



## Short Communication

## Extreme northern finding of two noctuid moths (Lepidoptera: Erebiidae and Noctuidae) in the Peter the Great Gulf, Russian Far East

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## ABSTRACT

The two East Asian subtropical–tropical noctuid moths, *Nyctemera adversata* (Schaller, 1788) (Erebiidae: Arctiinae) and *Dictyestra dissectus* (Walker, 1865) (Noctuidae: Noctuinae), are newly recorded in the Russian Far East on an extreme long distance to the north from their known localities in the neighboring countries. They were collected on the small Rikord Island in the Peter the Great Gulf after the period of strong southern wind associated with Typhoon Chaba. Data on the general distribution and bionomics of these species are given. This founding, along with other similar discoveries, is consistent with the current trend of global climate warming and indicates a northward expansion of the ranges of southern species in the Sea of Japan/East Sea region. Large migratory moths effectively use powerful air currents to move long distances, including over the sea, while small coastal islands can be used by them as intermediate sites and/or for possible establishing of invasive populations.

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## Introduction

In recent years many species of southern macromoths began to be detected in the extreme south of the Russian Far East (for the review see Dubatolov 2021; Koshkin et al. 2021; also see Beljaev 2021; Beljaev and Knyazev 2021; Spitsyn and Spitsyna 2021; Koshkin and Golovizin 2022; Matov and Komarov 2023). This trend is consistent with global warming. Some of these species already naturalized here, judging from their regular observations in nature. There are *Acosmeryx naga* (Moore) and *Ambulyx tobii* (Inoue) from Sphingidae and, obviously, *Megabiston plumosaria* (Leech), *Dysstroma cinereata* (Moore), *Photocotisia lucicolens* (Butler), and *Idaea trisetata* (Prout) from Geometridae. However, the others are usually recorded sporadically, and, probably, are accidental immigrants to the territory of Russia. The latter is especially true of the moths from the families Erebiidae, Nolidae, and Noctuidae, many of which are capable of active long-distance flight.

Present communication is dedicated to two southern noctuid moths, unexpectedly collected on the small isolated Rikord Island

in the Peter the Great Gulf (Figure 1) just at the finish of a period of strong southern wind associated with Typhoon Chaba. The Rikord Island is located about 33 km SW of Vladivostok and has a territory of about 5 square km. It has no permanent human population and is mostly covered with deciduous forest.

The work is carried out as part of the research program for Lepidoptera on small islands of the Peter the Great Gulf (Beljaev 2013, 2014a, 2014b, 2015, 2023a, 2023b; Ponomarenko and Zinchenko 2013; Ponomarenko 2014).

## Material and methods

Collecting of moths was held from 4 to 9 July 2002 in the northwestern part of the Rikord Island on a white canvas screen illuminated by a mercury choke-less lamp (400 watts) powered by a portable electric generator. The examined specimens are kept in the Federal Scientific Center of the East Asia Terrestrial Biodiversity, Vladivostok, Russia.

