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First record of two ambrosia beetle, *Platypus quercivorus* (Murayama) and *Platypus koryoensis* (Murayama) (Coleoptera: Curculionidae, Platypodinae) in Mainland China

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Platypus quercivorus (Murayama) and *P. koryoensis* (Murayama) are destructive tree pests that have killed thousands of oak trees in Japan and South Korea (Kinuura & Kobayashi 2006; Kim *et al.* 2009). These species are considered regulated pests in China because of their potential to cause serious damage (General Administration of Quality Supervision, Inspection, and Quarantine of the People's Republic of China 2017). We here report these two ambrosia beetles in Mainland China for the first time. Numerous representative specimens of both species were collected between 2012–2022 in several provinces of Mainland China from Fagaceae trees by hand or in traps. Currently, the species is distributed in natural forests and does not appear to attack healthy trees. Further survey is needed to confirm their economic importance.

Platypus quercivorus is the vector of *Dryadomyces quercivora* (formerly *Raffaelea quercivora*) which causes Japanese oak wilt (JOW) (Kubono & Ito 2002; De Beer *et al.* 2022), one of the most serious forest diseases in Japan causing mass mortality of oak trees (Kinuura & Kobayashi 2006). This species has a strong preference for Fagaceae hosts (*Quercus* and *Pasania*), and is considered an economically important pest in Japan (Kinuura & Kobayashi 2006). It is distributed throughout Asia and reported from including India, Indonesia, Japan, Laos, Thailand, Vietnam (Beaver 2016).

Platypus koryoensis is the vector of *Dryadomyces quercus-mongolicae* (formerly *Raffaelea quercus-mongolicae*) which causes Korean oak wilt (KOW) (Kim *et al.* 2009; De Beer *et al.* 2022). The disease occurs mainly on *Quercus mongolica* and has mass killed mass oak species in Korea (Choi *et al.* 2022). Its geographical distribution includes Korea and the Russian Far East (Beaver & Shih 2003; Hong *et al.* 2006). Kim *et al.* (2018) recorded the species' occurrence in northeast China by citing a 2013 publication from the Korea Forest Research Institute, no other record was found. *Platypus koryoensis* was not found with surveys in northern China (Liaoning and Jilin provinces) (EPPO RS 2009). We consider the Kim *et al.* (2018) record as dubious.

Wood & Bright (1992) recorded *P. quercivorus* and *P. koryoensis* from Taiwan island, but not from Mainland China. In past few years, we undertook an extensive survey of ambrosia beetles in China. The collect methods followed reference literatures (Hulcr *et al.* 2022; Luo *et al.* 2022). The flight interception traps and sticky traps were unbaited. During this survey, we collected suspected specimens of *P. quercivorus* and *P. koryoensis* from multiple sites (Figure 1). The senior author identified specimens by comparing the morphological characters with available references (Nobuchi 1973; Hong *et al.* 2006; Moon *et al.* 2008) and identifications were confirmed by Roger Beaver (Chiang Mai, Thailand). One representative specimen of each species has been selected from Yunnan and Jiangxi respectively for molecular diagnosis (*P. quercivorus*-III, *P. koryoensis*-III in Table 1). Portions of the cytochrome oxidase subunit I (COI) and the nuclear

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ribosomal 28S regions (28S) were amplified using the primers and protocols of Jordal *et al.* (2011). The nucleotide sequences were identified by the National Center for Biotechnology Information's Basic Local Alignment Search Tool (BLAST). 28S and COI of suspected *P. quercivorus* were 99% and 85% similar to the *P. quercivorus* (AB478183) and *P. quercivorus* (LC375259) from Japan respectively. 28S and COI of suspected *P. koryoensis* were 99% and 93% similar to the *P. koryoensis* (MW000930) and *P. koryoensis* (MW000662) from South Korea respectively. Although COI similarity of two beetles were not very high (<95%), 28S similarity were very high (99%), similar patterns of COI difference have been observed among disjunct populations of other weevil species (Cognato 2006; Jordal & Kambestad 2013; Lai *et al.* 2019).

