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TO THE KNOWLEDGE OF *PACHYRHYNCHUS MONILIFERUS* GERMAR, 1824 (COLEOPTERA: CURCULIONIDAE) SPECIES DISTRIBUTION AND BIOGEOGRAPHY WITH DESCRIPTION OF TWO NEW SUBSPECIES FROM PHILIPPINES

Anita Rukmane

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This article presents new distribution and faunistic data for *Pachyrhynchus moniliferus* Germar, 1824 species with all subspecies included. New distribution data are compared with previous records from various museum collections. The habitus photographs and distribution maps are included. Two new subspecies are described: *P. moniliferus* ssp. *babuyanensis* Rukmane, 2018 subsp. n. and P. *moniliferus* ssp. *herbidus* Rukmane, 2018 subsp. n.

Key words: *Pachyrhynchus moniliferus*, Curculionidae, Philippines, distribution, biogeography, fauna, new subspecies.

Anita Rukmane. Daugavpils University, Institute of life sciences and technology, Coleopterological Research Center, Parādes street 1a, Daugavpils, LV5401, Latvia: E-mail: anitakraslava@inbox.lv

INTRODUCTION

Pachyrhynchus moniliferus Germar, 1824 is one of the most diverse species in genus *Pachyrhynchus*, including five subspecies distributed on various islands of Philippine archipelago: *P. moniliferus chevrolati* Eydoux & Souleyet, 1839, *P. moniliferus eburnus* Heller, 1934, *P. moniliferus jagori* Heller, 1912, *P. moniliferus moniliferus* Germar, 1824, *P. moniliferus stellulifer* Heller, 1912 respectively. Schultze (Schultze 1923) in his early monographs gave detailed information about species distribution and pointed on similarity between *P. moniliferus* and *P. orbifer* Waterhouse, 1841. Author outlines, that *P. moniliferus* is found in the typical form and several very pronounced varieties in Luzon and has subspecies in Mindoro, Polillo, and the Catanduanes, such distribution for one species is really rare and exceptional for current group of weevils. Current study reveals new distribution data for *P. moniliferus* and shows, that species distribution range is even wider. Careful examination of *P. moniliferus* material from various museums (see material and method part) compared with subjectively new material of *P. moniliferus* available in DUBC allows analysing distribution of *P. moniliferus* in full.

Currently genus *Pachyrhynchus* comprises 145 species (Rukmane 2018). Scientists from all over

the globe have already made effort in studies of current genus (Chen & Lin 2017, Barševskis 2016, Bollino, Sandel & Rukmane 2017, Cabras & Rukmane 2016, Rukmane & Cabras 2018)
This article provides a reference point for those wishing to identify weevils of genus *Pachyrhynchus* and is additional source for a future systematic revision. Systematic part is based on a checklist of genus *Pachyrhynchus* (Rukmane 2018) and world catalogue of weevils provided by Alonso – Zarazaga (Alonso – Zarazaga 1999) in order with early records of Schultze (Schultze 1923).

MATERIAL AND METHODS

The material from following collections has been examined:
BNHM – British Natural History Museum (London, United Kingdom);
DUBC – Beetles Collection of Coleopterological Research Center, Institute of Life Sciences and Technology, Daugavpils University (Daugavpils, Latvia);
MNHN – National Museum of Natural History, (Paris, France);
SNTD - Senckenberg Natural History Collections of Dresden, (Dresden, Germany);
ZMUC – Natural History Museum of Denmark, University of Copenhagen (Copenhagen, Denmark).

The laboratory research and measurements have been performed using Nikon AZ100, Nikon SMZ745T and Zeiss Stereo Lumar V12 digital stereomicroscopes, NIS-Elements 6D software, and Canon 60D and Canon 1 Ds Mark II cameras.

RESULTS

***Pachyrhynchus moniliferus* ssp. *babuyanensis* subsp. n.** (Fig. 1A, B)

Type material. Holotype, male: ‘’PHILIPPINES, Babuyan Island, IV. 2017, local collector leg.’’ (white rectangular card, printed); ‘’HOLOTYPE, Male, *Pachyrhynchus moniliferus* ssp. *babuyanensis* Rukmane 2018, det. Anita Rukmane, 2018’’ (red rectangular card, printed) (DUBC).

