

Distributional pattern of *Chrysolina limbata* (Fabricius, 1775) (Coleoptera: Chrysomelidae: Chrysomelinae)

Особенности географического распространения *Chrysolina limbata* (Fabricius, 1775) (Coleoptera: Chrysomelidae: Chrysomelinae)

A.O. Bieńkowski & M.Я. Orlova-Bienkowskaja
А.О. Беньковский, М.Я. Орлова-Беньковская

A.N. Severtsov Institute of Ecology and Evolution, Leninsky prosp. 33, Moscow 119071, Russia.

Институт проблем экологии и эволюции им. А.Н. Северцова, Ленинский пр-т 33, Москва 119071, Россия.

KEY WORDS: Chrysomelidae, *Chrysolina limbata*, distribution.

КЛЮЧЕВЫЕ СЛОВА: Chrysomelidae, *Chrysolina limbata*, географическое распространение.

ABSTRACT. The first dot distributional map of *Chrysolina limbata* is presented (based on the specimens from 269 localities). The area of *Ch. limbata* occupies a long narrow band from Spain to Chita region. *Ch. limbata* is a Euro-Baikal boreal-mountain species. It occurs in great river valleys in the north and mostly in mountains in the south. In the Great Caucasus it occurs in two different altitudinal belts (0–1400 m and 1800–3200 m above sea level). In the Lesser Caucasus it is recorded only from subalpine meadow zone (1800–2600 m). The northern border of the area almost coincides with the northern boundary of deciduous-coniferous forest zone. In the north *Ch. limbata* is more rare in our days than it was in 19th century.

РЕЗЮМЕ. Впервые составлена точечная карта ареала *Chrysolina limbata* (по экземплярам из 269 местонахождений). Область распространения *Ch. limbata* простирается от Испании до Читинской обл. *Ch. limbata* принадлежит к группе евро-байкальских борео-монтанных видов. В северной части ареала он приурочен к долинам больших рек, а в южной обитает большей частью в горах. На Большом Кавказе вид встречается в двух высотных поясах (0–1400 м и 1800–3200 м над уровнем моря). На Малом Кавказе найден только в зоне субальпийских лугов (1800–2600 м). Северный предел распространения вида почти совпадает с северной границей зоны смешанных лесов. На севере *Ch. limbata* более редка в настоящее время, чем в XIX веке.

Introduction

Ch. limbata has a pronounced and complicated spatial structure. Both morphological differences and distribution of infraspecific forms are studied insufficiently. The identification of the subspecies is usually rather difficult. Many scientists, including Dr. L.N.

Medvedev [Medvedev & Okhrimenko, 1991], whose anniversary is being celebrated, studied the systematics and distribution of this species.

We are preparing a taxonomical revision of all geographical forms of *Ch. limbata* now. The present article is the first step of this work.

There are two main types of graphic interpretation of the geographic distribution — polygon map and dot map [Lopatin, 1989]. With the enough information, the latter type is preferential. Many leaf-beetles are not very mobile. So their areas often consist of a great number of small isolated parts. Dot map reveals landscapes and types of vegetation connected with the species, a pattern of distribution (aggregated or scattered). The elucidation of the taxonomical differences of closely related allopatric and sympatric forms also requires a precise geographical information.

Polygon maps have been prepared for the most of palaeartic leaf-beetles [e.g. Borowiec, 1984; Warchałowski, 1985, 1996]. Dot maps exist only for several species [e.g. Ogloblin, 1936; Silfverberg, 1987, 1989, 1994; Chernov et al., 1993; Bieńkowski, 1997, 2007; Lays, 1997; Mikhailov, 2000; Geiser, 2001; Wanntorp, 2009].

Distribution of *Ch. limbata* was briefly outlined by Brovdij [1977], Maltsev & Mosiakin [1980], Lopatin & Kulenova [1986], Dubeshko & Medvedev [1989], Okhrimenko [1990], Medvedev & Okhrimenko [1991], and Warchałowski [1993]. A dot map of the whole area of *Ch. limbata* is presented for the first time herewith.

