

## **LYCTUS (COLEOPTERA: BOSTRYCHIDAE): A NEVER ENDING STORY**

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**Abstract** Alien true powder post beetle (Lyctinae) species started to be a concern with the growing worldwide trade after the Second World War. *Lyctus brunneus* arrived in Central Europe 70 years ago and replaced the native species *Lyctus linearis* as lyctine beetle of economic importance. But this situation changed at the end of last century. The author received numerous *Lyctus cavicollis* samples from different places of Germany between 2010 and 2017. Until 20 years ago this species was rare in Central Europe. However, in the meantime it established indoors and outdoors and reached a similar economic importance as *Lyctus brunneus*. Infestation by lyctine beetles was a typical indoor problem in the past and the source of introduction were infested woods. Nowadays outdoor populations of *Lyctus cavicollis* (and in the south west of Central Europe also *Lyctus brunneus*!) may invade homes (for example with firewood).

**Key words** *Lyctus brunneus*, *Lyctus cavicollis*, *Minthea rugicollis* true powder post beetles

### **INTRODUCTION**

True powder post beetles of the subfamily Lyctinae (Family Bostrychidae) develop in the sapwood of seasoned timbers with high content of starch and are serious pests in furniture industry, in wooden doors, door frames and hardwood floors (Gay, 1953; Gerberg, 1957; Cymorek, 1969b). The economic importance of *Lyctus brunneus* (Stephens, 1830) in Central Europe started with the beginning of the 20<sup>th</sup> century. Until 1891 *L. brunneus* was very rare in Europe in contrast to the common *Lyctus linearis* (Fabricius, 1792). Up to 1923 this ratio reversed in UK (Hickin, 1960). On the European continent regular imports and fast propagation started after the Second World War with the increase of wood imports and world trade and *L. brunneus* replaced the native species *Lyctus linearis* as lyctine beetle of economic importance (Cymorek, 1969b, 1979). Until the end of the 20<sup>th</sup> century true powder post beetles which were sent for identification mainly belonged to *L. brunneus*. We had only one case with *L. linearis* from an outdoor wood storage place, an infestation with *Lyctus africanus* (Lesne, 1907) in souvenirs from the Ivory Coast, and one specimen of the genus *Trogoxylon*. But this situation changed dramatically during the past years. Lyctine beetles are now sent frequently for identification and the most prominent species are *L. brunneus* and *Lyctus cavicollis* (J.L. LeConte, 1805). A survey of these two species on their occurrence in Central Europe and habits until the year 2002 is given by Geiss (2002).

### **MATERIAL AND METHODS**

Most samples came from pest management professionals, museums, scientific institutes and zoological gardens. Infestations were examined in detail and expertises were written in four cases. The specimens

were included in the reference collection to save them for further studies. Wood samples with larvae were cultured at 25° C / 75% relative humidity. Identification was done according to Cymorek (1969a) and Gerberg (1957).

## RESULTS AND DISCUSSION

Twenty three samples of true powder post beetles belonging to the genera *Lyctus*, and *Minthea* were submitted for identification since 2010 from different places in Germany, 13 cases with *L. brunneus*, 8 cases with *L. cavicollis*, 1 case with *L. africanus* and 1 case with *Minthea rugicollis* (Walker, 1858), respectively. Most samples of *L. brunneus* were collected from parquet flooring and some from museums and galleries.

A strong infestation of *L. brunneus* was found 2012 in at least 12 years old doorframes. Reason for this infestation were small North Indian Rosewood tables (*Dalbergia sissoo* Roxb.) from India, which after production were shipped directly to Germany and delivered to the customer, who found wood dust 5 months and exit holes 8 month later in several door frames and doors close to these new tables. Development of the larvae took place in a tropical hardwood inside the door frames. Doors and door frames were removed in autumn 2011 and stored in an unheated garage. The inspection of the infested furniture (door frames, doors and Indian tables) was carried out in February 2012 after a cold period of at least four weeks with temperatures between -10° C and -20° C during the nights. No exit holes were present on the surface of the tables, but beetles, exit holes and living larvae were found in the sapwood in hollow spaces inside the tables. Some areas of the doorframes were heavily infested and gnawing marks of the adult females were found on the surface. More than 100 adults hatched from the doorframes three months later in Mai and another generation followed 5 to 6 months later in October/November.

