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Drosophilidae (Diptera) in Burma

IV. The Genus *Zaprionus*

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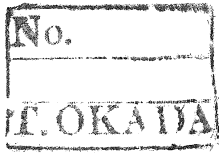
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Abstract Two new and four known species of the genus *Zaprionus* COQUILLET are reported from Burma.

OKADA and CARSON (1983) revised the genus *Zaprionus* COQUILLET with establishment of a new subgenus, *Aprionus*, to which eight species distributed mainly in the Oriental Region belong. This paper adds two new species to this subgenus on the basis of samples collected mainly from Burma, along with records of four known species.

Genus *Zaprionus* COQUILLET

Zaprionus COQUILLET, 1902, Proc. U. S. natn. Mus., 24: 31. — OKADA & CARSON, 1983, 544.

Type species: *Zaprionus vittiger* COQUILLET, 1901.

Diagnosis. Frons and mesoscutum with whitish longitudinal stripes. Anterior reclinate orbital well developed; posterior reclinate located at about middle between proclinate orbital and inner vertical. Mid and hind tarsi with minute cuneiform bristles.

Subgenus *Aprionus* OKADA et CARSON

Aprionus OKADA et CARSON, 1983, 545. Type species: *Zaprionus lineosus* (WALKER, 1860).

Diagnosis. Mesoscutum with 5, 7 or 9 longitudinal whitish stripes, i.e. median stripe present. Fore femur without tubercles below.

Zaprionus (*Aprionus*) *orissaensis* (GUPTA)

Drosophila (*Drosophila*) *orissaensis* GUPTA, 1972, Orient. Ins., 6: 561.

Zaprius (Aprionus) orissaensis: OKADA & CARSON, 1983, 547.

Specimens examined. Burma: 1 ♂, Pyin Oo Lwin (cited as Myamyoo in the previous papers of this series), 30. XII. 1981–6. I. 1982, ex trap (TODA); 2 ♂, 1 ♀, Mandalay, 26. XII. 1981–4. I. 1982, ex traps (TODA).

Distribution. India, Thailand; Burma (n. loc.): Pyin Oo Lwin, Mandalay.

Zaprius (Aprionus) grandis (KIKKAWA et PENG)

Drosophila grandis KIKKAWA et PENG, 1938, Jpn. J. Zool., 7: 543.

Drosophila (Drosophila) grandis: STURTEVANT, 1942, Univ. Texas Publ., (4213): 31; OKADA, 1956, Syst. Study, 139.

Zaprius (Aprionus) grandis: OKADA & CARSON, 1983, 548.

Specimens examined. Burma: 6 ♂, 5 ♀, Pyin Oo Lwin, 30. XII. 1981–6. I. 1982, ex traps (TODA); 1 ♀, Pyin Oo Lwin, 30. XII. 1981, by sweeping on forest floor (TODA); 1 ♀, Rangoon, 11–15. I. 1982, ex trap (TODA).

Distribution. Japan, Korea; Burma (n. loc.): Pyin Oo Lwin, Rangoon.

Zaprius (Aprionus) aungsani sp. nov.

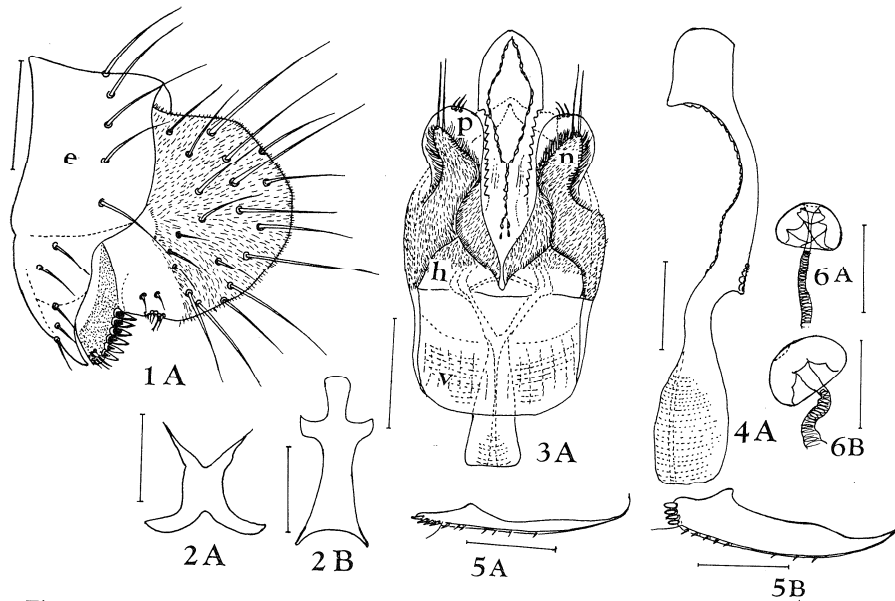
(Figs. 1–6 A)

