

THE SPECIES OF THE GENUS *SCAPHOIDEUS*
(HOMOPTERA: CICADELLIDAE) FOUND IN
THAILAND, WITH DESCRIPTIONS OF
NEW SPECIES^{1,2}

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Abstract: Three species of *Scaphoideus* have been previously reported from Thailand. One species has been verified; 2 were misidentifications. Seventeen species are described in this study of which 14 are described as new. *S. speciosus* Schumacher, 1915 is a new synonym of *S. ornatus* Melichar, 1903.

The leafhoppers of the genus *Scaphoideus* have been poorly known in Thailand. Ishihara (1961) reported 3 species (*S. morosus* Melichar, *S. festivus* Matsumura, 1902 and *S. albovittatus* Matsumura) from Thailand. Of these, only the 1st was correctly identified. The species reported as *festivus*, which is known only from Japan and U.S.S.R., was a species of *Scaphotettix*; the species called *albovittatus*, which is also only known from Japan, was a new species. In this study of the Thailand *Scaphoideus*, 17 species are included. Three were previously described and 14 are described as new to science. None of the Oriental species described by Distant (1908 a, b, 1918) have so far been found in Thailand.

The majority of the material studied was light-trap collected at the Northeast Agricultural Center, Thaphra, Khonkaen, Thailand, during all months of the year. Other material was borrowed from the following museums with the abbreviations as used in this paper:

BISHOP—Bishop Museum, Honolulu, Hawaii
BMNH—British Museum (Natural History), London, England
HU—Hokkaido University, Entomological Institute, Sapporo, Japan
MORAVIAN—Moravian Museum, Brno, Czechoslovakia
RIT—Rice Institute of Thailand, Bangkhen, Bangkok, Thailand
TPT—Northeast Agricultural Center Collection, Thaphra, Khonkaen, Thailand
UK—University of Kentucky Collection, Lexington, Kentucky
USNM—United States National Museum, Washington, D.C.

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GENUS *Scaphoideus* Uhler

Scaphoideus Uhler, 1889: 33. Type-species *Jassus immistus* Say, by original designation.

Length: 2.7-7.9 mm.

Body color usually brown or yellowish brown, with white, dark brown, orange or yellow patterns, streaks, spots, bands, or lines. ♂ usually smaller than ♀. Head same width or narrower than pronotum. Crown with bluntly pointed anterior margin, face longer than wide. Forewing long with moderately developed appendix; at least 3 reflexed crossveins between outer anteapical cell and costal margin, outer anteapical cell small, lying obliquely with respect to costal margin and usually acuminate distally; outer claval vein strongly curved distally and joining commisural margin at nearly a right angle. Apex of ♂ pygofer variously shaped, with large stout setae. Plate generally triangular, from about 1/2 to equal in length of pygofer, with spine-like setae. Style variously shaped, apex usually sharply pointed. Connective Y-shaped with fused or attached parameres which are variously shaped. Aedeagus with shaft tubular, short to long, with or without a pair of apical or subapical processes; dorsal to parameres, and membranously attached to connective. ♀ with ovipositor extending beyond pygofer. ♀ pygofer long, narrowed to apex, with stout setae.

KEY TO THE THAILAND SPECIES OF *Scaphoideus* ♂♂

1. Crown rounded with a transverse brown line behind margin and a wide brown band near posterior margin (FIG. 3-5) 2
- 1'. Crown with varied patterns but never as above 4
- 2 (1). Aedeagal shaft with a small pointed spine-like process on each side (FIG. 51-52) **acanthus**, n. sp.
- 2'. Aedeagal shaft without spine-like processes 3
- 3 (2'). Parameres robust, parallel, and bluntly rounded at apex (FIG. 42) **morosus** Melichar
- 3'. Parameres robust, converging and sharply pointed at apex (FIG. 48) **harlani**, n. sp.
- 4 (1'). Crown with a pair of large black spots, 1 near each eye, and a small black spot at apex (FIG. 9-10) . . . 5
- 4'. Crown without spots 6
- 5 (4). Aedeagal shaft with 2 pairs of short processes, 1 pair apical and other pair near middle (FIG. 81-82) **maai**, n. sp.
- 5'. Aedeagal shaft with but 1 pair of short apical processes (FIG. 75-76) **knappi**, n. sp.
- 6 (4'). Crown with orange transverse band or orange spots or dashes 7
- 6'. Crown patterned with brown, never with orange 11
- 7 (6). Crown robustly rounded, nearly white with an orange transverse band across middle behind ocelli (FIG. 37) **rubroguttatus** Matsumura
- 7'. Crown pointed or rounded, always with dark brown or black transverse bands or dashes along anterior margin 8
- 8 (7'). Crown with dark brown or black transverse bands along anterior margin (FIG. 32-33) 9
- 8'. Crown with dark brown or black dashes along anterior margin (FIG. 25, 31) 10
- 9 (8). Parameres long pointed with subapical triangular expansions (FIG. 132-133) **ornatus** Melichar
- 9'. Parameres short, chelate (FIG. 66-67) **chelatus**, n. sp.
- 10 (8'). Parameres long, parallel, and bent dorsally at apex (FIG. 60-61) **morrisoni**, n. sp.
- 10'. Parameres short, chelate (FIG. 72-73) **callus**, n. sp.
- 11 (6'). Forewings with reticulate venation **orientalis**, n. sp.
- 11'. Forewings with normal crossveins, not reticulate 12
- 12 (11'). Crown with anterior margin pointed, nearly foliaceous (FIG. 21, 23) **coronatus**, n. sp.
- 12'. Crown with anterior margin rounded, not foliaceous (FIG. 11, 13) 13
- 13 (12'). Style long and narrow, as long as parameres and connective (FIG. 89) **thailandensis**, n. sp.
- 13'. Style short, hooked, 1/2 length of parameres and connective (FIG. 101, 107) 14

- 14 (13'). Parameres curved dorsally at a right angle to connective (FIG. 91) **geniculatus**, n. sp.
 14'. Parameres only slightly curved dorsally (FIG. 97) 15
 15 (14'). Aedeagal shaft thin, with a pair of recurved apical processes (FIG. 99-100) **undulatus**, n. sp.
 15'. Aedeagal shaft robust, with a bifurcate apex (FIG. 105, 111) 16
 16 (15'). Parameres expanded at apex and cupped (FIG. 108-109) **vittatus**, n. sp.
 16'. Parameres not expanded at apex, but thin and parallel (FIG. 114-115) **fuscus**, n. sp.

Scaphoideus morosus Melichar FIG. 1, 3, 39-44, 141

Scaphoideus morosus Melichar, 1903: 197. — Ishihara, 1961: 251. — Hongsaprug, 1971: 52.

Length: ♂ 3.9-4.2 mm, ♀ 4.5-5.0 mm. .

Structure: Crown with bluntly pointed margin, median length longer than distance between eyes. Head same width as pronotum. Forewing long with small appendix. *Color*: Generally light brown. Crown with thin brown line on margin between eyes. Behind this line, a parallel thin brown line between eyes. Between eyes, 2 large brown square regions which meet at median line and end near eyes. Face yellow-brown, with 2 parallel transverse lines, below margin and above antenna. Pronotum and scutellum light brown with brown lateral margins. Forewing with brown-streaked pattern following most major veins, darker at base. ♂ *genitalia*: Plate triangular shaped, about 1/2 length of pygofer. Pygofer truncate at apex. Style S-shaped, hooked, with apex sharply pointed, outside edge smooth. Connective Y-shaped, parameres long, robust, U-shaped, terminally parallel, extending to middle of aedeagus. Aedeagus with shaft tubular, apex V-shaped, membranous area on ventral side; base rectangular in ventral view. ♀ *genitalia*: Posterior margin of 7th sternum slightly concave with a produced rounded lobe either side of a median emargination. Ovipositor extending only slightly beyond pygofer, pygofer long and narrowing to apex.

TYPES. Twenty syntypes, labeled "Colombo, Ceylon," are in the Moravian Museum, Brno, Czechoslovakia. A male specimen, with the male genitalia in a small vial attached to the pin, is here designated the lectotype.

THAILAND MATERIAL EXAMINED. THAILAND: 3 ♂♂, 5 ♀♀, Chumpae, Khonkaen, 19.V.1971, W. P. Morrison; 1 ♂, Kalasin, 24.V.1971, Morrison; 1 ♀, Chumpae, 30.V.1971, Morrison; 1 ♀, Kalasin, 26-30.V.1969, F. W. Knapp, light trap; 3 ♂♂, 1 ♀, Thaphra, Khonkaen, 27.VI.1968, Knapp; 2 ♀♀, Chumpae, 1.IV.1971, Morrison; 2 ♂♂, 13 ♀♀, Chumpae, 28.VI.1971, Morrison; 1 ♂, Kalasin, 22.V.1971; 1 ♂, 2 ♀♀, Kalasin, 22.V.1971, Morrison; 1 ♂, 1 ♀ Thaphra, Khonkaen, 2-7.VIII.1969, Knapp; (all UK, TPT).

REMARKS. All types were examined and appear to be the same species.

This species is known to us from Ceylon, India, and Thailand.

Scaphoideus harlani Kitbamroong & Freytag, new species FIG.4, 6, 45-50, 142

Resembling *S. morosus* in overall color, but larger, darker, and with distinct male genitalia.

Length: ♂ 4.5-4.6 mm, ♀ 5.0 mm.