Material

We have examined 1492 specimens of *Ch. limbata* (269 localities), obtained from 16 museums and 18 more colleagues as well as collected by us.

All available males were dissected, because the single feature to distinguish *Ch. limbata* from the sibling species *Ch. jennisseiensis* (Breit, 1920) is the male aedeagus

structure. We found *Ch. jensseiensis* in the Caucasus, Mongolia, and East Siberia only (107 males examined). A record of *Ch. jensseiensis* from European Russia (Tambov) [Medvedev & Okhrimenko, 1991] is based on the incorrect geographical label of the single male (examined). Therefore, only male specimens were used for preparing of the map for the Caucasus, Siberia, Mongolia, and adjacent territories (Asia Minor, Kazakhstan, the Urals). For other territories we used female findings too.

Results

General distribution

The area of *Ch. limbata* occupies a long narrow band from Spain to Chita region (Figs 1–2). The distance between the most western and eastern localities is about 9000 km. The northern border almost coincides with the boundary between the taiga and deciduous-coniferous forest zones. Area of *Ch. limbata* covers all natural zones from deciduous-coniferous forests to deserts.

In the west, *Ch. limbata* is distributed from North Sea and Baltic Sea shores to Mediterranean Sea shore. The Asian part of the area is much more narrow in latitudinal direction (less than 1000 km in Southern Siberia).

Gorodkov [1984] classifies such type of areas as Euro-Baikal one. He suggests that in the interglacial period the migration of insect species from Siberia to Europe was more intensive, than in the opposit direc-

tion, and Euro-Baikal type of distribution is an evidence of Siberian origin of the species [Gorodkov, 1977].

In the most part of their area *Ch. limbata* occurs in river valleys. The most of points (Figs 1–2) look like beads on the strings of great rivers: Elbe, Vistula, upper reaches of Danube, Bug, Yuzhniy Bug, Dnieper, Don, Volga, Oka, Klyazma, Kama, Tobol, Tura, Ishim, Ir-tish, Ob, Yenisei, Angara, upper reaches of Lena, Vitim, Shilka, Onon, and Kerulen.

In some southern regions, the distributional pattern of *Ch. limbata* is quite another: it occurs in mountains and avoids great river valleys and lowlands. The species is recorded from Pyrenees, Alps, Apennines, Balkans, Carpathians, the Caucasus and the mountains of the south of East Siberia and Mongolia. *Ch. limbata* is a typical mountain species in these regions. Its area bends round Pannonian lowland and Low-Danube lowland and does not run in these lowlands. *Ch. limbata* is abundant in the Great Caucasus and the Lesser Caucasus, but almost absent in the Terek and Kura river valleys. Only one male was collected in the Kura river valley (at Mamusta Vill., Lenkoran district, Caspian Sea shore). *Ch. limbata* is also absent in the adjacent western part of Caspian Coastal Plain and Ergeni hills.

The peculiarities of the distribution permit us to regard *Ch. limbata* to be boreal-mountain species. It occurs mostly in river valleys in the north and in mountains in the south. Besides that, the points of the findings

