FIRST RECORD OF THE GENUS *Leptophion* Cameron (Hymenoptera: Ichneumonidae: Ophiioninae) FROM VIETNAM

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ABSTRACT

The genus *Leptophion* is recorded for the first time from Vietnam, including new records of three species, viz. *L. giganteus* Shimizu & Watanabe, *L. maculipennis* (Cameron) and *L. radiatus* (Uchida), for the country. The comparative morphological and pictorial characters of Vietnamese specimens were given. In addition, variations and in-country distribution of newly recorded species were also provided.

**Keywords:** Ichneumonoidea, new records, parasitoids, taxonomy, wasps.

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INTRODUCTION

Ophioninae Shuckard, 1840 is one of the largest ichneumonid subfamilies with more than 1,100 recognized species in 33 genera all over the world (Gauld & Mitchell, 1981; Yu et al., 2016; Shimizu et al., 2016; Shaw & Voogd, 2019). They are solitary koinobiont endoparasitoids of Lepidoptera larvae and have nocturnal behavior (Gauld & Mitchell, 1981; Broad & Shaw, 2016). Despite being one of the most species-rich group, the Ophioninae has been poorly studied in Vietnam. Up to the present, only 25 species of three genera, viz. Dicamptus Szépligeti, 1905, Dictyonotus Kriechbaumer, 1894 and Enicospilus Stephens, 1835, have been known from the country (Gauld & Mitchell, 1981; Shimizu & Konishi, 2016; Vas, 2017; Pham & Long, 2016; Pham et al., 2020).

The genus Leptophion Cameron, 1901 comprises 33 currently recognized species, of which the most species richness was found in the Australasian region (21 species), followed by the Oriental region (14 species) (Shimizu et al., 2016; Yu et al., 2016). Whereas there are only few species occur in the Oceanic region (three species) and the Palaearctic region (one species), none has been known from the Afrotropical, the Nearctic and the Neotropical regions. Within the Oriental region, representatives of Leptophion were reported from Brunei, China, India, Indonesia, Malaysia, Myanmar, Nepal, Sri Lanka, Taiwan and Thailand, however, this genus has not been recorded in Vietnam so far (Gauld & Mitchell, 1981; Yu et al., 2016). Based on a new collection of ichnemnonids from Vietnam, we herein record the genus Leptophion for the first time from the country, with three included species. It is one among our efforts to study the diversity of Ichneumonidae in general and of Ophioninae in particular from the country.

MATERIALS AND METHODS

Specimens examined in this study were collected from 2004–2020 mainly by light traps and a lesser degree by sweep nets. All the specimens are deposited in the collection of Department of Insect Systematics, Institute of Ecology and Biological Resources (IEBR), Ha Noi, Vietnam. Other collections refer to in this paper are the Natural History Museum, London, UK (NHMUK), Laboratory of Systematics Entomology of Hokkaido University, Sapporo, Japan (SEHU) and Taiwan Agricultural Research Institute Council of Agriculture, Taichung, Taiwan (TARI).

Terms and indices:

Morphological terminology follows Broad et al. (2018) and those for wings follow Shimizu (2020). Indices follow those of Gauld & Mitchell (1981) and Shimizu et al. (2016) as below:

- **AI**: Alar Index for fore wing = length of 1m-cu&M between 2m-cu and bulla / length of 2rs-m
- **CI**: Cubital Index for fore wing = length of CU between 1m-cu&M and 2cu-a / length of 2cu-a
- **DMI**: Dorsal Metasomal Index = length of dorsum of T2 / length of dorsum of T3
- **FI**: Frontal Index for head = maximum diameter of median ocellus / distance between eyes
- **ICI**: Intercubital Index for fore wing = length of 2rs-m / length of M between 2m-cu and 2rs-m
- **NI**: Nervellar Index for hind wing = length of CU between M and cu-a / length of cu-a
- **PI**: Petiolar Index for T1 = distance between base of T1 and anterior margin of spiracle / distance between posterior margin of spiracle and apex of T1
- **SDI**: Second Discoidal Index for fore wing = length of CU between 2cu-a and 2m-cu / length of CU between M&RS and 1m-cu&M
Digital images of specimens were taken with a Leica IC80HD camera attached to Leica M80 stereomicroscope, except their wings were taken with a ILCE-500L/WAP2 digital camera attached to Leica M80 stereomicroscope.

