

Scolia watanabei, an adventive wasp newly discovered in Japan (Hymenoptera, Scoliidae, Scoliinae)

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外来種ワタナベツチバチ（ハチ目、ツチバチ科）の日本からの発見

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抄録：大阪市南港中央公園における訪花性ハチ目昆虫のモニタリング調査の過程で、これまで日本から記録のないワタナベツチバチ *Scolia watanabei* (Matsumura) (ハチ目ツチバチ科) が発見された。本種は、大型で顕著な斑紋を持つにもかかわらずこれまで記録がないこと、また本種の分布が知られている中国、台湾を含む海外からの大量の貨物が運び込まれる港湾地区でのみ見られることから、外来種であると考えられる。本種が確認されているのはごく狭い範囲に限られているため、侵入の初期の段階にあると考えられる。

Abstract: An aculeate wasp, *Scolia watanabei* (Matsumura) (Scoliidae), was newly discovered in Japan in the course of a survey of flower visiting hymenopterans at Nanko Chuo Park in Osaka City. This wasp is regarded as adventive in Japan because it had not been recorded in the country despite its conspicuousness, large size and striking maculation of the body, and the fact that the wasp was found only in the harbour district in Osaka City to which a large amount of cargo has been imported from foreign countries including China and Taiwan where this wasp is native. The distribution records of this wasp in Japan are confined to a very narrow area, suggesting it is in the initial phase of invasion.

Key words: Alien species, China, Taiwan, parasitoid wasp, Scarabaeidae,

Introduction

Like other groups of insect, records of newly adventive hymenopterans have been increasing in a recent rapid globalization (e.g. Ueno, 2014; Yamazaki and Matsumoto, 2005; Yoshida and Matsumoto, 2015; Matsumoto et al., 2018). In 2018, a scoliid wasp of notably unusual appearance was found in considerable numbers in the course of monitoring flower visiting Hymenoptera at Nanko Chuo Park in Osaka City. The wasp was identified as *Scolia watanabei* (Matsumura, 1912) which is distributed in Taiwan, China, India and Myanmar and had never been found in Japan. Here we record this species from Japan for the first time with a note on flowers visited by the wasp.

Materials and methods

Materials used in this study were obtained in the course of a survey of flower visiting Hymenoptera at Nanko Chuo Park in Osaka City by M. Hasegawa (the results will be published

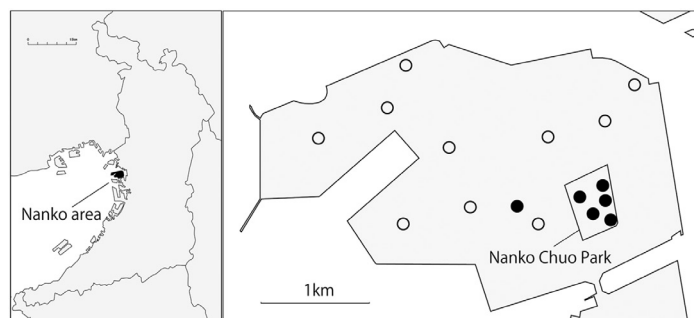


Fig. 1. Study area. (Circles show sites searched for *Scolia watanabei* in October. (○:absent, ●:present))

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elsewhere) and additional specimens were collected at the same locality by Matsumoto and Ichikawa in October, 2018. One Chinese male was used for comparison. All specimens examined were deposited in Osaka Museum of Natural History (OMNH). The Nanko Chuo Park is located in the Nanko district in Osaka city (Fig. 1), which was reclaimed from Osaka Bay from 1958. It is about 0.23 km² and has a playground, a baseball field and tennis courts and otherwise covered with grasses and planted shrubbery. We also checked flowers for the wasp at several sites (Fig. 1) in the Nanko area to assess the range of the wasp.

Results

Scolia (Discolia) watanabei (Matsumura, 1912)

- Discolia watanabei* Matsumura, 1912: 180, Pl. LIII, fig.12, ♂ (not ♀) .
Scplia pekingensis Betrem, 1928: 291, ♀ . Synonymized by Betrem 1941.
Scolia (Scolia) horni Betrem, 1928: 295, ♂ . Synonymized by Uchida, 1934.
Scolia (Scolia) kempfi Betrem, 1928: 294, ♀ . Synonymized by Gupta & Jonathan, 2003.
Scolia watanabei: Matsumura, 1931: 28, fig.144, ♂ (not ♀) .
Scolia watanabei: Uchida, 1934: 251, Taf II, fig.20, ♂ .
Scolia watanabei f. *shirakii* Uchida, 1934: 251, Tab II, fig.35, ♂ .
Scolia (Scolioides) watanabei: Betrem, 1941: 147.
Scolia (Scolioides) watanabei var. *pekingensis*: Betrem, 1941: 149.
Scolia (Scolioides) watanabei pekingensis: Yasumatsu, 1946: 14.
Scolia (Discolia) watanabei: Betrem & Bradley, 1964: 92.