Diagnosis. Aedeagus without incision on medioventral margin (Fig. 4 A). Hypandrium (h) prominently ridged, entirely and densely pubescent, with 2 pairs of long submedian spines at caudolateral apices (Fig. 3 A). Surstylus with ca. 6 or 7 black primary teeth in nearly straight row on entire length of distal margin (Fig. 1 A). Decasternum broad, blunt, bifid proximally and distally (Fig. 2 A). Ovipositor apically pointed (Fig. 5 A). Spermatheca with spiral introvert (Fig. 6 A).

♂, ♀. Body length, ♂ ca. 2.7 mm (range: 2.13–3.13), ♀ ca. 3.0 mm (2.63–3.75). Thorax length (including scutellum) ♂ ca. 1.2 mm (1.00–1.31), ♀ ca. 1.2 mm (1.19–1.31).

Head: Eye red. Antenna with 2nd joint blackish yellow, 3rd paler. Arista with ca. 3 (3–4) upper and 2 lower branches in addition to terminal fork. Frons brownish yellow with 3 whitish longitudinal stripes; median stripe running between two grey stripes, anteriorly continuing to stripe on carina and posteriorly bifurcating at anterior margin of ocellar triangle; lateral stripes running along eye margins; ocellar triangle black. Anterior reclinate orbital ca. 2/5 (mean=0.39, 0.33–0.50) length of posterior reclinate; proclinate ca. 6/7 (0.85, 0.63–1.00) length of posterior reclinate. Face yellow; carina blackish brown. Cheek yellow with black patch at base of vibrissa, ca. 1/8 (0.12, 0.11–0.13) as broad as maximum diameter of eye. Second oral ca. 3/8 (0.38, 0.20–0.50) length of vibrissa. Palpus black, with many long setae. Proboscis anterapically with greyish patch.

Thorax: Mesoscutum brownish yellow with 5 whitish longitudinal stripes; median stripe running between 2 acrostichal rows, bordered by 2 brown, posteriorly



Figs. 1-6. Male and female genitalia of *Zaprionus (Aprionus) aungsani* sp. nov. (A) and *Z. (A.) grandis* (KIKKAWA et PENG, 1938) (B). — 1, Periphallallic organs; 2, decasternum; 3, phallic organs (ventral view); 4, aedeagus (lateral view); 5, ovipositor; 6, spermatheca. (Scale-line=0.1 mm.)

broadened stripes; inner pair of stripes continuing to whitish stripes on eye margins and lateral margins of scutellum, laterally bordered by brown stripes running along line of dorsocentrals; outer pair faint, running from anterolateral corner just above humerus to base of postalar, interrupted at transverse suture. Scutellum greyish yellow, with 1 pair of whitish stripes on lateral margins. Thoracic pleura with 3 black longitudinal stripes. Postnotum greyish yellow. Humerals 2. Acrostichal hairs in 6 rows. Dorsocentrals 2 pairs; anterior ca. $5/8$ (0.62, 0.56-0.75) length of posterior; cross distance of dorsocentrals ca. 2.5 (1.50-3.33) times length distance. Prescutellars absent. Anterior scutellar ca. $5/6$ (0.83, 0.71-0.94) length of posterior; posteriors nearer to each other than to anterior. Sterno-index ca. 0.4 (0.29-0.50).

