

Moths of the Genus *Trabala* (Lepidoptera, Lasiocampidae) from Thailand^{1,2)}

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Abstract The Thai moths belonging to the lasiocampid genus *Trabala* WALKER, 1856, are enumerated. In addition to a known species, *T. vishnou* (LEFÈBVRE), a new moth, *T. niphanae*, is described, and *T. pallida* (WALKER), *T. irrorata* MOORE, *T. viridana* JOICEY et TALBOT and *T. krishna* ROEPKE are recorded for the first time.

The genus *Trabala* is one of the beautiful lasiocampid moths, having wings pale apple green in males and pale green or yellow in females. After the revisional work by ROEPKE (1951), knowledge of Southeast Asian *Trabala* has been extensively improved in Sundaland (HOLLOWAY, 1976, 1982, 1987) and in the Philippines (OWADA & KISHIDA, 1986, 1987). On the other hand, records from the Indochinese Peninsula are very scarce. From Thailand, we were able to find only one record, i.e. *T. vishnou* from Bangkok by TAMS (1924).

In July to September 1987, the National Science Museum, Tokyo, made a zoological expedition to Thailand and Peninsular Malaysia in cooperation with the Thailand Institute of Scientific and Technological Research and Universiti Malaya. The entomologists' party of the expedition made a round collecting trip: Bukit Fraser, Cameron Highlands, Gunung Berinchang, Pulau Pinang and Gunung Jerai in Peninsular Malaysia; Khao Luang, Khao Sok and Khlong Nakha in South Thailand; Nam Nao, Phu-Hin Rongkla, Lan Sang, Taksin Maharat and Tong Salaeng Luang in Central Thailand; Phu Rua in North East Thailand; Doi Inthanon, Doi Pui, Doi Angkhang and Chiang Rai in North Thailand.

During the collecting trip, one of us (OWADA) was able to collect sixteen specimens of *Trabala* at many localities. In addition to these, we had the opportunity to examine

1) This study is supported by the Grants-in-aid for Overseas Scientific Research Nos. 404101, 56041051, 56041060, 58041061, 5804174, 60041062, 60041078, 62041074, 62041087, 63043062 and 63043075 from the Ministry of Education, Science and Culture, Japan.

2) Scientific Results of the Lepidopterological Expedition to Thailand, No. 38.

the material collected by the Lepidopterological Expedition to Thailand made by the Entomological Laboratory, University of Osaka Prefecture.

In this paper, we will deal with the Thai specimens which are classified into six species, one of which is new to science and four are new to Thailand.

Trabala vishnou (LEFÈBVRE)

(Figs. 1, 2, 10, 12, 13)

Gastropacha vishnou LEFÈBVRE, 1827, Zool. J., **3**: 207.

Gastropacha sulphurea KOLLAR, 1848, in VON HÜGEL, Aufzähl. Beschr. F. C. VON HÜGEL Reise Kaschmir Himalayageb. gesamm. Ins., p. 471.

Amydona basalis WALKER, 1855, List Specimens lepid. Ins. Coll. Br. Mus., **6**: 1415.

Amydona prasina WALKER, 1855, List Specimens lepid. Ins. Coll. Br. Mus., **6**: 1417.

Trabala vishnou: WALKER, 1856, List Specimens lepid. Ins. Coll. Br. Mus., **7**: 1758; TAMS, 1924, J. nat. Hist. Soc. Siam, **6**: 279; ROEPKE, 1951, Meded. LandbHoges. Wageningen, **50**: 110–112, pl. 4, fig. 5, pl. 6, figs. 1–8, pl. 7, figs. 1–3.

Trabala mahananda MOORE, 1865, Proc. zool. Soc. Lond., **1865**: 821.

Male (Figs. 1, 2). Expanse 39–57 mm, length of forewing 21–29 mm.

Female (Fig. 10). Expanse 68–82 mm, length of forewing 38–46 mm.

Male genitalia (Figs. 12, 13).