Paratypes: 8 males, 2 females; ‘’PHILIPPINES, Babuyan Island, VIII. 2014, local collector leg.’’ (white rectangular card, printed); ‘’PARATYPE, Male, *Pachyrhynchus moniliferus* ssp. *babuyanensis* Rukmane 2018, det. Anita

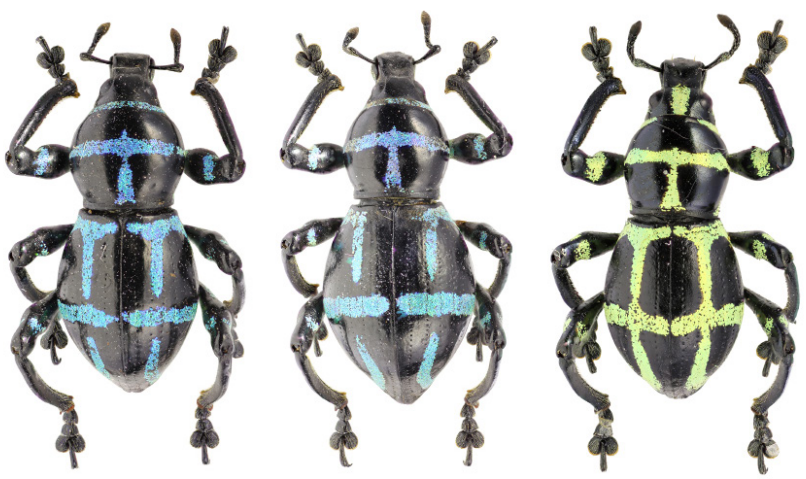

Fig.1. Dorsal habitus of *P. monilifureus* ssp. *babuyanensis* subsp. n. and *P. moniliferus* ssp. *herbidus* subsp. n. A – Male of *P. monilifureus* ssp. *babuyanensis* subsp. n.; B – Female of *P. monilifureus* ssp. *babuyanensis* subsp. n.; C – Male of *P. moniliferus* ssp. *herbidus* subsp. n..

Rukmane, 2018'' (red rectangular card, printed) (2 specimens); ''PHILIPPINES, Babuyan Island, III. 2017, local collector leg.'' (white rectangular card, printed); ''PARATYPE, Male, *Pachyrhynchus moniliferus* ssp. *babuyanensis* Rukmane 2018, det. Anita Rukmane, 2018'' (red rectangular card, printed);
''PHILIPPINES, Babuyan Island, III. 2017, local collector leg.'' (white rectangular card, printed); ''PARATYPE, Female, *Pachyrhynchus moniliferus* ssp. *babuyanensis* Rukmane 2018, det. Anita Rukmane, 2018'' (red rectangular card, printed);
''PHILIPPINES, Babuyan Island, IV. 2017, local collector leg.'' (white rectangular card, printed); ''PARATYPE, Male, *Pachyrhynchus moniliferus* ssp. *babuyanensis* Rukmane 2018, det. Anita Rukmane, 2018'' (red rectangular card, printed) (4 specimens);
''PHILIPPINES, Babuyan Island, IV. 2017, local collector leg.'' (white rectangular card, printed); ''PARATYPE, Female, *Pachyrhynchus moniliferus* ssp. *babuyanensis* Rukmane 2018, det. Anita Rukmane, 2018'' (red rectangular card, printed);
''PHILIPPINES, Babuyan Island, V. 2017, local collector leg.'' (white rectangular card, printed); ''PARATYPE, Male, *Pachyrhynchus moniliferus* ssp. *babuyanensis* Rukmane 2018, det. Anita Rukmane, 2018'' (red rectangular card, printed).

Distribution: Babuyan Island (Fig. 2).

Description. Male. Measurements (n=9): LB: 12.9 – 14.1 (holotype 13.8, mean 13.59); LR: 1.7 – 1.8 (holotype 1.8, mean 1.8); WR: 1.7 – 1.8 (holotype 1.8, mean 1.74); LP: 4.1 – 4.7 (holotype 4.1, mean 4.33); WP: 4.2 – 5.2 (holotype 4.5, mean 4.59); LE: 7.2 – 7.9 (holotype 7.8, mean 7.7); WE: 5.1 – 5.9 (holotype 5.9, mean 5.52). Dorsal habitus as in Fig. 1A.