## Systematic accounts

Family Erebiidae Leach, 1815

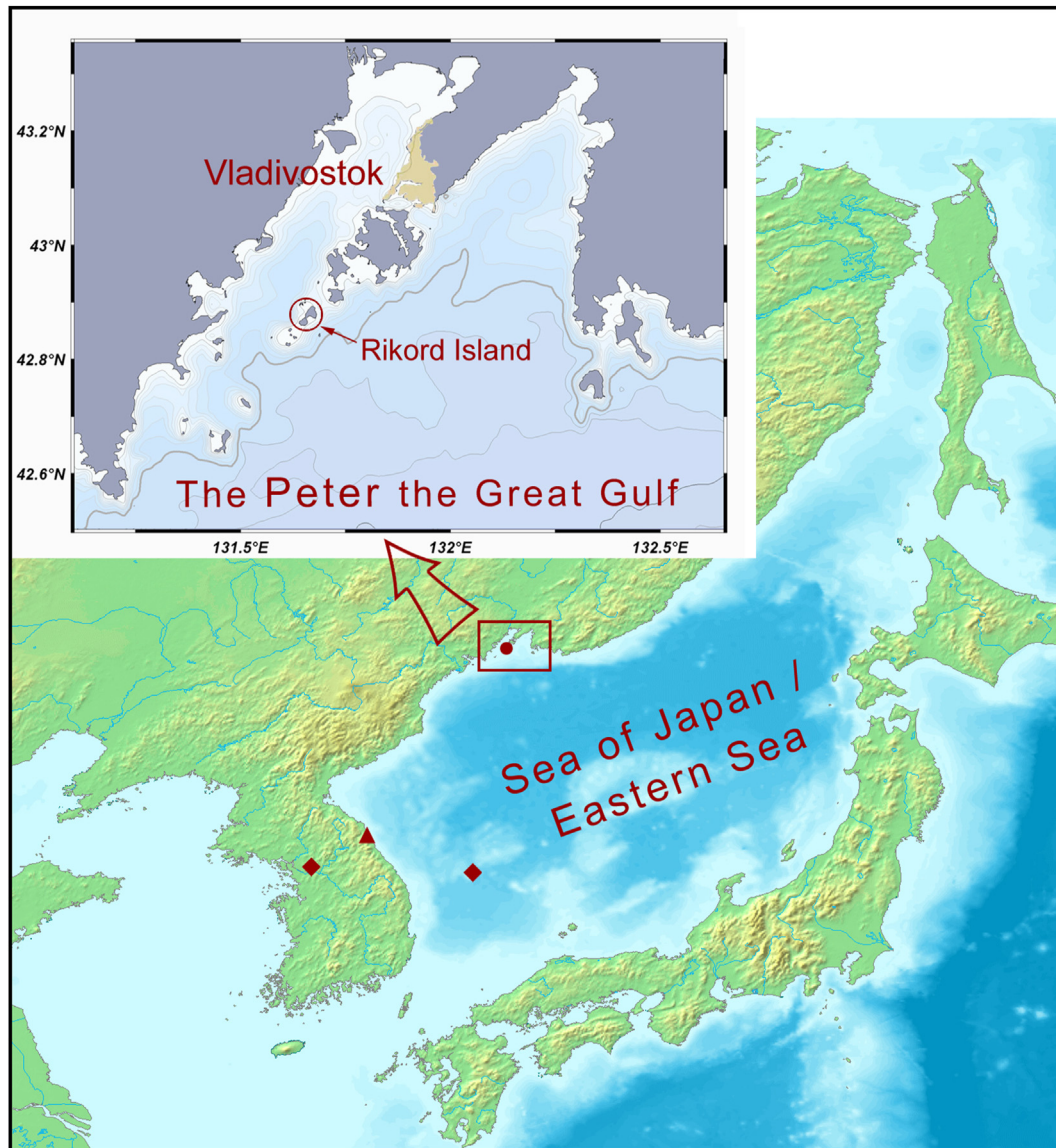
Subfamily Arctiinae Leach, 1815

*Nyctemera (Orphanos) adversata* (Schaller, 1788) (Figure 2)

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**Figure 1.** Geographical location of the Rikord Island and the nearest known collection sites of *Nyctemera adversata* (Schaller, 1788) and *Dictyestra dissectus* (Walker, 1865). ● – collection site of *N. adversata* and *D. dissectus* on Rikord Island, ▲ – most neighboring collection site of *N. adversata* in Korean Peninsula, ◆ – most neighboring collection site of *D. dissectus* in Korean Peninsula and in Ulleungdo Island.

**Material examined.** 1♂, Russia, Primorskii Krai, 33 km SW of Vladivostok, Rikord Island, 42°52'50" N 131°39'40" E, 9 vii 2022 (EA Beljaev leg.)

**Distribution.** Russia – first record (Russian Far East: S Primorskii Krai: Rikord Island), South Korea (including Jeju), Japan (S Honshu north up to Fukui and Chiba, Shikoku, Kyushu, Tsushima, Ryukyu Islands, Bonin Islands: Ogasawara), China (Shandong, Henan, Tibet, Sichuan, Hunan, Jiangxi, Zhejiang, Yunnan, Guangxi, Guangdong, Fujian, Hainan, Hong Kong, Taiwan), India, Nepal, Bhutan, Bangladesh, Myanmar, Thailand, Laos, Cambodia, Vietnam, Philippines, Sri Lanka; Malaysia and Indonesia (Peninsular Malaysia, Sumatra, Java, Borneo) (Holloway 1988; Jeong 2006; de Vos and Dubatolov 2010; Bayarsaikhan et al. 2017; Bucsek 2020; GBIF 2022).

