

The Carabini from different altitudes of Changbai mountain, Jilin Province, North-Eastern China (Coleoptera Carabidae Carabinae)

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ABSTRACT

In the present paper the Carabini fauna of different altitudes and habitats of Changbai Shan Mountains, Jilin Province, North-eastern China was investigated. After examination of the collected specimens we describe one new *Carabus* taxon: *Carabus (Carabus) szeli changbaicus* Rapuzzi et Li n. ssp.; *C. (Aulonocarabus) rufinus* Beheim et Breuning, 1943 was elevated to the specific status. Six *Carabus* taxa were recorded for the first time for the Chinese fauna: *C. (Carabus) manifestus pyonganicola* Deuve et Li, 1998; *C. (Morphocarabus) venustus* cf. *kaesongensis* Imura, 1993; *C. (Diocarabus) caustomarginatus* Imura et Mizusawa, 1994; *C. (Scambocarabus) kruberi* cf. *chaos* Imura, 1993; *C. (Acoptolabrus) schrencki minpongsanensis* Deuve et Li, 2003 and *C. (Fulgenticarabus) flutschii coreus* Deuve, 2006. *C. (Acoptolabrus) constricticollis jilinicus* Deuve, 1992 was treated as a valid subspecies.

KEY WORDS

Carabus; North-Eastern China; new subspecies; faunistic; taxonomy.

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INTRODUCTION

Changbai Mountain Chain is located in Antu county, Jilin province, North-Eastern China. The Mountains are on the border between China and North Korea (41° 35' - 42° 25' NL; 127° 40' - 128° 16' EL); the highest peak (White Rock Pk.) is 2749 m and it is the highest of North-Eastern China. It is composed by trachyte, white rock exposed in the summer; in winter the mountain is covered with pure white snow formed by the repeatedly volcanic eruptions. It is the head stream of Tumen river, Yalu river and Song-hua river. This mountain is heavily

forested, there are mainly *Pinus koraiensis* Siebold et Zucc., yezo spruce, *Abies holophylla* Maxim., hornbeam and maple at elevations between 500-1200 m; at 1200-1800 m above sea level there are spruce and fir forests; at the elevation of 1800 m mainly there is Ermans Birch forest, which is one of the China's most important forest areas. Sika deer, marten, Amur Tigers and other rare animals live in this forest. Till 1960 it is a nature reserve with an area of 215,000 hectares. Changbai Shan mountain is located in a temperate continental mountain climate zone, it is characterized by a long and cold winter, short and cool summer and the weather is rainy and

windy in spring, foggy in autumn. The annual average of temperature is between -7°C and $+3^{\circ}\text{C}$. The aim of the research was to study the Carabini fauna from Changbai Mountain at different altitudes and different habitats. We used sets of pitfall traps (50 plastic cups for each location) between June 13th-15th 2012. To attract and collect Carabini we used a mixture of granulated sugar, rice vinegar, white wine and water.

Four different altitudes and habitats were investigated: 1) Q1. Er-dao-bai-he, elevation 800 m. Theropencedrymion; 2) Q2. Huang-song-pu-lin-chang, elevation 1300 m. Coniferous forest; 3) Q3. Bai-shan-shang-fang, elevation 1850 m. Ermans Birch forest zone; 4) Q4. Nearby Tianchi weather station, elevation 2100 m. Tundra belt.

The examination of the collected Carabini specimens permitted us to have great results: 1) one new *Carabus* taxon is described and figured: *C. (Carabus) szeli changbaicus* Rapuzzi et Li n. spp. 2) the cohabitation of two different subspecies of *C. (Aulonocarabus) canaliculatus* Adams, 1812: *C. (A.) canaliculatus rufinus* Beheim et Breuning, 1943 and *C. (A.) canaliculatus vojnitzi* Mandl, 1979 permitted us to elevate as valid species *C. (A.) rufinus*. 3) six *Carabus* taxa were recorded for the first time for the Chinese fauna: *C. (Scambocarabus) kruberi* cf. *chaos* Imura, 1993; *C. (Tomocarabus) caustomarginatus* Imura et Mizusawa, 1994; *C. (Carabus) manifestus pyonganicola* Deuve et Li, 1998; *C. (Morphocarabus) venustus* cf. *kaesongensis* Imura, 1993; *C. (Acoptolabrus) schrencki minpongsanensis* Deuve et Li, 2003 and *C. (Fulgenticarabus) fluttschi koreus* Deuve, 2006. 4) *C. (Acoptolabrus) constricticollis jilinicus* Deuve, 1992 was treated as a valid subspecies in the present paper: *C. (Acoptolabrus) constricticollis jilinicus* Deuve, 1992 stat. rest.