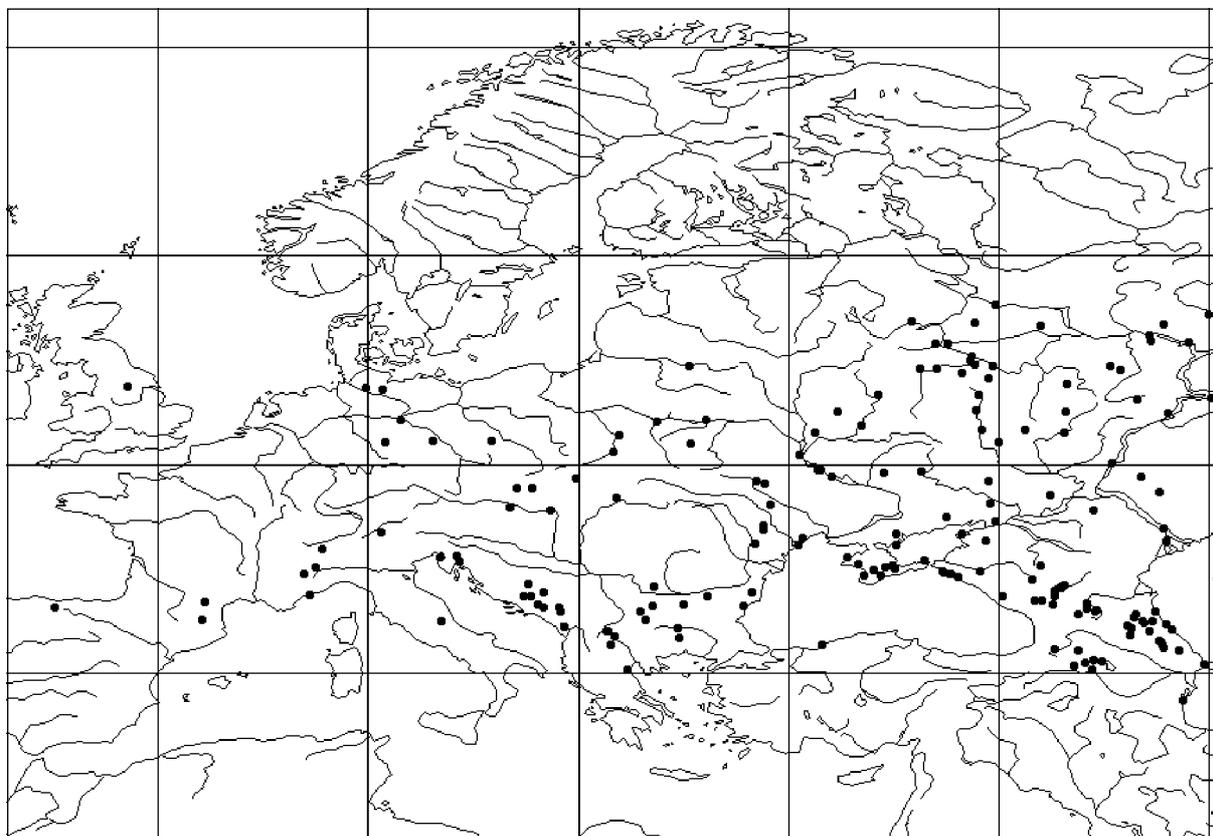


Fig. 1. Distribution of *Chrysolina limbata* (localities of examined specimens). Western part.

Рис. 1. Распространение *Chrysolina limbata* (местонахождения изученных экземпляров). Западная часть.

look more dense in mountains than on plains (Figs 1–2). Probably, this indicates that *Ch. limbata* is more abundant in mountains.

Altitudinal distribution in the Caucasus

In the Great Caucasus this species lives in all altitudes from 0 up to 1400 m above sea level (Fig 3), i.e. to the

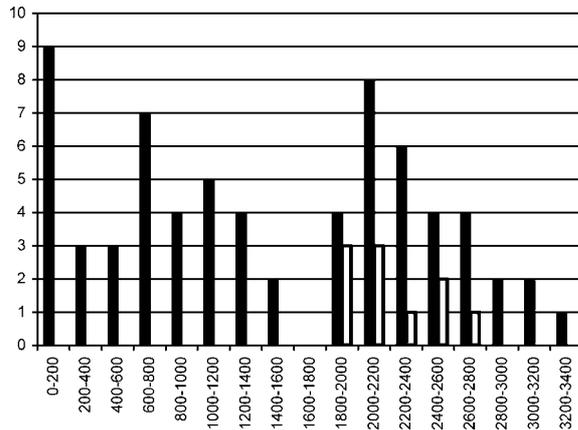


Fig. 3. Altitudinal distribution of *Chrysolina limbata* in the Great Caucasus (black rectangles) and the Lesser Caucasus (white rectangles). Abscisse — altitude (m), ordinate — number of localities.