**Host plants.** Different Asteraceae: *Erechites*, *Erigeron*, *Gynura*, *Picris*, *Senecio* (Holloway 1988).

**Flight period.** Polycyclic species; in Japan, moths occur from March to October, they are active during the daytime, but often come to lights at night (Kishida 2011).

**Notes.** For taxonomy, synonymy and other data on *N. adversata* and the genus *Nyctemera* Hübner see de Vos and Dubatolov (2010), Bucsek (2020), and Savela (2022).

The founding of *N. adversata* on the Rikord Island is placed from nearest known localities in S Korea at ~600 km NNE (NE Gangwondo: Kwon 2022).

The species belongs to the Old World pantropical, but presumably Indo-Australian genus *Nyctemera*, some species of which is known as migrants able to cover long distances over the seas. Thus, Australian *Nyctemera amica* (White) was recorded on the Norfolk Island (Holloway 1982), which is distanced 1500 km east of Australia. The record of *N. adversata* on Ogasawara Islands removed about 1000 km from the nearest mainland in Japan. Obviously,



**Figure 2.** Moths: *Nyctemera (Orphanos) adversata* (Schaller, 1788), from the Rikord Island.

native distribution of *N. adversata* is restricted to tropics and subtropics. [Kishida \(2011\)](#) supposes that the moths of *N. adversata* in the mainland of Japan come from the south. Evidently, Korean records also made on incoming moths. In China, the species reaches north of the basin of Yangtze, and its most northern record from Shandong ([iNaturalist 2022](#)) also could be based on migratory moth. Thus, origin of the moths collected on the Rikord Island could be removed more than 1500 km. However, the collected moth was quite fresh on appearance, and looks as recently hatched from a pupa. It is possible that this moth originates from more near temporal seasonal population, maybe in North Korea, as larvae of *N. adversata* feed on different Asteraceae common in open or disturbed habitats.

Family Noctuidae [Latreille, 1809](#)

Subfamily Noctuinae [Latreille, 1809](#)

*Dictyestra dissectus* ([Walker, 1865](#))  
([Figure 3](#))

**Material examined.** 1♂, Russia, Primorskii Krai, 33 km SW of Vladivostok, Rikord Island, 42°52'50" N 131°39'40" E, 9 vii 2022 (EA Beljaev leg.)

**Distribution.** Russia (Russian Far East, SW Sakhalin; S Primorskii Krai – first record: Rikord Island), S Korea (including Jeju), Japan (Hokkaido, Honshu, Shikoku, Kyushu, Tsushima, Ryukyu Islands), China (Hunan, Jiangxi, Zhejiang, Yunnan, Taiwan), India, Nepal, Bhutan, Myanmar, Thailand, Vietnam, Philippines, Sri Lanka, Malaysia, Brunei, Indonesia (Sumatra, Java, Borneo, Moluccas, Sulawesi, New Guinea islands) ([Holloway 1989](#); [Kononenko et al. 1998](#); [Fang 2003](#); [Yoshimatsu 2011](#); [Kemal et al. 2019](#); [Dubatolov et al. 2020](#); [Baidu Baike 2022](#); [Hreblay 2022](#)).