Body black, shiny, with markings of glossy green to blue recumbent round or lanceolate scales; rostrum in dorsal contour narrowing in apical part and bulging in basal part, length and width equal, LR/WR: 1; with shallow median impression and longitudinal groove on basal part from middle to base; each side of rostrum with patch of pale blue to green lanceolate scales on lateroventral part near antennal scrobe and on genae; long golden hairs on each lateral part near apex; forehead with longitudinal groove from midline to base; eyes small, not convex; prothorax with the following markings of glossy blue to green scales: 1) transverse stripe on scales along apical margin from one lateroventral part to other; 2) patch of scales on each lateroventral part; 3) transverse stripe of scales along midline of pronotum from one lateroventral margin to other; 4) dorsum with longitudinal stripe on median part of disc from basal margin to minutely above midline of disc; wider than long, WP/LP: 1.1; widest just in the

Fig.2. Distribution of *P. monilifureus* ssp. – *P. moniliferus* ssp. *babuyanensis* subsp. n. (marked with red); *P. moniliferus* ssp. *chevrolati* (marked with purple); *P. moniliferus* ssp. eburnus (marked with yellow); *P. moniliferus* ssp. *herbidus* subsp. n. (marked with green); *P. moniliferus* ssp. *jagori* (marked with blue); *P. moniliferus* ssp. *moniliferus* (marked with orange); *P. moniliferus* ssp. *stellulifer* (marked with brown).

middle; elytra widest in middle, LE/WE: 1.32; wider than prothorax, WE/WP: 1.31; nearly as twice as long as prothorax, LE/LP: 1.9; intervals well pronounced; each elytron with the following glossy blue to green scale stripes: 1) transverse stripe on sub-basal part along basal margin, from middle of interval I to lateroventral margin where stripe incurves and goes all long the lateral margin of elytron, another incurve near apex on interval III, where stripe incurves and goes up to apical 1/5 along interval III; 2) transverse stripe along midline of elytron, from middle of interval I to lateral margin; 3) longitudinal stripe along interval III from sub – basal part to basal 4/5; prosternum and procoxa densely covered with roundish glossy green to blue scales; prosternal process without scales; mesocoxa with few general scales; metacoxa without scales; metasternum densely covered with glossy blue to green scales; lateral parts of ventrites I and II covered with glossy scales; ventrites III to V without glossy scales; trochanter without glossy scales; each profemur, mesofemur and metafemur with few glossy scales on basal part and patch of glossy blue to green scales on subapical part. Male aedeagal body as shown in Fig. 3A, B.

Female. Measurements (n=2): LB: 12.8 – 15.5 (mean 14.15); LR: 1.8 – 1.9 (mean 1.85); WR: 1.7 – 1.8 (mean 1.75); LP: 3.7 – 4.6 (mean 4.15); WP: 3.9 – 4.8 (mean 4.35); LE: 7.6 – 9.3 (mean 8.45); WE: 5.6 – 6.7 (mean 6.15). Dorsal habitus as in Fig. 1B.

Differential diagnosis. This new subspecies clearly differs from the other subspecies with the following unique features: pronotum wider than in other subspecies; unique blue to green colour scally patches on body; according on available data, subspecies distribution restricted to Babuyan Island; eyes smaller, not convex from outline of the head.

Etymology. This new subspecies is named after Babuyan Island which is original site where this subspecies is distributed and abundant.

***Pachyrhynchus moniliferus* ssp. *herbidus* subsp. n.** (Fig. 1C)

Type material. Holotype, male: ‘’PHILIPPINES, Samar Island, Lope De Vega, IX. 2017, local collector leg.’’ (white rectangular card, printed); ‘’HOLOTYPE, Male, *Pachyrhynchus moniliferus* ssp. *herbidus* Rukmane 2018, det. Anita Rukmane, 2018’’ (red rectangular card, printed) (DUBC).

