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New records of *Claviger testaceus* PREYSSLER, 1790 and *C. longicornis* MÜLLER, 1818 (Coleoptera: Staphylinidae: Pselaphinae) in Poland with review of their habits

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ABSTRACT. Numerous new localities of *Claviger longicornis* and *C. testaceus* in Poland are reported, based on private and museum collections. The records represent the first in more than 50 years published reports on the occurrence of these beetles in the country. A short overview of the species' biology is given, circumstances of recent encounters are discussed and a bibliography concerning the species is provided. Distribution maps are given.

KEY WORDS: Staphylinidae, Pselaphinae, *Claviger longicornis*, *Claviger testaceus*, new records, myrmecophily, *Lasius*, Poland.

INTRODUCTION

Beetles of the genus *Claviger* PREYSSLER, 1790 are specialized myrmecophiles (symphiles sensu WASMANN 1896, myrmecoxenes of WHEELER 1910 or true guests in DONISTHORPE 1927) that are dependent on their host ants throughout the whole life cycle. Species occurring in Poland are the most common and most widely distributed members of the genus in Europe (LÖBL & BESUCHET 2004). Nonetheless, most of the records in the territory of Poland were published before the World War II (BURAKOWSKI et al. 1978) and the

only post-war reports were papers by URBAŃSKI (1949), PISARSKI (1953) and KUBISZ & PAWŁOWSKI (1998) for *C. testaceus*. Works of HORION (1949, 1951), cited in the Catalogue of the Fauna of Poland (BURAKOWSKI et al. 1978), quote already published data. Below we are presenting a short overview of the natural history of the species in question, circumstances of their finding in Poland in the recent years and hitherto unpublished data from museum collections. Distribution maps for both species (Figs 1, 2) were compiled from literature data and localities reported in the present article.

Abbreviations used: BK – B. KOTULA; DK – D. KUBISZ; EW – E. WRÓBLEWSKI; FK – F. KIRSCH; GP – G. POLENTZ; HN – H. NOWOTNY; ISEZ – Institute of Systematics and Evolution of Animals, PAS, Kraków; JM – J. K. MŁYNARSKI; LB – L. BOROWIEC; MB – M. L. BOROWIEC; MGB – Upper Silesian Museum, Bytom; MNHW – Museum of Natural History, Wrocław University, Wrocław; MR – M. RYBIŃSKI; RR – R. RUTA; SP – S. POPEK; SS – S. STOBIECKI; WM – W. MĄCZYŃSKI.

The genus *Claviger* PREYSSLER, 1790 is classified within supertribe Clavigeritae of the subfamily Pselaphinae, grouping obligatorily myrmecophilous species. The supertribe is divided into three tribes and 97 genera with 333 species and 23 subspecies (P. HLAVÁČ, pers. comm.). The genus *Claviger* contains 38 species and subspecies grouped in two subgenera and occurring in North Africa, almost whole of Europe and Turkey to Caucasus (P. HLAVÁČ, pers. comm.). *Claviger* (*Claviger*) *testaceus* is present in most of Europe, Turkey, and Iran; *C.* (*Clavifer*) *longicornis* inhabits almost whole Europe without its northernmost regions and Turkey (LÖBL & BESUCHET 2004). Members of the genus *Claviger* are closely associated with ants, living within their nests, feeding on food solicited from workers and possibly even relying on ants with respect to dispersion. They are characterized by numerous morphological and anatomical adaptations to myrmecophily, such as the reduction of the eyes and mouthparts or development of sophisticated glandular system (CAMMAERTS 1974). Colour photographs of both beetles can be found in the online atlas of the beetles of Poland (BOROWIEC 2009) and in LÖBL 2009.

