NOTES ON DIET COMPOSITION OF FIVE SPECIES OF THE FAMILY SCINCIDAE (REPTILIA: SQUAMATA) FROM NAM DONG RARE AND PRECIOUS GYMNOSPERMS CONSERVATION AREA, THANH HOA PROVINCE

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SUMMARY

We conducted the stomach content analyses of 15 specimens in five species of the Scincidae family. These examined species were collected in Nam Dong rare and precious gymnosperms conservation area, Thanh Hoa Province. The analyzed stomach contents of one specimen of Grass Sun Skink *Eutropis macular*ius (Blyth, 1853), three specimens of Reeves' Smooth Skink *Scincella reevesii* (Gray, 1838), three specimens of Forest Skink *Sphenomorphus cryptotis* Darevsky, Orlov & Ho, 2004, five specimens of Himalayan Forest Skink *Sphenomorphus indicus* (Gray, 1853) and three specimens of Hainan water skink *Tropidophorus hainanus* (Smith,1923) revealed in total 71 prey items. Almost stomachs of the 15 examined specimens were full of prey items, except in the stomach of three specimens of Hainan water skink *Tropidophorus hainanus*. There were very little prey items in *T. hainanus*, compared to the other skink species. Most preys were ticks, followed by spiders, woodlice, cockchafer and ants. Some materials like sand, bit of stone, plant fragments were excluded from the analysis. Among the five examined species, we found the highest prey taxon diversity for Grass Sun Skink *Eutropis macularius*, the lowest prey taxon diversity for Himalayan Forest Skink *Tropidophorus hainanus* and Reeves' Smooth Skink *Scincella reevesii.* It is very likely that the prey taxon diversity was correlated with the different sample sizes of the skinks.

Keywords: Diet, ecology, Nam Dong Conservation Area, skinks.

1. INTRODUCTION

Animal diet is a crucial part of the natural history, because not only does it reveal the source of the animal's energy for growth, maintenance, and/or reproduction (Dunham et al. 1989; Zug et al. 2001), but it also provides information on the ecological roles of the animal. Dietary information can be used to place an animal species in a broader ecological and evolutionary context (Greene, 1993) and to guide conservation efforts (Greene, 1994). Skinks are one of the most numerous and diverse of squamate families, with approximately 1300 species. This current study is focused on the family Scincidae, a poorly known reptilian family in Vietnam, especially the natural diet of them. They are mainly insectivorous, but a small proportion (15%) are considered omnivorous or herbivorous (Barry et al. 2017). The diet study about species of Scincidae family is fragmented and almost concentrate only a species or a group (Ngo, 2014, 2015; Le, 2018). In this study, we conducted the stomach content analyses of five species in the Scincidae family including: *Eutropis macularius* (Blyth, 1853), *Scincella reevesii* (Gray,1838), *Sphenomorphus cryptotis* Darevsky, Orlov & Ho, 2004, *S. indicus* (Gray, 1853) and *Tropidophorus hainanus* (Smith,1923). They were all found in the Nam Dong Rare and Precious Gymnosperms Conservation Area (hereafter Nam Dong CA), which is considered as one of the typical forest ecosystems on limestone that is still remaining in northern Vietnam. These species were recorded at the elevations between 300 and 900 m above sea level (a.s.l.) with the mountain slopes of 10–45%, and inclining from the Northwest to the Southeast. The typical habitat of the Nam Dong CA is characterized by the limestone karst forest. After being analyzed, the diet composition of five species in the Scincidae family are herein reported.

2. RESEARCH METHODOLOGY

Study area

Field surveys were carried out in Nam Dong CA (20°18'07" to 20°19'38" N; 104°52'8" to 104°53'26" E). Fourteen line transects were established with lengths from 3.5 to 21 km in Lo

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and Bau villages (Nam Dong commune), Na Ho village and Sua village (Son Dien commune), Phe and Kham villages (Tam Thanh commune), Bin village and He village (Son Lu commune) and Bang village (Trung Thuong commune). Each line transect was marked the start and end points.

