The Insect database in Dokdo, Korea: An updated version in 2020

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Academic editor: Paulo Borges

Received: 14 Dec 2020 | Accepted: 20 Jan 2021 | Published: 26 Jan 2021

Citation: Ryu J, Kim Y-K, Suh SJ, Choi KS (2021) The Insect database in Dokdo, Korea: An updated version in 2020. Biodiversity Data Journal 9: e62011. https://doi.org/10.3897/BDJ.9.e62011

Abstract

Background

Dokdo, a group of islands near the East Coast of South Korea, comprises 89 small islands. These volcanic islands were created by an eruption that also led to the formation of the Ulleungdo Islands (located in the East Sea), which are approximately 87.525 km away from Dokdo. Dokdo is important for geopolitical reasons; however, because of certain barriers to investigation, such as weather and time constraints, knowledge of its insect fauna is limited compared to that of Ulleungdo. Until 2017, insect fauna on Dokdo included 10 orders, 74 families, 165 species and 23 undetermined species; subsequently, from 2018 to 2019, we discovered 23 previously unrecorded species and three undetermined species via an insect survey.

New information

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

**Keywords**

biodiversity, Dokdo, insect fauna, newly-recorded species, insect database

**Introduction**

Islands are known for their ecologically- and biologically-important ecosystems. Due to geographical isolation, the movement of organisms is limited (Franks 2009) and island-like areas have low potential for both species transfer and settlement. For these reasons, as well as their small land area, islands often have low biodiversity (Mauchamp 1997). Island-like areas are also vulnerable to external intrusions, which represent a major threat to indigenous species (Kil et al. 2006). Recent developments in traffic pathways have decreased the number of isolated island ecosystems, thus allowing researchers to investigate the interactions between evolutionary and ecological processes that are responsible for island biodiversity (Gillespie et al. 2008).

The Intergovernmental Panel on Climate Change (IPCC) reports that climate change is causing sea levels and sea temperatures to rise and, if this trend continues, most coastal regions around the world will be at risk (Hong 2010, IPCC 2014). By 2100, these increases in sea level are estimated to reach at least 1 m, creating elevated flooding-related risks for large parts of the low-land island ecosystem, 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 particularly rapid (Korea Hydrographic and Oceanographic Agency 2020).

The Dokdo Islands, which are located at 37°14′26.8″ N and 131°52′10.4″ E, belong to an administrative district that includes the Ulleungdo Islands as well. The address of the Korean administrative district is 1-96 Dokdo-ri, Ulleung-eup, Ulleung-gun, Gyeongsangbuk-do, Korea. Tourists cannot stay in Dokdo for more than 30 min, although the Korean Coast Guard (KCG) and some residents can visit for longer time periods. These Islands were formed during the Pliocene Epoch by an underwater volcanic eruption that occurred between 2.5 and 4.6 million years ago (Raman et al. 2016) and subsequently promoted the formation of the Ulleungdo volcanoes via tectonic plate movement (Lee et al. 2002). Dokdo is built on sea floor that is about 2,000 m deep; it 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).

Dokdo is entirely composed of volcanic rocks and its island ecosystem is relatively disconnected from the outside world; therefore, it is an important subject for island ecology.
and biogeography (Cultural Heritage Administration 2009). In 1982, Dokdo was designated as Natural Monument No. 336 by the Korea Cultural Heritage Administration (KCHA) to be managed by the Dokdo Natural Reserve. Dokdo is very small, with an area of 187,554 m² and, because it has been protected and has inaccessible geographical features, there is extremely limited knowledge of its insect fauna. The Dokdo Islands are located at the bridge that connects Ulleungdo in Korea and the Oki Islands in Japan. Due to the fact that previous investigations of insect species on Dokdo played a vital role in characterising the biogeographic limits of these regions, the study of insect fauna on Dokdo is considered to be geographically important (Yasunaga and Duwal 2015).

Since the initial assessment of insects on Dokdo by Jolivet in 1974, many researchers have conducted follow-up 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). Here, we report 23 newly-identified and unrecorded species and three undetermined species on the Island and provide an updated database.

**Sampling methods**

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

![Figure 1. Map of Dokdo: East (Dongdo) and West (Seodo) Islands.](image-url)
**Sampling description:** In Dongdo, we performed sample collection along the slope leading from the marina, through the KCG facility and then to the old marina. In Seodo, we performed sample collection along a very steep slope leading to the fishermen's dormitory. Seodo has less vegetation distribution compared to Dongdo.

