Distribution of Asphondylia Gall Midges (Diptera: Cecidomyiidae) in Japan

Uechi, Nami
Tokuda, Makoto
Yukawa, Jun-ichi

http://hdl.handle.net/2324/2656
Distribution of *Asphondylia* Gall Midges  
(Diptera: Cecidomyiidae) in Japan

Nami UECHI, Makoto TOKUDA  
Entomological Laboratory, Graduate School of Bioresource and Bioenvironmental Sciences,  
Kyushu University, Fukuoka, 812-8581 Japan  

and  

Junichi YUKAWA  
Entomological Laboratory, Faculty of Agriculture,  
Kyushu University, Fukuoka, 812-8581 Japan

**Abstract.** Either summer or winter hosts have been known for the Japanese multivoltine gall midges of the genus *Asphondylia*. We renew the distribution records of these gall midges based on more recent and detailed collecting data that have been accumulated since Yukawa & Masuda (1996). Distributional information of each *Asphondylia* gall midge is quite important to combine gall midges utilizing summer hosts with those utilizing winter hosts, because host alternation by the gall midges has been suspected. The distributional information indicated two possible combinations between spring-summer and autumn-winter gall midges.

**Key words:** *Asphondylia*, Cecidomyiidae, gall, distributional information, multivoltine, host plant.

**Introduction**

In Japan, *Asphondylia* gall midges have been collected from at least 20 plant species of 18 families (Yukawa, 1971; Yukawa, 1982; Yukawa & Masuda, 1996; Table 1). Most of these species are multivoltine and cannot complete their annual life history on a single
host plant, because plant organs for oviposition do not exist on their respective host plants at the adult emergence season. Therefore, they have to find both summer and winter hosts that are utilized alternately in a year. Our recent field survey and DNA analysis suggest the possibility of host alternation by these gall midges (Yukawa et al., in preparation). In addition to these survey and analysis, the distributional information of each gall midge is quite important to combine summer and winter hosts that are necessary to coexist in the distribution range of respective gall midges.

The distributional information of the Japanese Asphondylia gall midges was roughly indicated in Yukawa & Masuda (1996). In the present paper, we renew the distribution records of the Japanese Asphondylia gall midges based on more recent and detailed collecting data that our colleagues and we have been accumulating since 1996.

Materials and Methods

We collected fruit or bud galls produced by Asphondylia gall midges on their respective host plants at various localities in Japan. For identification, some of the collected galls were dissected under a binocular microscope to obtain larval and pupal specimens. Remaining galls were maintained in plastic containers (10 cm in diameter, 6 cm in depth) to rear adult midges. Mature larvae, pupae or emerged adults were put into 70-75% ethanol for morphological observation or 99.5% acetone for DNA analysis. In addition to our own collecting data, we referred to distributional information from our colleagues.

In the present list, we arranged the collecting records of Asphondylia midge galls according to the usual systematic order of plant families. Respective collecting records consist of galled part, host plant, locality, collecting date, collector, and some other biological information. The names of Japanese main islands are abbreviated in brackets as HK (Hokkaido), HS (Honshu), SH (Shikoku), KY (Kyushu), and SW (the Southwestern Islands south of Yakushima Is.), and followed by the names of prefectures. The names of locality with an asterisk mean that the galls have previously been collected from that place, otherwise they were collected there for the first time. The collecting dates with a plus mark mean that the galls were collected there more than one time.

Some of collector's names are abbreviated as follows: JY (J. Yukawa), NU (N. Uechi), MT (M. Tokuda), and SU (S. Usuba).

Results

MORACEAE
Axillary bud gall on Morus alba L. by Asphondylia morivollena (Naito)

Most of galls collected in 2001 were parasitized by eurytomid wasps.

HAMAMELIDACEAE

Fruit gall on *Distylium racemosum* Sieb. et Zucc. (Fig.1A) by *Asphondylia* sp.


This gall was recorded previously only on Okinawa Is. We added the collection records from Ishigaki Is. and Fukuoka, for the first time.

ANACARDIACEAE

Flower bud gall on *Rhus succedanea* L. by *Asphondylia* sp.


Flower bud gall on *Rhus sylvestris* Sieb. et Zucc by *Asphondylia* sp.


CELASTRACEAE

Fruit gall on *Celastrus orbiculatus* Thunb. by *Asphondylia* sp.

[KY: Fukuoka]: Mt. Kusenbusan, Nakagawa Town, 12 Aug. 2001+, NU.

VITACEAE

Fruit gall on *Ampelopsis brevipedunculata* (Maxim.) Trautv. by *Asphondylia baca* Monzen


This is the first record of the fruit gall produced by *Asphondylia baca* on Ishigaki Is. Also see remarks.

