BEWARE THE DEADLY TALON

Neck-breaking, disemboweling, constricting, and snagging—the violent world of raptors. **BY ED YONG**

The role of *Velociraptor*'s infamous claws have received much scientific and pop culture fanfare ever since they clicked their way across a movie kitchen floor. In comparison, the formidable claws of modern raptors (birds of prey) have received little notice. Eagles, hawks, falcons, and owls are some of the most widespread and well-liked of all birds. Though it's always been suspected that these superb hunters use their talons to kill, we've known amazingly little about their techniques.

Paleontologist Denver Fowler and colleagues from Montana State University have changed some of that through the first comprehensive study of raptor feet. Their work in the late 2000s reveals that these familiar birds use a wide variety of killing strategies, including a few rather grisly ones. Some raptors use their talons to attack with high-speed killing blows, while others suffocate their prey to death in a constricting grip. Some give their victims the merciful death of a broken neck, but others eat their victims alive after slashing them open.

Fowler unveiled this macabre and violent world by measuring and photographing the talons and feet of 34 birds from 24 raptor species. He also studied more than 170 video sequences of raptor attacks, as well as many published accounts of predatory activity. By linking shape and size to actual behavior, he managed to document the wide range of uses that curved claws can be put to.

Fowler found that all raptors use their talons in a similar way when tackling small prey: Their feet imprison the victim, with talons deployed as a cage rather than as weapons. Falcons then use a notched ridge on their upper beak—the "tomial tooth"—to sever the spine or crush the head, while owls sometimes break their prey's neck with a swift twist. Accipitrids (eagles, hawks, kites, harriers, and the like) have weaker bites than falcons and no "tooth," so they use their feet to constrict their prey, cutting off the air supply much like pythons use their coils.

Because owls tend to ambush their prey on the ground, their chances of landing a killing blow are slimmer. Their feet have evolved to better restrain struggling prey. Their toes are shorter and stronger than those of other raptors. One toe can swivel backward to join another so the owl can grip with two pairs of opposing talons. That makes them powerful constrictors, capable of crushing small animals in a suffocating "fist." It also means they specialize in smaller victims, rarely tackling the larger prey that falcons and eagles hunt.

Larger prey simply can't be enclosed by feet, so falcons and accipitrids use different strategies when their meals get bigger. They'll stand on top of the animal, pinning it down with their full body weight. If the prey tires and stops moving, it's all over, but death only comes after a "prolonged and bloody scenario." The raptor plucks any fur or feathers, especially around the belly, and starts to feed, often using the large second claw to slash open the body and expose the innards. Grimly, the prey is sometimes still alive when this happens. It's only the ensuing blood loss or organ failure that finishes it off.

Accipitrids are more likely to consume their victims alive. To subdue any final struggles, they have two unusually massive talons on the first and second toes that provide extra grip. These piercing anchors give them the ability to cope with the most powerful struggling prey, and it's no coincidence that the accipitrids include the mightiest of the raptors.

Falcons, on the other hand, often kill their prey with a neck-break to avoid a protracted struggle. They specialize in high-speed assaults, striking their prey with rapid dives and swoops that can potentially cripple or even kill the victim outright. Peregrines and other falcons can afford to have smaller talons because their prey is more likely to be immobile once it hits the ground.

Aside from size, the type of prey matters little in determining the shape and proportion of the raptor foot. The only exceptions are species that are fish snagging specialists, such as the osprey and the bald eagle. Their talons are like fishhooks—exceptionally large, highly curved, and equal in size on all four toes.

Considering how popular and common birds of prey are, it's amazing that a study like this has never been attempted before. Even now, Fowler sees it as just the beginning. There's no reason why the same sort of analysis shouldn't apply to the extinct relatives of today's raptors, meat-eating dinosaurs, a theory that forms the plot of his sequel study.

Results of Fowler's sequel study were recently published in the scientific journal PLoS ONE. *He and fellow MSU researchers describe how comparing modern raptors helped them develop a new behavior model for sickle-clawed carnivorous dinosaurs like* Velociraptor. *Look for more on the scientists' research in an upcoming issue of* Montana Outdoors.

Ed Yong is a London-based science writer. Adapted from an article that originally appeared on his blog Not Exactly Rocket Science, *blogs.discovermagazine.com/notrocketscience/. Used with permission.*

FERRUGINOUS HAWK PHOTO: ISTOCKPHOTO.COM; TALON PHOTOS: *PLOS ONE*

DEATH FROM ABOVE A study by Montana State University researchers looked at the many ways various raptors like this ferruginous hawk use their curved claws to capture and kill prey.

Goshawk

Osprey

Peregrine falcon

Red-tailed hawk

Great gray owl