Claviger testaceus PREYSSLER, 1790

Lasius flavus (F.) is the main host of *Claviger testaceus* with *L. niger* (L.) and *L. alienus* (FÖRSTER) as occasional hosts. Isolated specimens were sporadically reported from nests of *Myrmica* LATR. ants (DONISTHORPE 1927). DONISTHORPE (1927) describes experiments where he introduced the beetle into nests of other ant species or even genera, where it seemed to be accepted and did not induce any aggression. The beetle seems to be present in the nests throughout the year. The beetles are sometimes found clinging onto gynes and males of *L. flavus* which led to suggestions that this wingless and blind beetle may rely on dispersion by ant sexuals. CAMMAERTS (2001) observed that under laboratory conditions *C. testaceus* is able to survive confined with a young founding queen of *L. flavus*, which may argue for this mode of dispersion. At the same time, however, direct evi-

dence is lacking (CAMMAERTS 2001). *Claviger testaceus* is fed by hosts, obtaining liquid food that the ants regurgitate on its mouthparts, as well as stealing food during trophallaxis between hosts. It is also able to suck contents of ant eggs, feed on larval secretions and excreta as well as on insect cadavers present in the nests. From time to time isolated specimens of this beetle are found, but it may occur in great numbers, exceeding one hundred specimens per one ant colony.

Upon disturbance of ant colony, workers grab the beetle with their mandibles and carry it down the nest. In such a situation *Claviger* actively seeks ants, sometimes mounting them and riding on the workers' backs. It seems that ants carry beetles to safety more quickly than brood (OSTERLOFF 1889, CAMMAERTS 1999b, present study). CAMMAERTS (1999b) noted that the beetles are given transportation priority over ant larvae together with insect cadavers in the nest but could not give reasons for this preference.

CAMMAERTS (1995) observed different patterns of the regurgitation process in *Lasius flavus* workers, with apparently the same mode of regurgitation towards *Claviger* and insect cadavers being prepared for larval food. Thus, he put forward a hypothesis that *C. testaceus* is not integrated into the colony as a member of its society, but rather mimicks an insect corpse. It was corroborated by further comparative studies of various behavioral reactions of *L. flavus* ants towards *C. testaceus* and other items present in the nests (CAMMAERTS 1999a, 1999b, 2001) that the ants treat the beetles in a manner similar to a few hours old insect cadaver. Such status enables the beetle to gain access to regurgitated food, liquids from ant larvae and insect cadavers in the nest, but at the same time exposes it to biting and danger of dismemberment. The beetles seem to avoid it by drawing the aggressive reactions to their trichomes — tufts of flexible and very resistant hairs at the outlet of exocrine glands — as well as benefiting from hardened cuticle (CAMMAERTS 1999a).

The literature concerning the species was first reviewed by DONISTHORPE (1927). KRÜGER (1910) describes anatomy and histology of the beetle and a series of papers by CAMMAERTS (1973, 1974, 1991a, 1991b, 1992, 1995, 1996, 1999a, 1999b, 2001) is an exhaustive treatment of the species' glandular system and certain aspects of behavior, making it one of the best researched myrmecophilous beetles. The immatures of the beetle, however, remain unknown, suggesting possibility of development outside ant colony. It is worth noting that short observation of the biology of the beetle by OSTERLOFF (1889) was one of the first mentions in the literature, neglected by later authors.

Claviger longicornis MÜLLER, 1818

It seems that biology of *C. longicornis* is similar to that of *C. testaceus*, although the information on this species is much more limited. The main host is *Lasius umbratus* (NYLANDER) and the beetle is occasionally found with *L. mixtus* (NYLANDER) – both species being temporary social parasites of the subgenus *Chthonolasius* RUZSKY. Rarely, it has been reported from other species of the genus, such as *L. niger* and *L. brunneus* (LATR.). It has been collected with *Lasius fuliginosus* (LATR.) as well, but given that this species is frequently founding new colonies as a temporary social parasite of *L. umbratus*, these were

probably nests where previous host died off. *Lasius umbratus* is a subterranean species (ants leave nests for nuptial flights, from July to September), usually nesting much deeper in soil than *L. flavus*, which makes it much more rarely encountered. Undoubtedly this contributes to the rareness of this beetle in collections.

The literature concerning this species is much more scarce than for *C. testaceus* and almost entirely restricted to faunistic notes (P. HLAVÁČ, pers. comm.).