Legs yellow. Preapicals on all tibiae; apicals on fore and mid tibiae. All metatarsi as long as 3 succeeding tarsal joints together.

Wing hyaline. Veins brown; cross veins clear. R_{2+3} straight; R_{4+5} and M parallel. C1-bristle 1. Wing indices: C ca. 2.4 (2.00-2.58), 4V ca. 1.7 (1.55-1.76), 4C ca. 1.0 (0.89-1.00), 5x ca. 1.6 (1.33-1.90), Ac ca. 2.6 (2.40-2.80), C3-fringe ca. 0.6 (0.56-0.64). Halteres white.

Abdomen: Tergites greyish yellow, each with greyish margin on posterior and lateral edge. Sternites greyish yellow.

Periphallallic organs (Fig. 1 A): Epandrium (e) pointed below, not pubescent,

with ca. 5 (5–6) bristles in upper part, 2 in middle part and 3 in lower part. Surstylus somewhat slender, caudoventrally with several small setae. Cercus large, nearly round on ventral margin, pubescent nearly entirely except for anteroventral part, separated from epandrium, with ca. 25 (14–24) long bristles.

Phallic organs (Figs. 3, 4 A): Aedeagus apically cap-shaped and quadrate in lateral view, subapically partially bilobed, submedially serrate on lateral margins; apodeme as long as aedeagus. Anterior paramere (p) broad, apically round and with 3 small sensilla. Posterior paramere absent. Ventral fragma (v) nearly quadrate, slightly broader than long.

♀ Reproductive organs: Ovipositor (Fig. 5 A) slender, with ca. 11 (9–12) marginal teeth and subterminal hair; 3–5 distal teeth stout. Spermatheca (Fig. 6 A) small, hemispherical.

Holotype ♂, Burma: Pyin Oo Lwin, 30. XII. 1981–6. I. 1982, ex trap (TODA); deposited in the Entomological Institute, Hokkaido University, Sapporo, Japan (EHU).

Paratypes. Burma: 1 ♂, same data as holotype; in the collection of senior author (S. W.). Japan: 2 ♂, 3 ♀, Kiyosumi, Chiba Pref., 15–22. X. 1980, ex traps (TODA); 1 ♀, Hirai, Kozagawa, Wakayama Pref., 12–19. IV. 1982, ex trap (TODA); in EHU and collections of S. W. and junior author (M. J. T.).

Distribution. Burma: Pyin Oo Lwin; Japan: Chiba Pref., Wakayama Pref.

Relationships. This species is very similar to the foregoing species, *Z. grandis*, in general appearance excepting smaller body size, but clearly distinguishable from the latter by ♂ and ♀ genitalic characters mentioned in the diagnosis, i.e., in *Z. grandis*: aedeagus with deep incision on medioventral margin; hypandrium not ridged, medially slightly pubescent, with 2 pairs of short submedian spines; surstylus with ca. 10 primary teeth on lower 2/3 of distal margin; decasternum elongate, concave on proximal margin, distally trifid (Fig. 2 B); ovipositor apically somewhat round (Fig. 5 B); spermatheca larger, apically shallowly depressed, with conical introvert (Fig. 6 B).

Remarks. The species name is dedicated to the late General Aung San, the national leader of Burma.

✓ *Zaprionus (Aprionus) bogoriensis* MAINX

Zaprionus bogoriensis MAINX, 1958, 125.

Zaprionus (Zaprionus) bogoriensis: WHEELER, 1986, Genet. Biol. Drosophila, 3e: 407.

