

Why Don't More Animals Change Their Sex

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(PhysOrg.com) -- Most animals, like humans, have separate sexes — they are born, live out their lives and reproduce as one sex or the other. However, some animals live as one sex in part of their lifetime and then switch to the other sex, a phenomenon called sequential hermaphroditism. What remains a puzzle, according to Yale scientists, is why the phenomenon is so rare, since their analysis shows the biological “costs” of changing sexes rarely outweigh the advantages.

A report by Yale scientists in the March issue of *The American Naturalist* says that while this process is evolutionarily favored, its rarity cannot be explained by an analysis of the biological costs vs benefits.

Sequential hermaphroditism naturally occurs in various organisms from plants to fishes. Following four decades of research that established why sex change is advantageous, the question remained why it is rare among animals. In this study, Yale graduate student Erem Kazancioglu and his advisor Suzanne Alonzo, assistant professor of ecology and evolutionary biology, demonstrate that sex change is surprisingly robust against costs.

While the adaptive advantage of sex change is well understood, it is not clear why relatively few animals change sex. According to Alonzo, “An intuitive, yet rarely studied, explanation is that the considerable time or energy it takes to change sex make hermaphroditism unfeasible for most animals.”

To test whether the biological costs of changing sex affect sex change actually occurs, the researchers built theoretical models of the

hermaphrodite and separate-sex life histories. In their “game” models, sex change “players” vary the age of their sex change, while the separate-sex strategy responds by altering the number of male and female offspring it produces.

“We were surprised to see that a hermaphrodite could spend 30 percent of its lifetime in the process of change sex, and still persist in a population,” said Kazancioglu. “This suggests that only huge costs can disfavor sex change.”

So, why is sex change so rare? And, why does one species of fish reproduce strictly as separate sexes, while another very closely related species flexibly changes sex? A comparative study of hermaphroditic and separate-sex mating systems, which the authors are currently performing, may provide a clue, according to Kazancioglu, “Reproductive behaviors such as parental care seem to disfavor sex change in some species. We are investigating whether general patterns like these may explain the rarity of hermaphroditism.”

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Provided by Yale University

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