Material examined. N. Thailand:— Chiang Mai Prov., Doi Angkhang (1,350 m), 1 ♂ 2 ♀, 10–12. IX. 1987, M. OWADA leg., 20 km West of Fang (900 m), 1 ♂, 11. IX. 1987, M. OWADA leg., Doi Pui (1,400 m), 1 ♂, 7–9. IX. 1987, M. OWADA leg., Doi Pui (1,300 m), 1 ♂, 26–27. X. 1985, S. MORIUTI *et al.* leg., Doi Pui, 1 ♀, 16. VI. 1984, Doi Inthanon (1,300 m), 1 ♂, 1, 3. XI. 1985, S. MORIUTI *et al.* leg., Doi Pakia (1,500 m), 2 ♂ 1 ♀, 5–7. IX. 1987, S. MORIUTI *et al.* leg. S. Thailand:— Surat Thani Prov., Phanom, Khao Sok Natn. Park (100 m), 1 ♂, 10–11. VIII. 1987, M. OWADA leg. Nepal:— Gandaki Zone, Parbat Distr., Kiumrung (2,250 m), 1 ♀, 17. X. 1981, M. OWADA leg., Modi Khola (2,670 m), Himaley Hotel, 1 ♀, 19. X. 1981, M. OWADA leg., Chomrong (2,000 m), 5 ♀, 21. X. 1981, M. OWADA leg., Kaski Distr., Dhampus Danda (2,100 m), 2 ♀, 23. X. 1981, M. OWADA leg.; Kathmandu, 1 ♂, 16. VIII., Godawari, 1 ♀, V–VII. 1973, 1 ♂, 2–6. V. 1987, T. MIYASHITA leg.; Sagarmatha Zone, Solukhumbu Dist., Kharikhola (1,980 m), 1 ♀, 7. X. 1979, M. OWADA leg., Manidingma (2,240 m), 1 ♀, 8. X. 1979, M. OWADA leg.; Bagmati Zone, Sindhu Distr., Ghorthali (1,600 m), 1 ♀, 10. XI. 1979, M. OWADA leg., Drumthali (2,420m), 1 ♂, 13. XI. 1979, M. OWADA leg.; Janakpur Zone, Ramechhap Distr., Changma (2,200 m), 1 ♂ 2 ♀, 13. X. 1979, M. OWADA leg. NE India:— West Bengal, Darjeeling (2,100 m), 2 ♀, 28. IX. 1983, M. OWADA leg., Darjeeling, Tiger Hill, 1 ♀, V. 1979. S. India:— Nirgili Hills, Gudalur (1,200 m), 1 ♂, 4. XI. 1977, T. HASEGAWA leg. Taiwan:— Taipei Hsien, Wulai, 1 ♂, 31. III. 1977, Y. KISHIDA leg., 1 ♀, 14–15. VI. 1973, M. OWADA leg., 1 ♂, 19. VIII. 1971, M. NISHIKAWA leg., Nantou Hsien, Lushan Spa, 1 ♂, 29. II. 1980, T. TANABE leg., 1 ♀, 2. VII. 1970, 1 ♀, 6. VIII. 1974, Y. KISHIDA, 3 ♂ 2 ♀, 26. VIII. 1983, H. YOSHIMOTO leg., Chiayi Hsien, Fenchihu, 1 ♀, 23. V.

1980, T. TANABE leg. Peninsular Malaysia:— Cameron Highlands, G. Berinchang (1,950 m), 3 ♂, 21–22. VII. 1987, M. OWADA leg., Cameron Highlands, 23, XII. 1971, Y. KISHIDA leg., 4 ♂, 1984; Genting Highlands (1,700 m), 6–8. IV. 1986, K. YAZAKI leg.

Distribution. Sri Lanka (ssp. *singhala* ROEPKE, 1951, p. 112), India, Burma, China, Taiwan, Vietnam, Cambodia, Thailand and Peninsular Malaysia.

Remarks. Widely distributed in the Asian Continent from India to Taiwan and mountains of the Malay Peninsula, though never discovered in the Sunda Islands and the Philippines.

Though the male genitalia are similar to those of *T. pallida* (WALKER), this species is easily distinguished from the latter by the larger size. However, some exceptional small male specimens were collected in Thailand and Peninsular Malaysia (length of forewing 21–25 mm), and such specimens are superficially similar to those of *T. pallida*. Diagnostic characters can be summarized as follows: antenna markedly large, post-medial line of hindwing almost straight, while it is smoothly curved near costa in *pallida*.

Trabala pallida (WALKER)

(Figs. 3, 4, 11, 14, 15)

Amydona pallida WALKER, 1855, List Specimens lepid. Ins. Coll. Br. Mus., 6: 1417.

Trabala pallida: ROEPKE, 1951, Meded. LandbHoges. Wageningen, 50: 112–113, pl. 1, figs. 1, 2, pl. 2, figs. 1, 2, pl. 3, fig. 1, pl. 9, figs. 1–6, pl. 11, fig. 1, pl. 12, fig. 1.

Trabala pallida montana ROEPKE, 1951, Meded. LandbHoges. Wageningen, 50: 113–114, pl. 1, fig. 3, pl. 3, fig. 2, pl. 9, figs. 7–9, pl. 11, fig. 2, pl. 12, fig. 2; HOLLOWAY, 1976, Moths Borneo special Refer. Mt. Kinabalu, p. 90, fig. 701; HOLLOWAY, 1987, Moths Borneo, (3): 53–54, fig. 63, pl. 6, figs. 12, 13.