Paratypes: 4 males, 3 females; ‘’PHILIPPINES, Samar Island, Lope De Vega, VII. 2017, local collector leg.’’ (white rectangular card, printed); ‘’PARATYPE, Male, *Pachyrhynchus moniliferus* ssp. *herbidus* Rukmane 2018, det. Anita Rukmane, 2018’’ (red rectangular card, printed) (2 specimens);
‘’PHILIPPINES, Samar Island, Lope De Vega, VII. 2017, local collector leg.’’ (white rectangular card, printed); ‘’PARATYPE, Female, *Pachyrhynchus moniliferus* ssp. *herbidus* Rukmane 2018, det. Anita Rukmane, 2018’’ (red rectangular card, printed) (3 specimens);
‘’PHILIPPINES, Samar Island, Lope De Vega, VIII. 2017, local collector leg.’’ (white rectangular card, printed); ‘’PARATYPE, Male, *Pachyrhynchus moniliferus* ssp. *herbidus* Rukmane 2018, det. Anita Rukmane, 2018’’ (red rectangular card, printed) (1 specimen);
‘’PHILIPPINES, Samar Island, Lope De Vega, X. 2017, local collector leg.’’ (white rectangular card, printed); ‘’PARATYPE, Male, *Pachyrhynchus moniliferus* ssp. *herbidus* Rukmane 2018, det. Anita Rukmane, 2018’’ (red rectangular card, printed) (1 specimen);
11 specimens (8 males and 3 females) are stored in SMTD with the distribution of Philippines, Samar Island. Specimens were wrongly identified as *P. moniliferus* var. *concinnus*, this variation originally belong to *P. moniliferus* ssp. *eburnus* which is distributed on Mindoro Island. After carefull examination of type material of *P. moniliferus* var. *concinnus* from BNHM, it is clear, that specimens from SNTD belongs to *P. moniliferus* ssp. *herbidus* **subsp. n.** Red rectangular cards with the following text: ‘’PARATYPE, Male, *Pachyrhynchus moniliferus* ssp. *herbidus* Rukmane 2018, det. Anita Rukmane, 2018’’ are added to all male specimens and ‘’ ’PARATYPE, Female, *Pachyrhynchus moniliferus* ssp. *herbidus* Rukmane 2018, det.

Anita Rukmane, 2018" to all female specimens.

Distribution: Samar Island (Fig. 2).

Description. Male. Measurements (n=5): LB: 12.3 – 14.0 (holotype 14.0, mean 13.06); LR: 1.7 – 1.9 (holotype 1.9, mean 1.8); WR: 1.7 – 1.9 (holotype 1.9, mean 1.76); LP: 3.3 – 3.8 (holotype 3.8, mean 3.56); WP: 3.7 – 4.1 (holotype 4.1, mean 3.88); LE: 6.8 – 7.9 (holotype 7.9, mean 7.22); WE: 4.9 – 5.6 (holotype 5.6, mean 5.14). Dorsal habitus as in Fig. 1C.

Body black, shiny, underside and elytra with weaker lustre, with markings of metallic green recumbent round scales; rostrum in dorsal contour straight, weakly bulging in basal ½, length and width sub equal, LR/WR: 1; two oval shape impressions on apical part, bulge in sub-median part and triangular impression in basal part, without longitudinal groove; each side of rostrum densely covered with metallic green scales; long golden hairs on each lateral part near apex; forehead wide, bulging medially, with longitudinal stripe of metallic green scales; eyes big, redirected laterally, convex from the outline of the head; antennal scape incurved ventrally, furnished with long light hairs on apical part dorsally; prothorax with the following markings of metallic green scapes: 1) transverse line of scales along apical margin from one lateroventral part to other, stripe interrupts in the middle; 2) patch of scales on each lateroventral part; 3) transverse line along middle of pronotum from one lateroventral margin to other; 4) dorsum with longitudinal line on median part of disc from basal margin to middle of disc; wider than long, WP/LP: 1.08; widest slightly above middle; with shallow impression on disc dorsally; elytra widest in middle; LE/WE: 1.41; wider than prothorax, WE/WP: 1.37; more than twice as long as prothorax, LE/LP: 2.08; intervals well pronounced; each elytron with the following metallic green scale lines: 1) transverse line on sub – basal part along basal margin, line slightly interrupts on suture and goes to lateroventral margin where line incurves and goes all long the lateral margin of elytron, another incurve near apex on middle of interval II; 2) transverse line along midline of elytron, line slightly interrupts on suture and goes to lateral margin; 3) longitudinal line along interval III from sub – basal part to apex, near apex line extends from middle of interval II to middle of interval IV.

Male aedegal body as shown in Fig. 3C, D.

