

Discovery of a Flightless *Aegus* (Coleoptera, Lucanidae) in Borneo¹⁾

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Abstract A new flightless *Aegus* is described from Mt. Mulu of Borneo. It resembles *A. cervicornis* DIDIER, but is distinguishable from the other Southeast Asian *Aegus* including *A. cervicornis* by its gourd-shaped body, atrophied wings and firmly interlocked elytra. The morphology of its third (final) instar larva is also reported.

Hindwing atrophy is known in several lucanid genera, such as *Apterocyclus* of Hawaii, *Apterodorcus* of Chili, *Colophon* of South Africa, and *Lissapterus* and *Lissotes* of Australia and New Zealand.

By the Kyoto University Expeditions to Sarawak in 1989, a female of the genus *Aegus* with atrophied wings was captured at the base camp near the summit of Mt. Mulu. In addition to this female, one damaged carcass of male and a few larvae of the same species were also collected at the same locality. The male carcass was so damaged that I was unable to examine male genitalic characters which may be necessary for determination of the true affinity of this *Aegus* with other congeneric members. However, the female of this form has very peculiar morphology and can be readily distinguished from any other *Aegus* species. After a further examination, it has become clear that this flightless *Aegus* is new to science as expected. Thus, I am going to describe this new *Aegus* species mainly based on the female characters. The morphology of the third (final) instar larva will be also reported.

The abbreviations of morphometric measurements (mm) of adults used herein are: BL – body length without mandibles; BT – body thickness; HL – head length; HW – head width; ML – mandible length; PL – pronotum length; PW – pronotum width; EL – elytra length; EW – elytra width; FTL – right front-tibial length; FTW – right front-tibial width. The genital organs were observed in 70% ethanol after treating it with weak solution of potassium hydroxide.

In the description of genitalia, I adopt the terminology of HOLLOWAY (1960). All the terms of larval morphology can be found in LAWRENCE (1981), and those of hindwings in HOLLOWAY (1963).

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Aegus hikidai ARAYA, sp. nov.

(Figs. 1-21)

Description of holotype (Figs. 1-3). Female (Fig. 1). Length from anterior margin of head (excluding mandibles) to apex of elytra 12.14 mm. Dull brownish black in color, depressed, upper surface frosted, closely and shallowly punctured, the punctures filled with yellowish matter and each bearing a very minute short seta. Legs and extremities of elytra clothed with short yellowish grey hairs.

Head transverse, strongly and closely punctured; anterior margin nearly straight and lateral margins triangularly projected outwards behind eyes. Mandibles short and evenly arcuate, with a process in middle. Clypeus roundly emarginate at the apex. Eye with distinct canthus completely covering outer margin. Antenna consisting of ten segments and partially geniculate; eight to tenth segments forming wholly pubescent club. Pronotum broader than long with rounded anterior lobes; lateral margins nearly parallel and strongly convergent to the narrow base. Elytra clothed with short yellowish grey hairs, firmly interlocked along the suture, and rounded at the sides, each with 6 deep striae upon the dorsal part, sutural interval fairly closely

