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Tokuda, Makoto

Uechi, Nami

Yukawa, Junichi

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Distribution of *Asteralobia* Gall Midges (Diptera: Cecidomyiidae) Causing Axillary Bud Galls on *Ilex* Species (Aquifoliaceae) in Japan*

Makoto TOKUDA, Nami UECHI

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. We revised and analyzed distributional information on two nominal and some unidentified Japanese *Asteralobia* species that produce axillary bud galls on *Ilex* species (Aquifoliaceae). Galls on *I. maximowicziana* are newly recorded from the Southwest Islands. Galls produced by respective *Asteralobia* species were collected from most of the distribution range of their host plants, whilst those on *I. integra* and on *I. goshiensis* were not found in some localities within the distribution range of the host plants. A wide and common distribution range of *Asteralobia sasakii* on *I. crenata*, *I. crenata* var. *paludosa,* and *I. maximowicziana* suggested a high dispersal ability of the species. Distribution patterns of *Asteralobia soyogo* on *I. chinensis*, *I. integra*, and *I. pedunculosa* indicated a possible host plant preference by the gall midge. An unidentified gall midge associated with *I. warburgi* is widely distributed in the Southwest Islands and gall dissection data as to age structure indicated that the gall midge might be different from *A. sasakii*.

Key words: *Asteralobia*, axillary bud gall, Cecidomyiidae, distribution, gall midge, *Ilex*.

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Introduction

In gall-making cecidomyiids, some of closely related species are known to produce, respectively, a similar sort of gall on different plant species within a single or related plant genera. In Japan, examples have been shown in *Asteralobia* gall midges on *Ilex* species (Aquifoliaceae) (Yukawa & Masuda, 1996) and *Lasioptera* gall midges on wild gourds (Miyatake *et al.*, 2000). In this paper, we refer to the *Asteralobia* gall midges on *Ilex*. They are suitable materials to study a possible process of speciation or host race formation in herbivores.

The genus *Asteralobia* consists of 10 species in the world, five of them being distributed in Japan and the remainders in Russian Far East (Kovalev, 1964; Yukawa, 1971; Yukawa, 1983). Among them, two Japanese species are associated with *Ilex* species (Yukawa, 1971; Yukawa & Masuda, 1996). *Asteralobia sasakii* (Monzen) makes axillary bud galls on *Ilex crenata* Thunb. (Monzen, 1937) and *Asteralobia soyogo* (Kikuti) on *Ilex pedunculosa* Miq. (Kikuti, 1939). Thereafter, a similar sort of axillary bud gall caused by congeneric cecidomyiids was successively found on *I. chinensis* Sims., *I. crenata* var. *paludosa* (Nakai) Hara, *I. goshiensis* Hayata, *I. integra* Thunb., *I. leucoclada* (Maxim.) Makino, *I. liukiuensis* Loes., and *I. warburgi* Loes. (Shinji, 1944; Yukawa, 1976; Yamauchi *et al.*, 1982; Yukawa, 1982; Yukawa & Sunose, 1988; Yukawa & Masuda, 1996). These cecidomyiids were tentatively included in *A. sasakii* in Yukawa & Masuda (1996), but their morphological features have never been compared among gall midges on different host species and the distributional information of respective gall midges has been fragmentary.

In order to identify these gall midges at the species level and to approach the process of speciation or host race formation, we have to synthesize various information such as their distribution range, morphological characters, DNA sequences, and other ecological data.

In this paper, we refer to the distribution range of respective Japanese *Asteralobia* gall midges on different *Ilex* species, as the first step toward a future evolutionary study. Distributional information, when combined with phylogenetic relations, will serve to analyze the shift of distribution range.

Materials and Methods

We collected axillary bud galls on *Ilex* spp. at various localities in Japan. Our colleagues also gave us many galls and their distributional information. Some of the collected galls were dissected under a binocular microscope to obtain larval and pupal specimens. Remaining galls were maintained in plastic containers (15 cm in diameter, 25 cm in depth) to rear adult midges. Mature larvae, pupae, and emerged adults were put into 75% ethanol

for morphological observation and 99.5% acetone for DNA analysis.

In the present paper, we arranged the collecting records of *Asteralobia* midge galls according to the alphabetical order of plant species. Each collecting record consists of host plant, locality, collecting date, collector, developmental stages of the gall midge, 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 Southwest 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 recorded in the same place. The collecting dates with a plus mark mean that the galls were collected there more than one time.