Examined specimens of the Scincidae family

We conducted the stomach content analyses of 15 specimens of five species in the Scincidae family. All studied vouchers had been collected in their natural habitats during the field trips in the Nam Dong CA. Specimens examined were as follows:

Eutropis macularius (Blyth, 1853) (n=1). VNUF R.2017.28 (Field number: ND.17.28), adult female collected in Bau Village, Nam Dong commune (20˚20.581'N, 104˚52.064' E, elevation: 169 m a.s.l.) on May 26, 2018 by V. Q. Luu et al.

Scincella reevesii (Gray, 1838) (n=3). Three adult females, VNUF R.2017.66 (Field number: ND.17.66), tail lost, collected in Lo Village (20˚19.394' N, 105˚55.013' E, elevation: 694 m a.s.l.) on May 28, 2017, and VNUF R.2017.128 (Field number: ND.17.128) found in Lo Village, (20˚18.718' N, 104˚54.421' E, elevation: 495 m a.s.l.), on June 02, 2017, and VNUF R. 2019.05 (Field number: ND.19.05) found in Bin Village (20˚17.844' N, 104˚52.737' E, elevation: 750 m a.s.l.) on June 24, 2019, all collected by V. Q. Luu et al.

Sphenomorphus cryptotis Darevsky, Orlov & Ho, 2004 (n=3). One adult male VNUF R.2018.82 (Field number: ND.18.82) collected in Nam Dong (20˚20.243' N, 10˚53.316' E, elevation: 195 m a.s.l.) on May 09 2018; two females VNUF R.2018.37 (Field number: ND.18.37) and VNUF R.2017.33 (Field number: ND. 17.33) collected in Nam Dong (20˚18.152' N, 104˚54. 506' E, elevation 551 m a.s.l) (elevation: 961 m a.s.l), on April 21, 2018 and May 26, 2017; collected by V. Q. Luu et al.

Sphenomorphus indicus (Gray, 1853) (n=5). Adult male VNUF R.2018.32 (Field number: ND.18.32) was collected in Nam Dong CA (20˚18.268' N, 10˚54.856' E, elevation: 513 m a.s.l.) on April 21, 2018; VNUF R.2018.55 (Field number: ND.18.55) (adult female) was found in Nam Dong CA (20˚17.878' N, 10˚52.807' E, elevation: 799 m a.s.l.) on April 23, 2018; VNUF R.2017.90 (Field number: ND. 17.90) (adult female) was found in Nam Dong CA (20˚19.760' N, 104˚55.013' E, elevation: 790 m a.s.l.) was found on May 31, 2017; VNUF R.2019.01 (Field number: ND.19.01) (adult male) was collected in Bin village (20˚17.857' N, 104˚52.766' E, elevation: 780 m a.s.l.) on June 14, 2019; VNUF R.2019.04 (Field number: ND.19.04) (juvenile male) was collected in Bin village (20˚17.797' N, 104˚52.711' E, elevation: 722 m a.s.l.) on June 24, 2019; all collected by V. Q. Luu et al.

Tropidophorus hainanus Smith, 1923 (n=3). A female VNUF R.2017.91 (Field name: ND.17.91) collected in Nam Dong CA (20˚19.760' N, 104˚55.013' E, elevation: 665 m a.s.l.) on May 30, 2017; VNUF R.2019.02 (Field number: ND.19.02) (female) (lost tail) was collected in Bin Village (20˚17.749' N, 104˚52.717' E, elevation: 698 m a.s.l) on May 05, 2019; VNUF R.2019.03 (Field number: ND.19.03) (Female) was collected in Bin Village (20˚17.749' N, 104˚52.713' E, elevation: 710 m a.s.l) on June 05, 2019, all collected by V. Q. Luu et al. Determine the diet composition of Scincidae in Nam Dong CA.

Food item sampling: Fifteen specimens of five species in the Scincidae family were dissected by making a mid-ventral incision, and the stomach was removed and slit longitudinally before being removed. The stomach contents were spread in a petri dish and examined under a dissection microscope. All the prey items were identified to the order level and, if possible, to family or species level.