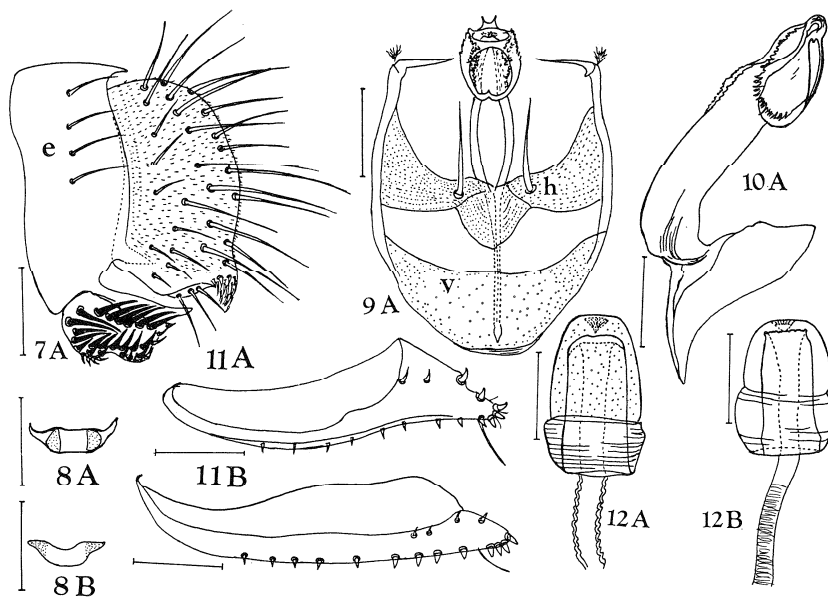
Drosophila argentostrigata BOCK, 1966, Univ. Queensl. Pap., 2: 273. *Syn. nov.*

Zaprionus argentostrigatus: BOCK, 1977, J. Austr. ent. Soc., 16: 270.

Zaprionus (Aprionus) argentostrigatus: OKADA & CARSON, 1983, 550.

Zaprionus multistriata STURTEVANT, 1927, Philip. J. Sci., 32: 365.

Specimens examined. Burma: 5 ♂, 2 ♀, Pyin Oo Lwin, 30. XII. 1981–6. I. 1982, ex traps (TODA); 7 ♂, 12 ♀, Mandalay, 26. XII. 1981–4. I. 1982, ex traps (TODA); 15 ♂, 12 ♀, Rangoon, 11–15. I. 1982, ex traps (TODA).



Figs. 7-12. Male and female genitalia of *Zaprionus (Aprionus) pyinoolwinensis* sp. nov. (A) and *Z. (A.) bogoriensis* MAINX, 1958 (B). — 7, Peripheral phallic organs; 8, decaesternum; 9, phallic organs (ventral view); 10, aedeagus (lateral view); 11, ovipositor; 12, spermatheca. (Scale-line=0.1 mm.)

Distribution. Australia, New Guinea, Celebes, Java, India, Philippines, Borneo, Malaya, Thailand; Burma (n. loc.): Pyin Oo Lwin, Mandalay, Rangoon.

Remarks. We judged *Z. argentostriatus* (BOCK, 1966) as a synonym of *Z. bogoriensis* MAINX, 1958, from the following descriptions and figure by MAINX (1958): "Die Grundfarbe des dorsalen Pleurentteils ist ein helleres braun und ist unterbrochen von zwei wellig verlaufenden, hellen Längsbändern. Der untere Pleurenteil ist ungestreift und bräunlichgelb." "Forceps ventral mit einem Feld von etwa 20 schwarzen Borsten verschiedener Länge, dorsal mit einer Reihe von 4 schwarzen, stärkeren Borsten (Abb. 1)."

✓ *Zaprionus (Aprionus) pyinoolwinensis* sp. nov.

(Figs. 7-12 A)

Zaprionus multistriata: DWIVEDI *et al.*, 1979, 71 (nec STURTEVANT, 1927).

Diagnosis. Thoracic pleura dark brown with longitudinal, brownish yellow, narrow stripes. Aedeagus apically expanded and notched; lateral margin of apical expansion and dorsosubapical ridge finely serrate (Fig. 10 A). Surstylus with ca. 6 or 7 stout black primary teeth in nearly straight row on upper half surface and ca.

12 or 13 brownish black secondary teeth and several small bristles scattered on lower half surface (Fig. 7 A). Ovipositor apically pointed, with 2 stout teeth on dorsal margin (Fig. 11 A).