The adopted systematic order for the listed species of genus *Carabus* is in accord to Deuve (2012).

RESULTS

Mt. Changbai Shan, Antu county, Jilin province, China. 13/15.VI.2012. Q1: Er-dao-bai-he, elevation 800 m. Theropencedrymion

- *Carabus (Aulonocarabus) rufinus* Beheim et Breuning, 1943 Status novo (Fig. 1). *C. rufinus* is

widespread in Liaoning Province, a single locality was recorded from Jilin (Dongfeng, Xiaogyuedingzi) nearby the border with Liaoning (Deuve et al., 2011). The new locality on Changbai Mountain is of great interest. On the same mountain but at higher altitude (see Q3, 1850 m) we observed the cohabitation with *C. (Aulonocarabus) canaliculatus vojnitzi* Mandl, 1979 (Figs. 4, 7, 8). In that case the two taxa must belong to two different species and *C. (A.) rufinus* must be treated as a different species: *Carabus (Aulonocarabus) rufinus* Beheim et Breuning, 1943 stat. nov. The aedeagus of *C. rufinus* is very characteristic (Figs. 2, 3), the median lobe is expanded and angled in the ventral side, the apex is enlarged, spatula like. The aedeagus of *C. canaliculatus vojnitzi* is smaller in general, without the expansion of the median lobe and with the apex shorter and simple (Figs. 5, 6, 9, 10); the aedeagus is in general similar to the edeagus of *C. (Aulonocarabus) canaliculatus* Adams, 1812. *C. rufinus* is a polymorphic species with several subspecies widespread in North-Eastern China: Liaoning Province, Jilin Province (marginal) and North-Western Korea. The subspecies are: *Carabus (Aulonocarabus) rufinus* Beheim & Breuning, 1943 *C. (A.) rufinus pappianus* Mandl, 1980 comb. nov. *C. (A.) rufinus beizhenensis* Deuve et Li, 2000 comb. nov.

- *C. (Leptocarabus) seishinensis elongatipennis* Imura et Yamaya, 1994 (Fig. 11), a common species in Korea Peninsula, is very local in North-Eastern China known from only very few localities nearby the border with North Korea (Deuve & Li, 2000a; Deuve et al., 2011).

- *C. (Scambocarabus) kruberi* cf. *chaos* Imura, 1993 (Fig. 12) By the shape of male aedeagus and the sculpture of elytra the collected specimens are close to the subspecies *chaos* Imura, 1993 from North Korea. New subspecies for Chinese fauna.

- *C. (Tomocarabus) fraterculus gaixianensis* Deuve et Li, 1998 (Fig. 13) By the cordate shape of the pronotum and slightly blue elytra collected specimens belong to *gaixianensis* Deuve et Li, 1998.

- *C. (Carabus) granulatus telluris* Bates, 1883 (Fig. 16) The species is very constant in North-Eastern China.

- *C. (Carabus) manifestus pyonganicola* Deuve et Li, 1998 (Fig. 18) The species is very common and widespread through Shanxi Province in the North China to North Korea with some valid subspecies. The specimens from Changbai Shan cor-



Fig. 1. *C. (A.) rufinus*, locality Q1, 28.5 mm. Fig. 2. Idem, aedeagus frontal view. Fig. 3. Idem, aedeagus lateral view. Fig. 4. *C. (A.) canaliculatus vojnitzi*, locality Q3, 29 mm. Fig. 5. Idem, aedeagus frontal view. Fig. 6. Idem, aedeagus lateral view. Fig. 7. Idem, holotype, 25 mm, with label. Fig. 8. Idem, holotype, details of head and pronotum. Fig. 9. Idem, holotype, aedeagus frontal view. Fig. 10. Idem, holotype, male aedeagus lateral view. Fig. 11. *C. (L.) seishinensis elongatipennis*, locality Q1, 25.2 mm.

