several times in the vicinity of the barking hound which was trailing a hare; one unsuccessful attack on a hare trailed by the hound was noted. At no time during these events did I observe the hawk attempt to strike the dog. It was also noted that Goshawks had walked along and followed hare trails on the snow surface (also cited in Palmer 1988), indicating a strong reliance upon hares in that area.

The effectiveness of exploiting beaters has been demonstrated in several species. Cattle Egrets (*Bubulcus ibis*) exploit cattle as "beaters" to flush insects and small mammals (Welty and Baptista 1988: page 422), and by doing so were more efficient than when foraging alone (Dinsmore 1973; Grubb 1976). Both Merlins (*Falco columbarius*) and Peregrine Falcons (*Falco peregrinus*) have followed Northern Harriers (*Circus cyaneus*) (Dickson 1984 in Palmer 1988); and Rough-legged Hawks (*Buteo lagopus*) have been observed following Arctic Fox (*Alopex lagopus*) to catch disturbed voles and lemmings (Welty and Baptista 1988). Reynolds (1965) suggested that beater associations may be regular, as with the Cattle Egret, or may represent an individual capacity to take advantage of a favorable situation. The latter better describes my observations, which likely originated out of curiosity as the Goshawk investigated the dog's barking and was rewarded with prey capture opportunities. As far as I can determine, this is the first report of a Northern Goshawk or any *Accipiter* sp. utilizing "beating" behavior to aid in prey capture.

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Giant Beaver, *Castoroides ohioensis*, Remains in Canada and an Overlooked Report from Ontario

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Harington, C. Richard. 2007. Giant Beaver, *Castoroides ohioensis*, remains in Canada and an overlooked report from Ontario. Canadian Field-Naturalist 121(3): 330-333.

The Giant Beaver (*Castoroides ohioensis*) was the largest ice age rodent in North America, reaching about the size of a Black Bear (*Ursus americanus*). In Canada, fossils of this species are commonly found in the Old Crow Basin, Yukon, and single specimens are known from Toronto, Ontario and Indian Island, New Brunswick. A hitherto overlooked 1891 record of a Giant Beaver skull from near Highgate, Ontario is the earliest for Canada.

Key Words: Giant Beaver, *Castoroides ohioensis*, Pleistocene, Highgate, Ontario, earliest Canadian record, paleoenvironment.

The Giant Beaver (*Castoroides ohioensis*) was the largest rodent in North America during the ice age (Quaternary – approximately the last 2 million years) (Kurtén and Anderson 1980). The great morphological similarity between Giant Beaver and modern Beaver (*Castor canadensis*) leaves no doubt that the two animals were much alike in appearance and were adapted to similar surroundings (Figure 1).

But there was one remarkable difference – size! Adults reached a length of nearly 2.5 m, the size of a Black Bear (*Ursus americanus*), and may have weighed as much as 200 kg (compared to a 1 m-long modern Beaver weighing about 30 kg) (Kurtén and Anderson 1980). However, Reynolds (2002), treating statistically a comprehensive sample, estimates Giant Beavers had a body mass of only 60 to 100 kg while assuming a length of 1.5 m [this ignores the nearly 2.5 m length of the skeleton displayed in Chicago's Field Museum of Natural History and the 2.2 m length for the Earlham College skeleton, which represents an immature individual (Barbour 1931, Figure 109)]. Using a regression she established for all rodents, Hopkins (2008) calculated a mass of 67 kg for *Castoroides*, which corresponds to Reynolds' estimate. Average weights of adult female Black Bears range from 40 to 70 kg and for adult males from 60 to 140 kg with body lengths of 1 to 2 m