Female. Measurements (n=3): LB: 12.2 – 13.6 (mean 12.9); LR: 1.8 – 1.9 (mean 1.83); WR: 1.7 – 1.8 (mean 1.73); LP: 3.1 – 3.4 (mean 3.2); WP: 3.4 – 3.8 (mean 3.63); LE: 6.2 – 7.8 (mean 7.23); WE: 5.2 – 5.8 (mean 5.5).

Differential diagnosis. This new subspecies clearly differs from the other subspecies by following features: rostrum without longitudinal groove; longitudinal scally patch of scales on forehead; eyes bigger than in other subspecies, convex from outline of the head; long, light hairs on apical part of antennal scape; pronotum widest slightly above middle; in order with restricted distribution of new subspecies which is Samar Island, none of *P. moniliferus* subspecies were recorded from this island previously.

Etymology. This new subspecies is named after

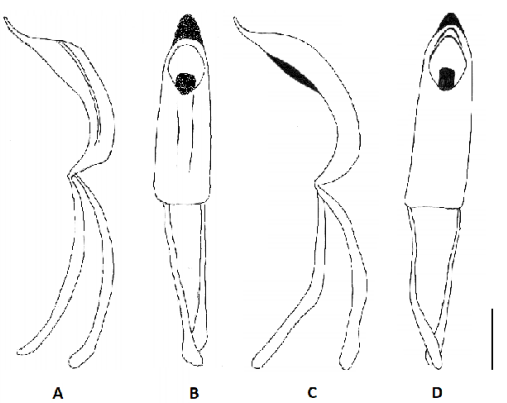

Fig. 3. Male aedegal body of *P. monilifureus* ssp. *babuyanensis* subsp. n. and *P. moniliferus* ssp. *herbidus* subsp. n. A – lateral view of *P. monilifureus* ssp. *babuyanensis* subsp. n., B – dorsal view of *P. monilifureus* ssp. *babuyanensis* subsp. n., C – Lateral view of *P. moniliferus* ssp. *herbidus* subsp. n., D – dorsal view of P. *moniliferus* ssp. *herbidus* subsp. n.

its metallic green scally markings, which remind grassy green colour. One of translations from Latin for green colour is Hebridus. Herbidus – green.

***Pachyrhynchus moniliferus* ssp. *moniliferus* Germar, 1824** (Fig. 4A, B)

= *Pachyrhynchus confinis* Chevrolat, 1841
= *Pachyrhynchus monilifer* Germar, 1871
Material examined: Philippines, 4 spec. (ZUMC); Luzon Island, 3 spec. (ZUMC), 290 spec. (SNTD), 155 spec. (BNHM); Aurora, IV. 2014, 1 spec. (DUBC); Banaue, IX. 2014, 1 spec. (DUBC); Cagayan, VII. 2014, 1 spec., XI. 2015, 1 spec. (DUBC); Dingalan, VII. 2016, 1 spec. (DUBC); Manilla, 26 spec. (ZUMC), 148 spec. (MNHN); Quirino, III. 2014, 1 spec., IV. 2014, 3 spec., V. 2015, 2 spec. (DUBC).
Specimens examined: 640 specimens.

Distribution: Philippines, Luzon Island (Fig. 2).

***Pachyrhynchus moniliferus* ssp. *chevrolati* Eydoux & Souleyet, 1839** (Fig. 5A, B)

= *Pachyrhynchus concinnus* Waterhouse, 1841
= *Pachyrhynchus chlorolineatus* Waterhouse, 1841
= *Pachyrhynchus mandarinus* Chevrolat, 1841
Material examined: Philippines, 101 spec. (MNHN); Luzon Island, 36 spec. (SNTD); Aurora, III. 2012, 1 spec., VIII. 2013, 1 spec., VIII. 2014, 2 spec. (DUBC); Dingalan, XI. 2015, 1 spec., IX. 2016, 3 spec. (DUBC); Isabela, VII. 2013, 1 spec. (DUBC); Labuyo, XI. 2014, 1 spec. (DUBC); Quirino, VIII. 2013, 2 spec., IV. 2014, 1 spec., V. 2015, 1 spec. (DUBC).

Specimens from BNHM marked as *Pachyrhynchus moniliferus* var. *chlorolineatus* belong to these subspecies.

Specimens examined: 151 specimens.

Distribution: Philippines, Luzon Island (Fig. 2).