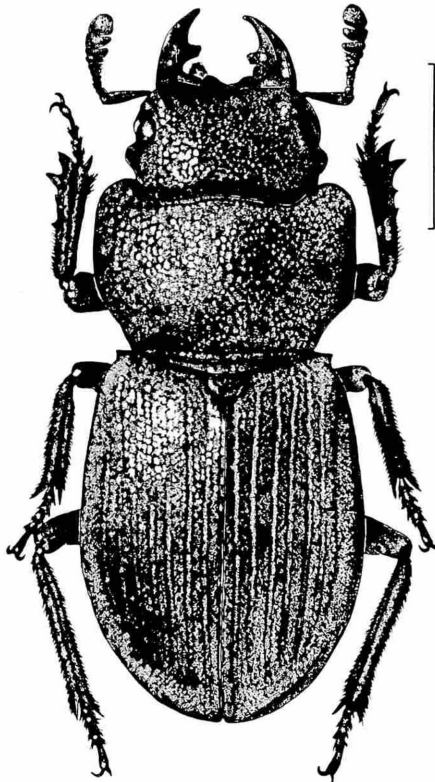
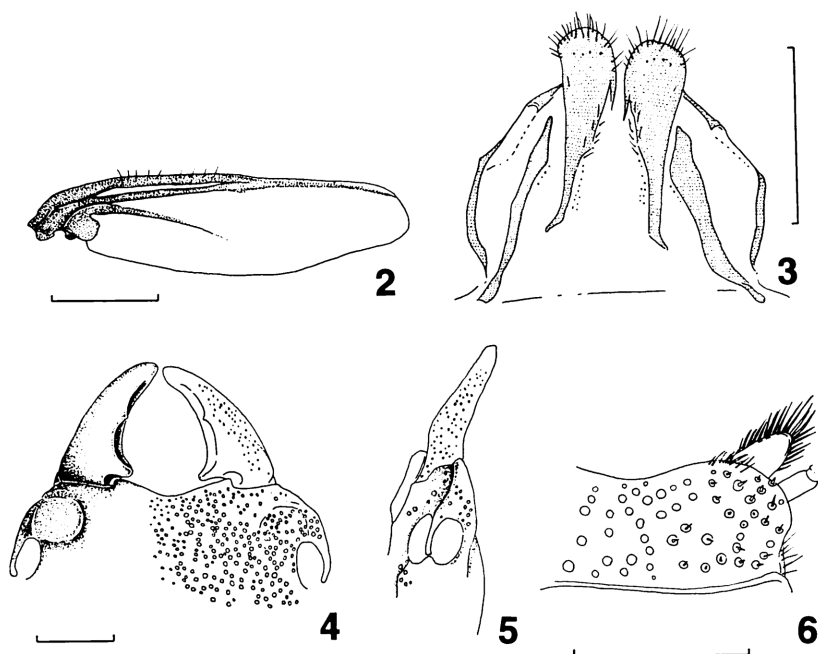


Fig. 1. *Aegus hikidai* ARAYA, sp. nov., ♀, holotype. Scale: 3 mm.

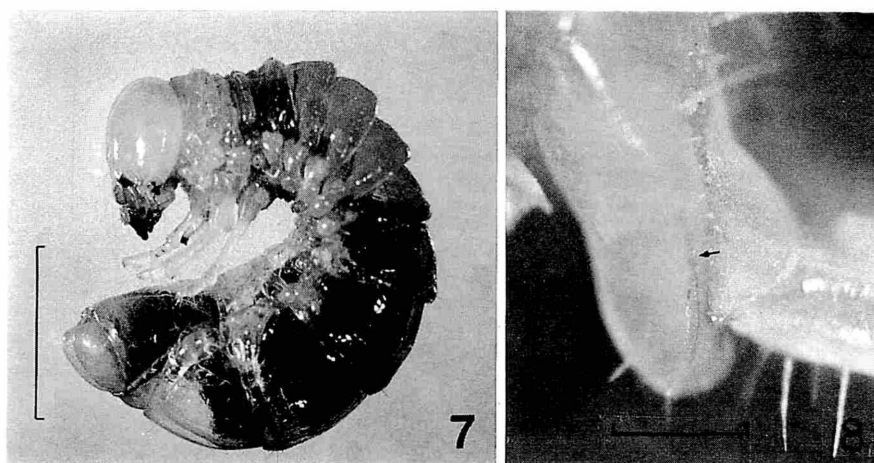


Figs. 2-6. *Aegus hikidai* ARAYA, sp. nov. — 2-3, ♀, Holotype; hindwing (2); female genitalia (3). Scales: 1 mm. — 4-6, ♂, Paratype; head, dorsal view (4); same, ventral view (5); mentum (6). Scales: 1 mm.

and the remaining intervals very finely and scantily punctured, the outer margins broad, flat, strongly punctured and setose; each sloping shoulder with a sharp projection. Hindwings (Fig. 2) very short and atrophied, 0.52 times the elytral length (about 3.2 mm in length); anal areas greatly reduced and not only the apical but also the radial recurrent parts disappeared, only costa and radius clearly recognizable; along the costal margin with short setae. Legs short, rather slender, clothed with short yellowish grey hairs; front tibia with three fine teeth before the terminal fork; middle tibia with two lateral spines; hind tibia without lateral spines. Metasternum coarsely punctured; abdomen clothed beneath with yellow setae. Female genitalia (Fig. 3) without styli, hemisternite relatively large and well sclerotized, with setae at the posterior end. BL - 12.14; BT - 3.57; HL - 1.86; HW - 3.54; ML - 1.26; PL - 3.04; PW - 4.81; EL - 6.58; EW (at widest part) - 5.15, (at shoulder) - 4.08; FTL - 2.29, FTW - 0.54.

