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Ants, Wasps and Bees of Take-shima, Northern Ryukyus, Japan (Hymenoptera, Aculeata)

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Abstract Faunal survey of ants, wasps and bees was conducted on Take-shima, Mi-shima group, Northern Ryukyus, Japan, in 2007. In total 36 species belonging to 26 genera were collected. Among them 14 ant, 3 wasp and 12 bee species are new to this island. Additional data for the aculeate fauna of Iwo-jima was presented based on the 2007 survey. A revised list of Aculeata from Take-shima, and a comprehensive list of Aculeata for the three Mi-shima islands are presented. Some biological and biogeographical notes are given for the aculeate fauna of the Mi-shima group.

Key words: Mi-shima group, Ryukyus, Aculeata, fauna, species number, biology, biogeography.

Introduction

In the previous papers (Ikudome and Yamane, 2007; Yamane and Ikudome, 2008) we presented additional information on the aculeate fauna of Iwo-jima (11.71km^2) and Kuro-shima (15.69km^2), volcanic islands belonging to the Mi-shima Islands, located in Northern Ryukyus. In 2007 we conducted faunal surveys on another island of the Mi-shima group, namely Take-shima (4.18km^2) (Fig. 1), which has no recent volcanic activity and is extensively covered with bamboos. The most comprehensive list of the Aculeata on this island is given in Yamane *et al.,* 1999, where only two species of bees and eight species of wasps are recorded. Our surveys added some ants, wasps and bees to the list.

Sampling methods

All of ants, wasps and bees were collected by Ikudome on 26-29 July and 22-24 October, 2007. The ants were sampled during 26-28 July by hand collecting (HC) and bait trapping (BT) using sausage as bait. The wasps and bees were mainly caught with a net on the flower of plants

along roads (plant names recorded), but some were collected by random sweeping by net to cover lower vegetation.

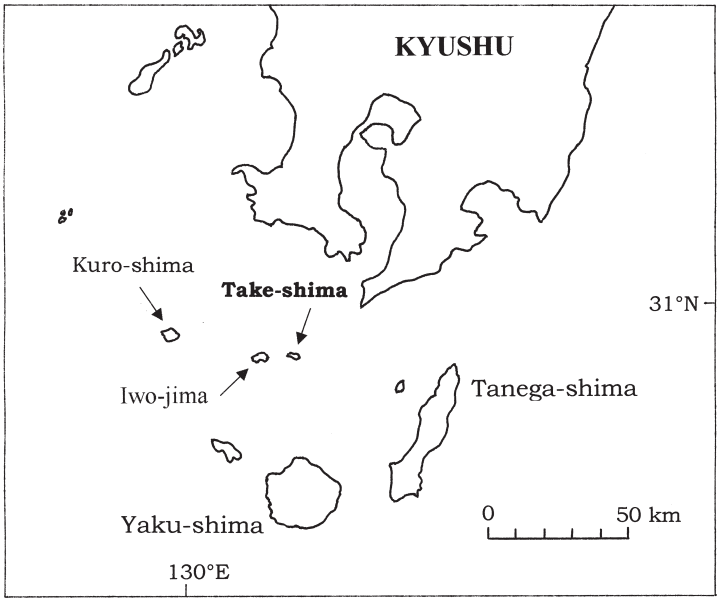

Fig. 1. Map of Take-shima and surrounding islands.

List of species collected in 2007

In total 36 species belonging to 26 genera were collected in 2007. Genera are arranged in alphabetical order in each family or subfamily. A revised list of aculeate Hymenoptera of this island is given in Table 1.

Formicidae
<Dolichoderinae>
1. *Ochetellus glaber* (Mayr) HC and BT
<Formicinae>
2. *Camponotus nawai* Ito HC & BT
3. *Camponotus ?bishamon* Terayama HC
4. *Camponotus vitiosus* F. Smith HC & BT
5. *Paratrechina flavipes* (F. Smith) HC
<Myrmicinae>
6. *Cardiocondyla kagutsuchi* Terayama HC
7. *Crematogaster nawai* Ito HC
8. *Crematogaster vagula* Wheeler BT
9. *Monomorium chinense* Santschi HC & BT
10. *Monomorium intrudens* F. Smith HC

11. *Pheidole fervens* F. Smith HC & BT
12. *Pheidole noda* F. Smith HC & BT
13. *Pristomyrmex punctatus* (F. Smith) HC
14. *Tetramorium bicarinatum* (Nylander) HC

Pompilidae

1. *Batozonellus annulatus* (Fabricius)

1 female, 28 vii.

