Why Play Dead?

Rethinking what used to be obvious

Susan Milius

Gary Gerald studies animal movement, so when two female brown snakes in the lab had babies, he wanted to see them in motion. He watched them crawling on a solid surface, then moved the youngsters to water in a modified gutter. But the system didn't work as planned for the newborn snakes.

"I would pick the little guys up and drop them right in the water, and right when I dropped them, they flipped upside down. They stayed motionless. Their bodies were rigid so if you touched one part, they'd spin like if you touch a stick floating on the water," says Gerald. He concluded that this was a new example of an animal feigning death.

Baby brown snakes (Storeria dekayi) are the latest addition to the long list of animals that practice some form of the strategy scientists call extreme immobility. Gerald, a physiological ecologist at Miami University in Oxford, Ohio, described his findings in August at the annual meeting of the Animal Behavior Society.

The list of animals that play possum includes not only the Virginia opossum, of course, but also some 21 snake species and plenty of other creatures as different as bison on the prairies and brittle stars in the oceans.

Many of these animals freeze when a predator appears, and standard wisdom maintains that predators lose interest in prey that doesn't move. Yet some biologists now question that truism and are looking for a fuller explanation for the roles that feigned death might play in animal interactions.

It's not easy to study predator-prey interactions. Modern research guidelines discourage handing over birds and mice for carnivores to kill. So, the newest insights are coming from creatures that don't attract such scruples. For playing dead, insects are the new opossums.

Possum possibilities

"Rabbit Trancing" is the title of a Web page of the Minnesota Companion Rabbit Society, which is about rabbits as pets. On that page, the society's educator, Tonia Baxter, asks, "Have you ever cradled your rabbit in your arms, much like you would hold a baby, and thought she fell right to sleep?"

Instead of taking a trusting nap, Baxter explains, rabbits, like many other animals, freeze when handled in certain ways. Offline, Baxter says that results vary depending on the individual rabbit.

For a lot of animals, flipping upside down induces a freeze, says John Morrissey of Hofstra University in Hempstead, N.Y. While growing up on a farm, he'd impressed his childhood pals with his power to "hypnotize" chickens by turning them on their backs.

The technique comes in handy for adult marine biologists, too, says Morrissey. For example, when fishing in a 17-foot boat for foot-long juvenile lemon sharks near the island of Bimini in the Caribbean, he accidentally hooked a 14-foot tiger shark. He couldn't bear to leave a hook in such a magnificent animal.

He and his companions roped the thrashing shark and nudged it onto its back. In less than a minute, it quieted down, as hypnotized as a chicken. The animal lay so still that Morrissey set out his medical gear on the animal's stomach while he worked the hook out of the shark's mouth.

Extreme immobility can even occur during a cockfight, says Harold Herzog of Western Carolina University in Cullowhee, N.C. He has attended many fights while studying human relationships with animals. "Sometimes, a chicken would roll over dead, the owner would pick the chicken up, and suddenly it would be back to life," says Herzog. Exhaustion doesn't explain the reaction. When birds snapped out of the collapse, they'd walk around normally.

What makes a tiny parasitic wasp freeze was uncharted scientific territory when Bethia King of Northern Illinois University in DeKalb started studying *Nasonia vitripennis* wasps. Only 2 to 3 millimeters long, they cruise road kill looking for fly pupae into which they can inject their eggs. "Sometimes when you work with them, they just fall over on their backs," says King.

The wasps don't freeze when startled, but tapping their antennae or gently squeezing their abdomens does induce immobility, King and Harmony Leaich, also of Northern Illinois, reported in the March *Journal of Insect Behavior*.

Researchers sometimes call these moments of extreme stillness "tonic immobility," making no claim about resemblance to death or implications about the behavior's function. Some animals, though, add special, cadaverous effects.

When a hognose snake that's facing a predator flips belly-up, its mouth opens and stays agape, sometimes oozing drops of blood. And the snake defecates or otherwise releases an unappetizing smell. "It's spectacular," says Gordon Burghardt of the University of Tennessee in Knoxville.

Grossly dead as the animal may look, Burghardt and Harry Greene, now at Cornell University, found that it's paying attention. Even snakes just 2 weeks old resurrect themselves sooner when a nearby human is looking away from them rather than directly at them.

When Gerald happened on a death-feigning hognose snake in the wild, he flipped it back to its normal, stomach-on-the-ground position. The snake rather damaged the cadaver illusion by rolling belly-up again.

Europe's grass snake puts on an even more realistic death act, says Patrick Gregory of the University of Victoria in British Columbia. When he caught his first grass snake years ago in France, it went limp. "I thought I'd accidentally killed it," he says. A death-feigning grass snake stays in character, not flopping back to its original position after it is turned over.

The relationships among the great range of freezing behaviors have yet
to be clarified. "I see them as part of a continuum," Burghardt says.

Many questions remain: Are some of the activities seizures? A mental meltdown in response to disorientation? And how do some feigners remain conscious of vital details such as the gazes of observers?