New observations in Poland

Claviger testaceus PREYSSLER, 1790

Kraków-Wieluń Upland (Wyżyna Krakowsko-Wieluńska): Kraków-Bielany DA14, 2 V 1985, 1 ex., leg. JM [ISEZ]; Kraków-Pychowice, DA14, 3 and 21 IV 1985, 2 exx., leg. DK [DK]; Kraków-Tyniec DA14, 16 IV 1988, 1 ex., leg. DK [DK]. In both Pychowice and Tyniec the beetles were collected in small, abandoned limestone quarries overgrown with xerothermous vegetation. The sites were warm and wind-protected. Beetles were found in *Lasius flavus* nests under stones. Despite the abundance of ant nests (found under every second stone), the beetles were rare. **Małopolska Upland (Wyżyna Małopolska):** Garb Pińczowski, 2 km N Pińczów, 50°32'N 20°31'E, DA69, 1 and 3 V 2008, over 120 exx., with *Lasius flavus* and *L. niger*, leg. LB and MB; Hill in Krzyżanowice, 50°27'N 20°33'E, DA69, with *L. flavus*, 2 V 2008, 2 exx., leg. LB and MB. Garb Pińczowski is a narrow range of calcareous hills in the region of Niecka Nidziańska. Host nests of *Lasius flavus* and *L. niger* were found under stones. Hill in Krzyżanowice is situated in the same region as the abovementioned site, in the subregion of Niecka Solecka. *Claviger testaceus* was collected here at the foot of the hill, by road between the reserve and cultivated fields. Nests of the host, in this instance *Lasius flavus*, were encountered by the road, in form of soil mounds overgrown by thyme (*Thymus* sp.). A comprehensive description of both localities, known for rare insects and xerothermous plants, can be found in LIANA (1976).

In the above localities the beetle was collected from several colonies of *Lasius flavus* situated under stones or in soil mounds. In one instance it was found in a nest of *L. niger*. In most colonies it was present in very large numbers, probably over a hundred specimens per nest, although no precise counts were carried out. The single colony of *L. niger* in which *Claviger* was found seemed to support smaller number of beetles than neighboring nests of *L. flavus*. Immediately after removing of stone and uncovering of subterranean galleries the ants started carrying the beetles into deeper reaches of the nests. One was under the impression that the ants gave priority to the beetles even before their own brood, as sometimes already all the beetles were carried down the galleries while a small amount of brood was still waiting for transportation. Some beetles were successful in mounting workers' backs. During excavation of soil-mound type nests of *L. flavus*, the most beetles were seen most numerous in the first portion of the soil dug out, with no beetles present after only several dozen seconds after the disturbance. This reflects the speed and effectiveness of ant re-

sponse to disturbance, as the beetles are very slow on their own. New for Małopolska Upland. **Lower Silesia (Dolny Śląsk):** 1 km SE Biała, "Białe Krowy" quarry, 50°52'N 16°40'E, XS13, 210 m, 12 VI 2010 and 27 VI 2010, with *Lasius flavus*, ca 70 exx., leg. LB, MLB, RR. Specimens were collected on two trips to a long-abandoned quartzite quarry dubbed "Białe Krowy" near Biała village in Lower Silesia at the base of East slope of the Ślęża massif. The old excavation sites are overgrown with mixed deciduous woodland, composed of many tree species: *Corylus avellana*, *Carpinus betulus*, *Fraxinus excelsior*, *Fagus sylvatica*, *Betula* and *Quercus*, bordering with abandoned cherry orchard to the North. The beetles were extremely abundant, occurring in vast majority of *L. flavus* colonies (all in soil under rocks) searched in the shaded excavation site but apparently absent from few sun-exposed mounds of *L. flavus* searched in the nearby orchard. Behaviour of the ants and beetles was similar to that noted for the above localities.