Structure: Crown with bluntly pointed margin, median length longer than distance between eyes. Head same width as pronotum. Forewing long with small appendix. *Color*: Generally light brown. Crown with transverse

brown line on margin between eyes, behind 2 large brown regions covering the posterior 1/2 of crown. Face yellow, with 2 transverse dark lines between eyes, below margin and above antenna. Pronotum and scutellum generally light brown, covered with 4-5 longitudinal bands of dark brown. Forewing with brown-streaked pattern following most major veins, darker at base. ♂ *genitalia*: Plate triangular shaped, about 1/2 length of pygofer, with a sharp-pointed apex. Pygofer truncate at the apex. Style S-shaped, apex bluntly pointed, and hooked, middle expanded on median margin. Connective Y-shaped, parameres long, robust, U-shaped, converging with a small thin seta on each side terminally. Aedeagus with shaft cone-shaped, convex near the base, base rectangular in ventral view, gonopore subapical. ♀ *genitalia*: Posterior margin of 7th sternum concave with a produced rounded lobe either side of a median emargination. Ovipositor extending only slightly beyond pygofer. Pygofer long, narrowing to apex.

TYPES. Holotype ♂ (USNM), S VIETNAM: Mekong Delta, Binh Thuy, 17.II.1972, H. J. Harlan; allotype ♀ (USNM), same locality, 21.II.1972, Harlan.

THAILAND SPECIMENS EXAMINED: THAILAND: 3 ♂♂, 1 ♀, Bangkaen, Bangkok, 15.VII.1970, light trap (UK, RIT).

REMARKS. This species can be separated from *S. morosus* by having parameres long, robust, U-shaped, and converging with a small thin seta on each side terminally.

This species is named for Captain H. J. Harlan, U. S. Army, who collected the specimens included in this study. This species has been confused with *S. morosus* in the past, and many records under that name belong here. Specimens have been seen by us from India, Java, Thailand, Vietnam, and the Philippine Islands.

Scaphoideus acanthus Kitbamroong & Freytag, new species

FIG. 5, 7, 51-56, 143

Resembling *S. morosus* but lighter colored and with distinct male genitalia.

Length: ♂ 4.0-4.5 mm, ♀ 4.9-5.5 mm.

Structure: Crown with bluntly pointed margin, median length is little longer than distance between eyes. Head same width as pronotum. Forewing long, with small appendix. *Color*: Generally yellowish brown. Crown with a transverse brown line behind ocelli, 2 large brown regions covering posterior 1/2. Face yellow, with 2 transverse dark brown lines between margin and antenna. Pronotum brown, with 5 white longitudinal stripes equally separated. Scutellum yellowish brown, with dark brown lateral margins. Forewing with brown-streaked pattern following most major veins, darker at base. ♂ *genitalia*: Plate triangular, about 1/2 length of pygofer. Pygofer with dorsal surface flat, ventral surface convex, and truncate apically. Style S-shaped, apex sharply pointed, median margin smooth. Connective Y-shaped, parameres long, robust, U-shaped and ridged near middle. Aedeagus with shaft stalked, shaft with a small pointed spine near apex on each side, gonopore subapical, base rectangular in ventral view. ♀ *genitalia*: Posterior margin of 7th sternum convex with a produced rounded lobe either side of a median emargination. Ovipositor extending only slightly beyond pygofer. Pygofer long, narrowing to apex.

TYPES. Holotype ♂ (USNM), THAILAND: Kalasin, 13.VI.1972, light trap, W. P. Morrison; allotype ♀ (USNM), same data as holotype; paratypes, 1 ♂, 4 ♀♀, same data as holotype (UK).

OTHER SPECIMENS EXAMINED. THAILAND: 1 ♂, Ubol, 20-22.XI.1967, light trap, F. W. Knapp (UK).

REMARKS. This species can be separated from *S. morosus* by having parameres long,

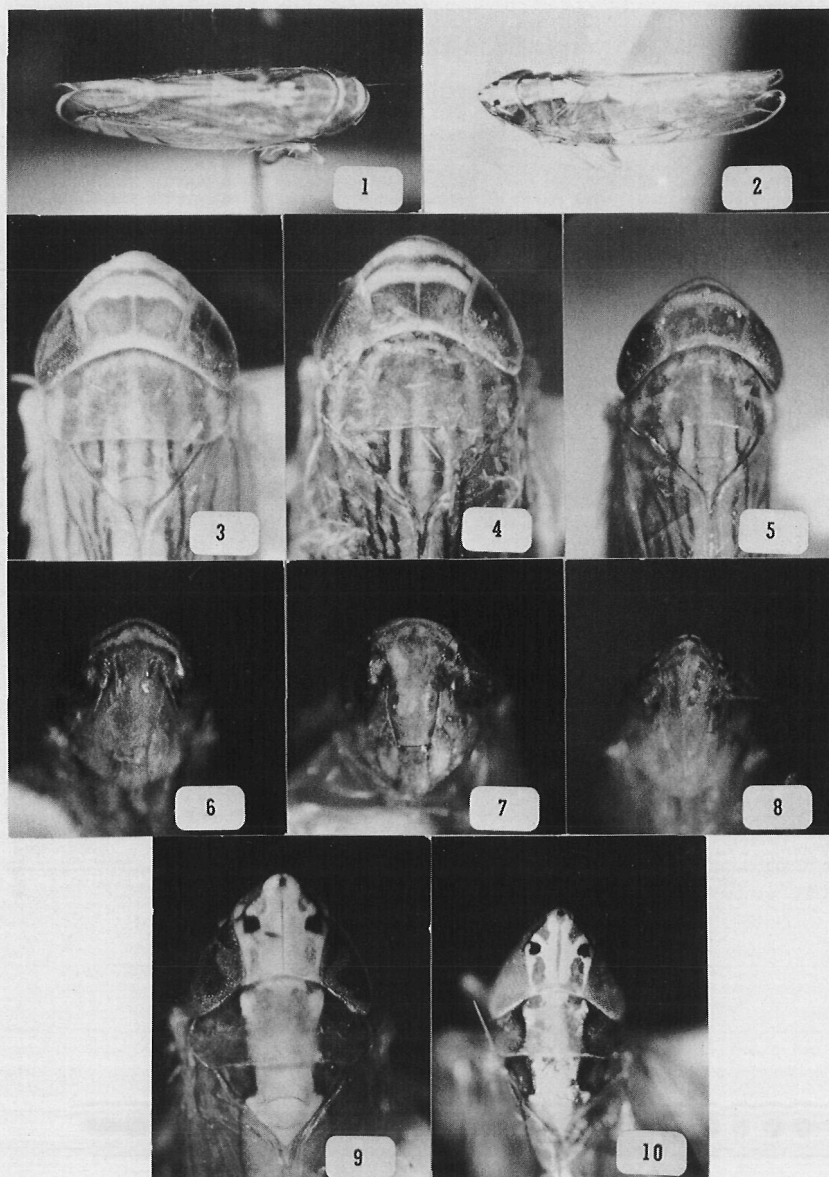


FIG. 1-10. 1, Lateral dorsal view of Thailand ♂ of *S. morosus* Melichar; 2, lateral dorsal view of holotype ♂ of *S. maai*, n. sp.; 3, dorsal view of head, pronotum and scutellum of Thailand ♂ of *S. morosus* Melichar; 4, dorsal view of head, pronotum and scutellum of holotype ♂ of *S. harlani*, n. sp.; 5, dorsal view of head, pronotum and scutellum of holotype ♂ of *S. acanthus*, n. sp.; 6, face view of holotype ♂ of *S. harlani*, n. sp.; 7, face view of holotype ♂ of *S. acanthus*, n. sp.; 8, face view of holotype ♂ of *S. maai*, n. sp.; 9, dorsal view of head, pronotum and scutellum of holotype ♂ of *S. maai*, n. sp.; 10, dorsal view of head, pronotum and scutellum of holotype ♂ of *S. knappi*, n. sp.

