New to Russia and poorly known species of the genus *Aphodius* (Coleoptera: Scarabaeidae)

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Aphodius (*Agoliinus*) *guttatus*, *A.* (*Chilothorax*) *clathratus*, and *A.* (*Aphodaulacus*) *kizeritskyi* are recorded from Russia for the first time. *Aphodius* (*Agoliinus*) *amurensis* previously known only from the type locality is found in the Lazo Nature Reserve (Russian Far East). All species are diagnosed and illustrated. Comments on diagnostic characters, distribution and bionomics are given.

Key words: new records, diagnostic characters, Russia, Coleoptera, Scarabaeidae, *Aphodius*

INTRODUCTION

Aphodius Illiger, 1798 is one of the largest beetle genera in the Russian fauna and the major group to control mammal dung and dung-breeding flies. Yet our knowledge of this genus is still poor in many aspects. Even a complete list of species recorded from Russia is not published. Almost every expedition to the southern Volga Region and southern Far East of Russia, aimed at collecting scarab beetles, yields new species to regional faunas or other important findings. In the present contribution, three species of the four (*A. guttatus* Eschscholtz, 1823, *A. clathratus* Reitter, 1892, and *A. kizeritskyi* Frolov, 2002) are recorded from Russia for the first time. Some of them were poorly or not illustrated, and no data about their biology were available.

MATERIAL AND METHODS

The examined material is deposited at the Zoological Institute, Russian Academy of Sciences, St. Petersburg (ZIN); Institute of Zoology, National Academy of Sciences of Armenia, Yerevan (IZE); Zoological Museum of Moscow State University (ZMMU); and in the collection of Alexander Ivanov, Ekaterinburg (AIC). The distribution map was made with ArcGIS 9.1 software. Locality coordinates for the map were taken from specimen labels, available atlases and the GNS database (http://earthinfo.nga.mil/html/index.html). The photos were made with a Leica DFC290 digital camera and a Leica MZ9.5 stereoscopic microscope. Partially focused serial images were combined in Helicon Focus software (Helicon Soft Ltd.) to produce completely focused photographs.