Food composition analyses: The food samples were determined under Stereo Microscope (Olympus SMC - HTV45B2). Based on Borrot et al. (1989), Dang & Ho (2012) and Sangpradub & Boonsoong (2006),

the food items of species of family Scincidae were identified to the lowest taxon. Some materials like sand, bit of stone, plant fragments were excluded from the analysis.

$$\text{Relative preys abundance} = \frac{\text{The number of preys of X}}{\text{The total number of preys}} \quad 100\%$$

(Franca Guidali et al. 2000)

3. RESULTS AND DISCUSSION

The results of stomach content analyses of 15 collected specimens showed that, 10% were empty, and 90% had at least one item. A total of 71 prey items were counted from the stomachs of all the examined specimens of five species. These prey items belonged to 11 orders of five classes of the two phyla: Arthropoda and Mollusca. In the stomach of five specimens of *Sphenomorphus indicus*, the most numerous prey items were Hemiptera, followed by Blattodae, Araneae, Acarina, Orthoptera, Hymenoptera and Lepidoptera, respectively (Fig. 1).

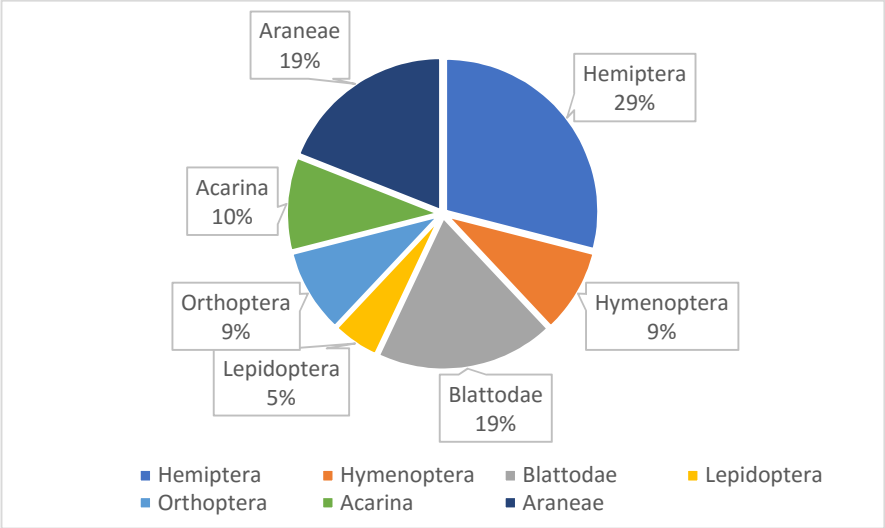

Figure 1. Percentage of prey items found in the stomachs of five specimens of *Sphenomorphus indicus*

The majority of the prey items we recorded from three specimens of *Sphenomorphus cryptotis* belonged to orders Acarina, Coleoptera and Blattodea (23% of all the Blattodea were termites) and Coleoptera with 15% of which being ladybugs (Coccinellidae), followed by the order Araneae (15%), the lowest portition of prey items are species of the two orders Lepidoptera and Hymenoptera (5%) (Fig. 2).