The common literature specifies that the development stages of *L. brunneus* can tolerate at least -7° C over night except for the eggs and the first larval stage (Cymorek, 1966). However, their high reproduction rate in 2012 after storage under temperatures below -10°C implicates a cold resistance to lower temperatures and longer periods than known from literature. Since the nutrient content in the wood decreases with the age, the risk of infestation by the lyctine beetles declines and more than 10 years old wood is less infested (Cymorek, 1979). The strong infestation of the door frames, the relatively short development time of the larvae and the body length of the beetles (4.5 - 6 mm) indicate that the wood is still susceptible to *L. brunneus* after a period of at least 12 years.

An unusual infestation with *L. brunneus* in railway sleepers during construction of a new underground railway line was inspected in October 2015. The responsables had already removed 75 heavily infested railway sleepers. Many exit holes were found at the edges of the woods and below the thin surface layer the whole sapwood part was found to be totally destroyed by *Lyctus* over the entire length of the railway sleepers. The leftover few larvae and beetles of *L. brunneus* were used for identification.

According to the Federal Railways standards only beech and oak can be used as wooden railway sleepers in Germany (DBS 918 144, 2007). The standard allows the presence of a low sapwood portion. However, some inspected railway sleepers consisted of up to 20% sapwood.

Outside of the tunnel and on the first 100 meters inside the tunnel, the sleepers were treated with carbolineum against infestation by fungi and wood-destroying insects. Within the tunnel, no treatment with carbolineum was carried out in order to avoid an odor emission in the subway stations. The whole railway line was therefore thoroughly inspected and active infestation was noticed in some sleepers. Another 400 infested railway sleepers were replaced to avoid any risk for the rail traffic and the remaining woods were treated with a water based and odorless preservative.

The infestation with *L. brunneus* began during the manufacture in summer 2013 and the storage of the railway sleepers in the sawmill and later on at an outdoor storage place of the train. The likelihood of a future active infestation of *L. brunneus* in the tunnel was discussed. The temperature on the surface of the railway sleepers was about 14° C in December and January and 18° C during summer time. A

development of *L. brunneus* is possible in less than 12 months under these temperature conditions depending on the nutrient content of the wood (Kuehne, 1981). According to Gay (1953) even a continuous temperature of 15° C is still sufficient for the development of *L. brunneus* with an extension of the development time to one year or even more. Vibrations and strong air flows by the rail traffic may also have a negative impact on the larval development and distribution of the adults in the underground tunnel.

An eight years old infestation of railway sleepers by *L. brunneus* was observed several months later in another town in North Rhine Westfalia. Both examples indicate that oak railway sleepers should have less than 10% sapwood and must be thoroughly examined for Lyctus infestation before their use in the railway line. These results indicate that the possibility of an infestation by *L. brunneus* in oak infrastructure of railway sleepers should be considered when planning new underground railway lines.

Eight infestations with *L. cavicollis* were discovered since 2013 in several Federal States of Germany. Beetles were twice isolated outdoors from dry Grape vine stems together with *Bostrychus capucinus* (Linnaeus, 1758) (Bostrychinae) and *Tarsostenus univittatus* (Rossi, 1792) (Cleridae). Another outdoor infestation was found in an outdoor children's playground in a zoological garden in North Rhine Westfalia (Gloyna, pers. com.). Indoor infestations of *L. cavicollis* derived from parquet flooring, door frames, a mahogany door and furniture. Only one sample of *L. africanus* arrived from a museum in Bavaria. *M. rugicollis* was discovered together with *Heterobostrychus brunneus* (Murray, 1867) (Bostrychinae) between picture frames which were sent from the Ivory Coast to a museum of modern art in Hessen. The exit holes of this species are only 0.8 mm in diameter and can easily be missed.

## CONCLUSION

The examples demonstrate well that true powder post beetles are a concern for the pest management professionals and for insurance companies as well. Since the year 2000 *L. brunneus* is gradually being replaced by *L. cavicollis*. Other species of the subfamily Lyctinae are rarely found. In the past *L. brunneus* was a typical indoor pest in Central Europe which was brought into new buildings with infested wooden materials or furniture. Now first outdoor populations were detected in the southwest of Central Europe (Geiss, 2015). *L. cavicollis* is found indoors and outdoors and may enter buildings with infested fire wood from the forest. Outdoor populations were found in the south west of Germany, but also in Rhineland-Palatinate and North Rhine Westphalia. The intensified use of untreated wood which is susceptible to *Lyctus* also favours infestations by these species even in places where they were not recognized before (e.g. in underground railway lines or in outdoor children's playground). We already know a lot about *L. brunneus* (Cymorek, 1966, 1969b, 1979; Hickin, 1960; Kühne, 1980, 1981; Pospischil 2012), but information on the requirements of *L. cavicollis* is quite rare despite Geiss (2002, 2015). We need more efforts to understand the requirements of *L. cavicollis* as a drywood pest.

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