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Ants, Wasps and Bees of Iwo-jima, Northern Ryukyus, Japan (Hymenoptera, Aculeata)

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Abstract A faunal survey of ants, wasps and bees was conducted on Iwo-jima, the Northern Ryukyus, Japan, in 2005. In total 35 species belonging to 28 genera were collected. Among them 17 species of ant, 1 of wasp and 6 of bee are new to this island. Some biological and biogeographical notes are given for the collected species, with a revised list of species of the Aculeata on Iwo-jima.

Key words: Iwo-jima, the Ryukyus, ants, wasps, bees, fauna, biology, biogeography.

Introduction

Iwo-jima located in the northern part of the Ryukyu Islands is a volcanic island with an area of 11.7 km^2 (Fig.1). Mt. Iwo-dake (703.7 m high) situated in the eastern part of the island is a central cone of the Kikai Caldera, and has been continuously active. The vegetation is characterized by the dominance of a kind of bamboo, *Pleioblastus linearis*.

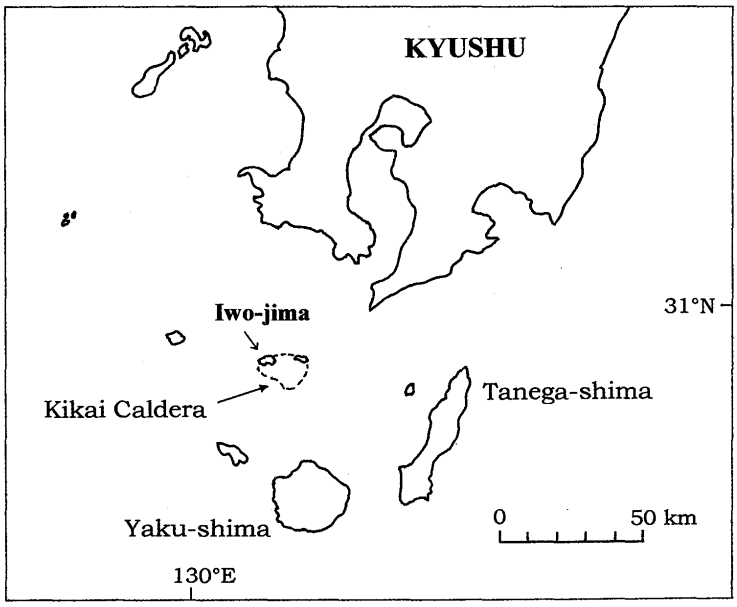

Fig. 1. Map of Iwo-jima and surrounding islands.

Up to now 25 aculeate species have been recorded from Iwo-jima (Yamane *et al.*, 1999). Since biota of this island seems to have been seriously damaged 7300 years ago by big eruptions (formation of Kikai Caldera), it is interesting to know which groups of the Aculeata have already arrived.

This time 24 species are newly recorded from this island. In this paper a list of ants, wasps and bees sampled on this island in 2005 is presented, with some biological and biogeographical notes. A revised list of the Aculeata from this island is also provided.

Sampling methods

Ants were collected with the following two methods by one of the authors, Yamane, on 1-4 November, 2005.

1) Cheese baiting. Thirty powdered-cheese baits were set up in each of the two sites: a) transect in a *Camellia japonica* (Theaceae) plantation, and b) transect along a narrow road surrounded by *Pleioblastus linearis* bamboo (Graminae). Ants were collected for around one hour after setting the baits on the ground in each site.

2) Manual collection. Ants were collected manually in several habitat types in the lowland. Ants sampled from leaves of *Mallotus japonicus* (Euphorbiaceae) were preserved in separate bottles. This pioneer tree has many extrafloral nectaries on the leaves to attract ants for defense against herbivore insects.

On the other hand, wasps and bees were caught by a net on the flower of plants along roads by the other author, Ikudome, on 14-17 July and 27-28 October, 2005. Some specimens were collected with the method of random sweeping by a net to cover lower vegetation.

List of the aculeate Hymenoptera

In total 35 species belonging to 28 genera were collected in 2005. Ants and wasps were identified by Yamane, and bees by Ikudome. Genera are arranged in alphabetical order in each family. The current species number of the Aculeata on Iwo-jima is summarized in Table 1.