Collected specimen samples were stored in 70% ethanol in conical tubes. They were then transferred to the Animal Systematics and Taxonomy Laboratory and Pest Control Laboratory at Kyungpook National University, Korea. The samples were identified using the national species list of Korea and other references (National Institute of Biological Resources 2019, Chérot and Malipatil 2016, Yasunaga 2017, Göllner-Scheiding 1976, Slater and Zheng 1984, Siwi and Doesburg 1984, Malenovský 2013, ZHANG et al. 2013, Viraktamath 1979, Kim 2012, YOO et al. 2008, Yang et al. 2014, Kurahashi and Samerjai 2018, Suh and Kwon 2017a, Suh and Kwon 2017b, Bourquia et al. 2019, Vane-Wright and Hughes 2007, Ang and Meier 2010).

**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 in the Global Biodiversity Information Facility (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    | Blattoidea      |             |
| 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      | Phorididae                    |
| family      | Psychodidae                   |
| family      | Rhiniidae                     |
| family      | Sarcophagidae                 |
| family      | Scathophagidae                |
| family      | Sepsidae                      |
| family      | Syrphidae                     |
| family       | Order            |
|--------------|------------------|
| Tephritidae  | Hemiptera        |
| Tipulidae    |                  |
| Alydidae     |                  |
| Anthocoridae |                  |
| Aphididae    |                  |
| Cicadellidae |                  |
| Cydnidae     |                  |
| Delphacidae  |                  |
| Lygaeidae    |                  |
| Miridae      |                  |
| Nabidae      |                  |
| Pentatomidae |                  |
| Piesmatidae  |                  |
| Rhopalidae   |                  |
| Rhyparochromidae |            |
| Scutelleridae|                  |
| Tingidae     |                  |
| Triozidae    |                  |
| Hymenoptera  |                  |
| Bethylidae   |                  |
| Braconidae   |                  |
| Chalcididae  |                  |
| Eupelmidae   |                  |
| Formicidae   |                  |
| Ichneumonidae|                  |
| Pteromalidae |                  |
| Lepidoptera  |                  |
| Crambidae    |                  |
| Erebidæ      |                  |
| 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|

**Usage licence**

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**Data resources**

**Data package title**: dokdo insect list, 1974-2019

**Resource link**: [https://doi.org/10.15468/h684as](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-be42-0e300abaab4](https://www.gbif.org/dataset/eb47a0de-862f-44c0-be42-0e300abaab4)

**Data format:** CSV.

| Column label               | Column description                                                                 |
|----------------------------|-----------------------------------------------------------------------------------|
| occurrenceID              | Unique identifier of the occurrence                                                |
| 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                                        |
| coordinateUncertaintyInMetres | 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             | Province 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                                                 |
| kingdom                   | kingdom name                                                                       |
| phylum                    | phylum name                                                                        |
| class                     | class name                                                                         |
| order                     | order name                                                                         |
| family                    | family name                                                                        |
| genus                     | genus name                                                                         |
Additional information

Results and Discussion

In this study, we first created an initial database, based on the results of surveys of insects on Dokdo from 1974 to 2017. This checklist confirmed the identification of 10 orders, 74 families, 165 species and 23 undetermined species of insects distributed on the Island.

Through our recent sampling, we collected and identified 23 previously unrecorded insect species in Dokdo. Of these species, ten are in the Order Hemiptera (Leptocorisa chinensis, Batracomorphus diminuta, Macrosteles striifrons, Recilia coronifera, Geotomus convexus, Creontiades coloripes, Nesidiocoris tenuis, Glaucias subpunctatus, Liorhyssus hyalinus and Horridipamera inconspicua); two are in the Order Coleoptera (Aphodius urostigma and Nacerdes melanura); ten are 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 is in the Order Lepidoptera (Vanessa indica) (Fig. 2).

