CORONELLA AUSTRIACA Laurenti (Smooth Snake): REPRODUCTION. The Smooth Snake is the rarest of the six reptiles native to the UK and is confined to the lowland heaths of Dorset, Hampshire and Surrey (Beebee & Griffiths, 2000). Although it has been the focus of several research and monitoring programmes (e.g. Spellerberg & Phelps, 1977; Goddard, 1984; Braithwaite et al., 1989; Gent & Spellerberg, 1993; Reading, 2004a, 2004b) many aspects of its behaviour in the wild remain poorly documented as a result of its restricted distribution and cryptic nature. Mating behaviour, and, specifically, copulation is a case in point. Spellerberg & Phelps (1977) inferred a mating period extending from May to early June based on observations of receptive females and a small number of observed copulations. They also suggested that mating may occur later in the year, explaining the observation that some females were found to be gravid in the spring. One of the few published accounts of Smooth Snake copulation in the wild in the UK is given in Braithwaite et al. (1989) who describe a mating seen in August 1987. In this note I report a Smooth Snake copulation observed in late summer in the New Forest, southern England.

The snakes were found on 6 September, 2009 at 14:20 BST during surveys conducted as part of a surveillance programme. The survey area consisted of ericaceous heath on a gentle south-west facing slope overlooking a valley mire drainage system. The two snakes were found under an artificial refuge of corrugated cellulose-bitumen measuring 45 x 50 cm. The substrate under the refuge consisted of dead, flattened heather (*Calluna* sp.) under which the snakes had buried themselves such that only their heads and the front 3-4 cm of their bodies were visible. The visible portions of the snakes were aligned in lateral contact with each other with the head of the larger individual immediately behind the head of the smaller. Multiple occupancy of artificial refuges by Smooth Snakes is not uncommon in this area and it was not until the snakes were retrieved for recording biometric data that it became apparent that the two were a mating pair. The left hemipene of the male was inserted into the cloaca of the female. Both individuals remained passive during handling, allowing routine photography of head and anterior body markings to be made for identification purposes. During this period the two voluntarily separated, allowing a full suite of measurements to be made. The male was markedly larger than the female. Total length, snout-vent length (SVL) and body mass of the male and female were 57.2 cm, 45 cm, 42 g and 47.4 cm, 39.5 cm and 32 g, respectively. Separation revealed some milky effluvium around the cloaca of the female. After data collection the snakes were released back under the refuge.

Environmental temperature data were recorded using a digital thermometer. Air temperature was 18.3ºC (the weather conditions were overcast [cloud cover: 8/8 oktas] and had been so since the afternoon of the previous day). Air temperature under the refuge was 19.7ºC prior to the refuge being lifted. Oesophageal body temperatures obtained from the snakes were 20.4ºC for the male and 21.6ºC for the female. These temperatures were markedly lower than the preferred body temperatures selected by this species in laboratory tests e.g., Gent & Spellerberg (1996) or the plateau temperatures recorded from specimens in the field e.g., de Bont et al. (1986) both of which are typically in the range of approximately 29-33ºC. The body temperatures were, however, markedly higher than the 15.3ºC and 15.5ºC recorded for a male and female mating in May, recorded by de Bont (1986). Thus, as has been noted by Shine et al. (2000) the ability to attain and maintain the preferred body temperature may be relatively unimportant for some aspects of snake behaviour.

The highly contrasting markings of the female indicated that she had recently sloughed (several other females were recorded in slough, or newly sloughed with freshly cast skins nearby on the same day). There was no neck-bite by the male on the female and no scarring to indicate that such a hold had occurred. 'Lizard-like' seizing of the female, behind the head, by the male, has been reported (e.g. Braithwaite et al., 1989; Phelps, 2004) but does not always occur. Engelmann et al. (1990) reported two matings in the Swiss Jura in which neck-biting was not observed.