Some collector's names are abbreviated as follows: IM (=I. Matoba), HN (=H. Nishio), JY (=J. Yukawa), MT (=M. Tokuda), MY (=M. Yukinari), NU (=N. Uechi), and TS (= T. Sunose).

Localities where *Ilex* galls were found in the previous and present field surveys were plotted on maps to indicate the distribution range of respective gall midges. Upon the maps, we illustrated the distribution range of respective host plants based on Hatusima (1971), Horikawa (1972), and Yamazaki (1989).

The gall midges associated with *I. goshiensis* and *I. liukiuensis* have never been identified due to the lack of their adult specimens (Yukawa & Masuda, 1996). Because the structure and size of their galls are somewhat different from those on other *Ilex* spp. (Yamauchi *et al.*, 1982; Yukawa & Masuda, 1996), they may not belong to the genus *Asteralobia*. However, we included their distributional information in this paper.

Results

Ilex chinensis (Fig. 1A) [see also Yukawa, 1988]

[HS: Kyoto]: Kamigyo-ku, Kyoto City, 18 Oct. 1975, K. Ohara; Sakyo-ku, Kyoto City, 18 Oct. 1978, H. Ikenaga, 3rd instars; **[HS: Wakayama]**: Nakano, Kanaya Town, 10 Mar. 2002, JY & IM, 3rd instars; Mt. Funaokayama, Katsuragi Town, 10 Mar. 2002, A. Yamamoto, 3rd instars; Saya, Katsuragi Town, 17 Mar. 2002, A. Yamamoto, 3rd instars; Sandanbeki, Shirahama Town, 9 Aug. 1999, JY, young larvae; **[HS: Okayama]**: Uetsukinaka, Shouou Town, 14 Oct. 1978, JY, 3rd instars; **[SH: Tokushima]**: Maeyama Park, Ishii Town, 15 Oct. 2001, MY, 3rd instars; **[KY: Fukuoka]**: Aobanomori Park, Fukuoka City, 27 Apr. 2000+, MT & NU, pupae; Mt. Sefuriyama, Fukuoka City, 25 Apr. 1967+, A. Nakanishi, adults; Mt. Tachibanayama, Fukuoka City, 17 Mar. 2002+, NU, 3rd instars; Ino, Hisayama Town, 4 Apr. 2001+, MT & NU, 3rd instars; Kurogi Town, 3 Jan. 1975, K. Takahashi, 3rd instars; Kyushu Univ. Forest, Sasaguri Town, 20 Oct. 2001+, MT & NU, 3rd instars; Miyajidake,

Tsuyazaki Town, 6 Jan. 2002, HN, 3rd instars; **[KY: Nagasaki]**: Hei, Futsu Town, 12 May 2000, MT & JY, old galls; **[KY: Oita]**: Usa Shrine, Usa City, 19 Sep. 1997, JY, 2nd instars; Mure, Mie Town, 20 Mar. 2002, MT & JY, 3rd instars; **[KY; Miyazaki]**: Morotsuka Village, Mar. 1978, T. Sanui, old galls; **[KY: Kagoshima]**: Shiroyama*, Kagoshima City, 27 Nov. 2001+, JY, 3rd instars.