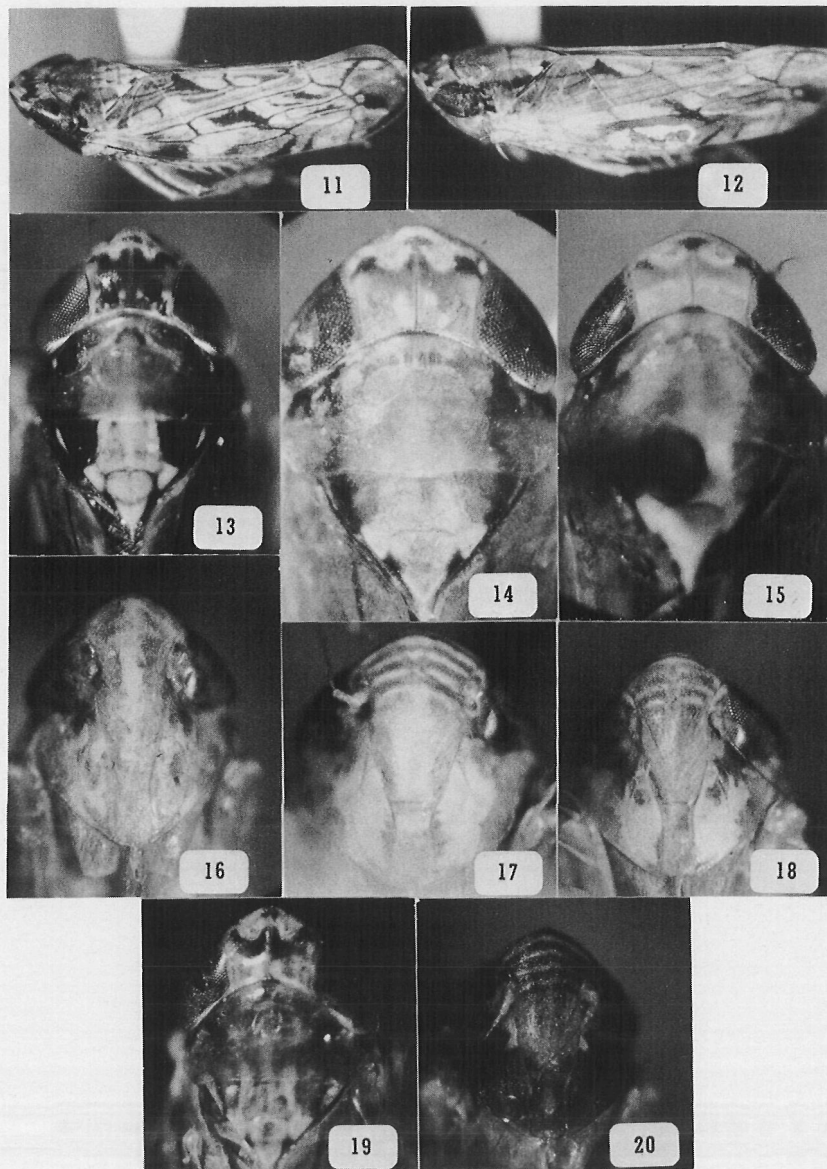


FIG. 11-20. 11, Lateral dorsal view of holotype ♂ of *S. undulatus*, n. sp.; 12, lateral dorsal view of holotype ♂ of *S. vittatus*, n. sp.; 13, dorsal view of head, pronotum and scutellum of holotype ♂ of *S. geniculatus*, n. sp.; 14, dorsal view of head, pronotum and scutellum of holotype ♂ of *S. vittatus*, n. sp.; 15, dorsal view of head, pronotum and scutellum of holotype ♂ of *S. fuscus*, n. sp.; 16, face view of holotype ♂ of *S. geniculatus*, n. sp.; 17, face view of holotype ♂ of *S. vittatus*, n. sp.; 18, face view of holotype ♂ of *S. fuscus*, n. sp.; 19, dorsal view of head, pronotum and scutellum of holotype ♂ of *S. undulatus*, n. sp.; 20, face view of holotype ♂ of *S. undulatus*, n. sp.

robust, U-shaped and ridged near the middle and aedeagus with shaft stalked, shaft with a small pointed spine on each side.

***Scaphoideus maai* Kitbamroong & Freytag, new species**

FIG. 2, 8-9, 81-86, 144

Resembling *S. intermedius* in overall color pattern but with distinct male genitalia.

Length: ♂ 4.2-4.8 mm, ♀ 4.8-5.1 mm.

Structure: Crown with bluntly pointed margin, median length longer than distance between eyes, head same width as pronotum. Forewing long, with small appendix. *Color*: Generally brown. Large whitish band from the tip of crown through middle of forewing. Crown with brown spot in middle of margin, a brown streak on margin before each ocellus, and a large brown spot behind each ocellus and connected to brown streak by a thin brown line. Face yellowish brown, with 2 brown lines across face, upper line larger; these lines below eyes but above antennae. Pronotum and scutellum brown on lateral margins, with 2 longitudinal yellowish lines near middle of whitish band. Forewing patterned with brown, darker lines found on major veins, darker patterns on apex and middle of wing. ♂ *genitalia*: Plate triangular. Pygofer truncate apically. Styles hook-like, apex sharply pointed, evenly rounded on median side and lateral side with 2 small humps. Connective Y-shaped, parameres long, divergent, and tapered posteriorly, extending to middle of aedeagus. Aedeagus with 2 pairs of processes, 1 pair apical and other pair near middle of shaft. ♀ *genitalia*: Posterior margin of 7th sternum produced with a median emargination. Ovipositor extending only slightly beyond pygofer. Pygofer long and narrowing to apex.

TYPES. Holotype ♂ (BISHOP 10,659), THAILAND: Chiangdao, 5-11.IV.1958, T. C. Maa; allotype ♀ (BISHOP), same data as holotype; paratypes: 10 ♂♂, 4 ♀♀, same data as holotype; 2 ♂♂, same data except native collector (12, BISHOP; 2 ♂♂, 2 ♀♀, UK).

OTHER SPECIMENS EXAMINED. THAILAND: 2 ♂♂, Chanthaburi Prov., Prew, 45 m, 25-30.IV.1958, Maa; 1 ♂, Chanthaburi, Prew, 25.IV.1958, Maa; 1 ♂, Chiangmai Prov., Fang (Agr. Exp. Station), 600 m, 14.VI.1965, malaise trap, P. D. Ashlock; 1 ♂, Chiangmai Prov., Fang, 500 m, 13.VI.1965, at light, Ashlock; 13 ♂♂, 4 ♀♀, Fang, 12-19.IV.1958, Maa; 2 ♂♂, 1 ♀, Banna, 5-10.IV.1958, Maa; 1 ♂, Pang-Kan Pawng, 15.XI.1957, J. L. Gressitt (BISHOP).

REMARKS. This species can be separated from *S. intermedius* by the apical processes being bent dorsally whereas in *S. intermedius* they bend ventrally.

This species is named for T. C. Maa, Bishop Museum, who collected many of the specimens included in this study.

***Scaphoideus knappi* Kitbamroong & Freytag, new species**

FIG. 10, 75-80, 145

Scaphoideus albovittatus Matsumura: Ishihara, 1961: 252 (misidentification).

Resembles *S. intermedius* in overall color pattern, but larger and with distinct male genitalia.

Length: ♂ 4.0-4.5 mm, ♀ 4.8-5.3 mm.

Structure: Crown with bluntly pointed margin, median length longer than distance between eyes. Head same width as pronotum. Forewing long, with a small appendix. *Color*: Generally brown with whitish band from tip of crown to near apex of forewing. Crown with brown spot near apex, larger brown streak on margin before each

ocellus; brown spot behind each ocellus and connected to brown streak by a thin brown line. Face yellow-brown, darker above, with a yellow, transverse band below ocelli but above antenna. Pronotum and scutellum brown on lateral margin. Forewing with brown-streaked pattern following most major veins; darker at base and apex. ♂ *genitalia*: Plate triangular, about 1/2 length of pygofer. Pygofer bluntly pointed at apex. Style hooked with apex sharply pointed. Parameres long, same width to pointed apex, extending to middle of aedeagus. Aedeagus with narrow apodeme, shaft narrow, cylindrical, with a short pair of apical recurved processes; gonopore apical. ♀ *genitalia*: Posterior margin of 7th sternum concave with a produced rounded lobe either side of a median emargination. Ovipositor extending only slightly beyond pygofer. Pygofer long and narrowing to apex.

TYPES. Holotype ♂ (USNM), THAILAND: Thaphra, Khonkaen, 16-21.XI.1968, light trap, F. W. Knapp; allotype ♀ (USNM), same data as holotype; paratypes: 1 ♂, 3 ♀♀, same data as holotype (UK).

OTHER SPECIMENS EXAMINED. THAILAND: 2 ♀♀, Thaphra, Khonkaen, 20-26.XI.1970, light trap, Knapp; 2 ♂♂, Khonkaen, 13-18.XI.1970, light trap, Knapp; 1 ♀, Thaphra, Khonkaen, 1-5.XII.1968, light trap, Knapp; 1 ♀, Khonkaen, 8-12.XI.1971, light trap, N. Kitbamroong; 2 ♀♀, Khonkaen, 2-7.X.1970, light trap, Knapp; 1 ♂, Kalasin, 16.IV.1971; 1 ♂, Khonkaen, 1-8.X.1971, Kitbamroong; 2 ♀♀, Thaphra, Khonkaen, 18-22.X.1971, Kitbamroong; 1 ♀, Khonkaen, 19-30.X.1970, light trap, Knapp (UK, TPT); 1 ♂, 2 ♀♀, Chiangmai, IV.1967, light trap; 1 ♂, Sunpathong, 26.II.1971, Chirapan (RIT).

REMARKS. This species was considered to be *S. albovittatus* by Ishihara in 1961; however, *S. albovittatus* has a completely different color pattern and male genitalia. This species is closely related to *S. intermedius*, but the male aedeagus has a single pair of apical processes while *S. intermedius* has a pair of apical processes and a pair of subapical dorsal processes.

This species is named for F. W. Knapp, Department of Entomology, University of Kentucky, who collected many of the specimens included in this study.

Scaphoideus geniculatus Kitbamroong & Freytag, new species

FIG. 13, 16, 87-92

Resembling *S. alboguttatus* in size and color but with distinct male genitalia.

Length: ♂ 6.2-6.5 mm, ♀ unknown.

Structure: Crown with bluntly pointed margin, median length the same distance as the length between eyes, head same width as pronotum; forewing long, with small appendix. *Color*: Generally brown. Crown yellow with posterior brown with anterior margin of brown with 3 large lobes, and a small brown rod-like spot anterior to median lobe, dark brown on lateral margins near ocelli. Face yellow, with 3 brown short transverse stripes on median between antenna. Pronotum and scutellum yellow with dark brown on lateral margins. Forewings with dark brown pattern following most major veins. ♂ *genitalia*: Plate triangular, about 2/3 length of pygofer. Pygofer bluntly pointed at apex. Style S-shaped, with a very long sharp pointed apex. Connective expanded at base, and gradually narrowed to form a long stalk, then divided into 2 small parameres which are divergent terminally. Aedeagus expanded at base, gradually narrowed near middle, expanded near apex, also apex divided into 2 parts and diverged.

TYPES. Holotype ♂ (BISHOP 10,660), THAILAND (NW): Chiangmai, Fang, 12-19.IV.1958, T. C. Maa; paratypes: 4 ♂♂, same data as holotype (2, BISHOP; 2, UK).

