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## Gall Wasps (Hymenoptera: Cynipidae) in Kyushu, Japan\*

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**Abstract.** Sixty-three sorts of gall induced by Cynipidae (Hymenoptera) were previously known to occur in Kyushu, Japan. Fifty-three sorts of them were recorded again during the course of this study, although ten sorts could not be found. In addition, 22 sorts were recorded, for the first time, from Kyushu. As a result, the number of sorts of cynipid gall in Kyushu stood at 85. Among them, 82 sorts were induced on eight species of *Quercus* (Fagaceae), one on *Castanea crenata* (Fagaceae), one on *Rosa multiflora* (Rosaceae), and one on *Rubus palmatus* var. *coptophyllus* (Rosaceae). New biological information was also obtained for some cynipid species or unidentified segregates. *Quercus aliena* was newly recorded as a host plant for *Andricus symbioticus* (Hymenoptera: Cynipidae) in Japan.

**Key words:** Cynipidae, fauna, gall, biological information, host plant, *Quercus*, Kyushu.

### Introduction

All gall wasps (Hymenoptera: Cynipidae) are obligate parasites of plants and either induce their own galls in plant tissues or develop as inquilines within the galls induced by other gall wasps. At least, a total of 1,369 cynipid species have been known to occur

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in the world (Ronquist, 1999). Many cynipid species alternate a bisexual generation with an agamic generation comprising only females and have distinct differences between the two generations in female morphological characters, gall shape, and galling site (e.g., Askew, 1984; Wiebes-Rijks & Shorthouse, 1992; Yukawa & Masuda, 1996; Stone *et al.*, 2002). Therefore, galling cynipid species are hardly identified without information on alternation of generations.

Because of such difficulty in species identification, the diversity of gall wasps has been frequently represented in Japan as the number of gall sorts instead of actual species number. One hundred and nine sorts of cynipid gall (including galls induced by agamic and inquiline cynipids) have been recorded from Japan (Yukawa & Masuda, 1996). Among them, 99 sorts are induced on the species of *Quercus* (Fagaceae), one on *Castanea* (Fagaceae), one on *Castanopsis* (Fagaceae), four on *Rosa* (Rosaceae), one on *Rubus* (Rosaceae), two on *Saussurea* (Asteraceae), and one on *Hieracium* (Asteraceae).

In Kyushu north of the Tokara Islands, only 63 (57.8 %) out of the 109 sorts have been known to occur, 60 sorts being induced on seven species of *Quercus*, one on *Castanea crenata* Siebold et Zuccarini, one on *Rosa multiflora* Thunberg ex Murray, and one on *Rubus palmatus* Thunberg ex Murray var. *coptophyllus* A. Gray (e.g., Shinji, 1944; Yukawa & Masuda, 1996; Abe, 1998; Katsuda, 2002). The limited number of cynipid records from Kyushu is possibly due to difficulties in combining the bisexual and agamic generations and to a lack of long-term and extensive field surveys such as those performed in the central Japan by Mr. Hisashi Masuda (e.g., Yasumatsu & Masuda, 1955; Masuda, 1959, 1972; Yukawa & Masuda, 1996). More numerous cynipid galls must be found in Kyushu through more intensive field surveys because almost all known host plant species of the Japanese cynipids are naturally distributed in Kyushu. In order to clarify the cynipid fauna of Japan, an accumulation of information on local fauna is required.

In this paper, cynipid species that were newly found in Kyushu through recent field surveys are enumerated together with those recorded previously from Kyushu. New information on biology, behavior, host plants, distribution range, and gall structure are also presented for some species.

### Materials and Methods

Most cynipid species and their galls listed in this study were collected from 1999 to 2003 through periodical field surveys at the Fukuoka Forest belonging to the Research Institute of Kyushu University Forests (FFKU, hereafter), Fukuoka Prefecture, Japan. Other species and galls were collected occasionally from various localities in Kyushu chiefly by ourselves and partly by our colleagues (see Acknowledgements).

Some of the collected galls were measured by slide calipers, and dissected under a binocular microscope to confirm whether they were induced by galling cynipids or modified by inquiline cynipids. The number of larvae and larval chambers per gall were recorded and the developmental stages were examined. When the remaining galls contained cynipid pupae, the galls were kept in plastic bags under laboratory conditions to rear adult wasps. When the galls did not contain cynipid pupae, the same sort of gall was collected again from the same locality in appropriate seasons to rear adults. In addition to the rearing method in the laboratory, adult wasps were reared under natural conditions by covering galls on the branches of host trees with pouches made of gauze. Biological information was obtained by field observations mainly in FFKU and partly in other places in Fukuoka Prefecture.