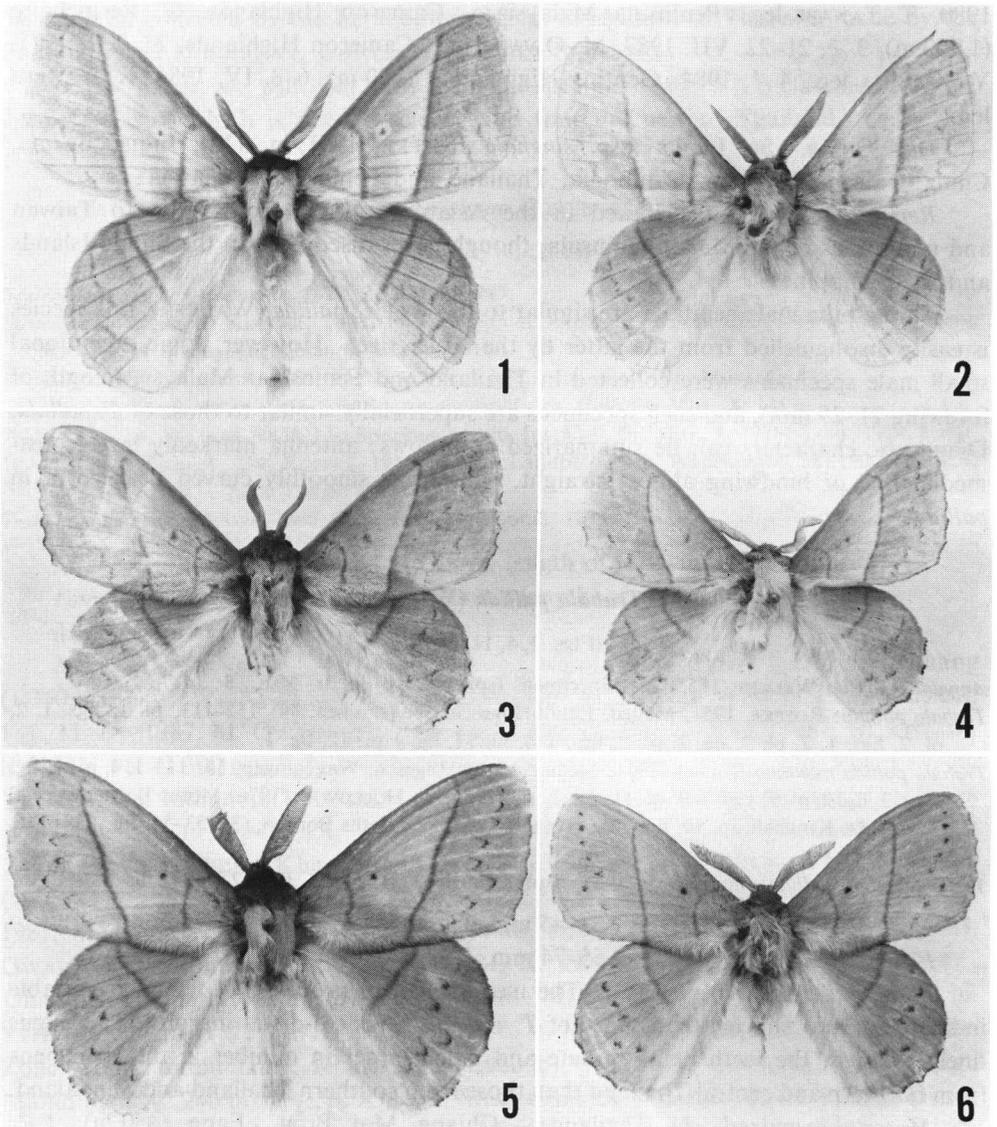
Trabala pallida pallida: HOLLOWAY, 1987, Moths Borneo, (3): 53–54, fig. 62, pl. 1, fig. 5.

Male (Figs. 3, 4). Expanse 31–45 mm, length of forewing 18–25 mm.

Female (Fig. 11). Expanse 55–74 mm, length of forewing 31–40 mm.