TABLE 1. Samples of *P. koryoensis* and *Platypus quercivorus* were collected in this study.

Ambrosia beetle	Collected information
Platypus koryoensis	**I.** Fujian Province, Wuyishan city, Wuyishan national nature reserve of Fujian, Guadun Village, 27.7366°N, 117.6393°E, 1220m, 2017.VII.21, log dissection, host unknown, Shengchang Lai, Lifang Xiao, Shang Tian & Peishan He leg (3 males, 3 females JXAU; 1 male, 1 female RAB); as before except: 2018.VII.10, log dissection, *Castanopsis fargesii* Franch., Shengchang Lai, Kaiping Hu, Jia Lv & Ling Zhang leg (3 males JXAU).
	II. Shaanxi Province, Hanzhong city, Foping national nature reserve of Shaanxi, Sanguanmiao, 33.6696°N, 107.8132°E, 1686m, 2020.VI.25, flight interception trap, Jianlong Chen leg (1 male JXAU).
	III. *Jiangxi Province, Ganzhou City, Longnan County, Jiulianshan national nature reserve of Jiangxi, Xiagongtang, 24.5384°N, 114.4658°E, 2020.VII.3, log dissection, host *Castanopsis* sp., Shengchang Lai, Yufeng Cao & Ling Zhang leg (4 males, 3 females JXAU). GenBank accessions: COI (LC719119, LC719120); 28S (LC719123).
Platypus quercivorus	**I.** Yunnan Province, Puer City, 22.70°N 101.18°E, 1366m, 2012.V.10-VI.7, sticky trap on tree trunk, T. Petrice & R. Haack leg. (2 males UFFE). **II.** Yunnan Province, Puer City, Jingdong County, Ailaoshan national nature reserve, 24.5318°N, 101.0145°E, 2496m, 2018.V.18-30, flight interception traps, Lingzeng Meng leg (1 female, 5 males HHU).
	III. *Yunnan Province, Xishuangbanna Dai Autonomous Prefecture, Jinghong City, Xishuangbanna national nature reserve, Guanping, 22.2400°N, 100.8903°E, 2020.VII.24-26, log dissection, host Fagaceae, Song Liao & Ye Xu leg (17 males, 6 females JXAU). GenBank accessions: COI (LC719121, LC719122); 28S (LC719124).
	IV. Guangdong Province, Guangzhou City, Baiyunshan, 23.1886°N, 113.3150°E, 2021.VI.26-29, flight interception traps, Yali Yu leg (1 male JXAU).
	V. Guangdong Province, Zhaoqing City, Dinghushan national nature reserve, 23.1579°N 112.5481°E, 2021.XI.18-22, flight interception traps, Yali Yu leg (1 female JXAU).
	VI. Yunnan Province, Xishuangbanna Dai Autonomous Prefecture, Jinghong City, Nabanhe national nature reserve, Guomenshan, 22.2335°N, 100.6215°E, 1000m, 2022.VI.19, log dissection, host *Castanopsis chinensis* (Sprengel) Hance, Yufeng Cao & Guangyu Yu leg (7 males, 3 females JXAU); as before except: 22.1111°N, 100.5841°E,1200m, 2022.VII.21, log dissection, host Fagaceae, Yufeng Cao & Guangyu Yu leg (2 males, 3 females JXAU).

Abbreviations
UFFE: University of Florida Forest Entomology Collection, Gainesville, Florida, USA,
HHU: College of Biological and Agricultural Sciences, Honghe University, China.
JXAU: College of Agricultural Sciences, Jiangxi Agricultural University, Nanchang, China.
RAB: Private collection, Roger Beaver, Chiangmai, Thailand.
*representing specimen of each species selected respectively for molecular diagnosis.

