THE WESTERN AUSTRALIAN
NATURALIST

Vol. 18 June 29, 1989 No.2

ONTOGENETIC COLOUR CHANGE IN THE GWARDAR, *PSEUDONAJA NUCHALIS*

By BRIAN BUSH, 26 Ayres Rd., Stoneville, W.A. 6554

INTRODUCTION

Gillam, (1979) and Mengden (1985) both highlight the colour and pattern variability in *Pseudonaja nuchalis*. Mengden presents chromosome and electrophoretic data suggesting this species may be composite, and provides a locality map for the various colour morphs. However, the few localities included for Western Australia suggest only a small series of specimens was available to him for examination from this State, and none from the Kalgoorlie Goldfields. In this paper I describe the development of adult colour and pattern in three hatchling *P. nuchalis* from Kalgoorlie, Western Australia and include brief notes on the local distribution of the morphs common to this region.

The three *P. nuchalis* used in this study are referred to as A, B and C respectively.

THE HATCHLINGS

Collection — In late 1984 I was advised of a seasonal snake problem occurring in the grounds of the Kalgoorlie-Boulder Racing Club. In late summer numerous small snakes invade the buildings and surrounds to the extent that several may be seen simultaneously vanishing down floorboard cracks and through ventilator gratings when disturbed. On 23 February 1985 I visited the racecourse and collected five live *P. nuchalis* and removed three dead specimens from spider's webs. Three of the live snakes were retained, the other two were released on the outskirts of Kalgoorlie away from human habitation.

Description — All eight snakes were of hatchling size, 219-242 mm snout-vent length (SVL), and were indistinguishable in colour and pattern, being reddish-brown dorsally with herringbone pattern and the greater part of the head black (see Figure 1), extending for 9-12 dorsal scales behind parietals. Belly was pale yellow with numerous distinctive orange spots. The ventral and subcaudal scale numbers in the three retained for observation were A = 218, 62; B = 218, 61; and C = 213, 62.

Captive maintenance — All three were housed in glass aquaria measuring 60 x 30 x 30 cm with a coarse white sand substrate and a piece of bark for cover. An electric blanket was placed beneath the aquaria to promote winter feeding. From the outset they preyed readily on small skinks: *Hemiergis peronii* and *Morethia obscura* initially and as their growth increased, *Ctenotus labillardieri*. During feeding the prey was always restrained with body coils. Winter feeding, encouraged by the artificial heating allowed the

growth of these snakes to exceed that recorded in *P. nuchalis* measured in the wild (Figure 2).