Figure 2. Newly-recorded insect species on Dokdo Island. 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.
In addition to the 23 previously unrecorded species on Dokdo, three undetermined species were identified to the genus level: two *Empoasca* species in the Family Cicadellidae and one *Sisyra* species in the Family Sisyridae. Furthermore, five of the 23 previously unrecorded species and one of the three unidentified species belong to new families, adding a total of six newly-added families to the Dokdo Insect Database. Finally, we generated an updated database of insect fauna on Dokdo that contains 10 orders, 81 families, 188 species and 23 unidentified species (Table 1).

| Order     | Family           | Scientific Name                                      | Newly recorded species | Undetermined name |
|-----------|------------------|------------------------------------------------------|------------------------|-------------------|
| Blattodea | Ectobiidae       | *Blattella nipponica* Asahina, 1963                  |                        |                   |
| Coleoptera| Aphodiidae       | *Aphodius urostigma* Harold, 1862                    | O                      |                   |
| Coleoptera| Carabidae        | *Anisodactylus signatus* (Panzer, 1796)              |                        |                   |
| Coleoptera| Carabidae        | *Anisodactylus tricuspidatus* A.Morawitz, 1863       |                        |                   |
| Coleoptera| Carabidae        | *Dolichus halensis* (Schaller, 1783)                 |                        |                   |
| Coleoptera| Carabidae        | *Harpalus jureceki* (Jedlicka, 1928)                |                        |                   |
| Coleoptera| Carabidae        | *Harpalus sinicus* Hope, 1845                       |                        |                   |
| Coleoptera| Carabidae        | *Stenolophus difficilis* (Hope, 1845)               |                        |                   |
| Coleoptera| Chrysomelidae    | *Callosobruchus chinensis* (Linnaeus, 1758)         |                        |                   |
| Coleoptera| Chrysomelidae    | *Cassida nebulosa* Linnaeus, 1758                    |                        |                   |
| Coleoptera| Chrysomelidae    | *Cassida piperata* Hope, 1842                       |                        |                   |
| Coleoptera| Chrysomelidae    | *Longitarsus succineus* (Foudras, 1859)             |                        |                   |
| Coleoptera| Chrysomelidae    | *Psylliodes punctifrons* Baly, 1874                 |                        |                   |
| Coleoptera| Chrysomelidae    | *Thlaspida biramosa* (Boheman, 1855)                |                        |                   |
| Coleoptera| Coccinellidae    | *Coccinella septempunctata* Linnaeus, 1758          |                        |                   |
| Coleoptera| Coccinellidae    | *Harmonia axyridis* (Pallas, 1773)                  |                        |                   |
| Coleoptera| Coccinellidae    | *Harmonia yedoensis* (Takizawa, 1917)               |                        |                   |
| Coleoptera| Coccinellidae    | *Propylea japonica* (Thunberg, 1781)                |                        |                   |