Aphodius (*Agoliinus*) *amurensis* Iablokoff-Khnzorian, 1972

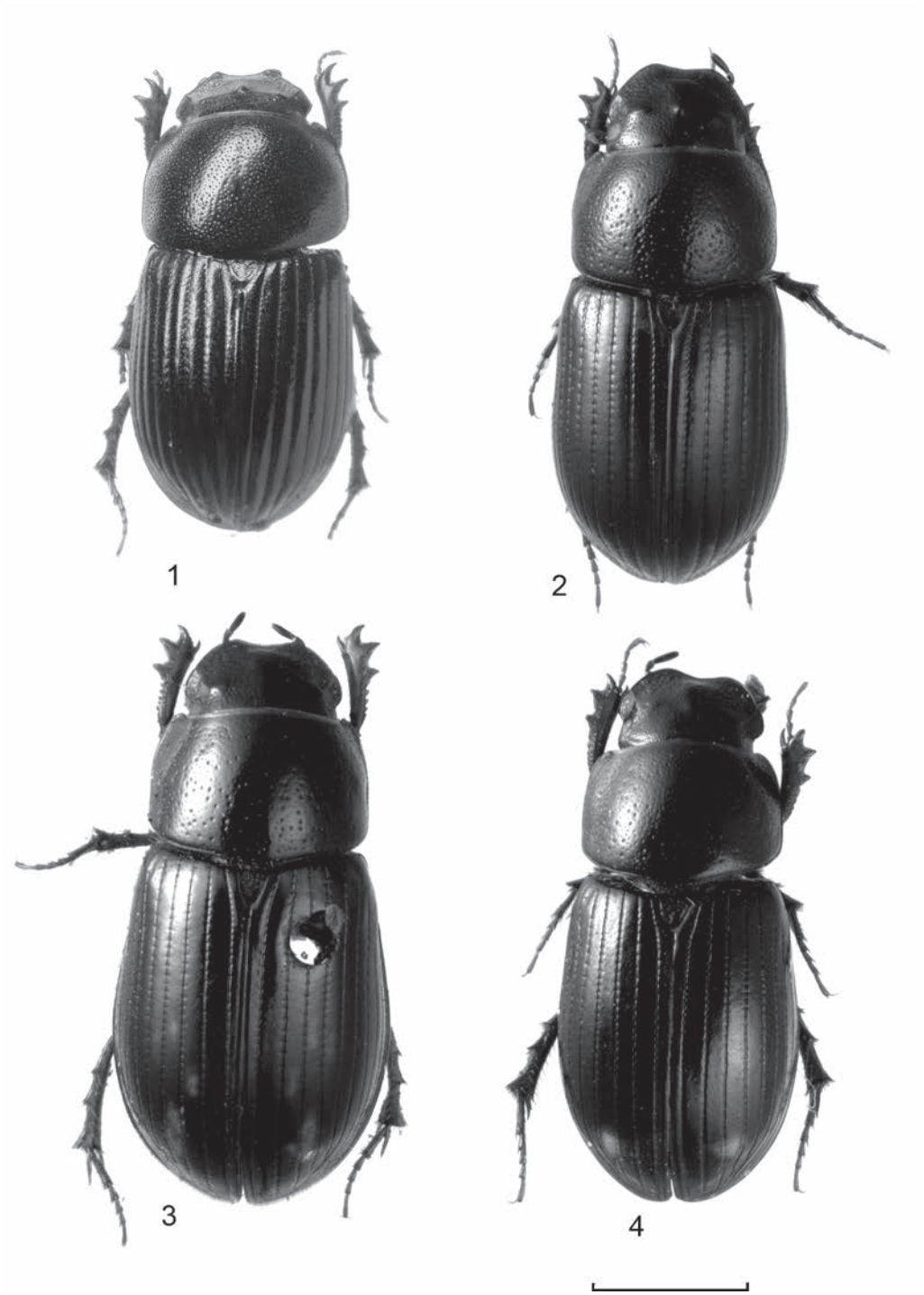
(Figs 1, 10)

Holotype. Male; **Russia**, *Primorskiy Terr.*, Shkotovo Distr., Village of Peyshula, 43°37′N 132°31′E, 15 Aug. 1971; IZE.

Paratypes. Two females; same data as holotype; IZE.

Additional material. Five males and five females; **Russia**, *Primorskiy Terr.*: Lazo Distr., Lazo Nature Reserve, 42°59′N 134°1′E, 6 Aug. 2008; coll. A. Frolov and L. Akhmetova; ZIN.

Diagnosis. *Aphodius amurensis* is similar to *A. piceus* Gyllenhal, 1808, but can be separated from it by the shape of the parameres and their feebly sclerotized processes (Figs 9, 10), convex elytral intervals, especially in apical parts, more convex and shorter body, and angulate clypeus (Figs 1, 2).



Figs 1–4. *Aphodius*, general view (1, 2, 4, male; 3, female). **1**, *A. amurensis* (holotype); **2**, *A. piceus*; **3**, *A. guttatus* (lectotype); **4**, *A. guttatus*.

Comments. *Aphodius amurensis* was described from a small sample collected in Shkotovo District of southern Primorskiy Territory (Iablokov-Khnzorian, 1972), and no more specimens were known until recently we found the species in the Lazo Nature Reserve. The new series was collected from fresh dung of Japanese deer (*Cervus nippon* Temminck, 1838) in a mixed forest. Probably *A. amurensis* is widely distributed in Primorskiy Territory, but its range is limited to areas with stable deer populations.

In the same locality, in older deer dung, we found numerous second and third instar *Aphodius* larvae. These larvae have characteristic head pattern similar to that of European *A. nemoralis* Erichson, 1848 (Frolov, unpublished data), also a member of the subgenus *Agoliinus* Schmidt, 1913. We believe the larvae collected in Lazo Natural Reserve belong to *A. amurensis* but failed to rear them to adults.

Aphodius (*Agoliinus*) *guttatus* Eschscholtz, 1823

(Figs 3, 4, 8)

Type material examined. *Lectotype*. Female; "USA, Unalaska"; ZMMU.

