Investigating Reproductive Strategies

Abstract

Students work in pairs to compare five aspects of an organism that reproduces sexually with one that reproduces asexually. As a class, students share their comparisons and generate a list of general characteristics for each mode of reproduction, and discuss the advantages and disadvantages of both.

Logistics

Time Required

- **Class Time:**
  50 minutes
- **Prep Time:**
  10 minutes to review activity and make copies of student pages

Materials

Copies of student pages

Prior Knowledge Needed

None

Appropriate For:

Primary Intermediate Secondary College

Learning Objectives

- There are two modes of reproduction; sexual and asexual.
- There are advantages and disadvantages to both sexual and asexual reproduction.

Special Features You'll Find Inside

- Illustrated information sheets for 12 organisms.
- A reference list for more information about the organisms used in this activity.
- A list of learning objectives and key ideas to help you guide classroom discussion during the activity.

Investigating Reproductive Strategies

Classroom Implementation

1. Divide students into pairs.
2. Hand each pair:
   - » The *Investigating Reproductive Strategies* worksheet (page S-1)
   - » 2 organism descriptions - one for an organism that reproduces sexually and one for an organism that reproduces either asexually or using both strategies - (see chart below).

Reproductive strategies used by organisms described in this activity:

Sexual	Asexual	Both Sexual and Asexual
Blue-headed wrasse	Amoeba	Brittle star
Duck leech	Salmonella	Meadow garlic
Grizzly bear	Whiptail lizard	Spiny water fleas
Leafy sea dragon		
Red kangaroo		
Sand scorpion		

3. Instruct each pair to read about their assigned organisms and complete the comparison table on the *Investigating Reproductive Strategies* worksheet.
4. When all pairs have completed the comparison table, have them post their tables around the room.
5. Ask students to walk around the room and read the comparison tables with the goal of creating a list of general characteristics for organisms that reproduce sexually and one for organisms that reproduce asexually.

> **Tip:** You may wish to have students record their ideas on a sheet of paper while they read the comparison tables

6. As a class, compile lists of general characteristics for organisms that reproduce sexually and asexually on the board. Learning objectives and discussion points for each category on the *Investigating Reproductive Strategies* worksheet are listed on pages 2-4 to help you guide the discussion.
7. Ask students to discuss the advantages and disadvantages of each mode of reproduction in their pairs. Have them prepared to support their reasoning.
8. Add advantages and disadvantages to the list of general characteristics for each mode of reproduction.
9. Lead a discussion on the types of situations or conditions in which each mode of reproduction would be most advantageous or disadvantageous. Do students think one reproductive mode is generally better? Why?

Investigating Reproductive Strategies
Learning Objectives

What are the advantages and disadvantages of sexual and asexual reproduction? Is one "better" than the other? You are an ecologist who wants to find out. To answer these questions you decide to compare 5 aspects of organisms that reproduce sexually with organisms that reproduce asexually. You will begin your study by looking at two different organisms. Once your comparisons have been made, you will share your information with all of the other ecologists in your class to draw general conclusions about each method of reproduction.

Fill in the table below with information for each organism you have been assigned.

	Sexual	Asexual
Relative complexity of organism (including size):	Learning Objectives/Discussion Points: • Complex organisms tend to reproduce sexually.	Learning Objectives/Discussion Points: • Simple organisms tend to reproduce asexually.
Number of parents who contribute genetic information to the offspring:	Learning Objectives/Discussion Points: • Two parents contribute genetic information. • Offspring have a combination of genetic information from their parents which makes them unique from their parents and from each other.	Learning Objectives/Discussion Points: • One parent contributes genetic information. • Offspring are exact genetic copies (clones) of the parent.
Reproductive mechanism:	Learning Objectives/Discussion Points: • Involves the combination of gametes from two parents. • With the internal fertilization of eggs by sperm, the chances of gametes meeting are increased. Fewer eggs and/or sperm may be produced by an individual. • When eggs and sperm are released outside the body, the gametes may not necessarily meet. Organisms that reproduce in this way must produce many gametes.	Learning Objectives/Discussion Points: • Asexual reproduction does not involve gametes. • Reproduction is by splitting in half, or forming new individuals that are released from the "parent".

