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The Insect database in Dokdo, Korea: An updated version includes 22 newly recorded species on the island and one species in Korea

Jihun Ryu[‡,§], Young-Kun Kim[|], Sang Jae Suh[|], Kwang Shik Choi[‡,§,¶]

‡ School of Life Science, BK21 Plus KNU Creative BioResearch Group, Kyungpook National University, Daegu, South Korea
§ Research Institute for Dok-do and Ulleung-do Island, Kyungpook National University, Daegu, South Korea
| School of Applied Biosciences, Kyungpook National University, Daegu, South Korea
¶ Research Institute for Phylogenomics and Evolution, Kyungpook National University, Daegu, South Korea

Corresponding author: Kwang Shik Choi (ksc@knu.ac.kr)

Abstract

Background

Dokdo, an island toward the East Coast of South Korea, comprises 89 small islands. Dokdo is a volcanic island created by a volcanic eruption that promoted the formation of Ulleungdo (located in the East sea), which is ~87.525 km away from Dokdo. Dokdo is an important island because of geopolitics; however, because of certain investigation barriers such as weather and time constraints, the awareness of its insect fauna is less compared to that of Ulleungdo. Dokdo's insect fauna was obtained as 10 orders, 74 families, and 165 species until 2017; subsequently, from 2018 to 2019, 23 unrecorded species were discovered via an insect survey.

New information

As per a recent study, the database of insect species on Dokdo has been identified as 10 orders, 81 families, 188 species, and 23 undetermined species. This database has been registered to the Global Biodiversity Information Facility (GBIF; www.GBIF.org), and is the first record for Dokdo's insect fauna.

Keywords

Biodiversity, Dokdo, insect fauna, newly recorded species, insect database

Introduction

An island is known for its ecologically and biologically important ecosystem. Because of its geographical isolation, the movement of organisms is limited (Franks 2009). Moreover, these island-like areas have low potential for both species transfer and settlement; therefore, they have low biodiversity because of the small land area. Furthermore, island-like areas are vulnerable to external intrusions, which is a major threat to indigenous species (Kil et al. 2006). However, because of recent developments in traffic pathways, isolated island ecosystems that are in isolation have decreased, thus allowing researchers to investigate the interactions between evolutionary and ecological processes that are responsible for biodiversity (Gillespie et al. 2008).

The Intergovernmental Panel on Climate Change (IPCC) report shows that climate change is causing the level and temperature of sea to rise; if this trend continues, most coastal regions around the world would be at risk (Hong 2010, IPCC 2014). By 2100, these increases in sea level were estimated to be at least 1 m, and the flooding-related risk for large parts of the low-land island ecosystem was high, which could lead to significant habitat loss for many organisms worldwide (Bellard et al. 2013). The average annual sea level in Korean coastlines has been rising since 1989, and the average annual rate of sea level rise (5.67 mm/yr) around Ulleungdo has been very quick (Korea Hydrographic and Oceanographic Agency 2020).

Dokdo belongs to an administrative district that includes Ulleungdo. However, tourists cannot stay for more than 30 min in Dokdo, although the Korean Coast Guard (KCG) and some residents can stay for a longer time period. Dokdo has an island ecosystem that is relatively disconnected from the outside; therefore, it is an important subject for island ecology and biogeography because the entire island is composed of volcanic rocks (Cultural Heritage Administration 2009). Dokdo was formed by an underwater volcanic eruption during The Pliocene between 2.5 and 4.6 million years ago. It has since been known to promote the formation of Ulleungdo volcanoes via a tectonic plate movement (Lee et al. 2002, Raman et al. 2016). Dokdo, is built on the sea floor that is ~2,000 m deep, comprises two main volcanic islands and 89 small islands (Sohn 1995, Ryu et al. 2012). The nearest land area to Dokdo is Jukbyeon, Uljin-gun, Gyeongsangbuk-do, which is 217.149 km away from Dokdo and 87.525 km from Ulleungdo (Hwang and Park 2007).

