Scientists find method to pick noncompetitive animals, improve production

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All plants and animals compete for limited resources such as food, mates, sun and territory. William Muir, a Purdue geneticist, has found a quantitative method of determining inherited traits that affect social inactions. Using this information can help breed for less aggressive animals that will be more productive. Muir is shown with Shamu, a domesticated tilapia. Credit: Purdue Agricultural Communication photo/Tom Campbell

A new statistical method of determining genetic traits that influence social interactions among animals may provide for more productive livestock.

Scientists from Purdue University, the Netherlands and England designed mathematical equations based on traits to choose animals that

are more congenial in groups, said William Muir, a Purdue Department of Animal Sciences geneticist. The new method is a tool that may contribute both to animal well-being and to securing the world's future food supply, including possibly permitting more animals to be domesticated, Muir said.

The tool makes it possible to design selective breeding programs to effectively reduce competitive interactions in livestock, he said. The method also aids in predicting how social interactions impact the natural evolution of species.

Muir and his colleagues write about the tool and its effectiveness in two papers published in the current issue of the journal *Genetics*. The journal's cover highlights the work with a photograph that Muir took of various colorful fish species interacting in a simulated ecosystem at the Monterey, Calif., aquarium.

"There is an inherited part of the associations among animals that has profound effects on performance," Muir said. "It's called competition. Animals compete for food, space, territory and mates."

In the first of the two papers, Muir and his colleagues explain the tool they developed to determine inherited traits that contribute to interactions among both individual animals and groups. The second paper refines the methodology and validates it by applying the tool to a flock of chickens.

In previous research, Muir showed that choosing less aggressive animals from a group for breeding purposes increases productivity. In the latest research, the scientists show that aggressiveness and all other traits affecting social interactions are inherited and can be estimated. They also found that by using the new tool they were able to confirm two-thirds more inherited trait variations that impact social interactions than

could be identified with classical selection analysis.

"Now we have a tool to explain how species in nature evolved in response to each other," Muir said. "It can be applied across species and can tell us how social interactions developed in the past and will develop in the future between individuals and among various animal species.

"This is important because the most stable ecosystems are those that have multiple species that cohabitate. Natural selection is nature's way of keeping the ecosystem in balance."

Muir previously proved that animals living in groups and bred to be more passive sustain fewer injuries and are more productive than animals bred naturally. For instance, chickens bred to be less aggressive don't engage in as much pecking, which often causes severe injury and even death. The energy that animals used for negative behavior or to avoid such activities is then transferred to production.

"This selection methodology is a roadmap to improving the breeding of domesticated animals," Muir said. "The tool also could allow us to domesticate more species as readily available food sources, such as cannibalistic shellfish and game fish."

Source: Purdue University