Albino *Elaphe climacophora* Occurring in Southwestern Kanto

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ABSTRACT: Four albino *Elaphe climacophora* were collected in a small area straddling the border between Tokyo and Kanagawa Prefecture. All were juveniles. Two were raised to maturity in captivity, and have bred successfully three times. Destruction of the environment endangering the herpetofauna in the area is discussed.

INTRODUCTION

A population of *Elaphe climacophora*, the "aodaisho", consisting entirely of albino specimens, exists in a restricted area within the city limits of Iwakuni City, Yamaguchi Prefecture. The albinism is controlled by a recessive gene (Maki, 1931). Nakamura & Ueno (1963) report that albinism occurs occasionally in this species, but they give no locality data other than Iwakuni. In the Kanto area, Anonymous (1966) records that some specimens were collected along the southern shore of Lake Sagami in Kanagawa Prefecture in August, 1966. These specimens are also alluded to by Hara (1977). According to A. Komori (pers. comm.) they were three adult specimens: two were found at a camping ground, and the third about 3 km west of the first site. They were kept at Tama Zoo, but died through an accident in December, 1966.

We report here some details concerning another area of Kanto in which albino aodaisho appear with a certain frequency. Specific localities will not be named, in order to protect the population from unscrupulous collectors.

The area is roughly 10 km in diameter, and straddles the border between the southwestern part of Metropolitan Tokyo and adjoining Kanagawa Prefecture. A total of 4 specimens have been collected in this area, and there are unverified reports of a number of other sightings. The unverified sightings will not be discussed here.

SPECIMENS COLLECTED

Specimen No. 1 (Fig. 1): A female baby was collected by a local resident on the

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Fig. 1. Female albino *Elaphe climacophora* collected as a hatchling in October, 1974; photographed on May 20, 1979.

Kanagawa side of the border in October, 1974. This specimen was obtained by one of us (KN) shortly afterward and kept alive in captivity. It was found by the side of a small stream watering a series of rice paddies. The ground color was cream, with the typical aodaisho juvenile blotched pattern showing in pale yellow. The eyes were pink. Total length was about 40 cm. Since this is the average length of aodaisho hatchlings (Fukada, 1965), we presumed that it was a hatchling born that year.

Specimen No. 2 (Fig. 2): In March, 1975, a baby male was collected by the same local resident that collected No. 1. It was found about 50 meters from the collection site of No. 1, and was of the same color and pattern as No. 1, but slightly smaller in size. This led us to conclude that the specimen was of the same age as No. 1, and possibly came from the same clutch of eggs. This specimen was also obtained by KN and maintained in captivity.

Specimen No. 3: Another baby, sex undetermined, was also collected in spring, 1975. The collector was a young boy, and the collection locality was the same as that of Nos. 1 and 2. Our local informant saw the snake and tried to obtain it for us, but the child refused to give it up. The fate of the specimen is unknown.

Specimen No. 4: In fall, 1977, an albino juvenile was collected on the Tokyo side

Fig. 2. Male albino *E. climacophora* collected as a hatchling in March, 1975; photographed on May 20, 1979. This male shows more pattern than the female of Fig. 1.

of the border about 10 km from the site of Nos. 1, 2, and 3. The collector was a local resident who had rented a patch of farmland for a vegetable garden. The snake was sighted on a road running through the farm. The landlord, who happened to pass by at the time, took the snake from the collector, saying that it was the "guardian" of his farm, and released it in the direction of a bamboo thicket on the other side of the road.

REPRODUCTION OF CAPTIVE SPECIMENS

The captive male and female hatchlings were kept in an ordinary glass aquarium with a screen cover and an incandescent light bulb controlled by a thermostat for heat in the winter. Temperatures were kept above 25°C, so that the animals did not hibernate. Both were force-fed initially on pieces of dead canaries, etc. obtained from a local pet shop, and on strips of sausage. The food was lubricated with egg yolk. After about two months the female began to feed spontaneously on pink mice. The male did not begin to feed spontaneously until after about one year. After spontaneous feeding began, growth was rapid, and soon both snakes were taking adult mice, either live or freshly killed.

Fig. 3. Eggs of clutch No. 2 hatching, July 24, 1978. One hatchling is emerging, and another in the egg at lower right has slit the eggshell.

Between April 1 and 15, 1977, courting behavior by the male was observed twice. Copulation was not observed. On May 22 the female laid 6 eggs: 4 were abnormal, and 2 were fully formed. The 2 good eggs were incubated in damp sphagnum moss at room temperature. One egg hatched on July 24. Since the other egg did not show signs of hatching, it was opened on July 26. The embryo was fully formed, but dead. It measured 31.4 cm in total length, and weighed 11 g. The successful hatchling was a female. It was not measured or otherwise handled for fear of affecting its feeding. It shed on August 1, and after that began to feed on pink mice.

In 1978 neither courtship nor mating were observed, but on May 24 the female laid 7 eggs: 6 were fully formed and one was abnormal. The good eggs were incubated in sphagnum moss at room temperature. In the middle of July an insect was seen coming and going through a hole in one of the eggs. This egg was opened, and the embryo was found to be alive, but with a deformed spine. It was preserved in formalin. The other 5 eggs hatched successfully on July 24 (Fig. 3). The hatchlings were not measured or otherwise unnecessarily handled. However, in spite of all precautions, only one fed spontaneously. The others had to be force-fed.