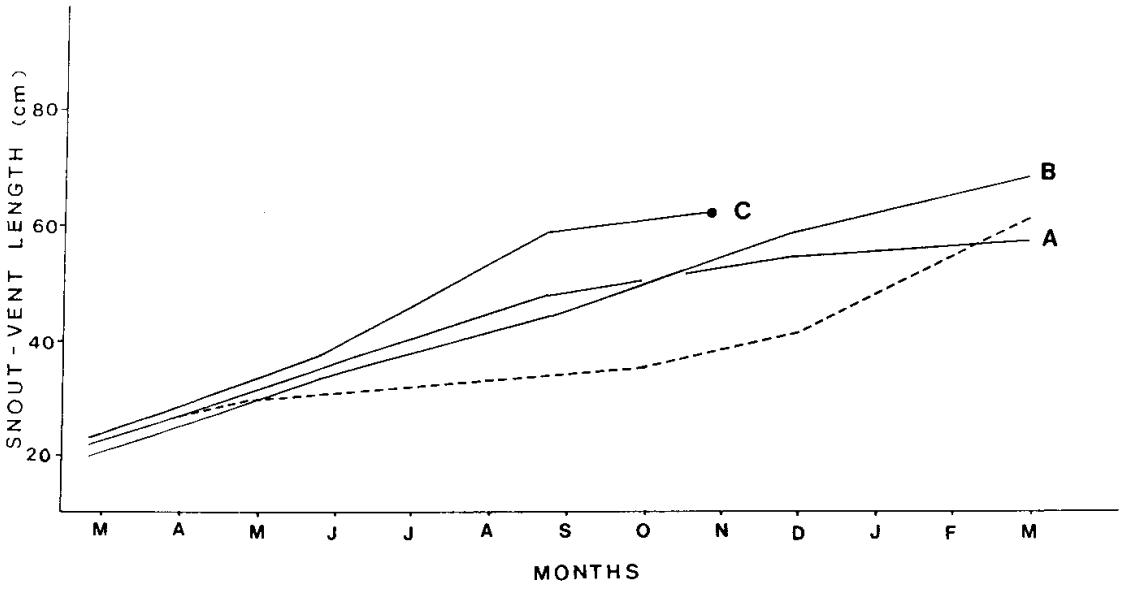

Figure 1. Growth rate of captive *P. nuchalis* juveniles (A, B & C) compared with inferred growth of wild *P. nuchalis* (broken line) based on measurements of snakes recorded in the wild. Although the captive snakes' growth exceeded the wild snakes during winter, the wild snakes displayed comparable growth at 12 months. Snake C died on 29/10/85.

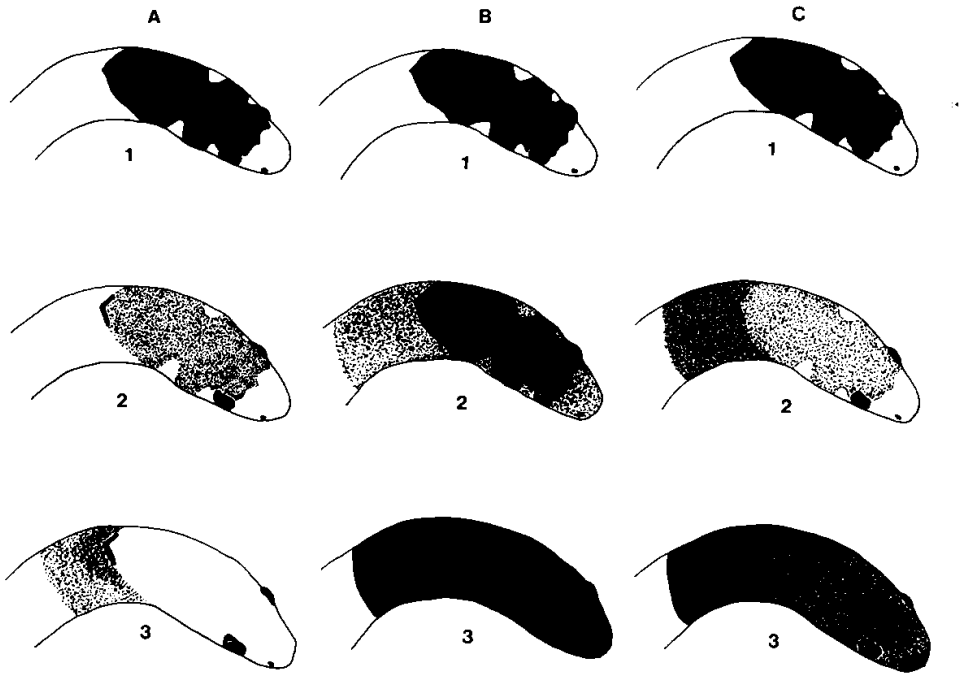

Figure 2. The head and neck region of the 3 captive *P. nuchalis* (A-C) illustrating ontogenetic increase or decrease in black pigment at (1) hatching, (2) 4 months and (3) 8 months.

SUBADULT COLOURATION

The following descriptions were recorded in Oct/Nov when snakes were about 8 months of age.