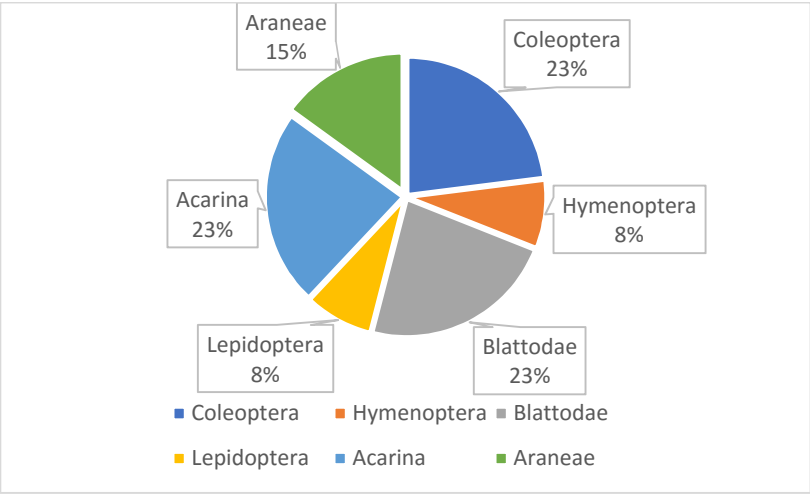

Figure 2. Percentage of prey items found in the stomachs of three specimens of *Sphenomorphus cryptotis*

In the stomach of three specimens of *Tropidophorus hainanus,* there were very little prey items comparing with other species. Particularly, the stomach of the specimen VNUF R.2019.02 had only one prey item, being an unnamed bug species (Cimicidae). This may be due to the fact that the size of this specimen is very small in comparison with other two specimens.

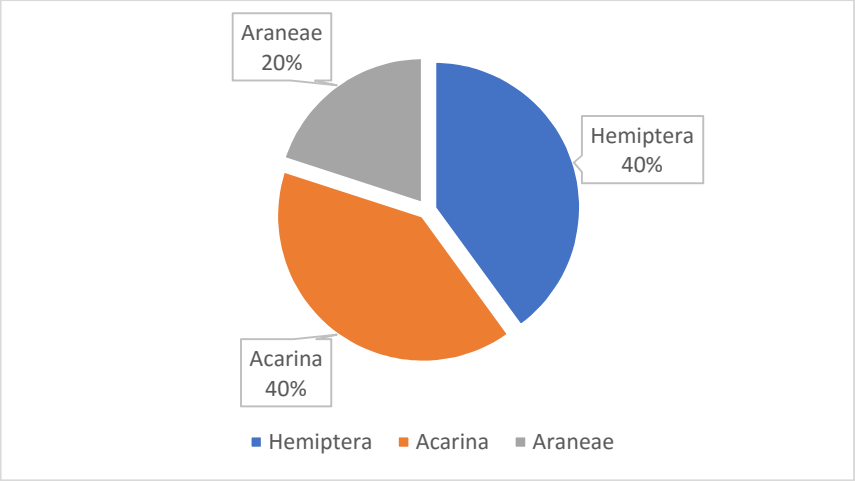

Figure 3. Percentage of prey items found in the stomachs of three specimens of *Tropidophorus hainanus*

In stomach of three specimens of *Scincella reevesii*, there was no prey item in the specimen VNUF R.2019.05. The numerous prey items were equal with 33.3% for all. For the two orders Hymenoptera and Acarina, the pery items found bees (Apidae) and ticks (Acariformes) respectively (Fig. 4).

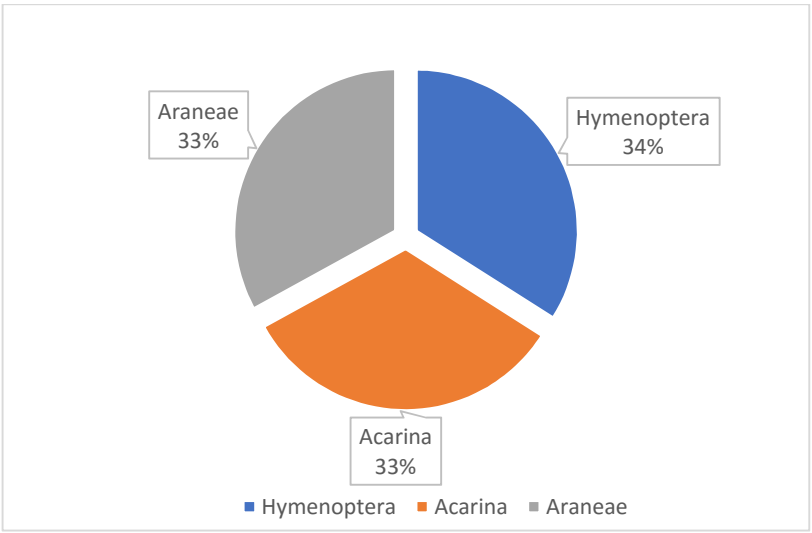

Figure 3. Percentage of prey items found in the stomachs of three specimens of *Scincella reevesii*