Table 1.
The updated database of insect species on Dokdo, based on data collected from 1974 to 2019.
| Order      | Family       | Scientific Name                      | Newly recorded species | Undetermined name |
|------------|--------------|--------------------------------------|------------------------|-------------------|
| Coleoptera | Coccinellidae| Scymnus babai Sasaji, 1971           |                        |                   |
| Coleoptera | Coccinellidae| Scymnus ferrugatus (Moll, 1785)      |                        |                   |
| Coleoptera | Coccinellidae| Scymnus sp. Kugelann, 1794           |                        | O                 |
| Coleoptera | Curculionidae| Auleutes sp. Dietz, 1896             |                        | O                 |
| Coleoptera | Curculionidae| Cosmobaris scolopacea Germar, 1819   |                        |                   |
| Coleoptera | Curculionidae| Ceutorhynchus albosuturalis (Roelofs, 1875) |                        |                   |
| Coleoptera | Curculionidae| Derestes tessellatocollis Motschulsky, 1860 |                        |                   |
| Coleoptera | Curculionidae| Rhinoncus cribricollis Hustache, 1916 |                        |                   |
| Coleoptera | Curculionidae| Rhinoncus jakovlevi Faust, 1893      |                        |                   |
| Coleoptera | Curculionidae| Scepticus insularis Roelofs, 1873    |                        |                   |
| Coleoptera | Curculionidae| Scepticus uniformis Kono, 1930       |                        |                   |
| Coleoptera | Curculionidae| Sitona lineatus (Linnaeus, 1758)     |                        |                   |
| Coleoptera | Elateridae   | Agrypnus miyamotii (Nakane & Kishii, 1955) |                        |                   |
| Coleoptera | Elateridae   | Melanotus castanipes (Paykull, 1800) |                        |                   |
| Coleoptera | Elateridae   | Melanotus cete Candèze, 1860         |                        |                   |
| Coleoptera | Elateridae   | Pectocera fortunei Candèze, 1873     |                        |                   |
| Coleoptera | Endomychidae | Ancylopus melanocephalus (Olivier, 1808) |                        |                   |
| Coleoptera | Endomychidae | Ancylopus pictus asiaticus (Strohecker, 1972) |                        |                   |
| Coleoptera | Hydrophilidae| Hydrophilus acuminatus Motschulsky, 1854 |                        |                   |
| Coleoptera | Latridiidae  | Cortinicara gibbosa (Herbst, 1793)   |                        |                   |
| Coleoptera | Latridiidae  | Stephostethus chinensis (Reitter, 1877) |                        |                   |
| Coleoptera | Mordellidae  | Mordella sp. Linnaeus, 1758          |                        | O                 |
| Coleoptera | Mordellidae  | Mordella tokejii Nomura, 1958        |                        |                   |
| Coleoptera | Nitidulidae  | Omosita colon (Linnaeus, 1758)       |                        |                   |
| Order       | Family               | Scientific Name                                      | Newly recorded species | Undetermined name |
|-------------|----------------------|------------------------------------------------------|------------------------|-------------------|
| Coleoptera  | Nitidulidae          | Omosita japonica Reitter, 1874                      |                        |                   |
| Coleoptera  | Oedemeridae          | Nacerdes melanura (Linnaeus, 1758)                  | O                      |                   |
| Coleoptera  | Scirtidae            | Cyphon sp. Paykull, 1799                            |                        |                   |
| Coleoptera  | Staphylinidae        | Aleochara fucicola Sharp, 1874                      |                        |                   |
| Coleoptera  | Staphylinidae        | Atheta sp. Thomson, 1858                            | O                      |                   |
| Coleoptera  | Staphylinidae        | Atheta tokiokai (K.Sawada, 1971)                    |                        |                   |
| Coleoptera  | Staphylinidae        | Cafius histrio (Sharp, 1874)                        |                        |                   |
| Coleoptera  | Staphylinidae        | Neobisnius sp. Ganglbauer, 1895                     | O                      |                   |
| Coleoptera  | Staphylinidae        | Paederus fuscipes Curtis, 1826                      |                        |                   |
| Coleoptera  | Tenebrionidae        | Gonocephalum coenosum Kaszab, 1952                  |                        |                   |
| Coleoptera  | Tenebrionidae        | Gonocephalum coriaceum Motschulsky, 1857           |                        |                   |
| Dermaptera  | Anisolabididae       | Anisolabis maritima (Bonelli, 1832)                |                        |                   |
| Dermaptera  | Anisolabididae       | Euborellia annulipes (H.F.Lucas, 1847)             |                        |                   |
| Dermaptera  | Forficulidae         | Forficula scudder de Bormans, 1880                  |                        |                   |
| Diptera     | Anthomyiidae         | Delia platura (Meigen, 1826)                        |                        |                   |