2. *Cyphononyx dorsalis* (Lepeletier)

1 female and 1 male, 26 vii.

Mutillidae

1. *Neotrogaspidia pustulata* (Smith)

1 female and 1 male, 27 vii (male on *Portulaca grandiflora*).

Scoliidae

1. *Campsomeriella annulata annulata* (Fabricius)

14 females, 26-28 vii, *Peucedanum japonicum, Alpinia speciosa, Hibiscus syriacus, Buddleja curviflora* var. *venenifera*; 10 females and 25 males, 22-26 vii, *Crepidiastrum lanceolatum, Polygonum chinense* var. *thunbergianum, Eupatorium variabile, Portulaca grandiflora.*

2. *Megacampsomeris mojiensis mojiensis* (Uchida)

3 females and 6 males, 26-28 vii, *Peucedanum japonicum, Alpinia speciosa, Buddleja curviflora* var. *venenifera, Callicarpa japonica* var. *luxurians*; 2 females and 11 males, 22 x, *Polygonum chinense* var. *thunbergianum, Portulaca grandiflora, Eupatorium variabile, Crepidiastrum lanceolatum.*

Eumenidae

1. *Anterhynchium flavomariginatum micado* (Kirsch)

2 females and 3 males, 26-28 vii, *Hibiscus syriacus, Siegesbeckia pubescens, Peucedanum japonicum.*

2. *Stenodynerus chinensis kalinowskii* (Radoszkowski)

1 female, 27 vii, *Portulaca grandiflora.*

Vespidae

1. *Polistes jokahamae* Radoszkowski

3 females, 26-27 vii, *Siegesbeckia pubescens*; 1 female, 22 x.

Sphecidae

1. *Isodontia nigella* (Smith)

1 female and 4 males, 26-28 vii, *Peucedanum japonicum.*

Colletidae

1. *Colletes perforator* Smith

1 male, 23 x, *Crepidiastrum lanceolatum.*

2. *Hylaeus hirashimai* Ikudome

150 females and 4 males, 28 vii, *Peucedanum japonicum*; 8 males, 22-23 x, *Crepidiastrum lanceolatum*; 2 males, 22 x, *Polygonum chinense* var. *thunbergianum*; 1 female and 2 males, 23 x, *Paederia scandens* var. *mairei*; 4 females and 1 male, 23 x, *Peucedanum japonicum.*

3. *Hylaeus insularum insularum* Yasumatsu et Hirashima

21 females and 25 males, 28 vii, *Peucedanum japonicum*; 1 female, 22 x, *Portulaca grandiflora*; 6 females and 41 males, 22-23 x, *Polygonum chinense* var. *thunbergianum*; 24 females and 45 males, 22-23 x, *Crepidiastrum lanceolatum*; 27 females and 12 males, 23 x, *Paederia scandens* var. *mairei*; 2 females, 23 x, *Callicarpa japonica* var. *luxurians*; 1 male, 23 x, *Peucedanum japonicum.*

Halictidae

1. *Halictus (Seladonia) aerarius* Smith

1 female, 22 x, *Portulaca grandiflora.*

2. *Lasioglossum (Evylaeus) pallilomum* (Strand)

24 females and 2 males, 27 vii, *Portulaca grandiflora*; 4 females and 2 males, 27 vii, *Siegesbeckia pubescens*; 1 female, 27 vii, *Buddleja curviflora* var. *venenifera*; 1 female, 28 vii, *Peucedanum japonicum*; 22 females and 5 males, 22-23 x, *Portulaca grandiflora*; 1 female, 22 x, *Polygonum chinense* var. *thunbergianum*; 2 females, 23 x, *Paederia scandens* var. *mairei.*

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

12 females and 8 males, 27 vii, *Portulaca grandiflora*; 4 males, 27 vii, *Siegesbeckia pubescens*; 20 females, 28 vii, *Peucedanum japonicum*; 13 females and 2 males, 22-23 x, *Portulaca grandiflora*; 2 females and 2 males, 22-23 x, *Crepidiastrum lanceolatum*; 1 female, 23 x, *Paederia scandens* var. *mairei.*

4. *Lasioglossum (Evylaeus) villosulum trichopse* (Strand)

3 females, 27 vii, *Buddleja curviflora* var. *venenifera.*

5. *Lasioglossum (Lasioglossum) scitulum* (Smith)