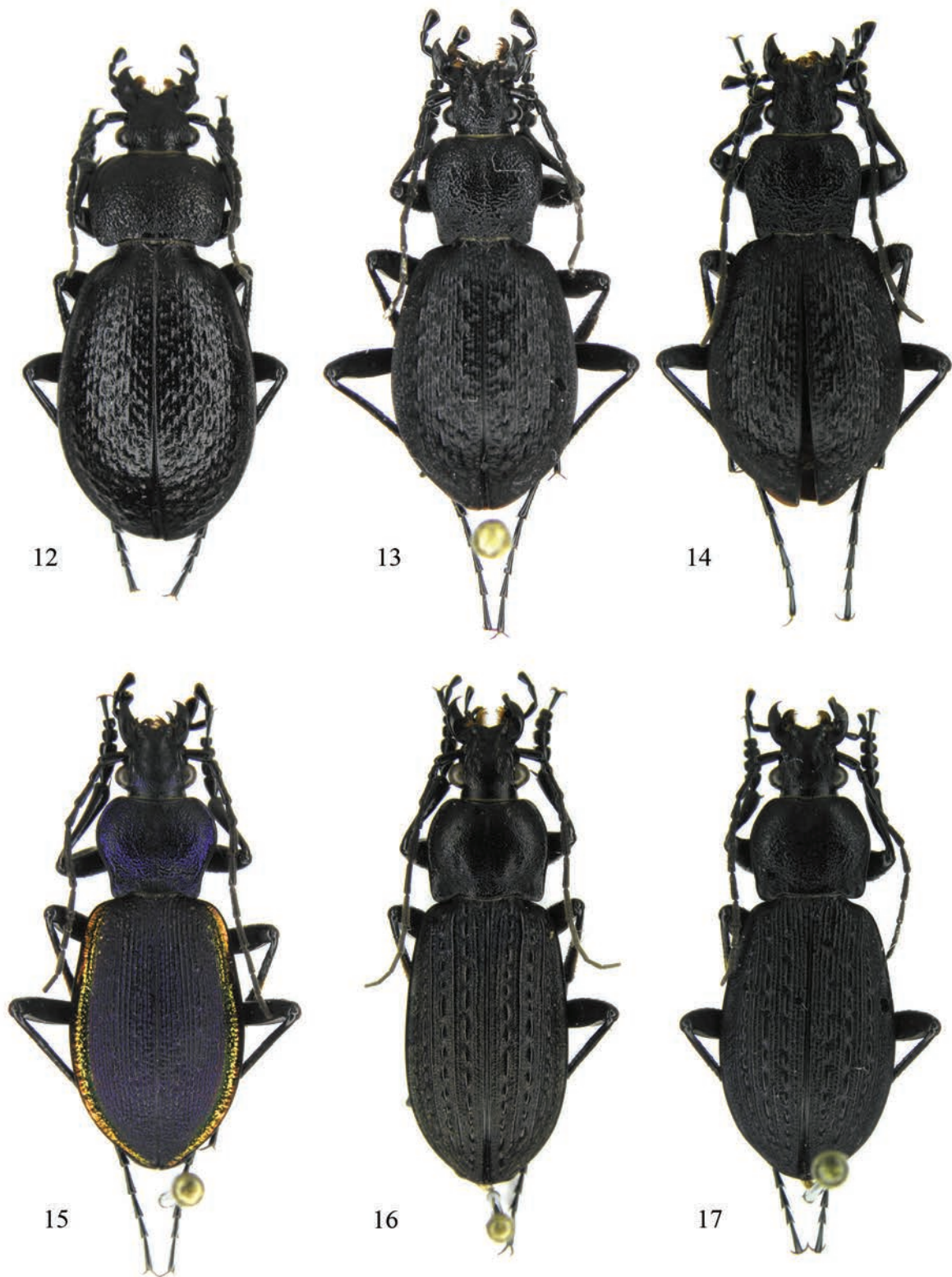


Fig. 12. *C. (S.) kruberi* cf. *chaos*, locality Q1, 23.3 mm. Fig. 13. *C. (T.) fraterculus gaixianensis*, locality Q1, 21mm. Fig. 14. *C. (T.) fraterculus neochinensis*, locality Q3, 16.8 mm. Fig. 15. *C. (D.) caustomarginatus*, locality Q2, 20 mm. Fig. 16. *C. (C.) granulatus telluris*, locality Q1, 22.9 mm. Fig. 17. *C. (C.) arvensis faldermanni*, locality Q3, 19.1 mm.

respond with the ssp. *pyonganicola* Deuve et Li, 1998 diffused not far in North Korea. New subspecies for Chinese fauna.