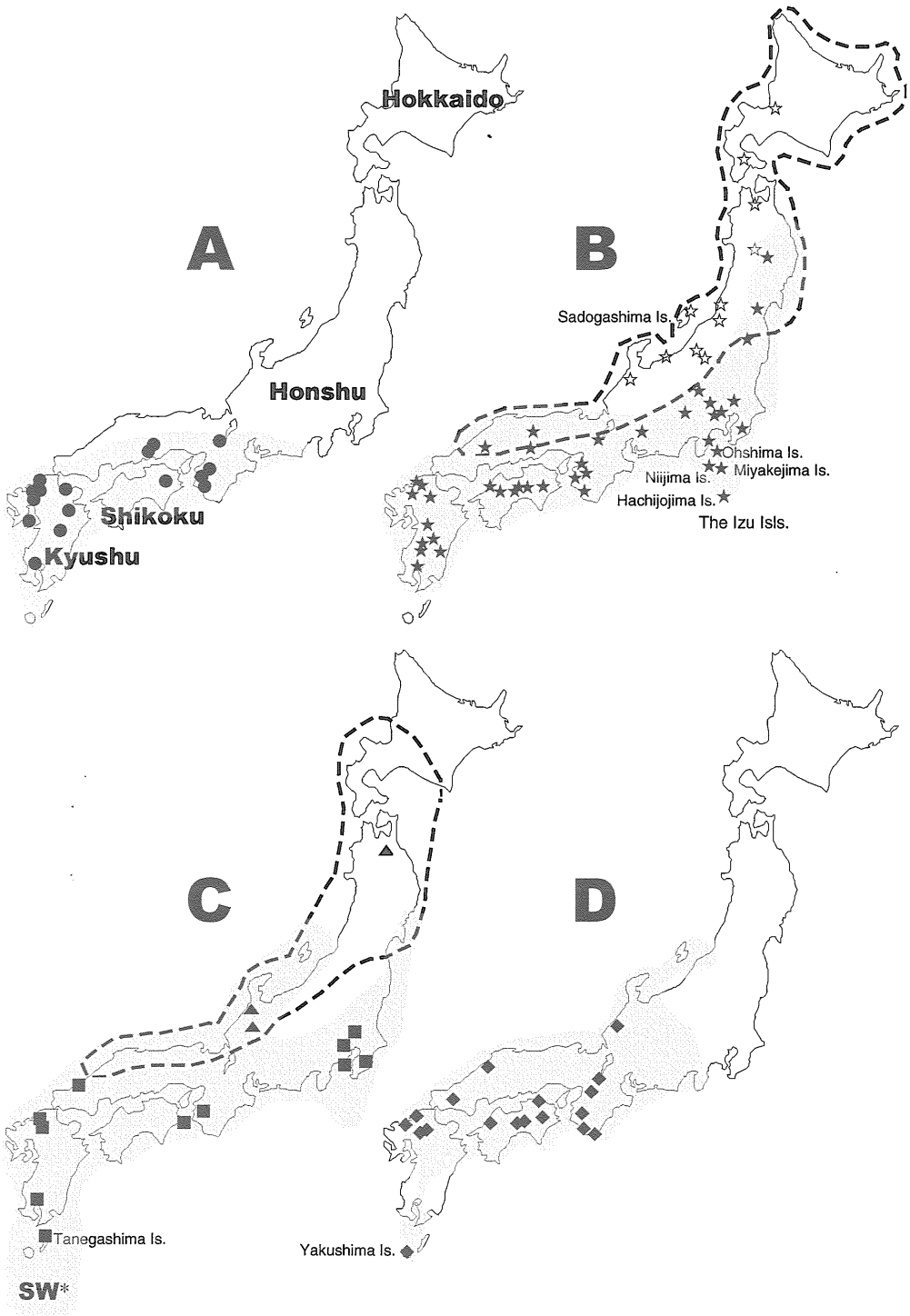
Ilex crenata (Fig. 1B) [see also Ijichi, 1937; Yano, 1964; Sunose, 1981; Tamura, 1966; Usuba, 1979; Yukawa, 1971; Yukawa, 1988; Yukawa & Sunose 1988]

[HS: Miyagi]: Mt. Aobayama, Sendai City, 22 Sep. 2001, MT & JY, 2nd instars; **[HS: Fukushima]** Soma City, 12 Feb. 1973, TS, 3rd instars; **[HS: Saitama]**: Kamio City, 5 Nov. 1974, TS, 3rd instars; **[HS: Chiba]**: Lake Toyofusako, Kimitsu City, 31 Mar. 2002, MT & JY, 3rd instars; Chiba Univ., Matsudo City, 4 Apr. 2000+, K. Tabuchi, 3rd instars; **[HS: Tokyo]** Hachijo-fuji, Hachijo Town*, Hachijojima Is., Jan. 2002, H. Sato, 3rd instars; **[HS: Kanagawa]**: Yokoyama, Sagamihara City, 8 Apr. 1988, Y. Yamashita & M. Okabe, adults emerged on 7 May reared by Y. Yamashita & S. Takasugi; **[HS: Shizuoka]**: Futo, Ito City, 3 Feb. 2002, K. Kiritani, 3rd instars; **[HS: Aichi]**: Seto City, 25 May 2000, K. Tabuchi, Adults; **[HS: Wakayama]**: Akanuma, Kainan City, 10 Mar. 2002, JY & IM, 3rd instars; Tanabe City, Mar. 1971, S. Gotoh, 3rd instars; Sando, Wakayama City, 15 Apr. 1975, K. Yamagishi, 3rd instars; Kaseda-higashi, Katsuragi Town, 17 Mar. 2002, A. Yamamoto, 3rd instars; **[HS: Kyoto]**: Mt. Daimonjiyama, Kyoto City, 14 Mar. 2000, NU, 3rd instars; Yonaki-toge, Kyoto City, 21 Apr. 2001, Y. Abe, pupae (adults emerged on 12 May 2001, reared by MT); **[HS: Okayama]**: Mt. Tsurugatayama, Kurashiki City, 11 Oct. 1978, JY; Tanokuma, Tsuyama City, 14 Oct. 1978, H. Ikenaga, 2nd & 3rd instars; **[HS: Hiroshima]**: Mt. Garyuyama, Geihoku Town, 3 Jun. 1967, JY; **[SH: Tokushima]**: Kamiyama Forest Park, Kamiyama Town, 15 Oct. 2001, MY, 3rd instars; **[SH: Ehime]**: Omogokei, Omogo Town, 11 May 1969, JY; **[SH: Kochi]**: Anauchi, Otoyo Town, 5 Dec. 2001, MT, 3rd instars; Kajigamori*, Otoyo Town, 5 Dec. 2001, MT, 3rd instars; Hiraishi, Tosa Town, 5 Dec. 2001, MT, old galls; Kami-yoshihara, Kagami Village, 5 Dec. 2001, MT, old galls; **[KY: Fukuoka]**: Mt.