Snake A — SVL500 mm. Dorsally pale brown with strong herringbone pattern and black nuchal chevron. Neck marginally darker immediately following chevrons (for photograph of similarly coloured specimen see Mengden 1985: 197D and Figs. 6C & 6D). The subadult colouration of this snake suggests its adult colour will be typical of the local northern morph: monotonal fawn to creamish-yellow with or without herringbone pattern but includes nuchal chevron at most or a few dark nuchal scales at least.

Snake B — SVL 525 mm. Dorsally orange with strong herringbone pattern and black head and neck for 20 dorsals behind parietals. This morph is illustrated by Mengden (1985: 197A), and is typical of the majority of *P. nuchalis* south of Kalgoorlie. The black neonatal head markings were retained in this individual during the development of the black neck and darkening of the pale parts of the head.

Snake C — SVL 623 mm. As for Snake B except the black neonatal head markings faded almost completely as the neck region darkened. At 4 months this individual had a distinct collar, however at 8 months the head was almost as dark again as at hatching. The black on neck extended for 19 dorsals behind parietals.

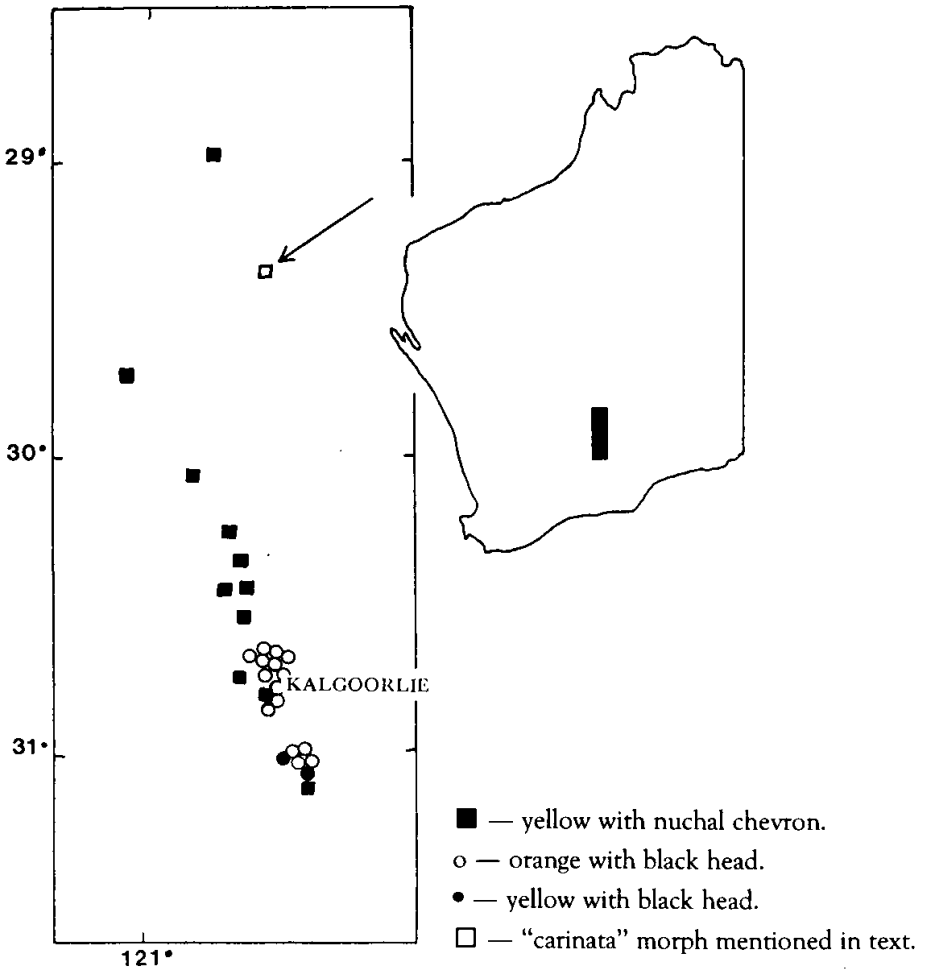

Figure 3. Distribution map of the colour morphs of *P. nuchalis* recorded in the Eastern Goldfields of Western Australia.

