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**First record of the larger black flour beetle (*Cynaesus angustus*)
(Coleoptera: Tenebrionidae) from Russia, with a review of its
North American and trans-continental expansion**

**Первая находка жука-чернотелки *Cynaesus angustus*
(Coleoptera: Tenebrionidae) в России с обзором его
североамериканской и трансконтинентальной экспансии**

YA.N. KOVALENKO*, A.N. DROGVALENKO & R.A. KHRYAPIN

Я.Н. КОВАЛЕНКО, А.Н. ДРОГВАЛЕНКО, Р.А. ХРЯПИН

Ya.N. Kovalenko, A.N. Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences, 33 Leninskiy prosp., 119071 Moscow, Russia. E-mail: sinodendron@rambler.ru

A.N. Drogvalenko, Museum of Nature of Kharkiv National University, 4 Svobody Sq, Kharkiv 61022, Ukraine. E-mail: triplaxxx@ukr.net

R.A. Khryapin, Moscow City Centre of Disinfection, 9 Jaroslavskoe Rte, Moscow 129337, Russia. E-mail: 79104408751@yandex.ru

The larger black flour beetle, *Cynaesus angustus* (LeConte, 1851), is recorded from Russia (Belgorod Province) for the first time. It is also first recorded in the literature from Ukraine (Lugansk and Kharkov Provinces), known previously from the Kharkov Province from the record in the Internet. Its economic importance, historical and contemporary distribution are discussed.

Впервые для России указывается жук-чернотелка *Cynaesus angustus* (LeConte, 1851). Этот вид также впервые указывается в литературе для Украины (Луганская и Харьковская области); ранее он был известен из Харьковской области по информации в Интернете. Обсуждаются его хозяйственное значение, а также географическое распространение в исторической ретроспективе и современный ареал.

Key words: invasion, invader, Russia, Ukraine, Coleoptera, Tenebrionidae, *Cynaesus*

Ключевые слова: инвазия, адвентивный вид, Россия, Украина, Coleoptera, Tenebrionidae, *Cynaesus*

INTRODUCTION

The larger black flour beetle, *Cynaesus angustus* (LeConte, 1851), is a beetle of the family Tenebrionidae of North American origin that nowadays is spread beyond its native continent. It is known as a pest of grain crops and other plant products. The article presents the first record of *C. angustus* from Russia and the first records of this species in the literature (previously available only in

the Internet) from Ukraine, with a review of the history of spreading of the species beyond the native area, as well as its harmfulness.

MATERIALS AND METHODS

The examined material is deposited in the collection of Museum of Nature of Kharkov National University (KUMN), the collection of All-Russian Plant Quarantine Centre (VNIKR) and the private collection of R.A. Khryapin (CRK).

*Corresponding author.

Order **COLEOPTERA**Family **TENEBRIONIDAE**Subfamily **DIAPERINAE**Genus *Cynaesus* LeConte, 1862*Cynaesus angustus* (LeConte, 1851)

Material examined. **Ukraine:** *Lugansk Prov.:* Slavyanoserbsk Distr., 33 km NW of Lugansk, Trokhizbenka Vill., at light, 1.VIII.2012, S.V. Kononov, 1 specimen (KUMN); same locality, 28.IV.2013, S.V. Kononov, 1 specimen (KUMN); same locality, 1.VI.2014, S.V. Kononov, 6 specimens (KUMN); *Kharkov Prov.:* Volchansk Distr., 7 km N Staryi Saltiv, Rubezhnoe Vill. environs, at light, 25.VIII.2012, Yu.A. Guglya, 1 specimen (KUMN); Chuguev Distr., Eskhar Vill. environs, "Dachi" station, under bark of dead elm, 49°47'58.36''N 36°37'23.74''E, 9.X.2013, B.M. Loboda, 1 specimen (KUMN). **Russia:** *Belgorod Prov.:* Belgorod Distr., Pulyaevka Vill., in home and at light, 50°27'06.9''N 36°39'40.5''E, 18–19.VI.2016, R.A. Khryapin, 1 male (VNIKR) and 1 female (CRK), **new record**.

Distribution. North America, introduced to Europe and Thailand.