The specimen of *Eutropis macularius* has a larger size, therefore the stomach of this specimen had the most numerous and diverse prey items with 27 items belonging to seven taxa. Most of the prey items of *Eutropis macularius* recorded herein belong to the order Hymenoptera (33%), 77,8% of which were ants (Formicidae) and the rest were bees (*Apis andreniformis*), followed by the order Acarina (19%), Coleoptera (15%) (all beetle preys belong to the family Scarabaeidae), Gastropooda and Blattodae (11% for each), Araneae (7%) and the last order Orthoptera (4%) (Fig. 5).

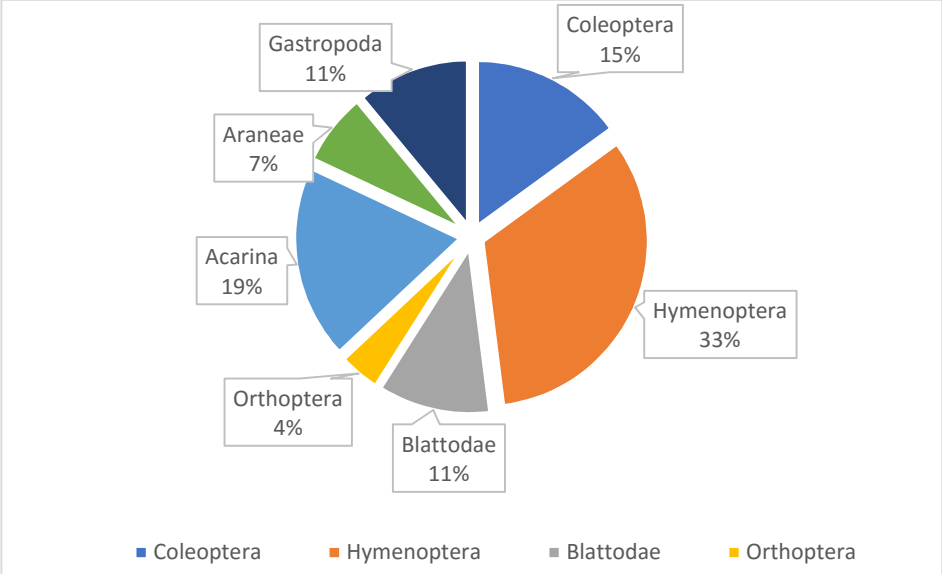

Figure 5. Percentage of prey items found in the stomachs of one specimen of *Eutropis macularius.*

Although the prey taxon diversity may be correlated with the different sample sizes, it is remarkable that the highest diversity of prey taxa could be documented for *Eutropis macularius*, the lowest prey taxon diversity for *Tropidophorus hainanus* and *Scincella reevesii.*

In general, we could identify a total of 71 prey items. Most numerous were Hymeoptera accounting for 21%, followed by Acarina, Coleoptera, Blattodae and Araneae.. When considering all stomachs together, Acarina and Araneae were the most abundant prey, and Lepidoptera (2%) is less abundant than the others.