- *C. (Morphocarabus) hummeli pusongensis* Imura, 1993 (Fig. 22) Very variable species with a number of subspecies described through North-Eastern Europe (Polar Ural), Siberia to the Pacific Ocean (including Sakhalin and some small Islands of Peter the Great Gulf). The very polychromus specimens with green-violet pronotum and green elytra margined with violet belong to the ssp. *pusongensis* Imura, 1993.

- *C. (Morphocarabus) wulffi dekraatzi* Kraatz, 1881 (Fig. 23) The species is widely distributed and common in North-Eastern China.

- *C. (Megodontus) vietinghoffi caesareus* Semenov, 1906 (Fig. 25) The subspecies is widely distributed in North-Eastern China (Deuve & Li, 2000 b).

- *C. (Acoptolabrus) schrencki schrencki* Motschulsky, 1860 (Fig. 26) The collected specimens belong to the typical form widespread in North-Eastern China and adjacent area of Far East Russia.

- *C. (Acoptolabrus) constricticollis jilinicus* Deuve, 1992 stat. rest. (Fig. 28). The two collected specimens correspond well with the specimens from Antu County area from where was originally described *C. c. jilinesis* Li, 1992 (name changed in *C. (A.) c. jilinicus* Deuve, 1992) by general morphology and size, also the elytra sculpture is much more interrupted with less elevated tubercles. The subspecies *jilinicus* was considered as a mere synonym of *C. constricticollis constricticollis* Kraatz, 1886 by Deuve & Li (2000 b). In our opinion, the collected specimens from the new locality confirm the differences between the two subspecies; the nominal subspecies is widespread in a large area of Heilongjiang, Jilin and Liaoning Provinces, and *jilinicus* is more localized on the mountain area of East Jilin near the border with North Korea.

- *C. (Damaster) jankowskii lii* Deuve, 1998 (Fig. 30). By the green lustre of elytra the population well corresponds to the ssp. *lii* Deuve, 1998.

- *C. (Damaster) smaragdinus liaodongensis* Li, 1992 (Fig. 31) The specimens show very shiny cold-green elytra without any copper color. The pronotum is copper-greenish, elongate (ratio L/l = 1.12) and the head very elongate.

Q2: Huang-song-pu-lin-chang, elevation 1300 m. Coniferous forest

- *Calosoma (Calosoma) inquisitor cyanescens* Motschulsky, 1859.

- *C. (Aulonocarabus) rufinus* Beheim et Breuning, 1943.

- *C. (Diocarabus) caustomarginatus* Imura et Mizusawa, 1994 (Fig. 15) This beautiful taxon described from North Korea for the first time is indicated from China. New species for the Chinese fauna.

- *C. (Carabus) manifestus pyonganicola* Deuve et Li, 1998.

- *C. (Carabus) szeli changbaicus* Rapuzzi et Li n. ssp. (Fig. 19) In this locality as well as at higher altitude (see Q3, 1850 m) we found a small size *Carabus* s. str. close to *C. angustus* Roeschke, 1898 species group typical from North Korea. After examination and comparison of the collected specimens with the closest taxa, we found that they belong to a new subspecies close to *C. (Carabus) szeli* Deuve, 1994. See description below.

- *C. (Acoptolabrus) schrencki minpongsanensis* Deuve et Li, 2003 (Fig. 27) By the small size, small and tiny head, shape of pronotum, sculpture of elytra, the collected specimens belong to the subspecies *minpongsanensis* Deuve et Li, 2003 described and known not far in the Northern part of North Korea. It is the first locality recorded to China. New subspecies for the Chinese fauna.

- *C. (Acoptolabrus) constricticollis jilinicus* Deuve, 1992.

- *C. (Damaster) jankowskii jankowskii* Oberthür, 1883 (Fig. 29) The elytra are black with a luster green margin and well correspond to the typical form widespread in North Korea.

- *C. (Damaster) smaragdinus coreicus* Hauser, 1921. The species is widespread in North-Eastern China with several subspecies described, most of them are with green or blue-green color of elytra. The specimens collected at low altitude of Changbai Shan (Q1, 800 m) well correspond to the ssp. *liaodongensis* Li, 1992 by the green elytra color. The specimens from Changbai Shan from medium and high altitudes belong to the subspecies *coreicus* known from North Korea and they are very different from the low altitude specimens. These specimens are of large size (37.3 mm, male fig. 32), orange-red color, and larger pronotum and head;

also the aedeagus is different: larger and more regularly curved. Further investigations will be necessary to better understand the systematic position of *C. smaragdinus* on Changbai Shan Mountains. If not any transition forms between *liaodongensis* and *coreicus* will be found at intermediate altitude, the two forms must be treated as valid species. Under that consideration it will be possible that *C. (Damaster) smaragdinus* and *C. (Damaster) branickii* represent two different species.