Рис. 3. Высотное размещение *Chrysolina limbata* на Большом Кавказе (черные прямоугольники) и на Малом Кавказе (белые прямоугольники). Абсцисса — высота над уровнем моря (м), ордината — число местонахождений.

upper range of broad-leaved and mixed coniferous-broad-leaved forests; some localities are in the belt of beech forest. The real number of lowland findings (0–200 m) may be less than it is shown in Fig. 3 because of inexact data on some museum labels (sometimes only the nearest city is indicated). *Ch. limbata* absolutely does not occur between 1400 and 1800 m above sea level, i.e. in the pine forest, subalpine crooked forest, and light forest belts. Then, this species appears over 1800 up to 3200 m in subalpine meadows belt, but is absent higher, in alpine meadows. In the Lesser Caucasus, an altitudinal distribution is different (Fig. 3). *Ch. limbata* is recorded only from subalpine meadows belt (1800–2600 m) there.

Northern border of the area

The most northern locality of *Ch. limbata* lies in the northern part of taiga zone, about 1000 km far from other known populations. We examined one male (right bank of Pechora river, Sergjeva-Shelja Vill., 20 km N of Ust-Tsilma, Zhuravskij leg., 2.7.1906). However, *Ch. limbata* was not recorded from taiga zone during the last 100 years.

Ch. limbata was originally described from England [Fabricius, 1775]. The type specimens were examined by us, but the exact type locality is unknown. Therefore, a point in England in Fig. 1 is conventional. This species was found in Great Britain for the last time in the beginning of 19th century [Stephens, 1831], and has been probably died out later.

