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USE OF SUBCAUDAL SCALE ANOMALIES AS AN AID IN RECOGNIZING INDIVIDUAL SNAKES

Mark-recapture studies on snakes usually rely on scale-clipping for identification of individual animals (Brown and Parker 1976), although other techniques such as photography of colour patterns have also been used (Ferner 1979; Fitch 1987). Scales regenerate over time, so that long-term recaptures may be difficult to identify. Recent studies on Australian common blacksnakes (*Pseudechis porphyriacus*, Elapidae) and water pythons (*Liasis fuscus*, Boidae) revealed that the number and position of divided vs entire subcaudal scales varied among individuals, and hence offered a means of recognizing individual animals. In addition to clipping ventral scales, we now routinely record subcaudal formulae, from the anal plate posteriorly, counting on the snake's right-hand side. The degree of detail recorded depends on the extent of variability among specimens in the scale characters counted. If simple counts of

entire and divided subcaudals are insufficient to uniquely identify specimens, one can record (i) positions of aberrant subcaudals divided into three rather than two segments; (ii) partly divided ("creased") subcaudals, where the division into two separate scales is incomplete; and (iii) anomalies between counts on the right- and left-hand sides of the tail.

The subcaudal count usually can be summarized in a short formula. For example, a snake with the first subcaudal entire, second divided, third partly divided, fourth and fifth entire, and remainder divided, would be scored as "1E, 1D, 1PD, 2E,∞D." Alternatively, scale anomalies can be added to pre-drawn diagrams on data sheets. In our experience with mark-recapture studies, many such formulae are unique to particular individuals within a population. Among 53 *P. porphyriacus* from Bubalahla Creek via Taralga, New South Wales (including one litter of 10), 41 (77%) had unique subcaudal formulae. One formula (5E,∞D) occurred in four snakes, and four other formulae in two snakes each. In combination with data on sex, body size, geographic location and ven-

tral scaleclips, these subcaudal formulae enabled us to easily recognise recaptured snakes. There were no duplications in subcaudal counts among the ten neonates from the same litter. Similarly, data on 115 *L. fuscus* from Fogg Dam via Darwin, Northern Territory, showed that 56 (49%) had unique subcaudal formulae. A single pattern (∞D) was shown by 37 snakes (32%), another (3E,∞D) by 9 animals, and other duplications by five or fewer individuals. Three duplications (all∞D) were observed among a litter of six hatchling *L. fuscus*.

Routine recording of subcaudal formulae may prove to be useful in other mark-recapture studies of snakes, and in other situations (e.g. captive specimens in large collections) where individual recognition is required. It is particularly valuable for studies on small species or on neonatal snakes, where scale-clipping is difficult and potentially injurious to the animal. In such cases, recording subcaudal formulae may permit individual recognition with a reduced number of ventral scale-clips. When used in combination with ventral scale-clipping, subcaudal scale formulae may significantly improve the

investigator's ability to recognize specific animals on recapture.

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