- *C. (Fulgenticarabus) flutschi coreus* Deuve, 2006 (Fig. 33) The collected specimens belong to the subspecies *coreus* Deuve, 2006 described and known from a single locality in North Korea (Yanggang, Mt. Samjiyon San) not far from Changbai Shan. New subspecies for the Chinese fauna.

Q3. Bai-shan-shang-fang, elevation 1850 m. Ermans Birch forest

- *Calosoma (Calosoma) inquisitor cyanescens* Motschulsky, 1859.

- *C. (Aulonocarabus) canaliculatus vojnitsi*

Mandl, 1979 (Fig. 4). As written above, in this locality we observed the cohabitation of two *Carabus (Aulonocarabus)* taxa: *C. (Aulonocarabus) rufinus* Beheim et Breuning, 1943 and *C. (A.) canaliculatus vojnitsi* Mandl, 1979: the specimens with elongate body, brown elytra and very dilated apex of aedeagus are *C. (A.) rufinus*; the specimens with black elytra, shorter body, larger pronotum and tiny apex of aedeagus are *C. (A.) canaliculatus vojnitsi*.

- *C. (Aulonocarabus) rufinus* Beheim et Breuning, 1943

- *C. (Tomocarabus) fraterculus neochinensis* Deuve et Li, 1998 (Fig. 14). By the smaller body size, the more regular elytral sculpture and the black color, the specimens correspond exactly with the subspecies *neochinensis* Deuve et Li, 1998.

- *C. (Carabus) arvensis faldermanni* Dejean, 1829 (Fig. 17). The taxon is known from different localities of North-Eastern China, Far East Russia North Korea; few localities are reported from South Korea (Kwon & Li, 1984).

- *C. (Carabus) szeli changbaicus* n. ssp. See description below.



Fig. 18. *C. (C.) manifestus pyonganicola*, locality Q1, 22.4 mm. Fig. 19. *C. (C.) szeli changbaicus* n. ssp., holotype male, 21 mm. Fig. 20. Idem, aedeagus frontal view. Fig. 21. Idem, aedeagus lateral view.