| Diptera     | Anthomyiidae         | Fucellia apicalis Kertesz, 1908                     |                        |                   |
| Diptera     | Anthomyiidae         | Fucellia boninensis Snyder, 1965                   |                        |                   |
| Diptera     | Anthomyiidae         | Pegomya cunicularia (Rondani, 1866)                |                        |                   |
| Diptera     | Calliphoridae        | Calliphora nigribarbis Smellen van Vollenhoven, 1863|                        |                   |
| Diptera     | Calliphoridae        | Hemipyrellia ligurriens (Wiedemann, 1830)          |                        |                   |
| Diptera     | Calliphoridae        | Lucilia illustris (Meigen, 1826)                   |                        |                   |
| Diptera     | Calliphoridae        | Lucilia porphyrina (Walker, 1856)                  | O                      |                   |
| Diptera     | Calliphoridae        | Lucilia sericata (Meigen, 1826)                    |                        |                   |
| Diptera     | Ceratopogonidae      | Culicoides circunscriptus Kieffer, 1918            | O                      |                   |
| Diptera     | Chironomidae         | Polypedilum sp. Kieffer, 1912                      | O                      |                   |
| Order    | Family      | Scientific Name                  | Newly recorded species | Undetermined name |
|----------|-------------|----------------------------------|------------------------|-------------------|
| Diptera  | Chloropidae | *Thaumatomyia notata* (Meigen, 1830) |                        |                   |
| Diptera  | Coelopidae  | *Coelopa frigida* (Fabricius, 1805) |                        |                   |
| Diptera  | Culicidae   | *Culex orientalis* Edwards, 1921  |                        |                   |
| Diptera  | Culicidae   | *Ochlerotatus togoi* (Theobald, 1907) |                        |                   |
| Diptera  | Drosophilidae | *Drosophila* sp. Fallén, 1823 |                        | O                 |
| Diptera  | Muscidae    | *Atherigona oryzae* Malloch, 1925 |                        | O                 |
| Diptera  | Muscidae    | *Musca bezii* Patton & Cragg, 1913 |                        |                   |
| Diptera  | Muscidae    | *Musca hervei* Villeneuve, 1922   |                        |                   |
| Diptera  | Muscidae    | *Orchis costata* (Meigen, 1826)   |                        | O                 |
| Diptera  | Phoridae    | *Megaselia spiracularis* Schmitz, 1938 |                        |                   |
| Diptera  | Psychodidae | *Psychoda alternata* Say, 1824    |                        |                   |
| Diptera  | Psychodidae | *Tinearia alternata* (Say, 1824)  |                        |                   |
| Diptera  | Rhiniiidae  | *Stomorhina obsoleta* Wiedeumann, 1830 |                        | O                 |
| Diptera  | Sarcophagidae | *Sarcophaga brevicornis* Ho, 1934 |                        | O                 |
| Diptera  | Sarcophagidae | *Sarcophaga melanura* Meigen, 1826 |                        |                   |
| Diptera  | Sarcophagidae | *Sarcophaga peregrina* (Robineau-Desvoidy, 1830) |                        | O                 |
| Diptera  | Scathophagidae | *Scathophaga stercoraria* (Linnaeus, 1758) |                        |                   |
| Diptera  | Sepsidae    | *Sepsis monostigma* Thomson, 1869  |                        | O                 |
| Diptera  | Syrphidae   | *Allobaccha apicalis* (Loew, 1858) |                        |                   |
| Diptera  | Syrphidae   | *Allograpta javana* (Wiedemann, 1824) |                        |                   |
| Diptera  | Syrphidae   | *Betasyrphus serarius* (Wiedemann, 1830) |                        |                   |
| Diptera  | Syrphidae   | *Dasysyrphus bilineatus* (Matsumura, 1917) |                        | O                 |
| Diptera  | Syrphidae   | *Episyrphus balteatus* (De Geer, 1776) |                        |                   |
| Diptera  | Syrphidae   | *Eristalis cerealis* Fabricius, 1805 |                        |                   |
| Diptera  | Syrphidae   | *Eristalis tenax* (Linnaeus, 1758) |                        |                   |
| Order       | Family       | Scientific Name                                      | Newly recorded species | Undetermined name |
|------------|--------------|-----------------------------------------------------|------------------------|-------------------|
| Diptera    | Syrphidae    | Metasyrphus corollae (Fabricius, 1794)               |                        |                   |
| Diptera    | Syrphidae    | Metasyrphus nitens (Zetterstedt, 1843)               |                        |                   |
| Diptera    | Syrphidae    | Scaeva komabensis (Matsumura, 1918)                 | O                      |                   |
| Diptera    | Syrphidae    | Melanostoma mellinum (Linnaeus, 1758)               |                        |                   |
| Diptera    | Syrphidae    | Sphaerophoria menthastri (Linnaeus, 1758)           |                        |                   |
| Diptera    | Syrphidae    | Xanthandrus comtus (Harris, 1780)                   |                        |                   |
| Diptera    | Tephritidae  | Campiglossa sada (Dirlbek & Dirlbekova, 1974)      |                        |                   |