Specimens examined

8 ♂2 ♀, Nanko Chuo Park (34.6330°N, 135.4324°E), Osaka-shi, Osaka, 1.X.2018 (M. Hasegawa); 1 ♂, Same Locality, 2.X.2018 (R. Matsumoto) ; 5 ♂48 ♀, Same Locality, 9.X.2018 (R. Matsumoto & A. Ichikawa) ; 2 ♂28 ♀, Same Locality, 25. X. 2018 (R. Matsumoto) ; 3 ♂11 ♀, Same Locality, 5.XI.2018 (R. Matsumoto) ; 1 ♀, Nanko Naka (34.6311°N, 135.4251°E), Osaka-shi, Osaka, 25.X.2018 (R. Matsumoto) ; 1 ♂, Soochow, China, 22. IX. 1918 (I. Suenson) .

At ten out of eleven sites outside the Nanko Chuo Park (Fig. 1), where we checked the flowers of *Solidago altissima* L. for *S. watanabei*, the wasp was not detected except one at Nanko Naka, 500 m west of Nanko Chuo Park, where a female was visiting a flower.

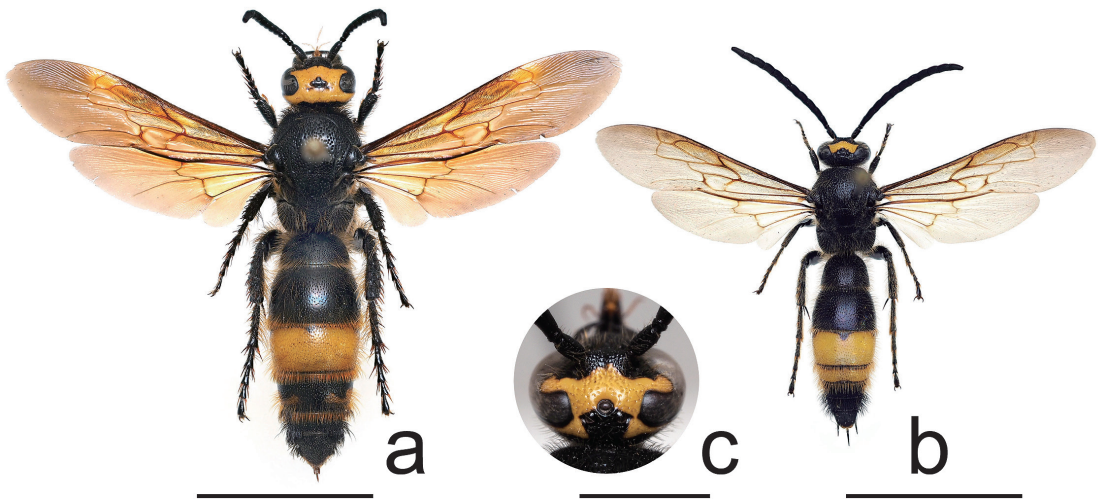


Fig. 2. *Scolia watanabei*, habitus in dorsal view. a: female, b: male, and c: head of male with extensively developed maculation. Bar: 10 mm for a, b; 3 mm for c.

Description of Japanese specimens

The Japanese specimens agree very well with the descriptions of Matsumura (1912), Uchida (1934) and Tsuneki (1972) of the male and with Yamane (1995) of the female. Here we describe the colour pattern of the body (Fig. 2), which is somewhat variable.

Male (Fig. 2b, c). Body black. Head with orange yellow marking occupying frons and upper part of supra-antennal area, usually extending sideways and occupying upper half of eye incisions. On vertex there are usually two triangular orange yellow spots located obliquely behind postocelli, spots usually connected with frontal marking (Fig. 2c). Lateral corner of this spot sometimes narrowly extended laterally along outer margin of eye to reach base of mandible. This narrow band sometimes separated from spot or rarely absent. In specimens with markings least developed, frontal marking not extending to eye incision and both posterior spots and narrow band along eye margin completely absent, resulting in more quadrate frontal marking (Fig. 2b). Metasomal tergite 3 entirely yellow except tiny black notch at middle on anterior margin. Posterior half of tergite 4 yellow, this yellow band sometimes developed to cover whole visible part of tergite or reduced to a pair of thin, transverse markings. Fifth tergite sometimes with a pair of lateral small spots but usually fifth and following tergites black. Sternites 3 and 4 each with small orange triangular spots laterally.