In enumerating cynipid species found in Kyushu, entries for each species are arranged in the following order: 1) Species name of cynipids; 2) Host plant species in Kyushu. Host plants that were recorded, for the first time, from Japan are indicated as ‘**New host record from Japan**’; 3) Galled part of bisexual generation, and Gall No. in parenthesis, following the ‘Insect and Mite Galls of Japan in Colors’ (Yukawa & Masuda, 1996); 4) Galled part of agamic generation, and Gall No. in parenthesis; 5) New biological information, if available; 6) Collecting data of galls (locality, date of collection, and abbreviations of collector’s names; JY: J. Yukawa, TK: T. Katsuda, SS: S. Sato). Species that were recorded from Kyushu for the first time are indicated as ‘**New collection record from Kyushu**’. Other unidentified species are listed in Table 1. They are indicated tentatively as Gen. sp. with successive numerals.

### List of cynipid species found in Kyushu

#### Tribe Cynipini

##### *Andricus mukaigawae* (Mukaigawa)

Host plant: *Quercus serrata* Thunberg

Galled part of bisexual generation: Leaf vein (C-123)

Galled part of agamic generation: Bud (C-126)

Collecting data: FFKU, 18. IV. 2000, TK leg.

##### *Andricus moriokae* Monzen

Host plants: *Quercus mongolica* var. *grosseserrata* Rehder et Wilson (= *Quercus crispula* Blume) & *Q. serrata*. Although *Q. mongolica* var. *grosseserrata* and *Q. crispula* have been synonymized with *Q. mongolica* (see Woods of the World: <http://www.forestworld.com>; Forestry Compendium, CAB International), the old

names were used in this study to distinguish the two known host trees that were previously separated into different species.

Galled part of bisexual generation: Leaf (C-145)

Galled part of agamic generation: Bud (C-133)

Collecting data: Tachibanaguchi, Hisayama T., Fukuoka Pref., 24. IV. 1999, TK leg.; Mt. Tachibanayama, Fukuoka Pref., 28. IV. 1999, TK leg.; FFKU, 20. VI. 1999, TK leg.; Mt. Konomiyama, Fukuma T., Fukuoka Pref., 21. VIII. 1999, JY *et al.* leg.; Nokonoshima Is., Fukuoka C., 19. V. 2000, TK leg.; Mt. Sefuriyama, Saga Pref., 14. V. 2001, TK leg.

#### *Andricus symbioticus* Kovalev

This species was recorded as *Callirhytis hakonensis* Ashmead in Yukawa & Masuda (1996) based on the letter from Keizo Yasumatsu to Hisashi Masuda. However, further morphological comparison is required to identify this gall wasp (Yoshihisa Abe, 2003, personal communication).

Host plants: *Quercus aliena* Blume (**New host record from Japan**), *Quercus dentata* Thunberg, *Q. mongolica* var. *grosseserrata*, & *Q. serrata*

Galled parts of bisexual generation: Leafstalk & Leaf vein (C-070)

Galled part of agamic generation: Twig (C-069)

New biological information: The inter-tree variations in the density of galls induced by bisexual generation were observed in 2000 among *Q. dentata* trees in the FFKU. Mature galls of bisexual generation were frequently infested by both adults and larvae of a weevil, *Curculio dentipes* (Roelofs) (Coleoptera: Curculionidae).

Collecting data: Chôjbaru, Kujû T., Oita Pref., 10. IX. 1999, TK leg.; Tachibanaguchi, Hisayama T., Fukuoka Pref., 16. V. 1999, TK leg.; FFKU, 29. XI. 1999, TK leg.

#### *Aphelonyx acutissima* Monzen

Host plants: *Quercus acutissima* Carruthers & *Quercus variabilis* Blume

Galled part of bisexual generation: Male flower (C-099)

Galled part of agamic generation: Leaf vein (C-094)

New biological information: In FFKU, 66 (59.5 %) out of 111 agamic generation galls, 45 (37.2 %) out of 121, and 75 (37.1 %) out of 202 were infested by unidentified curculionid larvae in 2000, 2001, and 2002, respectively.

