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# Biological Characteristics of *Takydromus wolteri* (Squamata: Lacertidae) Living on Jeju Island

Koo, Kyo-Sung* · Oh, Hong-Shik**

To identify the biological characteristics of Wolter lizard (*Takydromus wolteri*), this study was conducted from March 2011 to August 2012 in the areas of Geumoreum located in Hangyeong-myeon, and Saebyeoloreum located in Aewol-eup and in the zoological laboratory in Jeju National University, South Korea. Food source, enemies, activity period, breeding period, spawning period, spawning size in a clutch, biological traits of eggs and hatching periods were investigated. As a result of the study, it was found that *T. wolteri* eats Gryllidae, Araneina, Orthoptera, Diptera, Hymenoptera and Lepidoptera, but not Coleoptera, Formicidae, Oligochaeta. By observing the vicinities of *T. wolteri* habitats, it was seen that the natural enemies of *T. wolteri* were *Elaphe dione, Amphiesma vibakari ruthveni, Sibynophis chinensis, Rhabdophis tigrinus, Gloydius ussuriensis, Corvus macrorhynchos, Streptopelia orientalis, Falco tinnunculus, Pica pica sericea, Lanius bucephalus, Hypsipetes amaurotis.* Activities started in mid-March and hibernation started between late November and early December. Mating period was seen to run between May to June, breeding was May to August, and spawning was June to August. The average weight of spawned eggs (n = 12) was 0.3g; size was 9.5 × 7.2 mm; and the average fecundity of the clutch was 5 (with range 3~7). Incubation period was 18~20 days. The results would be useful as the necessary material for preparing conservation and management plans for *T. wolteri* habitats that depend on the changes in the habitat environment.

<Key words> *Takydromus Wolteri*, Biological Characteristics, Squamata, Jeju Island

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# Ⅰ. Introduction

Wolter lizard (*Takydromus wolteri*) that belongs to the *Takydromus* family of the Lacertidae species of the Squamata group is a species distributed throughout the Korean peninsula, Russia and the northeastern parts of China. It is different from other lizard species in that its muzzle end plate and nose plate arrangements are different, and it is a small lizard, of which the Jeju Island is the southern limit of its habitation(Arnold, 1997). The body is slightly flat and has an olive color skin with a distinct white lateral line on its stomach, which extends from the bridge of the nose through the bottom side of the ear canal to the hind legs. The back is yellowish white or greenish white(Kang and Yoon, 1975). It is active mainly from April and inhabits lowland grasslands or forested lowlands.

As the utilization of land increases due to population growth and industrial development, the degradation of natural resources is becoming a serious issue and is leading to reduction or disappearance of reptiles that share the habitat with humans. In order to conserve the disappearing reptile species, research on the species both in outdoors and laboratory, and public education and legislation are required(Pough et al., 2004). In Korea, with rapid urbanization and industrialization, reptile species have been drastically decreased due to human influence and some species are at the brink of extinction. Because reptile species, which are a classification group that's very sensitive to the environment, are greatly affected by environmental changes, identifying the species' biological characteristics is deemed to be a very important task even for species that are stable in maintaining their population.

With the extent of it having materials on the distribution of reptiles mentioned in illustrated books, in reality, studies of *T. wolteri* in Korea are insufficient (Shannon, 1956; Webb et al., 1962; Kang and Yoon, 1975). Here are a few of the recent studies: an immunohistochemical study on gastrointestinal endocrine cells (Lee and Ku, 2004); the group differences due to genetic techniques (Random Amplified Polymorphic DNA; Chang et al., 2004); the morphological differences of

T. amurensis (Chang et al., 2006). The biological characteristics, which may be the key point to understanding the target species for successfully conserving and managing a species, should be identified. In particular, since reptiles are very sensitive to the environment and are susceptible to even a small environmental change, it is very important to understand the biological traits of species that are stable in maintaining their populations. This study was conducted to provide the materials needed in preparing conservation and management measures for habitats in accordance with environmental changes by identifying the species characteristics of *T. wolteri* such as food source, natural predators, breeding, the number of eggs laid in a litter, egg size and growth process, etc.

# Ⅱ. Materials and Methods

Ecological examinations such as outdoor gathering activities and natural enemies and food sources were carried out from March 2011 to August 2012 in the areas of Geumoreum (N33$^0$ 25' 10.56", E126$^0$ 18' 20.00") located in Hangyeong-myeon, Geumak-ri and Saebyeoloreum (N33$^0$ 21' 57.34", E126$^0$ 21' 23.10") located in Aewol-eup, both in the City of Jeju, Jeju Island, South Korea(Figure 1).

For food sources, by using a sweeping net in the area where *T. wolteri* inhabit, all predictable insects considered as food sources were collected and moved to the laboratory and then fed to *T. wolteri* to study their food preferences. In order to determine the preference type of 4 different environments, tree branches, top of rock, under rock, bottom, were set. In addition, of the captured lizards, pregnant females were examined for the number of eggs spawned and a portable weight scale was used to weigh the egg (0.1 g), and for the length and width of eggs digital calipers were used. The incubation period was observed while breeding in a natural terrarium (45x45x60, HAGEN Inc.) prepared in the laboratory.