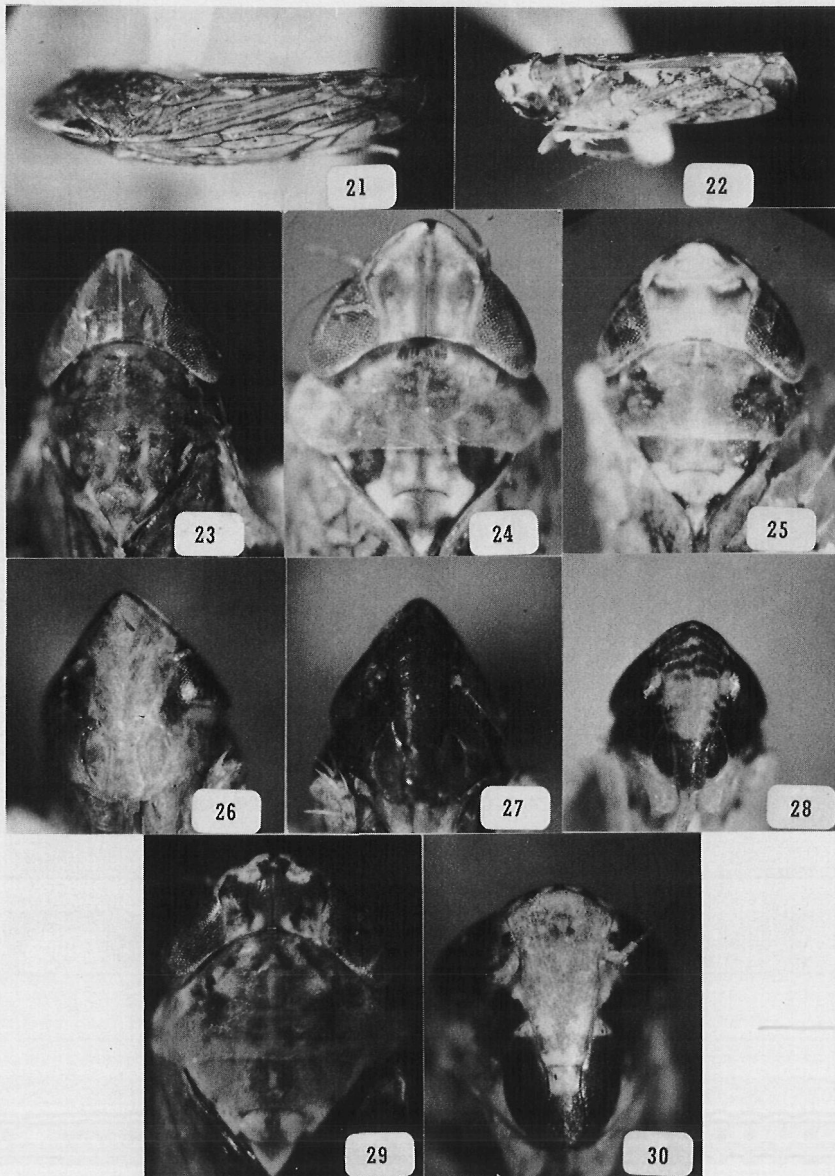


FIG. 21-30. 21, Lateral dorsal view of holotype ♂ of *S. coronatus*, n. sp.; 22, lateral dorsal view of holotype ♂ of *S. morrisoni*, n. sp.; 23, dorsal view of head, pronotum and scutellum of holotype ♂ of *S. coronatus*, n. sp.; 24, dorsal view of head, pronotum and scutellum of holotype ♂ of *S. orientalis*, n. sp.; 25, dorsal view of head, pronotum and scutellum of holotype ♂ of *S. morrisoni*, n. sp.; 26, face view of holotype ♂ of *S. coronatus*, n. sp.; 27, face view of holotype ♂ of *S. orientalis*, n. sp.; 28, face view of holotype ♂ of *S. morrisoni*, n. sp.; 29, dorsal view of head, pronotum and scutellum of holotype ♂ of *S. thailandensis*, n. sp.; 30, face view of holotype ♂ of *S. thailandensis*, n. sp.

OTHER SPECIMENS EXAMINED. THAILAND: 1 ♂, Lampoon, 4.XI.1971, light trap, W. P. Morrison (UK); 1 ♂, Chanthaburi, Prew, 25.IV.1958, T. C. Maa (BISHOP).

REMARKS. This species has the yellow median on the pronotum and scutellum, while *S. alboguttatus* has the pronotum and scutellum overall brown.

Scaphoideus coronatus Kitbamroong & Freytag, new species

FIG. 21, 23, 26, 117-122

Resembling no other species in the genus, head color pattern similar to *Cloanthanus* species.

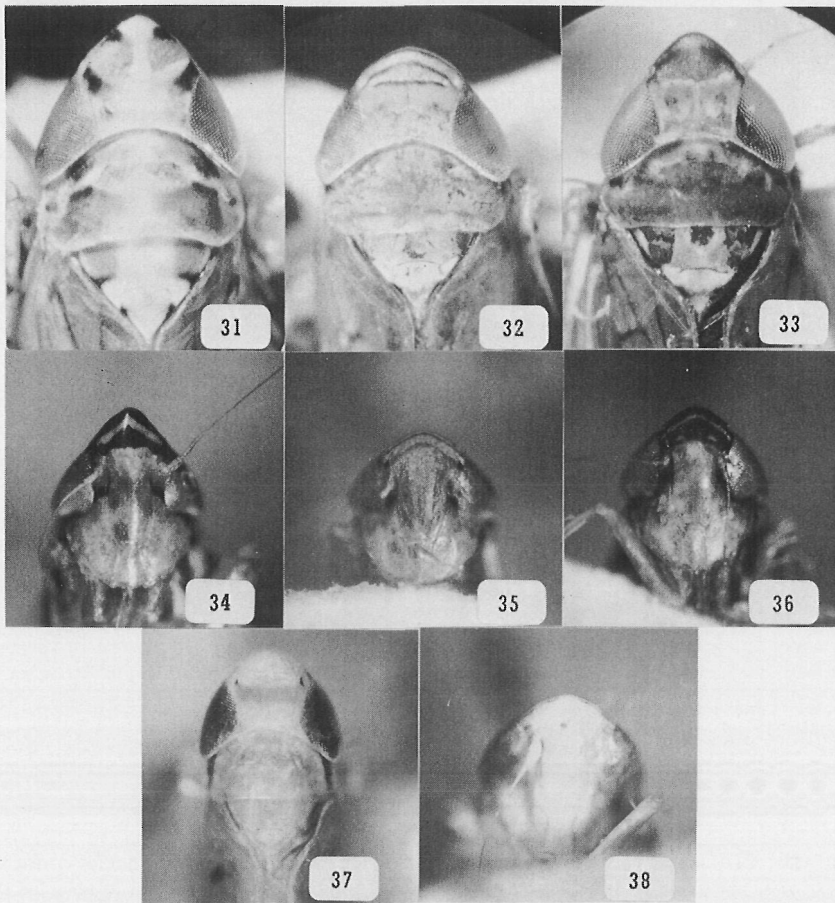


FIG. 31-38. 31, Dorsal view of head, pronotum and scutellum of holotype ♂ of *S. callus*, n. sp.; 32, dorsal view of head, pronotum and scutellum of Thailand ♂ of *S. ornatus* Melichar; 33, dorsal view of head, pronotum and scutellum of holotype ♂ of *S. chelatus*, n. sp.; 34, face view of holotype ♂ of *S. callus*, n. sp.; 35, face view of Thailand ♂ of *S. ornatus* Melichar; 36, face view of holotype ♂ of *S. chelatus*, n. sp.; 37, dorsal view of head, pronotum and scutellum of Thailand ♂ of *S. rubroguttatus* Matsumura; 38, face view of holotype ♀ of *S. rubroguttatus* Matsumura.

Length: ♂ 5.7-6.0 mm, ♀ unknown.

Structure: Crown with bluntly pointed margin, median length is little longer than distance between eyes, head same width as pronotum. *Color*: Generally dark brown. Crown dark brown with a yellow transverse band on margin between ocelli, 3 short median yellow longitudinal bars behind apex and 2 dark brown spots on each side near posterior edge of eye. Face yellow, with 3 indistinct dark brown transverse bands below margin. Pronotum mostly brown with yellow lateral margins. Scutellum brown with 2 longitudinal white lines on each side. Forewings brown with dark brown pattern following most major veins. ♂ *genitalia*: Plate triangular, with bluntly pointed apex, 2/3 length of pygofer. Pygofer dorsally flat, ventrally convex and truncate apically. Style S-shaped, with sharply pointed apex. Connective Y-shaped, expanded near base then forming a long stalk, apex slightly divided and sharply pointed. Aedeagus expanded at base, gradually narrowed at middle and then expanded near apex which divides into 2 small lobes.

TYPES. Holotype ♂ (BISHOP 10,661), THAILAND: Chiangmai, Doi Suthep, 4.IV.1958, T. C. Maa; paratypes: 1 ♂, same data as holotype; 1 ♂, same locality, 28-31.III.1958, Maa (BISHOP, UK).

REMARKS. This is a very distinct species with no known close relatives. It resembles a *Cloanthanus* in color pattern but belongs in *Scaphoideus* based on the male genitalia and the wing venation.

***Scaphoideus undulatus* Kitbamroong & Freytag, new species**

FIG. 11, 19-20, 99-104

Resembling *S. geniculatus* but with distinct genitalia.

Length: ♂ 5.8-6.1 mm, ♀ unknown.

Structure: Crown with bluntly pointed margin, median length same as distance between eyes. Head same width as pronotum. Forewing long with small appendix. *Color*: Generally dark brown. Crown with a dark brown median spot on margin, large brown W-shaped area between eyes, median part reaching spot on margin. Face yellow with 5 transverse brown lines below margin, lowest near base of antenna; gena, lora, and postclypeus brown. Pronotum and scutellum yellow to brown patterned with dark brown. Forewing with patterned dark brown along most major veins. ♂ *genitalia*: Plate triangular, about 2/3 length of pygofer. Pygofer truncate apically. Style hooked, with sharply pointed apex. Connective Y-shaped, parameres long, sharply pointed and divergent. Aedeagus curved near base, then gradually narrowing to a long stalked shaft with 2 short small processes curved toward base at apex; apex also with 2 short produced, parallel spines, base nearly rectangular in ventral view.