One of the non-feeders, a male, was transferred to a separate cage at the home

of RG on January 21, 1979. Within a week it began to accept spontaneously small pieces of pond smelt ("wakasagi" in Japanese), if these were left in the cage overnight. It began to grow well, and in March was also taking pieces of frozen mice. At the present writing, May, 1979, it is feeding on whole frozen mice (5–10 g) and pieces of smelt.

On March 17, 1979, courtship activity between the original pair was again observed. Copulation was not observed, but in April both the original female and the female born in 1977, which was caged with its parents, were found to be gravid. On April 20 the younger female laid 4 eggs, all of which were abnormal. On April 25 the older female laid 13 normal eggs. The eggs were adherent, forming 2 clusters of 6 and 4 eggs, with 3 eggs separate. The eggs were incubated as usual in sphagnum moss. Two eggs became moldy. They were opened and found to be coagulated. The remaining 11 eggs developed normally and began hatching on June 29. The last hatchling did not leave the egg until the evening of July 4. Reproductive data of the original pair are summarized in Table 1. Measurements of the eggs of clutch No. 3 were made 26 days after oviposition and are given in Table 2.

Table 1. Reproduction data of the original pair of albino *E. climacophora*.

Clutch No.	Courtship	Oviposition	No. of Eggs			
			Total	Abnormal	Normal	Hatched (date)
1	1 April 1977	22 May 1977	6	4	2	1 (24 July 1977)
2	not observed	24 May 1978	7	1	6	5 (24 July 1978)
3	17 March 1979	25 April 1979	13	0	13	11 (June 29–July 4, 1979)

Table 2. Size of eggs of No. 3 clutch 26 days after oviposition.

Egg No.	Length (mm)	Width (mm)
1	34.7	21.2
2	36.1	19.5
3	36.4	23.1
4	35.4	21.6
5	37.9	22.0
6	33.0	21.4
7	43.4	20.8
8	35.1	21.4
9	39.9	19.6
10	38.7	20.8
11	47.0	18.6
12	51.2	17.0
13	addled, not measured	
average	39.1	20.6

DISCUSSION

The collection of 4 albino *Elaphe climacophora* in a restricted area over a period of 3 years suggests that the population of this species in the area contains a larger percentage of albino individuals or individuals carrying the albino gene than populations in other parts of the country. In contrast to the Iwakuni population, however, the population is not entirely albino. We have both observed and collected normal individuals in the area. As a matter of fact, since all the individuals collected were juveniles, it may well be that the parents were normally colored individuals possessing the albino gene, and that albino specimens are unable to grow to maturity, due to their conspicuousness in what is now a fairly well populated area.

The general area is part of the so-called Tama Hills: low hills along the Tama River having steep, heavily wooded slopes, many small streams, and terraced rice paddies in the valleys. The environment was once ideal for the typical amphibian and reptilian fauna of the Kanto area. But because of indiscriminate housing development in the 1960s and early 1970s, paddies were filled in, hills leveled, forests cut down, roads built, and streams polluted because of the lack of sewers in the area. As a result, the herpetofauna has rapidly declined to a mere fraction of what it was 20 years ago.

In the area where the albino snakes have been collected, in addition to direct destruction of the environment, there is another danger to the herpetofauna: the vastly increased population of primary school children. On Sundays and holidays the paddies, streams, and woodlands are thronged by young children looking for crayfish, crabs, frogs, and newts. Particularly in spring snakes are often encountered during such forays by children. Death is the frequent fate of the snakes. Under such conditions, it is doubtful that a population of conspicuously white snakes can continue to survive for very long, unless some drastic steps are taken for their protection. Perhaps the best way to ensure that this population of beautiful snakes does not die out may be to work for its successful propagation in captivity.

The reproduction data we have presented here, while incomplete, seem to be typical of the species, both for normal (Fukuda, 1956, 1965) and for albino (Mishima et al., 1977) specimens. The dates of courtship and egg laying, however, are earlier than normal, due undoubtedly to the snakes being kept warm throughout the winter.

Fukuda (1978) reports that albino *E. climacophora* are difficult to raise in captivity. He had a survival rate of only 2 out of 7 hatchlings from Iwakuni (28.6%). Mishima et al. report 7-month survival rates of 1.5–100% for 5 clutches

of hatchlings born to Iwakuni parents, with only one clutch attaining 100% survival. To date we have attained a 100% survival rate. This may be simply fortuitous; or it may be due to the fact that our snakes, being less inbred than the Iwakuni specimens, are more hardy and adapt more easily to captivity.

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要 旨

関東地方南西部のシロヘビ R. ゴリス・長沼孝治

神奈川県と東京都南西部間の境界線をまたぐ地域で4頭のシロヘビの幼体を採集した。そのうちの2頭が飼育下で順調に育ち、3回に亘って繁殖した。採集場所の環境破壊についても一考察を述べた。