

Researcher's work is 'for the birds'

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An ongoing research project at the University of South Dakota aims to determine how birds respond physiologically to changes in their environment.

Far from being a local interest-only situation, the results yielded by the project could have implications for the study of global climate change.

"If we know how birds respond to those changing temperatures, changing photoperiods, then we can make some predictions about how birds will be able to respond (to changes in climate) and whether they can withstand those changes," said Dr. David Swanson, professor of biology at USD.

The project was started at USD by Swanson in 1990, and concerned the physical changes the birds undergo season to season.

The metabolic rates of birds that stayed in the area all year, as well as only part of the year, were studied because the total amount of energy a bird uses is directly related to its heat production.

"We looked at what their maximal capacity for heat production was in the summer, and compared that with their maximal capacity for heat production in the winter," Swanson said. "What we found was that the winter birds generally had higher maximal heat production than summer birds by about 25-50 percent on average. That enabled them to survive a lot colder temperatures than the summer birds could."

Heat production in birds is primarily the function of the skeletal muscles, specifically their flight muscles, although Swanson points out that muscle growth isn't related

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to the amount of time the birds spend flying.

"If anything, they're probably flying around a lot less (during the winter) because they're not taking trips back and forth to the nest," he said. "But they're shivering like crazy, so heat production in birds is (caused) primarily by shivering with those big flight muscles."

"The bigger muscles allow them to increase their shivering capacity, and that allows them to increase their cold tolerance," he said.

The USD researchers now are looking into the factors that regulate seasonal changes in muscle size, in particular a protein called myostatin, which is a muscle growth inhibitor.

"What we were hypothesizing was that this myostatin gene was down-regulated in the winter, and so ... that would free up the muscle to grow," Swanson said.

Tests on house sparrows showed that the gene was decreased by 55 percent in the winter, and the capacity for activating myostatin also was reduced, he said.

A broad spectrum of natural changes is being studied, as well.

"We're looking at it in several other wintering species," Swanson said. "We're also looking for changes in myostatin in migration because ... prior to engaging in migration birds get bigger muscles, and that helps to support

their migratory flights."

Swanson said it will be interesting to see if it shows the same results as the regular change of seasons, as well as the switch from longer to shorter days.

"That should tell us if it's really a general mechanism that birds use to regulate change in their muscle size whenever they need those changes," he said.

The results of these and other tests could give the researchers insight into the global issue of climate change.

"If the habitats that

they need and the temperatures that they can tolerate become mismatched, then there could be some potential problems for the populations of these birds," Swanson said.

Studies like the one at USD could give researchers a better idea of how and if the birds will acclimate to long-term change, he said.

In addition, there also could be positive outgrowths for humans.

Swanson said that while it isn't a specific interest of the USD project, one possible spinoff is in the field of muscle-wasting diseases such as muscular dystrophy.

"The role of myostatin in some of those diseases is actually being targeted by some research to look at potential treatments," he said.

For more information about Swanson and his research, visit <http://people.usd.edu/~dlswanson/>.

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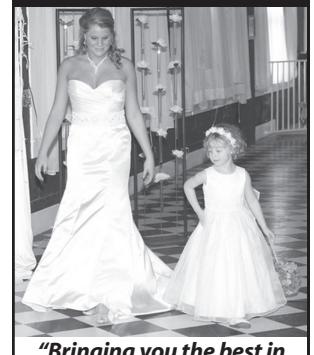
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