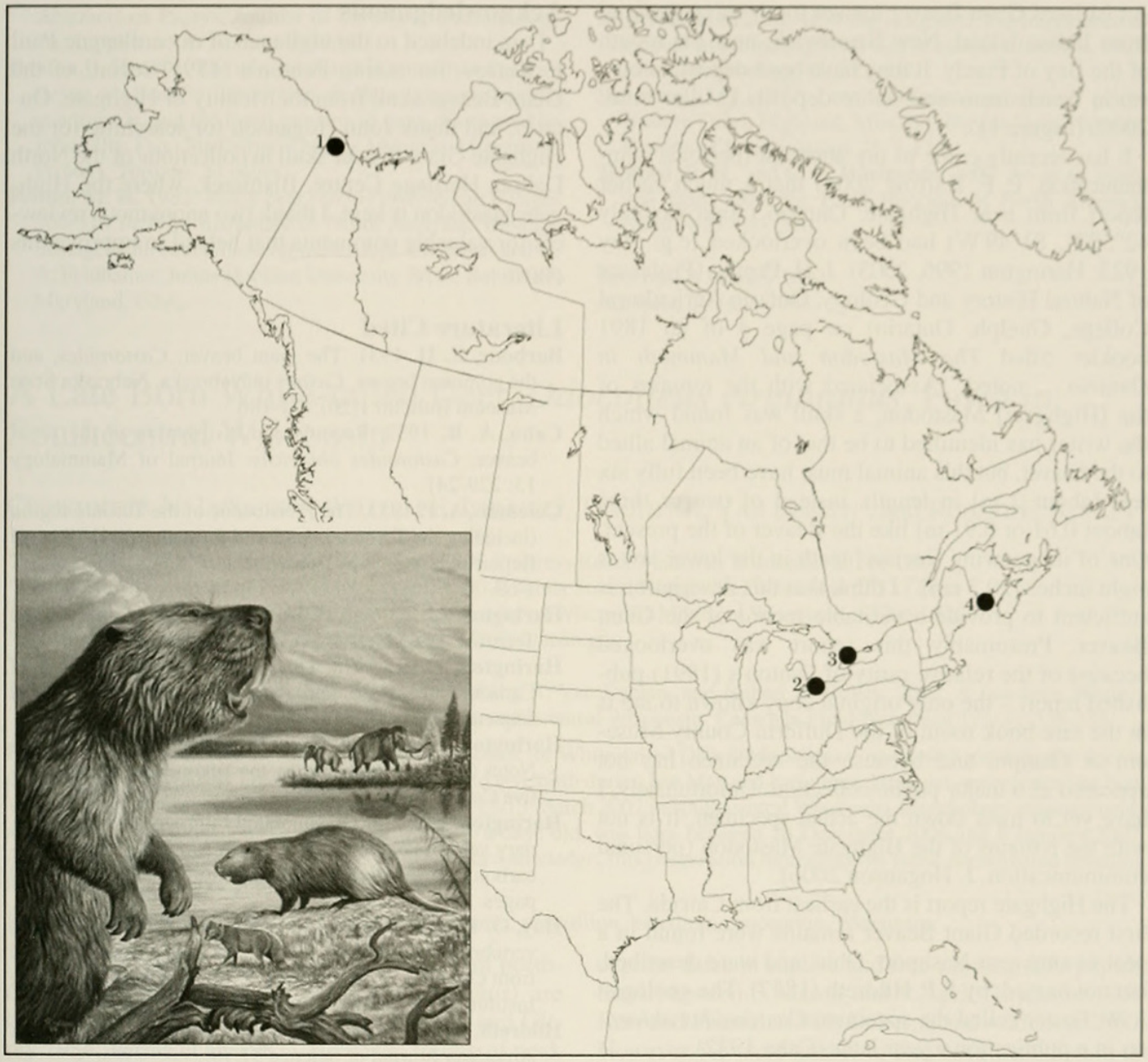

FIGURE 1. Locations of Giant Beaver (*Castoroides ohioensis*) fossil sites in Canada: 1. Old Crow Basin, Yukon Territory; 2. Highgate, Ontario; 3. Toronto, Ontario; 4. Indian Island, New Brunswick. Insert shows two Giant Beavers (with fox for scale) in the foreground and Woolly Mammoths (*Mammuthus primigenius*) in the background. Reduced black and white image of a painting by George Teichmann (C.R. Harington and N. Rybczynski, scientific advisors).