♂, ♀. Body length, ♂ ca. 3.7 mm, ♀ ca. 3.9 mm. Thorax length, ♂ ca. 1.9 mm, ♀ ca. 1.8 mm.

Head: Eye brownish red. Antenna with 2nd joint brown, 3rd greyish yellow. Arista with ca. 3 or 4 upper and 2 lower branches in addition to terminal fork. Frons ca. 1/3 as wide as head (measured at level of anterior ocellus), brown with 3 whitish longitudinal stripes; median stripe anteriorly continuing to stripe on carina, posteriorly bifurcating and encircling ocellar triangle; lateral stripes running along eye margins, with inside margins bordered by black stripes; ocellar triangle black. Anterior reclinate orbital ca. 2/3 length of posterior reclinate; proclinate ca. 1.2 times longer than posterior reclinate. Face greyish yellow; carina yellowish brown, high. Cheek greyish yellow with black patch at base of vibrissa, ca. 1/5 as broad as maximum diameter of eye. Second oral ca. 4/9 length of vibrissa. Palpus greyish yellow, with 1 prominent apical seta and many small setae.

Thorax: Acrostichal hairs in 6 rows. Mesoscutum brown with 9 whitish longitudinal stripes; median stripe continuing to median stripe on scutellum, and 4 on each side as follows: one between 2 outer acrostichal rows; one beside dorso-central row and appearing continuous with lateral stripes on frons and scutellum; short one appearing as white margin of humerus; and one posterior of suture. Scutellum greyish yellow with 3 whitish stripes fringed with black. Humerals 2. Drosocentrals 2 pairs; anterior ca. 4/9 length of posterior; cross distance of dorso-centrals ca. 3.3 times length distance. Prescutellars absent. Anterior scutellar ca. 7/9 length of posterior. Sterno-index ca. 0.5.

Legs greyish yellow. Preapicals on fore and hind tibiae; apicals on fore and mid tibiae. ♂ fore metatarsus distally with tuft of fine hairs. All metatarsi slightly shorter than 3 succeeding tarsal joints together.

Wing hyaline, slightly brownish. Vcins brown; cross veins clear. R_{2+3} straight; R_{4+5} and M parallel. C1-bristle 1. Wing indices: C ca. 3.2, 4V ca. 1.9, 4C ca. 0.9, 5x ca. 1.1, Ac ca. 4.0, C3-fringe ca. 0.7. Halteres greyish white.

Abdomen: Tergites greyish yellow; 1st to 3rd tergites each with faint grey band on posterior margin. Sternites yellowish white.

Periphallic organs (Figs. 7, 8 A): Epandrium (e) yellow, not pointed below, not pubescent, with ca. 4 bristles in upper part. Surstylus shaped parallelogram. Cercus yellow, large, oval, nearly entirely pubescent, fused to epandrium in lower part, with ca. 23 long bristles and tuft of small bristles at caudoventral corner. Decasternum forming small transverse bar with chitinized patch and pointed lateral process for attachment on each side.

Phallic organs (Figs. 9, 10 A): Aedeagus yellowish, curved ventrad, longer than apodeme, with large ventral process. Anterior paramere absent. Posterior paramere attached to caudolateral corner of novasternum, distally narrowing, not fused to

Table 1. Intra- and inter-specific variations of quantitative characters in *Z. bogoriensis* and *Z. pyinooowinensis*.

