Serangga 16(2): 1-18
ISSN 1394-5130 © 2011, Centre for Insect Systematics,
Universiti Kebangsaan Malaysia

DESCRIPTION OF A NEW SPECIES OF *BORNEOLA* MOHAMEDSAID FROM BORNEO WITH NOTES ON THEIR LARVAE (COLEOPTERA: CHRYSOMELIDAE: GALERUCINAE)

Haruo Takizawa
Nodai Institute of Research, Tokyo Agricultural Univ.,
Sakuragaoka 1-1-1, Setagaya, Tokyo, Japan 156-8502
E-mail: cpirka12@gmail.com

ABSTRACT

A new species of the genus *Borneola* Mohamedsaid, *B. mohamedsaidi*, n. sp., was described from Sabah, Malaysia. Larvae of *B. hijau* Mohamedsaid and another undetermined species of the genus were also described. Based on larval and adult characters, it was concluded that the genus belongs to the section Agelasticites of the subfamily Galerucinae.

Key words: *Borneola*, *Borneola mohamedsaidi*, n. sp., Sabah, Larvae, Chrysomelidae.

ABSTRAK

Satu spesies baru daripada genus *Borneola* Mohamedsaid, *B. mohamedsaidi*, n. sp., telah diperihalkan dari Sabah, Malaysia. Larva *B. hijau* Mohamedsaid dan beberapa spesies yang belum diketahui juga diperihalkan. Berdasarkan ciri-ciri larva dan dewasa, dapat disimpulkan bahawa genus ini adalah termasuk dalam kumpulan Agelasticites daripada subfamili Galerucinae.

Kata kunci: *Borneola*, *Borneola mohamedsaidi*, n. sp., Sabah, Larva, Chrysomelidae.

INTRODUCTION

The genus *Borneola* was established by Mohamedsaid in 1998 for two Bornean species. It is characterized by the combination of following features: Body above glabrous, oblong ovate and widened posteriorly; antennae long and filiform; pronotum convex and transverse, twice as wide as long, with all borders margined; lateral margins explanate; anterior coxal cavities opened posteriorly; elytra convex with explanate lateral margin; epipleuron abbreviated at basal 1/3rd to middle; male with last visible abdominal sternite weakly tri-lobed, with a deep median impression near apex; hind tibiae without apical spine; hind tarsi with 1st segment not distinctly longer than the followings combined; claws appendiculate. This genus was claimed to have similarity with *Morphosphaera* Baly and *Miltina* Chapuis by him, nothing has been added to the knowledge of this genus until now.

During my stay in the Institute for Tropical Biology and Conservation (ITBC), University Malaysia Sabah, I had chances to observe and examine this genus in the field. Based on these observations, I will describe a third species of the genus from Sabah, and larvae of *B. hijau* Mohamedsaid. On the basis of larval characters, it was concluded that the genus *Borneola* belongs to the group Agelasticites.

Taxonomy

Wilcox (1971-75) divided the subfamily Galerucinae into 6 tribes. After him, tribe Sermylini is composed of 6 sections, of which section Agelasticites includes 3 genera, viz. *Agelastica* Chevrolat, *Morphosphaera* Baly and *Miltina* Chapuis. When establishing the genus *Borneola*, Mohamedsaid compared this genus with *Morphosphaera* and *Miltina*. These four genera are differentiated as in the below key.

Key to the genera of section Agelasticites (modified from Kimoto, 1989)

1. Posterior tibia without spine at apex; 1st tarsal segment slender and narrow.....*Borneola* Mohamedsaid
- Posterior tibia with a spine at apex; 1st tarsal segment of posterior leg shorter and robuster. ….....….....2
2. Last 2 segments of maxillary palpus more or less enlarged; 4th segment somewhat cubical.....3
- Last 2 segments of maxillary palpus not enlarged; 4th slender and not cubical; pygidium shiny, glabrous and finely shagreened on basal half, on apical half densely punctured and pubescent; lateral margin of elytron visible from above; body ovate, dilated posteriorly; tibiae carinate and finely grooved above.....*Agelatica* Baly
3. Antennae filiform but not very slender; epipleuron distinct only before middle.....*Morphosphaera* Baly
- Male with 2nd and 3rd antennal segments minute; 4th to 10th with fairly long projections endoapically; female with 2nd antennal segment minute; 3rd twice as long as 2nd; 5th to 11th each somewhat flattened; 5th to 10th slightly produced endoapically; epipleuron distinct until apex.....*Miltina* Chapuis

Borneola mohamedsaidi n. sp. (Fig. 1A)

Male. Body ovate, 6 mm in length, strongly widened from humerus to posteriorly, widest slightly behind middle of elytra, convex dorsally; shining brown with legs and venter paler; antennae black, except for 3 basal segments brown and 2 apical ones whitish.