Fig. 1. A-D: Collection records of axillary bud galls on *Ilex* spp. caused by *Asteralobia* gall midges; host plant — ●: *I. chinensis*, ★: *I. crenata*, ☆: *I. crenata* var. *paludosa*, ▲: *I. leucoclada*, ■ : *I. integra*, ◆ : *I. pedunculosa*.

The shaded area in Fig. 1A, 1B, 1C, and 1D indicates the distribution range of *I. chinensis*, *I. crenata*, *I. integra*, and *I. pedunculosa*, respectively. The area surrounded by a broken line in Fig 1B and 1C indicates the distribution range of *I. crenata* var. *paludosa* and *I. leucoclada*, respectively.

*The Southwest Islands.


A
Hokkaido
Honshu
Shikoku
Kyushu
B
Sadogashima Is.
Ohshima Is.
Miyakejima Is.
Niijima Is.
Hachijojima Is.
The Izu Isls.
C
Tanegashima Is.
SW*
D
Yakushima Is.

Sefuriyama, Fukuoka City, 26 May 1967, A. Nakanishi, pupae & adults; Mt. Tachibanayama, Fukuoka City, 25 May 2001, MT, pupae; Ino, Hisayama Town, 4 Apr. 2001+, MT, 3rd instars; Mt. Hikosan*, Soeda Town, 19 Jun. 2000, MT, old galls; **[KY: Kumamoto]**: Otsuka, Hitoyoshi City, 4 May 2001, JY, old galls; Mt. Kyonojosan, Tomochi Town, 5 May 1981, J. Onagamitsu, old galls; **[KY: Miyazaki]**: Kyushu Univ. Forest, Shiiba Village, 27 May 1969, S. Hatusima, adults emerged on 17 and 18 Jun. reared by JY; **[KY: Kagoshima]**: Nishi-sakurajima, Sakurajima Town, 4 Mar. 1973, TS, 3rd instars; Mt. Kurinodake, Kurino Town, 6 Jun. 1971, K. Ohara, old galls.

Ilex crenata* var. *paludosa (= *Ilex crenata* subsp. *radicans*) (Fig. 1B) [see also Yukawa, 1976; Yukawa & Sunose, 1979; Sunose, 1982; Yukawa & Sunose, 1988; Yukawa, 1994]

[HK]: Hitsujigaoka, Sapporo City, 12 Oct. 1975, K. Yamagishi, 3rd instars; Hokkaido Univ. Botanical Garden, Sapporo City, 27 Jun. 2001, M. Shoubu, all galls contained larvae of an unidentified hymenopteran ectoparasitoid; **[HS: Aomori]**: Moya, Aomori City, 19 Jun. 2000, E. Kimura & S. Fukuda, pupae; **[HS: Akita]**: Obonai, Tazawako Town, 24 Jun. 1975, K. Yamagishi, 1st & 2nd instars.