***Pachyrhynchus moniliferus* ssp. *eburnus* Heller, 1934** (Fig. 4C, D)

Material examined: Philippines, 17 spec. (MNHN); Mindoro Island, 42 spec. (BNHM), 4 spec. (SNTD); Baco, IX. 2017, 4 spec., X. 2017, 1 spec. (DUBC); Mt. Halcon, XI. 2017, 3 spec., II. 2018, 2 spec. (DUBC).

Specimens from SNTD marked as *Pachyrhynchus moniliferus* var. *neojugifer* belong to these subspecies.

Specimens from BNHM marked as *Pachyrhynchus moniliferus* var. *concinnus* belong to these subspecies.

Specimens examined: 73 specimens.
Distribution: Philippines, Mindoro Island (Fig. 2).

***Pachyrhynchus moniliferus* ssp. *jagori* Heller, 1912**

Material examined: Philippines, Catanduanes Island, 1 spec. (SNTD).
Specimans examined: 1 specimen.

Distribution: Philippines, Catanduanes Island (Fig. 2).

***Pachyrhynchus moniliferus* ssp. *stellulifer* Heller, 1912** (Fig. 5C, D)

Material examined: Philippines, Luzon Island, 162 spec. (SNTD); Aurora, IX. 2017, 1 spec. (DUBC); Barlig, XI. 2015, 1 spec. (DUBC); Belance, VIII. 2013, 2 spec., V. 2014, 1 spec., VI. 2014, 1 spec., VII. 2014, 1 spec. (DUBC); Cabagan, VIII. 2017, 9 spec., X. 2017, 1 spec. (DUBC); Isabela, VIII. 2013, 2 spec., III. 2014, 1 spec., XII. 2014, 1 spec., XI. 2015, 1 spec., II. 2016, 1 spec. (DUBC); Manilla, 142 spec. (MNHN); Pinukpok, VIII. 2017, 1 spec. (DUBC); Rizal, VI. 2017, 1 spec. (DUBC); San Pablo, IX. 2014, 1 spec., VIII. 2015, 1 spec., IX. 2015, 1 spec., XI. 2015, 1 spec. (DUBC); San Guillermo, VII. 2017, 1 spec. (DUBC).

