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LGBTQIAP+ in Nature
Lesson plan: virtual or in-person

Lesson Topic:

We know that there is a beautifully wide range of ways humans can identify, and scientists are learning that wildlife is just as diverse! In nature, there are many examples of plants and animals that are LGBTQIAP+ (lesbian, gay, bisexual, transgender, queer/questioning, intersex, asexual/aromantic/agender, pansexual/polysexual, and so many additional gender identities and sexual orientations). Learn about fish that change sex (sometimes repeatedly), bisexual bonobos, gender fluid hummingbirds, and more.

This lesson is a good way to build an inclusive community within your group. It can help start discussions about diversity and get kids to feel comfortable asking questions.

Grades 4-8 with options for adjusting for elementary students through high school. This is a fun lesson to follow or pair with Human Growth and Development lessons.

This lesson packet includes:

- A google slides presentation to show kids with supporting notes for teachers. This can be used virtually or in-person. View the presentation here: LGBTQIAP+ in Nature_June 2023_sharable - Google Slides
- This lesson is geared towards older elementary and middle school kids, but there are suggestions below for adjusting it for older or younger students. Suggestions for discussion topics, creating research projects around this area, and nature journaling activities to follow the lesson.

Ways to adjust the lessons for your kids:

1. **Inside vs outside:**
    a. When teaching this lesson inside we recommend using a smart screen or projector & laptop.
    b. When teaching this lesson outside, we recommend printing off the “Outside Lesson Materials”, which is just a google doc with images formatted for easy printing. You can pair this with a printed lesson plan and tell each slide like a story to kids. Link: LGBTQIAP+ in Nature_printable photos_June 2023_sharable - Google Docs

2. **For young kids:**
    a. We support kids learning about science in an age-appropriate question-led way. Using words like “sex” and “gender” with young kids helps lay a solid foundation that these topics are not taboo and are just cool science! You could plan to tell one of these “stories” each day, stretching the lesson out and allowing time for lots of questions and lots of processing. Starting with—or only teaching—the Nonbinary hummingbird story works great (slides 22-24)!
3. **For older kids (middle and highschool):**
    a. This lesson only contains a few examples of LGBTQIAP+ in nature. There are SO many others out there! Have students choose a research topic that interests them—non-human animals that are nonbinary, gender fluid, sex changing, hermaphroditic, etc—and do more research. Choose a fun way for them to share their findings with the group.
    b. Have kids discuss and/or research why wildlife research on non-cis non-hetero animals has been absent until recently. Was it the scientists themselves choosing to ignore it? Was it the people funding the research steering it? Something else? All of it?
4. **For any age:**
    a. **Nature Journaling:** This lesson is great to pair with a nature journal entry. Have kids write about what they learned, if they have any “wonders” after the lesson, how this lesson makes them feel.
    b. **Practicing persuasion:** Have kids pretend that they need to convince someone that LGBTQIAP+ research is important. Why do we need to look for and study examples of LGBTQIAP+ animals in nature? Why is it important for humans to learn about this?
    c. **Make art:** Have kids make art about this topic. Some ideas include: drawing the animals you talked about, make an educational science diagram about one of the animal stories, make art about how learning about these stories marks you feel.

Notes for teaching the lesson

Below are notes for slides in the presentation. The number next to the text denotes which slide these facts or teaching tips go with. The notes are also in the “speaker notes” section of the google slides.

1. Today we’re learning about LGBTQIAP+ in Nature. Who knows what those letters stand for? Lesbian, gay, bisexual, transgender, queer/questioning, intersex, asexual/aromantic/agender, pansexual/polysexual.
2. Talk about how there are lots of definitions for “sex” but in this lesson it’s just the kind of gametes (or sex cells) you produce. Note- eggs are more expensive to produce than sperm. Sperm are smaller and cheaper to produce.
3.
4. It’s harder to tell with animals if they identify themselves as the gender scientists would assign them based on their sex. We need to base our knowledge of them off of our observations of their behavior. We can’t ask animals about it!