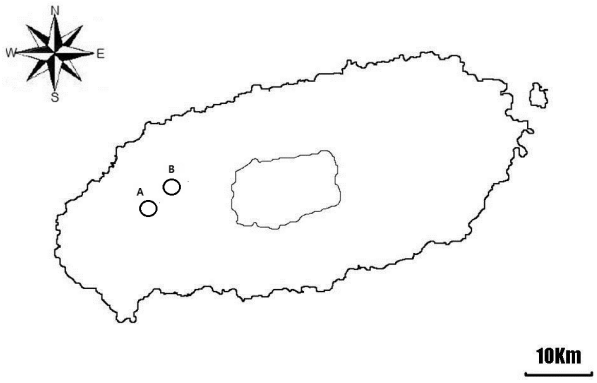


Figure 1. Two study sites of *Takydromus wolteri* in Jeju Island, South Korea. A) Geumoreum, B) Saebyeoloreum.

## Ⅲ. Results and Discussion

Although *T. wolteri* food sources were known to be mainly Gryllidae and Araneina, the results of studies by Song(2007) and Kim and Song(2010) for the first time identified that, in addition to Gryllidae and Araneina, Orthoptera, Diptera, Hymenoptera, and Lepidoptera were also preferred food sources. In addition, among insects, Coleoptera, Formicidae, Oligochaeta were found to be not eaten as food source (Table 1).

Table 1. Food Sources for *Takydromus wolteri*

| Preferred Food Source | Avoiding Food Source |
|---|---|
| Gryllidae<br>– Crickets | Coleoptera<br>– Ants |
| Orthoptera<br>– Silent slanted-face grasshoppers, grasshoppers, etc.) | Formicidae<br>– Carabid Beetles |
| Arachnida<br>– Spiders | Oligochaeta<br>– Earthworms |
| Diptera<br>– Flies, Mosquitoes | |
| Hymenoptera<br>– Bees | |
| Lepidoptera<br>– Butterflies, Moths | |

By monitoring their habitats, it was observed that Diones ratsnake (*Elaphe dione*) and Aisan tiger snake (*Rhabdophis tigrinus*) preyed on *T. wolteri* as natural enemies, and the fact that the scenes of small-to midsize birds, including big beak crow (*Corvus macrorhynchos*), wild pigeon (*Streptopelia orientalis*), kestrel (*Falco tinnunculus*), magpie (*Pica pica sericea*), shrike (*Lanius bucephalus*), brown-eared bulbul (*Hypsipetes amaurotis*), hunting *T. wolteri* was witnessed is deemed to be a very significant result. Furthermore, it was also identified that the Asian keelback (*Amphiesma vibakari ruthveni*), Asian many-toothed snake (*Sibynophis chinensis*) and Red-tongue viper snake (*Gloydius ussuriensis*) that were being bred seemed to prefer *T. wolteri* when they were fed as food source. As such, the natural enemies identified of *T. wolteri* were mainly small-to-midsize birds and snake family animals. Although the activities of *T. wolteri* in the Jeju area vary somewhat depending on the area, they were mainly seen to be from the middle of March and this was about 1 month earlier than the mid-April reported by Song(2007). In

addition, it was seen that they went into hibernation around late November to early December. Breeding season was observed to be from May to August with mating taking place between May~June and spawning between June to August, which were the same as those reported by Song(2007).

The results of Research on the preference place, *T. wolteri* spent most time on the tree brunches and they occasionally used rocks for resting and dying their body(Table 2). It is hardly seen that *T. wolteri* stayed under the rocks or bottom of cage. Spawned eggs (n = 12) were measured to be 0.30g in average weight and 9.5 mm x 7.2 mm in size, which was larger than the 10 mm x 5~6 mm reported by Song (2007). The average fecundity of the clutch was 5 (with range 3~7), which was somewhat different from the 4~5 reported by Song(2007), and reported for the first time was the fact that the incubation period was 18~20 days.

Due to population growth and industrial development the land utilization is on the rise, and as the habitats for *T. wolteri* are collapsing the population density is decreasing as well. It is deemed that aggressive efforts to avoid indiscriminate development of grasslands and protect habitats within grasslands are required in order to manage the population of *T. wolteri*. In addition, because reptiles, which play the role of the middle link in the food chain and are very sensitive to the environment, are greatly affected even by small environmental changes, it is thought that identifying the biological characteristics of the species-regardless of the fact that they currently maintain a stable population-is critical. In this regard, it is thought that the information about the daily life, strategy and species of *T. wolteri* identified in this study would be utilized in various ways for the conservation and preparation of management plans for the species.