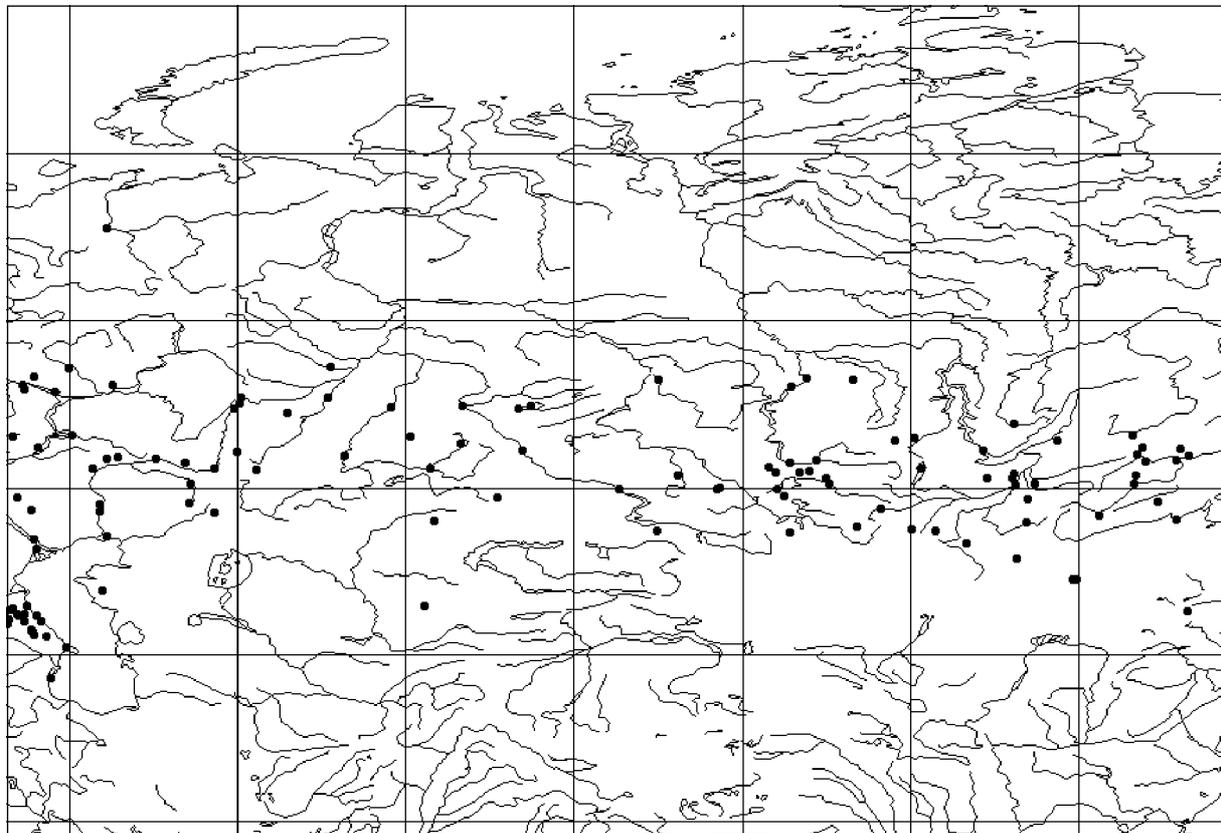


Fig. 2. Distribution of *Chrysolina limbata* (localities of examined specimens). Eastern part.

Рис. 2. Распространение *Chrysolina limbata* (местонахождения изученных экземпляров). Восточная часть.

In 19th century, *Ch. limbata* was common in Northern Europe, but now it has become a rare endangered species there [Winkelman, 1993; Geiser, 1998; Gardenfors, 2005; Danish Red Data Book, 2007].

ACKNOWLEDGEMENTS. We are grateful to Dr. S.V. Pushkariov (Moscow, Russia) for technical assistance in the preparing of maps, to Dr. J. Bezdek (Brno, Czechia), Dr. S.V. Dediukhin (Izhevsk, Russia), Dr. L.V. Egorov (Cheboksary, Russia), Dr. V.G. Grachiov (Moscow, Russia), Dr. E.V. Gus'kova (Chelyabinsk, Russia), Dr. O.N. Kabakov (St.-Petersburg, Russia), Dr. H. Kippenberg (Herzogenaurach, Germany), Mr. R.A. Khriapin (Moscow, Russia), Mr. A.A. Klimenko (Tver, Russia), Dr. L.N. Medvedev (Moscow, Russia), Dr. N.V. Okhrimenko (Krasnodar, Russia), Miss I.G. Pronina (Penza, Russia), Mr. P.V. Romantsov (St.-Petersburg, Russia), Dr. M.Yu. Savitsky (Moscow, Russia), Dr. M. Schöller (Berlin, Germany), Dr. M.E. Smirnov (Ivanovo, Russia), Dr. A. Warchałowski (Wrocław, Poland), Mr. A. Zubov (Moldova) for allowing to study *Chrysolina limbata* specimens, to Dr. J. Frisch (Museum für