Investigating Reproductive Strategies

Learning Objectives

	Sexual	Asexual
Relative amount of parental care:	Learning Objectives/Discussion Points: • Organisms tend to have longer gestation periods and developing offspring are protected. • Organisms tend to care for their young in some manner, increasing the chances of survival. • Organisms that invest time and energy in caring for their young tend to have fewer offspring. • Not all sexually reproducing organisms gestate or care for their young. These offspring are vulnerable to predators or the environment. In these cases, large numbers of gametes and/or offspring are produced, presumably to help offset the frequently high death rate of offspring before they can reproduce.	Learning Objectives/Discussion Points: • Organisms tend to have little or no parental care. • Organisms that reproduce by forming new individuals that separate from the parent provide a form of parental care to offspring before they are released. • Organisms that do not care for their young tend to produce large numbers of offspring. • Organisms where few offspring survive to reproduce have large numbers of offspring. • Organisms that split to produce an "adult" offspring often can rapidly reproduce again.
Genetic variation in offspring:	Learning Objectives/Discussion Points: • Genetic variation only results from sexual reproduction in which the genetic information from two parents combines. • Genetic variation helps a species (as a whole) survive. In the event of a change in environment or increased competition for resources, organisms with slightly different traits (due to genetic variation) may have a survival advantage. These differences provide the variations that natural selection can act on, resulting in new adaptations.	Learning Objectives/Discussion Points: • There is no genetic variation in offspring. Should a change in environment or competition for resources occur, there is no variation in traits among offspring that may provide some with a survival advantage. • If a parent has traits that are well adapted to a particular environment, its offspring will have these same traits, which may provide them with a survival advantage.

Investigating Reproductive Strategies

Overall Learning Objectives/Discussion Points:

- There are advantages and disadvantages to both sexual and asexual reproduction.
- For an individual it is "best" if the greatest number of its offspring survive to reproduce carrying its genes into the next generation. Some species produce large numbers of offspring, but only a few of these may survive to reproduce. Other species produce few offspring, but provide extended parental care to enhance each offspring's chance of survival.
- For a species it is "best" if individuals survive and reproduce so that the species does not go extinct. Genetic variation, which only results from sexual reproduction, may provide individuals with a survival advantage and the evolutionary potential for adaptations to new and changing environments.
- Organisms that can utilize both sexual and asexual modes of reproduction may be most adaptable to different conditions.

Standards

U.S. National Science Education Standards

Grades 5-8:

- Content Standard C: Life Science - Reproduction and Heredity; reproduction is a characteristic of all living systems; because no individual organism lives forever, reproduction is essential to the continuation of every species. Some organisms reproduce asexually. Other organisms reproduce sexually.
- Content Standard C: Life Science - Reproduction and Heredity; in many species, including humans, females produce eggs and males produce sperm. Plants also reproduce sexually–the egg and sperm are produced in the flowers of flowering plants. An egg and sperm unite to begin development of a new individual. That new individual receives genetic information from its mother (via the egg) and its father (via the sperm). Sexually produced offspring never are identical to either of their parents.

B. AAAS Benchmarks for Science Literacy:

Grades 6-8
The Living Environment

- Heredity
  - » In some kinds of organisms, all the genes come from a single parent.
  - » In organisms that have two sexes, typically half of the genes come from each parent.
  - » In sexual reproduction, a single specialized cell from a female merges with a specialized cell from a male.

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Name _____

Date _____

Investigating Reproductive Strategies

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Fill in the table below with information for each organism you have been assigned.