| Diptera    | Tephritidae  | Campiglossa sp. Rondani, 1870                      | O                      |                   |
| Diptera    | Tephritidae  | Ensina sonchi (Linnaeus, 1767)                     |                        |                   |
| Diptera    | Tephritidae  | Trupanea convergens (Hering, 1936)                 |                        |                   |
| Diptera    | Tipulidae    | Tipula sp. Linnaeus, 1758                          | O                      |                   |
| Hemiptera  | Alydidae     | Leptocorisa chinensis Dallas, 1852                  | O                      |                   |
| Hemiptera  | Anthocoridae | Orius sauteri (Poppius, 1909)                      |                        |                   |
| Hemiptera  | Anthocoridae | Orius sp. Distant, 1904                            | O                      |                   |
| Hemiptera  | Aphididae    | Aphis nerii Fonscolombe, 1841                      |                        |                   |
| Hemiptera  | Aphididae    | Aphis rumicis Linnaeus, 1758                       |                        |                   |
| Hemiptera  | Cicadellidae | Balclutha rubrinervis Matsumura, 1902              |                        |                   |
| Hemiptera  | Cicadellidae | Batracomorphus diminuta Matsumura, 1912            | O                      |                   |
| Hemiptera  | Cicadellidae | Empoasca sp.1 Walsh, 1862                          | O                      |                   |
| Hemiptera  | Cicadellidae | Empoasca sp.2 Walsh, 1862                          | O                      |                   |
| Hemiptera  | Cicadellidae | Hishimonus sellatus Uhler, 1896                    |                        |                   |
| Hemiptera  | Cicadellidae | Laburrus impictifrons Boheman, 1852                |                        |                   |
| Hemiptera  | Cicadellidae | Macrostelis striifrons Anufriev, 1968              | O                      |                   |
| Hemiptera  | Cicadellidae | Maestas oryzae Matsumura, 1902                     |                        |                   |
| Order                  | Family          | Scientific Name                  | Newly recorded species | Undetermined name |
|-----------------------|-----------------|----------------------------------|------------------------|-------------------|
| Hemiptera             | Cicadellidae    | *Psammomomili striatus* Linnaeus, 1758 |                        |                   |
| Hemiptera             | Cicadellidae    | *Recilia coronifera* (Marshall, 1866) | O                      |                   |
| Hemiptera             | Cydnidae        | *Geotomus pygmaeus* (Dallas, 1851) |                        |                   |
| Hemiptera             | Cydnidae        | *Geotomus convexus* Hsiao, 1977   | O                      |                   |
| Hemiptera             | Delphacidae     | *Laodelphax striatellus* (Fallén, 1826) |                        |                   |
| Hemiptera             | Delphacidae     | *Sogatella furcifera* (Horváth, 1899) |                        |                   |
| Hemiptera             | Delphacidae     | *Sogatella kolophon* (Kirkaldy, 1907) |                        |                   |
| Hemiptera             | Delphacidae     | *Unkanodes sapporonus* (Matsumura, 1935) |                        |                   |
| Hemiptera             | Lygaeidae       | *Nysius plebeius* Distant & W.L., 1883 |                        |                   |
| Hemiptera             | Miridae         | *Campylomma lividicornis* Reuter, 1912 |                        |                   |
| Hemiptera             | Miridae         | *Campylomma sp.* Reuter, 1878     | O                      |                   |
| Hemiptera             | Miridae         | *Creontiades coloripes* Hsiao & Meng, 1963 | O                      |                   |
| Hemiptera             | Miridae         | *Nesidiocoris tenuis* (Reuter, 1895) | O                      |                   |
| Hemiptera             | Miridae         | *Orthotylus flavosparsus* (C.Sahlberg, 1841) |                        |                   |
| Hemiptera             | Miridae         | *Trigonotylus caelestialium* (Kirkaldy, 1902) |                        |                   |
| Hemiptera             | Nabidae         | *Prostemma hilgendorfii* Stein, 1878 |                        |                   |
| Hemiptera             | Pentatomidae    | *Glaucias subpunctatus* (Walker, 1867) | O                      |                   |
| Hemiptera             | Pentatomidae    | *Nezara antennata* Scott, 1874    |                        |                   |
| Hemiptera             | Piesmatidae     | *Piesma capitatum* (Wolff, 1804)  |                        |                   |
| Hemiptera             | Piesmatidae     | *Piesma maculatum* (Laporte, 1833) |                        |                   |
| Hemiptera             | Rhopalidae      | *Liorhyssus hyalinus* (Fabricius, 1794) | O                      |                   |
| Hemiptera             | Rhyparochromidae| *Horridipamera inconspicua* Dallas, 1852 | O                      |                   |
| Hemiptera             | Rhyparochromidae| *Paradiuches dissimilis* (Distant & W.L., 1883) |                        |                   |
| Order          | Family               | Scientific Name                          | Newly recorded species | Undetermined name |