Quantitative character	<i>Z. bogoriensis</i>			<i>Z. pyinooowinensis</i>			Interspecific difference (<i>t</i> -test)
	(n)	Mean ± S. E.	Range	(n)	Mean ± S. E.	Range	
1. Body length (mm)	♂ 25 ♀ 24	3.40 ± 0.08 3.99 ± 0.12	2.75-4.06 2.81-4.81	13	3.66 ± 0.12 3.91 ± 0.09	3.13-4.04 3.25-4.56	1.89 0.53
2. Thorax length (mm)	♂ 25 ♀ 24	1.54 ± 0.04 1.63 ± 0.03	1.25-1.94 1.31-1.81	13	1.86 ± 0.05 1.83 ± 0.03	1.44-2.06 1.56-2.06	5.14** 4.35**
3. No. of upper branches of arista	49	3.04 ± 0.03	3-4	32	3.03 ± 0.03	3-4	0.22
4. No. of lower branches of arista	49	1.89 ± 0.04	1-2	32	2.00 ± 0.00		
5. Cheek width/eye diameter	49	0.20 ± 0.003	0.15-0.25	31	0.21 ± 0.007	0.16-0.33	1.28
6. Proclinate/posterior reclinate orbital	49	1.23 ± 0.03	0.80-1.60	32	1.18 ± 0.06	0.83-2.67	0.76
7. Anterior/posterior reclinate orbital	49	0.73 ± 0.014	0.50-0.83	32	0.68 ± 0.014	0.57-0.83	1.84
8. Frons width/head width	49	0.42 ± 0.012	0.25-0.53	32	0.32 ± 0.012	0.25-0.43	5.34**
9. Second oral/vibrissa	49	0.48 ± 0.004	0.38-0.54	32	0.46 ± 0.009	0.33-0.53	1.19
10. Anterior/posterior dorsocentral	49	0.45 ± 0.011	0.30-0.66	32	0.63 ± 0.010	0.47-0.83	10.34**
11. Cross/length distance of dorsocentrals	49	3.78 ± 0.07	2.67-5.33	32	3.32 ± 0.09	2.50-4.50	3.92**
12. Anterior/posterior scutellar	49	0.76 ± 0.01	0.64-0.88	31	0.78 ± 0.01	0.67-0.95	1.44
13. Distance from posterior to anterior scutellar/distance between posterior	49	1.29 ± 0.02	1.00-1.33	32	1.25 ± 0.03	0.86-1.57	1.28
14. Sterno-index	48	0.39 ± 0.01	0.31-0.56	31	0.46 ± 0.01	0.33-0.58	3.84**
Wing indices							
15. C	49	3.13 ± 0.04	2.56-3.75	32	3.22 ± 0.05	2.69-3.75	1.22
16. 4V	49	1.80 ± 0.02	1.59-1.9	32	1.86 ± 0.02	1.64-2.04	2.25*
17. 4C	49	0.85 ± 0.01	0.75-0.95	32	0.85 ± 0.02	0.57-0.96	0.09
18. 5x	49	1.13 ± 0.02	1.00-1.33	32	1.14 ± 0.02	0.8-1.29	0.12
19. Ac	49	2.79 ± 0.06	2.25-4.5	32	4.00 ± 0.14	2.75-5.50	7.88**
20. C3-fringe	49	0.64 ± 0.01	0.56-0.77	32	0.74 ± 0.01	0.64-0.82	8.86**
21. No. of hairs on upper epandrium	25	4.10 ± 0.20	3-5	13	3.5 ± 0.22	3-5	2.29*
22. No. of hairs on cercus (male)	25	25.10 ± 0.20	22-29	13	23.2 ± 1.22	17-35	1.47
23. No. of primary teeth on surstylus	25	4.76 ± 0.12	4-6	13	6.62 ± 0.14	6-7	9.54**
24. No. of secondary teeth on surstylus	25	13.20 ± 0.28	12-16	13	12.0 ± 0.11	12-13	4.01**
25. No. of hairs on cercus (female)	24	17.63 ± 0.34	15-27	19	19.37 ± 0.26	18-22	3.87**
26. No. of marginal teeth on ovipositor	24	13.42 ± 0.23	13-16	19	15.68 ± 0.29	15-18	6.10**

* 0.001 < P < 0.01. ** P < 0.001.

each other. Hypandrium (h) with 1 pair of long submedian spines.

♀ Reproductive organs: Ovipositor (Fig. 11 A) distally triangular, with ca. 19 marginal and 2 discal teeth, 3 short terminal hairs at apex, and subterminal hair on ventral margin; basal isthmus ca. 1/9 length of ovipositor. Spermatheca (Fig. 12 A) elongate, with deep introvert; outer capsule transversely wrinkled in basal part, with numerous fine spinules on surface of upper part and small apical indentation.