Ilex goshiensis (Fig. 2A) [see also Yamauchi *et al.*, 1982]

[SW: Okinawa]: Banna Park, Ishigaki City, Ishigakijima Is., 9 Mar. 2002, MT, 3rd instars; Mt. Omotodake, Ishigaki City, Ishigakijima Is., 10 Mar. 2002, MT, 3rd instars.

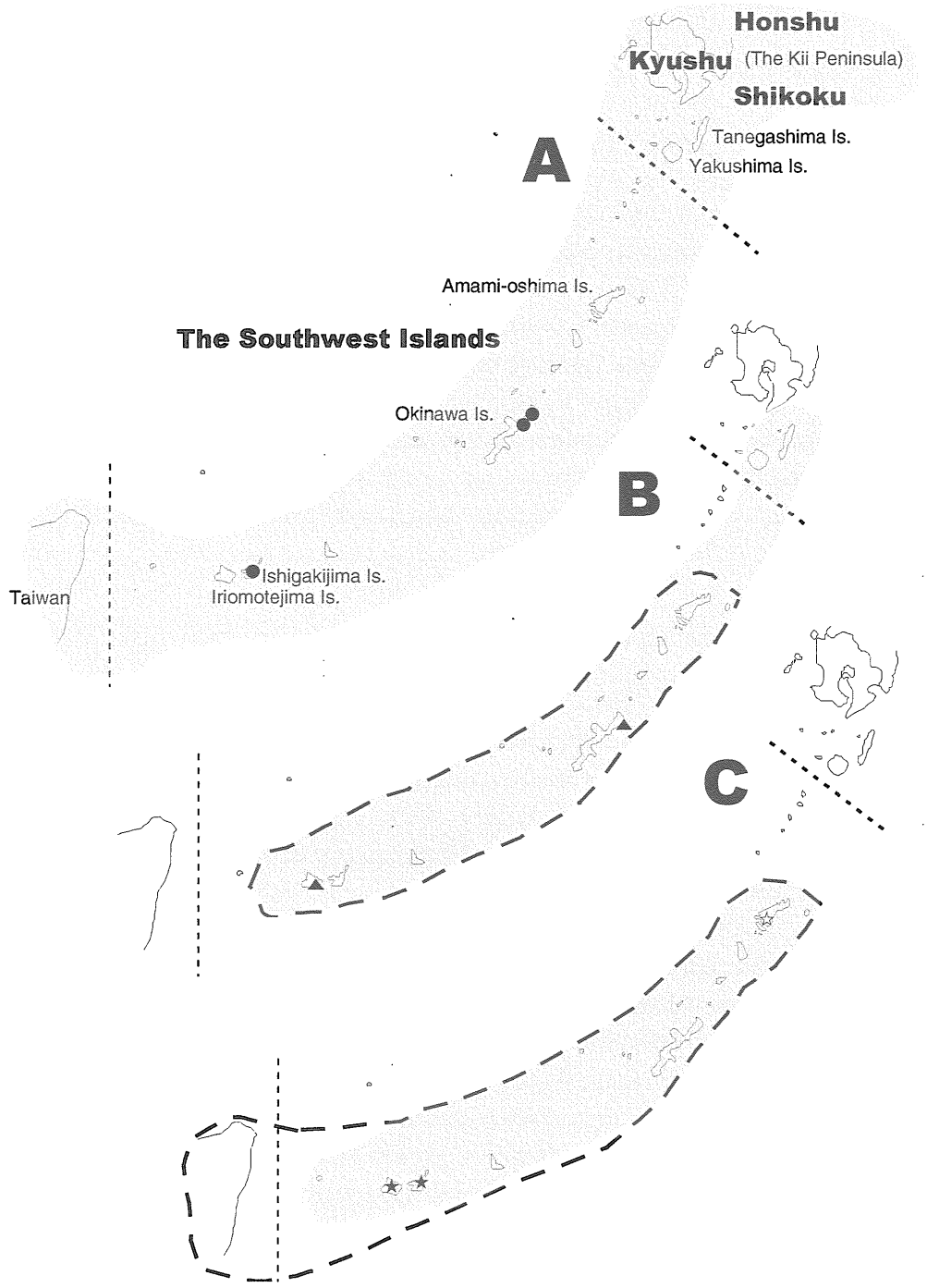
Ilex integra (Fig. 1C) [see also Usuba, 1979; Yukawa, 1988; Yukawa *et al.*, 2000]