Collecting data: FFKU, 24. VI. 1999, TK leg.; Mt. Konomiyama, Fukuma T., Fukuoka Pref., 21. VIII. 1999, JY *et al.* leg.

#### *Aphelonyx glanduliferae* Mukaigawa

Host plant: *Q. serrata*

Galled part of bisexual generation: Bud (C-127)

Galled part of agamic generation: Leaf vein (C-143)

New biological information: Bisexual generation galls were induced on the overwintered buds in mid March. The galls and larvae matured within two weeks. Soon after emergence in early April, both males and females walked to fresh leaves. On the lower surface of leaves, the male approached the female from behind and vibrated the wings twice. When the female accepted the male display, the female vibrated the wings once and mated with the male. The mated female did not accept any male again for about five (sometimes more) minutes after mating. This is the first finding of courtship behavior by this species.

Collecting data: FFKU, 20. VI. 1999, TK leg.; Tachibanaguchi, Hisayama T., Fukuoka Pref., 3. VII. 1999, TK leg.

***Biorhiza nawai* (Ashmead)**

Host plants: *Q. dentata*, *Q. mongolica* var. *grosseserrata*, & *Q. serrata*

Galled part of bisexual generation: Bud (C-134)

Galled part of agamic generation: Root (C-116)

New biological information: Distinct inter-tree variations in the density of galls induced by bisexual generation were observed in 2000 among *Q. serrata* trees in FFKU.

Collecting data: Tachibanaguchi, Hisayama T., Fukuoka Pref., 22. IV. 1999, TK leg.; FFKU, 20. VI. 1999, TK leg.

***Dryocosmus kuriphilus* Yasumatsu**

Host plant: *C. crenata*

Galled part of agamic generation: Bud (C-106)

This species is univoltine and reproduces parthenogenetically.

Collecting data: Yakuôji, Koga C., Fukuoka Pref., 28. IV. 1999, TK leg.; FFKU, 29. VI. 1999, TK leg.; Tachibanaguchi, Hisayama T., Fukuoka Pref., 3. VII. 1999, TK leg.; Nokonoshima Is., Fukuoka C., 19. V. 2000, TK leg.; Mt. Sefuriyama, Saga Pref., 14. V. 2001, TK leg.

***Neuroterus apralinus* (Giraud)**

Host plant: *Q. serrata*

Galled part of bisexual generation: Bud (C-132) (Fig. 1)

Galled part of agamic generation: Male flower (C-149) (Fig. 2)

Collecting data: FFKU, 20. III. 2000, TK leg. **New collection record from Kyushu**

***Neuroterus folimargo* Monzen**

Host plants: *Q. acutissima* & *Q. variabilis*

Galled part of bisexual generation: Male flower (C-097)

Galled part of agamic generation: Tip of leaf vein (C-086)

Collecting data: Yakuôji, Koga C., Fukuoka Pref., 28. IV. 1999, TK leg.; FFKU, 16. IV. 2001, TK leg.; Mt. Konomiyama, Fukuma T., Fukuoka Pref., 14. IV. 2001, TK leg.; Higashi-Hirao Park, Fukuoka C., 18. IV. 2001, TK leg.

#### *Neuroterus monzeni* Dettmer

Host plant: *Q. acutissima*

Galled part of bisexual generation: Male flower (C-101)

Galled part of agamic generation: Leaf (C-092)

Collecting data: Mt. Konomiyama, Fukuma T., Fukuoka Pref., 29. VIII. 1999, TK leg.

#### *Neuroterus moriokensis* Monzen

Host plant: *Q. serrata*

Galled part of bisexual generation: Male flower (C-150) (Fig. 3)

Galled part of agamic generation: Bud (C-125) (Fig. 4)

Collecting data: FFKU, 11. IV. 2000, TK leg. **New collection record from Kyushu**

#### *Neuroterus nawai* Ashmead

Host plants: *Q. acutissima* & *Q. variabilis*

Galled part of bisexual generation: Male flower (C-098)

Galled part of agamic generation: Leaf (C-091)

New biological information: Agamic generation galls appeared on the leaves in late August and dropped to the ground after maturation in November. This species overwintered as a pupa or an adult in the gall (Yukawa & Masuda, 1996). We found that adult emerged from the overwintered pupa in February and stayed in the gall until the following spring. The overwintering adult also stayed in the gall until the following spring. Both the adults exited the galls in late March. In both Mt. Konomiyama and Higashi-Hirao Park, Fukuoka Pref., this species overwintered as pupae. Most of these pupae became adults in the following spring, but a few of them did so in the year after next spring.