The ecological significance of the current observations remains unclear. The small size of the female suggests that she was breeding for the first time. The smallest gravid Smooth Snake that I have encountered previously had a total length of 44.3 cm and a SVL of 37.2 cm, while the smallest of seven females found breeding for the first time by Reading (2004a) had a SVL of 41.3 cm. The female currently reported had been captured before in April of the previous year, when it had a total length of 31.5 cm and a SVL of 27 cm and presumably would not have been sexually mature at that time. The male was first recorded in April 2006 with a total length of 48 cm and a SVL of 36.5 cm and would already have been sexually mature for several years.

Late summer mating in Smooth Snakes from England has been observed in captivity by Street (1979). He documented a late August mating of recently captured snakes, consisting of a male trailing a female and behaving aggressively towards other males, culminating in two copulations of several hours each over a period of 24 hours. To my knowledge definitive outcomes of these late summer copulations have not been recorded. The ability to produce young from autumn mating could impart a significant ecological advantage to a species that is at the extremes of its range in the UK. The lack of knowledge of the outcomes of these copulations is a significant gap in our understanding of Smooth Snake ecology. Spellerberg & Phelps (1977) concluded that matings late in the year resulted in the appearance of gravid females early the following year, prior to the spring mating period. That late summer copulation might produce viable offspring through the process of delayed fertilisation is suggested by the observation of Strugariu (2007) who recorded sperm storage in a wild-caught female, which was taken into captivity in May and produced six offspring in the September of the following year, throughout which time it was kept in isolation. It has also been suggested that in poor summers females may carry their litters over the winter and give birth the following year, which could also account for the observation of gravid females in the early spring (Braithwaite et al., 1984).

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TOMODON DORSATUS (Pampas Snake): REPRODUCTION. The colubrid snake *Tomodon dorsatus* (Duméril, Bibron & Duméril, 1854) occurs in Latin America in Brazil, Paraguay, Argentina and Uruguay. It is normally found in areas of humid tropical vegetation, including "ciliar" forests (Bizerra, 1998). *T. dorsatus* feeds only on molluscs, is diurnally active (Marques, 1998), and is viviparous with a seasonal reproductive cycle (Bizerra et al., 2005). There is little known about reproduction in *T. dorsatus*, especially biometry of neonates.

This note presents information on birth, litter (size and mass) and sex ratio in newborn *T. dorsatus*. Three gravid specimens of *T. dorsatus* (here named female 1, 2 and 3) were collected in São Paulo state (cities of Ibiuna, São Paulo and Cotia) and brought to Instituto Butantan where they were kept in captivity. The female's body size, relative clutch mass (RCM: clutch mass/body mass of mother after parturition) and detail about the neonates is shown in Table 1. Fifty-eight animals were produced. Male newborns (n = 34) averaged 163.15 mm snout-vent length - SVL (range = 150-180 mm), 47.06 mm tail length - TL (range = 40-55 mm) and 2.62 g mass (average = 1.90-4.0 g). Female neonates (n = 24) averaged 165.46 mm SVL (range = 150-180 mm), 46.46 mm TL (range = 30-55 mm) and 2.69 g mass (range = 1.7-4.0 g). The sexes of neonates did not differ significantly in mean snout-vent length ($t = 1.10$; $P = 0.27$), tail length ($t = 0.41$; $P = 0.67$), mass ($t = 0.39$; $P = 0.69$), and sexual dimorphism.

In adults, females are larger and heavier than males and males have greater higher relative tail length (Bizerra et al., 2005). This suggests ontogenetic variation in neonate growth. Neonates did not show correlation between TL and SVL and between total length and mass. Only one stillborn was observed. *T. dorsatus* seems to invest heavily in reproduction, since the RCM value (Table 1) is higher than values reported for other viviparous colubrids e.g., *Helicops leopardinus* (RCM 0.39) and other species (Seigel & Fitch, 1984).

Table 1.	**Female 1**	**Female 2**	**Female 3**
Female SVL (mm)	560	590	570
Female TL (mm)	170	155	170
Female wt (g) post birth	62	95	60.5
Litter size	13	24	21
	(4 ♀/9 ♂)	(12 ♀/12 ♂)	(8 ♀/13 ♂)
Litter mass (g)	39	72	42.64
RCM	0.69	0.76	0.70
Birth	Aug. 2001	Oct. 1999	Aug. 2009

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