Head distinctly narrower than prothorax; vertex convex and impunctate, impressed with a thin median line which is not reaching frontal tubercles; frontal tubercles triangular with acute anterior angle producing between antennal sockets, clearly separated from each other by a narrow and deep median line; frons transversely triangle, raised and ridged on lateral margins, medially depressed or flat on the disc, almost twice as wide as

long; rather strongly depressed around antennal sockets; archedly emarginated at anterior margin; clypeus flat and yellowish white; labrum transverse, gently round on anterior margin; labial palpi with 2 apical segments enlarged and short; eyes widely separated from each other, distance between them almost twice as wide as longitudinal diameter of eye; antennae 4/5 as long as body, rather stout, thickly pubescent beyond 2nd segment; 1st segment 2.7 times as long as 2nd; 3rd twice as long as 2nd; 8th twice as long as wide; relative length of each antennal segment as: 1st > 4th > 5th = 6th > 3rd = 7th > 8th = 9th > 11th> 10th > 2nd.

Pronotum transverse, twice as wide as long, margined on all borders; convex, covered with small punctures; deeply emarginated at anterior margin, archedly produced at posterior margin, roundly narrowed anteriorly, and narrowly explanate on lateral margins; both anterior and posterior angles round; the posterior angle obsolete, represented by a small fovea with a short seta. Scutellum tongue-shaped and convex longitudinally, 1.3 times as long as wide. Elytra broad, 1.4 times as long as wide, widest at posterior 1/3rd, rather strongly convex on the dorsum, widely explanate along lateral margins; shining and densely covered with punctures, the diameter of which is distinctly narrower than their interspaces; disc shallowly depressed posteriorly to scutellum; epipleuron wide basally, with innerborder margined and longitudinally sulcate on basal 1/4, hence becoming obsolete.

Venter covered with yellow pubescence; prosternal process narrow, but visible between fore coxae; 5th visible abdominal sternite weakly tri-lobed, with transverse and short median lobe; median lobe deeply incised medially; aedeagus weakly curved in lateral view, with long median orifice; gently narrowed from base to apex, which is obtusely pointed; venter with a sharp and long carina medially (Fig. 2a); legs fairly slender; posterior tarsus with 1st segment distinctly shorter than the followings combined together.

Female: Body 7.5 mm in length; similar to the male, except for the last visible abdominal sternite simple, not tri-lobed; relative length of antennal segments as: 1st = 4th > 5th = 6th > 3rd = 7th = 8th > 9th = 11th > 10h > 2nd.

Holotype: male, Kg. Kiapad, Inanam, Kota Kinabalu, Sabah, Malaysia, 12.VII.2009, H. Takizawa leg. (BORNEENSIS collection, ITBC, UMS)
Paratypes: 1 female, Poring Park, Ranau, Sabah, 21-22.I.2008, H. Takizawa leg.; 1 male, ditto, 4-5.IV.2008, H. Takizawa leg.; 1 male, Kg. Kiapad, Inanam, Kota Kinabalu, Sabah, 22.III.2009, H. Takizawa leg.
Distribution: Borneo (Sabah).
Remarks. This new species resembles to *B. variabilis* in its body shape and brownish coloration, but is clearly differentiated by its blackish antennae with shorter and robuster segments and with 2 apical segments whitish. The male aedeagus is somewhat similar to *variabilis* with a long median orifice, but is much weakly curved and shorter than in *variabilis*. Both *mohamedsaidi*, n. sp. and *variabilis* are clearly separated from metallic greenish *B. hijau* Mohamedsaid as shown in the key.

This new species was found at lower areas, viz. Kg. Kiapad (100-200m, asl) and Poring Park (700-1,000m asl), compared with *hijau* recorded from Kinabalu Park, HQ. (1,500-1,900m asl), Kundasang (1,200-1,300m asl), Gn. Alab (1,700-1,900m asl). But *variabilis* seems occuring on lower areas such as Poring Park (700-1,000m asl).

Since specimens examined were collected by sweeping, its host plant was not confirmed. A lot of lavae feeding on *Ficus* sp. were collected at Mahua Waterfall (700-800m, asl), Tambunan, but unfortunately were not reared to adults. These larvae were assumed to belong to *mohamedsaidi*, n. sp. or *variabilis*, on account of characteristic tubercular pattern and 8 pairs of defensive glands on the abdomen. Adults and larvae of *hijau* also feed on *Ficus subteriana* and *Ficus* spp. at Kinabalu Park, HQ.

