Same-sex behavior seen in nearly all animals

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This photo shows a female-female pair of Laysan Albatross. Females cooperatively build nests and rear young when males are scarce. Credit: Eric VanderWerf.

Same-sex behavior is a nearly universal phenomenon in the animal kingdom, common across species, from worms to frogs to birds, concludes a new review of existing research.

"It's clear that same-sex sexual behavior extends far beyond the well-known examples that dominate both the scientific and popular literature: for example, bonobos, dolphins, penguins and fruit flies," said Nathan Bailey, the first author of the review paper and a postdoctoral researcher in the Department of Biology at UC Riverside.

There is a caveat, however. The review also reports that same-sex behaviors are not the same across species, and that researchers may be

calling qualitatively different phenomena by the same name.

"For example, male fruit flies may court other males because they are lacking a gene that enables them to discriminate between the sexes," Bailey said. "But that is very different from male bottlenose dolphins, who engage in same-sex interactions to facilitate group bonding, or female Laysan Albatross that can remain pair-bonded for life and cooperatively rear young."

Published June 16 in the journal *Trends in Ecology & Evolution*, the review by Bailey and Marlene Zuk, a professor of biology at UCR, also finds that although many studies are performed in the context of understanding the evolutionary origins of same-sex sexual behavior, almost none have considered its evolutionary consequences.

"Same-sex behaviors—courtship, mounting or parenting—are traits that may have been shaped by natural selection, a basic mechanism of evolution that occurs over successive generations," Bailey said. "But our review of studies also suggests that these same-sex behaviors might act as selective forces in and of themselves."

A selective force, which is a sudden or gradual stress placed on a population, affects the reproductive success of individuals in the population.

"When we think of selective forces, we tend to think of things like weather, temperature, or geographic features, but we can think of the social circumstances in a population of animals as a selective force, too," Bailey said. "Same-sex behavior radically changes those social circumstances, for example, by removing some individuals from the pool of animals available for mating."

Bailey, who works in Zuk's lab, noted that researchers in the field have

made significant strides in the past two and a half decades studying the genetic and neural mechanisms that produce same-sex behaviors in individuals, and the ultimate reasons for their existence in populations.

"But like any other behavior that doesn't lead directly to reproduction—such as aggression or altruism—same-sex behavior can have evolutionary consequences that are just now beginning to be considered," he said. "For example, male-male copulations in locusts can be costly for the mounted male, and this cost may in turn increase selection pressure for males' tendency to release a chemical called panacetylnitrile, which dissuades other males from mounting them."

The review paper:

- Examines work done to test hypotheses about the origins of same-sex behavior in animals.
- Provides a framework for categorizing same-sex behavior, for example, is it adaptive, not adaptive, occurs often, infrequently?
- Discusses what has been discovered about the genetics of same-sex behavior, especially in the model organism, the fruit fly Drosophila, and in human beings.
- Examines connections between human sexual orientation research, and research on non-human animals, and highlights promising avenues of research in non-human systems.

The reviewers expected the research papers they read for their article would give them a better understanding of the degree to which same-sex behaviors are heritable in animals.

"How important are genes to the expression of these behaviors, compared to environmental factors?" Bailey said. "This is still unknown. Knowing this information would help us better understand how the behaviors evolve, and how they affect the evolution of other traits. It

could also help us understand whether they are something that all individuals of a species are capable of, but only some actually express."

Bailey recommends that fellow evolutionary biologists studying same-sex behavior in animals adopt some of the research approaches that have been successful in human studies.

"We have estimates, for example, of the heritability of sexual orientation in humans, but none that I know of in other animals," he said. "Scientists have also targeted locations on the human genome that may contribute to sexual orientation, but aside from the fruit fly, we have no such detailed knowledge of the genetic architecture of same-sex behavior in other animals."

Next in their research, Bailey and Zuk plan to begin experimentally addressing some of the many issues raised in their review.

Said Bailey, "We want to get at this question: what are the evolutionary consequences of these behaviors? Are they important in the evolution of mating behavior, or do they just add extra 'background noise'? We are pursuing work on the Laysan Albatross, in which females form same-sex pairs and rear young together. Same-sex behavior in this species may not be aberrant, but instead can arise as an alternative reproductive strategy."

Source: University of California - Riverside (news : web)

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