

OBSERVATIONS ON THE POSTOVIPOSITIONAL BEHAVIOR OF THE TAIWANESE AGAMID LIZARD, *JAPALURA SWINHONIS* (SQUAMATA: REPTILIA)

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ABSTRACT — A female *Japalura swinhonis* was found laying eggs in a nest hole on the ground within a subtropical forest in central Taiwan. Postovipositional behavior consisted of leveling of the stacked eggs, scraping of the soil to bury the eggs, filling of the spaces between the eggs, compressing of the soil tightly, and concealing the nest site. The female then left the nest site, and no nest guarding behavior was observed.

KEY WORDS: Agamidae, *Japalura swinhonis*, postovipositional behavior, parental care

Japalura swinhonis is a common tree lizard distributed throughout Taiwan under about 1200 m elevation (Ota, 1991a). Previous studies include systematics (Lou and Lin, 1983; Ota, 1991a), reproductive biology (Cheng and Lin, 1977, 1978, as *J. s. formosensis*; Lin, 1979; Lin and Cheng, 1986, as *J. m. mitsukurii*), population ecology (Lin and Lu, 1982, as *J. s. formosensis*) and behavior (Wei and Lin, 1981, as *J. s. formosensis*). In the latter, both thermoregulatory and social behaviors were well described but documentation of postovipositional behavior was brief. Aota (1940) noted that an individual of a highland species of *Japalura* in the Hohuansan area (ca. 2300 m elevation) dug a hole in the ground presumably for egg deposition, and that another individual, a female, was hidden with nine eggs in a deep nest-hole on a roadside slope. Although this highland population was

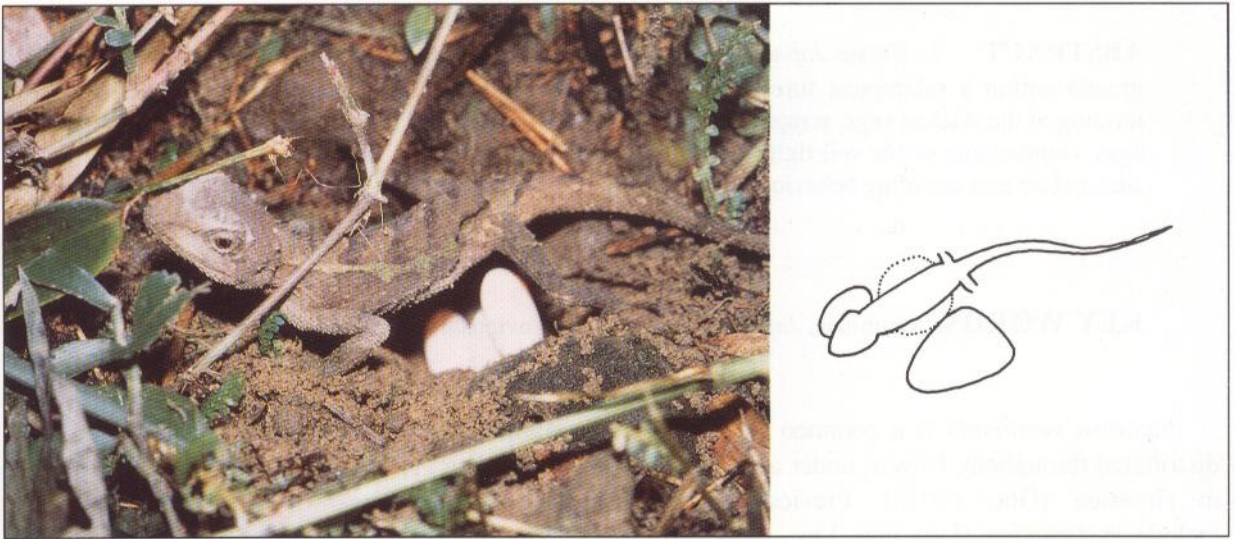
regarded as *J. swinhonis* by Lin and Cheng (1990), Ota (1991b) argued that it was probably *J. brevipes* or *J. makii*.

On the sunny morning of 25 August 1995, I found an ovipositioning *Japalura swinhonis* in the subtropical evergreen forest at the Fong-Huan-Ku Bird Park, Luku, Nantou County, Taiwan (600 m elevation; 24 ° 43' N, 120 ° 47' E). The female, having laid two eggs already, was laying the third egg when it was found. The nest was a funnel-shaped depression in the ground, (ca. 5 cm in diameter, 3 cm deep) located ca. 20 cm from a cement walkway. Although lizards are usually subject to disturbance (e.g., *Cnemidophorus tigris*, Anderson, 1993), the female *J. swinhonis* seemed not to be influenced by tourists who frequently walked by the nest. While being

photographed, she frequently ceased her activities, looked at the approaching camera but continued her behavior after the camera was held still for 20-30 seconds. In order to reduce the disturbance, I kept the camera at least 50 cm from the lizard and most behavior was observed from about 1 m.

The process of nest hole excavation was not observed. The highland *Japalura* sp. (see above) and *J. swinhonis* were reported to dig a nest hole

with their forelegs (Aota, 1940; Wei and Lin, 1981), but moist soil was densely attached to the snout of the female described herein (text-fig. 1). This soil on the snout looked similar to the way that soil remains on the tip of a hoe after digging. This may indicate that the lizard had also used the snout for nest construction. While laying the eggs, the lizard stood astride the nest hole with its head directed upwards (text-fig. 1), and I observed the following behaviors.



TEXT-FIGURE 1

Oviposition posture of *Japalura swinhonis*. Note that the female is standing astride the hole and the eggs are stacked on each other. The line drawing shows the position of the female, the nest (broken line) and rocks (solid line).