**Figure 3.** Moths: *Dictyestra dissectus* (Walker, 1865), from the Rikord Island.

**Host plants.** In Japan, larvae feed on *Trichosanthes cucumeroides* and *Gynostemma pentaphyllum* (Cucurbitaceae).

**Flight period.** Polycyclic species; in Japan, moths occur from March to October ([Yoshimatsu 2011](#)).

**Notes.** For synonymy to *D. dissectus* see [Poole \(1989\)](#).

General distribution of this species resembles that of *N. adversata*, but first one strongly penetrates to the north along the Japanese islands up to S Sakhalin ([Dubatolov et al. 2020](#)). Similarly, the territories nearest to the Rikord Island with known occurrence of *D. dissectus* in Korea (Ulleungdo Island: [Choi 2020](#); Gwangneung forest: [Byun et al. 2007](#)) are removed more than 600 km to south-east or south-west that demonstrate similar dispersal ability of both species. As the specimen of *N. adversata*, the collected moth was quite fresh on appearance, that supposes its origin more near temporal population. Far Eastern Cucurbitaceae (species from the genera *Thladiantha*, *Schizopenon*, *Actinostemma*, and *Echinocystis*), possibly suitable for *D. dissectus* as larval hostplants, are widely distributed in the south of this region ([Probatova 1987](#)). Thus, the establishment of temporary seasonal populations of *D. dissectus* here or in adjacent territories is not excluded.

## Discussion

Both species, *N. adversata* and *D. dissectus*, have a tropical–subtropical distribution and, despite the presence of potential host plants for larvae, are unlikely to live permanently in the Peter the Great Gulf area, where an average January temperature of about 12–14°C below zero. Thus, these moths should be considered as migrants.

The moths of *N. adversata* and *D. dissectus* were collected at the end of a four-day period of sustained dominance of strong south-east wind. According to the Vladivostok weather station (located 33 km NE of the Rikord Island), from July 6 to 9, a southeast wind prevailed and had a mean speed of up to 13 m/s with a maximum gust value up to 19 m/s (the data from the site [Raspisaniye Pogodi 2004–2023](#)) i.e. following the empirical Beaufort scale it varied from a strong breeze to a fresh gale (Beaufort wind forces 6 to 8). From the visual and physical impressions, the wind on the island roughly corresponded to these Beaufort's classes of the wind forces. This wind was the result of the passage of an atmospheric front, associated with the former Typhoon Chaba, which July 5, 2022 entered the mainland of South China and weakened to a cyclone.

Simultaneously with *N. adversata* and *D. dissectus*, a number of southern noctuid moths known as active migrants were observed: at the beginning of this wind, July 7 – *Eudocima tyrannus* (Guenée) (1 moth), and at the finish of the wind, July 9 – *Thyas juno* (Dalman) (4 moths), *Arcte coerulea* (Guenée) (1 moth) and *Mythimna separata* (Walker) (1 moth). They were not observed on July 4–6 before the wind, when the weather conditions for collecting at light were favorable, and flight of moths at light was most intensive. Obviously, all considered species reached the Rikord Island through this wind. It is noticeable that in the next period of the moth study on the Rikord Island, from July 27 to August 1, 2022, when the weather was relatively calm, none of the mentioned above species was noted.

This observation correlates with registration of subtropical noctuid moth *Risoba yanagitai* Nakao, Fukuda et Hayashi (Noctuidae), in Vladivostok at 2016, just after the passing of Typhoon Lionrock ([Beljaev and Velyaev 2016](#)). These data probably indicate that strong southern wind facilitates the regular incoming to the Russian Far East of a significant number of southern migrating Lepidoptera, settling on the coast of Peter the Great Gulf, including its small islands. Mass carrying of moths with wind from very long distances was noted also in the Russian High Arctic ([Gavrilov et al. 2021](#)).

These data indicate a significant role of typhoons in transporting Macroheterocera in the Sea of Japan/Eastern Sea region over distances of hundreds and possibly thousands of kilometers. In the west of the region, most intensive flow of megaton of southern moths appears to be along the Korean coast to the coast of the Peter the Great Gulf. Observations show that powerful air currents are probably actively used by rather large moths, which are capable of long-distance migrations. At the same time, small coastal islands can play the role of intermediate landing sites, and are left after some rest. This manner of migration can serve as an effective way to expand the species' range to the north, allowing almost immediate use of favorable climate changes to naturalize the species in new territories and form invasive populations. Thus, studying the relationship between migratory species and stormy weather events is of great scientific and practical interest.

## Conclusions

The founding of the moths in the Peter the Great Gulf region at a distance of more than 600 km from the nearest known localities of these species in connection with the passage of an atmospheric front with strong southern wind indicates that large migratory moths can effectively use powerful air currents for long-distance movements, including over the sea. At that, small coastal islands can be used by migrating moths as intermediate landing sites and/or for establishing (temporary) populations under favorable environmental conditions.

## Declaration of competing interest

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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