TYPES. Holotype ♂ (BISHOP 10,662), THAILAND: Banna, 5-10.IV.1958, T. C. Maa; paratypes: 3 ♂♂, same data as holotype (2, BISHOP; 1, UK).

OTHER SPECIMENS EXAMINED. THAILAND: 2 ♂♂, Chiangdao, 5-10.IV.1958, Maa (BISHOP, UK).

REMARKS. This species has the face with a dark brown gena, lora, and postclypeus, whereas in *S. geniculatus* these are yellow.

***Scaphoideus callus* Kitbamroong & Freytag, new species**

FIG. 31, 34, 69-74, 149

Resembling *S. albovittatus* but with distinct genitalia.

Length: ♂ 4.8-5.0 mm, ♀ 5.5-5.7 mm.

Structure: Crown with bluntly pointed margin, median length longer than distance between eyes. Head same width as pronotum. Forewing long. *Color*: Generally light brown, crown creamy white with 2 pairs of black spots along margin, 1 pair near eyes, other pair near apex and connected below margin on face; both pairs have some orange around them and are sometimes connected with orange. Face yellow, with 2 large transverse brownish black bands below apex, and a brown band on each side below antennae extending below eye on to lateral margin of pronotum. Pronotum with 2 large brown transverse bands which change to orange near median line. Scutellum with 2 transverse bands as on pronotum. Forewings yellow-brown, nearly clear with most major veins darker especially near base and apex. ♂ *genitalia*: Plate triangular, about 1/2 length of pygofer. Pygofer with a bluntly pointed apex. Style hooked, with a sharply pointed apex. Connective Y-shaped, parameres chelate type. Aedeagus cone-shaped, pointed at apex, base rectangular in ventral view. ♀ *genitalia*: Posterior margin of 7th sternum concave with a produced rounded lobe either side of a median emargination. Ovipositor extending only slightly beyond pygofer. Pygofer long, narrowing to a blunt apex.

TYPES. Holotype ♂ (USNM), THAILAND: Thaphra, Khonkaen, 27.VI.1968, light trap, F. W. Knapp; allotype ♀ (USNM), same locality as holotype, 2-7.VIII.1969; 4 paratypes, same locality as holotype: 1 ♂, 23-25.IX.1970; 1 ♂, 16-21.XI.1968; and 2 ♀♀, 24-29.IX.1968, Knapp (UK).

OTHER SPECIMENS EXAMINED. THAILAND: 1 ♀, Chumpae, 1.IV.1971, blacklight trap, W. P. Morrison (UK); 1 ♀, Khonkaen, 4.VI.1971, Kumma Chokethong (RIT).

REMARKS. The first person to recognize this species was Hongsaprug (1971); she described and illustrated this species from 1 male and 2 females from Nakornratchasima, Thailand. We have not seen these specimens but there is little question that they are this same species.

This species has the 2 distinct dark bands on the face, while these are represented by a median spot and 2 lateral spots in *S. albovittatus*.

Scaphoideus orientalis Kitbamroong & Freytag, new species

FIG. 24, 27, 123-128

Resembling *S. coronatus* but with distinct genitalia.

Length: ♂ 5.7-6.1 mm, ♀ unknown.

Structure: Crown with bluntly pointed margin, median length longer than distance between eyes. Head a little narrower than pronotum. Forewing long. *Color*: Generally brown. Crown with a transverse yellow band on margin, and a small dark brown transverse median spot. From near this spot 2 dark lines extend to eye, also 2 dark brown lobes between eyes and dark lines. Face dark brown with a small transverse yellow line on margin and a black line under the yellow line. Pronotum yellow, not patterned. Scutellum with lateral margins dark brown, yellow striped in median area and reaching middle edge of scutellum. Forewing patterned with dark brown. ♂ *genitalia*: Plate triangular, about 1/2 length of pygofer. Pygofer truncate apically. Style S-shaped, with a very sharply pointed apex. Connective Y-shaped, with a pair of small spines on sides near base, terminal divided into 2 small lobes. Aedeagus cone-shaped, apex divided into 2 small lobes, base rectangular in ventral view.

TYPES. Holotype ♂ (BISHOP 10,663), THAILAND (NW): Chiangmai Prov., Chiangdao, 450 m, 5-11.IV.1958, T. C. Maa; paratypes: 3 ♂♂, same data as holotype (2, BISHOP, 1, UK).

OTHER SPECIMENS EXAMINED. THAILAND: 1 ♂, Doi Aneka, Chiangmai, 9.IV.1953, Maa; 1 ♂, Chiangdao, 5-11.IV.1958, native collector (BISHOP).

REMARKS. This species has the face entirely brown whereas *S. coronatus* has the face mostly yellow.

***Scaphoideus vittatus* Kitbamroong & Freytag, new species**

FIG. 12, 14, 17, 105-110

Resembling *S. undulatus* but with distinct genitalia.

Length: ♂ 6.5 mm, ♀ unknown.

Structure: Crown with a bluntly pointed margin, median length same as distance between eyes. Head a little narrower than pronotum. Forewing long with small appendix. *Color*: Generally brown, crown with brown W-shaped area between eyes, median connected to a small brown rod near margin. Face yellow with 5 transverse light brown lines between eyes, upper line near margin and lower near base of antenna. Pronotum and scutellum with wide, median, whitish band extending to near apex of forewing, lateral margins dark brown; pronotum with a thin white line on margin. Forewing patterned with dark brown along most major veins. ♂ *genitalia*: Plate triangular, almost same length as pygofer. Pygofer truncate apically. Style hooked, with a very sharply pointed apex. Connective Y-shaped, enlarged near middle, parameres stalked and tapered to apex which divides into 2 small lobes. Aedeagus stalked at base, apex of shaft divided into 2 parallel lobes which are pointed at apex, base rounded in ventral view.

TYPES. Holotype ♂ (BISHOP 10,664), THAILAND: Chiangmai, Chiangdao, 5-11.IV.1958, T. C. Maa; paratypes: 2 ♂♂, same data as holotype (BISHOP, UK).

No other specimens have been seen.

REMARKS. This species has faint bands across the face and a bar-like spot on crown at apex whereas *S. undulatus* has distinct bands across face and a round spot on the crown.

***Scaphoideus morrisoni* Kitbamroong & Freytag, new species**

FIG. 22, 25, 28, 57-62, 148

Resembling *S. albovittatus* but with distinct male genitalia.

Length: ♂ 4.0-4.4 mm; ♀ 5.0 mm.

Structure: Crown with bluntly pointed margin, median length little longer than distance between eyes. Head same width as pronotum. Forewing long with small appendix. *Color*: Generally yellowish brown. Crown with 2 brownish orange dashes across middle between eyes. Face yellowish brown, with 5 dark brown transverse lines from margin down to base of antenna; gena, lora and postclypeus brown. Pronotum and scutellum with sides brown. Forewing with brown-streaked pattern following most major veins, darker at base and apex. ♂ *genitalia*: Plate long, triangular with bluntly pointed apex, about 3/4 length of pygofer. Pygofer truncate at apex. Style short, robust, at base with sharply pointed apex. Connective Y-shaped, stalked then expanded and rounded. Parameres narrow, stalked, apex divided into narrow sharply pointed lobes. Aedeagus with shaft cone-shaped, base nearly rectangular in ventral view. ♀ *genitalia*: Posterior margin of 7th sternum concave with a median emargination. Ovipositor extending only slightly beyond pygofer. Pygofer long, blunt at apex.

TYPES. Holotype ♂ (USNM), THAILAND: Kalasin, 1.VI.1971, W. P. Morrison; allotype ♀ (USNM), same data as holotype; paratypes: 2 ♂♂, 1 ♀ (without abdomen), same data as holotype (UK).