DISCUSSION

The subadult colouration of Snake A is of particular interest considering its neonatal colour was identical to Snakes B and C. Juveniles from north of Kalgoorlie, where I have only observed a single subadult *P. nuchalis* with the orange body and black head, tend to be pale yellow rather than the reddish-brown of those south of Kalgoorlie. However, here the pale subadult colour has occurred in a snake that was reddish-brown as a hatchling. This individual paled progressively after each slough and, although the dark neonatal head markings were still obvious, at SVL 310 mm it had changed to the subadult colouration dorsally. Snake A illustrates how rapid colour changes can occur in this species and causes me to consider my data on 'juveniles' from north of Kalgoorlie more closely. These measured 325-352 mm (except "carinata" morph collected at Kookynie on 27/2/82, SVL 226 mm) and therefore could have been reddish-brown at hatching. It is not possible to determine if any of the snakes removed from the racecourse are siblings. It is just as likely they hatched from eggs deposited communally by two or more females.

The ontogenetic change in head and neck colour in Snake C suggests the local population to be polymorphic rather than composite. At the stage in the development of its subadult colour, when the head had commenced darkening, the black nuchal chevron was distinct. Except for the orange body, development to this stage parallelled that in Snake A, allowing it to be placed with Mengden's "pale head, grey nape" morph. Locally this morph is the subadult colouration of his "southern" morph with nuchal chevron. Although the black head and neck is most often accompanied by an orange dorsum, south of Kalgoorlie individuals also occur with a pale yellow dorsum and black head and neck. This variant of the "orange with black head" morph, along with the colouration of Snake C during present study, appear as intergrades between the two morphs most common in this region. Also in this region are monotonal dark brown individuals with or without black nuchal scales.

Figure 1 depicts the increase or decrease in black pigment on the head and neck in the three Kalgoorlie *P. nuchalis* from hatchling to subadult. By comparing A (iii) and C (ii) the similarities in ontogenetic colour change in these two morphs can be seen. However, as adults they display little resemblance.

Figure 3 is a map of the four colour morphs I have recorded in this region. The "orange with black head" morph predominates in the south, which is the southernmost extension of distribution in *P. nuchalis* in this region, and is rare in the north. However, as illustrated by Mengden (1985, Fig. 7), on an overall distribution map of this species, this morph occurs widely between Lats. 20° and 32°S.

In *P. affinis, P. nuchalis* and *P. textilis* banded hatchlings occur. These bands tend to fade completely in *textilis* prior to adulthood (Cogger 1975), occasionally retained in *affinis* (pers. obs.) and often retained in *nuchalis* (see Storr *et al.* 1986 pl. 18), hence the banded and "carinata" morphs in this species.

In conclusion, on present study, the "southern", "pale head, grey nape", "orange with black head" and "carinata" morphs are all colour variants of *P. nuchalis*. The chromosome and electrophoretic differences recorded by Mengden may require further investigation by sampling the various colour morphs in those areas where two or more occur together.

REFERENCES

COGGER, H.G. 1975. *Reptiles and Amphibians of Australia.* A.H. & A.W. Reed, Sydney.

GILLAM, M.W. 1979. The genus *Pseudonaja* (Serpentes: Elapidae) in the Northern Territory. Territory Parks and Wildlife Commission. *Res. Bull. No. 1.*, 28pp.

MENGDEN, G.A. 1985. A chromosomal and electrophoretic analysis of the genus *Pseudonaja.* In *The Biology of Australasian Frogs and Reptiles* (Eds. G. Grigg, R. Shine & H. Ehmann) pp. 193-208. Surrey Beatty & Sons, Sydney.

STORR, G.M., SMITH, L.A. & JOHNSTONE, R.E. 1986. *Snakes of Western Australia.* Western Australian Museum, Perth.