Claviger longicornis MÜLLER, 1818

Pomeranian Lake District (Pojezierze Pomorskie): Piła, ruins of brewery near Kuźnik res., 53°11'N 16°44'E, XU19, with *Lasius umbratus*, 6 VIII 2003, 1 ex., ca. 20 VIII 2003, 1 ex., leg. RR. Ruins of the "Hammer" brewery are remnants of buildings from the second half of 19th century, demolished during World War II. The values of this object for conservation of interesting coleopterous fauna were discussed by RUTA and MELKE (2002) and WOJTASZYN and RUTA (2010). In August 2003, on hot sunny day, *Lasius umbratus* ants were observed moving on tramped, clayish and sandy floor, along one of the brick walls of the basement. Among them, one single individual of *C. longicornis* was found moving among ants. Another collection was made under identical circumstances two weeks later. **Małopolska Upland (Wyżyna Małopolska):** Garb Pińczowski, 2 km N Pińczów, DA69, 1 V 2008, 1 ex., leg. LB and MB. A single specimen of this beetle was collected along and mixed with more than a hundred specimens of *C. testaceus* that come from many *Lasius flavus* and a single *L. niger* nests. In the ant material there is a single sample of *Lasius umbratus*, unfortunately with no *Claviger* associated. We are unable to determine when and in which colony this species was found but it is probable it was present in the *L. umbratus* nest. For description of the locality see above. The species is for the first time reported from Pomeranian Lake District (Pojezierze Pomorskie) and Małopolska Upland (Wyżyna Małopolska).

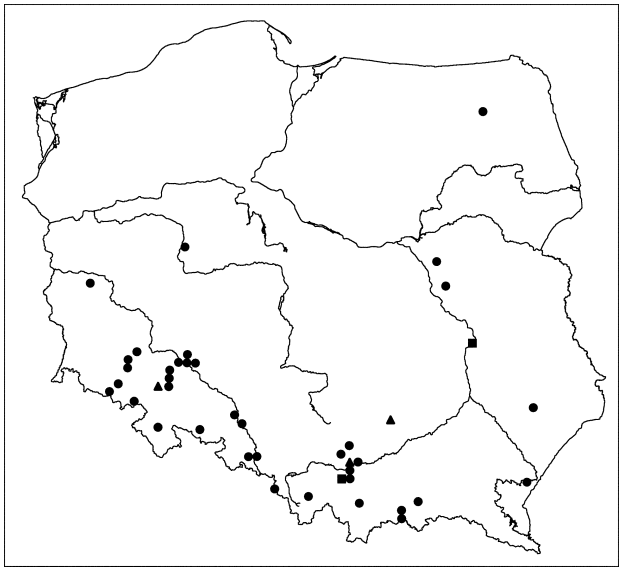

Fig. 1. Localities of Claviger testaceus in Poland (circles – until 1950; squares – 1951-1974, triangles – after 1975).

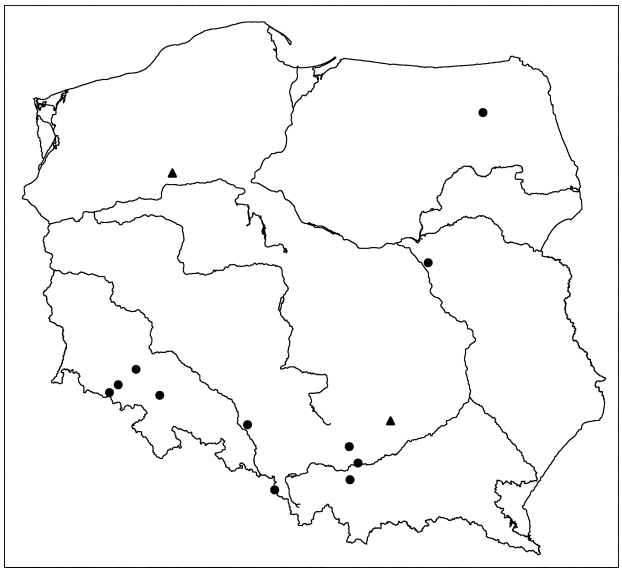

Fig. 2. Localities of Claviger longicornis in Poland (circles – until 1950; triangles – after 1975).

