ABNORMALITIES IN A LITTER OF *BOA CONSTRICTOR AMARALI*

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ABSTRACT: Abnormal hatchlings of *Boa constrictor amarali* were observed in a litter of a female kept in captivity at 18-25°C. The litter showed gross morphological abnormalities, unusual scutellation and changes in color pattern. Abnormalities induced by low temperatures are suggested to limit the southern distribution of *B. c. amarali*.

Key words: Boidae, temperature, embryonic development, abnormality, *Boa constrictor*

Introduction

The reproductive mode of snakes range from oviparity to viviparity, and intermediary stages between these extremes are also recognized (Fitch, 1970; Shine and Bull, 1979; Shine, 1983). Such variety has stimulated studies on the selective forces working on the evolution of reproductive mode in snakes *(e. g.* Neill, 1964; Shine and Bull, 1979).

A largely widespread though is that viviparity achieves homeostasis and more suitable conditions to embryonic development than oviparity, due to the protection provided by the body and behavior of the pregnant female (see Packard *et al*., 1977; Shine and Bull, 1979). Snakes are ectothermics subjected to environmental contingencies, but like other reptiles, they may regulate body temperature within a narrow range. In this regard, viviparity would allow wider distribution into colder areas.

In this study, an abnormal litter of *Boa constrictor amarali* (Forcart) from a female kept in captivity at low temperature and without access to thermoregulation is reported.

Material and Methods

A couple of adult *B. c. amarali* was collected at the Mogi-Guaçu municipality, state of São Paulo, southeastern Brazil. The pair mated in captivity, and the pregnant female was kept in a terrarium at temperatures ranging from 18°C during night, and 25°C during the day.

After seven months the female gave birth to sixteen hatchlings. Most of the newborns were kept in captivity and fed on mire until death. The specimens were preserved and deposited at the collection of the Departamento de Zoologia (DZRC). UNESP, Rio Claro, São Paulo, Brazil. Scale counts and color pattern were compared with normal individuals and with data from the literature.

Results and Discussion

The sex ratio in sixteen newborn snakes was 1:1, and meristic data, sex and length of the animals at the time of death are shown in Tab. 1. Ventral scutes ranged from 221 to 228 and the sub-caudals were divided in variable extent, differing from the usual single condition. Six specimens had ventrals fewer than lower limit given hy Peter and Orejas-Miranda (1970), and all specimens had fewer sub-caudals than that found in normal *B. c. amarali* (42-53 sub-caudals. personal observation). On the other hand, the middle dorsal scale rows, and infralabial counts were normal. Reduction in ventral scales was also reported in experimental studies with colubrid snakes kept at low temperatures during pregnancy (Fox *et al*., 1961; Osgood, 1978).

One dead-born snake (DZRC nº 836), showed kinks and curled vertebral column at the posterior third of the body. Moreover, this specimen had a longitudinal opening in the ventral side of the body wall, which

Table 1. Snout-vent length (SVL, cm), tail length (TL, cm), and scale
counts of the abnormalities of *B. c. amarali*. M=Male, F=Female.

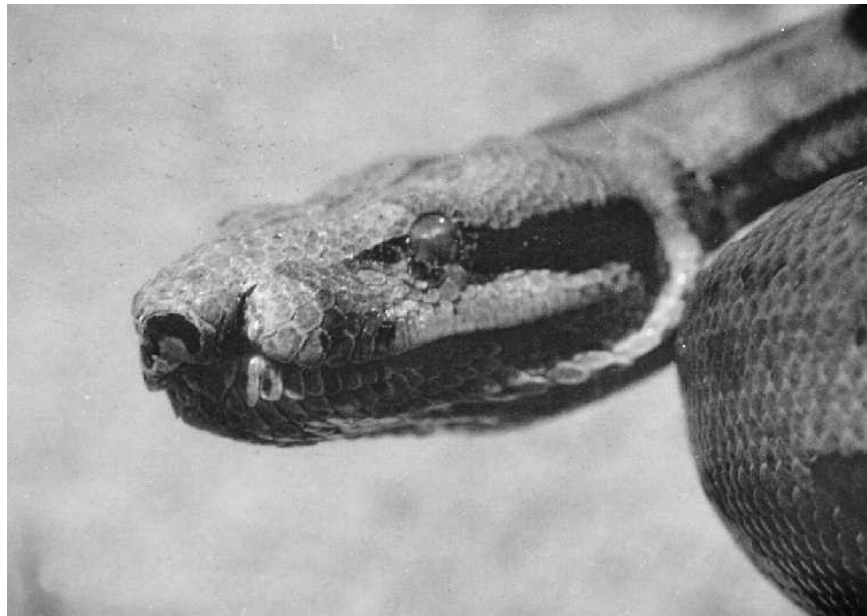| nº	SVL	TL	Ventrals	Sub-caudals		Sex
				Single	Divided	
821	910	77	225	-	-	M
822	680	90	226	33	5	M
823	923	90	224	30	7	M
824	1150	80	226	29	4	F
825	520	50	225	27	9	M
826	643	53	226	27	6	F
827	985	82	228	18	19	F
828	988	72	228	23	11	F
829	998	80	223	26	6	F
830	400	41	228	31	2	M
831	624	50	224	26	3	M
832	595	48	225	26	5	M
833	965	74	228	31	3	F
834	512	54	223	32	4	M
835	569	49	228	28	6	F
836	262	27	221	20	9	F