All collection data of this survey are listed in Table 1. *Platypus koryoensis* was collected at three locations of natural forest in northern and southern China, including Fujian, Jiangxi and Shaanxi provinces. *Platypus quercivorus* was collected at six locations of natural forest only in southern China, including Guangdong and Yunnan provinces (see also Figure

1). Their hosts were mostly Fagaceae trees, which were already dying from other causes. Although these species were not found in healthy hosts in our survey, they need to be considered as potential pests capable of attacking healthy oaks. Results showed that these two beetles were considered native species and may widely distributed in Mainland China. We recorded these two beetles in Mainland China for the first time. Further survey is needed to confirm their potential risk.

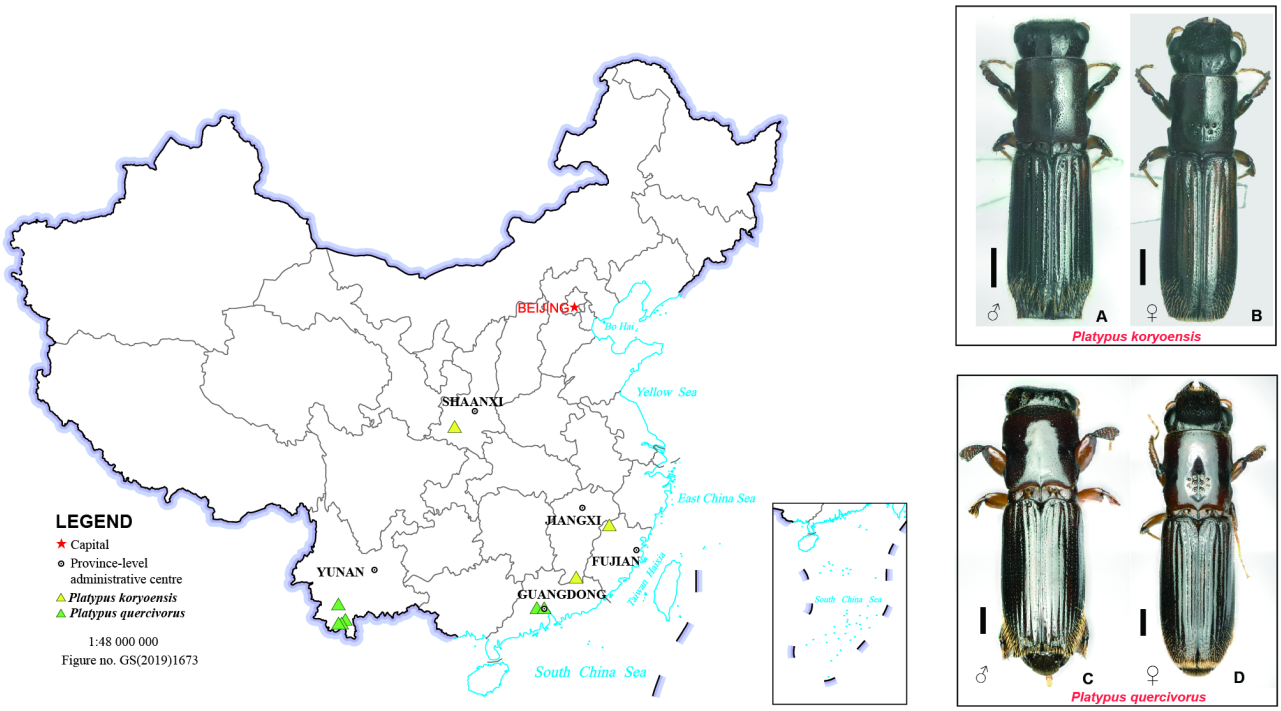

FIGURE 1. Locations of two ambrosia beetle were collected in this study. Locations where *P. koryoensis* was recorded are marked yellow, *P. quercivorus* was recorded are marked green. (A) *P. koryoensis* male, (B) *P. koryoensis* female, (C) *P. quercivorus* male, (D) *P. quercivorus* female. Scale bars: 0.5 mm.

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