Furthermore, Dokdo is located at 131°52'10.4" E and 37°14'26.8" N; the address of Korean administrative district is 1-96 Dokdo-ri, Ulleung-eup, Ulleung-gun, Gyeongsangbuk-do, Korea. In 1982, Dokdo was designated as Natural Monument No. 336 by the Korea Cultural Heritage Administration (KCHA) and was managed by Dokdo Natural Reserve. Dokdo was a very small island with an area of 187,554 m^2; however, there is extremely limited awareness of its insect fauna because it has been a protected island and has inaccessible geographical features. Dokdo is located at the bridge that connects Ulleungdo in Korea and Oki Island in Japan. Since the previous investigation for insect species on the

island played a vital role in the biogeographic limit, the study of insect fauna on Dokdo is considered to be geographically important (Yasunaga and Duwal 2015).

After the initial study of insects on Dokdo by Jolivet in 1974, many researchers have conducted studies and by 2017 10 orders, 74 families, and 165 species of insects have been identified (Jolivet 1974, Yoon 1978, Lee and Kwon 1981, Kwon et al. 1996, An 2000, Korean Ministry of Environment 2001, Ulleung Research Institute of Gyeongju University 2004, Park and Suh 2005, Kim and Yeom 2006, An 2008, Kim et al. 2009, Lee et al. 2009, Park et al. 2010, Park et al. 2011, Park et al. 2013, Daegu Regional Environmental Office 2012, Daegu Regional Environmental Office 2016, Choi et al. 2015, Park et al. 2017, Hwang et al. 2017). In this study, we newly identified 23 unrecorded species on the island and reported an updated database.

Sampling methods

Study extent: In this study, between September 2017 and September 2018, we collected samples four times from Dokdo-Anyongbok-gil, Ulleung-eup, Ulleung-gun, Gyeongsangbuk-do, Korea (131°52'03.2"E, 37°14'27.2'N) using sweeping, beating, brandishing, black light traps, and pit-fall traps. The survey was divided into East (Dongdo) and West (Seodo) using terrain isolation (Fig. 1).

Sampling description: In Dongdo, we performed sample collection along the slope leading from Marina, through the KCG facility, and then to the old Marina. In Seodo, we performed the sample collection along a very steep slope leading to the fishermen's dormitory. Note that Seodo had less vegetation distribution compared to Dongdo.

We stored the collected specimen samples in 70% ethanol or conical tubes. Then, we transferred them to the animal systematics and taxonomy laboratory and pest control laboratory at Kyungpook National University, Korea. The samples were then identified using the national species list of Korea (National Institute of Biological Resources 2019).

Database update: We created a new checklist by adding 23 newly confirmed insect species with reference to the previous reports and compiled it into a database. The data have been registered to the GBIF.

Geographic coverage

Description: The survey was divided into Dongdo and Seodo.

Coordinates: 37-14 Latitude; 131-52 and 131-51 longitude.

Taxonomic coverage

Taxa included:

Rank	Scientific Name	Common Name
kingdom	Animalia	Animals
phylum	Arthropoda	Arthropods
class	Insecta	Insects
order	Blattodea	
family	Ectobiidae	
order	Coleoptera	
family	Aphodiidae	
family	Carabidae	
family	Chrysomelidae	
family	Coccinellidae	
family	Curculionidae	
family	Elateridae	
family	Endomychidae	
family	Hydrophilidae	
family	Latridiidae	
family	Mordellidae	
family	Nitidulidae	
family	Oedemeridae	
family	Scirtidae	
family	Staphylinidae	
family	Tenebrionidae	
order	Dermaptera	
family	Anisolabididae	
family	Forficulidae	
order	Diptera	
family	Anthomyiidae	
family	Calliphoridae	
family	Ceratopogonidae	
family	Chironomidae	
family	Chloropidae	

family	Coelopidae	
family	Culicidae	
family	Drosophilidae	
family	Muscidae	
family	Phoridae	
family	Psychodidae	
family	Rhiniidae	
family	Sarcophagidae	
family	Scathophagidae	
family	Sepsidae	
family	Syrphidae	
family	Tephritidae	
family	Tipulidae	
order	Hemiptera	
family	Alydidae	
family	Anthocoridae	
family	Aphididae	
family	Cicadellidae	
family	Cydnidae	
family	Delphacidae	
family	Lygaeidae	
family	Miridae	
family	Nabidae	
family	Pentatomidae	
family	Piesmatidae	
family	Rhopalidae	
family	Rhyparochromidae	
family	Scutelleridae	
family	Tingidae	
family	Triozidae	
order	Hymenoptera	