5.
6. An evolutionary change = changes seen in offspring. It's hard for scientists to connect some behaviors to genetics/evolution, especially if they likely don't leave offspring behind (two male partners, for example). Just because science doesn't know HOW it works *yet* doesn't mean that it doesn't! We just need to figure it out.
7. Male Marsh Hawks are dominant, they hold territories, and mate with the females within the territory.They usually kick other males out.
8. There are a smaller proportion of males that have female plumage/feathers. They aren't kicked out by the dominant males because they look like females, and get to mate with the females within the dominant male's territory. They have more offspring this way than if they were trying to compete directly with the dominant males.
9. This is an example that's basically the opposite:
    a. When the White-necked Jacobin are juveniles they all have the same plumage. All of the males (the ones producing sperm) grow up to have male plumage.
    b. About 80% of the females (the ones producing eggs) grow up to have the more typical female plumage. BUT 20% of the females grow up to look like males. They still mate with males and produce eggs though!
    c. This is because the hummingbirds all defend food sources. Males are dominant, and usually kick females out of the flowers before they're done eating. Females still get food, but they have to work harder for it. Males are less likely to kick another male off of a flower because they don't want to fight. So the females that look like males have an easier time finding food. This make it easier for them to raise their young.
10. So we talked about examples of Males that look like Females and Females that look like Males, but those animals were all still producing either sperm or eggs, and are the "sex" that they would be assigned by scientists based on their chromosomes.
    a. There are some cooler animal stories!
    b. This is an animal that is BOTH male and female at the same time.
    c. All of the snails in WI that live on land are hermaphrodites. They are BOTH male and female. These snails need to find another snail to mate with. They both produce eggs, they both produce sperm. They each give each other sperm that they use to fertilize their eggs. They both lay eggs. Finding a mate is MUCH easier, and they still get the reproductive / genetic benefits of swapping genetic material
    d. Remember, words matter. When we're talking about non-human animals, we can use the word "hermaphrodite". We only use it to talk about a creature with full sets of both male and female reproductive organs. If we're talking about humans, we use the word "intersex" instead. This word encompasses the full range of human physical and emotional expression.
11. Now let's talk about stories where animals are changing sex.
    a. Many types of fish can change sex as they age.
    b. When fish are changing sex, it's always about who needs to be bigger: males or females. The fish usually change from the sex that is smaller to the sex that is larger as they age and grow. Whether the male or female is bigger depends on the species.
12. When fish change from female to male: usually because one male mates with many females.
13. They need to be big and strong enough to fight off other males. If they were a small male, they wouldn't be able to compete with the large ones, and wouldn't mate. It makes more sense for them to be female, mate and reproduce and lay their own eggs. Then

when they're older and bigger, they switch to male and have a chance at having LOTS of mates and LOTS AND LOTS of offspring. This switch usually happens if the dominant male is eaten, dies, or moves away. Then the largest female will transition to male and take their place.

14. Clownfish switch the other way: males become females.
    a. When clownfish are born, they're "undifferentiated". They have tissue inside their bodies that can become ovaries and also tissue that can become testes. If the dominant female is removed, the largest male will transition to become female. They take their place, and start producing eggs instead of sperm.
    b. In clownfish communities, the female is larger and dominant. She holds the territory and mates with her choice of males.
15. In the last two stories, once the animal transitioned from male to female or female to male, the change is permanent. This is an example of a fish that can make the change multiple times. The Trimma okinawa is a little fish that lives on Japanese coral reefs. These fish are tiny and have lots of predators. There is one dominant male that mates with many females. If the large male gets eaten, the largest most dominant female will transition to male. BUT if another new larger male shows up, that fish that transitioned to male can switch back to female! If they stayed male, the new male would kick them out and they wouldn't get to mate. But since they can switch back to female, they are still able to mate.
16. A lot of the research on primates is incomplete—white scientists have a long history of being uncomfortable with animal (and human) activity that isn't cis hetero. (that's putting it mildly). So a lot of observations didn't get published, or if they did, didn't get recognized.
17. Now we know that nearly all bonobos are bisexual. They have multiple partners from both sexes.
18. In 2018 scientists reported male spider monkeys mating with other males. This was the first homosexual activity recorded in spider monkeys.
19. A 2020 paper reported nesting behavior of a same sex pair of cranes. Two females had established a territory, built a nest, and were taking care of eggs together. They were living in McMillan Marsh Wildlife Area in Marathon County, Wisconsin, USA. Researchers had a video camera at their nest, and were able to watch them during the nesting season.
20. These two female birds behaved almost exactly like a male-female pair of parents. The both females spent time incubating the eggs, but the older female incubated for longer stretches of time. The pair tended the eggs for 28 days, but scientists aren't sure what happened to the nest after that.
    a. Since we don't know if the eggs hatched we don't know if they were fertilized. The females could have laid infertile eggs, or they could have mated with males outside of their partnership and laid fertilized eggs. Either way, these two females spent a lot of time taking good care of their eggs!
21. The last story I want to talk about today is about hummingbirds. There's a group called "Brilliant" hummingbirds with lots of species in them. The Amethyst-throated Sunangel is one of the species that is in the "Brilliant" group. On the left is a typical male, on the right is a typical female.
22. Scientists studying these birds veeeery closely learned that their plumage AND behavior exist on a gradient. Female hummingbirds of this species usually have fewer iridescent/shiny feathers and longer beaks than males. Females forage from different

