Goshawk hunt and prey-evasion strategies revealed

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Stealth is the goshawk's greatest asset. Plummeting out of the air, the raptors fix their gaze on the oblivious victim below. Intrigued by the birds' attack tactics, Suzanne Amador Kane from Haverford College, USA, decided to find out more about the factors that guide a goshawk during its approach and in the final instants before a strike. However Kane knew that she could only begin to understand the hunters' strategy from a bird's-eye perspective, and to do that she would have to team up with an experienced falconer. She publishes her discovery that goshawks hold victims at one point in their gaze during the first stage of an attack, switching to a parallel pursuit during the final approach, and that victims have to break their attacker's visual fix to escape by turning abruptly in *The Journal of Experimental Biology*.

Taking advantage of academic contacts, Kane linked up with Robert Musters - a falconer from The Netherlands who works regularly with biomechanics to study bird flight - and his 2.5-year-old goshawk, Shinta. 'Robert is an inventor and engineer and he designed the helmet that Shinta wore,' says Kane, who supplied Musters with the tiny spy camera that was mounted on the bird's head. However, once Shinta was released into the wild Musters had no control over where she flew or what she filmed, 'She would film whatever she encountered', chuckles Kane.

After sifting through several hours of hunting footage, Kane found 16 short pursuits to investigate with undergraduate researchers Andrew Fulton and Lee Rosenthal. Manually analysing the motion of background objects in the bird's vision and the position of the target during her

approach, Kane was able to extract information about Shinta's trajectory in the majority of attacks and the evasive action taken by the rabbit or pheasant that was in her sights.

Explaining that goshawks usually spy out their victims from a vantage point before launching an attack, Kane describes how Shinta first made a beeline towards her prey by holding the victim in the centre of motion of her gaze to minimise the time to impact and optimise the surprise factor. Then, once the target had been startled and was running for its life, the goshawk switched to a pursuit strategy where she held the prey at a constant angle in her vision as she closed in. Kane explains that this allows the predator to intercepts its victim in the fastest time while also masking the attacker's approach from the victim's perspective. However, once she was within striking range Shinta switched strategy again, flying parallel to the fleeing animal, which gave her time to decide when to strike. And when Kane compared Shinta's tactics with those of goshawks filmed by British falconers David and Adam Burns from the ground, she often saw the same pattern of behaviour as she had seen previously when the goshawks closed in for the kill. However, Kane adds that although she would expect goshawks to use this strategy in the majority of cases, she says, 'you would expect them to use different strategies in certain circumstances'.

Having identified the key components of the goshawk attack, Kane says, 'One of the other things we wanted to study was how the prey try to evade capture'. Analysing the escape trajectories of the rabbits and pheasants that successfully eluded capture, Kane, Fulton and Rosenthal realised that the survivors made a sharp sideways turn away from the predator. 'In our videos you could see that only the sideways motion was effective at breaking the visual fix', says Kane. Adding that there is no way that a rabbit or pheasant could usually out run or out manoeuvre super agile goshawks, Kane suggests, 'Maybe what they are trying to do is counter the sensory abilities of the predator. They are trying to take

advantage of the way the predator does its visual guidance to escape'.

More information: Kane, S. A., Fulton, A. H. and Rosenthal, L. (2015). When hawks attack: animal-borne video studies of goshawk pursuit and prey evasion strategies. *J. Exp. Biol.* 218, 212-222. jeb.biologists.org/content/218/2/222.abstract

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