family	Bethylidae	
family	Braconidae	
family	Chalcididae	
family	Eupelmidae	
family	Formicidae	
family	Ichneumonidae	
family	Pteromalidae	
order	Lepidoptera	
family	Crambidae	
family	Erebidae	
family	Geometridae	
family	Hesperiidae	
family	Lycaenidae	
family	Noctuidae	
family	Nymphalidae	
family	Papilionidae	
family	Plutellidae	
family	Pyralidae	
family	Sphingidae	
family	Tortricidae	
family	Yponomeutidae	
order	Neuroptera	
family	Chrysopidae	
family	Hemerobiidae	
family	Sisyridae	
order	Odonata	
family	Aeshnidae	
family	Coenagrionidae	
family	Libellulidae	
order	Orthoptera	
family	Gryllacrididae	

family	Gryllidae	
family	Mogoplistidae	

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Data resources

Data package title: dokdo insect list, 1974-2019

Resource link: https://doi.org/10.15468/h684as

Number of data sets: 1

Data set name: dokdo_insect_list_1974-2019

Download URL: https://www.gbif.org/dataset/eb47a0de-862f-44c0-be42-0e300abaaab4

Data format: CSV.

Column label	Column description
occurrenceID	Unique identifier of the occurence
basisOfRecord	State of the recorded specimen
eventDate	Date of the data registration
institutionCode	Abbreviation of the institution having custody of the object
scientificName	Full scientific name
ScientificNameAuthorship	The authorship information for the scientificName formatted according to the conventions of the applicable nomenclaturalCode
collectionCode	Abbreviation of specimen or database
decimalLatitude	Geographic latitude of the collection site
decimalLongitude	Geographic longitude of the collection site
coordinateUncertaintyInMeters	The horizontal distance (in metres) from the given decimalLatitude and decimalLongitude describing the smallest circle containing the whole of the Location
countryCode	Country code
Identification Date	Date for identifying the specimen
Identified by	Identifier for the specimen

stateProvince	Provinc in which the specimen was collected
county	County in which the specimen was collected
locality	Locality in which the specimen was collected
catalogNumber	Specimen number for occurrence
vernacularName	Common or vernacular name in Korea

Additional information

Result and Discussion

In this study, we created the initial database based on the results of a survey of insects on Dokdo from 1974 to 2017. Moreover, the checklist was confirmed that 10 orders, 74 families, 165 species, and 23 undetermined species of insects distributed on the island were identified.

In this study, the previously recorded 23 insect species were collected in Dokdo. The species are as follows: ten species in the Order Hemiptera (*Leptocorisa chinensis*, *Batracomorphus diminuta*, *Macrosteles striifrons*, *Recilia coronifera*, *Geotomus convexus*, *Creontiades coloripes*, *Nesidiocoris tenuis*, *Glaucias subpunctatus*, *Liorhyssus hyalinus*, *Horridipamera inconspicua*); two species in the Order Coleoptera (*Aphodius urostigma* and *Nacerdes melanura*); ten species in the Order Diptera (*Dasysyrphus bilineatus*, *Scaeva komabensis*, *Sepsis monostigma*, *Lucilia porphyrina*, *Stomorhina obsoleta*, *Sarcophaga brevicornis*, *Sarcophaga peregrina*, *Atherigona oryzae*, *Orchisia costata,* and *Culicoides circumscriptus*); and one species in the Order Lepidoptera (*Vanessa indica*) (Fig. 2).

In addition to the 23 newly unrecorded species in Dokdo, four undetermined species were identified to the genus stage: *Empoasca* sp. in Family Cicadellidae; *Sisyra* sp. in Family Sisyridae. Furthermore, five of the 23 unrecorded species and one of the four unidentified species belong to newer families; note that a total of six families were newly added. Finally, we confirmed the updated database of insect fauna on Dokdo: 10 orders, 81 families, 188 species, and 23 unidentified species (Table 1).

Among the 23 unrecorded species on Dokdo, *B. diminutus* was first discovered in Korea, and the remainder of the species was recorded in the Korean peninsula. In this study, *C. circumscriptus*, which is known for being extremely annoying and sucking blood KCG and residents, has been identified for the first time in Dokdo using Black light trap with dry ice.