[HS: Chiba]: Chiba Univ., Matsudo City, early May 2001+, K. Tabuchi, adults; **[HS: Kanagawa]**: Bishamon, Miura City, 3 Jan. 2002, M. Sueyoshi, 3rd instars; **[HS: Wakayama]**: Miyazaki, Arida City, 10 Mar. 2002, JY & IM, 3rd instars; **[HS: Yamaguchi]**: Susa Town, 3 Apr. 2001, MT & JY, old galls; **[SH: Tokushima]**: Ishima Is., Anan City, 6 Jun. 2001, MY, old galls; **[KY: Fukuoka]**: Maizuru Park, Fukuoka City, 15 Mar. 2000+, MT & NU; Minami Park, Fukuoka City, 18 Jun. 2001, NU, old galls; Miyazaki, Chikushino City, 4 Jan. 2002, HN, 3rd instars; **[KY: Kagoshima]**: Ryugamizu, Kagoshima City, 4 Nov. 1969, A. Mori, old galls; Nishino-omote, Nishino-omote City, Tanegashima Is., 23 Feb. 2001+, K. Ogata, 3rd instars.

Ilex leucoclada (Fig. 1C) [see also Yukawa, 1982]

Fig. 2. A-C: Collection records of axillary bud galls on *Ilex* spp. caused by *Asteralobia* gall midges; host plant — ●: *I. goshiensis*, ▲: *I. liukiuensis*, ■: *I. warburgii*, ★: *I. maximowicziana*, ☆: *I. maximowicziana* var. *kanehirae*.

The shaded area in Fig. 2A, 2B, and 2C indicates the distribution range of *I. goshiensis*, *I. liukiuensis*, and *I. maximowicziana*, respectively. The area surrounded by a broken line in Fig. 2B and 2C indicates the distribution range of *I. warburgii* and *I. maximowicziana* var. *kanehirae*, respectively.


Honshu
Kyushu
(The Kii Peninsula)
Shikoku
Tanegashima Is.
Yakushima Is.
A
Amami-oshima Is.
The Southwest Islands
Okinawa Is.
B
Ishigakijima Is.
Iriomotejima Is.
Taiwan
C

[HS: Aomori]: Towadako Town, 16 Nov. 1996, E. Kimura & S. Fukuda, 3rd instars; **[HS: Ishikawa]**: Mt. Fujishagadake, Yamanaka Town, 10 May 1988, I. Togashi, adults emerged on 25 May reared by I. Togashi.

Ilex liukiuensis (Fig. 2B) [see also Yamauchi *et al.*, 1982]

[SW: Okinawa]: Urauchi Riv., Taketomi Town, Iriomotejima Is., 7 Mar. 2002, MT, old galls; Aira Riv., Taketomi Town, Iriomotejima Is., 7 Mar. 2002, MT, old galls.

***Ilex maximowicziana* Loes. (New gall record)** (Figs. 2C & 3)

[SW: Okinawa]: Banna Mountain Highway, Ishigaki City, Ishigakijima Is., 9 Mar. 2002, MT, pupae; Banna Park, Ishigaki City, Ishigakijima Is., 2 Mar. 2001+, MT & NU, pupae; Mt. Omotodake, Ishigaki City, Ishigakijima Is., 25 Feb. 2001+, MT & NU, 3rd instars & pupae; Aira Riv., Taketomi Town, Iriomotejima Is., 7 Mar. 2002, MT, 3rd instars; Komi, Taketomi Town, Iriomotejima Is., 1 Mar. 2001, MT & NU, pupae; Takana, Taketomi Town, Iriomotejima Is., 7 Mar. 2002, MT, 3rd instars; Urauchi Riv., Taketomi Town, Iriomotejima Is., 7 Mar. 2002, MT, old galls.

Remarks: The axillary bud is transformed into a subglobular swelling (Fig. 3); usually 8 to 15 larvae inhabiting each gall; gall size: 13.7mm in mean maximum diameter, 8.5-20.0mm in range (N = 18; galls collected from Ishigakijima Is. and Iriomotejima Is. in 2001, taken together). Adults emerged from 11 to 18 March 2002 from the galls collected by MT on 9 and 10 March 2002 from Banna Park and Mt. Omotodake, Ishigakijima Is. A photograph, which was taken by Mr. Itsuro Katanoda in Uken Village, Amami-oshima Is. (Katanoda, 1999), clearly indicates the occurrence of the axillary bud galls on *Ilex maximowicziana* var. *kanehirae* (Yamamoto) Yamazaki on Amami-oshima Is, although actual galls were not collected previously on that island.

