EVOLUTION

Moonlight turns white barn owls into terrifying 'ghosts'

The feathery glint startles their rodent prey, making them easier to catch.

BY **KATHERINE J. WU** MONDAY, SEPTEMBER 2, 2019 **NOVA NEXT**

White barn owls scare the bejesus out of their rodent prey, making them easier to catch. Image Credit: Alexandre Roulin, University of Lausanne

Being white can make it tough to blend in—if you're a nocturnal bird, that is.

For years, researchers have puzzled over the snowy plumage of some barn owls (*Tyto alba*), which makes them stick out like sore thumbs against the black backdrop of night. This lack of camouflage becomes even more apparent when these pearly predators take to the skies beneath a full moon, which can backlight the birds as they descend upon their rodent prey.

But these frost-feathered creatures may have good reason not to shirk this lunar spotlight. It turns out that white barn owls actually hunt *best* when the moon looms large—not in spite of their conspicuous coloration, but because of it.

The driving force behind this counterintuitive trend, described in a study published today in the journal *Nature Ecology & Evolution*, is a neat visual trick: As light bounces off of bright plumage, it has a deer-in-headlights effect on rodents, triggering a freezing response that makes them easier to catch.

In other words, the ghostly plumage of the white barn owl is so visible, it's scary—and that can mean curtains for its super-skittish prey.

"This is a really exciting paper," says Monica Carlson, who studies avian plumage at Princeton University, but was not involved in the study. "Given that we [humans] are a diurnal species...we're biased toward studying the species we see the most. But this forges new territory in the study of how animals' colors have evolved."

Barn owls (Tyto alba) are one of the most widespread birds in existence. They're recognizable by their heart-shaped faces, and come in varying shades of auburn and white. Image Credit: Alexandre Roulin, University of Lausanne

In a world where predators often rely on camouflage to sneak up on their prey, most nocturnal hunters have evolved coats, scales, hairs, and feathers in hues of brown, gray, or black that match the sunless landscape. Barn owls, whose feathers range from deep russet to luminous white, fly in the face of this trend—and until now, it's been totally unclear why, says study author Alexandre Roulin, a behavioral biologist at the University of Lausanne in Switzerland. (A quick aside: Though snowy owls are also white, that's more to help them blend into their native Arctic tundra, where they often hunt during the day.)

But inklings of inspiration began to dawn on Roulin during the evening jaunts he'd take to capture barn owls for study. On nights when the moon was full, the whitest of the birds would appear to him "like stars crossing the sky," he says. "They [were] just so visible."

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Dazzling though the birds were to human eyes, Roulin suspected that white barn owls' ghostly pallor might betray their presence to prey, saddling the birds with a hunting handicap on moonlit nights. But when he and his colleagues dug into their barn owl database—which contained nearly 30 years' worth of meticulous recordings from 360 nest-boxes in western Switzerland—and overlaid some of the measurements onto the lunar cycle, they discovered the exact opposite to be true.

On new moon nights, when the moon was least visible in the sky, white and red owls were equally efficient hunters, and hauled the same number of prey back to the owlets in their nests. As the moon waxed, however, the red owls began to falter. And by the time the full moon rolled around, their nestlings weighed less than those raised by white parents—who, in contrast, seemed entirely unphased by the extra light.

To suss out the secrets of the white birds' relative success, the team rounded up several dozen common voles (*Microtus arvalis*), a favorite food among barn owls, and placed each rodent in a brightly or dimly lit room that mimicked either the beginning or end of the lunar cycle. Then, because live birds would have been too difficult to test, the team acquired a set of red and white taxidermied barn owls—all

immortalized in postures of flight—and flung them at the voles via a 7-foot zipline.

Of course, the stuffed birds posed no *real* threat. But these vulnerable voles were none the wiser. As the owls hurtled down the zipline, most of the rodents froze in fear for several seconds—a common response to an approaching predator, Roulin says. Under new moon conditions, the voles reacted similarly to all the owls the researchers sent their way. But when the room's "moon" was full, the voles' paralysis lasted five seconds longer if their assailants were white instead of red.

One of the white (left) and one of the red (right) taxidermied owls used in the study. Image Credit: San-Jose et al., Nature, 2019

The stuffed white owls also seemed to draw predatory power from the faux moonlight: The better lit the room was, the brighter the birds glowed—and the longer the voles remained immobile.

Motionless prey is much easier to catch, which is great news for (living) white barn owls, Roulin says. In the wild, this terrifying tactic may buy the birds a few extra seconds to swoop in for the kill—explaining, perhaps, their hunting prowess on moonlit nights, when they're basically "ghosts," Roulin jokes.

"The beautiful thing about this study is that it doesn't just aim to describe [how the owls' color affects survival]—it also describes the mechanism behind the process," says Maria Delgado, a behavioral ecologist at the University of Oviedo in Spain who was not involved in the study.

From a color-challenged rodent's point of view, there's one big difference between a red owl and a white one: brightness, generated by light reflecting off their feathers. On a small scale, a predator's beacon-like glow might compromise its stealth. Taken to an extreme, however, this weakness becomes a strength that exploits rodents' natural aversion to strong light.

Given their glimmer, you might expect the whitest barn owls to be terrible hunters when moon looms large. But it turns out that quite the opposite is true. Image Credit: Isabelle Henry

That's exactly what seems to be going on here, Roulin says. In a follow-up experiment, the researchers introduced another taxidermied white owl to the voles —only this time, they coated the bird's feathers with duck preen wax, a substance that dulls their natural sheen. Faced with this more muted bird, the voles seemed far less flummoxed, and were quicker to unfreeze. "It's almost like [these waxed birds] were red," he says.

Still, we shouldn't feel *too* badly for the browner birds, Roulin adds. The melanin

behind their red plumage reinforces feather strength, bolstering the birds against abrasion and fluctuations in temperature. And although white barn owls may shine when the moon is full, their cloak of visibility could come with costs under other circumstances, such as when they're trying to avoid detection by competitor bird species like carrion crows.

Tradeoffs like these are probably why the species hasn't gone monochromatic. In the wild, the plumage of barn owls spans the spectrum between red and white, and each subtle variation may be ideally suited to its own time and place. Roulin and his team are now surveying barn owl populations worldwide to see if some habitats—such as those with more cloud or tree cover—might favor birds of certain shades.

Depending on the color of their plumage, barn owls might have their own time of the month. Image Credit: Alexandre Roulin, University of Lausanne

Plenty of questions remain, with few researchers to answer them, Roulin says. Studying nocturnal animals as a diurnal human isn't easy: When nighttime field

work gets particularly intense, some of Roulin's students get just four hours of sleep a night.

Still, studies like these are crucial for expanding our understanding of the many factors that drive the evolution of plumage, Carlson says. From our perspective, it may seem like there's little to see after the sun has set. But for nocturnal predators like the barn owl, that couldn't be further from the truth.

"We need to conduct these studies while taking into consideration the ecological niche of the species we're studying," she says. After all, taking a different perspective—even one that's often in the dark—can be pretty illuminating.