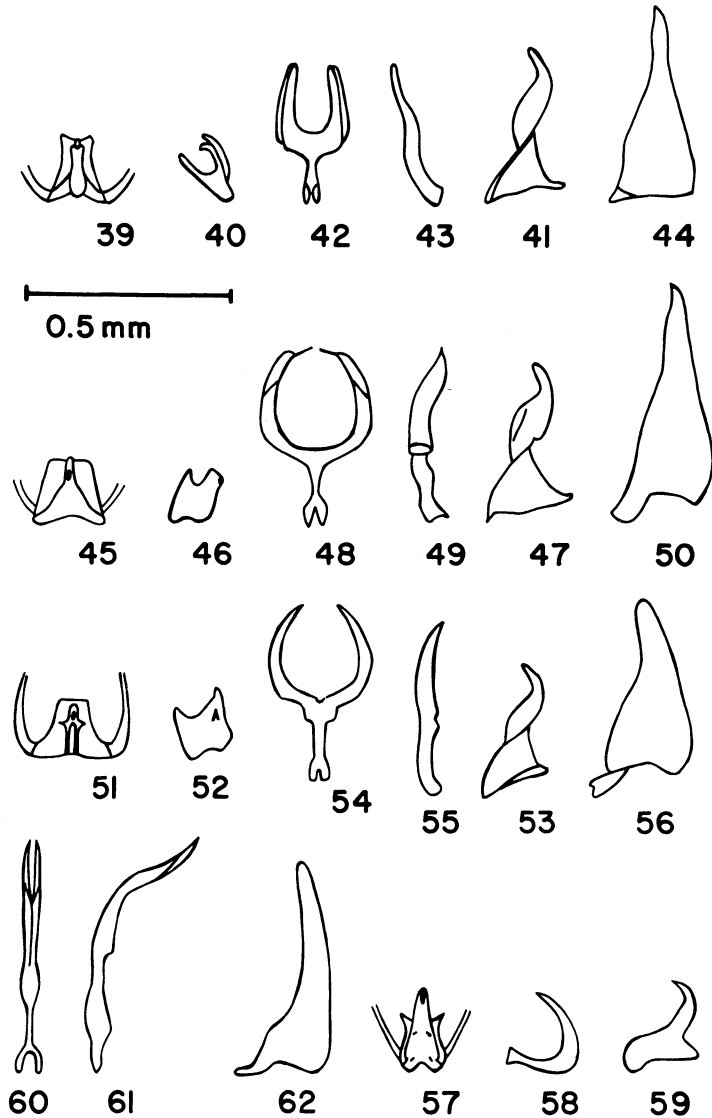


FIG. 39-62. ♂ genitalia: 39-44, *Scaphoideus morosus* Melichar: 39, aedeagus, ventral view; 40, aedeagus, lateral view; 41, style, ventral view; 42, connective and parameres, ventral view; 43, connective and parameres, lateral view; 44, plate, ventral view. 45-50, *S. harlani*, n. sp.: 45, aedeagus, ventral view; 46, aedeagus, lateral view; 47, style, ventral view; 48, connective and parameres, ventral view; 49, connective and parameres, lateral view; 50, plate, ventral view. 51-56, *S. acanthus*, n. sp.: 51, aedeagus, ventral view; 52, aedeagus, lateral view; 53, style, ventral view; 54, connective and parameres, ventral view; 55, connective and parameres, lateral view; 56, plate, ventral view. 57-62, *S. morrisoni*, n. sp.: 57, aedeagus, ventral view; 58, aedeagus, lateral view; 59, style, ventral view; 60, connective and parameres, ventral view; 61, connective and parameres, lateral view; 62, plate, ventral view. All drawn to the same scale.

REMARKS. This species resembles *S. albovittatus* in color pattern but is much smaller and face is darker.

This species is named after Dr W. P. Morrison, New Mexico Department of Agriculture, who collected this interesting species.

Scaphoideus ornatus Melichar FIG. 32, 35, 129-134, 147

Scaphoideus ornatus Melichar, 1903: 196.

Scaphoideus speciosus Schumacher, 1915: 125. **New synonymy.**

Length: ♂ 4.1-4.2 mm, ♀ 4.3-4.6 mm.

Structure: Crown with bluntly pointed margin, median length longer than distance between eyes. Head same width as pronotum. Forewing long, with small appendix. *Color:* Generally light brown. Crown with a thin transverse black line near and parallel to margin, a large, orange transverse band between eyes bordered with black. Face yellowish brown, with 2 parallel transverse thin brown lines near margin. Pronotum with 2 transverse orange bands, 1st across anterior margin between eyes, 2nd near posterior margin. Scutellum with a large transverse orange band across middle. Forewing with brown-streaked patterns following most major veins, darker at base and apex. ♂ *genitalia:* Plate triangular, about 3/4 length of pygofer. Pygofer truncate at apex. Style hooked, with sharply pointed apex, and with 2 small humps on inner side. Connective Y-shaped, parameres long, parallel, sharply pointed at apex and about 1/3 from apex expanded into a small triangular flag-like area on each side. Aedeagus with shaft tubular, expanded at base gradually narrowing near middle, apex with a pair of small recurved spines; base rectangular in ventral view, concavely notched at dorsal end. ♀ *genitalia:* Posterior margin of 7th sternum convex with a median emargination. Ovipositor extending only slightly beyond pygofer. Pygofer long and narrowing.

TYPE. Holotype ♂ (MORAVIAN), CEYLON: Pendeniya, I.1902, Dr Uzel, Melichar Collection.

THAILAND SPECIMENS EXAMINED. THAILAND: 1 ♂, 1 ♀, Khonkaen, 2-7.X.1970, light trap, F. W. Knapp; 1 ♀, Thaphra, Khonkaen, 16-21.XI.1968, light trap, Knapp; 1 ♀, Thaphra, Khonkaen, 19.VII.1968, black light, Knapp; 1 ♂, Ubol, 19-22.XI.1969, light trap, Knapp (UK; 1 ♀, TPT).

REMARKS. This species has been seen from Thailand, India, Ceylon and Formosa.

Holotype male of *S. speciosus* from Kosempo, Formosa, IV.1912 has been examined, and is the same as *S. ornatus*; it is deposited in the Institut für Pflanzenschulzforschung Kleinmachnow, Berlin, East Germany.

Scaphoideus chelatus Kitbamroong & Freytag, new species FIG. 33, 36, 63-68

Resembling *S. ornatus* but with quite different male genitalia.

Length: ♂ 4.4 mm, ♀ unknown.

Structure: Crown with bluntly pointed margin, median length longer than distance between eyes. Head same width as pronotum. Forewing long, with small appendix. *Color:* Generally brown. Crown yellowish brown with a transverse dark brown line, interrupted at middle, along margin; a wide orange transverse band between eyes. Face

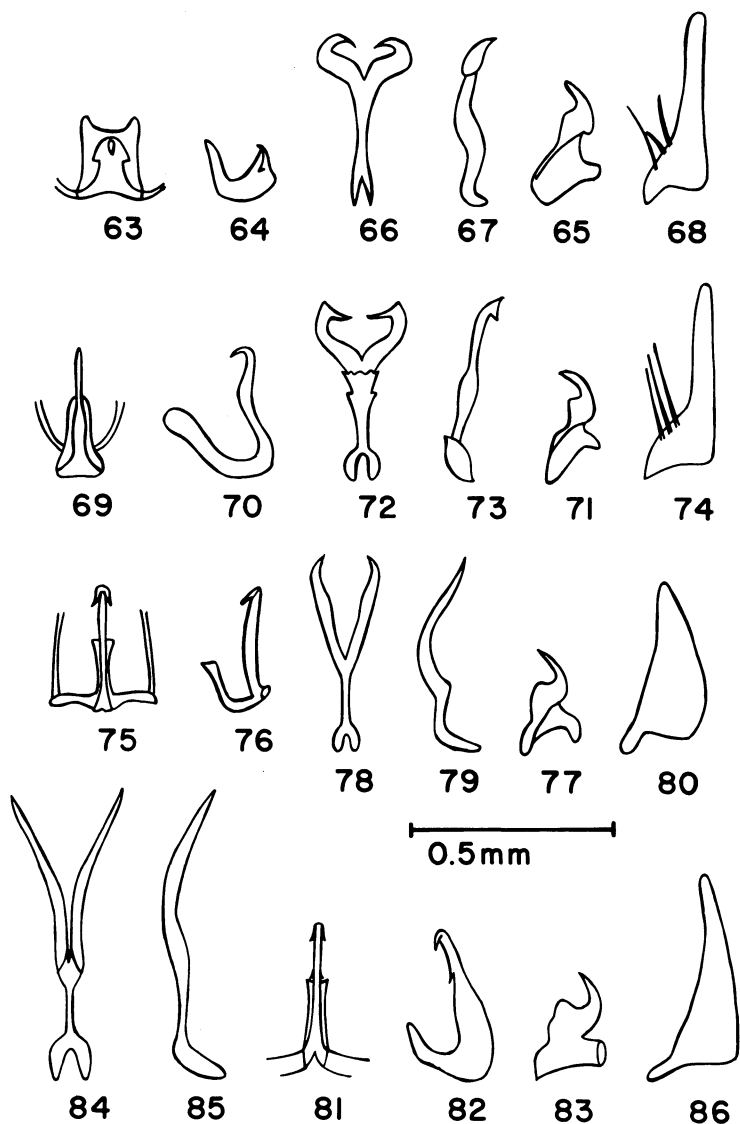


FIG. 63-86. ♂ genitalia: 63-68, *Scaphoideus chelatus*, n. sp.: 63, aedeagus, ventral view; 64, aedeagus, lateral view; 65, style, ventral view; 66, connective and parameres, ventral view; 67, connective and parameres, lateral view; 68, plate, ventral view. 69-74, *S. callus*, n. sp.: 69, aedeagus, ventral view; 70, aedeagus, lateral view; 71, style, ventral view; 72, connective and parameres, ventral view; 73, connective and parameres, lateral view; 74, plate, ventral view. 75-80, *S. knappi*, n. sp.: 75, aedeagus, ventral view; 76, aedeagus, lateral view; 77, style, ventral view; 78, connective and parameres, ventral view; 79, connective and parameres, lateral view; 80, plate, ventral view. 81-86, *S. maai*, n. sp.: 81, aedeagus, ventral view; 82, aedeagus, lateral view; 83, style, ventral view; 84, connective and parameres, ventral view; 85, connective and parameres, lateral view; 86, plate, ventral view. All drawn to the same scale.

yellowish brown with 2 dark brown transverse bands below margin, lower band wider and with a yellow spot near middle of each side. Pronotum and scutellum banded as in *S. ornatus*. Forewing with brown-streaked pattern following most major veins, darker at base and apex. ♂ *genitalia*: Plate triangular with blunt finger-like apex, 2/3 length of pygofer. Pygofer truncate at apex. Style S-shaped, with a sharply pointed apex. Connective Y-shaped, parameres convex and converged, "chelate-like," with a small V-shaped median notch at base. Aedeagus cone-shaped, with a small rounded knob at apex, base nearly rectangular in ventral view.

TYPE. Holotype ♂ (USNM), THAILAND: Thaphra, Khonkaen, 16-21.XI.1968, light trap, F. W. Knapp.

No other specimens have been seen.

REMARKS. The chelate type of parameres in this species is quite different from that found in *S. ornatus* and shows some similarity to the *morosus* group.

***Scaphoideus thailandensis* Kitbamroong & Freytag, new species**

FIG. 29-30, 93-98

Resembling *S. geniculatus* in general size and color, but with distinct male genitalia.

Length: ♂ 7.5 mm, ♀ unknown.

