

## Note

### A report of unusual aggregation behaviour in Bullsnares (*Pituophis catenifer sayi*) near a nest site in Saskatchewan

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#### Abstract

We describe an unusual aggregation of Bullsnares (*Pituophis catenifer sayi*) near a nest site in Saskatchewan. Bullsnares is a wide-ranging oviparous colubrid that reaches the northern tip of its continental range on the prairies and badlands of Canada. At that location, it is considered a species of Special Concern, but, until recently, has been the subject of relatively few natural history reports. This is significant, because, at the northern edge of their range, Bullsnares may behave differently than elsewhere due to thermal limitations experienced at high latitudes. On 29 June 2019, we observed a mass of five adult Bullsnares in a Silver Sagebrush (*Artemisia cana*) shrub on a slope in southwestern Saskatchewan. Aggregations of Bullsnares are known to occur at hibernacula, during mating, and inside nest chambers before and after oviposition. However, we are unaware of the occurrence of surface aggregations in any other situation. We suggest that these Bullsnares may have been exhibiting communal gestation, a behaviour thought to be rare in oviparous snakes whereby gravid females congregate before parturition or oviposition for thermal stability or protection from predators.

Key words: Bullsnares; *Pituophis catenifer sayi*; aggregation behaviour; nesting; herpetology

Bullsnares (*Pituophis catenifer sayi*) is a large oviparous colubrid whose range stretches across the great plains of North America, from the prairies and badlands of southern Alberta and Saskatchewan in Canada to northern Mexico (Ernst and Ernst 2003). In Canada, Bullsnares has been assessed as a species of Special Concern, in part because of habitat loss and suspected population declines across much of its range (COSEWIC 2017).

Bullsnares have been well studied outside of their Canadian range (e.g., Fitch 1982; Moriarty and Linck 1998; Kapfer *et al.* 2008a,b,c, 2010; Iverson *et al.* 2012), and knowledge of Bullsnares ecology in Canada has expanded greatly in recent years (e.g., Didiuk 2003; Kissner and Nicholson 2003; Wright 2008, 2016; Martinson 2009; Fortney *et al.* 2012; Martino *et al.* 2012; Gardiner *et al.* 2013; COSEWIC 2017; Somers *et al.* 2017; Edkins *et al.* 2018; Powell *et al.* 2018). However, there are still important knowledge gaps in terms of whether they behave differently at the northern periphery of their range relative to ar-

reas further south. At the edge of their northern range, certain aspects of Bullsnares behaviour may be unique because of thermal limitations (Edkins *et al.* 2018).

During radio tracking of snakes along Gap Creek in southwestern Saskatchewan, Canada (~2 km south of 49.873°N, 109.573°W), N.B.J. and J.L.V.P. observed an aggregation of five adult Bullsnares in a Silver Sagebrush (*Artemisia cana* Pursh) shrub (Figure 1). The area, which lies on the boundary between Cypress Upland and Mixed Grassland ecoregions, is composed of prairie grasslands interspersed with shrubs (SCDC 2019). It includes large tracts of native prairie used for grazing cattle. We observed snakes on an exposed south-facing slope at 1045 on 29 June 2019. The sky was clear, ambient air temperature was 24.6°C, and wind speed was 4.9 km/h. The five Bullsnares were touching each other in a coiled mass. Two of the five snakes had previously been captured, processed, and implanted with radio transmitters, which alerted us to their presence before our arrival. Both implanted snakes were females



**FIGURE 1.** An aggregation of five Bullsnakes (*Pituophis catenifer sayi*) in a Silver Sagebrush (*Artemisia cana*) shrub observed on an exposed south-facing slope at 1045 on 29 June 2019. The observation was made in a grazing pasture adjacent to Gap Creek (~2 km south of 49.873°N, 109.573°W) in southwestern Saskatchewan, Canada, during a radiotelemetric study. Photo: Noah Johnson.

as determined by a cloacal probe (Fitch 1960). All five snakes were more than 1 m in total length. The two known females had been previously measured with a flexible string (1470 mm and 1290 mm snout-vent length). We were unable to process the remaining three snakes to determine sex or exact length. The approximate size of the unprocessed snakes became visually apparent when they uncoiled and moved away from the shrub. None of the snakes showed any signs of defensive behaviour, such as hissing or striking. This lack of aggression was not unusual because snakes often have the tendency to remain motionless when approached if under cover (N.B.J. and J.L.V.P. pers. obs.). We were able to count the individual snakes when they eventually separated from each other and entered nearby burrows, likely because of our presence. Bullsnake eggshells from previous seasons were found nearby among numerous mammal

burrows and patches of loose soil, suggesting that the slope was an actively used Bullsnake nest site.