This new species is dedicated to Dr. M. S. Mohamedsaid of Kuala Lumpur, who established this genus, as a token of my gratitude for his kind support to my study.

Borneola hijau Mohamedsaid (Fig. 1B)

Male: Body shape similar to *mohamedsaidi*, n. sp., 6.5–7 mm in length; dorsum metallic greenish blue; venter black; antennae black with last 2 segments whitish; labrum anteriorly brownish.

Antennae rather robust, with 8th segment 3 times as long as wide; distance between eyes 1.3 times as wide as longitudinal diameter of eye; frontal tubercles ending above antennal sockets; labial palpi with 4th segment truncate at apex. Scutellum triangular and flat, almost as long as wide; epipleuron with inner border margined on basal 1/3.

Aedeagus blackish brown, slender with short median orifice, rather strongly curved with apical portion produced in a slender process; venter without carina (Fig. 2cc).

Female: Body slightly larger, 7-8 mm in length; similar to males, but with the last visible abdominal sternite simple.

Specimens examined: 1 ex., Gn. Alab, Crocker Range Park, Tambunan, Sabah, 26.I.2008, H. Takizawa leg.; 1 ex., ditto, 20.II.2008, H. Takizawa leg.; 1 ex., ditto, 20.III.2008, H. Takizawa leg.; 1 ex., 12.IV.2008, H. Takizawa leg.; 1 ex., ditto, 28.IV.2007, H. Takizawa leg.; 1 ex., ditto, 30.V.2008, H. Takizawa leg.; 1 ex., ditto, 17.VI.2007, H. Takizawa leg.; 1 ex., ditto, 22.VI.2007, H. Takizawa leg.; 1 ex., ditto, 24.VI.2007, H. Takizawa leg.; 1 ex., ditto, 26.VII.2007, H.Takizawa leg.; 1 ex., ditto, 28.VII.2007, H. Takizawa leg.; 1 ex., ditto, 14.X.2007, H. Takizawa leg.; 1 ex., ditto, 27.XI.2008, H. Takizawa leg.; 1 ex.,ditto, 20.XII.2008, H. Takizawa leg.; 1 ex., Kundasang**,** Ranau, Sabah, 5.I.2008, H. Takizawa leg.; 1 ex., ditto, 18.I.2009, H. Takizawa leg.; 1 ex., ditto, 21.III.2009, H. Takizawa leg.; 1 ex., 14.VII.2007, H. Takizawa leg.; 1 ex., ditto, 22.IX.2007, H. Takizawa leg.; 1 ex., ditto, 20.X.2007, H. Takizawa leg.; 1 ex., ditto, 19.XI.2008, H. Takizawa leg.; 1 ex., ditto, 17.XII.2007, H. Takizawa leg.; 1 ex., Kinabalu Park, HQ, Ranau, Sabah, 18.I.2008, H. Takizawa leg.; 1 ex., ditto, 22.I.2008, H. Takizawa leg.; 1 ex., ditto, 7.II.2008, H. Takizawa leg.; 1 ex., ditto, 20.II.2008, H. Takizawa leg.; 3 exs., 24.II.2009, H. Takizawa leg.; 1 ex., 28.II.2008, H. Takizawa leg.; 1 ex., ditto, 26.II.2008, H. Takizawa leg; 1 ex., ditto, 24.III.2008, H. Takizawa leg.; 1 ex., ditto, 14.IV.2008, H. Takizawa leg.; 1 ex., ditto, 13.V.2008, H. Takizawa leg.; 1 ex., 27-28.V.2008, H. Takizawa leg.; 1 ex., ditto, 29.VI.2008, H. Takizawa leg.; 1 ex., ditto, 8.VII.2008, H. Takizawa leg.; 1 ex., ditto, 10.VIII.2007, H. Takizawa leg.; 1 ex., 27.IX.2007, H. Takizawa leg.; 1 ex., ditto, 16.X.2007, H. Takizawa leg.; 1 ex., ditto, 22.X.2007, H. Takizawa

leg.; 1 ex., ditto, 21.XII.2007, H. Takizawa leg.; 5 exs., ditto, 23-24.XII.2008, H. Takizawa leg.; 1 ex., Mesilau, Ranau, Sabah, 21.II.2008, H. Takizawa leg.; 1 ex., ditto, 6.III.2008, H. Takizawa leg.; 1 ex., ditto, 28.V.2010, H. Takizawa leg.
Host plants: *Ficus subteriana* and *Ficus* spp. (Fig. 3A)
Distribution: Borneo (Sabah).
Remarks. This species is rather common in montaneous areas of 1,200 – 1,900m asl, feeding on leaves of *Ficus* spp. along trails (Fig. 3B). This is found all year round at Kinabalu Park, HQ area, except for November, but Mohamedsaid reported specimen collected on November at the same area (Mohamedsaid, 1998).