Additional material. One male and two females; **Russia**, *Kamchatka Terr.*: Karaginskiy I., Village of Yagodnoe, 27 July 2008; coll. O. Khruleva; ZIN.

Diagnosis. *Aphodius guttatus* can be distinguished from other species of the subgenus *Agoliinus* distributed in Russia by an elytral pattern with more or less developed yellowish maculae. From a similar species *A. piceus*, it differs also in the shape of the parameres and their membranous processes (Figs 8, 9), and in an almost indistinct frontal tubercle (Figs 3, 4).

Comments. *Aphodius guttatus* has been described from Aleutian Islands and is widely distributed in North America (Gordon & Skelley, 2007). It was not recorded from Eurasia so far. We had no opportunity to examine comparative material from America, except for the lectotype, but the specimens from Kamchatka agree well with the latter and with the description of *A. guttatus* given by Gordon and Skelley (2007).

The specimens from Kamchatka differ from the lectotype in the body colouration. The head and pronotum of the lectotype are dark brown with paler sides; the legs are brown; the elytra are brown with small yellowish maculae on elytral bases, humeral umbones, and in the distal half of third to fifth elytral intervals (Fig. 3). The specimens from Kamchatka are darker with dark brown to almost black upper side of the body and dark brown legs, and with the elytra having only one small yellowish macula in apical part of each elytron (Fig. 4). Such a variability in colouration lies withing the range of interspecific variations commonly found in many *Aphodius* species. Elytral pattern varies considerably in North American specimens, and yellowish maculae are reduced in some individuals (Gordon & Skelley, 2007). Therefore we suppose that the specimens from Kamchatka and Aleutian Islands are conspecific.

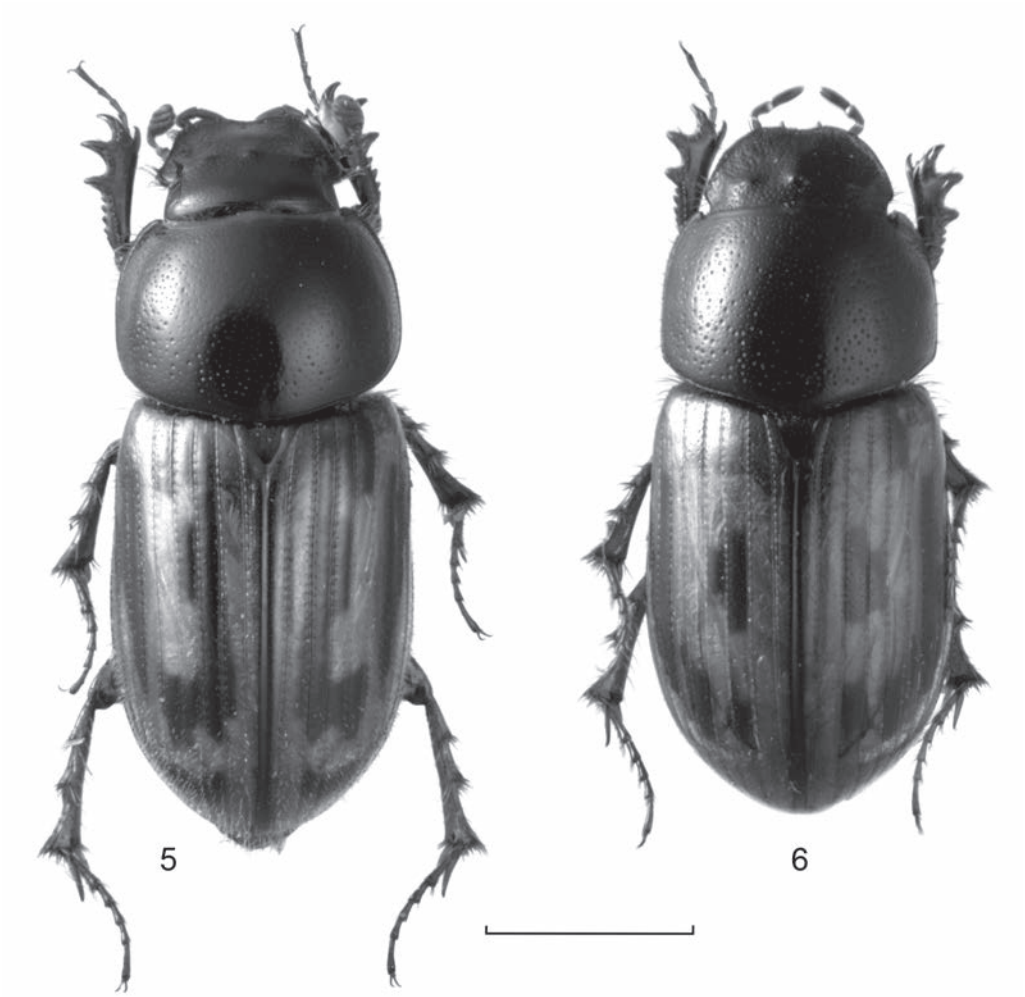
Aphodius (*Aphodaulacus*) *kizeritskyi* Frolov, 2002

