

**CORONELLA AUSTRICA** (smooth snake): PHOTOGRAPHIC RECORD OF AUTUMN COPULATION. The smooth snake, *Coronella austriaca*, is one of three species of snake native to the UK. Its range is restricted to lowland heathland sites in southern England, and it is both secretive and rare (Reading, 2004a). In the UK, the smooth snake is often associated with mature dry heathland, though it will also take advantage of adjacent habitats including wet heath, scrub and grassland (Gent, 1988; Beebee & Griffiths, 2000). It is believed that, after emerging from hibernation in April, mating will generally take place in May (Spellerberg & Phelps, 1977; Frazer, 1983; Reading, 2012). The adult females subsequently give birth to live young between late August and October (Smith, 1951; Goddard & Spellerberg, 1980; Frazer, 1983; Braithwaite et al., 1989).

The smooth snake's mating, copulation, and parturition behaviour has, however, been witnessed so infrequently that the species' reproductive ecology is still not fully understood. Recorded copulations in the wild in the UK are rare. The information gained from those that have been recorded may indicate a more protracted and complex mating behaviour than previously thought. For example, Spellerberg & Phelps (1977) observed copulations across an extended mating period from May to early June, Braithwaite et al. (1989) record a mating in August, and Bull (2010) records a mating in September. Some females have been found to be gravid during the spring, suggesting that mating could have taken place late in the previous year (Spellerberg & Phelps, 1977; Braithwaite et al., 1989). This has also been witnessed by Atkins (2011).

On 27 September 2013 at 15:40, copulation between two adult smooth snakes was observed and photographed (see Figs. 1 and 2).

The snakes were found during fieldwork trialling a new proposed 'Standardised Reptile Survey Methodology' (Limburn & Woodley, 2014), which involves a photographic mark-recapture study of smooth snakes. The survey site is a heathland reserve unit within the Morden Bog and Hyde Heath SSSI near Wareham, Dorset, which is managed by Amphibian and Reptile Conservation (ARC). Fieldwork was carried out under Natural



**Figure 1.** Copulating smooth snakes. Photograph by Stuart Handyside.



**Figure 2.** Close-up view of copulating smooth snakes. Photograph by Stuart Handyside.

England licence to ARC.

The snakes were found under a corrugated metal refuge on a north-east facing slope. The sloping habitat consisted of dry heath leading to low lying wet heath; the dry heath primarily consisting of ling (*Calluna vulgaris*), bell heather (*Erica cinerea*) and dwarf gorse (*Ulex minor*). The vegetation under the refuge consisted of compressed dead *C. vulgaris*. Both snakes were calm when handled and remained joined at the cloaca allowing photographs and the recording of identification details. The female snake had a total length of 492 mm and snout-vent length (SVL) of 413 mm. The male

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snake had a slightly longer total length (520 mm) with a SVL of 405 mm. Sexual dimorphism in the species is indicated by longer tail length in the males, due to allometric growth. Measurements of SVL applied to calculations in Reading (2004a) suggest the age of both snakes to be between 6 and 7 years.

Weather conditions at the time of the observation were dry, with a light wind and cloud cover of 67%. Environmental data were recorded using a digital thermometer and hygrometer. The air temperature was 21°C, with relative humidity of 65%. These were average conditions for September, based on environmental data from the nearest weather station, covering the period 2000-2013 inclusive. The mean spring temperature for 2013 was 0.9 °C cooler than average, whilst the mean summer temperature was 0.5 °C warmer.

Three neonate smooth snakes were also found under the same refuge as the copulating adults. Although it is unknown if the female found in copulation had given birth to these juveniles, we consider it possible. Our observation may therefore suggest that mating in smooth snakes can occur shortly, or immediately after, the female has given birth. Pernetta (2009) suggests that high levels of rainfall and lower average temperatures can reduce basking opportunities for gravid smooth snakes, resulting in a longer gestation period. If our observed smooth snake gave birth late in the season due to the unfavourable weather conditions recorded for spring 2013, this could have been a reason for the female's willingness to mate so late in the year. Reading (2004b) describes the smooth snake as being 'prudent opportunistic breeders' compared to the observations of Strugariu (2007), who suggests the species could be a 'capital breeder' utilizing long-term sperm storage.

We aim to further investigate these possibilities by relocating and monitoring the female during spring 2014, to determine if the copulation has resulted in successful fertilization and to deduce the probable length of her gestation. The individual markings (head patterns) of each snake were photographed during the observation, enabling re-identification during future surveys of the site. Further investigation could also be carried out to compare temperature and other environmental

data with the dates of known copulations and births.

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