Table 2. Daily Life of *Takydromus wolteri*

| Location/ Time | 08:00~ 10:00 | 10:00~ 12:00 | 12:00~ 14:00 | 14:00~ 16:00 | 16:00~ 18:00 | 18:00~ 08:00 |
|---|---|---|---|---|---|---|
| Tree Branches | 2 | 3 | 2 | 2 | 2 | 2 |
| Top of Rocks | 1 | 0 | 1 | 0 | 1 | 1 |
| Under Rocks | 0 | 0 | 0 | 0 | 0 | 0 |
| Bottom | 0 | 0 | 0 | 1 | 0 | 0 |
| Daily Life | Although stayed motionless during early morning, started activities starting around 9 AM. | Moves around actively and rests by on a tree branch it climbed. | After eating food, moves around actively. | Looking for shelter it comes back down to the ground. | After eating food and water, moves around actively. | Increasingly becomes lethargic and stops activities. |

## References

Arnold, E. N.(1997). Interrelationship and evolution of the east Asian grass lizards, *Takydromus wolteri* (Squamata: Lacertidae). *J. Linn. Zool.*, 119, 267−296.

Arnold, E. N., Arribas, O., & Carranza, S.(2007). Systematics of the palaeoarctic and oriental lizard tribe Lacertini (Squamata: Lacertidae: Lacertinae), with descriptions of eight new genera. *Zootaxa*, 1430, 1−86.

Chang, M. H., Song, J. Y. & Chung, K. H.(2004). Intraspecific Diversity of Korean *Takydromus wolteri* (Reptilia: Squamata) Based on Randomly Amplified

Polymorphic DNA (RAPD) Analysis. *Korean Journal of Environmental Biology*, 22, 295-299.

Chang, M. H., Song, J. Y. , Oh, H. S. & Chung, K. H.(2006). Taxonomic Revision of Genus *Takydromus* (Squamata: Lacertidae) in Korea. *Korean Journal of Environmental Biology*, 24, 95-101.

Kang, Y. S. & Yoon, I. B.(1975). *Illustrated Encyclopedia of Fauna & Flora of Korea Vol. 17 Amphibia-Reptilia*. Seou: Samhwa Publisher.

Kim, J. B. & Song. J. Y.(2010). *Korean amphibians and reptiles*. World science.

Lee, H. S. & Ku, S. K.(2004). An immunohistochemical study of endocrine cells in the alimentary tract of the grass lizard, *Takydromus wolteri* Ficher (Laceridae). *Acta histo.*, 106, 171-178.

Pough, F. H., Andrews, R. M., Cadle, J. E., Crump, M. L., Savitzky, A. H. & Wells, K. D.(2004). *Herpetology*. New Jersey: Pearson Prentice Hall, 726.

Shannon, F. A.(1956). The reptiles and amphibians of Korea. *Herpetologica*, 12, 22-49.

Song, J. Y.(2007). Current Status and Distribution of Reptiles in the Republic of Korea. *Korean Journal of Environmental Biology*, 25, 124-138.

Webb, R. G., Jones, J. K. & Buers, G. W.(1962). Some Reptiles and Amphibians from Korea. *Univ. Kansas Publ. Mus. Nat. Hist.*, 15, 149-173.

<국문초록>

# 제주도에 서식하는 줄장지뱀(*Takydromus wolteri*)의 생물학적 특징에 관한 연구

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이 연구는 줄장지뱀(*Takydromus wolteri*)의 생물학적 특징을 밝히기 위하여 2011년 3월부터 2012년 8월까지 제주특별자치도 제주시 한경면 금악리에 있는 금오름과 제주시 애월읍 새별오름 및 제주대학교 동물학 실험실에서 이루어졌다. 생물학적 특성으로는 먹이원, 천적, 활동기간, 교미기, 산란기, 한배산란수 및 산란된 알의 형태적 특성과 부화기간 등을 조사하였다. 조사결과, 귀뚜라미류, 거미류, 메뚜기류, 파리류, 벌류, 나비류 등 다양한 절지동물을 포식하는 것이 관찰되었으나, 딱정벌레류와 개미류, 지렁이류 등은 포식하지 않는 것으로 나타났다. 줄장지뱀의 천적의 가능성 있는 동물로는 누룩뱀, 대륙유혈목이, 비바리뱀, 유혈목이, 쇠살모사 등 파충류들과 큰부리까마귀, 멧비둘기, 황조롱이, 까치, 때까치, 직박구리 등의 조류가 서식지 주변에서 관찰되었다. 활동은 3월 중순경에 시작하였고, 11월말이나 12월초에 동면에 들어가기 시작하는 것으로 나타났다. 교미기는 5-6월, 번식기는 5-8월, 산란기는 6-8월이었다. 실험실 환경에서 줄장지뱀의 일일 활동공간을 조사한 결과, 대부분의 시간을 나뭇가지 위에서 보내는 것으로 나타났다. 한배산란수는 평균 5개(범위 3-7), 알(n=12)의 무게는 평균 0.30g, 장경과 단경은 각각 9.50mm와 7.20mm였으며, 부화기간은 18~20일이었다. 이 연구결과는 줄장지뱀의 서식지 보호와 관리방안을 마련하는데 필요한 중요한 자료가 될 것이라 판단된다.

**주제어 : 줄장지뱀, 생물학적 특질, 유린목(Squamata), 제주도**