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Relative complexity of organism (including size):		
Number of parents who contribute genetic information to the offspring:		
Reproductive mechanism:		
Relative amount of parental care:		
Genetic variation in offspring:		

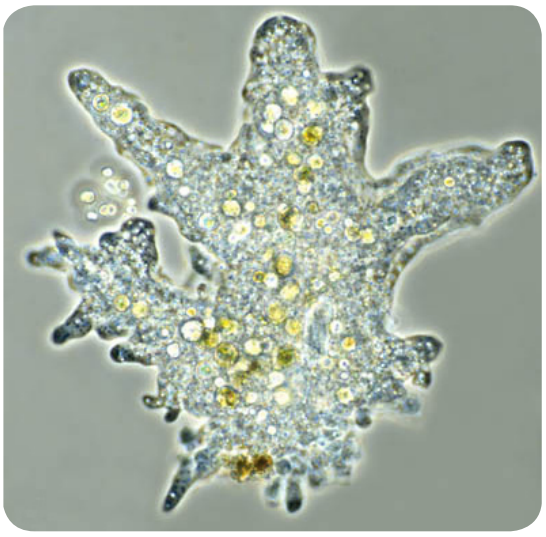
Name _____

Date _____

Reproductive Strategies

Animal Profile:
AMOEBA (*Amoeba proteus*)

Take one look through a microscope at a drop of healthy pond water and you'll find a ton of one-celled organisms zooming about. Some of these cells move by fluttering tiny hair-like cilia, while others are propelled by large whip-like flagella. You'll also come across a lot of blobby cells creeping about and engulfing other cells by extensions of their bodies. These one-celled critters are known as amoeba, and they move and feed by extending bulges called pseudopodia (false feet). When an amoeba moves, it reaches pseudopodia away from its edges and anchors them at their tips. The rest of the cell's insides stream into the pseudopodia until the entire amoeba has slurped into a new location.



Steve Durr

Amoeba proteus with several green algae trapped inside food vacuoles.

Amoebas are found all over the place, from oceans to soil. They play a very important ecological role by making meals of the huge number of bacteria, algae, and small protists found on this planet. One common amoeba is the giant amoeba, *Amoeba proteus*. Giant amoebas reproduce by binary fission, a fancy word that means splitting in two. When a giant amoeba begins to divide, it pulls its pseudopodia in to form a kind of ball. After its nucleus doubles, the amoeba constricts in the middle, as if a belt were being pulled tighter and tighter around the cell. Finally, the two new cells pinch apart, send out pseudopodia, and slink away from each other. In this way, two identical "daughter" cells are created from one. When conditions are right, this amoeba can divide every 48 hours.

Name _____

Date _____

Reproductive Strategies

Animal Profile:
BLUE-HEADED WRASSE
(*Thalassoma bifasciatum*)

Adult male Blue-Headed Wrasse

Many animals are born male or female and stay that way for the rest of their lives. Not so with the blue-headed wrasse, a tropical fish that darts about amongst the corals and sponges in shallow Caribbean waters. Females of this fish can completely transform into males when the conditions are right.

Blue-headed wrasses, like many reef fish, are small and brilliantly colored. Most of them - young males and females - are yellow and sport a greenish-black stripe on their sides. The others - the few, the proud, and the powerful - are older males with showy blue heads, green bodies, and thick black and white stripes around their collars.

Virginia O. Skinner

Adult female or young male Blue-Headed Wrasse

Big blue-headed males defend territories around the reefs, where they strut their stuff until the smaller yellow females find them attractive. When this happens, the female swims with the male and spawns (releases her eggs). The male quickly fertilizes them with his sperm before they float away into the ocean. Blue-headed males can mate with as many as 100 females per day!

Of course, these big males can lose their territories because of nasty little things like death and rivalry. When that happens, the largest yellow female in the area may morph into a blue-headed male and begin defending a territory. So, some of the blue-headed males were born male, while others were born female.

Virgina O. Skinner

Juvenile Blue-Headed Wrasse

For the females that transform into males, this is a great deal. They can get a lot of their genes into the next generation by laying eggs when they are younger, and then fertilizing eggs as males when they're older.

