

Sea urchins



Echinometra mathaei
Rock boring sea urchin



Echinometra oblonga
Black rock boring urchin



Colobocentrotus atratus
Helmet sea urchin



Heterocentrotus mammillatus
Pencil sea urchin



Diadema paucispinum
Long spine urchin



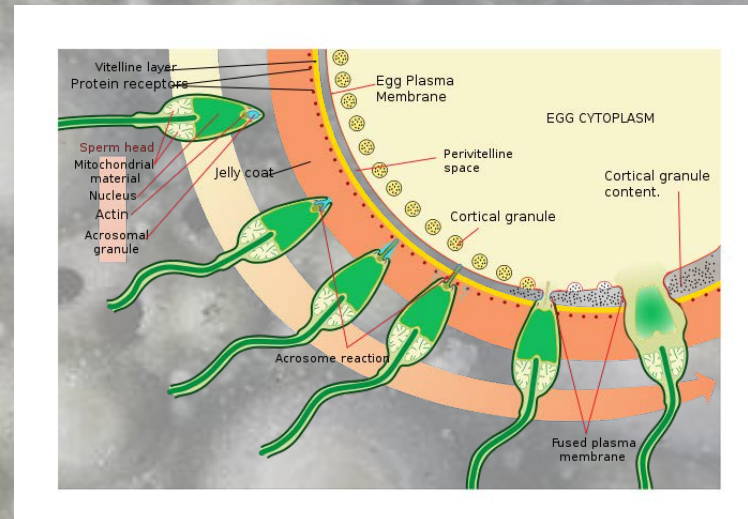
Tripneustes gratilla
Collector sea urchin