Borneola variabilis Mohamedsaid (Fig. 1C)

Male. Body shape and pale brown coloration similar to *mohamedsaidi*, n. sp., 7 mm in length; distance between eyes 1.5 times as wide as longitudinal diameter of eye; maixillary palpi with 3rd segment as wide as 4th; 4th bluntly cubical at apex; antennae pale brown, rather slender; 4th antennal segment as long as 1st; 8th 3.5 times as long as wide; pronotum with anterior angle distinctly angulate; scutellum oblong ovate and flat, as long as wide; epipeluron with inner border marginate on basal half; aedeagus longer, pale brown, strongly curved in lateral view and curved downward at apex; venter with a long median carina (Fig. 2bb); fore tarsus with 1st segment wide, twice as long as wide.

Female. Body 7-8 mm in length; 5th visible abdominal sternite simple at apex.
Specimens examined: 1 male, Poring Park, Ranau, Sabah, 28-29.XI.2007, H. Takizawa leg.; 1 male, 1 female, Muaya Waterfall, Kg. Muaya, Sipitang, Sabah, 7-9.III.2009, H. Takizawa leg.; 1 female, Teng Bukap, Sarawak, 25.II.1993, K. Maruyama leg.; 1 female, Kpg. Sikau, Sarawak, 26.II.1993, K. Maruyama leg.
Distribution: Borneo (Sabah, Sarawak).
Remarks. This species seems inhabiting lower area and rare. I could examine only 5 specimens. They are all brownish specimens, though Mohamedsaid mentioned presence of individuals with blackish elytra in Sabah. Specimens were collected in February, April, May, June, November and December.

Key to the species of genus *Borneola* Mohamedsaid

Adult

1a. Body above metallic blue; legs and antennae blackish, except for 2 apical antennal segments whitish; pronotum almost subparallel-sided, with impunctate disc; male aedeagus short and blackish brown, with apex straightly curved downward.....*B. hijau*

1b. Body above brownish to dark brownish; pronotum roundly widened from base to apex, with densely punctate disc.....2

2a. Antennae blackish with 2 apical segments yellowish brown; 5th to 8th segments each slightly widened; 8th twice as long as wide; male aedeagus gently curved in lateral view, and almost straight at apex.....*B. mohamedsaidi*, n. sp.

2b. Antennae light brownish; 5th to 11th segments each slender; 8th segment 3.5 times as long as wide; male aedeagus strongly curved in lateral view, and distinctly curved downward at apex.....*B. variabilis*

Larva

A lot of larvae feeding on *Ficus* spp. were observed at Kinabalu Park, HQ., Poring Park, Gn. Alab, and Kundasang. These larvae are chracteristic in having 8 pairs of defensive glands opening on tubular projection on the abdomen. From this character these larvae are considered to belong to the genus group *Agelastica* (Takizawa, 1972). Hence larvae with tubular projections and defensive glands are unknown, these larvae are considered as members of *Borneola*. This assumption is supported by the fact that both adults of *hijau* and these larvae are found common on *Ficus* spp. in surveyed areas. These larvae are characterized by tubercular patterns of: Prothorax in *D-DL-Epa* type; meso- and metathorax in *DLai*, *DLpi*, *DLe* type; abdomen in *Dm* type with *DL*.

Larvae of glanduliferous group are distinguished by the following key.