Discussion. *Cynaesus angustus* was described in the middle of the 19th century from the Colorado Desert, which is a part of the Sonoran Desert (North America). Its natural range is within the Sonoran and Chihuahuan Deserts (Southwestern USA and Northwestern Mexico), where the beetles were collected in various decaying plant matter, mainly in rotting cactuses (family Cactaceae) and other succulent plant remains (*Agave* spp., *Yucca* spp. etc.), which are characteristic of the North American desert flora (Ferro et al., 2013; Dunkel et al., 1982). Prior to early 20th century, the species was unknown outside its natural distribution area.

The first records of *C. angustus* in USA outside the Southwestern states are from the 1920s and 1930s (Dunkel et al., 1982). In the following decades, the larger black flour beetle had massively extended distribution eastwards and northwards, reaching the North American eastern coast and sev-

eral Canadian provinces in the north. Furthermore, there was an incident of transcontinental transportation in 1964, when a heavily infested shipment of tobacco, originating from the state of Georgia (USA), was detected in the seaport of Dublin (Ireland) (Dunkel et al., 1982; Soldati & Godinat, 2013); however, that incident has not led to the invasion of Europe by the species.

Active dispersal of *C. angustus* outside its natural range is apparently due to the ability of the species to develop in agricultural products and by-products. The larger black flour beetle infests many kinds of plant materials, such as corn (the most preferred medium), wheat, soya beans, sorghum, barley, oats, as well as tobacco, dry fruits, etc. (Dunkel et al., 1982). Additionally, *C. angustus* is able to develop, sometimes *en masse*, on the industrial waste of plant origin, such as that of cotton production (Nansen et al., 2008). Moreover, the larger black flour beetle, which originally used to inhabit deserts, exhibited major ecological flexibility, when it colonised new habitats in the Eastern and Northern United States and South Canada, successfully developing under the bark of trees and shrubs in the forest zone (Dunkel et al., 1982). These facts suggest the lack of certain trophic specificity in *C. angustus*, which, as in many other cases of detritophagy, can be attributed to specialized symbiotic intestinal microflora, which allows the beetles to utilise such broad spectrum of plant materials (Paulian, 1988).

The first article on finding *C. angustus* in the continental Europe was published in 1989, based on material collected in Sweden in 1988 (Andersson & Ferrer, 1989). It was subsequently recognized as misidentification of another *Cynaesus* species, namely *C. depressus* Horn, 1870. Correctly identified *C. angustus* specimens were collected in Sweden a little later, in 1989 (Ferrer & Andersson, 2002a, 2002b). More recently it was recorded in Finland (Ferrer & Andersson, 2002b), Germany (Reibnitz & Schawaller, 2006) and France (Denux & Zagatti, 2010; Soldati, 2007; Soldati & Godinat,

2013). Additionally, there are published records of the species from Thailand (Delobel & Tran, 1993). Here *C. angustus* is recorded from Russia (Belgorod Province) for the first time and first recorded in the literature from Ukraine (Lugansk and Kharkov provinces) [an unpublished record from the Kharkov Province in Ukraine is available in the Internet (Loboda, 2013a, 2013b)]. The locality of *C. angustus* in Russia is only approximately 30 km away from one of the localities in Ukraine (Rubezhnoe village environs in Kharkov region), since Kharkov and Belgorod provinces lie on opposite sides of Russian-Ukrainian border.

Cynaesus angustus is of a significant economic importance (Dunkel et al., 1982). For example, in Minnesota the larger black flour beetle is considered a major pest of stored corn (Barak et al., 1981). There are published records when *C. angustus* bred *en masse* on cotton production waste, with the resulting beetles entering houses and public buildings on a large scale, probably attracted by light, causing serious discomfort to the local residents (Nansen et al., 2008). As reported by Soldati & Godinat (2013), *C. angustus* has similar habits in Europe: there are numerous reports of beetles in and around human habitations. *Cynaesus angustus* is considered a quarantine pest in several countries, such as Australia and New Zealand (Ikin et al., 1999; MAF Biosecurity New Zealand, 2010). In order to keep its numbers under control, even biological and biochemical means have been developed, based on use of certain enzyme inhibitors in its larvae (Oppert et al., 2006), or using the pathogenic nematode *Steinernema carpocapsae* (Weiser) (Nansen et al., 2013) or the microsporidian *Nosema cynaea* Krall (Krall, 1950).

We can expect further expansion and naturalisation of *C. angustus* in Eastern Europe, as was the case in Scandinavia and Western Europe; it is likely to expand its range eastwards and naturalise in the Asian part of Russia. Additionally, it may well start to exercise the same degree of

injuriousness to agriculture in Russia and Ukraine as it exhibits in North America.

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