Unpublished historical data

Claviger testaceus PREYSSLER, 1790

Mazowiecka Lowland (Nizina Mazowiecka): Kamionek EC28, 1 ex., leg. WM [MGB]; Natolin EC35, 4 V 1900, 3 exx., leg. WM [MGB]. **Kraków-Wieluń Upland (Wyżyna Krakowsko-Wieluńska):** Czatkowice DA05 ad Krzeszowice, 11 VII 1902, 11 exx., leg. SS [ISEZ]; Czerna DA05 ad Krzeszowice, 30 VIII 1902, 4 exx., leg. SS [ISEZ]; Ojców DA16, ok. 1880, 3 exx., leg. EW [ISEZ]; Kraków-Zakrzówek DA24, 18 and 21 IV 1937, 29 IV and 13 V 1938, 7 IV 1939, 64 exx., leg. SP [ISEZ]; Kraków-Pychowice DA14, 3 and 21 IV 1985, 2 exx., leg. DK [DK]. **Lower Silesia (Dolny Śląsk)**: Gogolin BA89, 3 V 1923, 1 ex., leg. HN [MGB], 7 IV 1926, 8 exx., leg. FK [MGB], 6 V 1932, 2 exx., leg. HN [MGB], 15 IV 1938, 1 ex., leg. HN [MGB]; Jawor WS85, VI 1912, 2 exx., leg. GP [MNHW]. **Eastern Sudety Mts. (Sudety Wschodnie):** Kamienna Góra XR68, 4 VI 1939, 1 ex., leg. NH [MGB]. **Western Beskidy Mts. (Beskidy Zachodnie):** ad Cieszyn CA21, 1868, 75 exx., leg. BK [ISEZ]; Głogoczów DA12 ad Myślenice, 26 V 1897 and 19 IV 1898, 56 exx., leg. SS [ISEZ]; Rabka DV29, ok. 1900, 4 exx., leg. MR [ISEZ]; Piwniczna DV77, 13 V 1899 and 1 VIII 1900, 31 exx., leg. SS [ISEZ]; Rytro DV78, Roztoka Mała, 5 VI 1892, 2 exx., with *Formica fusca* L., leg. SS [ISEZ]; Ptaszkowa DV99 ad Grybów, 5, 17 and 28 VI 1892, 72 exx., with *Lasius flavus*, leg. SS [ISEZ]. **Eastern Beskidy Mts. (Beskidy Wschodnie):** Przemyśl: Winna Góra FA21, 8 V 1880, 7 exx., leg. BK [ISEZ]. New for Mazowiecka Lowland (Nizina Mazowiecka).

Claviger longicornis MÜLLER, 1818

Mazowiecka Lowland (Nizina Mazowiecka): Wawer EC18, 12 IV 1905, 1 ex., leg. WM [MGB]. **Kraków-Wieluń Upland (Wyżyna Krakowsko-Wieluńska):** Kraków-Zakrzówek DA24, above Grota Twardowskiego Cave, 6 IX 1925, 1 ex., leg. SS [ISEZ]. **Western Beskidy Mts. (Beskidy Zachonie):** Jastrzębia DA12 ad Sułkowice, 21 IV 1897, 3 exx., with *Lasius mixtus*, leg. SS [ISEZ]; Lanckorona DA02, VIII 1972, 1 ex., leg. JM [DK]. New for Mazowiecka Lowland (Nizina Mazowiecka)

DISCUSSION

Both *Claviger* species are considered rarities in Poland and *C. longicornis* is classified under VU (=vulnerable) in the Red List of Polish Animals (PAWŁOWSKI et al. 2002). Most of the data concerning their occurrence is historical, dating more than 100 years. Literature data (BURAKOWSKI et al. 1978) suggests that both species are more common in southern part of the country (Figs 1, 2) and prefer xerothermous sites. On the other hand, the locality of *C. longicornis* near Piła is situated in the old cellar surrounded by shrubs and forest which is relatively cool even during the summer. The observations from the vicinity of

Pińczów as well as historical data from the vicinities of Kraków and Cieszyn are the first published reports of mass occurrence of *C. testaceus*, although similar observations were published for other countries (e.g. PEARCE 1973).

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