INTRODUCTION

The Island of Gageodo (old name: Soheuksando), Shinan county of Jeollanam-do province is located on the southwestern tip of the Korean peninsula (34°03′N, 125°07′E, 16.34 km²). This island is a southwestern national border island between Korea and China (Fig. 1), about 136 km southwest from Mokpo and 70 km southwest from the Island of Heuksan-do. The largest peak on the island is Mt. Doksilsan (elevation 639 m), which is the third highest peak in the islands of Korea. In addition to elevation, the island is important in geography since it is located in the most southwestern part of Korea and a migratory bird passage between the southern China and mainland Korea. Therefore this island harbors diverse flora (783 vascular plants) and avifauna (128 bird species).

Moth fauna of the island was first surveyed by Shin and Nho (1970), and later by others (Ra et al., 1986; Choi and Lee, 1995; Choi et al., 2009). The present study was conducted to investigate the moth fauna by compiling all previous information regarding the distribution of moths. In addition, we report seven new records of moths for the first time in Korea.

MATERIALS AND METHODS

We surveyed moths during three years: 2009, 2012, and 2013. In 2009, three surveys were conducted at eight sites (May, August, and October). Similarly, three surveys were conducted at eight sites in 2012 (April, June, and September), while two surveys were conducted at two sites and on a road between two villages in 2013 (June and September) (Table 1). Moth collections were conducted using an UV light trap (BioQuip, USA) during night and a net during daytime. Specimens were preserved in Mokpo National University and a private collection (Sung-Soo Kim).
RESULTS AND DISCUSSION

A total of 253 species and 2,707 individuals in 18 families were recognized from the three-year-survey on Gageodo Island. During the last 40 years, the moth fauna of the island has been relatively unknown because of limited access to the island. We expected that the total number of moth species would increase since the previous studies were focused on macromoths.

Among 18 families, Geometridae had the greatest species richness, with 63 species (24.9%), followed by Noctuidae (57 species, 22.5%), Erebidae (44 species, 17.4%), Crambidae (38 species, 15.0%), and Sphingidae (10 species, 4.0%). Among individuals, Erebidae (791 individuals, 29.2%) was the dominant taxon, followed by Geometridae (541 individuals, 20.0%), Noctuidae (509 individuals, 18.8%), Crambidae (208 individuals, 7.7%), and Sphingidae (196 individuals, 7.2%). These five families comprised 84 and 83% of the species richness and abundance, respectively (Table 2).

The annual differences in species richness and abundance were not significant (one-way ANOVA, species richness $d.f. = 2, 5, F=0.73, p=0.53$; abundance $d.f. = 2, 5, F=0.36$,

Fig. 1. Map showing the location of the island, Isl. Gageodo, Shinan-gun, Jeollanam-do in South Korea.
Yearly changes in the number of species and individuals showed 130 species and 736 individuals in 2013, 125 species and 1,444 individuals in 2012 and 99 species and 527 individuals in 2009. Annual changes in diversity and evenness indices showed that the Simpson’s evenness index was highest in 2009 and other indices were similar during the three years (Table 3). Seasonal occurrence of species showed a unimodal pattern in which the numbers of species and individuals increased from April and May, peaked in June and decreased to September and October (Fig. 2).

Seven species were first recorded from Korea: two pyralids (Herculia drabricilialis Yamanaka and Didia striatella (Inoue)), four crambids (Clapeosoma pryeri (Butler), Demo­botys pervulgalis (Hampson), Yezobotys dissimilis (Yamanaka) and Syllepte cissalis Yamanaka), and one erebid (Hy­pena siniosa Wileman). One crambid Miyakea raddeella (Caradja) was also found from this study. This species was not included in the Korean list (Park et al., 2012), but Sasaki (2013) noted that it occurs in the Korean peninsula.

**SYSTEMATIC ACCOUNTS**

Family Zygaeinidae Latreille, 1809
1* *Eterusia aedea sugitanii* Matsumura, 1927 (Fig. 3A)

*Eterusia aedea sugitanii* Matsumura, 1927: 83; Choi and Owada, 2010: 95. Type locality: Japan.

**Note.** This species has not been found since the first specimen was caught from this island (Choi and Owada, 2010). Although Gageodo island is closer to southern China, the morphological characteristics of the specimen more closely resemble those from Japan than China (Choi and Owada, 2010). This could support the hypothesis that the moth fauna in the southern Korean sea are similar to those on the islands of Japan. However, further study is needed to confirm this.

