

could only be opened by forcing a finger into it. When the finger was withdrawn, the glottis immediately returned to the closed position. To hold the glottis open and permit the passage of air, a 40-cm piece of 10 mm outside diameter, 7 mm inside diameter, plastic tube was inserted 2 cm. With the turtle prone, the lungs were then ventilated by gently blowing into the tube at irregular intervals over the next hour. No water drained out through the tube, although fluid apparently from the stomach came out of the mouth. After being seemingly lifeless for over 2 h, the turtle suddenly raised its head well into the air and took a deep breath. For the next 30 min distinct breaths gradually became more frequent and the tube was finally removed. Movement of the flippers also gradually resumed. The turtle was left prone for the next 11 h in a confined area. In the morning it was found active and appeared fully recovered. A large quantity (1.5 kg) of voided feces was present. When released, the turtle swam a short distance near the surface, took a breath, and dove out of sight in a normal manner.

Dead green turtles of various sizes which I have examined have all shown a closed glottis, like the comatose specimen reported here. This appears to be the normal state, serving to prevent the inhalation of seawater. The glottis appears to open only with the outward movement of the hyoid apparatus

and gaping of the mouth to take a breath. Closure of the glottis in the green turtle, or any other sea turtle species, has not been previously mentioned in connection with resuscitation efforts. If the goal is to ventilate the lungs, then an open air passage must be established. The insertion of a small plastic tube is a simple and convenient way to meet this objective. In addition, since the lungs are located dorsally, under the carapace, the prone position for resuscitation would seem best to avoid compression from the heavy food-laden digestive tract and other organs.

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## OBSERVATIONS ON LIVE *Azemiops feae*, FEA'S VIPER

Rare and poorly known even within its natural range of southern China and adjacent southeast Asia, *Azemiops feae* nevertheless occupies a strategic phylogenetic position within advanced snakes. The first specimen collected was in Burma by the European explorer M. L. Fea. This find was reported by Boulenger in 1888, who named the monotypic species in honor of Fea and allied the snake with *Atractaspis* and *Causus*. However, the most recent attempt to establish its phylogenetic relationship (Liem et al. 1971) concludes that *Azemiops* is a distant, but primitive evolutionary line within the Viperidae. Character comparison places it between the genera *Causus* on the one hand and *Agkistrodon* on the other (Marx and Rabb 1972). The implication that *Azemiops* was an early offshoot of the mainline of vipers gives it an important position within the radiation of vipers.

In China, *Azemiops* has been reported in the southern provinces—Yunnan, Guizhou, Sichuan, Guangxi, Fujian, Jiangxi, and Zhejiang (Zhao and Zhao 1981). To this range is added, of course, Burma (Boulenger 1888) and preserved specimens in the Museum National D'Histoire Naturelle (Paris) with collection locations of North Viet Nam and Tibet. To summarize Zhao and Zhao (1981), this species is montane (100-2000 m in altitude), seasonal (active 7 March to 24 November), and crepuscular; it is found at roadsides, along rice fields, in straw or grass, and even beside or within homes.

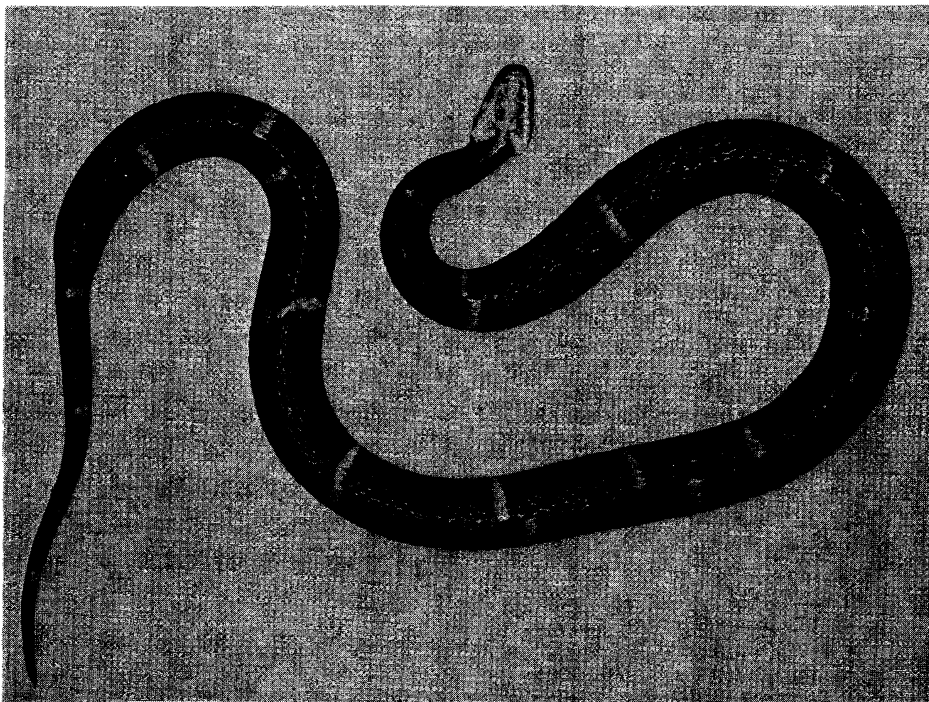
Over the last several years, we obtained living specimens from China that arrived in the United States in November. The actual