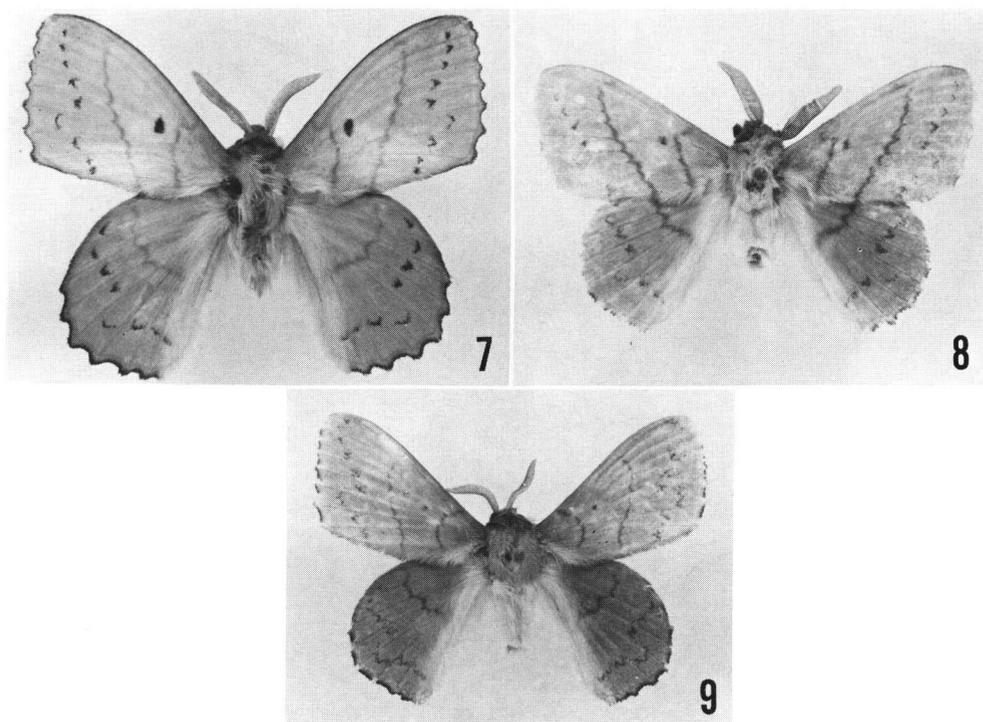
Male genitalia (Figs. 14, 15). The median pair of processes of tegumen variable in shape, clearly shorter than those of *T. vishnou*. Ventro-distal margin of aedeagus finely toothed, the teeth being minute and much larger in number in the specimens from northern and central Thailand than those from southern Thailand and Sundaland.

Material examined. N. Thailand:— Chiang Mai Prov., Fang (450 m), 1 ♂, 13–16. IX. 1987, 1 ♂, 29–31. X. 1985, S. MORIUTI *et al.* leg., Chiang Mai, 1 ♀, 21. V. 1984, A. M. COTTON leg. NE Thailand:— Loei Prov., Phu Rua (800 m), 1 ♂, 15–19. VIII. 1987, S. MORIUTI *et al.* leg. C. Thailand:— Kanchanaburi Prov., Erawan (600 m), 6 ♂, 27–28. XI. 1985, S. MORIUTI *et al.* leg. E. Thailand:— Chanthaburi Prov., Khao Soi Dao (400 m), 1 ♂, 7–8. X. 1985, H. KUROKO *et al.* leg. S. Thailand:— Surat Thani Prov., Phanom, Khao Sok Natn. Park (100 m), 1 ♂, 10–11. VIII. 1987, M. OWADA leg. Peninsular Malaysia:— Cameron Highlands, 1 ♀, 1984; Bukit Fraser (1,300 m), 1 ♂, 17–19. VII. 1987, M. OWADA leg. Sumatra:— Karo Hills,



Figs. 1-6. Males of *Trabala*. — 1. *T. vishnou* LÉFÈBVRE, Doi Pui, North Thailand, 7-9. IX. 1987. — 2. *T. vishnou* LÉFÈBVRE, Khao Sok Natn. Park, South Thailand, 10-11. VIII. 1987. — 3. *T. pallida* (WALKER), Fang, North Thailand, 13-16. IX. 1987. — 4. *T. pallida* (WALKER), Erawan, Central Thailand, 27-28. XI. 1985. — 5. *T. irrorata* MOORE, Khao Yai, Central Thailand, 22. IX. 1987. — 6. *T. niphanæ* sp. nov., holotype. $\times 1.3$.

1 ♂, 9. X. 1983; 3 ♀, 1986. Borneo:— Sabah, Mt. Kinabalu, Kundasan (1,000 m), 1 ♂ 1 ♀, 3-18. V. 1980, T. HASEGAWA leg.; near Kinabalu, 1 ♂; Crocker Range, NW of Keningau, 1 ♀, 1987, N. KOBAYASHI. Java:— Djakarta, 1 ♀, 24. XII. 1973, Y.



Figs. 7-9. Males of *Trabala*. — 7. *T. krishna* ROEPKE, 20 km W of Fang, North Thailand, 11. IX. 1987. — 8. *T. krishna* ROEPKE, 20 km NEE of Roxas, North Palawan, 12-17. I. 1988. — 9. *T. viridana* JOICEY et TALBOT, Khlong Nakha, South Thailand, 12-13. VIII. 1987. $\times 1.3$.

KISHIDA.