Sea urchin fertilization

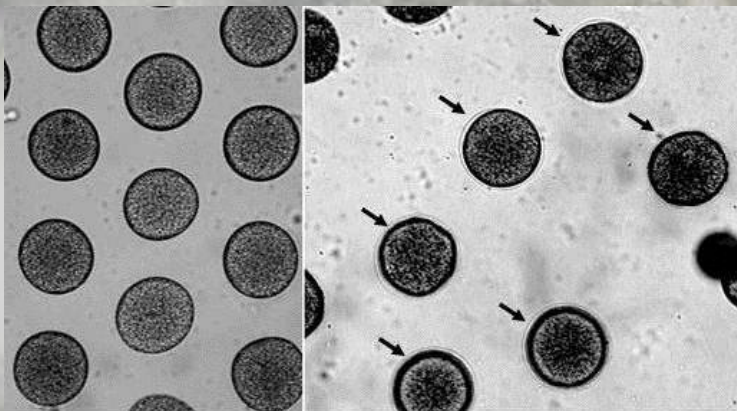
VIDEO



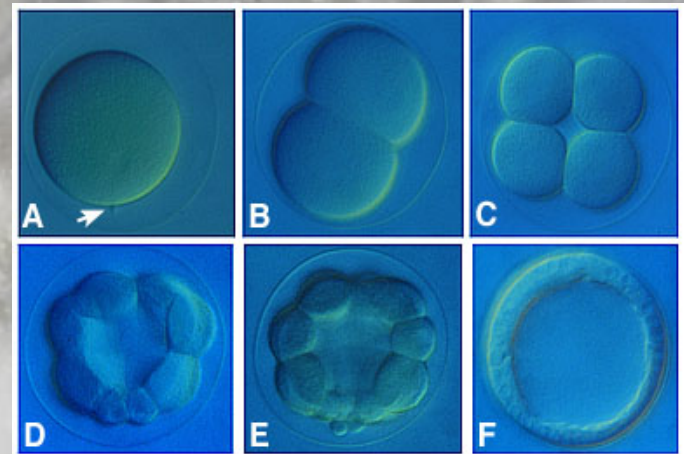
1. spawning



2. acrosomal reaction



3. cortical reaction

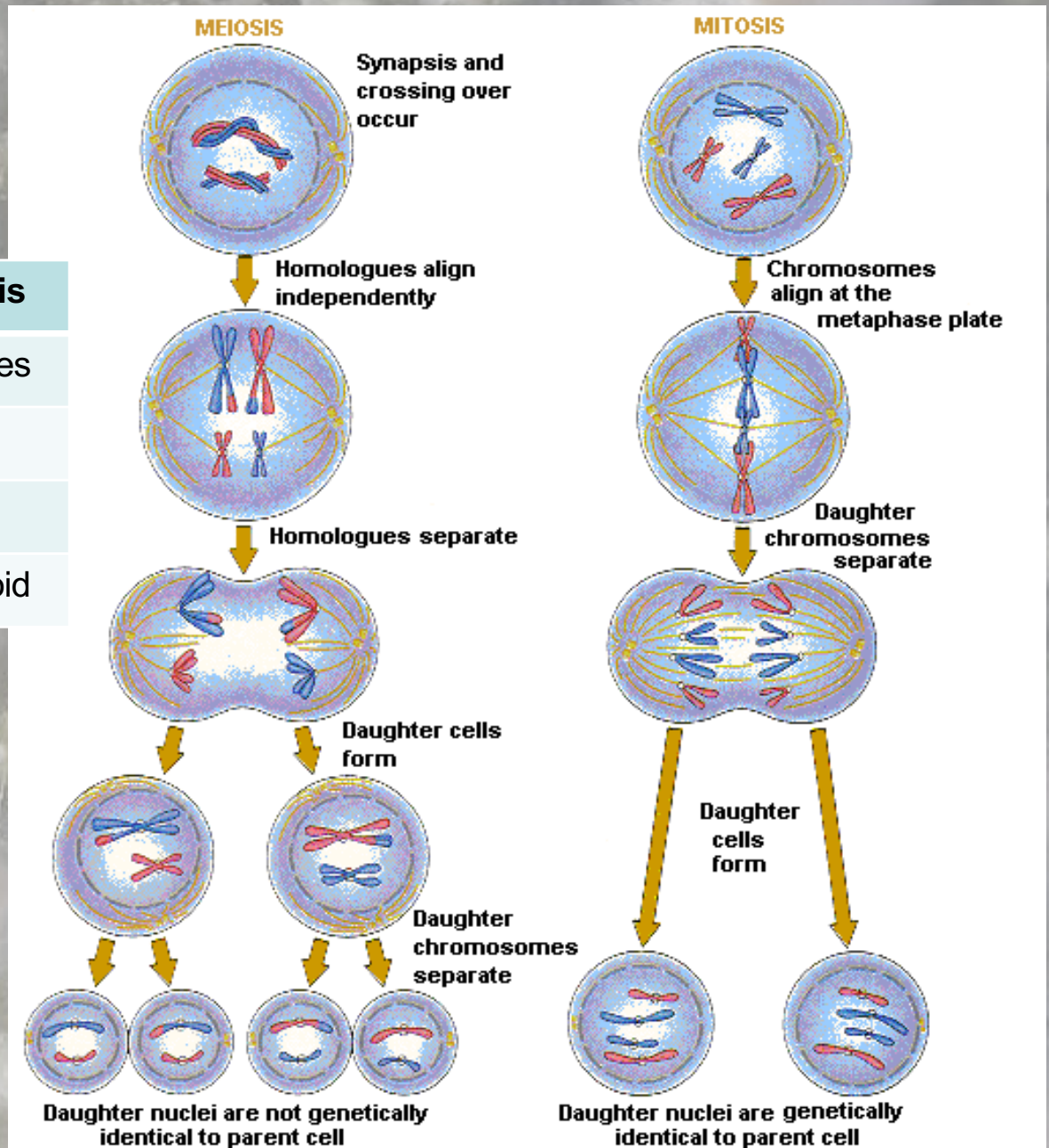


4. cleavage

Mitosis VS meiosis

[VIDEO](#)

	Mitosis	Meiosis
Function	somatic cells	gametes
Cell division	1x	2x
Daughter cells #	2	4
Daughter cells	diploid	haploid



How does water quality affect fertilization?