Fruit gall on *Ampelopsis brevipedunculata* forma *glabrifolia* (Honda) Kitamura by *Asphondylia baca* Monzen

[SW: Okinawa]: Banna Park, Ishigaki City, 2 Mar. 2001+, NU.
Fruit gall on *Cayratia japonica* (Thunb.) Gagnep by *Asphondylia* sp.


**CORNACEAE**

Fruit gall on *Aucuba japonica* Thunb. by *Asphondylia aucubae* Yukawa et Ohsaki


Fruit gall on *Aucuba japonica var. borealis* Miyabe et Kudo by *Asphondylia aucubae* Yukawa et Ohsaki


Fruit gall on *Helwingia japonica* (Thunb.) F. G. Dietr. by *Asphondylia* sp.


This gall was recorded previously only in Kagoshima Prefecture. We added the collection records from Yamanashi, Kyoto and Fukuoka Prefectures, for the first time.

**ERICACEAE**
DISTRIBUTION OF *ASPHONDYLIA* GALL MIDGES

**Figs. 1A-D:** Galls produced by *Asphondylia* gall midges; A: fruit galls on *Distylium racemosum* [HAMAMELIDACEAE]; B: flower bud galls on *Pieris japonica* [ERICACEAE]; C: Fruit gall on *Ardisia japonica* [MYRSINACEAE]; D: Fruit galls on *Callicarpa japonica* [VERBENACEAE] (The fruit was all transformed into galls).

Flower bud gall on *Pieris japonica* D. Don (Fig. 1B) by *Asphondylia* sp.


**MYRSINACEAE**

Fruit gall on *Ardisia japonica* (Thunb.) Bl. (Fig. 1C) by *Asphondylia* sp.


**OLEACEAE**
Fruit gall on *Ligustrum japonicum* Thunb. by *Asphondylia sphaera* Monzen


Flower bud gall on *Ligustrum japonicum* Thunb. by *Asphondylia sp.*


An unidentified gall midge producing flower bud galls on *L. japonicum* has been considered to be different from *A. sphaera* that is responsible for fruit galls on the same host plant (Yukawa & Masuda, 1996). In the present paper, however, they are treated as an identical species because our preliminary DNA analysis indicated their similarity (unpublished data).

Fruit gall on *Ligustrum obtusifolium* Sieb. et Zucc. by *Asphondylia sphaera* Monzen


Fruit gall on *Osmanthus heterophyllus* (G. Don) P. S. Green by *Asphondylia sp.*

DISTRIBUTION OF ASPHONDYLIA GALL MIDGES

RUBIACEAE
Flower bud gall on *Paederia scandens* (Lour.) Merrill by *Asphondylia* sp.

[KY: Fukuoka]: Inunaki, Wakamiya Town, 8 Jul. 1999, NU; Kyushu Univ. Forest, Sasaguri Town, 19 Sep. 2000+, NU.

VERBENACEAE
Fruit gall on *Callicarpa japonica* Thunb. (Fig. 1D) by *Asphondylia* sp.


Most of galls were parasitized by eurytomid wasps. See remarks for further details.

CAPRIFOLIACEAE
Bud gall on *Weigela coraeensis* Thunb. by *Asphondylia diervillae* Felt


Bud gall on *Weigela decora* Nakai [New host rec.] by *Asphondylia diervillae* Felt


Bud gall on *Weigela hortensis* K. Koch by *Asphondylia diervillae* Felt


ZINGIBERACEAE
Fruit gall on *Alpinia intermedia* Gagnep by *Asphondylia* sp.


Remarks

The collection records of *Asphondylia* gall midges on the following host plants were excluded from the aforementioned data, because they will be referred to in Yukawa et al. (in preparation) that deals with the host alternation by the soybean pod gall midge: fruit gall on *Prunus zippeliana* Miq. (ROSACEAE); pod gall on *Glycine max* (L.) Merrill, *Glycine usuriensis* Regel et Maack., and *Lespedeza bicolor* Turcz. (FABACEAE); flower bud gall and fruit gall on *Hedera rhombea* (Miq.) Bean (ARALIACEAE).
Table 1. Distributional range of *Asphondylia* gall midges in Japan.