Name _____

Date _____

Reproductive Strategies

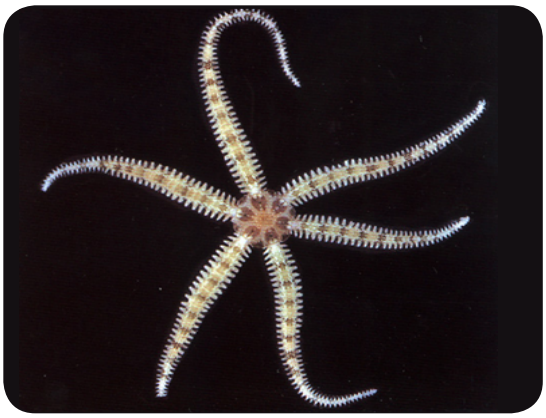
Animal Profile:
BRITTLE STAR (*Ophiactis savignyi*)

Peer into the hole of a sea sponge and you may catch a glimpse of "the world's most common brittle star," *Ophiactis savignyi*. These brittle stars are tiny - only an inch or two across with arms stretched. They inhabit virtually all of the world's tropical and sub-tropical ocean habitats.

Brittle stars are related to sea stars, or starfish, and have a similar body structure. They've got a central disk, which holds all the important stuff like the mouth, stomach and reproductive organs. Then there are the arms - long, slender, wavy and edged with short spines. These arms are what give brittle stars their name. They can break off voluntarily and regenerate.

O. savignyi takes the ability to regenerate one step further and actually splits in half in order to reproduce. When fission happens, the brittle star fractures down the middle of its disk, creating two identical 3-armed brittle stars. These stars then grow new arms from their empty arm-spaces. But this isn't the only way *O. savignyi* reproduces. Like all brittle stars, they also reproduce sexually. At certain times of the year, large females and males raise their disks off the surface, balance on their legs, and release sperm and eggs into the ocean. When the sperm and eggs meet they produce larvae that float away to new habitats.

Fission is the main way that *Ophiocomella* reproduces, but since they don't move far or fast, this results in large groups of brittle star clones in one area. Scientists believe that sexual reproduction might be a good way for the brittle star to populate new areas far away from their clone-filled sponge homes.



Michael Roy

Ophiactis savignyi

Tamara McGovern

A recently divided Ophiactis savignyi. Three tiny arms are beginning to regenerate.

Ellen Muller - www.pbase.com/imagine

Brittle star spawning.

Name _____

Date _____

Reproductive Strategies

Animal Profile:
DUCK LEECH (*Theromyzon tessulatum*)

Biopix.dk

Leeches are the stuff of horror movies and doomed journeys into infested waters, and this leech is no exception to the rule. It has the disgusting habit of attaching itself to nostrils, eyes, throats and even brains. Thankfully for humans, it only does this in ducks and other waterfowl, earning it the common name "duck leech."

The duck leech does a fair job getting around and probably gets spread as ducks move from pond to pond. This leech, like all leeches, is a hermaphrodite, meaning that a leech has both male and female reproductive parts. But that doesn't mean it can move into a pond all alone, reproduce with itself, and start a new leech population. It still takes two to tango, as they say, and a leech requires sperm from another leech to fertilize its eggs.

Biopix.dk

Young attached to the underside of a parent leech.

When the duck leech reproduces, two leeches rub together and give each other their sperm. Each leech will use the other's sperm to fertilize its eggs before placing them in gooey cocoons for protection. The leech attaches the cocoons, which hold as many as 400 eggs, to a rock or other sheltered place. The parent then waves its body over the eggs, passing fresh oxygen-rich air over them with the movement of its body. After 21 days, all 400 of the developing young leeches attach to their parent's belly. They remain attached there until the parent finds a suitable bird for a meal. When that happens, the young bloodsuckers leave their parent behind and attach to the host for their first blood meal. The parent dies shortly thereafter, but not before giving hundreds of new eyeball-suckers a shot at the game of life.

Name _____

Date _____

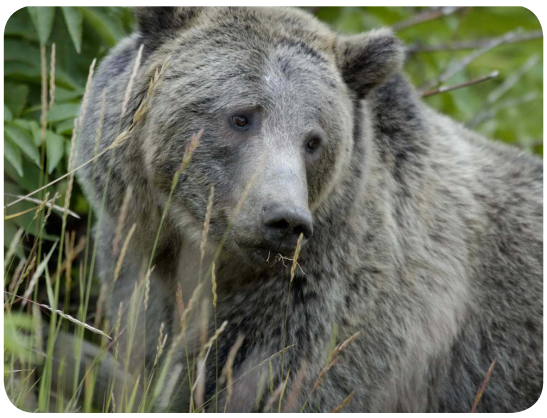
Reproductive Strategies

Animal Profile:
GRIZZLY BEAR (*Ursus arctos horribilis*)

US Fish and Wildlife Service/Larry Aumiller

Grizzly bears used to roam throughout the Great Plains of North America, hunting elk and moose and nibbling on berries and grasses. Grizzly bears still do these things, of course, but habitat loss and hunting have confined the bears to rough, mountainous areas. In the lower 48 states, they're only found in Montana, Idaho, Wyoming and Washington.