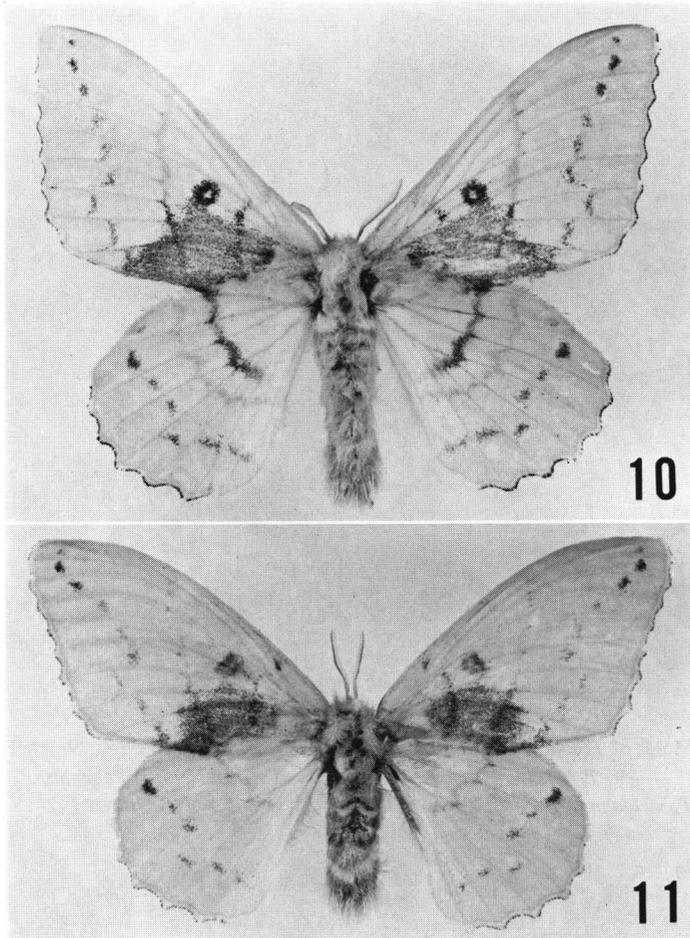
Distribution. S. E. China, Thailand (new record), Peninsular Malaysia, Sumatra, Borneo, Java and Bali.

Remarks. Lowland fliers in Thailand. The ground colour is pale and tinged with blue in Thai specimens, while somewhat dark greenish in Sumatran and Bornean ones. Our specimens from South Thailand and Peninsular Malaysia are intermediate between them. ROEPKE (1951) distinguished Javanese highland subspecies, ssp. *montana*, from the nominotypical lowland fliers. HOLLOWAY (1976) recorded ssp. *montana* from Mt. Kinabalu, Borneo, and later (1987) pointed out that the habitats of the two races are overlapped throughout Sundaland.

Trabala irrorata MOORE

(Figs. 5, 16, 17)

Trabala irrorata MOORE, 1884, Trans. ent Soc. Lond., **1884**: 375; MOORE, 1885, J. Linn. Soc. Zool., **21**: 55; TAMS, 1935, Mém. Mus. r. Hist. nat. Belg., (h. s.), **4**(12): 44, pl. 4, fig. 2; ROEPKE, 1951,



Figs. 10, 11. Females of *Trabala*. — 10. *T. vishnou* LEFÈBVRE, Doi Angkhang, North Thailand, 10–12. IX. 1987. — 11. *T. pallida* (WALKER), Chiang Mai, North Thailand, 21. VI. 1984. $\times 1.3$.

Meded. LandbHoges. Wageningen, **50**: 114–116, pl. 1, figs. 6, 7, pl. 3, fig. 4, pl. 10, figs. 1, 2, pl. 11, fig. 4, pl. 12, fig. 4; OWADA & KISHIDA, 1986, Bull. natn. Sci. Mus., Tokyo, (A), **12**: 134–138, figs. 4, 14, 21; HOLLOWAY, 1987, Moths Borneo, (3): 50–51 (? part).