Collecting data: Mt. Konomiyama, Fukuma T., Fukuoka Pref., 26. X. 1999, TK leg.; Higashi-Hirao Park, Fukuoka C., 11. I. 2000, SS & TK leg.

#### *Neuroterus vonkuenburgi* Dettmer

Host plants: *Q. acutissima* & *Q. variabilis*

Galled part of bisexual generation: Male flower (C-096) (Fig. 5)

Galled part of agamic generation: Leaf (C-088) (Fig. 6)

New biological information: An outbreak of bisexual generation was observed on 3 April 2001 in Kego Shrine, Fukuoka City. Almost all male catkins of *Q. acutissima* trees (N = 5) were heavily galled.

Collecting data: Higashi-Hirao Park, Fukuoka C., 10. IV. 2000, TK leg.; Ino, Hisayama T., Fukuoka Pref., 3. IV. 2000, TK leg.; Kego Shrine, Minami-Ku, Fukuoka C., 3. IV. 2001, TK leg.; **New collection record from Kyushu**

#### *Trichagalma serratae* (Ashmead)

Host plant: *Q. acutissima*

Galled part of bisexual generation: Male flower (C-100)

Galled part of agamic generation: Twig (C-073)

Collecting data: Yakuôji, Koga C., Fukuoka Pref., 16. VII. 1999, TK leg.; Tachibanaguchi, Hisayama T., Fukuoka Pref., 16. VIII. 1999, TK leg.; Mt. Konomiyama, Fukuma T., Fukuoka Pref., 21. VIII. 1999, JY *et al.* leg.

### Tribe Diplolepidini

#### *Diplolepis japonica* (Walker)

Host plant: *R. multiflora*

Galled parts of bisexual generation: Leaf vein & leafstalk (C-324)

This species is univoltine (Yukawa & Masuda, 1996). There is no agamic generation, although bisexual generation males are frequently killed by *Wolbachia*.

New biological information: Mature galls dropped to the ground from early June to mid August. Cynipid larvae in the galls on the ground were frequently infested by rodents in FFKU during the winter. The rates of infestation by the rodents were 68.2 % (15/22) in 2001, 58.8 % (20/34) in 2002, and 69.2 % (18/26) in 2003.

Collecting data: Ino, Hisayama T., Fukuoka Pref., 22. V. 1999, TK leg.; FFKU, 30. VI. 1999, TK leg.

### Tribe Synergini

The following three species are inquiline in the galls induced by other cynipids.

#### *Synergus quercicola* (Shinji)

Host plant: *Q. serrata*

Host cynipid gall of the first generation: Agamic generation gall of Gen. sp. 23 (C-141)

Host cynipid gall of the second generation: Unknown

Galled part: Leaf (C-142)



Collecting data: FFKU, 30. VI. 1999, TK leg.

*Synergus gifuensis* Ashmead

Host plant: *Q. serrata*

Host cynipid gall: Agamic generation gall of *A. mukaigawae* (C-126)

Galled part: Bud (C-131)

Collecting data: FFKU, 23. VII. 2000, TK leg.

*Synergus iwatensis* Shinji

Host plant: *Q. serrata*

Host cynipid gall: Agamic generation gall of Gen. sp. 28 (C-154)

Galled part: Cupule (C-156)

Collecting data: FFKU, 30. VI. 1999, TK leg.

**Remarks**

Fifty-three out of 63 sorts of cynipid gall that had been previously known to occur in Kyushu were recorded again in this study, although ten sorts could not be found. In addition, 22 sorts were recorded, for the first time, from Kyushu. These galls have been known to occur elsewhere in Japan other than Kyushu. As a result, 85 sorts of cynipid gall are now known to exist in Kyushu. Among them, 82 sorts are induced on eight species of *Quercus* (Fagaceae), one on *Castanea crenata* (Fagaceae), one on *Rosa multiflora* (Rosaceae), and one on *Rubus palmatus* var. *coptophyllus* (Rosaceae).

Before this study, 19 galling cynipid species were identified only for 31 sorts among the previously known 63 sorts of cynipid gall in Kyushu (e.g., Shinji, 1944; Yukawa & Masuda, 1996; Abe, 1998; Katsuda, 2002). During the course of this study, three nominal cynipid species were newly detected. As a result, 22 cynipid species are now recognized to exist in Kyushu. The actual number of cynipid species in Kyushu may be less than 85, which is the total number of gall sorts, because many cynipid species and unidentified segregates are responsible for more than one sort of gall including those of different generations and inquiline species (Yukawa & Masuda, 1996).