The 40 undetermined species that have been identified up to the genus stage are classified as unrecorded or new species in Korea. Because of geographical characteristics, studying these insects is considered to be very important to understand Dokdo's biodiversity.

Conflicts of interest

The authors declare that there is no conflicts of interest.

Acknowledgements

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Figure 1.

Map of Dokdo, East(Dongdo) and West (Seodo) islands.

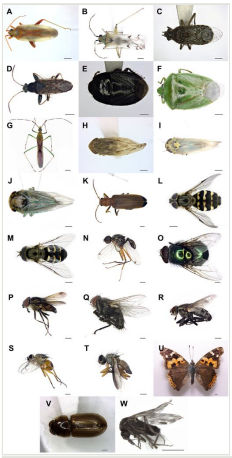

Figure 2.

Newly recorded insect species on island Dokdo. **A** *Creontiades coloripes* **B** *Nesidiocoris tenuis* **C** *Liorhyssus hyalinus* **D** *Horridipamera inconspicua* **E** *Geotomus convexus* **F** *Glaucias subpunctatus* **G** *Leptocorisa chinensis* **H** *Recilia coronifera* **I** *Macrosteles striifrons* **J** *Batracomorphus diminuta* **K** *Nacerdes melanura* **L** *Dasysyrphus bilineatus* **M** *Scaeva komabensis* **N** *Sepsis monostigma* **O** *Lucilia porphyrina* **P** *Stomorhina obsoleta* **Q** *Sarcophaga brevicornis* **R** *Sarcophaga peregrina* **S** *Atherigona oryzae* **T** *Orchisia costata* **U** *Vanessa indica* **V** *Aphodius urostigma* **W** *Culicoides circumscriptus*. Scale bars: F, G, L, M, R, U = 2.0 mm; A, C, D, K, O, P, Q = 1.0 mm; B, E, H, I, J, N, S, T, V, W = 0.5 mm.

Table 1.

The updated database of insect species on Dokdo from the year 1974 to 2019.

Order	Family	Scientific Name	Newly recorded species	Undetermined name
Blattodea	Ectobiidae	*Blattella nipponica*		
Coleoptera	Aphodiidae	*Aphodius urostigma*	O	
Coleoptera	Carabidae	*Anisodactylus signatus*		
Coleoptera	Carabidae	*Anisodactylus tricuspidatus*		
Coleoptera	Carabidae	*Dolichus halensis*		
Coleoptera	Carabidae	*Harpalus jureceki*		
Coleoptera	Carabidae	*Harpalus sinicus*		
Coleoptera	Carabidae	*Stenolophus difficilis*		
Coleoptera	Chrysomelidae	*Callosobruchus chinensis*		
Coleoptera	Chrysomelidae	*Cassida nebulosa*		
Coleoptera	Chrysomelidae	*Cassida piperata*		
Coleoptera	Chrysomelidae	*Longitarsus succineus*		
Coleoptera	Chrysomelidae	*Psylliodes punctifrons*		
Coleoptera	Chrysomelidae	*Thlaspida biramosa*		
Coleoptera	Coccinellidae	*Coccinella septempunctata*		
Coleoptera	Coccinellidae	*Harmonia axyridis*		
Coleoptera	Coccinellidae	*Harmonia yedoensis*		
Coleoptera	Coccinellidae	*Propylea japonica*		
Coleoptera	Coccinellidae	*Scymnus* (*Neopullus*) *babai*		
Coleoptera	Coccinellidae	*Scymnus ferrugatus*		
Coleoptera	Coccinellidae	*Scymnus* sp.		O