1 female, 27 vii, *Portulaca grandiflora.*

6. *Sphecodes* sp. 1

1 male, 27 vii, *Portulaca grandiflora.*

7. *Sphecodes* sp. 2

1 male, 22 x, *Portulaca grandiflora.*

Megachilidae

1. *Megachile okinawana* Yasumatsu et Hirashima

10 females and 3 males, 28 vii, *Canavalia lineata.*

Apidae

1. *Amegilla florea* (Smith)

1 female and 1 male, 26 vii, *Buddleja curviflora* var. *venenifera*; 2 females, 27 vii, *Buddleja curviflora* var. *venenifera*; 2 females, 22 x, *Buddleja curviflora* var. *venenifera.*

2. *Xylocopa appendiculata cirvumvolans* Smith

2 females, 26 vii, *Buddleja curviflora* var. *venenifera*; 1 female, 27 vii, *Alpinia speciosa.*

Additional collection data from Iwo-jima

* indicates a new record.

Scoliidae

1. *Campsomeriella annulata annulata* (Fabricius)

2 females, 4 v, *Rhaphiolepis umbellata,* S. Ikudome leg.

2. *Megacampsomeris mojiensis mojiensis* (Uchida)

1 female and 1 male, 4 v, *Rhaphiolepis umbellata,* S. Ikudome leg.

Eumenidae

1. *Stenodynerus chinensis kalinowskii* (Radoszkowski)

1 male, 4 v, *Rhaphiolepis umbellata,* S. Ikudome leg.

Vespidae

1. *Polistes jokahamae* Radoszkowski

1 female, 4 v, *Rhaphiolepis umbellata,* S. Ikudome leg.

Andrenidae

1. *Andrena (Chloranderna) knuthi* Alfken *

9 females, 4 v, *Ixeris dentata,* S. Ikudome leg.

Halictidae

1. *Lasioglossum (Evylaeus) taeniolellum* Vachal *

1 female, 4 v, *Ixeris dentata,* S. Ikudome leg.

Table 1. A revised list of the species of the Aculeata on Take-shima. (* indicates a new record.)

Ants (14 species)
Formicidae
1. *Ochetellus glaber* *
2. *Camponotus nawai* *
3. *Camponotus ?bishamon* *
4. *Camponotus vitiosus* *
5. *Paratrechina flavipes* *
6. *Cardiocondyla kagutsuchi* *
7. *Crematogaster nawai* *
8. *Crematogaster vagula* *
9. *Monomorium chinense* *
10. *Monomorium intrudens* *
11. *Pheidole fervens* *
12. *Pheidole noda* *
13. *Pristomyrmex punctatus* *
14. *Tetramorium bicarinatum* *
Wasps (11 species)
Pompilidae
1. *Batozonellus annulatus* *
2. *Cyphononyx dorsalis* *
3. *Hemipepsis amamiensis*
Scoliidae
1. *Campsomeriella annulata*
2. *Megacampsomeris mojiensis*
Mutillidae
1. *Neotrogaspidia pustulata* *
Eumenidae
1. *Anterhynchium flavomarginatum*
2. *Stenodynerus chinensis*
Crabronidae
1. *Trypoxylon petiolatum*
Vespidae
1. *Polistes jokahamae*
Sphecidae
1. *Isodontia nigella*
Bees (14 species)
Colletidae
1. *Colletes perforator* *
2. *Hylaeus hirashimai* *
3. *Hylaeus insuralum* *
Halictidae
1. *Halictus (Seladonia) aerarius* *
2. *Lasioglossum (Evylaeus) pallilomum* *
3. *Lasioglossum (Evylaeus) smilodon* *
4. *Lasioglossum (Evylaeus) villosulum trichopse* *
5. *Lasioglossum (Lasioglossum) scitulum* *
6. *Sphecodes* sp. 1 *
7. *Sphecodes* sp. 2 *
Megachilidae
1. *Megachile okinawana* *
Apidae
1. *Amegilla florea* *
2. *Thyreus decorus*
3. *Xylocopa appendiculata cirvumvolans*
Total
12 families, 29 genera, 39 species

Apidae

1. *Eucera nipponensis* (Pérez) *

7 females, 4 v, *Rhaphiolepis umbellata,* S. Ikudome leg.

2. *Xylocopa appendiculata circumvolans* Smith *

2 males, 4 v, *Rhaphiolepis umbellata,* S. Ikudome leg.

Table 2. Number of the aculeate species on each island of the Mi-shima group.