Holotype ♂, Burma: Pyin Oo Lwin, 30. XII. 1981–6. I. 1982, ex trap (TODA); in EHU.

Paratypes. Burma: 13 ♂, 14 ♀, same data as holotype; in EHU and the collections of S. W. and M. J. T. China: 1 ♂, 6 ♀, Kunming, X. 1986, ex trap (GAN); in EHU and Kunming Institute of Zoology, Academia Sinica, Kunming, The People's Republic of China.

Distribution. India; Burma: Pyin Oo Lwin; southern China: Kunming.

Relationships. This species is very close to the foregoing species, *Z. bogoriensis*, but is distinguishable from the latter by the diagnostic characters, i.e., in *Z. bogoriensis*: thoracic pleura pale brown, with 3 poorly defined pale silvery stripes; aedeagus apically horizontally flattened, with ca. 25 small teeth in 2 rows on each subapical side and numerous minute spherules on submedial portion; surstylus with ca. 4 or 5 primary teeth in straight row above; ovipositor apically somewhat round, with 2 ordinary teeth on dorsal margin (Fig. 11 B). Although these two species can be distinguished from each other by the diagnostic characters, they are very similar in general appearance. To reveal inter- and intra-specific variations in these two sibling species, morphometric analyses were carried out for 26 quantitative characters. The results are presented in Table 1. The first two characters, body length and thorax length, were compared for each sex. Although the ranges of all the 26 characters overlapped between the two species, the interspecific difference was statistically highly significant ($p < 0.001$) in 11 characters. DWIVEDI *et al.* (1979) reported some specimens (3 ♂, 5 ♀) collected from Meghalaya, Shillong District, India, under the name of *Z. multistriata* STURTEVANT, which was synonymized with *Z. bogoriensis* (cf. OKADA & CARSON, 1983, and the remarks for the foregoing species). However, we have concluded that the Indian specimens from Meghalaya are different from *Z. bogoriensis* but conspecific with the new species described here, *Z. pyinoolwinensis*, on the basis of personal communication from Prof. J. P. GUPTA, who kindly reexamined the Indian specimens through our request. He, furthermore, informed us that the description and the figure of ovipositor by DWIVEDI *et al.* (1979) had been of a different species, *Z. obscuricornis* (DE MEIJERE, 1915). On the other hand, we consider *Z. multistriata* STURTEVANT to be a synonym of *Z. bogoriensis* as was pointed out by OKADA and CARSON (1983). However, this judgement is based only on one character, i.e. "... pleurae yellow", described by STURTEVANT (1927). The taxonomic status of *Z. multistriata* STURTEVANT remains unclear, until its type material, only 1 ♀ from the Philippines, can be re-

examined. Unfortunately, it is unknown where the type is deposited, though STURTEVANT (1927) mentioned, "the types of the new species based on Philippines material have been returned to Professor BEZZI."

✓ *Zaprionus (Aprionus) obscuricornis* (DE MEIJERE)

Stegana obscuricornis DE MEIJERE, 1915, Tijdschr. Ent., 58 suppl.: 94.

Drosophila obscuricornis: DUDA, 1924, Arch. Naturg., 90(A): 221.

Zaprionus obscuricornis: OKADA, 1964, Nature and Life SE Asia, 3: 442.

Zaprionus (Aprionus) obscuricornis: OKADA & CARSON, 1983, 549.

Specimens examined. Burma: 2 ♂, 6 ♀, Pyin Oo Lwin, 30. XII. 1981-6. I. 1982, ex traps (TODA); 3 ♂, 6 ♀, Mandalay, 26. XII. 1981-6. I. 1982, ex traps (TODA); 1 ♂, 1 ♀, Rangoon, 11-15. I. 1982, ex trap (TODA).

Distribution. Java, Sumatra, Lombok, Sabah, Brunei, Sarawak, Malaya, Thailand, India; Burma (n. loc.): Pyin Oo Lwin, Mandalay, Rangoon.

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