field collectors have not released details, but the snakes were presumably caught in the wild shortly before shipment when the snakes would be preparing for hibernation. Observations of these living snakes, supplemented by preserved specimens, give a clarified picture of these very primitive vipers.

*Azemiops feae* goes by several common names: Fea's viper (after its discoverer), jade-belt snake (reference presumably to the broken ring pattern along its body), and white-headed viper (actually a misleading name). In life, the head of *Azemiops* is burnt orange to yellow, with a symmetrical pattern of dark rust colored spots. When preserved, this head color bleaches to white, the presumed source of its latter common name. The tongue is banded. The body is gray black. Beginning at the neck, the body is crossed by orange rings, one or two scales wide. These rings are often disconnected dorsally so that each side is slightly offset (Fig. 1). The rings do not continue across the belly. The belly is evenly cream colored with a slight pinkish tinge. Two (2) of fifteen (15) individuals had bobtails, cleanly healed, likely the result of a natural injury.

When threatened, all displayed a distinctive defensive behavior. Characteristically the body would be flattened and thus laterally widened; the usually oval head was reconfigured into more of a triangular shape by outward flaring of the back of the jaws (quadratomandibular joints). Some vibrated their tails rapidly. If intimidated at close range the snake would strike toward the threatening object with mouth open, sometimes erecting, other times not erecting the fangs. One vigorous strike reached over 18 cm in a snake 63 cm in total length. The disturbed *Azemiops* sought cover (e.g. hidebox) when available, or escape.

The only report of stomach contents is of a common gray shrew (Marx and Olechowski 1970). In captivity, we found all generally reluctant to feed. Those that did, usually ate (newborn mice) unseen overnight. The three observed predatory strikes were newborn



**Figure 1.** *Azemiops feae*, Fea's viper. In life the head is orange to golden with dark brown mottling or spots symmetrically placed. The body is gray-black, crossed by orange rings that may be continuous (e.g. first and third rings in neck) or broken (e.g. second and fourth rings). The pictured individual, a male, was 45.4/9.1 cm snout-vent/tail length respectively.

mice which were not released but held in the jaws. None showed an interest in small amphibians (*Rana pipiens*, *Ambystoma macrodactylum*), fish (guppies), or lizards (*Anolis*) although this could reflect a general loss of appetite prior to hibernation.

All live *Azemiops* were kept individually or in pairs in terraria with 2-3 cm of potting soil on the bottom, temperature gradients (15-33° C), hide boxes, and loose cover (paper). The light cycle was 12L/12D upon arrival but two weeks later reduced to 8L/16D L. Water was available ad libitum. Although they would push at the potting soil with their snouts, no burrowing activity was observed. Hide boxes within the cooler temperatures were preferred (15-20° C). Despite the continuous presence of water in shallow dishes, and observed occasional drinking, the snakes seemed especially susceptible to dehydration as evidenced by weight loss (up to 10% in 30 days in some).

Within five weeks of their arrival, histological examination (H & E, light microscopy) of the left ovaries of two females revealed three and five ovarian follicles, the largest approximately 1.5 x 8 mm. Neither ovaries nor reproductive tracts suggested oviparity or viviparity. One testis from each of five males was similarly examined. In all the males, the seminiferous tubules were up to three cell layers thick, lumina were conspicuous, and stages up to advanced spermatids and spermatozoa were present, although neither were numerous.

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