(Pelton 1982), so Reynolds' estimate is still within the range for Black Bears. Other differences include a relatively narrow tail, cheek teeth with S-shaped enamel patterns on the grinding surfaces, and cutting teeth (incisors) about 15 cm long with prominently ridged outer surfaces (Harington 1996).

A primitive beaver (smaller than the modern beaver) called *Dipoides* that occupied Eurasia and North America during the late Tertiary (some 5 million years ago – indeed members of this genus occupied beaver ponds in the vicinity of Strathcona Fiord, Ellesmere Island, about 4 million years ago, Tedford and Harington (2003), and the Hand Hills, Alberta perhaps even earlier (Owen and Burns 2006) evidently gave rise to *Procastoroides*, a large beaver about two-thirds the size of the Giant Beaver. That beaver probably evolved into the Giant Beaver some 3 million years ago.

Castoroides ranged from Florida to the Yukon and from New Brunswick to Nebraska, but it has not been found outside of North America. Giant Beavers seem to have flourished in the region south of the Great Lakes toward the close of the last glaciation, about 10 000 years ago, and became extinct about that time (Harington 1996).

In Canada, Giant Beaver fossils have been found in great abundance in the Old Crow Basin of the northern Yukon (Harington 1977, 1978), and a single incisor was collected from the Don Formation in Toronto (Coleman 1933; Harington 1978) – fossils from both places probably extending back to at least last (Sangamonian) interglacial time some 130 000 years ago.

An isolated Giant Beaver incisor tooth was recovered from Indian Island, New Brunswick, near the mouth of the Bay of Fundy. It may have been deposited on a storm beach from near-shore deposits (Miller et al. 2000) (Figure 1).

It has recently come to my attention (personal communication, P. F. Karrow 2006) that a much earlier report from near Highgate, Ontario (approximately 42°30'N, 81°49'W) had been overlooked (e.g. Hay 1923; Harington 1996, 2003). J. H. Panton (Professor of Natural History and Geology, Ontario Agricultural College, Guelph, Ontario) on page 4 of an 1891 booklet titled *The Mastodon and Mammoth in Ontario*..., noted: "Associated with the remains of the [Highgate] Mastodon, a skull was found which the writer has identified to be that of an animal allied to the beaver, but this animal must have been fully six feet [about 2 m] in length, instead of two or three [about 0.61 or 0.91 m] like the Beaver of the present. One of its gnawing [incisor] teeth in the lower jaw is eight inches [20.3 cm]." I think that this description is sufficient to provide a veritable record of the Giant Beaver. Presumably this report was overlooked because of the relative rarity of Panton's (1891) published report – the only original copy known to me is in the rare book room of the Dufferin County Museum at Guelph, and because the specimen has not appeared in a major public collection. Unfortunately, I have yet to track down the actual specimen. It is not with the remains of the Highgate Mastodon (personal communication, J. Hoganson 2006).

The Highgate report is the earliest from Canada. The first recorded Giant Beaver remains were found in a peat swamp near Nashport, Ohio, and were described, but not named, by S.P. Hildreth (1837). The geologist J. W. Foster called the specimen *Castoroides ohioensis* in a publication a year later (Cahn 1932).

Giant Beavers, being well-adapted to swimming, seem to have preferred lakes and ponds bordered by swamps as their habitat because their remains have been found in ancient swamp deposits so often (Harington 1996). American Mastodons (*Mammut americanum*) evidently occupied similar habitat in open spruce forests. Indeed, at Boney Spring, Missouri, eight mastodon cheek teeth show tooth marks probably made by the lower incisors of *Castoroides* (Saunders 1977). It is worth noting that pollen analysis of sediment recovered from a hole in the sternum of the Highgate Mastodon (with which the Giant Beaver skull was associated) indicate that both mastodon and Giant Beaver occupied a boreal forest dominated by spruce probably between about 12 000 and 10 300 years ago (Hoganson 2006). Presumably this pollen analysis was carried out by McAndrews (1994, page 183) who indicates that his "recent analysis of mud" from the Highgate Mastodon shows that it belongs to pollen subzone 1b, which in his Figure 10.2 dates between about 11 800 and 10 000 BP [radiocarbon years before present (taken as 1950)].