Coleoptera	Curculionidae	*Auleutes* sp.		O
Coleoptera	Curculionidae	*Cosmobaris scolopacea*		
Coleoptera	Curculionidae	*Ceutorhynchus albosuturalis*		
Coleoptera	Curculionidae	*Dermestes tessellatocollis*		
Coleoptera	Curculionidae	*Rhinoncus cribricollis*		
Coleoptera	Curculionidae	*Rhinoncus jakovlevi*		
Coleoptera	Curculionidae	*Scepticus insularis*		
Coleoptera	Curculionidae	*Scepticus uniformis*		
Coleoptera	Curculionidae	*Sitona lineatus*		
Coleoptera	Elateridae	*Agrypnus miyamotoi*		
Coleoptera	Elateridae	*Melanotus castanipes*		
Coleoptera	Elateridae	*Melanotus cete*		
Coleoptera	Elateridae	*Pectocera fortunei*		
Coleoptera	Endomychidae	*Ancylopus melanocephalus*		
Coleoptera	Endomychidae	*Ancylopus pictus asiaticus*		
Coleoptera	Hydrophilidae	*Hydrophilus acuminatus*		
Coleoptera	Latridiidae	*Cortinicara gibbosa*		
Coleoptera	Latridiidae	*Stephostethus chinensis*		
Coleoptera	Mordellidae	*Mordella* sp.		O
Coleoptera	Mordellidae	*Mordella tokejii*		
Coleoptera	Nitidulidae	*Omosita colon*		
Coleoptera	Nitidulidae	*Omosita japonica*		
Coleoptera	Oedemeridae	*Nacerdes melanura*	O	
Coleoptera	Scirtidae	*Cyphon* sp.		O
Coleoptera	Staphylinidae	*Aleochara fucicola*		
Coleoptera	Staphylinidae	*Atheta* sp.		O

Coleoptera	Staphylinidae	*Atheta tokiokai*		
Coleoptera	Staphylinidae	*Cafius histrio*		
Coleoptera	Staphylinidae	*Neobisnius* sp.		O
Coleoptera	Staphylinidae	*Paederus fuscipes*		
Coleoptera	Tenebrionidae	*Gonocephalum coenosum*		
Coleoptera	Tenebrionidae	*Gonocephalum coriaceum*		
Dermaptera	Anisolabididae	*Anisolabis maritima*		
Dermaptera	Anisolabididae	*Euborellia annulipes*		
Dermaptera	Forficulidae	*Forficula scudderi*		
Diptera	Anthomyiidae	*Delia platura*		
Diptera	Anthomyiidae	*Fucellia apicalis*		
Diptera	Anthomyiidae	*Fucellia boninensis*		
Diptera	Anthomyiidae	*Pegomya cunicularia*		
Diptera	Calliphoridae	*Calliphora nigribarbis*		
Diptera	Calliphoridae	*Hemipyrellia ligurriens*		
Diptera	Calliphoridae	*Lucilia illustris*		
Diptera	Calliphoridae	*Lucilia porphyrina*	O	
Diptera	Calliphoridae	*Lucilia sericata*		
Diptera	Ceratopogonidae	*Culicoides circumscriptus*	O	
Diptera	Chironomidae	*Polypedilum* sp.		O
Diptera	Chloropidae	*Thaumatomyia notata*		
Diptera	Coelopidae	*Coelopa frigida*		
Diptera	Culicidae	*Culex orientalis*		
Diptera	Culicidae	*Ochlerotatus togoi*		
Diptera	Drosophilidae	*Drosophila* sp.		O
Diptera	Muscidae	*Atherigona oryzae*	O	

Diptera	Muscidae	*Musca bezzii*		
Diptera	Muscidae	*Musca hervei*		
Diptera	Muscidae	*Orchisia costata*	O	
Diptera	Phoridae	*Megaselia spiracularis*		
Diptera	Psychodidae	*Psychoda alternata*		
Diptera	Psychodidae	*Tinearia alternata*		
Diptera	Rhiniidae	*Stomorhina obsoleta*	O	
Diptera	Sarcophagidae	*Sarcophaga brevicornis*	O	
Diptera	Sarcophagidae	*Sarcophaga melanura*		
Diptera	Sarcophagidae	*Sarcophaga peregrina*	O	
Diptera	Scathophagidae	*Scathophaga stercoraria*		
Diptera	Sepsidae	*Sepsis monostigma*	O	
Diptera	Syrphidae	*Allobaccha apicalis*		
Diptera	Syrphidae	*Allograpta javana*		
Diptera	Syrphidae	*Betasyrphus serarius*		
Diptera	Syrphidae	*Dasysyrphus bilineatus*	O	
Diptera	Syrphidae	*Episyrphus balteatus*		
Diptera	Syrphidae	*Eristalis cerealis*		
Diptera	Syrphidae	*Eristalis tenax*		
Diptera	Syrphidae	*Metasyrphus corollae*		
Diptera	Syrphidae	*Metasyrphus nitens*		
Diptera	Syrphidae	*Scaeva komabensis*	O	
Diptera	Syrphidae	*Melanostoma mellinum*		
Diptera	Syrphidae	*Sphaerophoria menthastri*		
Diptera	Syrphidae	*Xanthandrus comtus*		
Diptera	Tephritidae	*Campiglossa sada*		