Family Pyralidae Linnaeus, 1758  
Subfamily Pyralinae Linnaeus, 1758

2* *Herculia drabicilialis* Yamanaka, 1968 (Figs. 3B, 5A)

*Herculia drabicilialis* Yamanaka, 1968: 131, Pl. 23, fig. 9, Pl. 24, fig. 18, Pl. 25, fig. 21. Type locality: [Japan] Mt. Takao, Tokyo.

**Material examined.** 4♀, Korea, Jeollanam-do, Gageodo Island, 7 Sep 2013, Kim SS.

**Diagnosis.** Wing expanse 19 mm. This species shows short, upturned and reddish brown labial palpi, dark brown or ash-gray wing ground color, slender, pale yellow medial lines, gently excurved postmedial lines of forewing and slender, blackish medial lines of hindwing. This species can be distinguished from other congeners in Korea by its small size and pinkish wing cilia. The female genitalia can be distinguished by the strongly tapered papillae anales, long apophyses, simple ostium bursae, long, slender and membranous ductus bursae and the small ovate corpus bursae without a signum.

**Distribution.** Korea (new record), Japan.

Subfamily Phycitinae Zeller, 1839

3* *Didia striatella* (Inoue, 1959) (Figs. 3C, 5B, C)

*Apomyelois striatella* Inoue, 1959: 294, figs. 2, 3. Type locality: Japan.

**Material examined.** 1♀, Korea, Jeollanam-do, Gageodo Island, 7 Sep 2013, Kim SS.

**Diagnosis.** Wing expanse 22 mm. The adults show cuspid-like, upturned labial palpi that are covered with blackish brown scales, filiform antennae, grayish forewings with long blackish horizontal strips from the costa to termen and whit-
ish hindwings with blackish scales on veins. This species is superficially similar to *Trisides fasciellus* (Inoue, 1982), but can be distinguished by the brown or dark ground color of the forewing, narrow grayish costa, blackish long horizontal strips and the whitish hindwing with blackish scales on veins. The female genitalia can be distinguished by the small papilla anales, long apophyses, weakly sclerotized ostium bursae, anteriorly expanded ductus bursae and large ovate corpus bursae with a large patch of dense processes of signa.

**Distribution.** Korea (new record), Japan.

Family Crambidae Latreille, 1810  
Subfamily Crambinae Latreille, 1810

190 *Miyakea raddeella* (Caradja, 1910) (Fig. 3D)  
*Eromene raddeella* Caradja, 1910: 115, 116. Type locality: [Russia] Radde, Amur.

*Miyakea expansa* Butler, 1881: 590; Bae et al., 2008: 45.  
Type locality: Japan.

**Material examined.** 1 ♀, Korea, Jeollanam-do, Gageodo Island, 9 Apr 2013, Kim SS.

**Diagnosis.** Wing expanse 16 mm. The species can be distinguished by the simple small papillae anales, short apophyses, tube-shaped weakly sclerotized antrum, long ductus bursae and ovate corpus bursae with an elliptical signum patch and a short triangular process.

**Distribution.** Korea (new record), Japan.

Subfamily Odontiinae Guenée, 1854

20 *Clupeosoma pryeri* (Butler, 1881) (Figs. 3E, 4C–E)  
*Hydrorybina pryeri* Butler, 1881: 588. Type locality: Japan.

**Material examined.** 1 ♀, Korea, Jeollanam-do, Gageodo Island, 9 Jun 2013, Kim SS.

**Diagnosis.** Wing expanse 16 mm. The species can be distinguished by the filiform antennae, long, porrect labial palpi, orange ground color of the forewing that shows the medially curved ante- and postmedial lines, lunular discocellular dot and blackish broad termen, and pale blackish hindwing with blackish postmedial line and termen. The male genitalia can be distinguished by the large fan-shaped valva with blackish stripes, triangular uncus, long, tongue-shaped juxta and short saccus, as well as the medially curved aedeagus without a cornutus. The 8th male abdomen showed a M-shaped strongly sclerotized plate anteriorly and a tri-pod shaped process posteriorly.

**Distribution.** Korea (new record), Japan.

Subfamily Pyraustinae Meyrick, 1890

3 Syellepte cissalis Yamanaka, 1987 (Figs. 3F, 5D, E)  
*Syellepte cissalis* Yamanaka, 1987: 194, figs. 2, 4, 5, 5a. Type locality: [Japan] Tsurugi, Ishikawa Pref.

**Material examined.** 1 ♀, Korea, Jeollanam-do, Gageodo Island, 7 Sep 2013, Kim SS.

**Diagnosis.** Wing expanse 22 mm. The adults can be distinguished by the filiform antennae, the blackish forewing with long blackish discocellular spot and the medially strongly bent postmedial line and the blackish hindwing with blackish ante- and postmedial lines. The female genitalia can be distinguished by the simple small papillae anales, short apophyses, tube-shaped weakly sclerotized antrum, long ductus bursae and ovate corpus bursae with an elliptical signum patch and a short triangular process.