Type material examined. *Holotype*. Male; **Turkmenistan**, Duzu-Olum, Sumbar River, about 10 km upstream of Sharloun, 21 Oct. 1902; ZIN.

Paratypes. One female; **Turkmenistan**: Imam Baba, 36°45′N 62°28′E, 3 Oct. 1899; coll. V. Kizeritsky; ZIN. One female; **Turkmenistan**: Iolotan′, 37°18′N 62°21′E, 12 Nov. 1912; coll. V. Kizeritsky; ZIN.

Additional material. **Russia**, *Astrakhan' Prov.*: 22 specimens, 7 km NNE of Dosang, 46°56′N 48°01′E, 31 Oct. 2005, coll. V. Kozlov, ZIN (11), AIC (11); 35 specimens, same locality, 1 Nov. 2005, coll. V. Kozlov, ZIN (18), AIC (17); 36 specimens, environs of Dosang, 46°54′N 47°55′E, 1 Nov. 2009, coll. A. Frolov, ZIN; 48 specimens, 15 km NE of Dosang, 47°00′N 47°58′E, 31 Oct. 2009, coll. A. Frolov, ZIN; 9 specimens, 8 km NE of Dosang, 46°56′N 48°00′E, 4 Nov. 2009, coll. A. Frolov, ZIN.

Diagnosis. *Aphodius kizeritskyi* differs from two other species of the subgenus *Aphodaulacus* Koshantschikov, 1911 distributed in the adjacent regions, *A. turkestani-*



Figs 5–6. *Aphodius*, general view (male). **5**, *A. clathratus*; **6**, *A. melanostictus*.