Ilex pedunculosa (Fig. 1D) [see also Yano, 1964; Yukawa, 1971; Yukawa, 1988]

[HS: Ishikawa]: Mt. Kurakakeyama, Komatsu City, 17 Mar. 2002, I. Honda, 3rd instars; **[HS: Kyoto]**: Mt. Kazan*, Kyoto City, 12 Mar. 2000+, NU & Y. Tohsaka, 3rd instars; **[HS: Wakayama]**: Shiono-misaki, Kushimoto Town, 17 Feb. 1976, TS, 3rd instars; Kotonotaki, Susami Town, 5 May 2001, M. Shoubu, pupae; Akanuma, Kainan City, 10 Mar. 2002, JY & IM, 3rd instars; **[HS: Shimane]**: Hitokubota, Sada Town, 2 Apr. 2001, MT & JY, old galls; **[HS: Yamaguchi]**: Omine-cho, Mine City, 3 Jan. 2002, MT, 3rd instar; **[SH: Kagawa]**: Saiho, Takamatsu City, 2 Oct. 1990, JY, 2nd instars; **[SH: Tokushima]**: Kamiyama Forest Park, Kamiyama Town, 15 Oct. 2001, MY, 3rd instars; **[SH: Kochi]**: Kajigamori*, Otoyo Town, 5 Dec. 2001, MT, old galls; Osugi, Otoyo Town, 5 Dec. 2001, MT, 3rd instars; **[KY: Fukuoka]**: Mizunashi, Maebaru City, 5 May 1965, Y. Miyatake; Mt. Toriyayama, Amagi City, 26 Feb. 2002, N. Kuroiwa & HN, 3rd instars; Mt. Hikosan, Soeda Town, 25 Oct. 2001, MT & NU, 3rd instars; Miyajidake, Tsuyazaki Town, 6 Jan. 2002, HN, 3rd

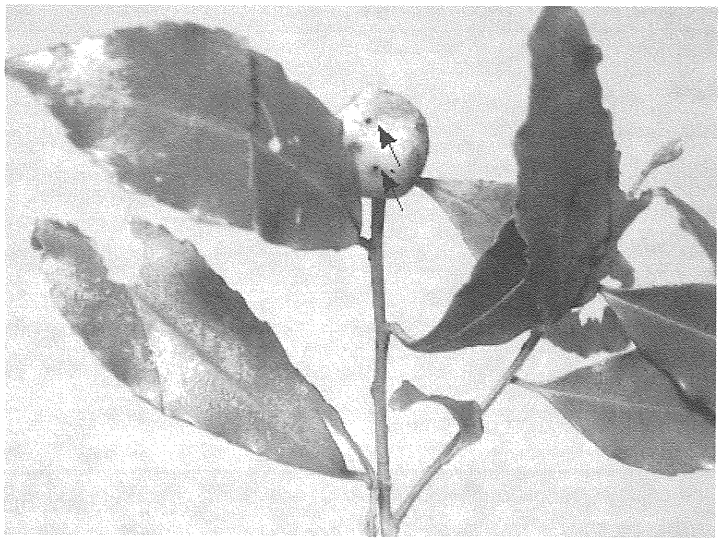


Fig. 3. An axillary bud gall caused by *Asteralobia* sp. on *Ilex maximowicziana*. Arrows point toward the exit holes of the gall midge.

instars.

Ilex warburgi (Fig. 2B) [see also Yamauchi *et al.*, 1982]

[SW: Kagoshima]: Kamiya, Sumiyo Village, Amamioshima Is., 28 Mar. 2002, Y. Sato, 3rd instars; **[SW: Okinawa]**: Banna Park, Ishigaki City, Ishigakijima Is., 2 Mar. 2001+, MT & NU, 3rd instars; Komi, Taketomi Town, Iriomotejima Is., 1 Mar. 2001, MT & NU, 3rd instars.

Discussion

The distribution range of *Asteralobia* gall midges is summarized in Table 1. The gall midges were collected from most of the distribution range of respective host plants. Although axillary bud galls have never been found on *I. leucoclada* in Hokkaido, and on *I. liukiuensis* on Tanegashima Is. and Yakushima Is., more frequent field surveys will provide us with further information in these areas.