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I am indebted to the vigilance of my colleague Paul F. Karrow for noting Panton's (1891) record of the Giant Beaver skull from the vicinity of Highgate, Ontario, and thank John Hoganson for searching for the Highgate Giant Beaver skull in collections of the North Dakota Heritage Centre, Bismarck, where the Highgate Mastodon is kept. I thank two anonymous reviewers for valuable comments that helped to improve this paper.

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A Late Born White-tailed Deer, *Odocoileus virginianus*, Fawn in Southcentral Wisconsin

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Published reports of peak breeding and parturition dates for White-tailed Deer (*Odocoileus virginianus*) indicate that deer in northern regions typically breed during November and give birth during late May and early June. However, we report a late born White-tailed Deer fawn killed by a vehicle between 12-13 March 2007 in south central Wisconsin. Morphology measurements and body weight indicated the individual was 63-76 days old, was born between 26 December 2006 and 8 January 2007, and was conceived between 14-27 June 2006. To our knowledge, this observation represents the latest documented breeding activity in northern deer populations.

Key Words: White-tailed Deer, *Odocoileus virginianus*, parturition, breeding, conception, Wisconsin.

Seasonally polyestrous breeding activities of northern White-tailed Deer (*Odocoileus virginianus*) are clearly synchronized by photoperiod (Verme and Ullrey 1984; Verme et al. 1987). However, timing of peak breeding activities and parturition can be affected by nutrition and deer herd demographics (Demarais et al. 2000). Low quality nutrition can prolong breeding and fawning activities, while high quality nutrition can shift peak breeding and fawning periods to earlier dates (Verme and Ullrey 1984).

Breeding dates vary throughout the range of the White-tailed Deer and may occur throughout the year in Central America or within short (2-3 weeks) time periods in northern deer populations (Dahlberg and Guettinger 1956; Moore and White 1971; Verme 1977; Clark 1981; Webb and Nellis 1981; Ozoga and Verme 1984). Similarly, gestation for deer varies from 196 to 213 days (Cheatum and Morton 1946; Haugen and Davenport 1950; Verme 1965, 1969), with peak parturition occurring in late May to early June in most northern deer populations (Verme et al. 1987; Brinkman 2003; Burris 2005).

Although rarely documented, occurrences of late breeding activity have been reported in northern deer populations. Throughout southcentral and northern Minnesota, previous investigations have reported conception dates in captive and free-ranging deer populations between 3 March and 9 April (Erickson 1952; Kerr and Peterson 1988; DePerno and Anderson 2000). However, we were unable to find documentation in the scientific literature of breeding activity occurring during June in northern deer populations. Our purpose was to report an occurrence of a late-born fawn and subsequent evidence of late breeding activity by White-tailed Deer in southcentral Wisconsin.

On 14 March 2007 a vehicle-killed spotted male fawn was retrieved from State Highway 23 near the village of Plain in Franklin Township, Sauk County, Wisconsin (43°16'30"N, 90°03'00"W). Because Highway 23 is frequently traveled by WEI, we are certain this fawn was killed between 12-13 March 2007. At the time of carcass retrieval, recorded body weight was 17.7 kg (39.2 lbs); however, the hindquarters were slightly scavenged. Because the amount of tissue removed by scavengers was minimal (≤ 1 kg), the estimated body weight of this fawn was 18.7 kg (41 lbs).

Normally, fawns from well-fed adult females average 3-4 kg (6.6 to 8.8 lbs) at birth (Verme and Ullrey 1984; Nelson and Woolf 1985; Verme 1989) and typically gain 0.20 to 0.24 kg (0.44 to 0.53 lbs) per day (Robbins and Moen 1975; Verme and Ullrey 1984). Thus, we assumed the fawn weighed approximately

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