Fig. 1. A fronto-lateral view of the head of *B. c. amarali* showing the labial cleft.

extended from the 110th to 185th ventral scute, the ventrals were fused at the edge of the opening. Another specimen, DZRC no. 829 (Fig. 1), born alive showed a labial cleft (leporine lip) extending from the left side of the rostral scute to the left nasal opening (see Bellairs and Boyd, 1957 for details on such abnormality). This specimen fed on mice, and the labial cleft apparently was no hindrance either to capture or swallow the prey. One of the specimens had the left eye swollen (macrophthalmia), an abnormality

Fig. 2. Alive specimen of *B. c. amarali* from the abnormal litter.
Note the unusual color pattern with the parallel dorso-lateral stripes
seen at left side and partially at the right side of the snake

also reported by Rossi (1962) in a litter of *B.* c. *occidentalis*.

The hemipenis of two preserved snakes (DZRC nos. 821 ond 823) were prepared following the method described by Pesantes (1994). The organs were not different from those of normal snakes in form, spermatic sulci or ornamentation characteristics. However, the hemipenis were smaller than those of normal specimens, feature that could be related to the shortening of the tail. In fact, the tail length in normal *B. c. amarali* perform 9.9% of the total length (SD=1.28; n=24) while in the experimental litter the tail was only 8.2% of the total length (SD=1.31; n=16). The reduction of the hernipenis length is thought to decrease mate success and/or fertilization.

All the experimental snakes showed a variable degree of abnormalities in color pattern, with a tendency to fuse the dorsal saddles forming two parallel dorso-lateral dark stripes (Fig. 2). This pattern was also observed in *Python molurus,* from a clutch of eggs exposed to low temperatures during incubation (Vinegar, 1973). Schwaizer (1965), reported a specimen of *B. constrictor* with a single dorsal stripe, but without any comment on the possible cause of the abnormality. In some individuals of our experimental litter the dorsal blotches were present but in reduced number, and did not exceed 15, more often 1 to 3 restricted to the posterior part of the body. Such coloration is very unusual since normal *B. c. amarali* possess 22 or more dorsal blotches; (Peters and Orejas-Miranda, 970). The tail color was normal in all specimens though.

The importance and complexity of the color pattern in snake biology are well known. Color pattern is related to concealment and camouflage, mimicry, deliberate conspicuousness, warning, aid in vision and protection of vital organs *(e. g.* Bechtel, 1978; Greene, 1988; Pough, 1988). In fact, the correlation of the color pattern to life history features such as habitat, behavior, movement patterns and so on, in snakes was well documented by Jackson *et al.* (1976). Therefore, changes in normal color pattern can be disastrous for snakes (but see Andrén and Nilson, 1981; Sazima and Di-Bernado, 1991). According to such view, it is reasonable to consider that a change from blotched to striped pattern, observed in the abnormal litter, might have negative influence in the predator-prey relationship for *B. c. amarali* in nature, as well as on other

life history traits.

In summary, we found evidence that temperatures ranging from 18 to 25ºC during pregnancy of *B. c. amarali* may result in gross morphological abnormalities, which reduces the survivorship, changes in color pattern that may compromise fitness, and anatomical abnormalities which may reduce the reproductive performance. All these factors may set limits to the advantages brought by viviparity. McGinnis and Moore (1969) estimated the body temperature of *B. constrictor* to be around 26.4ºC, but with sharp decline in suboptimal temperature of 15-20ºC. Myres and Eells (1968) reported thermal aggregation and basking in *B. c. imperator* at the northern part of its range, and commented on this behavior for large snakes. São Paulo state is the southern limit of *B. c. amarali* distribution. Since gestation in *B. constrictor* last 6 months at 23-28ºC (Foekema, 1973), the pregnant female may have to keep body temperature above the suboptimal condition for a long time to have a normal litter. Aggregative behavior may help the animals to thermoregulate, but even such strategy may have limits imposed by climate. In this regard, the present distribution of *B. c. amarali* may be set by reproductive constraints along others historical and ecological causes.

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要 約

レッドテイルボアから生まれた異常個体

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妊娠期間中, 18-25℃の室内で飼育されていたレッドテイルボア (*Boa constrictor amarali*) の1腹の子の中に異常な個体が見られた. 鱗の数の減少や体彩の異常, 尾の短縮などが見られたが, 妊娠期間中の温

度が低かったためと思われ，それは本種の分布の南
限を示唆している．

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