Grizzly bears are enormous animals that require large territories, especially when food becomes hard to find. Males can weigh as much as 453.6 kg (1000 pounds), females can clock-in around 317.5 kg (700 pounds), and their territories can be as large as 906.5 square kilometers (350 square miles). Though grizzlies spend most of their days wandering around alone, they come together to mate during early summer. During mating, the male deposits his sperm into the female, where her eggs are fertilized. Females delay implantation of the fertilized eggs, so the embryos don't begin developing until the females are nestled into their warm dens in November. Mothers give birth 8 weeks later to between 1 and 4 cubs. Until they leave the den in late spring, the cubs live off their mom's milk, which means mom has to eat enough in the summer and fall to survive hibernation and to feed her cubs, too!



US Fish and Wildlife Service/ Terry Tollefsbol

Cubs stay with their mother for 3 years or so. She won't reproduce again until they leave her side. Because reproduction and growth are slow and the bears need large territories with a lot of food to survive, grizzlies are sensitive to over-hunting and habitat loss. Thankfully, they're protected by the Endangered Species Act, and many conservation and wildlife biologists are working to keep the grizzlies a part of our natural world.

Name _____

Date _____

Reproductive Strategies

Animal Profile:
LEAFY SEA DRAGON (*Phycodurus eques*)

Jeff Jeffords - divegallery.com

Dragons lurk in the cool waters off the southwestern Australian coast, but they aren't the mythical beasts that devour huge ships before slipping away into the deep. Instead, these dragons are calm, gorgeous fish known as leafy sea dragons (*Phycodurus eques*). Though not as large as mythical dragons, leafy sea dragons can be pretty big. They grow up to 51 cm (1.7 feet) in length and have long leaf-like appendages sprouting from their bodies. This leafiness helps them blend in with their seaweed habitat, protecting them from predators and giving them an advantage while hunting for food. Like their cousins the seahorses, leafy sea dragons have long tubular snouts they use to suck up tiny shrimp. To hunt, they drift around camouflaged as a piece of seaweed and ambush their small crunchy prey.

www.stuarthutchison.com.au

Eggs attached under a male sea dragon's tail.

Leafy sea dragons and their relatives reproduce in a way that's rare in the fish world: the males carry and hatch the young instead of the females. When sea dragons mate, the female finds a potential dad and deposits her eggs underneath his tail where his sperm fertilize them. Pregnant dads can have as many as 200 incubating eggs tucked tightly beneath their tails. It pays to have a dad that looks like seaweed, because the eggs are protected from predators there. The eggs cling for 4-5 weeks before they hatch. The young are less than 2.5 cm (1 inch) long when they finally hatch. Many of them, sadly, will become little fishy snacks for larger fish, but the lucky ones who survive will grow up to be beautiful adults. Getting protection from dad when they were developing likely gave them one fin up in the vast ocean world.

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Reproductive Strategies

Plant Profile:
MEADOW GARLIC
(Liliaceae: *Allium canadense*)

Larry Allain @ USGS National Wetlands Research Center

Long before settlers ventured into North America with their European garlic and onions, Native Americans were likely spicing-up their cooking with a native garlic known as meadow garlic. This garlic, called *Allium canadense* by botanists, grows wild from Florida to Canada. Surprisingly, it belongs to the same family as garden-variety lilies - those big colorful flowers that perch in flower vases and add splashes of color to many gardens around the world. Even though it's called meadow garlic, it really smells and tastes more like an onion. Rubbing the leaves and stems emits a definite bad breath, onion smell.