**RESULTS**

**Taxonomy**

*Genus Leptophion* Cameron, 1901

*Leptophion* Cameron, 1901: 227. Type species: *Leptophion longiventris* Cameron, by monotypy.

**Diagnosis.** Mandibles not twisted, barely narrowed, often with a sub-basal swelling and an oblique groove on outer surface; mandibular teeth subequal or upper tooth slightly longer than lower one; clypeus more or less swollen; occipital carina complete dorsally and laterally, its lower end absent, not joining to oral carina; notauli faintly present as vestiges or completely absent; epicnemial carina present and its upper end reaching above level of lower margin of pronotum; posterior transverse carina on mesosternum usually complete (rarely interrupted in a few Australasian species); propodeum with anterior transverse carina complete (rarely absent laterally in some species), posterior transverse carina absent, sometimes with vestiges laterally; fore wing with a glabrous area on anterior corner of discosubmarginal cell and almost always without distinct sclerite; 1m-cu&M vein on fore wing sinuous or curved, usually without ramellus; fore tibial spur without membranous flange; mid and hind trochantelli simple; hind tarsal claws with distal pectina usually projecting beyond apical tooth (Gauld & Mitchell, 1981; Shimizu et al., 2016; personal observations).

*Leptophion* species are most similar to members of *Dicamptus* because they share the characteristic of mandible shape, but they are lacking the sclerites in discosubmarginal cell of the fore wing (almost always absent) while one or more clearly defined sclerites always present in the latter genus. Key to Indo-Papuan genera of Ophioninae can be found in Gauld & Mitchell (1981).

**Figure 1.** Head, frontal view of a *L. giganteus*, b *L. maculipennis* and c *L. radiatus* (scale bar 1 mm)

**New country records**

*Leptophion giganteus* Shimizu & Watanabe, 2016 (Figs 1a, 2a, 3a, 4a)

*Leptophion giganteus* Shimizu & Watanabe. In Shimizu, Watanabe & Maeto, 2016: 79. Holotype: ♀, Taiwan (TARI).

Diagnostic characters. Fore wing without sclerite, vein 2r&Rs joining pterostigma proximally, Second Discoidal Index (SDI) from 1.2–1.4, postero-proximal part of second subdiscal cell distinctly infumate, postero-discal corner of subbasal cell from 85–105°, postero-discal corner of second discal cell from 95–108°; hind wing with all hamuli on R1 uniform in size and shape, proximal corner of marginal cell about 45°; scutellum with lateral carina present on anterior 0.2–0.3; mesopleuron punctate.
Specimens examined. Dong Nai Province, Cat Tien National Park: 1♀ (IEBR), 8.viii.2005, Truong Xuan Lam coll.; Cao Bang Province, Phia Oac-Phia Den National Park, 1♀ (IEBR), 15.v.2010, 1600 m, light trap, Hoang Vu Tru coll.; Lao Cai Province, Sapa, Ban Khoang: 1♀ (IEBR), 4.vii.2013, light trap, Hoang Vu Tru coll.; Lao Cai Province, Hoang Lien National Park: 1♀ (IEBR), 14.v.2015, light trap, Hoang Vu Tru coll.; 1♀ (IEBR), 24.x.2020, ligh trap, Pham Van Phu coll.; Kon Tum Province, Kon Plong, Mang Canh: 1♀ (IEBR), 5.vi.2019, light trap, Nguyen Van Tuan coll.; Kon Tum Province, Dak Glei: 1♂ (IEBR), 8.iii.2019, 1600–1700 m, Pham Van Phu coll.

Distribution. Previously known from Taiwan (Shimizu et al., 2016). These are the first records of this species from Vietnam.

Figure 2. Wings of a L. giganteus, b L. maculipennis and c L. radiatus (scale bar 5 mm)

*Leptophion maculipennis* (Cameron, 1905)
(Figs 1b, 2b, 3b, 4b)

*Spilophion maculipennis* Cameron, 1905: 125. Lectotype: ♀, Sri Lanka (NHMUK).

*Leptophion maculipennis*: Townes, Townes & Gupta, 1961: 265.

