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Note

American Marten (*Martes americana*) and Northern Goshawk (*Accipiter gentilis*) simultaneously attack Gray Squirrel (*Sciurus carolinensis*)

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Abstract

A Northern Goshawk (*Accipiter gentilis*) was observed following an American Marten (*Martes americana*). The marten's attempts to capture a Gray Squirrel (*Sciurus carolinensis*) forced the squirrel into the open where the goshawk repeatedly attempted to capture it as the marten chased it through the trees. Attacks on prey flushed by heterospecific predators have been reported for a few other raptors, but this type of interaction has not been reported previously for either goshawks or martens.

Key words: Northern Goshawk; *Accipiter gentilis*; American Marten; *Martes americana*; Gray Squirrel; *Sciurus carolinensis*; predation

Several species of raptors have been reported to exhibit a form of noncooperative hunting in which one species flushes potential prey into the open where another species of predator can attack it. For raptors, Ellis *et al.* (1993) summarized reports of a Peregrine Falcon (*Falco peregrinus*) following a Raven (*Corvus corax*), a White Hawk (*Leucopternis albicollis*) following a troop of monkeys (species not indicated), and a Golden Eagle (*Haliaeetus leucocephalus*) following an American Badger (*Taxidea taxus*). Brockman and Barnard (1979), Kozma (2016), and McConnell (2011) report Merlins (*Falco columbarius*) using the hunting activity of other raptors to expose prey to capture. Kozma (2016) also saw American Kestrels (*Falco sparverius*) exhibiting similar behaviour. Bandy and Bandy (1978) report Marsh Hawks (*Circus hudsonius*) following Red Fox (*Vulpes vulpes*), and Graves (2004) observed a Red-shouldered Hawk (*Buteo lineatus*) using Wild Turkeys (*Meleagris gallopavo*) to flush insect prey. Such intraguild competition for shared food resources may include kleptoparasitism (stealing food that has already been captured by another animal), and either species may attempt to exploit resources made more easily available by the

other (Jung *et al.* 2009; Jung 2021). We report observations of similar interactions between a Northern Goshawk (*Accipiter gentilis*) and an American Marten (*Martes americana*).

These observations were made between ~0920 and 0925 on 6 January 2022. The temperature was -11.1°C, wind speed was ~14.5 kph, and snow depth was ~39.4 cm in the area. A storm over the previous two days had produced ~30 cm of fluffy new snow. B.M.G. and S.M.P. were inside a house in Marquette Township, Michigan (46.560885°N, 087.472622°W), that was adjacent to large areas of relatively natural woodlands. A bird feeder in the yard commonly attracted Red Squirrel (*Tamiasciurus hudsonicus*) and Eastern Gray Squirrel (*Sciurus carolinensis*).

A marten was observed within 10 m of the bird feeder. It was travelling through the snow toward an Ironwood (*Ostrya virginiana* (Miller) K. Koch) tree where an Eastern Gray Squirrel was located. While we watched the marten, we saw a goshawk in the trees above it. The marten chased the squirrel up a large Sugar Maple (*Acer saccharum* Marshall) tree. The goshawk attempted to ambush the squirrel while the squirrel attempted to escape the marten. Both the

goshawk and marten made numerous attempts to capture the squirrel and were within <1 m of each other several times. The squirrel jumped to another tree, but the marten did not leap after it. The marten descended part way to the ground, then leapt from the tree from a height of 5–10 m, landing in the fluffy snow. This happened twice as the marten moved between trees. The marten crossed the open yard to follow the squirrel to a clump of Black Spruce (*Picea mariana* (Miller) Britton, Sterns & Poggenburgh) ~40 m to the northeast. It did not get close to the squirrel again, and the squirrel escaped through the tree tops further to the northeast. The goshawk stayed in the maple tree and watched. The marten left the spruce and was last seen travelling on the ground ~100 m to the south of the spruce. The goshawk followed it until both were out of sight over a hill.

Direct competitive interactions for food resources can take several forms, dependent on costs, benefits, and opportunities. First and simplest with regard to evolution, learning, and cognition is that a predator may opportunistically detect a prey item that happens to have been made more vulnerable because of pursuit by another predator. This entails no modification of normal hunting behaviour; a predator simply detects prey and attacks.

A second situation would involve kleptoparasitism. This behaviour is adaptive if the cost of taking prey from another predator is less than the cost of catching that prey by oneself. We saw no evidence of this; the marten did not capture the squirrel, and the goshawk attacked the squirrel, rather than the marten. Furthermore, kleptoparasitism in this situation could be costly. Allowing the marten to capture the squirrel and then stealing that meal would save the goshawk the cost of capturing the squirrel. However, a marten may be a formidable adversary, as martens are capable of killing and eating goshawks (Paragi and Wholecheese 1994).

A third situation would involve an evolutionary or cognitive association between the activity of an intraguild predator and the availability of prey. The predator might reduce its foraging costs and increase encounter rate by letting the intraguild competitor expose prey (to act as a “beater”; Rand 1954). Thus, it would pay to follow the competitor. This is a simpler behavioural modification than kleptoparasitism, because the following predator must simply learn to associate the beater with the likely presence of prey and then respond as normal to cues from prey. Indeed, Brockman and Barnard (1979) suggest that kleptoparasitism could evolve from the use of beaters.

Is there any evidence to indicate whether this was a chance encounter of goshawk and marten, followed by an opportunistic response by the goshawk

to normal prey-associated stimuli, or whether the goshawk was using a more complex foraging strategy in which it associated the marten with prey availability? Although parsimony would argue for the former, all else being equal, we suggest that several pieces of evidence support the latter possibility.

We do not know whether the goshawk had been following the marten before we saw them, but it did follow the marten after both had been unsuccessful in capturing the squirrel until they were out of visual range. Furthermore, the goshawk did not attack the squirrel when the marten was travelling on the ground between trees, but instead sat in a tree watching. Finally, while Red Squirrel is a common component of goshawk diets in the western Great Lakes region, Eastern Gray Squirrel is not (Boal *et al.* 2006). Eastern Gray Squirrels in southeastern Minnesota average 600.4 g (Thoma and Marshall 1960), while Red Squirrels in the Upper Peninsula of Michigan average 163.4 g (Kramm *et al.* 1975). Thus, because gray squirrels are almost four times the body mass of Red Squirrels, adult gray squirrels may be difficult for goshawks to capture, and this kind of interspecific interaction could facilitate success. These actions support our interpretation that the goshawk was using the marten as a beater and that this was not a chance encounter of two predators attracted to the same prey. Of course, this is a single observation; verification of such behaviour will require more data.

Although goshawk foraging ecology has been relatively well studied (e.g., Penteriani *et al.* 2013; Miller 2017; Kusal and Kajtoch 2020; Squires *et al.* 2020), use of another foraging animal to flush prey has not been reported previously for this species, nor has any raptor been reported to use a marten in this manner. Ellis *et al.* (1993) suggested that use by raptors of other species to flush prey might be much more common than the few anecdotes they cited would suggest, especially among forest species whose foraging behaviour is difficult to observe. Our observation broadens the distribution of this foraging strategy to another taxon of raptor and another mammalian carnivore species used to flush prey.

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Writing – Original Draft: B.M.G.; Writing – Review & Editing: B.M.G.; Conceptualization: B.M.G.; Investigation: B.M.G. and S.M.P.

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