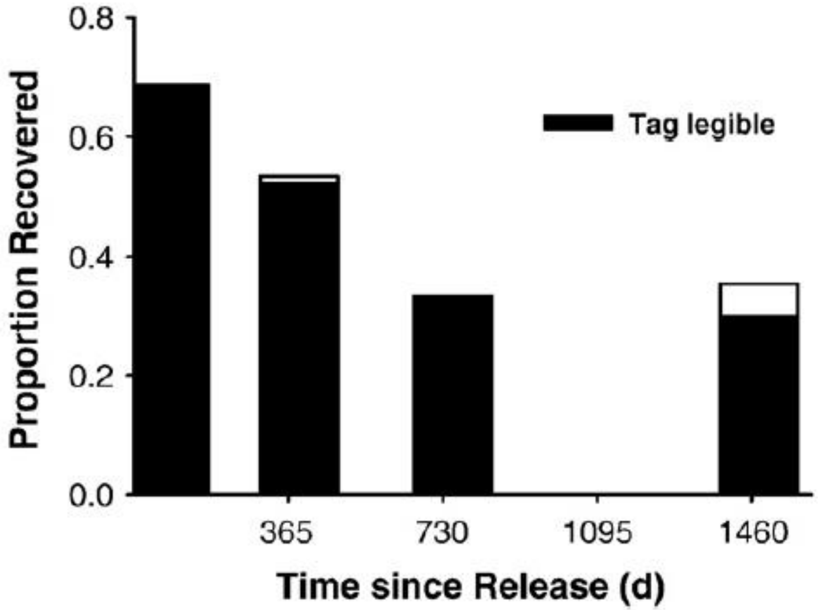


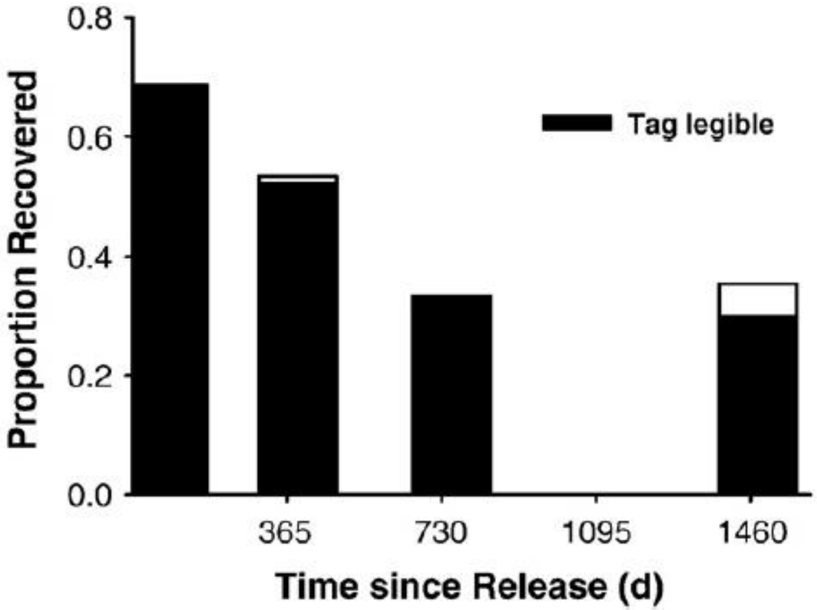
Fig. 3. Recovery rates of 327 tagged *Cenchritis muricatus* on Yawzi Point, St John (USVI). Snails were released in February 2003 and re-sampled in May 2003, March 2004, March 2005, and March 2007. Only snails with legible tags and lacking shell damage were used in the growth analyses.

Follow the same procedure.

You can find this in the packet I gave you.

SHARE IN GROUPS

What did you write?