In Canada, Bullsnakes often nest communally (Wright 2008). Communal nesting is apparently widespread among reptiles (Graves and Duvall 1995) and is also found among close relatives of Bullsnake, such as Pinesnake (*Pituophis melanoleucus*; Burger and Zappalorti 1986) and Gophersnake (*Pituophis catenifer deserticola*; Williams *et al.* 2015). Communal nesting enhances thermal and hydric stability for eggs and may be especially important when suitable nesting sites are limited (Graves and Duvall 1995). Female Bullsnakes have been observed aggregating inside underground nest chambers before oviposition, and several days following oviposition (Wright 2008). However, coiled masses of female Bullsnakes outside nest chambers are apparently unusual or have gone unreported in the literature. While tracking

Bullsnakes at Gap Creek during the summer of 2019, it was not uncommon to observe two snakes sharing the same burrow or hollow tree; however, this is our first observation of a coiled mass of five snakes.

Graves and Duvall (1995) reviewed communal aggregation behaviour associated with parturition in reptiles. Communal gestation is the aggregation of gravid females before parturition. This behaviour is thought to be especially important for females at high latitudes and altitudes. However, Graves and Duvall (1995) note that communal gestation appears mainly in viviparous species and is thought to be rare in egg laying snakes. The mass of Bullsnakes may have consisted of gravid females that formed an aggregation for thermoregulatory advantages before oviposition. Indeed, the date of observation coincides with the typical timing of oviposition (Wright 2008; Iverson *et al.* 2012). One of the known females in the mass had recently migrated to the nest site from its normal home range roughly 1.2 km away and was presumed gravid for this reason. Gravid *Pituophis* females maintain elevated body temperature (Kapfer *et al.* 2008c) and control over altered body temperature is important for promoting the development of embryos in other snakes (Lourdais *et al.* 2008). Graves and Duvall (1995) suggested that aggregation might help females retain heat because a group of snakes in physical contact would have increased thermal inertia because of their greater mass and reduced surface area. In addition, an aggregation might deter avian predators because several snakes would be harder to pick up than a single snake (Graves and Duvall 1995).

The aggregation we observed was likely not associated with other events where aggregation is observed in Bullsnakes, i.e., mating, and egress or ingress at hibernacula. In southwestern Saskatchewan, Bullsnakes emerge in spring (late April to May) and mate immediately after (Gardiner *et al.* 2013; R.G.P. unpubl. data). Congregation at communal hibernacula typically occurs in late September or early October (Gardiner *et al.* 2013; R.G.P. unpubl. data). It is also unlikely that the Bullsnakes were aggregating to share a limited resource, because there were many similar shrubs in the immediate vicinity.

Our observation reinforces previous studies that have quantified the importance of shrubs as structural features on the landscape (Martino *et al.* 2012; Edkins *et al.* 2018). If communal gestation occurs in Bullsnakes, shrubs may facilitate this behaviour and should be preserved. Likewise, if suitable nesting sites are limited, these sites should also be located so they can be protected.

We note that this observation is not proof of communal gestation; some of the unprocessed snakes may have been males, and we did not collect data on ovi-

position. Our conclusion would have been strengthened if we had determined the sex of all five snakes and if they contained eggs. Future research might confirm the presence of this aggregation behaviour in other populations, its possible significance to reproduction, and whether both sexes aggregate for thermoregulatory advantages.

### Author Contributions

Conceptualization, Writing – Original Draft Preparation: N.B.J.; Investigation: N.B.J. and J.L.V.P.; Project Administration, Supervision, Writing – Review & Editing: C.M.S. and R.G.P.

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