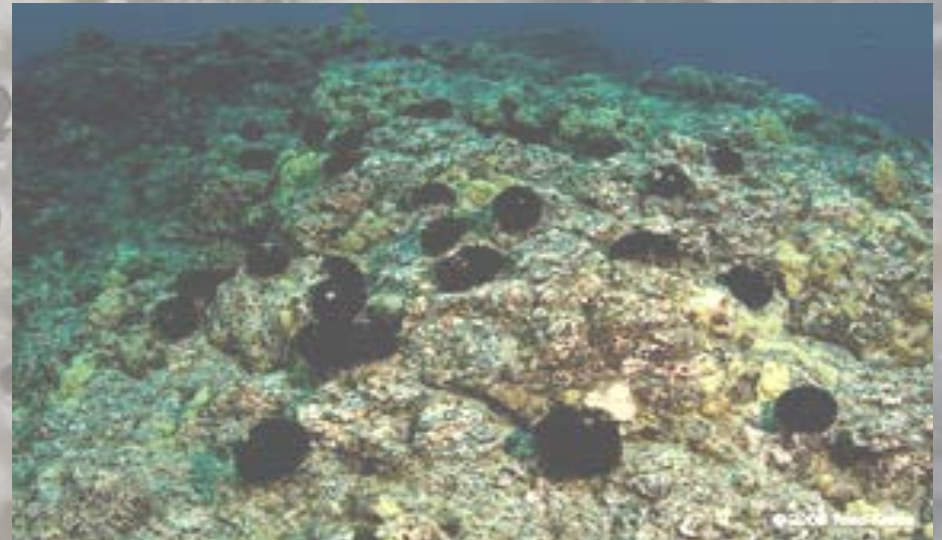
Water quality effects on the ecosystem



□ Massimo Boyer - Kudalaut.

Research at HIMB

Collaboration with The Nature Conservancy Hawai'i, the Division of Aquatic Resources



[VIDEO](#)

HYPOTHESIS-TESTING

What is a scientific hypothesis?

- A proposed explanation (i.e., an educated guess) for something you can **observe** and is **testable**.

How do you make a hypothesis?

- Make an “If... then...” sentence.
- If I change VARIABLE X, then I expect RESULT Y.

EXAMPLE: If you increase the water temperature in an aquarium, then the fish will start spawning.

BAD EXAMPLE: If a fish spawns, then it is protecting its territory.

How do you test a hypothesis?

- Test experiment: Only change one variable.
- Control experiment: Don't change any variables.

CLASS ACTIVITIES

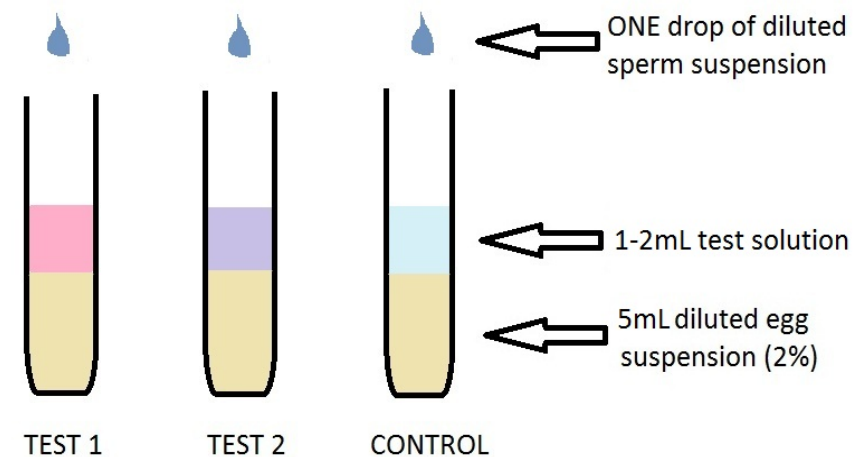
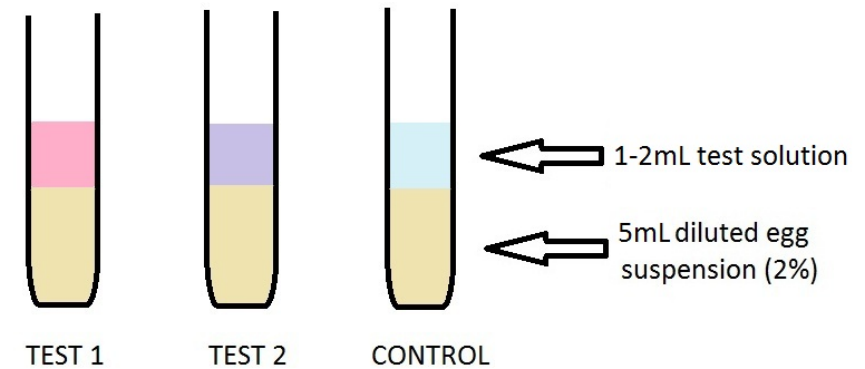
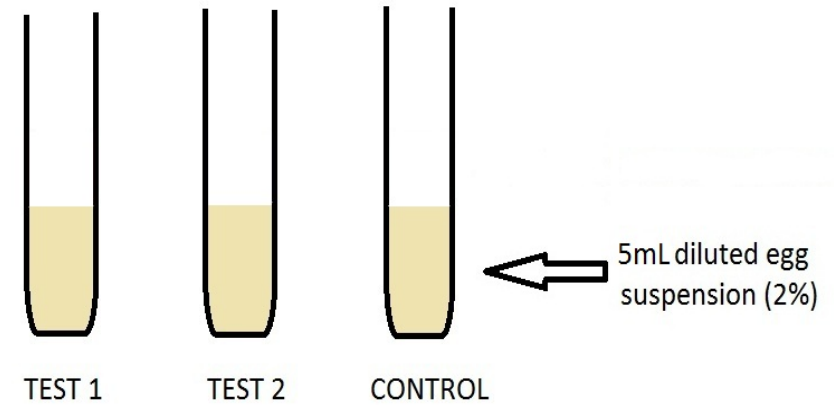
1. Urchin spawning
2. Develop hypothesis: If we expose sea urchin gametes to water manipulated with (salt? freshwater? MiracleGro?), then fertilization will be and development will be (slower? faster?).
3. Explain your hypothesis reasoning to an instructor.
4. Start experiments.
5. Clean up.
6. Discuss results.