Formicidae

1. *Camponotus bishamon* Terayama
   Two colonies from rotting wood found at an edge of a *Pleioblastus linearis* forest. Foragers from *Mallotus japonicus* leaves. 1 queen from the flower of *Buddleja curviflora* on 14 vii 2005 (S. Ikudome). New to Iwo-jima.
2. *Camponotus nawai* Ito
   A colony from a dead twig on a living *Camellia* tree. Foragers from leaves of *M. japonicus*. New to Iwo-jima.
3. *Camponotus japonicus* Mayr
   Foragers from a garden (almost bare ground); 1 worker from the flower of *Buddleja curviflora* on 16 vii 2005 (S. Ikudome). New to Iwo-jima.
4. *Camponotus devestivus* Wheeler
   A founding queen from rotting wood alongside a road. New to Iwo-jima.
5. *Cardiocondyla kagutsuchi* Terayama
   Foragers from a stone wall. In Japan this species has been treated as *C. nuda* (Mayr), which is an Australian and Polynesian species (Seifert, 2003). New to Iwo-jima.
6. *Crematogaster vagula* Wheeler
   Foragers were cheese-baited. New to Iwo-jima.

7. *Formica hayashi* Terayama et Hashimoto
   Foragers from the garden (almost bare ground), and from leaves of *M. japonicus*. New to Iwo-jima.
8. *Monomorium chinense* Santschi
   Foragers from the stone wall, and the garden (bare ground), and also cheese-baited. New to Iwo-jima.
9. *Ochetellus glaber* (Mayr)
   Foragers from the stone wall and leaves of *M. japonicus*. New to Iwo-jima.
10. *Paratrechina flavipes* (F. Smith)
   Some colonies nesting in fallen twigs in the *Camellia* plantation, and in soil at the edge of *Pleioblastus* forest. Foragers were cheese-baited and also found on leaves of *M. japonicus*. New to Iwo-jima.
11. *Pheidole indica* Mayr
   A colony nesting in crevices of concrete near the port. Foragers from the garden (bare ground). New to Iwo-jima.
12. *Pheidole noda* F. Smith
   Some colonies nesting in the soil of the *Camellia* plantation. Foragers were cheese-baited, and also from leaves of *M. japonicus*. New to Iwo-jima.
13. *Pheidole fervens* F. Smith
   Some colonies nesting in the soil of the *Camellia* plantation. Foragers were cheese-baited, and also from the garden (bare ground), stone wall and leaves of *M. japonicus*. New to Iwo-jima.
14. *Solenopsis japonica* Wheeler
   Manual collection. New to Iwo-jima.
15. *Temnothorax anira* Terayama et Onoyama
   Foragers from the stone wall. New to Iwo-jima.
16. *Tetramorium bicarinatum* (Nylander)
   Foragers were cheese-baited. New to Iwo-jima.
17. *Vollenhovia benzai* Terayama et Kinomura
   Foragers from the *Camellia* plantation. New to Iwo-jima.

Pompilidae

1. *Batozonellus maculifrons* (Smith)
   1 female, 15 vii 2005.
2. *Episylon arrogans* (Smith)
   1 female, 15 vii 2005. Yellowish white marking on hind tibia much reduce.

Table 1. Ant species sampled from cheese baits.

	Camellia plantation	Trail thru bamboo forest
Pheidole noda	19	21
Pheidole fervens	16	16
Tetramorium bicarinatum	2	0
Paratrechina flavipes	2	8
Monomorium chinense	1	7
Crematogaster vagula	1	0

30 baits were set up in each site. Frequency of occurrence in baits is shown for each species.

Scoliidae

1. *Campsomeriella annulata annulata* (Fabricius)

10 males and 9 females, 14-16 vii 2005 (*Erigeron bonariensis*: 8m, *Peucedanum japonicum*: 2m2f, *Polygonum cuspidatum*: 1m, *Canavalia lineate*: 1m4f, *Portulaca grandiflora*: 2f, *Buddleja curviflora* forma *venenifera*: 1f)

2. *Megacampsomeris mojiensis* (Uchida)

13 males, 27 x 2005 (*Youngia denticulate*: 3m, *Polygonum cuspidatum*: 7m, *P. chinense* var. *thunbergianum*: 2m)

Eumenidae

1. *Stenodynerus chinensis simillimus* Yamane et Gusenleitner

4 males and 2 females, 14-16 vii 2005; 1 male, 27 x 2005.