Male (Figs. 4-6). Head (Figs. 4-5) transverse, strongly and closely punctured, with a protuberance at the anterior part of each eye. Each mandible short and slightly arcuate, with developed basal tooth bearing dull apex, and with a trace of upper tooth at middle part. Mentum (Fig. 6) roundly emarginate at the apex, with punctures each bearing a very short minute seta. HL - 2.20; HW - 3.75; ML - 1.85.

Third (final) instar larva (Figs. 7-21). Body length 21.5 (mm); body width 4.2 (at

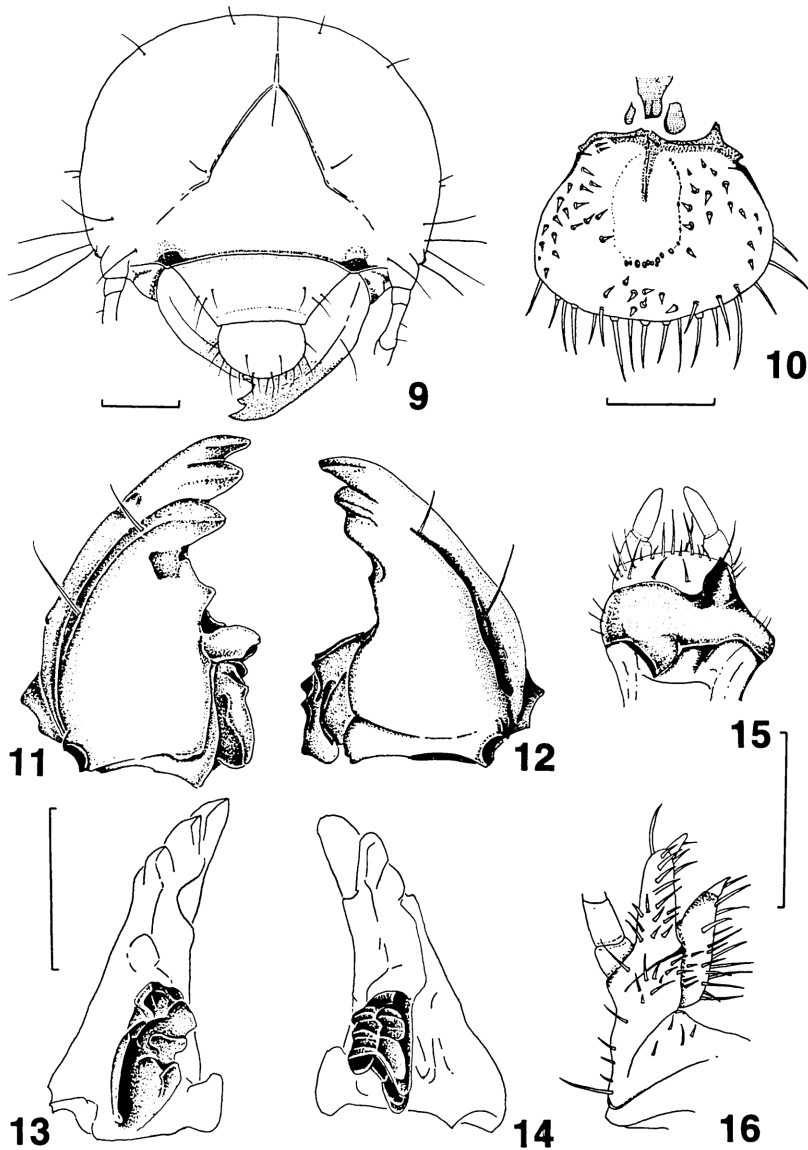


Figs. 7–8. Third (final) instar larva of *Aegus hikidai* ARAYA, sp. nov., lateral view (7); mesocoxal pars stridens (8). Scales: 5 mm for Fig. 7; 0.5 mm for Fig. 8.

thoracic part), 5.5 (at abdominal part); head length (from vertex to fronto-clypeal suture) 3.1; head width 4.7. Body (Fig. 7) elongate and cylindrical, bent in a C-shape, whitish in color, abdomen swollen posteriorly; head yellowish brown; legs yellowish brown.