|---------------|----------------------|------------------------------------------|------------------------|-------------------|
| Hemiptera     | Rhyparochromidae     | *Stigmatonotum rufipes* (V. Motschulsky, 1866) |                        |                   |
| Hemiptera     | Scutelleridae        | *Cantao ocellatus* (Thunberg, 1784)      |                        |                   |
| Hemiptera     | Tingidae             | *Cantacader leithieryi* Scott, 1874      |                        |                   |
| Hemiptera     | Triozidae            | *Trioza chenopodi* Reuter, 1876          |                        |                   |
| Hymenoptera   | Bethylidae           | *Acrepyris minutus* Yasumatsu, 1955      |                        |                   |
| Hymenoptera   | Braconidae           | *Apanteles* Förster, 1862 O              |                        |                   |
| Hymenoptera   | Braconidae           | *Cotesia* sp. 1 Cameron, 1891 O          |                        |                   |
| Hymenoptera   | Braconidae           | *Cotesia* sp. 2 Cameron, 1891 O          |                        |                   |
| Hymenoptera   | Braconidae           | *Deuterixys* sp. Mason, 1981 O           |                        |                   |
| Hymenoptera   | Braconidae           | *Lysiphebus* sp. Förster, 1862 O         |                        |                   |
| Hymenoptera   | Chalcididae          | *Brachymeria femorata* (Panzer, 1801)    |                        |                   |
| Hymenoptera   | Chalcididae          | *Brachymeria minuta* (Linnaeus, 1767)    |                        |                   |
| Hymenoptera   | Eupelmidae           | *Eupelmus australiensis* (Girault, 1913) |                        |                   |
| Hymenoptera   | Eupelmidae           | *Eupelmus* sp. Dalman, 1820 O            |                        |                   |
| Hymenoptera   | Formicidae           | *Hypoponera nippona* (Santschi, 1937)    |                        |                   |
| Hymenoptera   | Formicidae           | *Lasius meridionalis* (Bondroit, 1920)   |                        |                   |
| Hymenoptera   | Formicidae           | *Monomorium floricola* (Jerdon, 1851)    |                        |                   |
| Hymenoptera   | Formicidae           | *Monomorium intrudens* Smith, 1874       |                        |                   |
| Hymenoptera   | Formicidae           | *Myrmecina graminicola nipponica* Wheeler, 1906 |                    |                   |
| Hymenoptera   | Formicidae           | *Pachycondyla chinensis* (Emery, 1895)   |                        |                   |
| Hymenoptera   | Formicidae           | *Pheidole fervida* Smith, 1874           |                        |                   |
| Hymenoptera   | Formicidae           | *Ponera japonica* Wheeler, 1906          |                        |                   |
| Hymenoptera   | Formicidae           | *Pristomymex pungens* Mayr, 1866         |                        |                   |
| Hymenoptera   | Formicidae           | *Solenopsis japonica* Wheeler, 1928      |                        |                   |
| Hymenoptera   | Formicidae           | *Strumigenys lewisi* Cameron, 1886       |                        |                   |
| Order                  | Family               | Scientific Name                          | Newly recorded species | Undetermined name |
|-----------------------|----------------------|------------------------------------------|------------------------|-------------------|
| Hymenoptera           | Formicidae           | *Tetramorium caespitum* (Linnaeus, 1758) |                        |                   |
| Hymenoptera           | Ichneumonidae        | *Homotropus* sp. Förster, 1869            |                        | O                 |
| Hymenoptera           | Pteromalidae         | *Halticoptera circulus* (Walker, 1833)   |                        |                   |
| Lepidoptera           | Crambidae            | *Cnaphalocrocis medinalis* Guenée, 1854   |                        |                   |
| Lepidoptera           | Crambidae            | *Diaphania indica* (Saunders, 1851)      |                        |                   |
| Lepidoptera           | Crambidae            | *Maruca vitrata* (Fabricius, 1787)       |                        |                   |
| Lepidoptera           | Crambidae            | *Palpita nigropunctalis* Bremer, 1864    |                        |                   |
| Lepidoptera           | Crambidae            | *Spoladea recurvalis* (Fabricius, 1775)  |                        |                   |
| Lepidoptera           | Erebididae           | *Catocala dula* Bremer, 1861             |                        |                   |
| Lepidoptera           | Geometridae          | *Odontopera arida* Butler, 1878          |                        |                   |
| Lepidoptera           | Geometridae          | *Scopula ignobilis* Warren, 1901         |                        |                   |
| Lepidoptera           | Hesperidae           | *Pamara guttatus* Bremer & Grey, 1853    |                        |                   |
| Lepidoptera           | Lycaenidae           | *Arhopala bazalus* (Hewitson, 1862)     |                        |                   |
| Lepidoptera           | Lycaenidae           | *Pseudozizeeria maha* (Kollar, 1844)    |                        |                   |