Diagnostic characters. Fore wing without sclerite, vein 2r&Rs joining pterostigma proximally, Second Discoidal Index (SDI) about 0.9, proximal corner of marginal cell distinctly infumate, postero-distal corner of subbasal cell from 78–88°, postero-discal corner of second discal cell from 88–99°;
First records of the genus Leptophion

hind wing with penultimate hamulus on R1 longer and more curved than its fellows, proximal corner of marginal cell from 90–95°; mandible with an oblique groove; scutellum with lateral carina extending to posterior 0.1–0.2; mesopleuron punctate and striate, with black marking.

Specimens examined. Thai Nguyen Province, Dinh Hoa, Phu Dinh: 1 ♀ (IEBR), 2.iv.2004, 100 m, Hoang Vu Tru coll.; Lao Cai Province, Sapa: 1 ♀ (IEBR), 8.x.2004, light trap, Nguyen Thi Thu Huong coll.; Vinh Phuc Province, Tam Dao National Park: 1 ♀ (IEBR), v.2013, light trap, Hoang Vu Tru coll.; Bac Can Province, Ba Be National Park: 1 ♀ (IEBR), 12.v.2014, Hoang Vu Tru coll.; Cao Bang Province, Phia Oac-Phia Den National Park: 2 ♀ (IEBR), 7.v.2013, light trap, Hoang Vu Tru coll.; 2 ♀ (IEBR), 23.v.2020, Hoang Vu Tru & Pham Van Phu coll.; Tuyen Quang Province, Na Hang, Trung Phin: 2 ♀ (IEBR), 18.ix.2017, light trap, Pham Thi Nhi, Hoang Vu Tru & Pham Van Phu coll.; Son La Province, Copia National Park: 1 ♀ (IEBR), 4.ix.2016, light trap, Pham Van Phu coll.; Kon Tum Province, Dak Glei: 1 ♀ (IEBR), 10.iii.2019, sweep net, Pham Van Phu coll.

Distribution. Previously known widely from the Australasian region (Australia and Papua New Guinea) and the Oriental region (China, India, Indonesia, Malaysia, Nepal, Sri Lanka, Thailand and Taiwan) (Gauld & Mitchell, 1981; Shimizu et al., 2016). These are the first records of this species from Vietnam.

Figure 3. Mesopleuron of a L. giganteus, b L. maculipennis, c L. radiatus, and Proximal corner of marginal cell and hamuli on hind wing of d L. giganteus, and e L. maculipennis (scale bar 1 mm)

Leptophion radiatus (Uchida, 1956) (Figs 1c, 2c, 3c, 4c)

Spilophion radiatus Uchida, 1956: 18. Holotype: ♀, Taiwan (SEHU).

Leptophion radiatus: Townes, Townes & Gupta, 1961: 306.

Diagnostic characters. Fore wing without sclerite, vein 2r&Rs joining pterostigma proximally, Second Discoidal Index (SDI) about 0.9, postero-proximal part of second subdiscal cell distinctly infumate, postero-distal corner of subbasal cell about 62°, postero-discal corner of second discal cell about 80°; hind wing with all hamuli on R1 uniform in size and shape, proximal corner of marginal cell about 45°; scutellum with lateral carina present on
anterior 0.2–0.3; mesopleuron punctate; mesosternum black.

Specimen examined. Kon Tum Province, Kon Plong, Mang Canh: 1♂ (IEBR), 5.vi.2019, light trap, Nguyen Van Tuan coll.

Distribution. Previously known from India, Laos, Malaysia, Nepal and Taiwan (Gauld & Mitchell, 1981; Shimizu et al., 2016). It is the first record of this species from Vietnam.

**Figure 4.** Dorsal view of scutellum of a *L. giganteus*, b *L. maculipennis*, and c *L. radiatus* (scale bar 0.5 mm)

**Figure 5.** Distribution map of *Leptophion* species in Vietnam: 1. *L. giganteus*; 2. *L. maculipennis*; 3. *L. radiatus*
Table 1. Morphological comparison of *Leptophion* species recorded from Vietnam and other localities