2. *Anterhynchium flavomarginatum* (Smith)

6 males, 16 vii 2005. Five males have a more or less complete orange apical band on gastral tergite 3. In the remaining specimen, the orange band on tergite 3 is absent, and scutellum and metanotum are almost wholly black as in *A. melanopterum*. However, in the shape of clypeus and aedeagal shaft the specimen agrees well with *A. flavomarginatum*.

Vespidae

1. *Polistes jokahamae* Radoszkowski

5 females, 15 vii 2005; 2 females, 27 x 2005.

Sphecidae

1. *Isodontia nigella* (Smith)

11 males, 15-17 vii 2005.

2. *Sceliphron madraspatanum kohli* Sickman

3 males, 14-16 vii 2005.

Crabronidae

1. *Tachysphex nigricolor nigricolor* (Dalla Torre)

1 female, 15 vii 2005.

Philanthidae

1. *Cerceris japonica* Ashmead

1 female, 7 viii 1982 (Sk. Yamane); 1 female, 27 x 2005. New to Iwo-jima.

Colletidae

1. *Hylaeus hirashimai* Ikudome

20 males and 1 female, 15-16 vii 2005, *Peucedanum japonicum*; 7 males and 3 females, 27 x 2005, *Youngia denticulata*; 7 males and 7 females, 27 x 2005, *Polygonum cuspidatum*; 18 males, 27 x 2005, *Polygonum chinense* var. *thunbergianum*; 3 males and 7 females, 28 x 2005, *Peucedanum japonicum*. New to Iwo-jima.

2. *Hylaeus insularum* Yasumatsu et Hirashima

140 males and 18 females, 15-16 vii 2005, *Peucedanum japonicum*; 6 males and 18 females, 27 x 2005, *Polygonaum cuspidatum*; 2 females, 27 x 2005, *Polygonum chinense* var. *thunbergianum*; 12 females, 27 x 2005, *Youngia denticulata*; 1 male and 3 females,

27 x 2005, *Paederia scandens* var. *mairei*; 1 female, 28 x 2005, *Peucedanum japonicum*.

Halictidae

1. *Halictus aerarius* Smith

   1 female, 15 vii 2005, *Peucedanum japonicum*. New to Iwo-jima.

2. *Lasioglossum (Evylaeus) japonicum* (Dalla Torre)

   1 male, 27 x 2005, *Polygonum chinense* var. *thunbergianum*. New to Iwo-jima.

3. *Lasioglossum (Evylaeus) smilodon* Ebmer et Sakagami

   3 males and 10 females, 16 vii 2005, *Peucedanum japonicum*; 1 female, *Portulaca grandiflora*; 4 males and 13 females, 27 x 2005, *Youngia denticulata*; 1 male, 27 x 2005, *Polygonum chinense* var. *thunbergianum*. New to Iwo-jima.

Megachilidae

1. *Megachile okinawana* Yasumatsu et Hirashima

   11 males and 3 females, 15-16 vii 2005, *Canavalia lineate*; 1 male, 16 vii 2005, *Buddleja curviflora* forma *venenifera*. New to Iwo-jima.

Apidae

1. *Amegilla florea florea* (Smith)

   10 males and 6 females, 14-16 vii 2005, *Buddleja curviflora* forma *venenifera*; 1 male and 1 female, 16 vii 2005, *Canavalia lineate*; 1 male, 14 vii 2005, *Zingiber mioga*. New to Iwo-jima.

Biological and biogeographical notes

All the 17 ant species collected in 2005 represent first records for this island. Since only one ant species, *Aphaenogaster osimensis* (not found in the present material), has been recorded, total species number is currently 18 for this island. Most remarkable finding is that no ponerine and cerapachyine species was found. Forest-dwelling myrmicines are also very scarce in both species number and abundance. Probably unstable forest condition, attributable to both volcanic and human activities, has been responsible for this. On the other hand, at least five are so-called tramp species (*C. kagutsuchi, M. chinense, P. indica, P. fervens* and *T. bicarinatum*). *Ochetellus glaber* is also a species typically inhabiting human-disturbed areas.

Six species were sampled from cheese baits. In both sites two *Pheidole* species, *P. noda* and *P. fervens*, were most dominant (Table 2). Two species, *Crematogaster vagula* and *Tetramorium bicarinatum*, were sampled only from cheese baits. Eight species were found from leaves of *Mallotus japonicus*. Nesting sites were confirmed in six species: *Camponotus bishamon, C. nawai, Paratrechina flavipes, Pheidole indica, P. fervens*, and *P. noda*.