Key to genera of glanduliferous larval group

1a. Body without paired defensive glands on the dorsum; abdominal segments with or without *Dm* on the dorsum.....Non-glanduliferous group
1b. Body with 8 to 12 pairs of defensive glands on the dorsum; abdominal segments with *Dm* on the dorsum.....2
2a. Thorax and abdomen with paired defensive glands.....3
2b. Abdomen only with paired defensive glands.....7
3a. Thoracic segments and first to eighth abdominal segments each with a pair of defensive glands.....4
3b. Meso- & metathorax each with 2 pairs of defensive glands; first to eighth abdominal segments each with a pair of defensive glands.....*Arthrotus* Motschulsky
4a. Dorsum with extremely short setae and narrow tubercles..... *Hamushia* Chujo
4b. Dorsum with longer setae and broader tubercles.....5
5a. Abdomen with *Da* on both sides separated; *Dpi* on both sides fused into a slender band.....*Sphenoraia* Clark
5b. Abdomen with *Da* and *Dpi* on both sides each fused into a slender band; or both *Da* and *Dpi* on both sides separated.....6
6a. Full grown larva with *EP* and ventral tubercles dechitinized..... *Agelasa* Motschulsky
6b. Full grown larva with well-chitinized *EP*; if ventral tubercles dechitinized, *Da* and *Dpi* on both sides separated.....*Gallerucida* Motschulsky
7a. Abdomen with defensive glands opening as a slit between *DLa* and *DLp*..... 8
7b. Abdomen with defensive glands opening at apex of long cylindrical *DL*.....*Borneola* Mohamedsaid
8a. Dorsum dark brown to blackish, densely covered with chitinous platelets; *Da* and *Dpi* on both sides each fused into slender band.....*Agelastica* Chevrolat
8b. Dorsum yelllowish white, without dense chitinous platelets; abdomen with *Da* on both sides separated.....*Morphosphaera* Baly

Borneola hijau Mohamedsaid (Fig. 4)

Fully grown larva: Body 10 mm in length; subcylindrical, subparallel-sided on metathorax to 3rd abdominal segment, hence slightly narrowed both anteriorly and posteriorly; yellowish white with dorsal and dorso-lateral areas dark brown; tubercles and legs dark brown; abdomen with 8 pairs of defensive glands, opening apically on long tubular *DL;* with a lonigtudinal stripe of dense chitinous platelets around *EP*.

Head ovate in outline, slightly longer than wide, with a pair of black ocelli; epicranial suture divaricated behind middle, with straight arms; endo-carina distinct; vertex with 4 pairs of long setae; frons slightly depressed medially, with 3 pairs of long setae; with 6 setae below eye and antennal sockets; antennae 2-segmented with an accessory appendix; clypeus basally brownish, with 2 pairs of setae; labrum rounded on apical margin, with 2 pairs of short setae; mandible with 4 tooth; lacinia undeveloped.

Pronotum with *D-DL-Epa* (10L2S) and small *EPp* (1S); *D-DL-EPa* with 4 small pinnhead elevations; *P* (1L); *ES-SS* (2S) subquadrate and weakly chitinized. Meso-and metathorax dorsally with 2 transverse band: *Da-DLai* (2L) and *Dp-DLpi* (4L); these bands narrowly separated from homologous ones on the other side; *DLe* (4L) large; mesothoracic spiracle united with *EPa* (1L1S); both *EPa* (1L1S) and *EPp* (1S) distinctly smaller than *DLai*; a small round tubercle without setae present laterally to *EPa*; *P* (1L); *ES* (1S) and *SS* (1S) small and weakly chitinized. 2nd abdominal segment with *Dpi* (1L) on both sides united; *Dpe* (1L)small; *Dm* (1L) smaller than *Dpe*; *Da* (1L) on both sides separated; *DLa* and *DLp* forming a long tubule (*DL*: 4L), on whose apex defensive gland is opening; all these tubercles fused into a large tubercle covering dorsum; spiracle situated laterally to *DL*; *EP* (3L) oval, large and convex; *P* (1L3S) slightly narrower than *EP*; *PS* (1L2S) larger than *SS* (1S); a minute tubercle present anteriorly to *PS*; *ES* (1S) minute; 8th abdominal segment with *Dpi* and *Dpe* fused into *Dp* (2L), on both sides united; pygidium with 6 pairs of long setae. Claws appendiculate, with pulvillus chitinized apically.

Specimens examined: 6 exs., Kinabalu Park, HQ, Ranau, Sabah, 28-29.II.2008, H. Takizawa leg.; 4 exs., ditto, 14-15.IV.2008, H. Takizawa leg.; 11 exs., ditto, 23-25.VII.2008, feeding on *Ficus subteriana*, H. Takizawa leg.; 1 ex., ditto, 23-24.XII.2008, H. Takizawa leg.; 3 exs., Gn. Alab, Tambunan, Sabah, 15.IX.2007, H. Takizawa leg.

Remarks. Determination is based on common occurrence of both adults and larvae in these mountaneous areas. With extensive surveys of 46 days in Kinabalu Park, 23 days in Gn. Alab, and 21 days in Kundasang for 4 years, I could find only *B. hijau* on these areas.