THE EXPERIMENTS

1. Your instructor will prepare four test tubes with a consistent concentration of eggs in each.

2. Add ???mL or ???drops of test solution to each of your test tubes. For your control, use filtered sea water. Be sure the amounts you add to each test tube (?mL or ?drops) is the same!

3. Use bulb pipette to add ??? drops of sperm solution to each test tube. **Note the time** (T=0).



4. Each student should keep track of ONE TEST TUBE.

A) Remove a couple drops from the bottom of the test tube and place this on a slide. Don't use up all your eggs!

Return any extra liquid in your pipette back to the test tube.

B) Examine the first 20 eggs you come across and quantify the number of fertilized vs. unfertilized eggs.

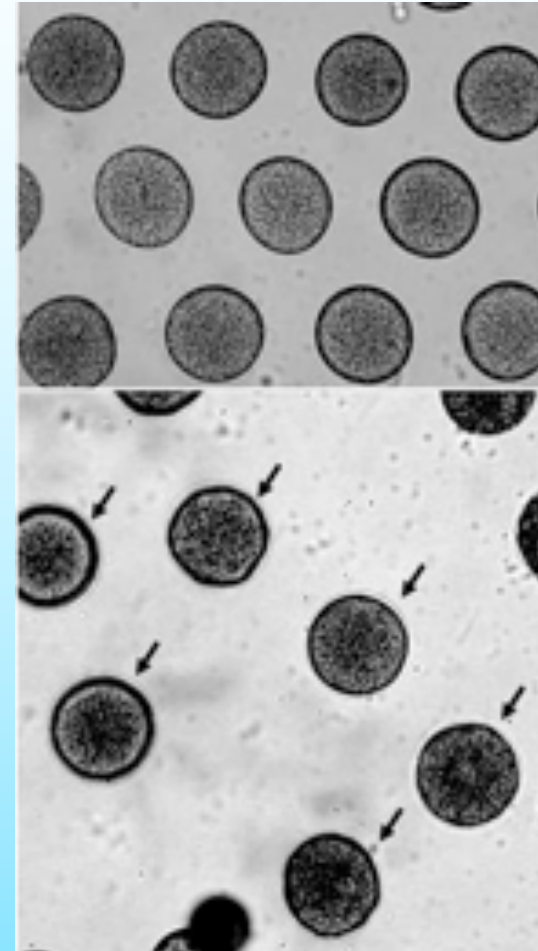
C) Every 15 minutes, examine a new batch of 20 urchin eggs.

D) As soon as cleavage is observed, begin collecting data on the total number of cleaved eggs.

Note: It takes about **40 minutes** for first **cleavage** to occur.

	Total fertilized (fertilization envelope OR cleaved)	Total cleaved
T=0	e.g. 16/20	e.g. 0/20
T=15		
T=30		
Etc.		

Identifying fertilized eggs



Results discussion

- Was urchin egg fertilization affected by water quality differences?
- How did you detect these changes?
- What do your results tell you about how other organisms may be affected?

CLEAN UP

- Wash all lab materials in the sinks
 - Clean pipettes by sucking up fresh water twice and rinse the outside.
- Use sink sponges to wipe down tables, then use blue/yellow rags and cleaner spray
- Sweep floors
- Place chairs on top of table



- Dry microscope slides and cover slips
- Dry tubes UPSIDE DOWN