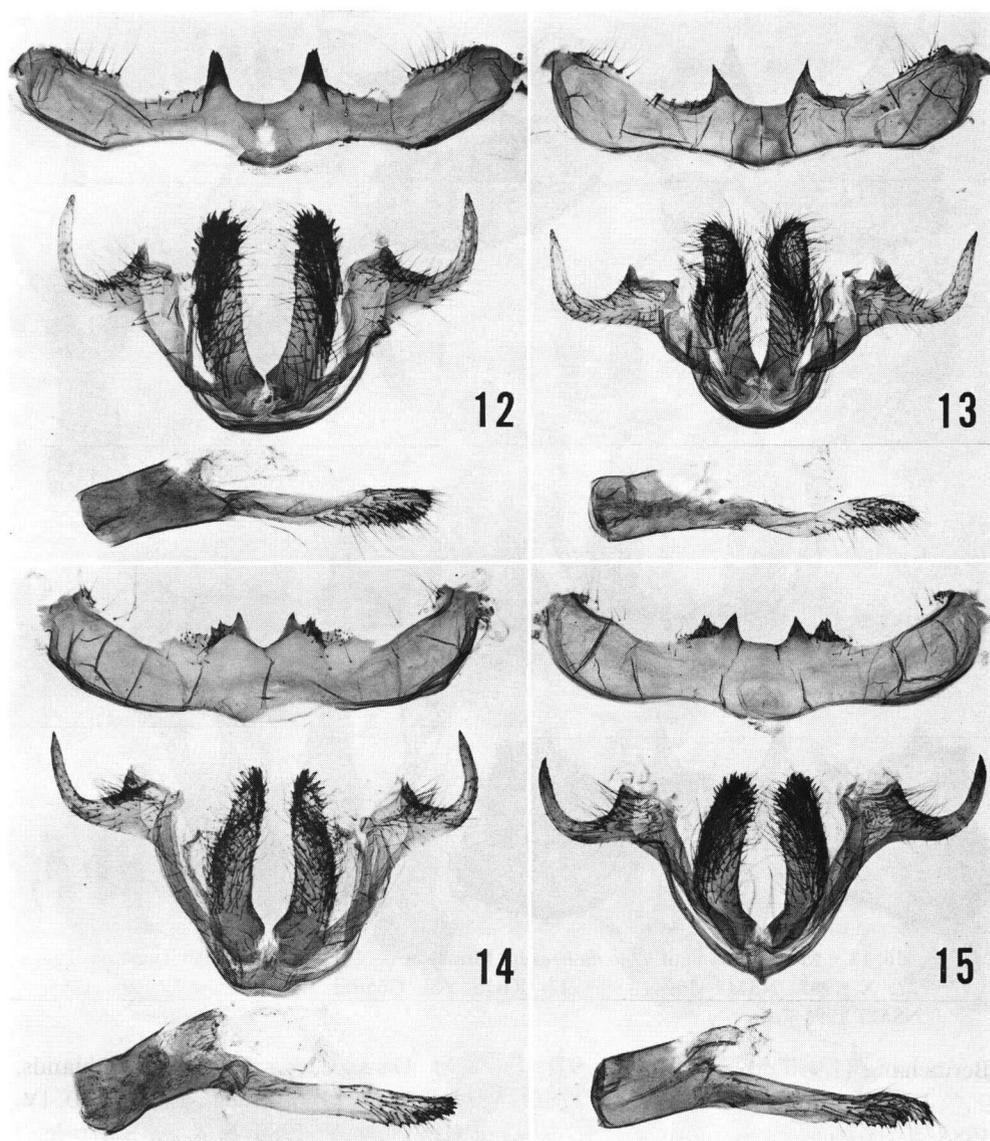
Trabala hantu: HOLLOWAY, 1987, Moths Borneo, (3): 54, fig. 64, pl. 6, fig. 16.

Male (Fig. 5). Expanse 43–50 mm, length of forewing 22–28 mm.

Female. Expanse 69 mm, length of forewing 41 mm.

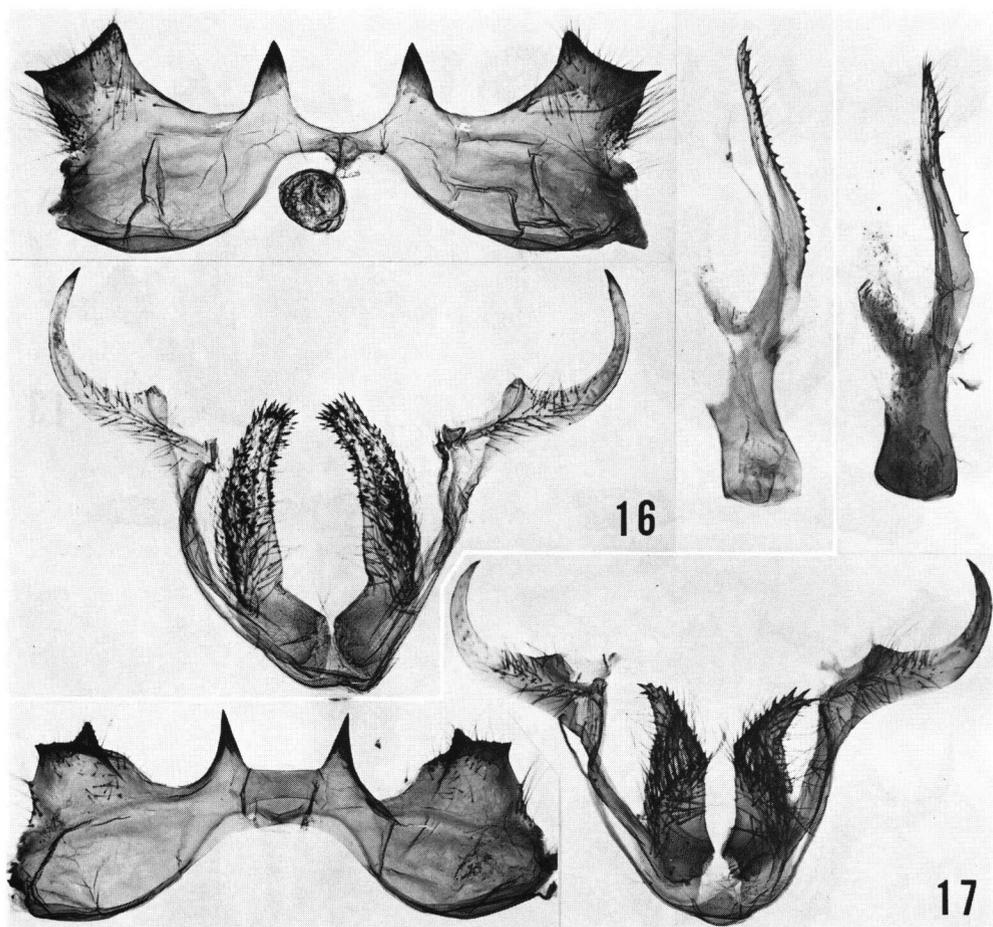
Male genitalia (Figs. 16, 17).