Naturkunde, Humboldt-Universität, Berlin, Germany), Dr. J. Hajek (The National Museum, Praha, Czechia), Dr. A.G. Koval (All-Russian Institute for Plant Protection, Pushkin, Russia), Dr. R. Krause (Staatliches Museum für Tierkunde, Dresden, Germany), Dr. A.V. Lagunov (Ilmenny Zapovednik, Miass, Russia), Dr. K.V. Makarov (Moscow Pedagogical State University, Moscow, Russia), Dr. G.S. Medvedev, Dr. B.A. Korotyayev, and Mrs. S.V. Andreeva (Zoological Institute of Russian Academy of Sciences, St.-Petersburg, Russia), Dr. N.B. Nikitsky and Dr. A.A. Gusakov (Zoological Museum of the Moscow State University, Moscow, Russia), Dr. A.B. Ruchin (Mordovsky Zapovednik, Russia), Dr. K. Schneider (Institut für Zoologie der Martin-Luther-Universität, Halle (Saale), Germany), Dr. H. Schönmann (Naturhistorisches Museum, Wien, Austria), Dr. H. Silfverberg (Zoological Museum, University of Helsinki, Helsinki, Finland), Dr. A.Yu. Solodovnikov (Zoologiske Museum, Copenhagen, Denmark), Dr. M.N. Tsurikov (Zapovednik Galichia Gora, Lipetsk reg., Russia), Dr. L. Zerche (Deutsches Entomologisches Institut, Müncheberg, Germany), Dr. R.D. Zhantiev and Dr. V.Yu. Savitsky (Biological Faculty of the Moscow State University, Moscow, Russia) for the generously allowing us to borrow material from the respective institutional and museum collections.