Meadow garlic, also known as wild garlic, grows from bulbs like other lilies in its family. The bulbs lie dormant underground over winter, storing energy for the burst of growth and reproduction that comes in spring and early summer. Bees aren't turned off by the onion smell, and they buzz around pollinating the small, pink or white flowers. Although each flower has both male and female reproductive parts, it can't mate with itself. The bees are needed to move pollen from one plant to another. This produces fertile seeds that eventually disperse and grow into new plants that have a mix of genes from the two parent plants.

But meadow garlic doesn't only depend on bees or other pollinators to spread itself around. Perched underneath the flowers are clusters of little, nubby growths called bulblets. The bulblets are outgrowths of the plant, and when dropped, sprout into new plants identical to their parent. The bublets provide enough start-up energy for the new plants to grow and eventually produce flowers and bulblets of their own. The ability of plants in the lily family to reproduce both with and without fertilization means they can spread easily. Some lilies have actually become pests by taking over pastures, gardens, and roadsides across the country.

Name _____

Date _____

Reproductive Strategies

Animal Profile:
RED KANGAROO (*Macropus rufus*)

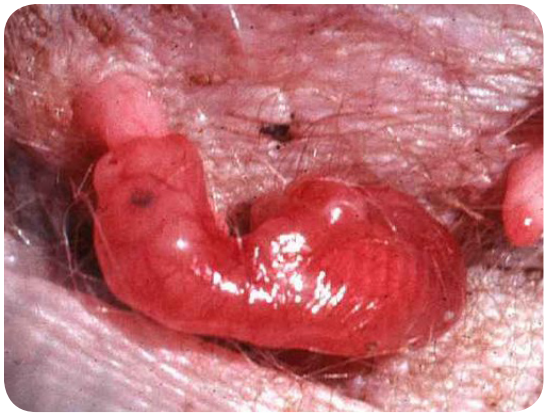
In the desolate, dry plains of central Australia, mobs roam around the countryside. But these aren't mobs of people. Mobs are actually the official name for groups of red kangaroos, *Macropus rufus*. And unlike angry mobs of people, mobs of red kangaroos aren't usually to be feared. They are skittish and will scatter when frightened. When they're really moving, red kangaroos can leap as far as 3.7 meters (12 feet) in one jump and reach speeds of 56 kph (34.8 mph)!

Chris Willis

A mother red kangaroo with a joey in her pouch.

Red kangaroos are one of the largest marsupials, and herbivorous mobs of them bounce about eating grasses and other vegetation. They're usually headed by the most mature female and include lots of other females and young kangaroos, called joeys. When it's mating time, males will sometimes box each other for females with their powerful jumping legs. The winning male deposits his sperm in the female, where an egg is fertilized.

After mating, females give birth to one baby kangaroo, which has only gestated for about 33 days. The young are very undeveloped after such a short time. Like most marsupials, baby red kangaroos spend a lot of time growing in their mom's pouches. When it's born, a young kangaroo is tiny, pink, hairless, and blind, but it knows to head straight for the pouch. It swims through mom's fur to get there, where it attaches to a nipple and finishes developing. After about 7 months, a joey gets too big for mom's pouch and will leave to bounce around next to her. Once this happens, the mom gives birth to another tiny pink baby. Females can continuously give birth and usually have about 3 joeys every two years.



Geoff Shaw - http://kangaroo.genome.org.au

A newborn kangaroo in its mother's pouch.

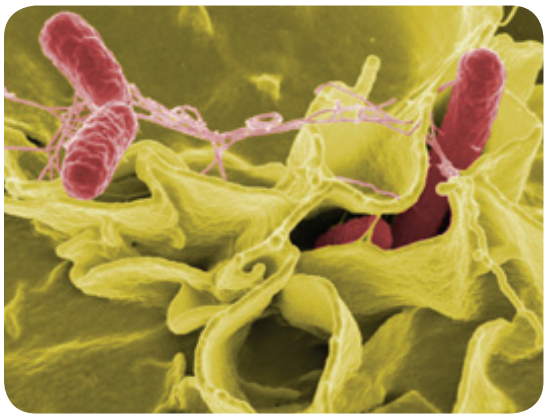
Name _____

Date _____

Reproductive Strategies

Animal Profile:
SALMONELLA (*Salmonella typhimurium*)

There are times when we eat something and our stomachs hurt badly, and then there are times when they hurt REALLY badly. When it hurts dreadfully bad, it could be from food poisoning, which leads to fever, nausea and diarrhea. Yick. And that's a mild case of food poisoning! Some of the more life-threatening cases can send a person to the hospital.