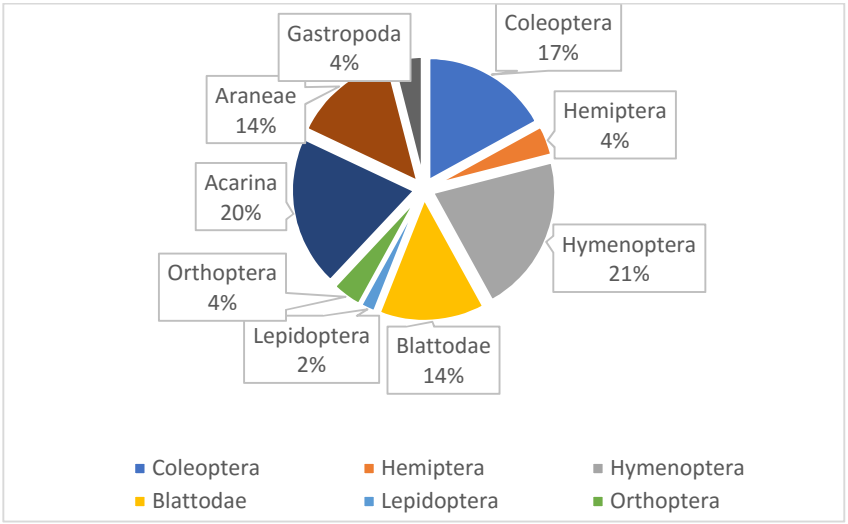

Figure 6. Percentage of prey items found in the stomaches of five species of Scincidae in Nam Dong CA

4. CONCLUSION

Scincid lizards are generally active foraging predators and their dietary composition is largely constrained by resource availability, foraging model, body size, and diversity of appropriately sized preys (Honda et al., 1999; Miles et al., 2007; Ngo et al., 2014, 2015). Our stomach content analyses revealed that five representatives of the Scincidae family in Nam Dong CA feed on various prey taxa.

In this study, the most abundant prey of the family Scincidae in Nam Dong CA was Hymeoptera and the lowest prey was Lepidoptera. Although the prey taxon diversity may be correlated with the different sample sizes, it is remarkable that the highest diversity

of prey taxa could be documented for *Eutropis macularius*, the lowest prey taxon diversity for *Tropidophorus hainanus* and *Scincella reevesii.* In the previous study of Ngo (2020) showed that the Bronze Skink *E. macularius* is an omnivorous species. In this study, we found 27 items belonged to seven taxa in stomach of this species including most of insect, ant, spider… Facing the high energetic value of the prey consumed and its relative abundance, it can be expected that these species spend less time for foraging than the others.

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THÀNH PHẦN THỨC ĂN CỦA NĂM LOÀI TRONG HỌ THẰN LẰN BÓNG (REPTILIA: SQUAMATA) ĐƯỢC KHI NHẬN TẠI KHU BẢO TỒN CÁC LOÀI HẠT TRẦN QUÝ, HIẾM NAM ĐỘNG, TỈNH THANH HÓA

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TÓM TẮT

Chúng tôi tiến hành phân tích 15 dạ dày của năm loài trong họ Scincidae đã được thu tại Khu bảo tồn các loài hạt trần quý hiếm Nam Động, tỉnh Thanh Hóa. Một mẫu thuộc loài *Eutropis macularius,* ba mẫu của loài *Scincella reevesii*, ba mẫu của loài *Sphenomorphus cryptotis,* năm mẫu của loài *Sphenomorphus indicus* và ba mẫu của loài *Tropidophorus hainanus* đã thu được tổng số 71 mẫu thức ăn. Hầu hết trong dạ dày của 15 mẫu này đều có thức ăn trừ dạ dày của ba mẫu thuộc loài *Tropidophorus hainanus* đã ghi nhận rất ít mẫu thức ăn trong dạ dày của loài này. Các mẫu thức ăn được tìm thấy nhiều nhất là côn trùng, chủ yếu là bọ ve, nhện, mối, mọt gỗ và kiến. Những thành phần khác như cát, sỏi nhỏ, một ít thực vật thì sẽ không được phân tích cụ thể. So sánh thành phần thức ăn của năm loài, chúng tôi ghi nhận loài *Eutropis macularius* có hệ thức ăn đa dạng nhất và thấp nhất là *Tropidophorus hainanus* and *Scincella reevesii,* điều này có thể lí giải do kích thước của các loài khác nhau dẫn đến số lượng thức ăn trong dạ dày cũng có sự chênh lệch.

Từ khóa: Khu bảo tồn Nam Động, sinh thái, thằn lằn, thức ăn.

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