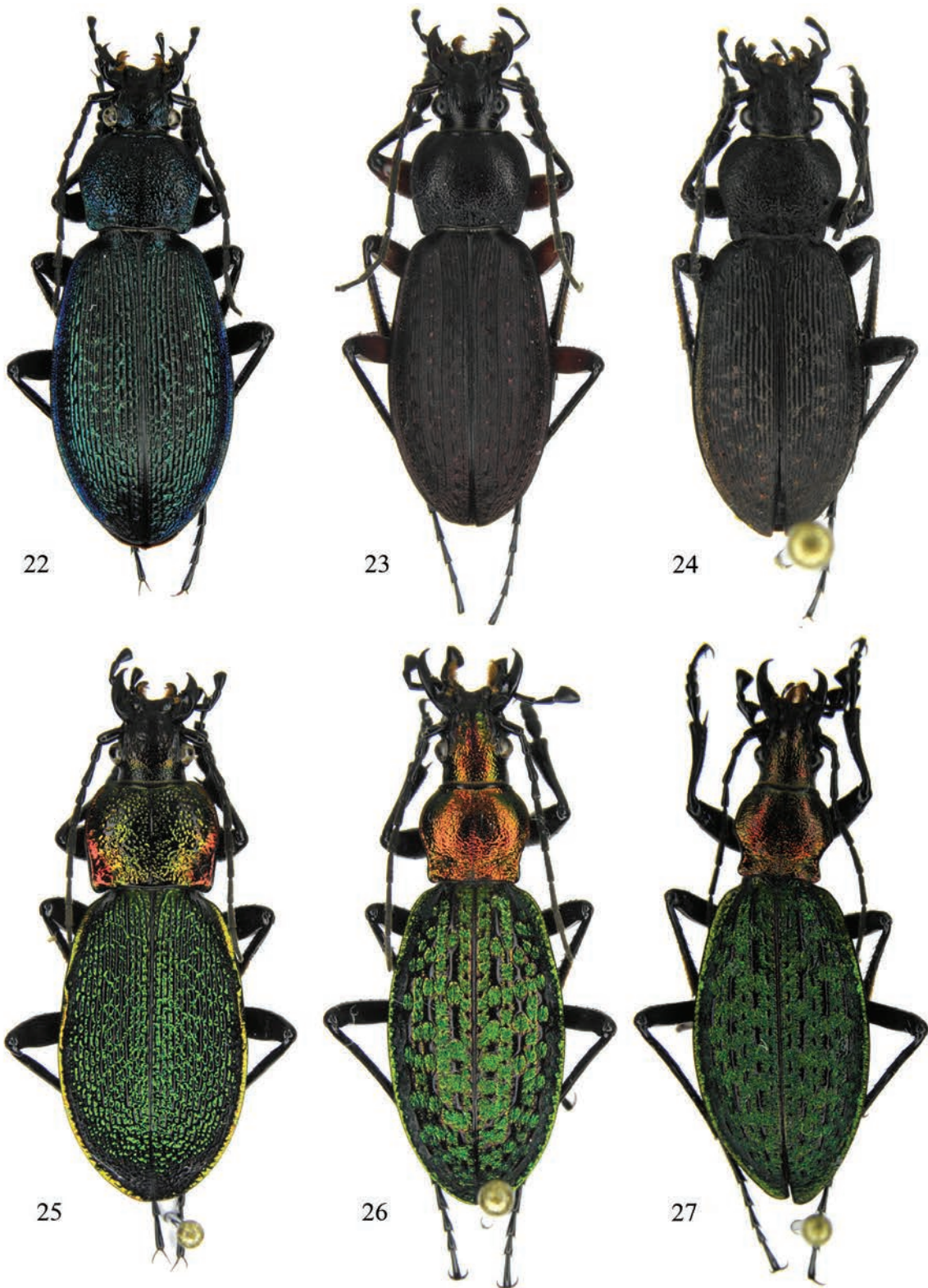


Fig. 22. *C. (M.) hummeli pusongensis*, locality Q1, 25.2 mm. Fig. 23. *C. (M.) wulffiusi dekraatzi*, locality Q1, 22 mm. Fig. 24. *C. (M.) venustus* cf. *kaesongensis*, locality Q4, 16.8 mm. Fig. 25. *C. (M.) vietinghoffi caesareus*, locality Q1, 28.9 mm. Fig. 26. *C. (A.) schrencki schrencki*, locality Q1, 24,5 mm. Fig. 27. *C. (A.) schrencki minpongsanensis*, locality Q2, 24 mm.