Diptera	Tephritidae	*Campiglossa* sp.		O
Diptera	Tephritidae	*Ensina sonchi*		
Diptera	Tephritidae	*Trupanea convergens*		
Diptera	Tipulidae	*Tipula* sp.		O
Hemiptera	Alydidae	*Leptocorisa chinensis*	O	
Hemiptera	Anthocoridae	*Orius sauteri*		
Hemiptera	Anthocoridae	*Orius* sp.		O
Hemiptera	Aphididae	*Aphis nerii*		
Hemiptera	Aphididae	*Aphis rumicis*		
Hemiptera	Cicadellidae	*Balclutha rubrinervis*		
Hemiptera	Cicadellidae	*Batracomorphus diminuta*	O	
Hemiptera	Cicadellidae	*Empoasca* sp.1		O
Hemiptera	Cicadellidae	*Empoasca* sp.2		O
Hemiptera	Cicadellidae	*Hishimonus sellatus*		
Hemiptera	Cicadellidae	*Laburrus impictifrons*		
Hemiptera	Cicadellidae	*Macrosteles striifrons*	O	
Hemiptera	Cicadellidae	*Maiestas oryzae*		
Hemiptera	Cicadellidae	*Psammotettix striatus*		
Hemiptera	Cicadellidae	*Recilia coronifera*	O	
Hemiptera	Cydnidae	*Geotomus pygmaeus*		
Hemiptera	Cydnidae	*Geotomus convexus*	O	
Hemiptera	Delphacidae	*Laodelphax striatellus*		
Hemiptera	Delphacidae	*Sogatella furcifera*		
Hemiptera	Delphacidae	*Sogatella kolophon*		
Hemiptera	Delphacidae	*Unkanodes sapporonus*		
Hemiptera	Lygaeidae	*Nysius plebeius*		

Hemiptera	Miridae	*Campylomma lividicornis*		
Hemiptera	Miridae	*Campylomma* sp.		O
Hemiptera	Miridae	*Creontiades coloripes*	O	
Hemiptera	Miridae	*Nesidiocoris tenuis*	O	
Hemiptera	Miridae	*Orthotylus flavosparsus*		
Hemiptera	Miridae	*Trigonotylus caelestialium*		
Hemiptera	Nabidae	*Prostemma hilgendorfii*		
Hemiptera	Pentatomidae	*Glaucias subpunctatus*	O	
Hemiptera	Pentatomidae	*Nezara antennata*		
Hemiptera	Piesmatidae	*Piesma capitatum*		
Hemiptera	Piesmatidae	*Piesma maculatum*		
Hemiptera	Rhopalidae	*Liorhyssus hyalinus*	O	
Hemiptera	Rhyparochromidae	*Horridipamera inconspicua*	O	
Hemiptera	Rhyparochromidae	*Paradieuches dissimilis*		
Hemiptera	Rhyparochromidae	*Stigmatonotum rufipes*		
Hemiptera	Scutelleridae	*Cantao ocellatus*		
Hemiptera	Tingidae	*Cantacader lethierryi*		
Hemiptera	Triozidae	*Trioza chenopodi*		
Hymenoptera	Bethylidae	*Acrepyris minutus*		
Hymenoptera	Braconidae	*Apanteles* sp.		O
Hymenoptera	Braconidae	*Cotesia* sp.1		O
Hymenoptera	Braconidae	*Cotesia* sp.2		O
Hymenoptera	Braconidae	*Deuterixys* sp.		O
Hymenoptera	Braconidae	*Lysiphlebus* sp.		O
Hymenoptera	Chalcididae	*Brachymeria femorata*		
Hymenoptera	Chalcididae	*Brachymeria minuta*		