Material examined. N. Thailand:— Chiang Mai Prov., Doi Pui (1,300 m), 4 ♂, 26–27. X. 1985, S. MORIUTI *et al.* leg. C. Thailand:— Phuket Prov., Nam Tok Ton Sai (300 m), 1 ♂, 17–18. X. 1985, H. KUROKO *et al.* leg.; Nakhon Nayok



Figs. 12–15. Male genitalia of *Trabala*. — 12. *T. vishnou* LEFÈBVRE, Doi, Angkhang, North Thailand, 10–12. IX. 1987, NSMT 2079 ♂. — 13. *T. vishnou* LEFÈBVRE, Khao Sok Natn. Park, South Thailand, 10–11. VIII. 1987, NSMT 2075 ♂. — 14. *T. pallida* (WALKER), Fang, North Thailand, 29–31. X. 1985, NSMT 2080 ♂. — 15. *T. pallida* (WALKER), Khao Sok Natn. Park, South Thailand, 10–11. VIII. 1987, NSMT 2081 ♂.

Prov., Khao Yai (800 m), 2 ♂, 21–22. IX. 1987, 1 ♂, 11–19. XI. 1985, S. MORIUTI *et al.* leg. Peninsular Malaysia:— Taiping, 2 ♂, VII. 1987; Cameron Highlands, G.