Head capsule (Fig. 9) yellowish brown in color, ovoid, 1.2 times as wide as long, and sparse and short setae on antero-lateral part. Antennae with 4 segments, moderately long. Lateral ocellus present at each basal side of antenna. Clypeus transverse and trapezoidal, narrowed anteriorly, with short setae at antero-lateral parts. Labrum transverse, widened anteriorly, rounded at anterior margin bearing long setae. Epipharynx (Fig. 10) with 8–9 spine-like setae in haptomerum, well separated from protophoba; phoba asymmetrical, lateral side present only at one side, protophoba consisting of short blunt peg, left part of phoba consisting of blunt peg, but right part lacking; left side of chaetoparia with about 16 setae, and the right with about 20 setae; pternotormae weakly developed; eptitorma present; haptolachus consisting of 3 nesia, without setae. Mandibles (Figs. 11–14) asymmetrical, with well-developed molae, each mandible with 3 incisor teeth at apex, right mandible with a small teeth on the dorsal margin between apical teeth and mola. Maxillae (Fig. 15) symmetrical; labium and developed hypopharynx as in Fig. 16.

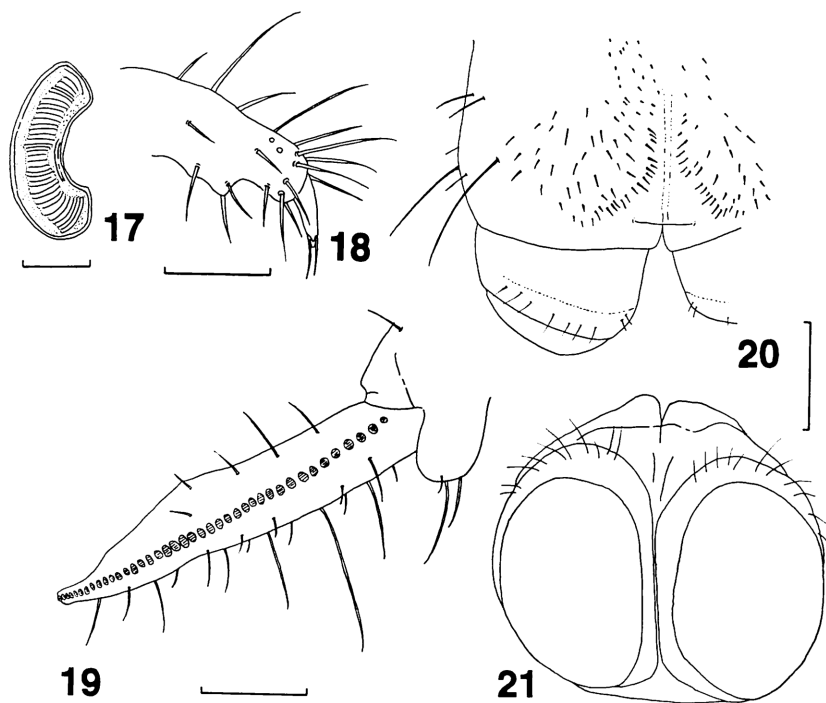
Dorso-lateral side of each thoracic segment with rows of long setae. Prothorax with dorso-lateral sclerotized plate very poorly defined, with a pair of small C-shaped spiracles on lateral side (Fig. 17). Thoracic legs yellowish brown, 4-segmented, moderately long and slender, with numerous setae, and with long and sharp claw with a few setae near each apical part (Fig. 18); mesocoxal stridulatory (pars stridens, Fig. 8) with a single distinct row of granular carinae along the outer edge; metatrochanteral stridulatory (plectrum, Fig. 19) with a row of about 40 oval granular carinae of about



Figs. 9–16. Third (final) instar larva of *Aegus hikidai* ARAYA, sp. nov., head capsule (9); epipharynx (10); right (11) and left (12) mandibles; mola of right (13) and left (14) mandibles; maxillae (15); labium and hypopharynx (16). Scales: 1 mm for Figs. 9, 11–16; 0.5 mm for Fig. 10.

the same size.