| Lepidoptera           | Noctuidae            | *Agrotis ipsilon* (Hufnagel, 1766)      |                        |                   |
| Lepidoptera           | Noctuidae            | *Arcte coerula* Guenée, 1852            |                        |                   |
| Lepidoptera           | Noctuidae            | *Callopistria argyrostra* Butler, 1881   |                        |                   |
| Lepidoptera           | Noctuidae            | *Cosmia achatina* Butler, 1879           |                        |                   |
| Lepidoptera           | Noctuidae            | *Daddala lucilla* Butler, 1881           |                        |                   |
| Lepidoptera           | Noctuidae            | *Diarsia canescens* Butler, 1878        |                        |                   |
| Lepidoptera           | Noctuidae            | *Thyas juno* (Dalman, 1823)             |                        |                   |
| Lepidoptera           | Noctuidae            | *Macdunnoughia confusa* (Stephens, 1850)|                        |                   |
| Lepidoptera           | Noctuidae            | *Mythimna separata* (Walker, 1865)      |                        |                   |
| Lepidoptera           | Nymphalidae          | *Cynthia cardui* Linnaeus, 1758          |                        |                   |
| Lepidoptera           | Nymphalidae          | *Vanessa indica* Herbst, 1794            |                        | O                 |
| Lepidoptera           | Papilionidae         | *Papilio xuthus* Linnaeus, 1767          |                        |                   |
| Lepidoptera           | Plutellidae          | *Plutella xylostella* (Linnaeus, 1758)   |                        |                   |
| Order           | Family            | Scientific Name                          | Newly recorded species | Undetermined name |
|-----------------|-------------------|------------------------------------------|------------------------|-------------------|
| Lepidoptera     | Pyralidae         | Oncocera semirubella (Scopoli, 1763)     |                        |                   |
| Lepidoptera     | Sphingidae        | Macroglossum stellatarum (Linnaeus, 1758)|                        |                   |
| Lepidoptera     | Tortricidae       | Adoxophyes orana (Fischer v.Roslerstamm, 1834) |                        |                   |
| Lepidoptera     | Tortricidae       | Archips oporana (Linnaeus, 1758)         |                        |                   |
| Lepidoptera     | Tortricidae       | Cochyliida contumescens Meyrick, 1931    |                        |                   |
| Lepidoptera     | Tortricidae       | Cochyliida richteriana (Fischer v.Roslerstamm, 1837) |                        |                   |
| Lepidoptera     | Tortricidae       | Tortrix sinapina Butler, 1879            |                        |                   |
| Lepidoptera     | Yponomeutidae     | Yponomeuta meguronis Matsumura, 1931     |                        |                   |
| Neuroptera      | Chrysopidae       | Chrysopa pallens (Rambur, 1838)          |                        |                   |
| Neuroptera      | Hemerobiidae      | Hemerobius humilinus Linnaeus, 1758      |                        |                   |
| Neuroptera      | Sisyridae         | Sisyra sp. Burmeister, 1839              | O                      |
| Odonata         | Aeshnidae         | Anax parthenope Selys, 1839              |                        |                   |
| Odonata         | Coenagrionidae    | Ischnura asiatica Brauer, 1865           |                        |                   |
| Odonata         | Libellulidae      | Pantala flavescens Fabricius, 1798       |                        |                   |
| Odonata         | Libellulidae      | Rhyothemis fuliginosa Selys, 1883        |                        |                   |
| Odonata         | Libellulidae      | Sympetrum darwinianum Selys, 1883        |                        |                   |
| Orthoptera      | Gryllacrididae    | Nippancistroger sp. Griffin, 1913        | O                      |
| Orthoptera      | Gryllidae         | Teleogryllus emma (Ohmachi & I.Matsuura, 1951) |                        |                   |
| Orthoptera      | Gryllidae         | Velarifictorus aspersus (F.Walker, 1869) |                        |                   |
| Orthoptera      | Mogoplistidae     | Ornebius kanetataki (S.Matsumura, 1904)  |                        |                   |

Amongst the 23 previously unrecorded species on Dokdo, B. diminuta was first discovered in Korea and the remainder of this species has been recorded in the Korean Peninsula. In addition, C. circumscriptus, a blood-sucking insect known for being extremely annoying to
the KCG and residents of Dokdo, has been identified for the first time in Dokdo, using a black light trap with dry ice.

The 23 undetermined species that have been identified up to the genus stage are classified as unrecorded or new species in Korea. Due to geographical characteristics, the study of these insects is considered to be very important for understanding the biodiversity of Dokdo Island.

Conflicts of interest

The authors declare that there are no conflicts of interest.

Acknowledgements

This research was supported by a Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (2016R1A6A1A05011910).

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