First instar larva is characterized by small, separate tubercles and absence of chitinous platelets. Second instar larvae look like the 3rd instars, with dorsal and dorso-lateral tubercles enlarged and fused together to cover dorsal and dorso-lateral areas, but tubular tubercle *DL* is shorter. This 1st instar larva is similar to that of *variabilis-mohamedsaidi*, but may be ditinguished by the absence of meso- and metathoracic *EPp*.

Larvae were found feeding on leaves of *Ficus subteriana* and *Ficus* spp. (Fig. 3C) along trails on February, April, July, September and December. Judging from body size, the larvae most probably passes 3 instars stages. When fully grown, they seem to enter the soil and pupate like other members of glanduliferous genera.

Borneola sp. (*variabilis* Mohamedsaid or *mohamedsaidi*, n. sp.) (Fig. 5)

Body 12 mm in length; subcylindrical and subparalel-sided on methathorax to 5th abdominal segments, weakly narrowed both anteriorly and posteriorly; yellowish white, head and legs yellowish brown; tubercles dark brown; dorsal and dorso-lateral tubercles almost united with dense chitinous platelets; epipleural region densely covered with chitinous platelets; abdomen with 8 pairs of defensive glands opening apically on long tubular *DL*.

Head ovate in outline, slightly longer than wide; surface smooth; clypeus and labrum yellowish white; epicranial suture divaricated behind middle, with arms weakly curved; endo-carina

distinct; vertex and frons each with 3 pairs of long setae; frons narrowly brownish at anterior margin; with 6 pairs of long setae below eye and antennal socket; clypeus with 2 pairs of setae; labrum rounded at anteior margin, with a pair of setae; mandibles without distinct teeth; lacinia undeveloped.

Prothorax with *D-DL-EPa* (11L7S) and *EPp* (1L); *ES-SS* (2M) weakly chitinized; meso- and metathorax with *Da* (1L), *Dp* (1L1S) on both sides united; *DLai* (2S), *DLpi* (1L1S), *DLe* (5L); mesothoracic spiracle united with *EPa* (1L1S) which is as large as *DLai*; *EPp* disappeared in last instra larva; a small tubercle without setae situated anteriorly to trochantin; *P* (1L), *SS* (1S) hardly chitinized; *ES* (1M) small. 2nd abdominal segment with *Da* (1L) not united with *Da* on the other side; 2 small tubercles situated anteriorly to *Da*; *Dpi* (1L) on both sides united; *Dm* (1L); *Dpe* (1L); *DLi* and *DLe* fused into long tubular *DL* (4L), on which defensive glands are opened; *EP* (3L), *P* (2L5S), *PS* (3S); *SS* (1S), *ES* (1S), hardly chitinized; spiracles situated exteriorly to *DL*.

Eighth abdominals egment with *Dpi* and *Dpe* fused into *Dp* (2L), on both sides united; pygidium (10L8S). Legs pale brown; claws appendiculate, with pulvillus chitinized apically.

Specimens examined: 9 exs., Poring Park, Ranau, Sabah, 8-9.VII.2008, H. Takizawa leg.; 4 exs., ditto, feeding on *Ficus* sp., 7-8.XII.2008, H. Takizawa leg.

Remarks. Determination is tentative, and is based on the fact that *B. hijau* was not found at Poring after 49 days of collecting. They feed on leaves of *Ficus* sp., showing peculiar defensive behaviour of cycloalexy (Fig. 3D: Vasconcellos-Neto & Jolivet, 1998).

ACKNOWLEDGEMENTS

I wish to thank Dr. Abdul Hamid Ahmad, the director of the Institute of Tropical Biodiversity and Conservation (ITBC), Universiti Sabah Malaysia for his kind help and hospitality during my staying in ITBC, also to the authorities of Japan International Cooperation Agency (JICA) for sending me to ITBC as a volunteer researcher.

REFERENCES

Kimoto, S. 1989 Chrysomelidae (Coleoptera) of Thailand, Cambodia, Laos and Vietnam. IV. Galerucinae, Esakia, Kyushu Univ., 27: 1-241.

Takizawa, H. 1972 Descriptions of larvae of glanduliferous group of Galerucnae in Japan, with notes on subdivisions of the subfamily (Coleoptera: Chrysomelidae), *Insecta Matsumurana* suppl. 10, 1-14.

Mohamedsaid, M. S. 1998, *Borneola*, a new genus of Galerucinae from Malaysia (Coleoptera: Chrysomelidae). *Serangga* 3(1): 15-22

Vasconcellos-Neto, J. & Jolivet, P. 1988 Une nouvelle strategie de defense: la strategie de defense annulaire (cycloalexie) chez quelque larves de Chrysomelides bresiliens. *Bull. Soc. Ent. Fr.* 92 (9-10): 291-299.