Abdomen widened posteriorly; 1st to 5th abdominal segments of about the same size, with minute setal area at anterior 4/5 and rows of long setae at posterior 1/5 on



Figs. 17–21. Third (final) instar larva of *Aegus hikidai* ARAYA, sp. nov.; thoracic spiracles (17); claw of right front leg (18); metatrochanteral plectrum (19); raster of last abdominal sternite (20); anal sclerite (21). Scales: 0.1 mm for Fig. 17; 0.5 mm for Figs. 18–19; 1 mm for Figs. 20–21.

dorso-lateral side: 6th wider, with minute and long dorso-lateral setae; 7th to 9th extremely swollen with only rows of long setae at each dorso-lateral side; lateral lobe of each segment with a few long setae; ventral part of 1st to 9th segments with several long setae; last sternite bearing a raster with minute spine-like setae (Fig. 20). Abdominal spiracles of 1st to 4th segments moderately large, semicircular, 5th to 8th small, oval. Anal sclerite (Fig. 21) consisting of 2 well-developed oval lateral lobes provided with oval pads.

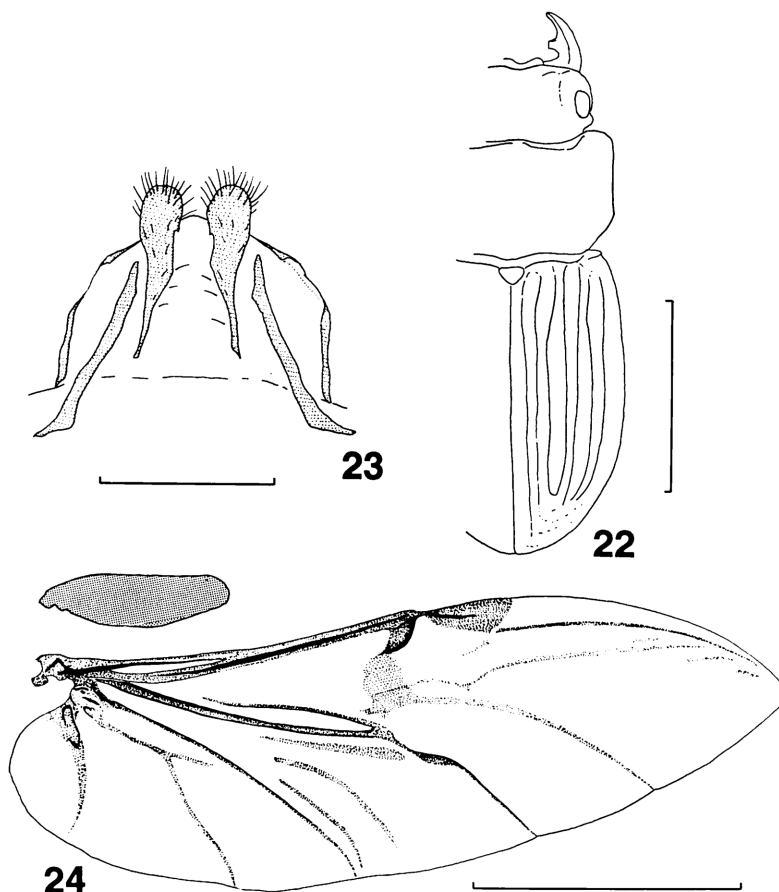
Specimens examined. Holotype, female, Mt. Mulu (1,850 m in altitude), Miri Division, Sarawak, Malaysia, 20–XII–1989, T. HIKIDA leg.; paratype, male (damaged carcass), same data as holotype, K. ARAYA leg.; larvae, same data as holotype, K. ARAYA leg.

The holotype female is deposited in the collection of the National Science Museum (Natural History), Tokyo, and the paratype and larval specimens in the entomological collection of the Department of Zoology, Kyoto University.

Etymology. This new species is dedicated to Dr. Tsutomu HIKIDA, Department of Zoology, Faculty of Science, Kyoto University, who collected the holotype specimen.