**Distribution.** Korea (new record), Japan.

4 *Demobots pervulgalis* (Hampson, 1913)  
(Figs. 3G, 4F, G, 5F, G)  
*Pyrausta pervulgalis* Hampson, 1913: 24. Type locality: Japan, China.

**Material examined.** 1 ♀, Korea, Jeollanam-do, Gageodo Island, 9 Jun 2013, Kim SS.

**Diagnosis.** Wing expanse 22 mm. The adults can be distinguished by the yellowish filiform antennae, projected labial palpi beyond frons, yellowish body, yellowish white ground color of the forewing that shows pale blackish costa, central fascia with dark grayish horizontal lines on veins, medially strongly projected postmedial line and dark grayish horizontal lines on the termen and the yellowish white hindwing with grayish postmedial line and dots on the termen. The male genitalia can be distinguished by the strongly tapered uncus with apical hairs, slender valva with a long, button-shaped harpe, thin, hooked sacculus process and medially projected saccus, and the rod-shaped aedeagus with spinular cornuti. The female genitalia can be distinguished by the small papillae anales, simple ostium bursae, long, twisted ductus bursae and sac-shaped corpus bursae with a large, diamond-shaped signum.

**Distribution.** Korea (new record), Japan.

Korean name: 19 철강두줄포충나방 (신칭), 28 속주홍들명나방 (신칭), 18 신앙무늬등명나방 (신칭), 44 몽남등명나방 (신칭)
Fig. 4. Male abdomen and genitalia. A, B, Miyakea raddeella; C–E, Clupeosoma pryeri; F, G, Demobotys pervulgalis; H, I, Yezobotys dissimilis; J, K, Lymantria albecens; L, M, Lymantria dispar.

Fig. 5. Female genitalia. A, Herculia drabrilialis; B, C, Didia striatella; D, E, Syllepte cissalis; F, G, Demobotys pervulgalis; H, Hypena sinuosa.
**Yezobotys dissimilis** (Yamanaka, 1958)  
(Figs. 3H, 4H, I)  
*Pyrausta dissimilis* Yamanaka, 1958: 265, Pl. 35, figs. 1, 2, 4.  
Type locality: Japan.

**Material examined.** 3♂, Korea, Jeollanam-do, Gageodo Island, 9 Jun 2013, Kim SS.  
**Diagnosis.** Wing expanse 24–28 mm. This species is very similar to *Demobotys pervulgalis* (Hampson), but can be distinguished by the broad central fascia of the forewing and the strongly dentate postmedial line of fore- and hindwings. The male genitalia are similar to those of *Demobotys pervulgalis*, but can be distinguished by the short spinular harpe and sacculus of valva, and the dense spinular cornuti of the male aedeagus.

**Distribution.** Korea (new record), Japan.

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**Amblychia angeronaria** Guenée, [1858] (Fig. 3I)  
*Amblychia angeronaria* Guenée, [1858], in Boisduval & Guenée: 215; Choi et al., 2013: 92. Type locality: [India] Central.  
*Amblychia sinibia* Wehrli, 1938: 88. Type locality: [China] Sichuan, Tachien-lu (Kangding).  
*Amblychia torrida* Moore, 1877: 621. Type locality: [Andaman Island] South Andaman (Port Blair).

**Note.** The largest geometrid species in Korea was first found from this island (Choi et al., 2013). In 2014, we also found few specimens hiding under leaves during daytime and flying at night.

**Family Erebidae Leach, [1815]  
Subfamily Lymantriinae Hampson, 1893**

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**Lymantria albescens** Hori and Umeno  
(Figs. 3K, 4J, K)  
*Lymantria dispar* ab. *albescens* Matsumura, 1927: 25. Type locality: [Japan] Okinawa.  
*Lymantria dispar* al. *albescens* Hori and Umeno, 1930: 18. Type locality: [Japan] Yakushijima Island, Ishigakijima.  
*Lymantria dispar*: Shin and Noh, 1970: 36.  
*Lymantria dispar* postalba Inoue, 1956: 141; Kim, 2002: 7.

**Note.** This species is externally similar to *L. dispar* (Figs. 3K, 4L, M), but can be distinguished by the smaller wingspan, darker ground color of the male wing, and the smaller male genitalia and short aedeagus. We suspected that this species occurs on the island, but no specimens were found during this survey.

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Korean name: 1*뒤짙은들명나방(신칭), 2*큰노랑남방가지나방, 3*남방매미나방(신칭), 4*파도수염나방(신칭)
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