Most species of wasps recorded this time have been already known from this island, while most bee species (6) were recorded for the first time. However, more species must be added to the bee fauna as the faunal survey has not been conducted from spring to early summer. Anyway, the bee fauna seems very poor. One of the reasons for this scarcity of bee fauna is that the vegetation is not so rich. This island is largely covered with the bamboo, *Pleioblastus linearis*, except for the eastern area in which the active volcano is located.

Table 2. A revised list of species of the Aculeata on Iwo-jima. (* indicates a new record.)

Ants (18 species)

Formicidae

1. *Aphaenogaster osimensis*
2. *Camponotus bishamon* *
3. *Camponotus devestivus* *
4. *Camponotus japonicus* *
5. *Camponotus nawai* *
6. *Cardiocondyla kagutsuchi* *
7. *Crematogaster vagula* *
8. *Formica hayashi* *
9. *Monomorium chinense* *
10. *Ochetellus glaber* *
11. *Paratrechina flavipes* *
12. *Pheidole fervens* *
13. *Pheidole indica* *
14. *Pheidole noda* *
15. *Solenopsis japonica* *
16. *Temnothorax anira* *
17. *Tetramorium bicarinatum* *
18. *Vollenhovia benzai* *

Wasps (24 species)

Pompilidae

1. *Batozonellus maculifrons*
2. *Cyphononyx dorsalis*
3. *Episylon arrogans*
4. *Hemipepsis amamiensis*

Mutillidae

1. *Neotrogaspidia pustulata*
2. *Smicromyrme lewisi*

Scoliidae

1. *Campsomeriella annulata annulata*
2. *Megacampsomeris mojiensis*
3. *Scolia fascinata*

Eumenidae

1. *Anterhynchium flavomarginatum*
2. *Stenodynerus chinensis smillimus*

Vespidae

1. *Polistes jokahamae*

Sphecidae

1. *Chalybion japonicum*
2. *Isodontia nigella*
3. *Sceliphron madraspatanum kohli*

Crabronidae

1. *Crossocerus opacifrons*
2. *Liris festinans*
3. *Liris subtessellatus*
4. *Tachysphex nigricolor nigricolor*
5. *Trypoxylon frigidum*
6. *Trypoxylon malaisei*
7. *Trypoxylon petiolatum*

Nyssonidae

1. *Bembecinus hungaricus*

Philanthidae

1. *Cerceris japonica* *

Bees (7 species)

Colletidae

1. *Hylaeus hirashimai* *
2. *Hylaeus insularum*

Halictidae

1. *Halictus aerarius* *
2. *Lasioglossum japonicum* *
3. *Lasioglossum smilodon* *

Megachilidae

1. *Megachile okinawana* *

Apidae

1. *Amegilla florea florea* *

TOTAL

14 families
39 genera
49 species

Flowering plants are scanty in both species number and abundance, and are only found in restricted areas, for example, narrow open land along roads and plantations, seaside, village and so on.

The occurrence of *Megachile okinawana* is of special interest in terms of geographical distribution. This species belongs to the species group of *M. bicolor* which is essentially an Indian inhabitant and is superficially very similar to *M. xanthothrix* and *M. yaeyamaensis* but is separated from them chiefly by the color tone of hairs on the body. *M. okinawana* has been known ranging from the Central Ryukyus (Ikudome and Yamane, 1990) northward to Yaku-shima (Yamane, *et al.*, 1999). The present record from Iwo-jima expands the known range of this species further to the north. *M. xanthothrix* is known from Tanega-shima, Koshiki-jima, Kyushu, Shikoku, the western part of Honshu in Japan, and *M. yaeyamaensis* occurs on the Southern Ryukyus. It means that these three species may show an allopatric distribution, since up to now no island has been known to be inhabited by more than one species. This pattern is similar to that in the large carpenter bees (*Xylocopa*) in the Ryukyus (Yamane *et al.*, 1983).

Two eusocial bee species, *Apis cerana* and *A. mellifera*, whose colonies reproduce by budding were not found. Although the European honeybee *A. mellifera* was once introduced (in 2000 or 2001) to the island, the colony did not survive (H. Sato, personal comm., 2006). Probably pollen and nectar may not have been enough or stable in amount to support the colony throughout the active season.

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