Natural History. *Aegus hikidai* sp. nov. was found on the floor of mountain moss-forest dominated by oak trees (1,850 m in altitude). The holotype female was captured at night on a leaf near the log from which larvae and male adult carcass were collected. During the daytime, the adults are supposed to hide themselves under logs or detritus because no additional adult was captured by surface gleaning of logs and forest floor in the daytime. Larvae were found in numbers within burrows dug into the detritus beneath the moss covering the rotten log lying on the forest floor.

Notes. The adult of this new *Aegus* resembles that of *A. cervicornis* DIDIER, 1925 (Figs. 22–24), also described from Borneo, and they apparently belong to the same species-group within the genus. However, this new species differs from the latter in the morphology of female genital organ with larger hemisternite bearing many setae at the posterior end. Besides, *A. hikidai* sp. nov. is clearly distinguishable not only



Figs. 22–24. *Aegus cervicornis*, ♀; dorsal view (22); female genitalia (23); hindwing (24; upper shadow: hindwing of *Aegus hikidai* ARAYA, sp. nov., ♀, holotype, on the same scale). Scales: 0.5 mm for Fig. 22; 1 mm for Figs. 23–24.

from *A. cervicornis* but also from the other Southeast Asian members of *Aegus* by its gourd-shaped body due to the broad pronotum and rounded elytra with sloping shoulders. Atrophied wings and firmly interlocked elytra are also its unique characteristics shared by no other species in the genus. On the other hand, such characteristics of *A. hikidai* sp. nov. as frosted body surface with fine punctures bearing short yellowish setae, triangular projections on the lateral side of head, concaved pronotum, spineless hind tibiae and rounded anterior lobes of pronotum, all of which are shared by *A. cervicornis*, are associated with those of the genus *Aegotypus* PARRY, 1873. Thus, these species may be intermediate between *Aegus* and *Aegotypus*.

As to the larval morphology, such characteristics of *A. hikidai* sp. nov. as the long and slender legs (especially trochanters), mola of mandible, mesocoxal pars stridens, metatrochanteral plectrum, swollen abdominal segments, and anal sclerite with 2 well-developed oval lateral lobes are similar to those of other *Aegus* larvae previously reported (VAN EMDEN, 1935; GRAVERY, 1916), whereas the presence of ocellus and the raster of the last abdominal sternite are not found in the other congeneric larvae.

In *A. cervicornis*, the inner wings are highly developed (about 1.4 times longer than the elytra), the base of the wing is broad, all the veins are recognizable, and the apical part of wings is about two-fifths the whole wing length (Fig. 24). On the other hand, the atrophied wings of *A. hikidai* are very short (0.52 times the elytral length), with the anal areas greatly reduced and both the apical part and radial recurrent disappeared, and only the costa and radius are clearly recognizable. Morphological changes with hindwing atrophy were described by HOLLOWAY (1963) for some lucanid beetles: 1) the part of the wing beyond the radial recurrent has been reduced in length or has disappeared completely, and in wings that are greatly reduced the apex is close to the base of the costa; 2) the posterior margin has moved towards the costal margin; 3) there has been a general overall decrease in the size of the wing. Thus, the wings of *A. hikidai* seem to be at the last stage of degeneration, and this suggests that *A. hikidai* has been flightless and geographically isolated for a long time.

Generally, flightless species tend to be more isolated and localized than fully winged species having wide distributional ranges. It is, therefore, expected that other geographically isolated flightless species of this genus may be found from mountains other than Mt. Mulu in Borneo.

Acknowledgments

I wish to express my hearty thanks to Dr. M. MATSUI and Dr. T. HIKIDA, Kyoto University, for their help in the field and to Mr. D. LABANG, Mr. A. A. HAMID, and the staff of National Park and Wildlife, and Forest Research Sections, Forest Department of Sarawak, for continuous support during the field work in Sarawak. I also thank Dr. M. KON, Kyoto University, for critically reading the manuscript of this paper. Lastly, I would like to express my sincere gratitude to Professor emeritus T. HIDAHA, Kyoto University, for giving me the opportunity of making researches in Sarawak.

Specimens Examined for Comparison

All the specimens examined for comparison are deposited in the entomological collections of the Department of Zoology, Kyoto University (catalogued as KUZ).