Structure: Crown with blunt but distinct margin; median length shorter than distance between eyes. Head narrower than pronotum. Forewing long with small appendix. *Color*: Generally brown. Crown with large dark brown W pattern, median brown marking extending widely to near apex then abruptly narrowed and extending over margin. Face yellow with brown dash above each antenna, most of gena, lora and lower 2/3 of postclypeus brown. Pronotum yellow-brown with heavy maculations along anterior margin. Scutellum yellow. Forewing with brown streak pattern following most major veins, darker at base and apex. ♂ *genitalia*: Plate long, thin triangular, same length as pygofer. Pygofer sharply pointed at apex. Style hooked, bluntly pointed at apex. Connective Y-shaped, stalked, then expanded; parameres divided into 2 long and converging lobes at apex. Aedeagus with dorsal basal process, notched at apex; shaft expanded at middle and narrowing to rounded apex, base rectangular in ventral view.

TYPE. Holotype ♂ (BISHOP 10,665), THAILAND (NW): Chiangmai Prov., Chiangdao 450 m, 5-11.IV.1958, T. C. Maa.

No other specimens have been seen.

REMARKS. This species has a dark pattern on the face which is quite distinct and different from the nearly all yellow face of *S. geniculatus*.

***Scaphoideus fuscus* Kitbamroong & Freytag, new species**

FIG. 15, 18, 111-116

Resembling *S. thailandensis* but with bands across face and with distinct male genitalia.

Length: ♂ 7.9 mm, ♀ unknown.

Structure: Crown with bluntly rounded margin, median length shorter than distance between eyes. Head narrower than pronotum. Forewing long, with small appendix. *Color*: Generally light brown. Crown with 3 large brown spots, 1st on median line near margin, 2nd and 3rd near eyes. All spots connected by brown band. Face yellow-brown, with 5 transverse light brown lines between margin and base of antenna. Pronotum yellowish brown, with brown longitudinal bands. Scutellum yellow with brown lateral margins. Forewing streaked with a brown pattern following most major veins. ♂ *genitalia*: Plate outwardly bent but triangular, almost same length as

pygofer. Pygofer truncate at apex. Style hooked, with bulbous bluntly pointed apex. Connective as in *S. morrisoni* but larger and parameres converging. Aedeagus expanded near base, gradually narrowed and laterally compressed to a rounded laterally flattened apex; a pair of subapical pointed processes; base triangular.

TYPE. Holotype ♂ (BISHOP 10,666), THAILAND (NW): Fang, Chiangmai, 12-19.IV.1958, T. C. Maa.

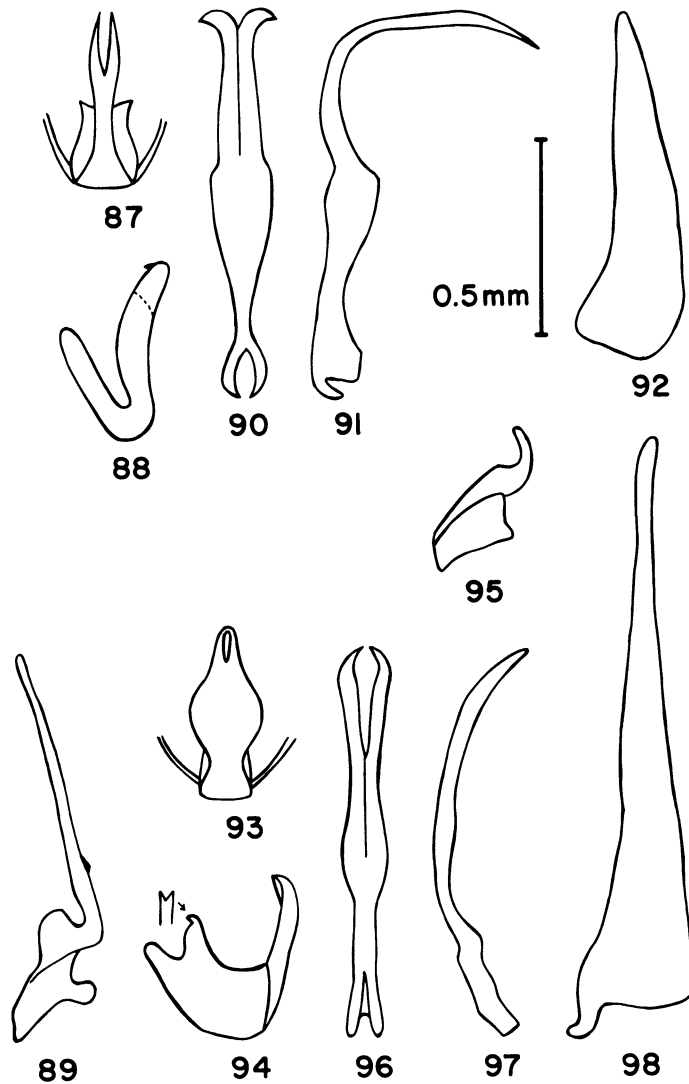


FIG. 87-98. ♂ genitalia: 87-92, *Scaphoideus geniculatus*, n. sp.: 87, aedeagus, ventral view; 88, aedeagus, lateral view; 89, style, ventral view; 90, connective and parameres, ventral view; 91, connective and parameres, lateral view; 92, plate, ventral view. 93-98, *S. thailandensis*, n. sp.: 93, aedeagus, ventral view; 94, aedeagus, lateral view; 95, style, ventral view; 96, connective and parameres, ventral view; 97, connective and parameres, lateral view; 98, plate, ventral view. All drawn to the same scale.

No other specimens have been seen.

REMARKS. This species has bands across face and an unusual style whereas *S. thailandensis* lacks the bands and has a more typical style.

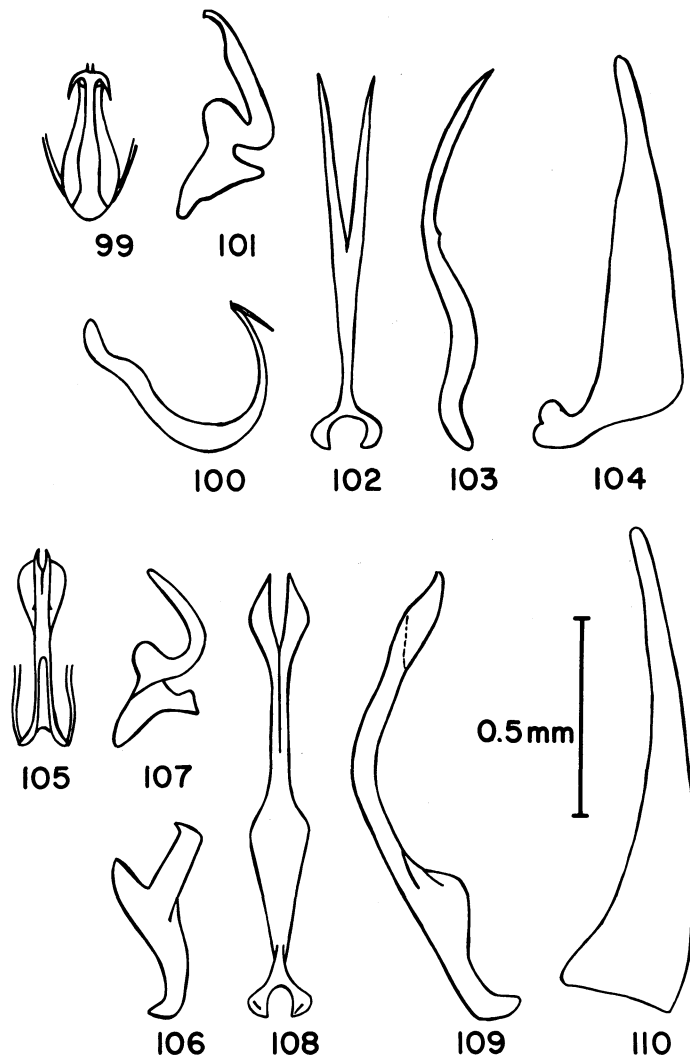


FIG. 99-110. ♂ genitalia: 99-104, *Scaphoideus undulatus*, n. sp.: 99, aedeagus, ventral view, 100, aedeagus, lateral view; 101, style, ventral view; 102, connective and parameres, ventral view; 103, connective and parameres, lateral view; 104, plate, ventral view. 105-110, *S. vittatus*, n. sp.: 105, aedeagus, ventral view; 106, aedeagus, lateral view; 107, style, ventral view; 108, connective and parameres, ventral view; 109, connective and parameres, lateral view; 110, plate, ventral view. All drawn to the same scale.