Female. Body black. Head with area behind level of eye incisions orange yellow except small triangular area surrounded by ocelli, and small, transverse band behind it black. The yellow area extending laterally along outer margin of eye, downwards to level of 1/2 to 2/3 of the height of eye. Metasomal tergite 3 entirely orange yellow except extreme margin very narrowly black. Sternite 3 and sometimes 4 with small triangular spots laterally.

Body length. Female 17mm to 23 mm, male 15mm to 20 mm.

Flowers visited

Scolia watanabei was collected from flowers of *Achyranthes bidentata* Blume var. *fauriei* (H. Lév. et Vaniot) (Amaranthaceae) (Fig. 4a) and *Justicia procumbens* L. (Acanthaceae) early in October. The former was the main nectar source for the wasp. Later in October, these plants finished flowering and *Solidago altissima* L. (Asteraceae) attracted many individuals (mainly females) (Fig. 4b) instead.



Fig. 3. Metasoma of *Scolia watanabei* in ventral view. a: female, b: male. Bar: 5 mm.



Fig. 4. Females of *Scolia watanabei* visiting flowers. a: *Achyranthes bidentata* var. *fauriei*, b: *Solidago altissima*.

Discussion

Scolia watanabei was described based on the holotype male from Taiwan (Matsumura, 1912) under the genus *Discolia* Saussure & Sichel, 1864, which is now treated as subgenus of the genus *Scolia*, with Yamane (1995) later describing the female. Betrem (1928) described *Scolia pekingensis* which was later treated as a variety of *watanabei* by Betrem (1941) and as a subspecies of *watanabei* by Yasumatsu (1946). Gupta and Jonathan (2003) treated *Scolia kempi* Betrem, 1928 from eastern India and Myanmar as another subspecies of *S. watanabei*. So *S. watanabei* is native to China, Taiwan, eastern India and Myanmar, and has not previously been recorded extraliminally. In Japan this wasp is considered to be adventive because it had never been recorded in spite of its conspicuousness, large size and striking maculation of the body. This supposition is supported by the fact that the wasp was found only in the harbour district in Osaka City where a large amount of cargo arrives from foreign countries, including China, Taiwan.

Three subspecies, viz. *watanabei* from Taiwan, *pekingensis* from north China, and *kempi* from India and Myanmar have been recognized in *S. watanabei*, (Yasumatsu, 1946; Tsuneki, 1972; Gupta and Jonathan, 2003). Tsuneki (1972) described males of *pekingensis* as differing from the nominate subspecies in having the yellow mark on the head transversely linear and maculation of the metasoma confined mainly to the third tergite. Yamane (1995) described metasomal sternites 3-5 of the male of *S. watanabei* from Taiwan as having yellow lateral spots in his key to Taiwanese species of Scoliinae. Gupta and Jonathan (2003) described *kempi* can be differentiated from *pekingensis* by vertex of the female, which is maculated with yellow (entirely black in *pekingensis*) and third and fourth tergites of the male maculated with yellow. The markings on the head of Japanese males is not transversely linear and metasomal tergites 3 and 4 have orange yellow bands or pairs of markings unlike that of Chinese specimens described by Tsuneki (1972). Vertex of the Japanese females is widely yellow unlike Chinese female described by Gupta and Jonathan (2003). On the other hand, sternite 5 of Japanese males lacks lateral spots, unlike Taiwanese specimens described by Yamane (1995) and spots on sternites 3 and 4 are neither large nor elongated unlike specimens from Myanmar described by Gupta and Jonathan (2003). Furthermore the Japanese population shows significant variation in body markings. In this situation, we could not identify the Japanese specimens to subspecies so we record the species pending subspecies identification.

Scoliid wasps are known as parasitoids of scarabaeid and lucanid larvae (Coleoptera). In the study area, *Gametis forticula* (Janson, 1881), *Gametis jucunda* (Faldermann, 1835), *Protaetia orientalis submarumorea* (Burmeister, 1842), *Protaetia brevitarsis* (Lewis, 1879) and *Anomala albopilosa* (Hope, 1839) of Scarabaeidae are abundant and seem to be potential hosts of *S. watanabei*; however, this has not been confirmed. In fact male wasps were observed flying around cut and piled grass, under which were larvae of scarabaeid beetles.

The second author, Hasegawa has monitored the flower visiting Hymenoptera at Nanko Chuo Park twice to three times a month from April to October in 2018. In this monitoring, *S. watanabei* had never been detected until September 19th, but in October it came to be the most dominant species of all flower-visiting Hymenoptera (Hasegawa unpublished). Although it is not clear when this wasp was introduced to Osaka, because it had not been found at almost all sites in the Nanko area other than Nanko Chuo Park, nor in other localities in Japan, it is possible that the wasp was introduced very recently and is in the initial stage of invasion in Japan.

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