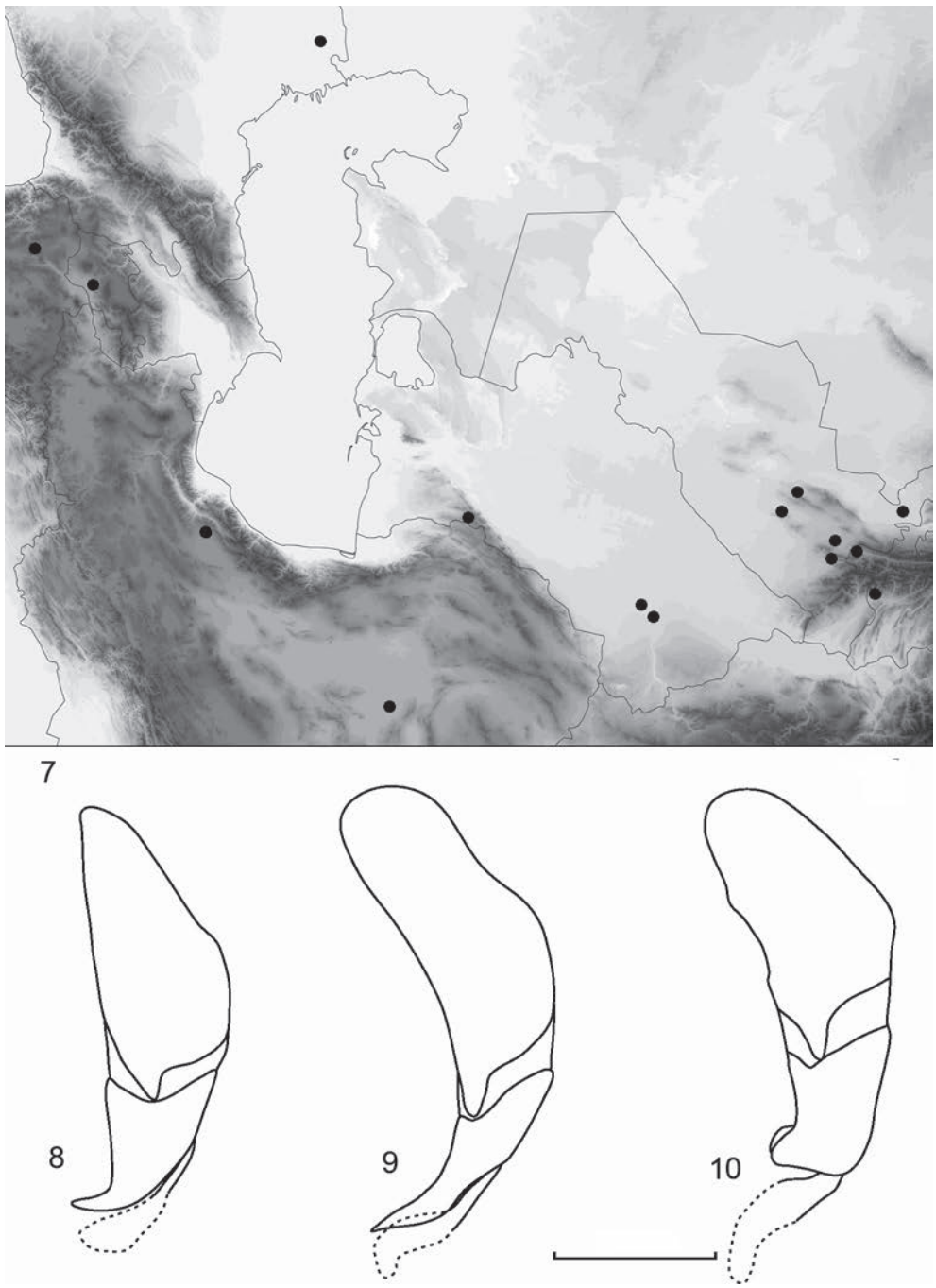
cus Heyden, 1881 and *A. saraevi* Nikolajev, 2004, in having pubescent sides of pronotum, and from the former, also in the slenderer and more curved apices of parameres (Frolov, 2002a: Figs 1, 6).

Comments. In the examined material of *Aphodius kizeritskyi* from Russia, pubescence of the pronotum varies considerably being almost indistinct in some specimens. It is possible that the description of *A. saraevi* is based on the specimens of *A. kizeritskyi* with abraded setae on the sides of pronotum. Additional material from Kazakhstan is needed to separate the two species reliably or to confirm the synonymy. *Aphodius kizeritskyi* was so far known only from a few type specimens collected in Turkmenistan. It is possible that this species is more widely distributed in the Caspian region and most probably occurs in Atyrau and Mangystau provinces of Kazakhstan.

Aphodius (*Chilothorax*) *clathratus* Reitter, 1892

(Figs 5, 7)

Material examined. **Russia**, *Astrakhan' Prov.*: 3 specimens, Dosang railway station, 46°55′N 47°55′E, 29 Oct. 2005, coll. V. Kozlov, ZIN (2),



Figs 7–10. *Aphodius*, distribution map (7) and aedeagus in lateral view (8–10). **7**, *A. clathratus*; **8**, *A. guttatus*; **9**, *A. piceus*; **10**, *A. amurensis*.