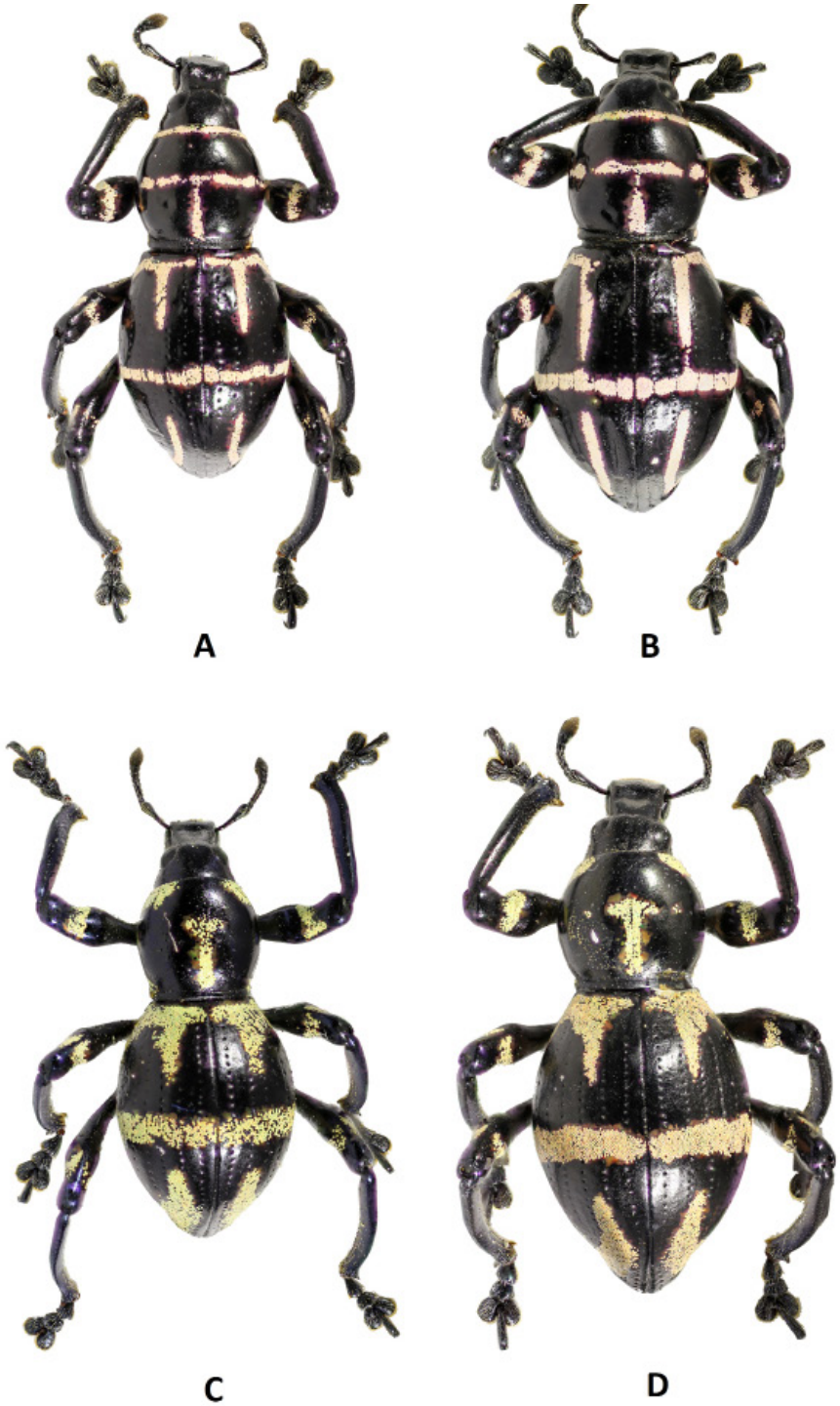

Fig. 4. Dorsal habitus of *P. moniliferus* ssp. – A – Male of *P. moniliferus* ssp. *moniliferus*; B – Female of *P. moniliferus* ssp. *moniliferus*; C – Male of *P. moniliferus* ssp. *eburnus*; D – Female of *P. moniliferus* ssp. *eburnus*.