Leveling of the eggs.-After oviposition of the third egg, the female crawled across the nest and turned around to face it. She arranged the stacked eggs to nearly the same level with her snout by pushing the eggs with her snout and rapidly pecking them into position (text-fig. 2).

Scraping of the soil.-The female stood astride the nest again and started to bury the eggs. To support and balance herself while burying the eggs, she lowered her head and crouched so that

her snout touched the ground. With the support of her snout and one foreleg, the other foreleg was free to scrape the soil into the nest hole (text-fig. 3). Both forelegs were used in turn to scrape, and she changed position so as to scrape the soil from around the nest hole.

Filling of gaps.-At the early stage of the burying process, the female occasionally stopped scraping to fill gaps among the eggs with soil. She pushed the soil on the eggs into gaps with



TEXT-FIGURE 2

Position of eggs before burial. The eggs were leveled by the snout of the female that positioned herself by the nest hole. The line drawing shows the position of the female, the nest (broken line) and rocks (solid line).



TEXT-FIGURE 3

Egg burial. The female is burying the eggs by scraping the surrounding soil into the nest hole using her right foreleg. The line drawing shows the position of the female, the nest (broken line) and rocks (solid line).

her snout, and then pecked the soil rapidly to compress it. She alternated between scraping and filling behaviors.

Compressing of the soil-After about three-fourths of the gaps were filled, the filling behavior stopped. The female stepped on the soil with both forelegs simultaneously to compress it (text-fig. 4); the feet and lower arms formed a vertical column, and the anterior part of body trembled up and down rapidly. The female alternated between scraping and compressing behaviors.

Concealing the nest.-After the eggs were buried, the female moved nearby small stones and litter seemingly to conceal the nest (text-fig. 5). She left the nest site and returned to the trees after completing the concealment of the nest.

Wei and Lin (1981) noted that a captive female *Japalura swinhonis* guarded the nest and chased away intruders that approached the partially buried eggs. My field observations indicate that this species constructed a nest in the ground

and buried the eggs completely before leaving them. Complete burial in a deep nest hole may prevent the odor of the eggs from being detectable to predators, and the postovipositional behaviors may be regarded as the simplest stage of the diverse forms of parental care in reptiles (Shine, 1988). Although parental care in reptiles is relatively uncommon compared with mammals, birds and amphibians, nest construction is probably common to most oviparous lepidosaurians (Somma, 1990).

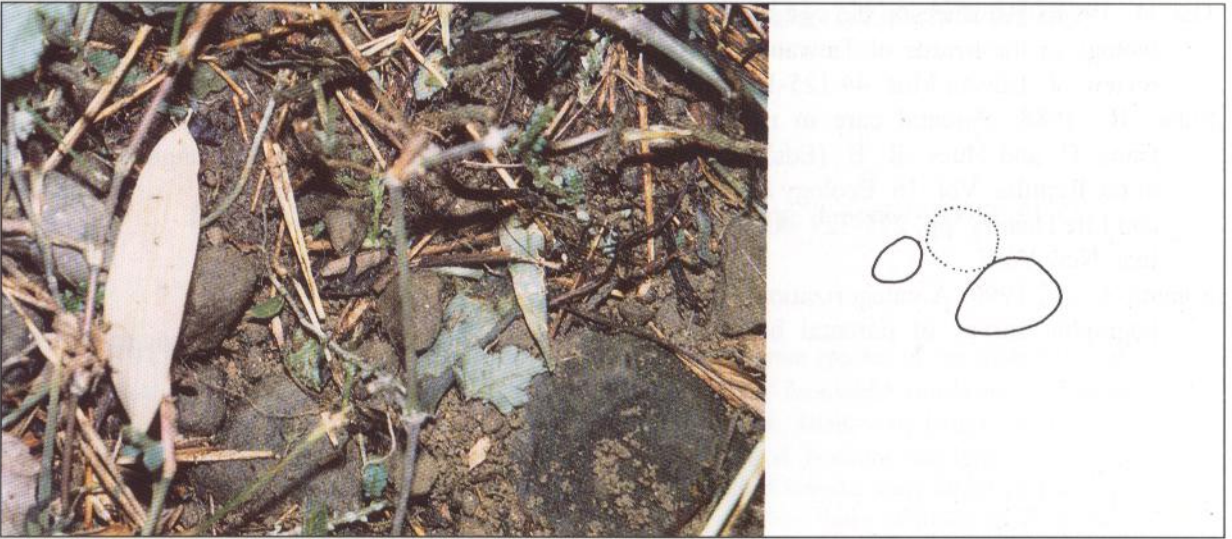
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TEXT-FIGURE 4

Soil compressing. The female is compressing the soil by trembling her body up and down and stepping on the soil with both forefeet simultaneously. The line drawing shows the position of the female, the nest (broken line) and rocks (solid line).



TEXT-FIGURE 5

The hidden nest hole. Stones and other litter were moved to cover the nest site before the female returned to the trees. The line drawing shows the position of the nest (broken line) and rocks (solid line).

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臺灣斯文豪氏攀蜥的產後行爲

周文豪

摘要

在台灣中部亞熱帶林裡觀察到一隻雌性斯文豪氏攀蜥在地上掘坑產卵，其產後行爲包括：整平相疊的卵，扒土掩埋，填滿卵間隙，壓實填土與掩飾埋卵處等。雌蜥在完成掩埋藏卵處後離去，未見護巢行爲。

關鍵詞：飛蜥科，斯文豪氏攀蜥，產後行爲，親護行爲