Hymenoptera	Eupelmidae	*Eupelmus australiensis*		
Hymenoptera	Eupelmidae	*Eupelmus* sp.		O
Hymenoptera	Formicidae	*Hypoponera nippona*		
Hymenoptera	Formicidae	*Lasius meridionalis*		
Hymenoptera	Formicidae	*Monomorium floricola*		
Hymenoptera	Formicidae	*Monomorium intrudens*		
Hymenoptera	Formicidae	*Myrmecina graminicola nipponica*		
Hymenoptera	Formicidae	*Pachycondyla chinensis*		
Hymenoptera	Formicidae	*Pheidole fervida*		
Hymenoptera	Formicidae	*Ponera japonica*		
Hymenoptera	Formicidae	*Pristomyrmex pungens*		
Hymenoptera	Formicidae	*Solenopsis japonica*		
Hymenoptera	Formicidae	*Strumigenys lewisi*		
Hymenoptera	Formicidae	*Tetramorium caespitum*		
Hymenoptera	Ichneumonidae	*Homotropus* sp.		O
Hymenoptera	Pteromalidae	*Halticoptera circulus*		
Lepidoptera	Crambidae	*Cnaphalocrocis medinalis*		
Lepidoptera	Crambidae	*Diaphania indica*		
Lepidoptera	Crambidae	*Maruca vitrata*		
Lepidoptera	Crambidae	*Palpita nigropunctalis*		
Lepidoptera	Crambidae	*Spoladea recurvalis*		
Lepidoptera	Erebidae	*Catocala dula*		
Lepidoptera	Geometridae	*Odontopera arida*		
Lepidoptera	Geometridae	*Scopula ignobilis*		
Lepidoptera	Hesperiidae	*Parnara guttatus*		
Lepidoptera	Lycaenidae	*Arhopala bazalus*		

Lepidoptera	Lycaenidae	*Pseudozizeeria maha*		
Lepidoptera	Noctuidae	*Agrotis ipsilon*		
Lepidoptera	Noctuidae	*Arcte coerula*		
Lepidoptera	Noctuidae	*Callopistria argyrosticta*		
Lepidoptera	Noctuidae	*Cosmia achatina*		
Lepidoptera	Noctuidae	*Daddala lucilla*		
Lepidoptera	Noctuidae	*Diarsia canescens*		
Lepidoptera	Noctuidae	*Thyas juno*		
Lepidoptera	Noctuidae	*Macdunnoughia confusa*		
Lepidoptera	Noctuidae	*Mythimna separata*		
Lepidoptera	Nymphalidae	*Cynthia cardui*		
Lepidoptera	Nymphalidae	*Vanessa indica*	O	
Lepidoptera	Papilionidae	*Papilio xuthus*		
Lepidoptera	Plutellidae	*Plutella xylostella*		
Lepidoptera	Pyralidae	*Oncocera semirubella*		
Lepidoptera	Sphingidae	*Macroglossum stellatarum*		
Lepidoptera	Tortricidae	*Adoxophyes orana*		
Lepidoptera	Tortricidae	*Archips oporana*		
Lepidoptera	Tortricidae	*Cochylidia contumescens*		
Lepidoptera	Tortricidae	*Cochylidia richteriana*		
Lepidoptera	Tortricidae	*Tortrix sinapina*		
Lepidoptera	Yponomeutidae	*Yponomeuta meguronis*		
Neuroptera	Chrysopidae	*Chrysopa pallens*		
Neuroptera	Hemerobiidae	*Hemerobius humulinus*		
Neuroptera	Sisyridae	*Sisyra* sp.		O
Odonata	Aeshnidae	*Anax parthenope*		

Odonata	Coenagrionidae	*Ischnura asiatica*		
Odonata	Libellulidae	*Pantala flavescens*		
Odonata	Libellulidae	*Rhyothemis fuliginosa*		
Odonata	Libellulidae	*Sympetrum darwinianum*		
Orthoptera	Gryllacrididae	*Nippancistroger* sp.		O
Orthoptera	Gryllidae	*Teleogryllus emma*		
Orthoptera	Gryllidae	*Velarifictorus aspersus*		
Orthoptera	Mogoplistidae	*Ornebius kanetataki*		