References

- Bieńkowski A.O. 1997. Some surprising discoveries of *Chrysolina relucens* (Coleoptera, Chrysomelidae) on the White Sea shore, in Siberia and in the Far East // Ent. Fennica. Vol.7. P.195–199.
- Bieńkowski A.O. 2007. A monograph of the genus *Chrysolina* Motschulsky, 1860 (Coleoptera: Chrysomelidae) of the world. Part 1. Moscow: Techpolygraphcentre Publ. 417 pp.
- Borowiec L. 1984. Zoogeographical study on Donaciinae of the world (Coleoptera, Chrysomelidae) // Polskie Pismo ent. Vol.53. P.433–518.
- Brovdij V. M. 1977. [Leaf-beetles. Chrysomelinae] // Fauna of the Ukraine. Vol.19. Beetles, Vol.16. Kiev: Naukova dumka Publ. 385 pp. [in Ukrainian].
- Chernov Yu.I., Medvedev L.N. & Khruleva O.A. 1993. [Leaf beetles (Coleoptera, Chrysomelidae) in the Arctic] // Zool. Zhurn. Vol.72. No.9. P.78–92 [in Russian].
- Danish Red Data Book. 2007. <http://www.dmu.dk/International>
- Dubeshko L.N. & Medvedev L.N. 1989. [Ecology of leaf-beetles of Siberia and Far East]. Irkutsk: Irkutsk University Publ. 224 pp. [in Russian].
- Fabricius J.C. 1775. Systema Entomologiae, sistens Insectorum classes, ordines, genera, species, adiectis synonymis, locis, descriptionibus, observationibus. Flensburgi et Lipsiae. 32+832 pp.
- Gardenfors U. 2005 (ed.). The 2005 Red List of Swedish Species. Swedish Species Information Centre. 496 pp.
- Geiser E. 2001. Die Käfer des Landes Salzburg. Faunistische Bestandserfassung und tiergeographische Interpretation // Monographs on Coleoptera (Wien). Vol.2. 706 pp.
- Geiser R. 1998. Rote Liste der Käfer (Coleoptera) // Binot M., Bless R., Boie P., Gruttke H. & Pretscher P. (eds). Rote Liste gefährdeter Tiere Deutschlands. Schriftenreihe für Landschaftspflege und Naturschutz. Bd.55. S.168–230.
- Gorodkov K.B. 1977. [Faunistic relation between Siberia and Central Europe] // 7th International symposium on the entomofauna in Central Europe. Leningrad, 19–24. September, 1977. Proceedings. P.32–33 [in Russian].
- Gorodkov K.B. 1984. [Types of the areas of Insecta of tundra and forest zones of the European part of USSR] // Areal nasekomykh Evropejskoi chasti SSSR. Leningrad: Nauka Publ. P.3–20 [in Russian].
- Lays P. 1997. Les Donaciinae (Coleoptera: Chrysomelidae) de la faune de Belgique. Chorologie, phenologie et evaluation de la derive faunique // Notes fauniques de Gembloux. No.33. P.67–143.
- Lopatin I.K. 1989. [Zoogeography. Ed. 2]. Minsk: Vysheishaya shkola Publ. 318 pp. [in Russian].
- Lopatin I.K. & Kulenova K.Z. 1986. [Leaf-beetles (Coleoptera, Chrysomelidae) of Kazakhstan. Key to identification]. Alma-Ata: Nauka. 200 pp. [in Russian].
- Maltsev I.V. & Mosiakin S.A. 1980. [To the characteristic of the subfamily Chrysomelinae (Coleoptera, Chrysomelidae) in Crimea] // Conservation of nature and natural resources. No.1. Simferopol: Simferopol University Publ. P.95–100 [in Russian].
- Medvedev L.N. & Okhrimenko N.V. 1991. [To the knowledge of leaf-beetles of the genus *Chrysolina* Motsch. (Coleoptera, Chrysomelidae) of the Caucasus] // Entomol. Obozr. Vol.60. No.4. P.866–874 [in Russian].
- Mikhailov Yu.E. 2000. New distributional records of Chrysomelidae from the Urals and Western Siberia [on some "less interesting" faunistic regions] (Insecta: Coleoptera) // Faunistische Abhandlungen (Dresden). Bd.22. No.3. S.23–38.
- Ogloblin D.A. 1936. [Chrysomelidae. Galerucinae] // Fauna SSSR. Insecta. Coleoptera. Vol.26. No.1. Moscow-Leningrad: AN SSSR Publ. 457 pp. [in Russian].
- Okhrimenko N.V. 1990. [Distributional pattern of leaf-beetles of the genus *Chrysolina* (Coleoptera: Chrysomelidae) in the Caucasus] // Advances of entomology in the USSR: Coleoptera. 10th Congress of all-Union Entomological Society 11–15. September 1989. Proceedings. Leningrad. P.104–105 [in Russian].
- Silfverberg H. 1987. Mapping the Finnish Chrysomelidae (Coleoptera). 1 // Notulae Ent. Vol.67. P.5–16.
- Silfverberg H. 1989. The problem of arctic Chrysomelidae (Coleoptera) // Fauna norv. Ser.B. P. 53–55.
- Silfverberg H. 1994. Chrysomelidae in the Arctic // Novel aspects of the biology of Chrysomelidae. Kluwer Acad. Publ. P.503–510.
- Stephens J.F. 1831. Illustrations on British entomology; or, a Synopsis of Indigenous Insects. Mandibulata. Vol.4. London: Baldwin and Cradock Publ. 414 pp.
- Wanntorp H.-E. 2009. Svenska bladbaggar: *Oulema septentrionis* (Weise, 1880) och *Cryptocephalus bameuli* Duhaldeborde, 1999, två nygamla arter i den nordiska faunan (Coleoptera, Chrysomelidae) // Ent. Tidskrift. Vol.130. No.10. P.1–6.
- Warchałowski A. 1985. Chrysomelidae. Stonkowate (Insecta: Coleoptera). Cz.1 // Fauna Polski. T.10. Warszawa: Państwowe wydawnictwo naukowe. 273 pp.
- Warchałowski A. 1993. Chrysomelidae. Stonkowate (Insecta: Coleoptera). Cz.3 // Fauna Polski. T.15. Warszawa: Dział wydawnictwa MiZ PAN. 279 pp.
- Warchałowski A. 1996. Übersicht der westpaläarktischen Arten der Gattung *Longitarsus* Berthold, 1827 (Coleoptera: Chrysomelidae: Halticinae) // Genus (Supplement). 266 S.
- Winkelman J.K. 1993. *Chrysolina limbata* in Nederland // Ent. ber. Amstr. Vol.53. P.44–48.