Wilcox, J. A. (1971-75) Coleopterorum Catalogus, Supplementa, Chrysomelidae: Galerucinae, pars 78 (1-4), 770 pp.

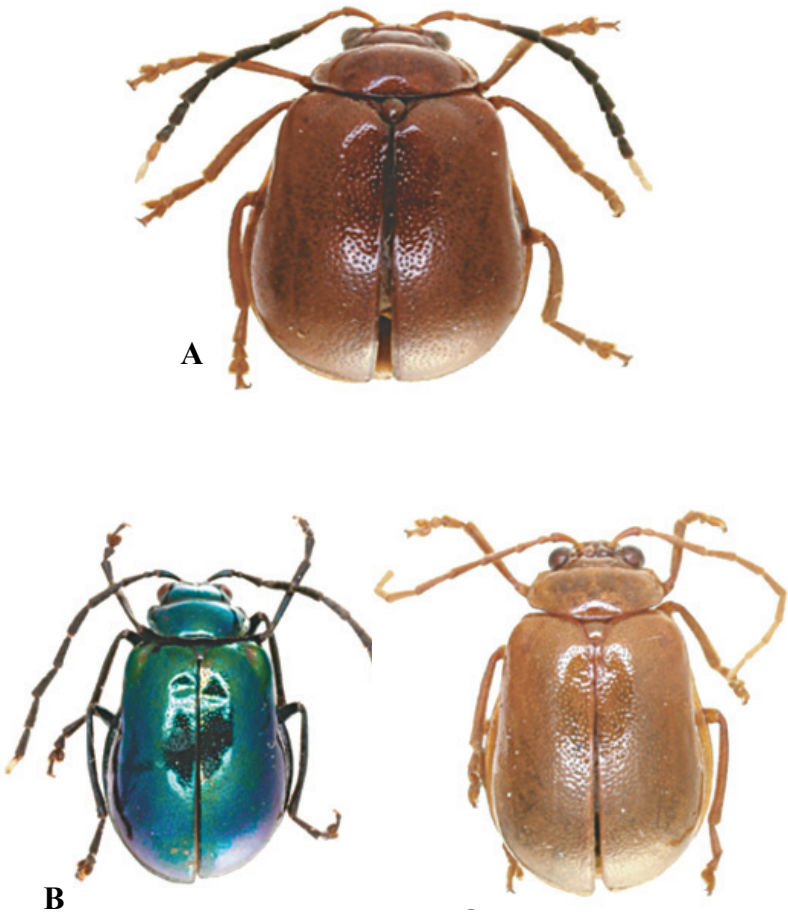

Figure. 1. (A). *Borneola mohamedsaidi*, n. sp. (holotype),
(B). *Borneola hijau* Mohamedsaid (Kinabalu Park),
(C). *Borneola variabilis* Mohamedsaid

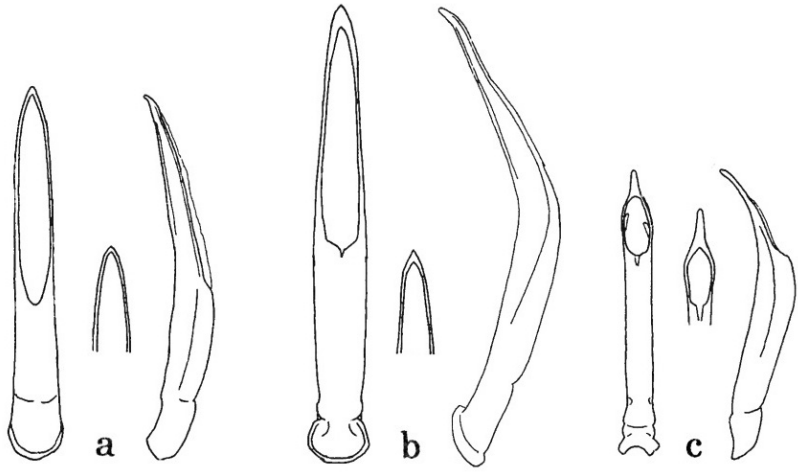

Figure. 2. Aedeagus of *Borneola* spp. (left: dorsal view; middle: apical portion; right: lateral view) of: (a) *B. mohamedsaidi*, n. sp. (holotype). (b) *B. variabilis* Mohamedsaid (Poring Park). (c) *B. hijau* Mohamedsaid (Kinabalu Park).