Rocky Mountain Laboratories, NIAID, NIH

Salmonella (rod-shaped) invading human cells.

The interesting thing is, it's not poisoning at all, but the result of a sinister bacteria known as *Salmonella*. This one-celled, rod-shaped bacteria is fairly common, and can be found naturally in raw eggs, raw meats, on the bodies of some reptiles, and in animal feces. It's when *Salmonella* finds itself in the warm growth chambers of our bodies that it hits pay dirt.

When *Salmonella* from infected food reaches our small intestine, it divides rapidly, producing copies of itself through simple division. These bacteria continue to rapidly divide, increasing in number and infecting other cells. This causes our immune system to respond, but *Salmonella* does a good job of fending it off. It takes about 12-72 hours to feel the effects of a *Salmonella* invasion. Our bodies can fight off some *Salmonella* infections, but we generally need the help of antibiotics to overcome them.

Thankfully, *Salmonella* is not one of those extreme bacteria that can survive the freezing temperatures of the Arctic or the boiling heat of volcanic thermal vents. Humans have adapted to *Salmonella's* existence by cooking, pasteurizing, and freezing our foods and drinks, which does a good job of killing the bacteria. Still, *Salmonella* infection is common enough and turns up where people aren't washing their hands or cooking meat thoroughly.

Name _____

Date _____

Reproductive Strategies

Animal Profile:
SAND SCORPION (*Paruroctonus mesaensis*)

Sinister beasts are underfoot when the sun goes down in the dunes of the Mojave Desert. The sand scorpion, which spends its days in a burrow underground, emerges to sting, kill and munch its prey. Shine an ultraviolet light into the night, and the ground will come alive with yellow-green glowing scorpions, out devouring beetles, crickets, other scorpions, and even cannibalizing their own kind. If it's the right time of year, glowing scorpions might also be dancing the night away.

Philip H. Brownell, Ph.D.

Sand scorpion (Paruroctonus mesaensis) capturing a burrowing cockroadh. Photo taken under UV illumination..

Yep, that's right, sand scorpions dance during courtship. Males grasp the females by their pinchers, or pedipalps, and move them around in circles. After dancing for a while, the male deposits a packet of sperm on a stick or other surface. Then, he moves the female until she is on top of the sperm. She takes in the sperm and fertilizes her eggs internally. The dance ends here, and the male usually skitters off to find more mates. But every now and then, the female rears back, stings the male, and eats him for her next meal!

© T.C. van der Ende - scorpiology.com

Scorpions (Tityus trinitatis) engaged in courtship dance.

Young sand scorpions spend about 12 months developing inside their mother before they are born live. After they're born, they quickly crawl onto their mom's back where they stay until they're big enough to leave the burrow. On average, a sand scorpion mom has about 33 newborns hitching rides on her back. But things aren't always easy there either, and sometimes the young eat each other or the mom eats the young. Clearly, stingers don't make life trouble-free for the sand scorpion, but they're still able to be a very successful organism in their dry, sandy habitats.

http://scorpion.amnh.org

Mother scorpion (syntropis) carrying babies on her back.

http://scorpion.amnh.org

Spermatophor from a male scorpion.