<table>
<thead>
<tr>
<th>Gall midge</th>
<th>Host plant</th>
<th>Hokkaido</th>
<th>Honshu</th>
<th>South of Tohoku</th>
<th>Shikoku</th>
<th>Kyushu</th>
<th>South of Yakushima Is.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Univoltine gall midges</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Asphondylia</em></td>
<td>Morus spp.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>montivora</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Asphondylia</em></td>
<td>Aucuba japonica</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>aucuba</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Asphondylia</em></td>
<td>Ligustrum spp.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>sphaera</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Multivoltine gall midges utilizing spring-summer hosts**

<table>
<thead>
<tr>
<th>Gall midge</th>
<th>Host plant</th>
<th>Hokkaido</th>
<th>Honshu</th>
<th>South of Tohoku</th>
<th>Shikoku</th>
<th>Kyushu</th>
<th>South of Yakushima Is.</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Asphondylia</em></td>
<td>Rhus spp.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>sp.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Asphondylia</em></td>
<td>Amelosia brevipedunculata</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>baca</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Asphondylia</em></td>
<td>Cayratia japonica</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>sp.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Asphondylia</em></td>
<td>Helwingia japonica</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>sp.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Asphondylia</em></td>
<td>Pieris japonica</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>sp.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Asphondylia</em></td>
<td>Callicarpa japonica</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>sp.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Multivoltine gall midges utilizing autumn-winter hosts**

<table>
<thead>
<tr>
<th>Gall midge</th>
<th>Host plant</th>
<th>Hokkaido</th>
<th>Honshu</th>
<th>South of Tohoku</th>
<th>Shikoku</th>
<th>Kyushu</th>
<th>South of Yakushima Is.</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Asphondylia</em></td>
<td>Distylium racemosum</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>sp.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Asphondylia</em></td>
<td>Sapium japonicum</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>sp.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Asphondylia</em></td>
<td>Celastrus orbiculatus</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>sp.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Asphondylia</em></td>
<td>Ardisia japonica</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>sp.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Asphondylia</em></td>
<td>Osmanthus heterophyllus</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>sp.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Asphondylia</em></td>
<td>Paederia scandens</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>sp.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Asphondylia</em></td>
<td>Weigela spp.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>diervillae</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Asphondylia</em></td>
<td>Alpinia intermedia</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>sp.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1 shows the distribution range of univoltine and multivoltine *Asphondylia* gall midges in Japan. The univoltine gall midges can complete their annual life history on a known single host plant species or genus, no matter where they are distributed in. However, we need to combine spring-summer gall midges with autumn-winter gall midges to make their annual life cycle complete. Most of the multivoltine gall midges are distributed commonly in Honshu and Kyushu. Only two of them have been recorded from Shikoku, but further surveys will confirm their occurrence, because many other gall midges that are distributed both in Honshu and in Kyushu are found also in Shikoku (Yano, 1964; Yukawa, 1976; Yukawa, 1977).

Therefore, we focused on the presence or absence records in Hokkaido and on the Southwestern Islands south of Yakushima Island. From Table 1, we suspect the combination
between *A. baca* and *A. diervillae* because they are only multivoltine gall midges distributed in Hokkaido. The galls of *A. diervillae* have never been found on the Southwestern Islands, as species of the genus *Weigela* (its host plants) are not distributed on the islands (Satake et al., 1989). However, *A. baca* is considered to complete its annual life cycle only on *Ampelopsis brevipedunculata* because we observed its fruit galls even in February on these islands.

As mentioned earlier, the fruit gall on *Callicarpa japonica* caused by an *Asphondylia* gall midge is different in appearance and inner structure from that recorded in Yukawa & Masuda (1996). This gall midge was collected from Kyushu (Kagoshima Prefecture) and the Southwestern Islands. A similar distribution pattern was found also for an *Asphondylia* gall midge on *Alpinia intermedia*. We must keep this pattern in mind for establishment of further combinations.

As to the remaining gall midges, we could not divide them into species group to determine possible combinations due to the overlapping of their distribution ranges.

**Acknowledgements**

We wish to express our thanks to the following persons for their help in collecting galls and giving us information on the *Asphondylia* gall midges: Dr. S. Akimoto (Hokkaido Univ.), Mr. K. Goukon (Tohoku Gakuin Univ.), Prof. Y. Iokawa (Joetsu Univ. of Education), Mr. S. Usuba (Saitama City), Mr. K. Ogata (Nishinoomote City), Mr. M. Yukinari (previously in Tokushima Agr. Exp. Stn.), Mr. F. Kawamura (Okinawa Pref. Agr. Stn.), Mr. Y. Tohsaka (Kyoto Univ.), Mr. S. Fukuda (Hachinohe City), Ms. E. Kimura (Aomori City), Mr. S. Sato, Miss M. Shoubu, and Mr. H. Inoue (Kyushu Univ.). Nami Uechi and Makoto Tokuda also thank Dr. O. Tadauchi, Dr. S. Kamitani, and Mr. D. Yamaguchi (Kyushu Univ.) for their encouragement.

**References**


Yukawa, J., 1977. Check list of midge galls of Japan, with descriptions of newly recorded