New biological information, such as life cycle, behavior, population density, and natural enemies, was also obtained in this study for some cynipid species or segregates. *Quercus aliena* was newly recorded as a host plant for *Andricus symbioticus* in Japan.

For clarifying the Japanese cynipid fauna, it is necessary to determine taxonomic positions of unidentified species and segregates, to investigate the combination of generations, and to accumulate more detailed biological information.

**Table 1.** A list of unidentified species collected from Kyushu.

Unidentified species (Gen. sp.)	Host plant *	Galled part †	Collecting data †
1	<i>V</i>	BG: Leaf (C-048) (Fig. 7) AG: Unknown	FFKU, 12. IV. 2000, TK leg. <sup>3</sup>
2	<i>GL</i>	BG: Bud (C-056) (Fig. 8) AG: Twig (C-052) (Fig. 9)	Konomi., 21. VIII. 1999, JY <i>et al.</i> leg. <sup>3</sup>
3	<i>GL</i>	BG: Bud (C-054) (Fig. 10) AG: Leaf vein (C-059)	HHP, 10. IV. 2002, TK leg. <sup>3</sup>
4	<i>GL</i>	BG: Leaf vein (C-055) (Fig. 11) AG: Unknown	HHP, 18. IV. 2001, TK leg. <sup>3</sup>
5	<i>GL</i>	Leaf vein (C-057) (Fig. 12) <sup>1</sup>	HHP, 30. VIII. 2001, TK leg. <sup>3</sup>
6	<i>GL</i>	BG: Twig (C-053) (Fig. 13) AG: Leaf vein (C-058) (Fig. 14)	HHP, 2. XII. 2001, TK leg. <sup>3</sup>
7	<i>GI</i>	Leaf (C-060) <sup>1</sup>	Konomi., 16. X. 2001, TK leg.
8	<i>D</i>	BG: Ramentum (C-063) AG: Leaf vein (C-068)	FFKU, 22. VII. 2000, TK leg.
9	<i>A</i>	BG: Bud (C-079) AG: Twig (C-076)	Konomi., 25. VI. 2000, TK leg.
10	<i>V</i>	BG: Bud (C-080) AG: Leaf vein (C-085)	FFKU, 3. VIII. 2000, TK leg.
11	<i>A</i>	BG: Cupule (C-104) (Fig. 15) AG: Leaf vein (C-081) (Fig. 16)	TB, 11. VII. 1999, TK leg. <sup>3</sup>
12	<i>A</i>	BG: Leaf (C-087) AG: Leaf vein (C-082)	TB, 18. VII. 1999, TK leg.
13	<i>A</i>	BG: Ramentum of male catkin (C-095) AG: Leaf vein (C-083)	TB, 10. V. 1999, TK leg.
14	<i>A</i>	BG: Leaf (C-093) AG: Leaf vein (C-084)	Konomi., 21. VIII. 1999, JY <i>et al.</i> leg.; TB, 28. VIII. 1999, TK leg.; Mt. Sefuriyama, Saga Pref., 14. V. 2001, TK leg.
15	<i>S</i>	Twig (C-118) <sup>1</sup>	FFKU, 20. IV. 2001, TK leg.
16	<i>S</i>	BG: Twig (C-120) AG: Surface of trunk near the ground (C-115)	FFKU, 12. I. 2001, TK leg.

Table 1. Continued.