Galls on *I. integra* have never been recorded from the Southwest Islands and those on *I. goshiensis* in Honshu, Shikoku, and Kyushu, even though frequent surveys have been performed (e.g. Yamauchi *et al.*, 1982; Yukawa, 1976; Yukawa, 1988; present data). The main difficulty in talking about the distribution range of a species is the reliance to be placed on absences. A species may be erroneously recorded as absent when collecting has been insufficient or at the wrong season, or when a species is rare (Yukawa, 1984). In the

Table 1. Distribution range of gall midges producing axillary bud galls on *Ilex* in Japan.

Host plant	HK	HS	SH	KY	SW
I. chinensis	—	●	●	●	—
I. crenata	—	●	●	●	—
I. c. var. *paludosa*	●	●	—	—	—
I. goshiensis	—	○	○	○	●
I. integra	—	●	●	●	○
I. leucoclada	○	●	—	—	—
I. liukiuensis	—	—	—	○*	●
I. maximowicziana	—	—	—	—	●
I. m. var. *kanehirae*	—	—	—	—	●
I. pedunculosa	—	●	●	●	—
I. warburgi	—	—	—	—	●

Abbreviations and symbols indicated in Table 1 are as follows: HK: Hokkaido; HS: Honshu; SH: Shikoku; KY: Kyushu; SW: The Southwest Islands; — : Host plant is not distributed; ○ : Host plant is distributed but gall midge has never been recorded; ● : Both host plant and gall midge are distributed.

* Host plant is distributed only on Tanegashima Is. and Yakushima Is.

case of gall midges associated with *Ilex* spp., we can easily find galls at any seasons because galls remain on the host trees long after the event of galling (Yukawa & Masuda, 1996). In addition, galls on other *Ilex* spp. than *I. integra* and *I. goshiensis* were frequently found in the Southwest Islands and in Honshu, Shikoku, and Kyushu, respectively (Figs. 1 & 2). Therefore, these gall midges may well be absent from aforementioned areas. If so, these distribution patterns, when combined with phylogenetic data, will contribute to discussing host plant and distribution range shift by the respective cecidomyiid species.

Our preliminary data of DNA analysis (Tokuda & Yukawa, unpublished data) indicate that gall midges associated with *I. crenata* var. *paludosa*, and *I. maximowicziana* are possibly identical with *A. sasakii* on *I. crenata*. This gall midge is distributed most widely and commonly in Japan including Sadogashima Is. (Yukawa & Sunose 1988) and the Izu Isls. (Sunose, 1981) (Figs. 1B & 2C). Such a wide and common distribution pattern seems to suggest that the gall midge has a high dispersal ability compared to others.

Gall midges associated with *I. chinensis* and *I. integra* are mainly distributed in Shikoku, Kyushu, and western parts of Honshu (Figs. 1A & 1C). Based on adult morphology and DNA analysis (Tokuda & Yukawa, unpublished data), we suspect that these two gall midges are identical with *A. soyogo* that produces axillary bud galls on *I. pedunculosa* in the same areas (Fig. 1D).

Ilex integra is distributed widely in Japan except Hokkaido and northern parts of Honshu (Fig. 1C; Horikawa, 1972), but the galls on this plant have been collected from some

restricted parts of eastern Honshu (Chiba and Kanagawa Prefectures) and Tanegashima Is. (Kagoshima Prefecture) (Fig. 1C), where *I. chinensis* and *I. pedunculosa* are not distributed (Figs. 1A & 1D). Similarly in Kyushu, we collected galls from *I. integra* at several localities where both *I. chinensis* and *I. pedunculosa* were not found. In addition, many galls were found on *I. pedunculosa* trees but not on *I. integra* trees, even though they (a total of 130 trees) grow sympatrically at Kamiyama Forèst Park (Kamiyama Town, Tokushima Prefecture) (Masaaki Yukinari, 2001, personal communication). At Ino (Hisayama Town, Fukuoka Prefecture), we observed a similar phenomenon between co-existing *I. chinensis* and *I. integra* trees. The former bears galls but the latter does not. These results suggest a possibility that *A. soyogo* prefers *I. pedunculosa* and *I. chinensis* to *I. integra* for galling.

An unidentified gall midge associated with *I. warburgi* is widely distributed in the Southwest Islands (Fig. 2B). This species was still 3rd instar in early March when *A. sasakii* already pupated in the galls on *I. maximowicziana* in Ishigakijima Is. and Iriomotejima Is. Therefore, this gall midge seems to emerge later in the season than *A. sasakii*, suggesting that they are temporally isolated and not identical.

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