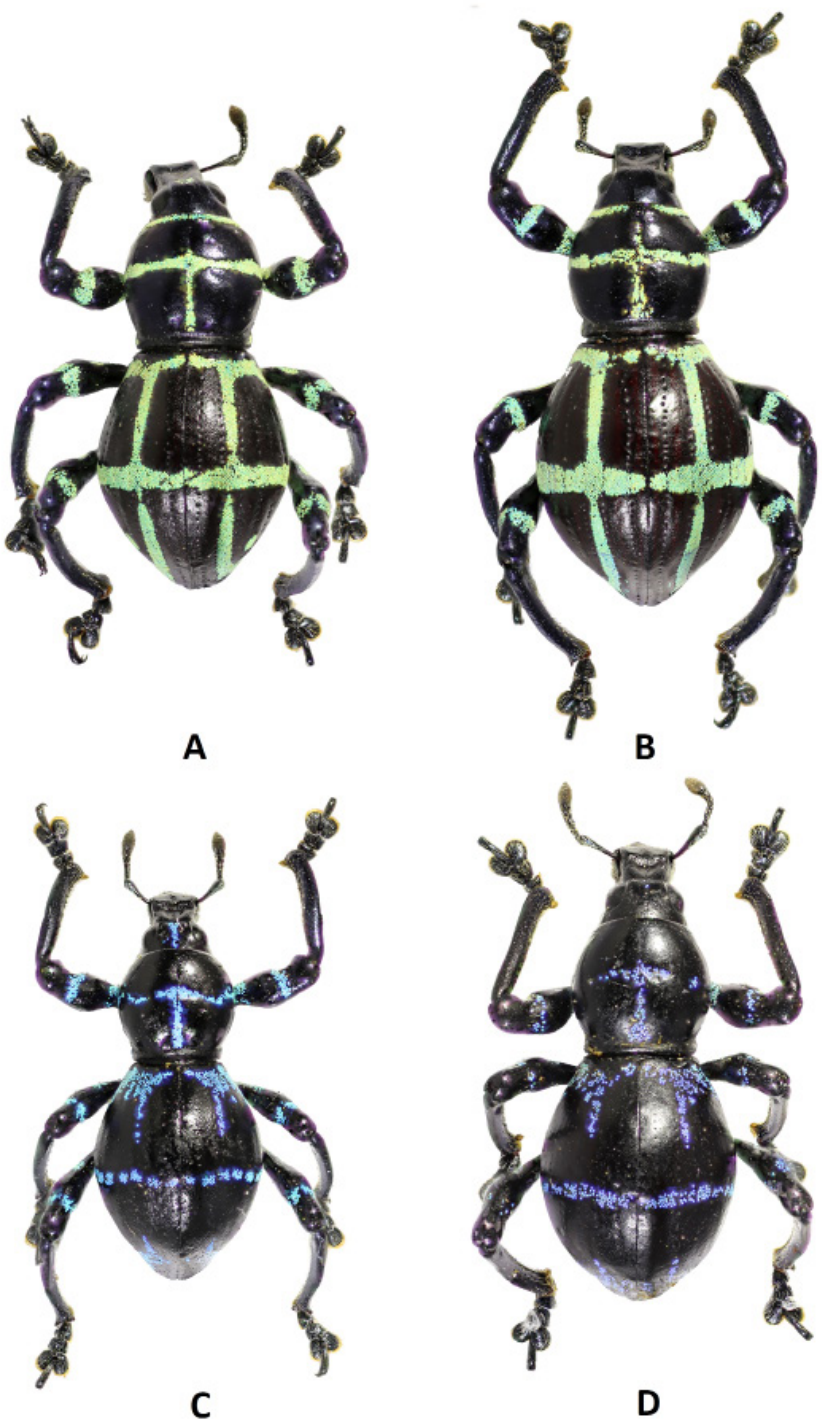

Fig. 5. Dorsal habitus of *P. moniliferus* ssp. – A – Male of *P. moniliferus* ssp. *chevrolati*; B – Female of *P. moniliferus* ssp. chevrolati; C – Male of *P. moniliferus* ssp. *stellulifer*; D – Female of *P. moniliferus* ssp. *stellulifer*.

Specimens from SNTD marked as *Pachyrhynchus moniliferus* var. *inornatus* belong to these subspecies.
Specimens examined: 334 specimens.

Distribution: Luzon Island (Fig. 2). This subspecies show high similarity to *Pachyrhynchus stellio* Heller, 1912, which is also known from Luzon Island.

DISCUSSION

Big part of material of BNHM (38 spec.) and SNTD (224 spec.) from Catanduanes Island were wrongly identified and confused with *P. decussatus* Waterhouse, 1841.

P. moniliferus is variable in size, line markings and coloration on prothorax and elytra. Markings on prothorax and elytra may be present as a few dots (*P. moniliferus* ssp. *stellulifer* etc.), or complete lines (*P. moniliferus* ssp. *chevrolati* etc.). Typical *P. moniliferus moniliferus* represents in series of local forms with most of such forms having intermediate forms.

According to previous records, general distribution of *P. moniliferus* is in central and southern Luzon, Polillo, Mindoro, and Catanduanes and reaches in a southeasterly direction to Samar. According to new data, *P. moniliferus* have wider distribution range which is from northern part of Luzon, including Babuyan Island (*P. moniliferus babuyanensis*), central and southern parts of Luzon, where distribution of three subspecies overlap (*P. moniliferus* ssp. *moniliferus*, *P. moniliferus* ssp. *stellulifer*, *P. moniliferus* ssp. *chevrolati*), Catanduanes (*P. moniliferus* ssp. *jagori*), Mindoro (*P. moniliferus* ssp. *eburnus*) and Samar (*P. moniliferus* ssp. *herbidus*). *P. moniliferus* ssp. *stellulifer* previously were recorded from Mindoro, Naujan; Mangaran; San Jose; Mount Halcon, while new records reveals that species is represented by various forms on Luzon Island.

As firstly reported by Charles Darwin and Alfred Wallace in the papers ''On the Tendency of Species to form Varieties'' and ''Perpetuation of Varieties and Species by Natural Means'' individuals within a species will have likewise genes but will be different in phenotypic features and behaviour caused by fairy differences in the genotype and response to environmental conditions. Such is the case with *P. moniliferus* with numerous local forms. For more detailed analyse of species relation and distribution paths it is necessary to investigate genetic research methods such as DNA barcoding.

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