Unidentified species (Gen. sp.)	Host plant *	Galled part <sup>+</sup>	Collecting data <sup>†</sup>
17	<i>S</i>	BG: Leaf vein (C-137) AG: Root (C-117)	FFKU, 15. IV. 2000, TK leg.
18	<i>S</i>	BG: Leafstalk (C-124) (Fig. 17) AG: Leaf vein (C-136) (Fig. 18)	FFKU, 3. VII. 2000, TK leg. <sup>3</sup>
19	<i>S</i>	Bud (C-130) (Fig. 19) <sup>1</sup>	FFKU, 6. II. 2002, TK leg. <sup>3</sup>
20	<i>S</i>	AG: Leafstalk & Leaf vein (C-138) <sup>2</sup>	FFKU, 18. IV. 2000, TK leg.
21	<i>S</i>	Leaf vein (C-140) <sup>1</sup>	Yakuôji, Koga C., Fukuoka Pref., 13. X. 1999, TK leg.
22	<i>S</i>	AG: Leaf (C-141) <sup>2</sup>	TB, 18. IV. 1999, TK leg.; FFKU, 2. IV. 2000, TK leg.
23	<i>S</i>	Leaf (C-144) (Fig. 20) <sup>1</sup>	FFKU, 16. VI. 2000, TK leg. <sup>3</sup>
24	<i>S</i> & <i>MG</i>	Leaf vein (C-146) <sup>1</sup>	FFKU, 3. IX. 2000, TK leg.
25	<i>S</i>	Leafstalk & Leaf vein (C-147) (Fig. 21) <sup>1</sup>	FFKU, 18. IV. 2000, TK leg. <sup>3</sup>
26	<i>S</i>	BG: Leaf (C-148) (Fig. 22) AG: Unknown	FFKU, 8. IV. 2000, TK leg. <sup>3</sup>
27	<i>S</i>	BG: Male flower (C-151) AG: Cupule (C-154)	FFKU, 7. IV. 2000, TK leg.
28	<i>S</i>	Cupule (C-155) <sup>1</sup>	FFKU, 18. VII. 2000, TK leg.
29	<i>MG</i>	Bud (C-186) <sup>1</sup>	FFKU, 28. VIII. 2002, TK leg.
30	<i>MG</i>	Bud (C-188) <sup>1</sup>	FFKU, 28. VIII. 2002, TK leg.
31	<i>MG</i>	Leaf (C-191) <sup>1</sup>	Mt. Kujûsan, Oita Pref., 10. IX. 1999, TK leg.
32	<i>MG</i>	Cupule (C-192) <sup>1</sup>	FFKU, 23. VI. 2002, TK leg.

\* *A*: *Q. acutissima*, *D*: *Q. dentata*, *GI*: *Quercus gilva* Blume, *GL*: *Q. glauca*, *MG*: *Q. mongolica* var. *grosseserrata*, *S*: *Q. serrata*, *V*: *Q. variabilis*

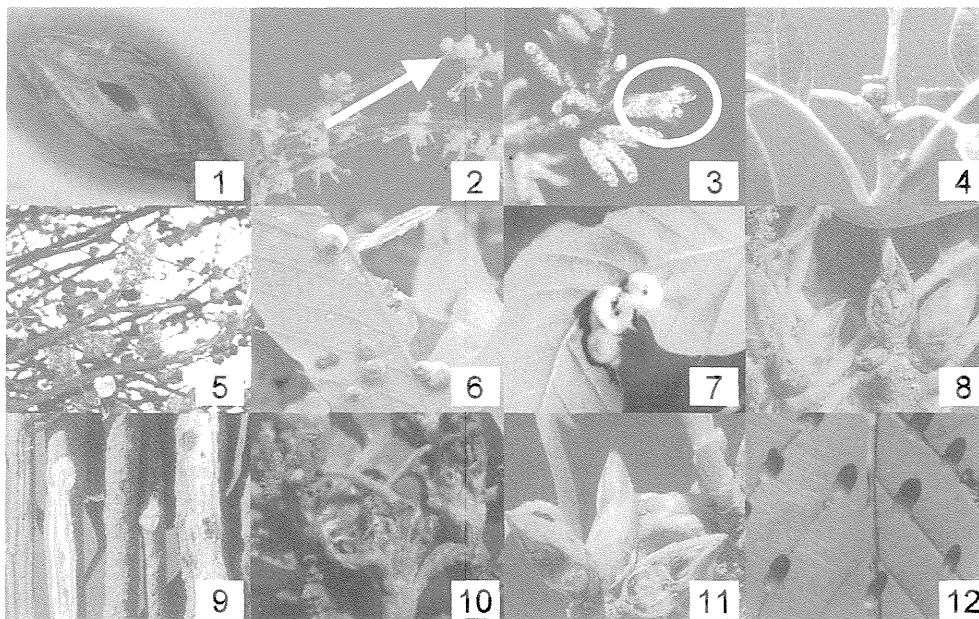
<sup>+</sup> BG: Bisexual generation, AG: Agamic generation

<sup>†</sup> Konomi.: Mt. Konomiyama, Fukuma T., Fukuoka Pref., HHP: Higashi-Hirao Park, Fukuoka C., TB: Tachibanaguchi, Hisayama T., Fukuoka Pref.