Aegus cervicornis: 1 ♂, Long Rapung, near Mt. Murrud, Kelabit Highland (alt. 1,000 m), Sarawak, Malaysia, 17-I-1991, K. ARAYA leg.; 1 ♀, Pa Lungang, near Mt. Murrud, Kelabit Highland (alt. 1,000 m), Sarawak, Malaysia, 22-I-1991, K. ARAYA leg.; 3 ♂♂, 2 ♀♀, same locality, 23-I-1991, K. ARAYA leg.

要 約

荒谷邦雄: ボルネオにおける後翅が退化したネプトクワガタ属の1種の発見。——1989年に実施された京都大学海外学術調査の期間中、東マレーシア・サラワク州のムル山の山頂直下に広がるカン類を中心とした熱帯雲霧林(標高約1,850 m)において、後翅が退化した特異なネプトクワガタ属(*Aegus*)の1種の雌成虫、雄成虫の死骸、および数頭の幼虫が採集された。検討の結果、このネプトクワガタは新種であることが判明したので、ここにムルハネナシネプトクワガタ *Aegus hikidai* ARAYA, sp. nov. として記載した。なお、雄成虫の死骸は破損がひどかったため、記載は主として雌成虫の形態に基づいて行なった。また、あわせて3令(終令)幼虫の記載も行なった。

この新種は、同じくボルネオより記載されている *A. cervicornis* DIDIER に近縁で、同じ種群に属するものと考えられるが、*A. cervicornis* とは雌交尾器の形態でも区別できるほか、後翅が退化していること、上翅の会合部が融合していること、および体形が瓢箪形であることなどから、*A. cervicornis* を含むその他すべてのネプトクワガタ属の種から容易に区別される。しかしその一方で、*Aegus hikidai* ARAYA, sp. nov. および *A. cervicornis* の成虫がもつ、体表面が黄色の毛をとまなう点刻で覆われ艶消し状であること、複眼後方の頭部側縁が三角形状に突出すること、前胸背板の前角が丸く前方に突出し、かつ側縁部が後方に向かって内側に強くくびれること、後脛節の側縁に鋸歯状の突起がないことなどの特徴は、*Aegotypus* 属にも共通するものである。*Aegus hikidai* ARAYA, sp. nov. と *A. cervicornis* を含む種群は、*Aegus* 属と *Aegotypus* 属とをつなぐグループとして位置づけられるかもしれない。

Aegus hikidai ARAYA, sp. nov. の終齢幼虫の形態に関しては、左右大顎とも臼歯部がいちじるしく発達していること、脚部、とくに転節が非常に細長いこと、中脚基節の発音器摩擦部(pars stridentata)は基節外面に広く存在し、前縁部に一系列の大顆粒条をそなえること、後肢転節の発音器絨部(plectrum)が一系列に配置した楕円形の顆粒条から成り立っていること、腹部がいちじるしく肥大していること、大きい二つの肛門丘が突出していることなどの形態は、*Aegus* 属の幼虫の特徴をよく表わしている。一方、単眼と思われる凸レンズ状の膨らみが触角の基部に存在すること、第9腹節腹面の毛群を形成する毛が短かくかつ少ないことなどは、これまでに報告されている *Aegus* 属の幼虫には知られていない、本種の幼虫独自の形態だと見なされる。なお、幼虫は、熱帯雲霧林の林床にある倒木の下や、倒木表面についた苔の下に溜まった泥状の腐植物中に見られた。

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A New Record of *Ophrygonius singapurae* (Coleoptera, Passalidae) from Thailand

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Recently, BOUCHER (1993) revised definitions of the passalid genera *Ophrygonius* ZANG and *Aceraius* KAUP based on the morphology of mandibular dentition patterns. Up to this time, no species of the passalid genus *Ophrygonius* have been known from Thailand (HINCKS & DIBB, 1935, 1958; BOUCHER, 1993). Recently, we had an opportunity to examine some passalid beetles in the entomological collection of the National Science Museum (Natural History), Tokyo, and found a specimen of *Ophrygonius singapurae* GRAVELY labelled "Chanthaburi, 19-VI-1963, Thai, R. KAWASAKI"/"Sizumu NOMURA Bequest 1981". This is the first record of *O. singapurae* from Thailand.

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