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## **Punishment Important in Plant-Pollinator Relationship**

Figs and the wasps that pollinate them present one of biologists' favorite examples of a beneficial relationship between two different species. In exchange for the pollination service provided by the wasp, the fig fruit provides room and board for the wasp's developing young. However, wasps do not always pollinate the fig. Fig trees "punish" these "cheaters" by dropping unpollinated fruit, killing the wasp's offspring inside, report researchers working at the Smithsonian Tropical Research Institute.

Their results, published in the Proceedings of the Royal Society, show that sanctions against cheaters may be critical to maintain the relationship.

"Relationships require give and take. We want to know what forces maintain this 80-million-year-old arrangement between figs and their wasp pollinators," said lead author, Charlotte Jandér, graduate student in Cornell University's Department of Neurobiology and Behavior, who conducted the study as a Smithsonian pre-doctoral fellow. "What prevents the wasps from reaping the benefits of the relationship without paying the costs?"

Some wasp species passively carry pollen that sticks to their bodies. Others actively collect pollen in special pouches. Jandér evaluated the ability of six different fig tree-fig wasp species pairs to regulate cheating. She introduced either a single pollen-free wasp, or a wasp carrying pollen, into a mesh bag containing an unpollinated fig. The wasps entered the figs to lay their eggs. Jandér found that trees often dropped unpollinated figs before young wasps could mature.

"This is really about the all-too-human theme of crime and punishment. We found that in actively pollinated fig species—when wasps expend time and energy to collect and deposit pollen--wasps that did not provide the basic service of pollination were sanctioned. However, in passively pollinated species—when the wasps do not need to make an effort to pollinate--sanctions were absent," said Allen Herre, STRI staff scientist. "Although we still need to clearly understand the costs associated with applying sanctions, it seems like sanctions were only present where needed."

"Sanctions seem to be a necessary force in keeping this, and other, mutually-beneficial relationships on track when being part of a mutualism is costly," said Jandér. "In our study, we saw less cheating when sanctions were stronger. Similar results have been found among human societies

and in social insects. It is very appealing to think that the same general principles could help maintain cooperation both within and among species.”

STRI, headquartered in Panama City, Panama, is a unit of the Smithsonian Institution. The institute furthers the understanding of tropical nature and its importance to human welfare, trains students to conduct research in the tropics and promotes conservation by increasing public awareness of the beauty and importance of tropical ecosystems. Web site: [www.stri.org](http://www.stri.org).

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