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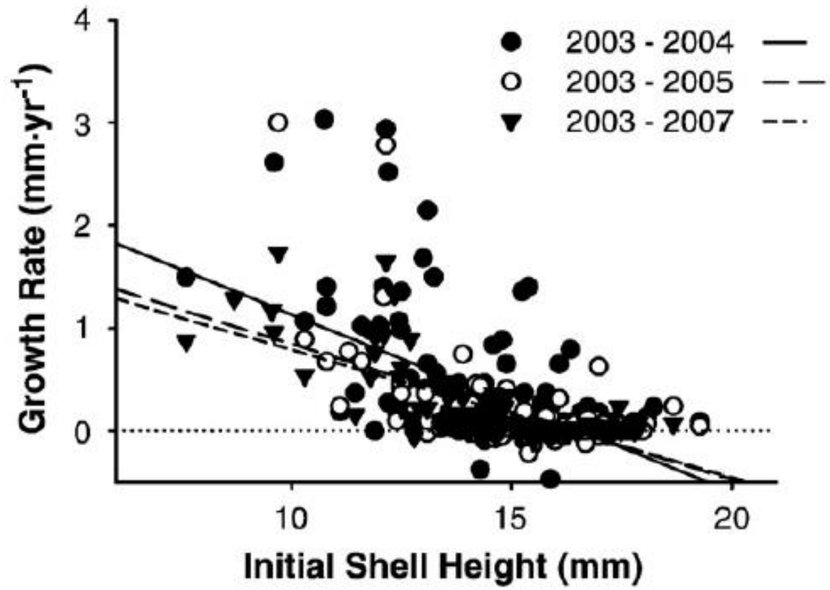
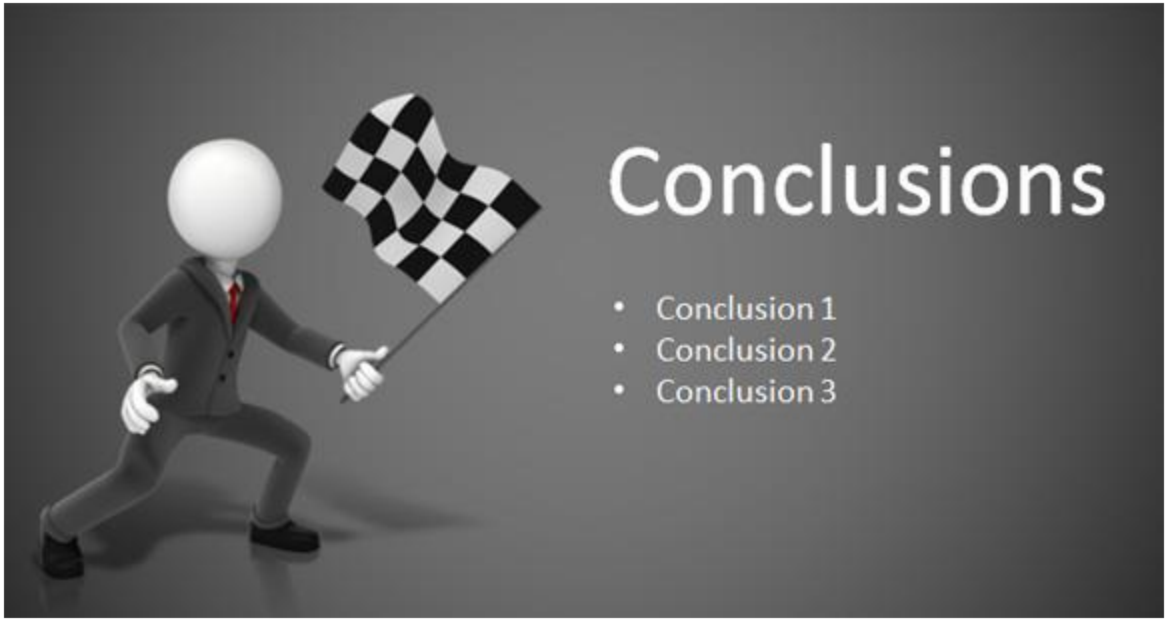


Fig. 5. Ford-Walford plot of annualized growth rate of tagged *Cenchritis muricatus* after one, two, or four years. Growth rates did not vary consistently among release sites. Regression slopes were shallower with increased sampling interval, but the predicted size of growth cessation remained consistent.

CONTINUE MARKING UP OTHER FIGURES

RESULTS > CONCLUSIONS

Most important results must be found in conclusions



http://cdn2.free-power-point-templates.com/articles/wp-content/uploads/2013/04/conclussions-ppt-template.jpg

CONCLUSIONS

5. Conclusions

1. On rock cliffs of St. John (US Virgin Islands), knobby periwinkle populations possess mean densities of 5-10 m^{-2} with individuals found 14 m above MLW.
2. Knobby periwinkles are more commonly found in rock crevice microhabitats than expected by chance.
3. Although crawling speeds may reach 3 $cm \cdot min^{-1}$ under ideal conditions, dry and heterogeneous rock surfaces likely preclude regular diurnal migrations to the sea.
4. Repeated mark-recapture of tagged periwinkles exhibited high recovery rates (ca. 35% after 4 yr), absence of mortality, and a projected cessation of growth at 16.5 mm (shell height).
5. Projections using von Bertalanffy growth functions (VBGF) suggest that periwinkles will require 15+ years to achieve the maximum shell height. These VBGF models cannot address extraordinary individuals reaching 22 mm.

Do the conclusions match the results found in the figures?

CONCLUSIONS

What should the conclusions connect?

5. Conclusions

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What should the conclusions connect?

- The results to the scientific problems

Do they?

LOOK BACK

5. Conclusions

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In order to evaluate the unique supralittoral distribution of the knobby periwinkle, we sought to address three biological responses to sustained aerial exposure: microhabitat utilization, crawling speed, and individual growth rate. First, is *Cenchritis muricatus* more commonly found in microhabitats that provide a spatial refuge from desiccation and thermal stresses? Second, is snail mobility sufficient to grant a temporal refuge via diurnal migrations to the sea? Third, are the consequences of behavioral choices manifested in snail growth and survivorship differences among rock wall sites? In this study, we show that the knobby periwinkle's persistence in the high-shore area may lie in its longevity.

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SCIENTIFIC PROBLEM (TRANSLATION)

General:

- Where on the shore is the periwinkle found?

Specific:

- Is the Periwinkle mostly found in tiny habitats that prevent them from drying up?
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CONCLUSIONS

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Did the conclusions address the problems?

H.W.

Continue marking up the figures of your PRJA.

Have them ready for next class to discuss in your small groups.