Family Genus	T	I	K
Formicidae			
1. *Aphaenogaster*	-	1	2
2. *Camponotus*	3	4	2
3. *Cardiocondyla*	1	1	-
4. *Crematogaster*	2	1	3
5. *Formica*	-	1	-
6. *Hypoponera*	-	-	1
7. *Lasius*	-	-	1
8. *Monomorium*	2	1	2
9. *Ochetellus*	1	1	1
10. *Pachycondyla*	-	-	1
11. *Paratrechina*	1	1	2
12. *Pheidole*	2	3	2
13. *Ponera*	-	-	1
14. *Pristomyrmex*	1	-	1
15. *Solenopsis*	-	1	-
16. *Temnothorax*	-	1	-
17. *Tetramorium*	1	1	1
18. *Vollenhovia*	-	1	2
Pompilidae			
1. *Auplopus*	-	-	1
2. *Batozonellus*	1	1	1
3. *Cyphononyx*	1	1	1
4. *Episylon*	-	1	-
5. *Hemipepsis*	1	1	-
6. *Leptodialepis*	-	-	1
7. *Parachyphononyx*	-	-	1
8. *Platydialepis*	-	-	1
Mutillidae			
1. *Neotrogaspidia*	1	1	-
2. *Smicromyrme*	-	1	-
Scoliidae			
1. *Campsomeriella*	1	1	1
2. *Megacampsomeris*	1	1	1
3. *Scolia*	-	1	1
Eumenidae			
1. *Anterhynchium*	1	1	1
2. *Eumenes*	-	-	1
3. *Euodynerus*	-	-	1
4. *Stenodynerus*	1	1	1
Vespidae			
1. *Parapolybia*	-	-	1
2. *Polistes*	1	1	2
3. *Vespa*	-	-	1
Sphecidae			
1. *Chalybion*	-	1	-
2. *Isodontia*	1	1	1
3. *Sceliphron*	-	1	1
Crabronidae			
1. *Crossocerus*	-	1	-
2. *Liris*	-	2	2
3. *Tachysphex*	-	1	-
4. *Trypoxylon*	1	3	2
Nyssonidae			
1. *Bembecinus*	-	1	-
Philanthidae			
1. *Cerceris*	-	1	1
Colletidae			
1. *Colletes*	1	-	1
2. *Hylaeus*	2	2	2
Halictidae			
1. *Halictus*	1	1	-
2. *Lasioglossum* (*Evylaeus*)	3	3	3
3. *L.* (*Lasioglossum*)	1	-	2
4. *Nomia*	-	-	1
5. *Sphecodes*	2	-	2
Andrenidae			
1. *Andrena*	-	1	3
Megachilidae			
1. *Megachile*	1	1	3
Apidae			
1. *Amegilla*	1	1	1
2. *Ceratina*	-	-	1
3. *Eucera*	-	1	-
4. *Tetraloniella*	-	-	1
5. *Thyreus*	1	-	1
6. *Xylocopa*	1	1	1
TOTAL	39	53	68

T: Take-shima, I: Iwo-jima, K: Kuro-shima.

Biological and biogeographical notes

All the ant species collected on Take-shima in 2007 represent new records for this small island. Since leaf litter, soil, rotting wood and dead twigs were not examined this time, some species inhabiting these habitats will be found in the future. Half the species collected are so-called tramp species. It is interesting that on all the three islands of the Mi-shima group the famous tramp species

Technomyrmex brunneus has not been collected, while *Ochetellus glaber,* another dolichoderine species occupying a similar niche, has been constantly collected on all the islands.

Three species are added to the wasp list for Take-shima. The occurrence of two mutillid species on Take-shima and Iwo-jima indicates the strong dispersal ability of mutillids over the sea. The poor vespid fauna (1 species) of Take-shima and Iwo-jima contrasts with the rather rich fauna (4 species) of Kuro-shima, which is largest in the Mi-shima group and has the oldest fauna and flora.

Most of the bees from Take-shima are basically Palaearctic elements as for Iwo-jima and Kuro-shima. However, *Megachile okinawana,* a more southerly ranging species, is known from Yakau-shima and Iwo-jima beyond Watase's Line (Yamane *et al.,* 1999; Ikudome and Yamane, 2007). On the other hand, *Lasioglossum sumilodon* is known only from the Central and Northern Ryukyus (Yamane and Ikudome, 2008). Although Take-shima is extensively and densely covered with bamboos and has poorer vegetation than Iwo-jima, the number of bee species from Take-shima (14) was more than that from Iwo-jima (11). Two eusocial bee species, *Apis cerana and A. mellifera,* whose colonies reproduce by budding, have not been found on any of the three islands.

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