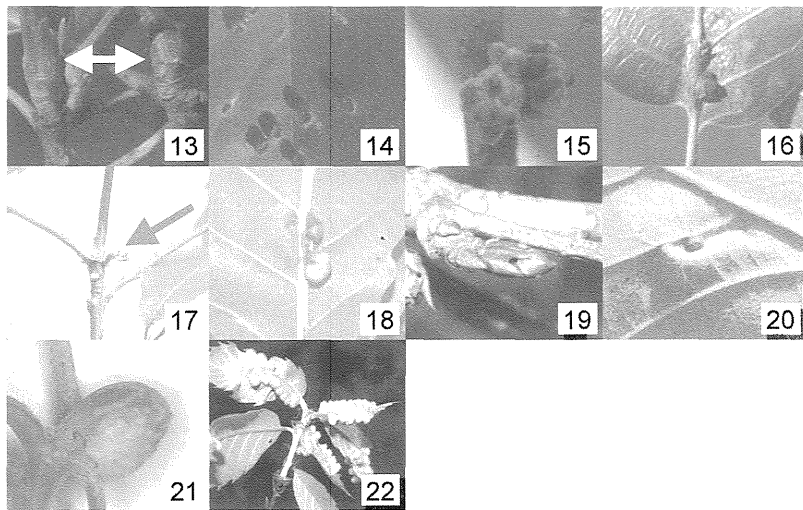
<sup>1</sup> It could not be determined that this gall was induced by bisexual or agamic generation larvae because only parasitoid adults emerged from this gall.

<sup>2</sup> This species is univoltine and reproduces parthenogenetically. There is no bisexual generation (Yukawa & Masuda, 1996).

<sup>3</sup> New collection record from Kyushu



- Fig. 1.** Bisexual generation galls of *Neuroterus aprilinus* on a bud of *Quercus serrata*.
- Fig. 2.** An agamic generation gall of *Neuroterus aprilinus* on the male flowers of *Quercus serrata*.
- Fig. 3.** Bisexual generation galls of *Neuroterus moriokensis* on the male flowers of *Quercus serrata*.
- Fig. 4.** An agamic generation gall of *Neuroterus moriokensis* on a bud of *Quercus serrata*.
- Fig. 5.** Bisexual generation galls of *Neuroterus vonkuenburgi* on the male flowers of *Quercus acutissima*.
- Fig. 6.** Agamic generation galls of *Neuroterus vonkuenburgi* on a leaf of *Quercus variabilis*.
- Fig. 7.** Bisexual generation galls of Gen. sp. 1 on a leaf of *Quercus variabilis*.
- Fig. 8.** Bisexual generation galls of Gen. sp. 2 on the buds of *Quercus glauca*.
- Fig. 9.** Agamic generation galls of Gen. sp. 2 on the twigs of *Quercus glauca*.
- Fig. 10.** Bisexual generation galls of Gen. sp. 3 on a bud of *Quercus glauca*.
- Fig. 11.** Bisexual generation galls of Gen. sp. 4 on the buds of *Quercus glauca*.
- Fig. 12.** Galls of Gen. sp. 5 on a leaf of *Quercus glauca*.



**Fig. 13.** Bisexual generation galls of Gen. sp. 6 on the twigs of *Quercus glauca*.

**Fig. 14.** Agamic generation galls of Gen. sp. 6 on a leaf of *Quercus glauca*.

**Fig. 15.** Bisexual generation galls of Gen. sp. 11 on the cupules of *Quercus acutissima*.

**Fig. 16.** Agamic generation galls of Gen. sp. 11 on a leaf of *Quercus acutissima*.

**Fig. 17.** A bisexual generation gall of Gen. sp. 18 on a leafstalk of *Quercus serrata*.

**Fig. 18.** Agamic generation galls of Gen. sp. 18 on a leaf of *Quercus serrata*.

**Fig. 19.** A gall of Gen. sp. 19 on a bud of *Quercus serrata*.

**Fig. 20.** A gall of Gen. sp. 23 on a leaf of *Quercus serrata*.

**Fig. 21.** A gall of Gen. sp. 25 on a leafstalk of *Quercus serrata*.

**Fig. 22.** Bisexual generation galls of Gen. sp. 26 on the leaves of *Quercus serrata*.

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