flowers (because their bill length matches the flowers they eat from). Scientists learned that birds that were male (produced sperm) but looked like females also had longer beaks than typical males. And the reverse was true too - females that looked more like males had shorter beaks. Because their foraging behavior depends on their beak length, birds not only looked like a male or female or something in between, they also behaved that way - at least as far as looking for food goes. The scientists think this happens because competition for food is so fierce.

Resources:

Articles written for the general public:

1. Does transgenderism exist in nature? Some examples in birds and insects. Published by University of Michigan College of Literature, Science and the Arts on Dec 14, 2020. Accessed June 14, 2023. https://sites.lsa.umich.edu/eeblog/2020/12/14/does-transgenderism-exist-in-nature-some-examples-in-birds-and-insects/
2. Are there "Transgender" Proclivities in Animals? Published by JSTOR Daily on October 6, 2016 and accessed June 14, 2023. Are There Transgender Proclivities in Animals? | JSTOR Daily https://daily.jstor.org/transgender-proclivities-in-animals/
3. These Female Hummingbirds Masquerade As Males. Published by The Cornell Lab All About Birds on December 16, 2020, accessed on June 14, 2023. These Female Hummingbirds Masquerade as Males | All About Birds All About Birds https://www.allaboutbirds.org/news/these-female-hummingbirds-masquerade-as-males/#
4. YouTube Video: Sex-Changing Clownfish published by University of Illinois at Urbana-Champaign's BeckmanInstitute https://www.youtube.com/watch?v=2rPtMrwMhJU
5. Animals that change sex: How and why do they do it? Published by Ediciones el Pais, Science & Tech on Nov 14, 2022. Accessed on June 14, 2023. https://english.elpais.com/science-tech/2022-11-14/animals-that-change-sex-how-and-why-do-they-do-it.html
6. Scientists explore the evolution of animal homosexuality. Published by Imperial College London on May 2, 2019. Accessed on June 14, 2023. https://www.imperial.ac.uk/news/190987/scientists-explore-evolution-animal-homosexuality/

Scientific Publications:

1. Evanno G, Madec L, Arnaud JF. (2005). Multiple paternity and postcopulatory sexual selection in a hermaphrodite: what influences sperm precedence in the garden snail Helix aspersa? Mol Ecol. Mar;14(3):805-12. doi: 10.1111/j.1365-294X.2005.02449.x. PMID: 15723671.
    a. https://pubmed.ncbi.nlm.nih.gov/15723671/
2. Sunobe, Tomokio, Akinobu Nakazono. (1993). Sex Change in Both Directions by Alteration of Social Dominance In *Trimma okinawae* (Pisces: Gobiidae). Ethology. Jan-Dec; 94 (4): 339-345.
    a. https://onlinelibrary.wiley.com/doi/10.1111/j.1439-0310.1993.tb00450.x

3. Thompson, Hillary & Gordon, Nicole. (2020). First Description of Nesting Behavior of a Same-Sex Pair of Whooping Cranes (Grus americana) in the Reintroduced Eastern Migratory Population. Waterbirds. 43. 326-332. 10.1675/063.043.0312.
4. Bleiweiss, Robert. (2001). Asymmetrical expression of transsexual phenotypes in hummingbirds*Proc. R. Soc. Lond. B.*268639–646 http://doi.org/10.1098/rspb.2000.1408