

responsible for under-representation of perched hawks during morning periods, why was the afternoon road census estimate more accurate? By mid-day hawks are no longer hunting intensely and have moved up to higher perches, where they can maximize radiant absorption as well as competitor detection and territory defense. Observation of perched hawks during a census would be enhanced during these periods thus providing more accurate estimates of activity.

Although the road survey technique is not always accurate for the Red-tailed Hawk, this does not mean that the technique is an imprecise estimator of activity patterns for other species. Activity of Rough-legged Hawks (*B. lagopus*) may be more accurately gauged by the survey technique, since they tend to hunt in more open habitat (Weller, Iowa Bird Life 34:58–62, 1964) making perched birds more obvious. Schnell (1967) in fact used the road census technique to assess the influence of various environmental factors on flight of this species. Activity of larger raptors such as eagles (e.g., Golden Eagle [*Aquila chrysaetos*]), may be more accurately estimated by the road census technique because their larger silhouette is more conspicuous, while the converse may be true for smaller birds of prey (e.g., American Kestrels [*Falco sparverius*]). On the other hand, the road census may be an entirely invalid estimator of activity of some species due to their specific behavioral patterns. For example, Northern Harriers (*Circus cyaneus*) fly a large percentage of the day, but much of their perched time is spent on the ground (Weller, Wilson Bull. 67:189–193, 1955) where they are not always visible. Therefore, before using a survey method for determining activity patterns of raptor species, workers should consider factors I have noted above which affect detectability of perched birds (especially perch-site selection).

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**Extreme aggression in Great Blue Herons.**—Meyerriecks (Publ. Nuttall Ornith. Club 2: 98, 1960) noted that contact during aggressive interactions between Great Blue Herons (*Ardea herodias*) was quite rare and he never observed a fight which resulted in damage to either of the combatants. Benson and Penny though (Philosophical Trans. Royal Soc. Lond. B. 260:417–527, 1971) reported an immature Grey Heron (*A. cinerea*) was stunned fighting with another Grey Heron, and Woolfenden et al. (Bird-Banding 47:48–53, 1976) reported starving Cattle Egrets (*Bubulcus ibis*) occasionally grabbed at one another with their toes and pecked during brief fights. The present note describes two observed and one apparent case of extreme aggression by Great Blue Herons.

On 18 July 1982 at 18:00 near the Creston Valley Wildlife Interpretation Centre (CVWIC) at Creston, British Columbia, a young-of-the-year heron carrying a black bullhead (*Ictalurus melas*) landed about 100 m away from a foraging adult heron in an area where earlier an adult heron defended a territory about 300 m in radius. After 30 sec the juvenile, still carrying the bullhead, flew to a location about 20 m from the adult and assumed an aggressive upright display, followed by a forward display (see Meyerriecks 1960). The adult then flew at the juvenile, and landed on its back. The two herons stabbed with their bills and buffeted each other with their wings for about 20 sec before the adult, using its feet, gripped the juvenile's neck and submerged its head and body. About 20–30 sec later the juvenile heron lifted its head above water, still holding the bullhead. The adult struck its bill toward the

juvenile's head but missed. The juvenile swallowed the bullhead and began sparring with the adult while vocalizing between strikes. Once, the adult's bill struck down to the back of the throat of the juvenile, which caused an injury. After that the herons were startled by a shout and the adult flew and landed about 300 m away, the juvenile remained, bleeding profusely from the corner of its mouth. It dipped its bill in water and approximately 1 min later captured and ate a 12-cm bullhead.

On 19 May 1983 between 14:14 and 14:20 at Duck Lake, 12 km north of Creston, a second observed case of extreme aggression occurred. One adult heron (A) had just captured and eaten a 10-cm largemouth bass (*Micropterus salmoides*) when a second adult heron (B) flew toward it. As B approached, A flew 10 m in the opposite direction. B then landed 15 m from A and the two faced one another, both in aggressive upright postures. B turned and in a forward posture walked slowly away from A. A then followed, still in an aggressive upright posture. A turned and in a forward posture walked slowly away from B. B followed, still in a forward posture. B then flew and landed on the back of A. B struck four glancing blows at the head and neck of A, and with its mandibles grasped A's neck just below the head and held A's head under water for 5 sec. A freed itself from B's grasp whereupon B struck and hit A on the back. A then flew and landed about 150 m from B.

On another occasion we discovered a dead heron which we believed to have been killed fighting with another heron. At 08:00 on 11 January 1979, EM observed an adult Great Blue Heron standing near a small opening in the ice near the CVWIC and a dead juvenile heron in the snow 12 m away. The carcass had a punctured cranium and in the fresh snow were spots of blood, wing tip marks, and heron tracks. No signs of a predator's activities were found in the snow or on the carcass.

We believe these incidents of extreme aggression are related to limited access to foraging sites. Deep water in summer (Forbes and Flook, unpubl.) and ice in winter restrict the access of Great Blue Herons to their foraging sites and possibly intensify competition among herons. Adults feeding young in May and the presence of fledged young on the foraging grounds in July may also increase competition. Bayer (Natl. Audubon Soc. Resear. Rept. No. 7:213–217, 1978) found that juvenile Great Blue Herons in Oregon fed non-territorially and disappeared at a greater rate over winter than did adults. He suggested that territory acquisition was essential to over-winter survival. We believe that the intense aggression we observed resulted from a shortage of suitable foraging sites, and that the risk of serious injury during aggressive fighting perhaps explains the rarity of such behavior.

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**Combined-effort hunting by a pair of Chestnut-mandibled Toucans.**—Combined hunting efforts have been reported for many predatory birds, including Cattle Egrets (*Bubulcus ibis*) (Wiese and Crawford, *Auk* 91:836–837, 1974), Golden Eagles (*Aquila chrysaetos*) (Meinertzhagen, *Ibis* 14:530–535, 1940), Lanner Falcons (*Falco biarmicus*) (Mebs, *Vogelweit* 80:142–149, 1959), Eleonora's Falcons (*Falco eleonora*) (Walter, *Eleonora's Falcon*, Univ. Chicago Press, Chicago, Illinois, 1979), and Crested Caracaras (*Polyborus plancus*) (Whitacre et al., *Wilson Bull.* 94:565–566, 1982), with either of two general scenarios occurring: one