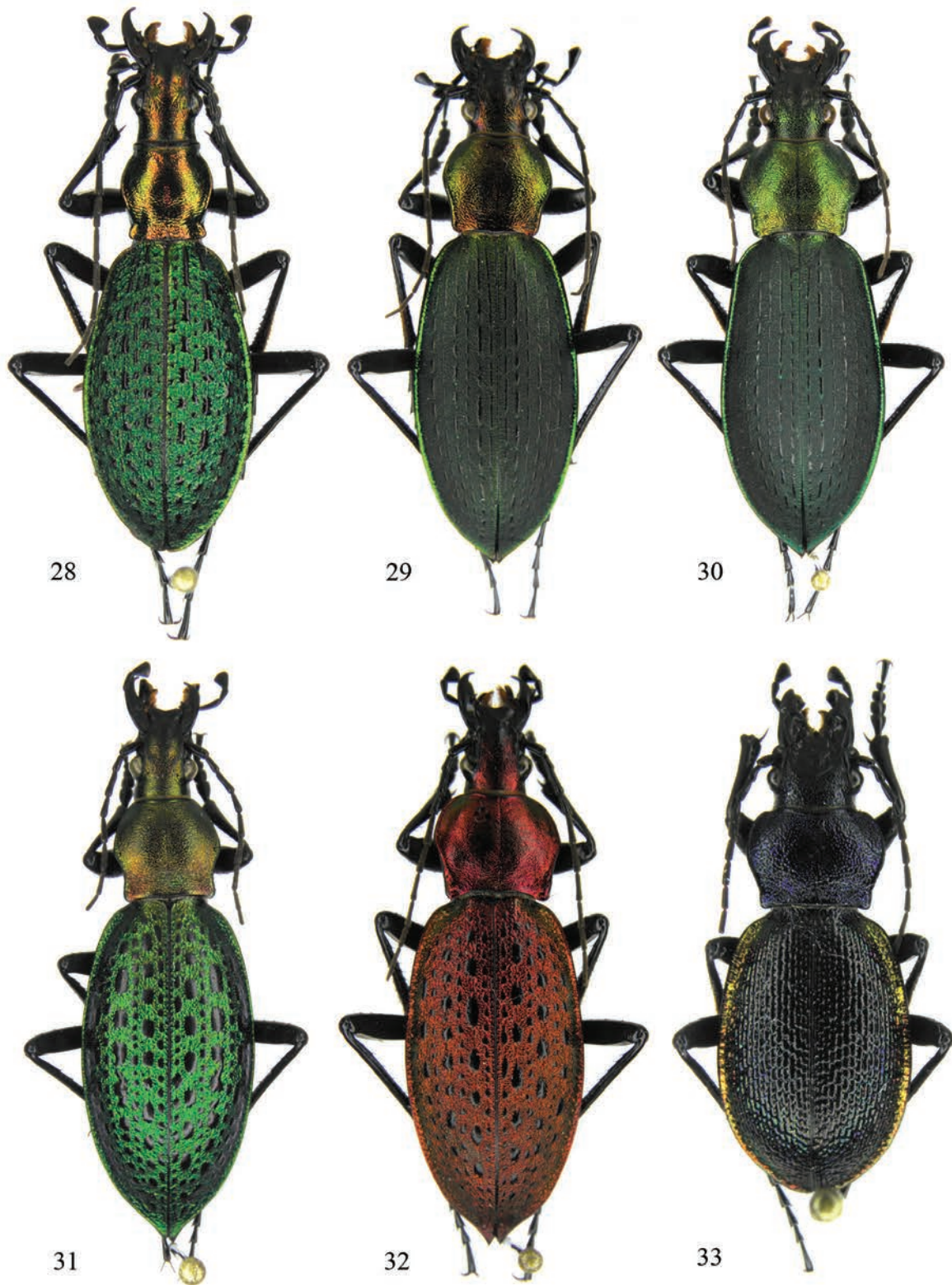


Fig. 28. *C. (A.) constricticollis jilanicus*, locality Q1, 28.8 mm. Fig. 29. *C. (D.) jankowskii jankowskii*, locality Q2, 32.7 mm. Fig. 30. *C. (D.) jankowskii lii*, locality Q1, 36.5 mm. Fig. 31. *C. (D.) smaragdinus liaodongensis*, locality Q1, 33 mm. Fig. 32. *C. (D.) smaragdinus coreicus*, locality Q3, 37.7 mm. Fig. 33. *C. (F.) flutschii coreus*, locality Q2, 20.6 mm.

- *C. (Morphocarabus) venustus* cf. *kaesongensis* Imura, 1993. The specimens collected on the high altitude of the Changbai Shan are very similar to the specimens from the adjacent areas of North Korea. By the morphological characters they belong to *C. (M.) venustus kaesongensis* Imura, 1993. New subspecies for the Chinese fauna.

- *C. (Damaster) smaragdinus coreicus* Hauser, 1921 (Fig. 32).

Q4. Nearby Tianchi weather station, elevation 2100 m. Tundra belt

- *C. (Aulonocarabus) rufinus* Beheim et Breuning, 1943.

- *C. (Tomocarabus) fraterculus neochinensis* Deuve et Li, 1998 New subspecies for the Chinese fauna.

- *C. (Morphocarabus) venustus* cf. *kaesongensis* Imura, 1993 (Fig. 24).

New taxon

***Carabus (Carabus) szeli changbaicus* Rapuzzi et Li n. ssp.**

Holotype: 1 male, Huang-song-pu-lin-chang, 1300 m., Mt. Changbai Shan, Antu county, Jilin province, China. 13/15.VI.2012 (Coniferous forest); preserved in Ivan Rapuzzi collection, Prepotto (UD), Italy. Paratype: 1 male, Bai-shan-shang-fang, 1850 m., Mt. Changbai Shan, Antu county, Jilin province, China. 13/15.VI.2012 (Ermans Birch forest); preserved in Key Laboratory of remote sensing monitoring of geographic environment, Harbin, China.