Figure. 3. (A) *Ficus* sp., a host plant of *B. hijau,* (B) *B. hijau* on *Ficus* sp. at Kinabalu Park, (C) Larvae of *B. hijau* feeding on host at Kinabalu Park, (D) Larvae of *Borneola* sp. feeding on *Ficus* sp. at Poring Park.

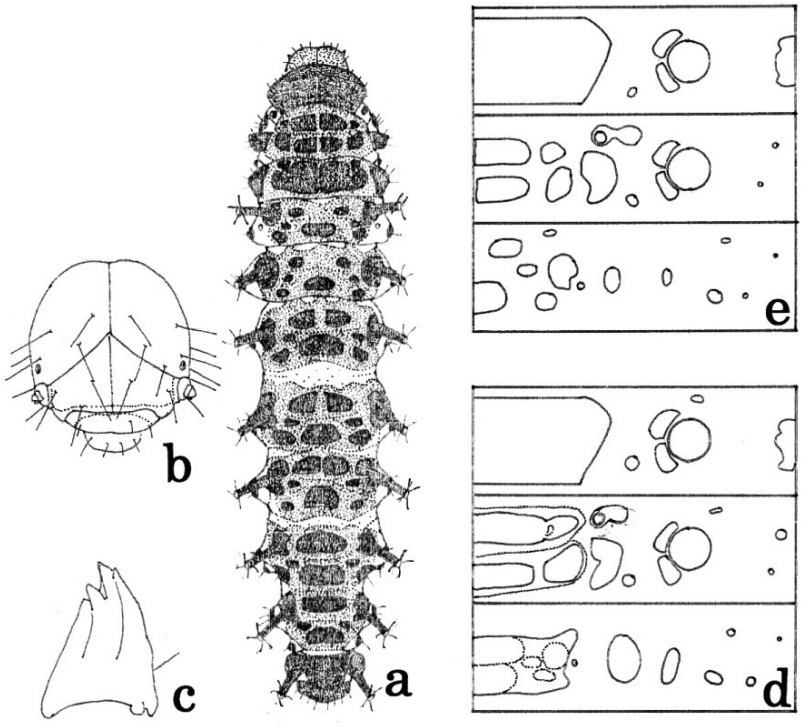

Figure. 4. Larva of *B. hijau* Mohamedsaid
(a) habitus of last instar larva. (b) head capsule. (c) mandible. (d) schematic presentation of tubercle pattern (above: prothorax, middle: mesothorax, below: 2nd abdominal segment). (e) ditto, 2nd instar larva.

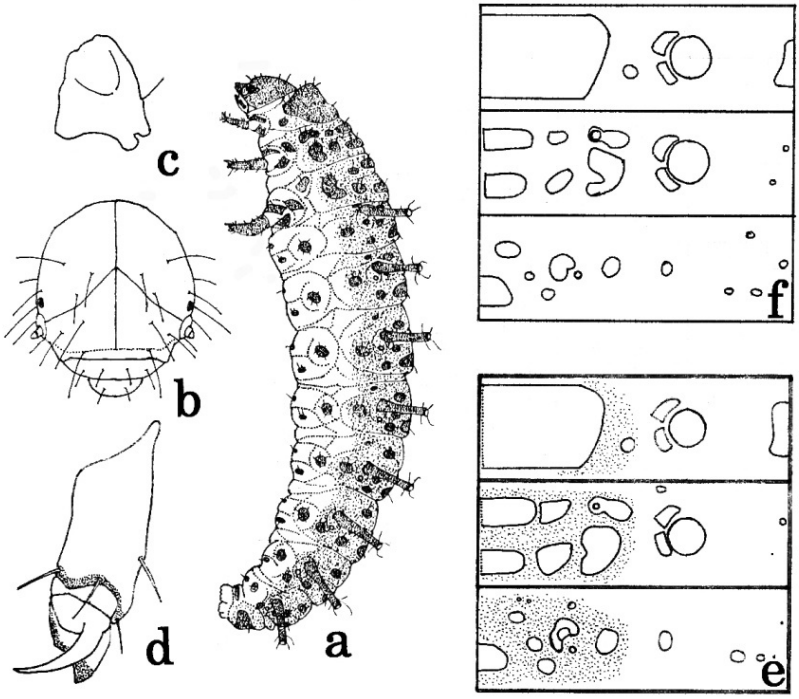

Figure. 5. Larva of *Borneola* sp.
(a) habitus of last instar larva. (b) head capsule. (c) mandible. (d) fore tarsus. (e) schematic presentation of tubercle pattern of last instar larva (above: prothorax, middle: mesothorax, below: 2nd abdominal segment). (f) ditto, 1st instar larva.