AIC (1); 6 specimens, environs of Dosang, 46°55´N 47°55´E, fixed sands, larvae from old horse dung, 9 Apr. 2008 (three larvae reared to adults in laboratory), coll. A. Frolov and L. Akhmetova, ZIN; 6 specimens, 7 km NNE of Dosang, 46°56´N 48°01´E, 31 Oct. 2005, coll. V. Kozlov, ZIN (3), AIC (3); 6 specimens; same locality, 1 Nov. 2005, coll. V. Kozlov, ZIN (3), AIC (3). **Turkey**, *Kars Prov.*: 1 specimen, Sarikamis, 40°20´N 42°34´E, 7 Apr. 1912, ZIN. **Armenia**: 4 specimens; Yerevan, 40°11´N 44°30´E, 17 March 1935, coll. M. Ter-Minasyan and A. Richter, ZIN; 1 specimen, same locality, 4 May 1911, ZIN; 13 specimens, same locality, Nov. 1911, ZIN. **Iran**: 2 specimens; Kazvin, 36°16´N 50°00´E, 8 Jan.1943, coll. E. Pavlovskiy, ZIN; 1 specimen; Khorasan, 11 Nov. 1901, coll. N. Zarudny, ZIN. **Turkmenistan**: 1 specimen; western Kopet-Dagh, Aydere, 38°24´N 56°45´E, 10 Apr. 1980, coll. A. Fet, ZIN; 9 specimens, Murghab, 37°30´N 61°58´E, 19 Febr. 1912, ZIN; 1 specimen, Iolotan´, 37°18´N 62°21´E, 10 Dec. 1926, coll. V. Kizeritskiy, ZIN; 2 specimens, same locality, 19 March 1926, coll. V. Kizeritskiy, ZIN. **Uzbekistan**: 4 specimens, Samarkand, 1892, coll. D. Glasunov, ZIN; 1 specimen, Chupan-Ata, 39°39´N 66°57´E, 1892, coll. D. Glasunov, ZIN; 1 specimen, environs of Samarkand, 39°39´N 66°57´E, 6–24 Febr. 1896, coll. L. Barshchevskiy, ZIN; 1 specimen, Golodnaya Step railway station, 40°30´ N 68°45´E, 13 Apr. 1903, coll. N. Ivanov, ZIN; 1 specimen, same locality, 9 Apr. 1903, coll. G. Jacobson, ZIN; 1 specimen, Nurata, 40°33´N 65°41´E, 6–15 Febr. 1987, coll. Baskakova, ZIN; 3 specimens, Kaynar-Bulak, 39°15´N 66°56´E, coll. D. Glasunov, ZIN; 4 specimens; environs of Navoi, 40°05´N 65°22´E, 9 Sept. 1986, coll. S. Kurbatov, ZIN. **Tajikistan**: 2 specimens; Penjakent, 39°30´N 67°36´E, 10–28 Nov. 1943, coll. A. Kiritshenko, ZIN; 1 specimen, Karatag, 38°37´N 68°20´E, coll. E. Willberg, ZIN.

Diagnosis. Males of *A. clathratus* can be separated from the most similar species *A. melanostictus* Schmidt, 1840 by having distinctly and rather densely pubescent apices of elytra (Fig. 5), distinct setae on disc of metathorax, narrower body, and more developed dark maculae on elytra. *Aphodius melanostictus* has minutely to indistinctly pubescent apices of elytra (Fig. 6), glabrous disc of metathorax in both sexes, wider body, and less developed dark maculae on elytra.

Comments. Elytral pattern is not a reliable character to distinguish *Aphodius clathratus* and *A. melanostictus* due to its variability in both species. Females of these species can sometimes be difficult to distinguish.

Aphodius clathratus was described from Ordubad (Azerbaijan). Depository of its type specimen is unknown. The species was recorded from Transcaucasia and Middle Asia (Frolov, 2002b), but no reliable findings from Russia were known. The map of localities for this species based mostly on the ZIN material suggests that *A. clathratus* is rather widely distributed but the locality in Dosang environs is the northernmost and far away from others (Fig. 7). The range of this species is still obscure since it is difficult to separate it from closely-related and very similar *A. melanostictus*. Some published records of *A. clathratus* apparently belong to *A. melanostictus* and vice versa.

Three adults of *A. clathratus* were reared in the laboratory from the larvae we collected in the vicinity of Dosang. The larvae are similar to those of *A. melanostictus* described by Maltsev (1966), but this description is very short and incomplete.

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