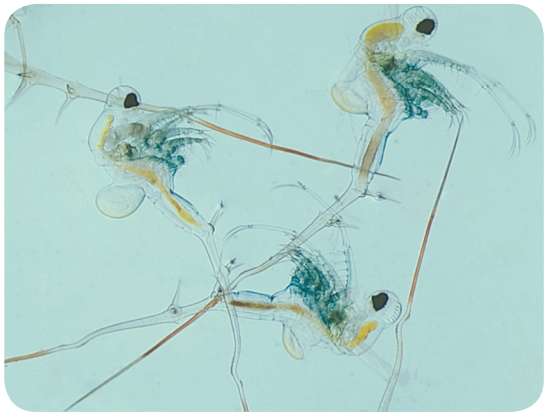
Name _____

Date _____

Reproductive Strategies

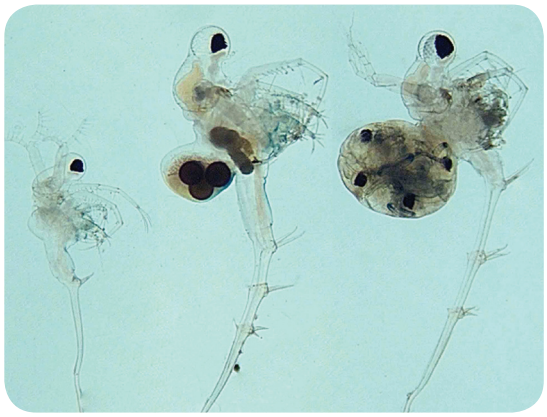
Animal Profile:
SPINY WATER FLEA (*Bythotrephes longimanus*)

There's a tiny, transparent crustacean that swims jerkily around in the Great Lakes. It spikes fish in their mouths with its long tail and gobbles up other microscopic aquatic animals (zooplankton). It's called the spiny water flea, but it's more related to crabs and lobsters than to any insects. Though many different kinds of water fleas are common in ponds and streams, the spiny water flea is not a welcome visitor. It's an invader from European waters and it competes with local fish and water fleas for food. It's protected from predators by its nasty barbed tail, which makes up 70% of its 2 cm long body.



Pieter Johnson, University of Colorado at Boulder

Spiny water fleas are a threat to ecosystems because of their power to rapidly reproduce. Like all water fleas, this one alternates between asexual and sexual phases. Most of the time, a female produces eggs without fertilization. She releases about 10 eggs into the brood chamber on her back, where they develop into young clones within several days. During summer, females can produce clones of themselves every 2 weeks.



Pieter Johnson, University of Colorado at Boulder

Different reproductive forms of spiny water fleas. Male (left), female with asexual eggs (center), and female with sexual eggs (right).

When food becomes scarce or temperatures change, some females produce spiny little males. These males mate with other females that have produced special eggs used for fertilization, called "resting eggs." They're called this because after these eggs are fertilized, they leave the mom and remain dormant before hatching. Many water flea resting eggs can survive drying or being eaten by fish.

Spiny water fleas seem to have a lot on their side, and they're in the Great Lakes to stay. Still, biologists are working hard to keep them from spreading into too many more lakes in the future.

Name _____

Date _____

Reproductive Strategies

Animal Profile:
DESERT GRASSLANDS WHIPTAIL LIZARD (*Aspidoscelis uniparens*)

NPS - Sally King

Nothing is ever what it seems in the world of reproduction. Take the example of the desert grassland whiptail, a species of lizard that lives in the southwestern United States. These lizards have long sleek bodies with lines that go from nose to tail. They race around in the dry leaves and branches eating termites, grasshoppers, beetles and many other insects. Like normal lizards, the whiptails perform courtship, mate and lay their eggs.

Sounds pretty ordinary, right? But if we took a closer look, we'd find that not a single one of these lizards is a male! This all-female whiptail species is able to reproduce without fertilization, a process that is called parthenogenesis.

© David Crews, Ph.D., University of Texas at Austin

Two female desert grasslands whiptail lizards engaged in pseudocopulation.

In this species, females take turns playing male during courtship and mating. If the "female" is interested, the "male" will wrap around her and grip "his" jaws around her body. The couple will stay like this for 5 to 10 minutes. This is called pseudocopulation or false mating, because no males or sperm are involved.

The "female" from this mating pair will eventually lay her eggs, which all hatch into copies of their mom. Females will "mate" and lay 2 to 3 eggs about 3 times over the breeding season. It turns out that females who lay eggs after "mating" with another female lay more eggs than females who don't mate. Laying a few more eggs is definitely an advantage in the harsh desert where survival of the young is difficult.