| Characters                                      | *L. giganteus* Vietnam | *L. megacephalum* Taiwan (Shimizu et al., 2016) | *L. maculipennis* Vietnam | *L. radiatus* Taiwan (Shimizu et al., 2016) | Others (Gauld & Mitchell, 1981) |
|------------------------------------------------|------------------------|-----------------------------------------------|---------------------------|---------------------------------------------|---------------------------------|
| 20th flagellomere (long:wide)                  | 2.0–2.5                | 1.9–2.3                                       | 1.9–2.1                   | 2.2                                         | 2.4–2.7                         |
| Length of fore wing (mm)                       | ♀: 17–21              | ♀: 17–21                                      | ♀: 15–17                  | ♀: 11.7                                      | ♀: 14.5–15                     | 13–15                           |
| Postero-discal corner of second discal cell on fore wing (degree) | 95–108                | 105–110                                       | 88–99                     | 95                                          | 80                             | 85                              |
| Proximal corner of marginal cell on hind wing (degree) | 45                    | 45                                            | 90–95                     | 95                                          | 90–95                          | 50                              | 45                             | 45 |
| AI                                             | 1.0–1.4                | 1.1–1.4                                       | 1.1–1.3                   | 1.0–1.4                                     | 1.3–1.65                       | 0.9                             | 0.8–0.9                       | 0.85–1.0                        |
| CI                                             | 0.3–0.4                | 0.2–0.3                                       | 0.3–0.4                   | 0.2–0.4                                     | 0.2–0.25                       | 0.2                             | 0.2–0.3                       | 0.15–0.25                       |
| DMI                                            | 1.1–1.3                | 1.2–1.3                                       | 1.1–1.3                   | 1.1–1.3                                     | 1.2                            | 1.1–1.2                         |
| FI                                             | 0.6–0.7                | 0.6–0.7                                       | 0.5–0.6                   | 0.5–0.7                                     | 0.6                            | 0.6                             |
| ICI                                            | 0.9–1.2                | 0.9–1.0                                       | 0.7–1.0                   | 0.7–0.9                                     | 0.65–0.75                      | 0.6                             | 0.5–0.7                       | 0.59–0.65                       |
| NI                                             | 1.3–1.7                | 1.5–1.7                                       | 1.0–1.4                   | 1.1–1.2                                     | 1.0–1.2                        | 1.3                             | 1.1–1.5                       | 1.4–1.6                         |
| PI                                             | 2.3–2.6                | 2.3–2.6                                       | 2.5–2.7                   | 2.1–2.5                                     | 2.4                            | 2.3–2.6                         |
| SDI                                            | 1.2–1.4                | 1.1–1.2                                       | 0.7–0.9                   | 0.85–0.95                                   | 0.9                            | 0.9–1.0                         | 0.85–0.95                     |
DISCUSSION

Although type specimens of Leptophion giganteus, L. maculipennis and L. radiatus have not been examined by us, the Vietnamese specimens agreed well with descriptions and illustrations of these species by Gauld & Mitchell (1981) and Shimizu et al. (2016). Our new findings showed that the species composition of Leptophion in Vietnam is more or less similar to that of Taiwan. Additionally, L. maculipennis is a widespread species from the Australasian region to the Oriental region, L. radiatus is known from India, Malaysia, Nepal and Taiwan, whereas L. giganteus is also recorded from Taiwan and Vietnam. Since the latter species was described recently (Shimizu et al., 2016), further studies is required to elucidate the actual distribution of this species. Compared with Leptophion specimens from other localities, populations from Vietnam revealed some morphological variations (Table 1). The most noticeable variation is the fore wing length of female specimens. The fore wing length of female specimens of L. giganteus from Vietnam is equal to that of Taiwanese specimens, however, L. maculipennis from Taiwan with the longer fore wing, i.e. 17–20 mm vs. 15–17 mm in specimens of L. maculipennis collected from Vietnam and to the contrary, L. radiatus found Taiwan with the shorter fore wing, i.e. 11.7 mm vs. 14.5–15 mm in specimens of the same species collected from different localities in Vietnam. The Second Discoidal Index for fore wing (SDI) of the Vietnamese L. giganteus varies from 1.2–1.4, somewhat greater than that in Taiwanese specimens (1.1–1.2). The Petiolar Index for T1 (PI) of the Vietnamese L. maculipennis (2.5–2.7) is longer than that of Taiwanese specimens. The Nervellar Index for hind wing (NI) of the Vietnam L. radiatus (1.3) and the ratio between the length and width of 20th flagellomere (2.2) are both smaller than those of other localities (see Gauld & Mitchell, 1981) (1.4–1.6 and 2.4–2.7, respectively). The Alar Index for fore wing (AI) of L. maculipennis between Vietnamese and Taiwanese specimens (1.0–1.4) is slightly smaller than data recorded from other localities (1.3–1.65) by Gauld & Mitchell (1981).

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