Death value

Biologists for years held that predators tend to stop attacking once prey dies, or at least stops moving.

But are predators really that gullible? Theoretician Graeme Ruxton of the University of Glasgow, author of *Avoiding Attack* (2004, Oxford University Press), protests the assumption of a predator's "apparently maladaptive loss of interest."

And Morrissey likewise expresses skepticism: "If you're a pizza and you play dumb, I'm still going to eat you."

Only a few tests have examined whether immobility offers protection. For example, a 1975-reported experiment—which no one would do today—offered captive foxes a series of live ducks. Each of the 50 ducks went limp when a fox caught it. A few did survive; they were immobile but alive when the fox carried them to what seemed to be a storage site.

Gregory, who has been reviewing past literature, says that the 1975 paper suggests that death feigning might work for an animal tangling with a predator that typically caches prey.

A 1981 paper describes putting a cat into an arena with a pair of quail. When researchers induced one quail to freeze, the cat in 14 out of 16 tests went after the mobile bird. When both birds started out mobile, the cat sometimes left its first victim alive but immobile and moved on to attack the second bird. Ruxton points out that it's disadvantageous for predators amid multiple targets to spend too much time making sure that each conquest is dead.

More-recent work focuses on insects. Takahisa Miyatake of Okayama University in Japan got interested in death feigning while researching ideas for wiping out sweet potato weevils (*Cyclas formicarius*) in Japan's southwestern islands. The weevils sometimes go still while lying on their backs, though to Miyatake's discerning eye, such details as parallel antennae reveal that they're still alive. He found that the feigning tendency goes through a daily rhythm, and feints are shorter when the weevils get hungry.

To study evolutionary aspects of such behavior, he and his colleagues switched to red flour beetles (*Tribolium castaneum*). The researchers selected 20 beetles that stayed immobile longer than most did and 20 beetles that did so only briefly or not at all. At first, the feints differed by only a few seconds. After 10 generations of selective breeding, though, the long feigners stayed immobile for 2 minutes, and the short feigners hardly ever went still. Death feigning is heritable, Miyatake and his colleagues concluded.

When the researchers offered the two groups of beetles to jumping spiders, the long feigners were more likely to survive. So, death feigning is beneficial, the team reported in 2004.

Miyatake suggests that beetles are combining some other defense with immobility. He and his colleagues have recently found that when attacked, some of the beetles release benzoquinone, which smells vile, at least to people.

Another approach to death feigning comes from a study of the pygmy grasshoppers (*Criotettix japonicus*) in Japan. When gulped into a frog's mouth, the grasshopper bends its big back legs straight down so they become the upright of a top-heavy T shape. Then, the grasshopper goes rigid.

Such "curious behavior," says Atsushi Honma of Kyoto University looked like death feigning. Yet he wondered why the grasshopper bothered to feign death when it was already in a frog's mouth.

Honma and his colleagues offered grasshoppers to a range of predators with different killing styles: Japanese quail, spiders, big mantid insects, and small frogs. Only the frogs attempted to swallow the grasshoppers whole. And only during frog attacks did the grasshoppers freeze into the rigid-T pose.
When researchers prevented grasshoppers from assuming that pose, small frogs were more likely to swallow the insects.

In contrast, when researchers offered 20 intact grasshoppers to a frog, 16 of them eventually escaped alive from the frog's mouth, Honma and his colleagues report in the July 7 Proceedings of the Royal Society B. Thus, Honma says, the posture doesn't work by resembling death. It just makes the animal hard to swallow.

A bulky shape won't explain all death-feigning poses, Ruxton said in the April 13 Nature. However, he says, the Honma paper "will do the valuable service of shaking us from the rut of interpreting such behaviors uncritically as feigning death."

**Fish tale**

When fish biologist Michael Tobler and his family went to the Yucatán for a vacation, he hadn't planned on working. Yet he couldn't resist the temptation when, 2 days in a row, he saw dead fish lying on the bottom of a cenote sinkhole. Any fish that dies in the wild is usually quickly consumed.

Tobler, of the University of Oklahoma in Norman, spent the next 4 days underwater looking for dead fish.

One break came after he'd floated for 15 minutes staring at a dead-looking Parachromis friedrichsthalii cichlid. Smaller fish gradually drew closer until some began nibbling the cichlid's tattered fins. In an instant, the seemingly dead fish reared off the bottom and attacked one of the scavengers.

Although this cichlid is a death feigner, it's not trying to avoid predators, Tobler said in the March 2005 Journal of Fish Biology. It is itself a predator, and feigning death is the way that it hunts.

Biologists have described this strategy only twice before, but Tobler speculates that it might be more common than it seems. "Fish do a lot of cool stuff, and we don't know about it," he says.

The same, of course, could be said of creatures on land. And when animals are playing dead, scientists still have a long to go to explain why.
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References:


Further Readings:


For information about rabbit trancing, go to http://www.mnhouserabbit.org/care/trancing.html (Minnesota Companion Rabbit Society).

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