DESCRIPTION OF HOLOTYPE MALE. Length including mandibles: 21 mm (Fig. 19), maximum width of elytra: 7.1 mm. Color black with metallic luster on head, dorsum and pronotum cupped with margin of elytra green. Very close to *C. (Carabus) szeli* Deuve, 1994 but separate by ticked head, more parallel elytra with stronger elevated intervals. Aedeagus (Figs. 20, 21) longer and thin; apex more regular curved in frontal view. In lateral view the apex is a little larger and more curved on the left.

VARIABILITY. In general very little variability: the length of the body is 20.3 mm. The color is more green and shiny.

Q1 locality	N-E China	Korea Peninsula
1) <i>C. rufinus</i>	X	
2) <i>C. seishinensis elongatipennis</i>		X
3) <i>C. kruberi</i> cf. <i>chaos</i>		X
4) <i>C. fraterculus gaixianensis</i>	X	
5) <i>C. hummeli pusongensis</i>	X	X
6) <i>C. wulffiusi dekraatzi</i>	X	
7) <i>C. granulatus telluris</i>	X	X
8) <i>C. manifestus pyonganicola</i>		X
9) <i>C. vietinghoffi caesareus</i>	X	
10) <i>C. schrencki</i>	X	
11) <i>C. constricticollis jilinicus</i>	X	
12) <i>C. jankowskii lii</i>	X	
13) <i>C. smaragdinus liaodongensis</i>	X	
	10 taxa	5 taxa
Q2 locality		
1) <i>C. rufinus</i>	X	
2) <i>C. caustomarginatus</i>		X
3) <i>C. manifestus pyonganicola</i>		X
4) <i>C. szeli changbaicus</i> n. ssp.	X	
5) <i>C. schrencki minpongsanensis</i>		X
6) <i>C. constricticollis jilinicus</i>	X	
7) <i>C. jankowskii</i>		X
8) <i>C. smaragdinus coreicus</i>		X
9) <i>C. flutschii coreus</i>		X
	3 taxa	6 taxa
Q3 locality		
1) <i>C. canaliculatus vojnitzi</i>		X
2) <i>C. rufinus</i>	X	
3) <i>C. fraterculus neochinensis</i>	X	X
4) <i>C. arvensis faldermanni</i>	X	X
5) <i>C. szeli changbaicus</i> n. ssp.	X	
6) <i>C. venustus</i> cf. <i>kaesongensis</i>		X
7) <i>C. smaragdinus coreicus</i>		X
	5 taxa	5 taxa
Q4 locality		
1) <i>C. rufinus</i>	X	
2) <i>C. fraterculus neochinensis</i>	X	X
3) <i>C. venustus</i> cf. <i>kaesongensis</i>		X
	2 taxa	2 taxa

Table 1. The *Carabus* fauna of Changbai Shan.

CONCLUSIONS

The Carabini fauna of Changbai Shan Mountain is of a great interest. The study of the collected specimens from different altitudes and habitats permitted us to (i) describe one new *Carabus* taxon: *C. szeli changbaicus* n. ssp., (ii) record for the first time six new *Carabus* taxa for the Chinese fauna; and (iii) better understand the systematic position of *Carabus (Aulonocarabus) canaliculatus* Adams, 1812 species group and the status of *C. (Acoptolabrus) constricticollis jilanicus* Deuve, 1992. Further investigations will be necessary to clarify the status of *C. (Coptolabrus) smaragdinus/branickii* group that will be possibly to be treated as separate species.

The Carabini fauna of Changbai Shan is very rich: 23 *Carabus* taxa and 1 *Calosoma* species were recorded. In general the *Carabus* fauna is something intermediate between the "classic" fauna of North-Eastern China (9 taxa) and Korean Peninsula fauna (11 taxa); one taxon seems to be endemic (*C. szeli changbaicus* n. ssp.) but it belongs to a typical species group from Korean Peninsula (*C. angustus* species group) and 3 species are widespread in North-Eastern China and Korean Peninsula. We also found some differences in the *Carabus* fauna from the four investigated areas of the Changbai Shan Mountains. In fact many of the *Carabus* species collected at the lower altitude on the Western slope of the mountain (locality Q1, 800 m) belong to the classic species known from North-Eastern China. Instead the *Carabus* from medium-high altitudes on Changbai Shan Mountain (localities from Q2 to Q4, 1300/2100 m) are mainly the typical species from the North Korea fauna.

The table 1 report the collected *Carabus* taxa from every investigated localities and their main distribution.

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