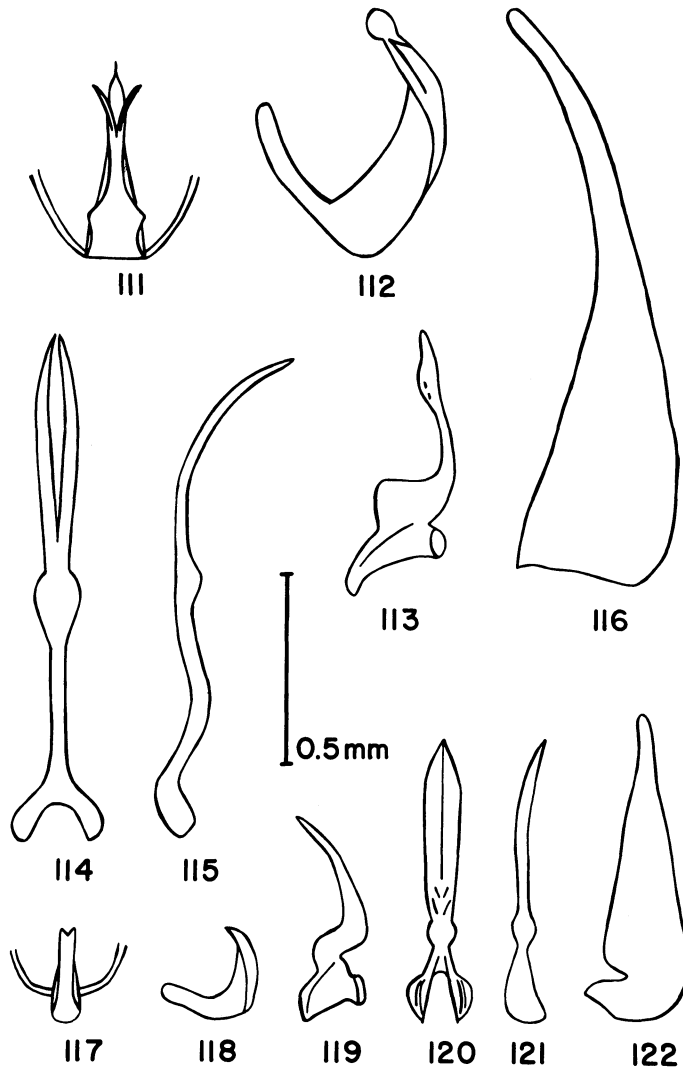


FIG. 111-122. ♂ genitalia: 111-116, *Scaphoideus fuscus*, n. sp.: 111, aedeagus, ventral view; 112, aedeagus, lateral view; 113, style, ventral view; 114, connective and parameres, ventral view; 115, connective and parameres, lateral view; 116, plate, ventral view. 117-122, *S. coronatus*, n. sp.: 117, aedeagus, ventral view; 118, aedeagus, lateral view; 119, style, ventral view; 120, connective and parameres, ventral view; 121, connective and parameres, lateral view; 122, plate, ventral view. All drawn to the same scale.

Scaphoideus rubroguttatus Matsumura

FIG. 37-38, 135-140, 146

Scaphoideus rubroguttatus Matsumura, 1914: 223.

Length: ♂ 4.1 mm; ♀ 5.0 mm.

Structure: Crown with bluntly rounded margin, median length longer than the distance between eyes. Head same width as pronotum. Forewing long with small appendix. *Color*: Generally yellow. Crown with wide transverse

orange band between eyes, with a small dark brown triangular spot on each side anterior to band. Face yellow, with small dark streak near the base of antenna. Pronotum with 2 longitudinal orange bands, with 2 median orange bars between them, a dark black longitudinal stripe lateral to each orange band. Scutellum with 2 orange bands parallel to median line. Forewing with faint brown streaked pattern following most major veins; a dark spot near base of clavus and apex of wing. ♂ *genitalia*: Plate triangular, blunt at apex, about 1/2 length of pygofer. Pygofer

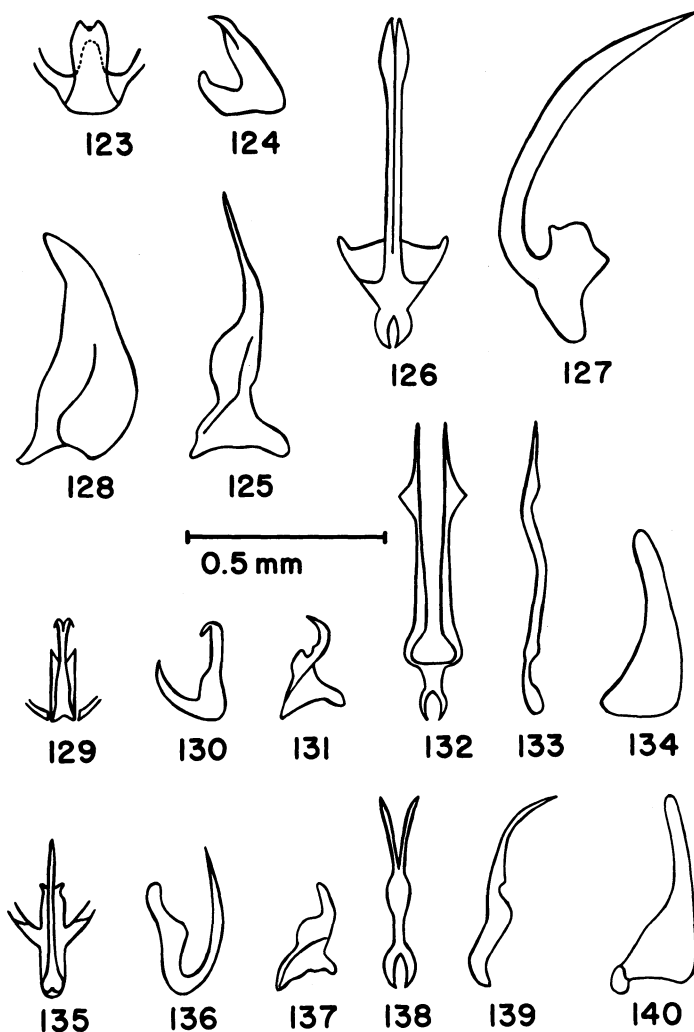


FIG. 123-140. ♂ genitalia: 123-128, *Scaphoideus orientalis*, n. sp.: 123, aedeagus, ventral view; 124, aedeagus, lateral view; 125, style, ventral view; 126, connective and parameres, ventral view; 127, connective and parameres, lateral view; 128, plate, ventral view. 129-134, *S. ornatus* Melichar: 129, aedeagus, ventral view; 130, aedeagus, lateral view; 131, style, ventral view; 132, connective and parameres, ventral view; 133, connective and parameres, lateral view; 134, plate, ventral view. 135-140, *S. rubroguttatus* Matsumura: 135, aedeagus, ventral view; 136, aedeagus, lateral view; 137, style, ventral view; 138, connective and parameres, ventral view; 139, connective and parameres, lateral view; 140, plate, ventral view. All drawn to the same scale.

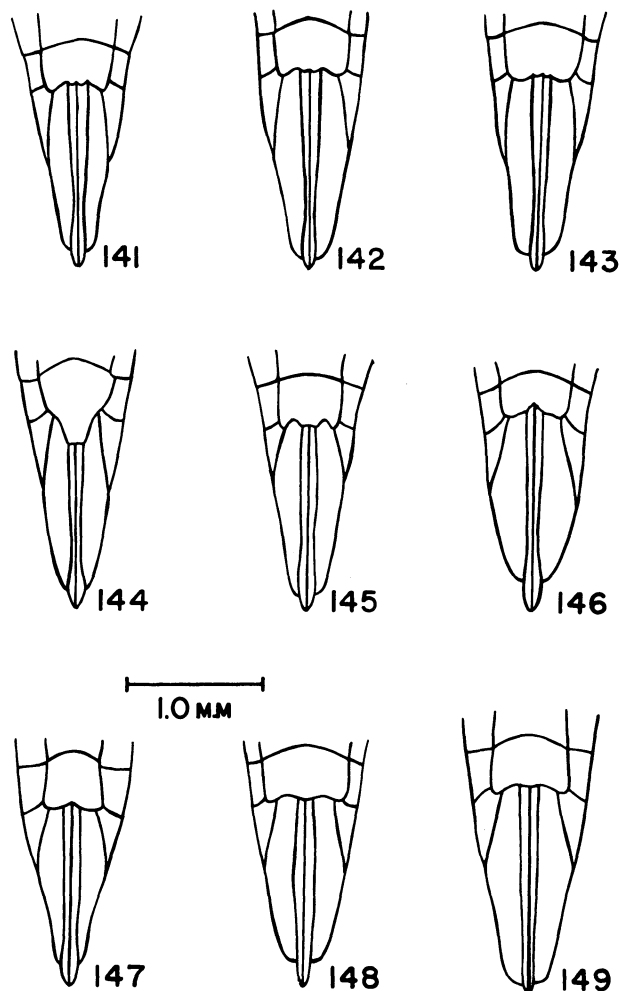


FIG. 141-149. External view of ♀ genitalia: 141, *S. morosus* Melichar; 142, *S. harlani*, n. sp.; 143, *S. acanthus*, n. sp.; 144, *S. maai*, n. sp.; 145, *S. knappi*, n. sp.; 146, *S. rubroguttatus* Matsumura; 147, *S. ornatus* Melichar; 148, *S. morrisoni*, n. sp.; 149, *S. callus*, n. sp. All drawn to the same scale.

truncate at apex. Style hooked, with bluntly pointed apex. Connective Y-shaped, stalked then expanded, parameres short, pointed, narrow and divergent. Aedeagus with shaft long, tubular, sharply pointed at apex, base rectangular with lateral processes in ventral view. ♀ genitalia: Posterior margin of 7th sternum convex with sharp angled median emargination. Ovipositor extending very slightly beyond pygofer. Pygofer long, blunt at apex.

TYPE. Holotype ♀ (HU), FORMOSA (Giran): N. Tsuru.

THAILAND SPECIMENS EXAMINED. THAILAND: 1 ♂, Bangkok, 7.X.1971, Manasri (RIT).

REMARKS. This species is now known to us from Formosa, Thailand, Vietnam, and the Philippines.

Acknowledgments: We wish to thank the following individuals and institutions for the loan of their specimens: Dr J. L. Gressitt, Bishop Museum, Honolulu; Dr W. J. Knight, British Museum (Natural History), London; Mrs Waree Hongsaprug, Rice Institute of Thailand, Bangkok, Bangkok; Dr J. P. Kramer, U. S. National Museum, Washington; and Mr Chalermwong Tirawat, Northeast Agricultural Center, Taphra, Khonkaen, Thailand. Also, we wish to thank the following people for loan of Oriental type material used in this study: Dr S. Takagi, Hokkaido University, Sapporo, Japan; Dr W. J. Knight, British Museum (Natural History), London, England; and Dr Jaroslav Stehlik, Moravian Museum, Brno, Czechoslovakia.

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