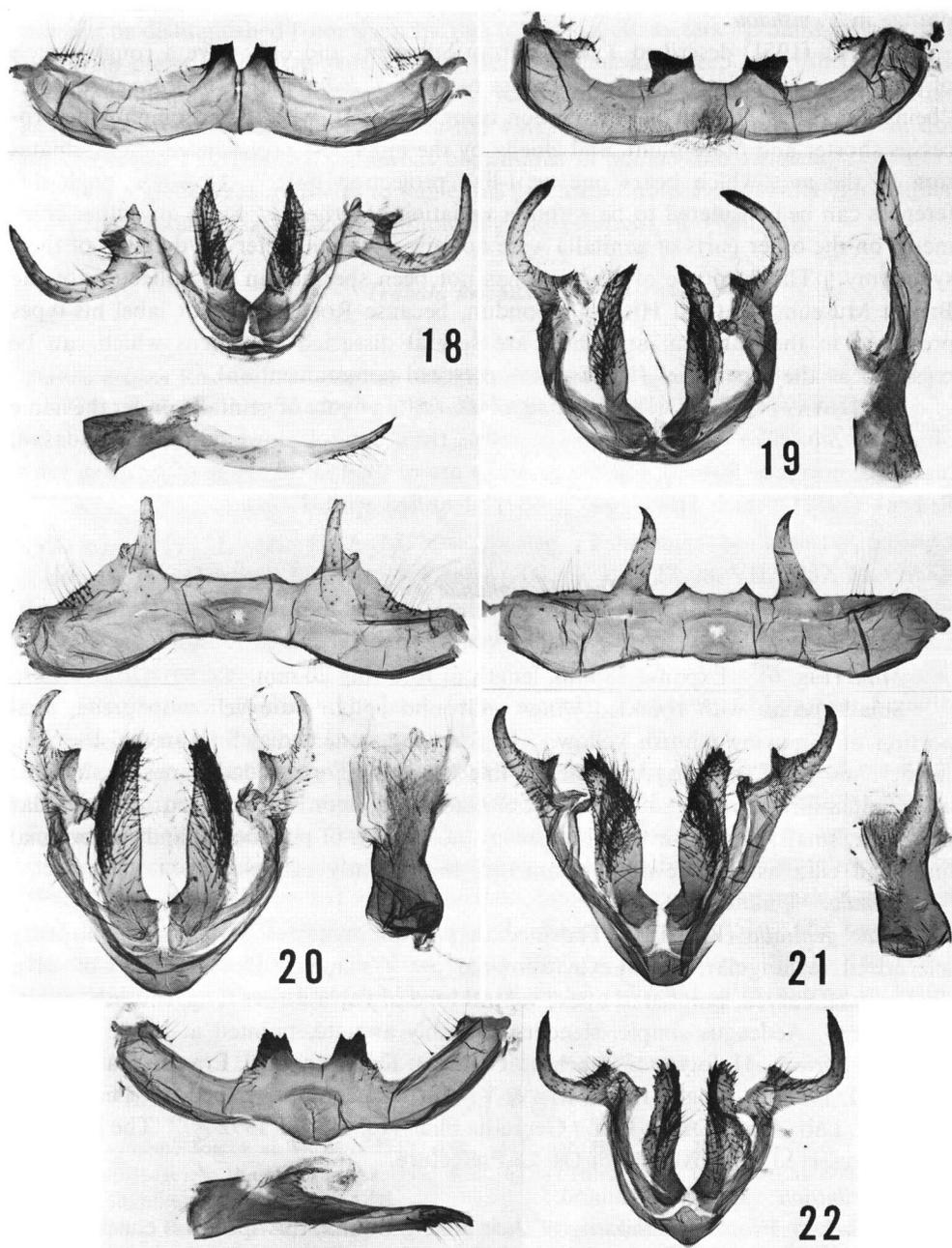


Figs. 16, 17. Male genitalia of *Trabala irrorata* MOORE. — 16. Doi Pui, North Thailand, 26–27. X. 1985, NSMT 1994 ♂. — 17. Khao Yai, Central Thailand, 11–19. XI. 1985, NSMT 1996 ♂.

Berinchang (1,950 m), 1 ♀, 21–22. VII. 1987, M. OWADA leg.; Cameron Highlands, 2 ♂; Bukit Fraser (1,300 m), 2 ♂, 17–19. VII. 1987, M. OWADA leg., 1 ♂, 27–30. IV. 1986, S. SAITO leg. Sumatra:— Mt. Sibayak II, 2 ♂, 4. V. 1988, S. & A. SAITO leg.; Karo Hills, 1 ♂, 1986. Borneo:— Sabah, Sandakan, Sepilok, 1 ♂, 31. VII. 1981, T. YASUDA leg., Kundasan 1,300 m, 1 ♂, VIII. 1987, K. MARUYAMA leg. Philippines:— Mindanao, S. Cotabato, Maitum, Gasy (700 m), 1 ♂, 12–13. VIII. 1985, M. OWADA leg.

Distribution. Burma, Thailand (new record), Peninsular Malaysia, Simalur (ssp. *simalura* ROEPKE, 1951), Sumatra, Borneo, Java and Mindanao.

Remarks. Robust species with rather round forewing. Ante- and postmedial lines and cilia of both wings tinged with orange, while they are never tinged with



Figs. 18–22. Male genitalia of *Trabala*. — 18. *T. niphanae* sp. nov., holotype, NSMT 1992 ♂. — 19. *T. garuda* ROEPKE, Kundasan, Borneo, VIII. 1987, NSMT 2071 ♂. — 20. *T. krishna* ROEPKE, 20 km W of Fang, North Thailand, 11. IX. 1987, NSMT 2067 ♂. — 21. *T. krishna* ROEPKE, 20 km NEE of Roxas, North Palawan 12–17. I. 1988, NSMT 2070 ♂. — 22. *T. viridana* JOICEY et TALBOT, Khlong Nakha, South Thailand, 12–13. VIII. 1987, NSMT 2065 ♂.

orange in *T. vishnou*.

ROEPKE (1951) described *T. hantu* from Sumatra, and only gave a rough sketch of tegumen. He pointed out the difference between *T. hantu* and *T. irrorata* as follows: "being less robust, the medial excavation being narrower, with the accompanying process shorter and more blunt, and chiefly by the much less pronounced lateral dilatation of the *unc*, which bears one wart-like projection only." However, such differences can be considered to be within a variation of *irrorata*. Since any other comments on the other parts of genitalia were not given, we will defer the decision of their synonymy. The holotype of *T. hantu* has not been specified in the collection of the British Museum (Natural History), London, because ROEPKE did not label his types preserved in the museum, and there are several dissected specimens which can be regarded as the type series (HOLLOWAY, personal communication).

HOLLOWAY (1987, fig. 61) illustrated an interesting figure of genitalia under the name of *T. irrorata*. We examined two specimens from Sepilok, lowland, and Kundasan, highland, northern Borneo, but the genitalia are of the typical shape of *irrorata*, sensu ROEPKE (1951), which HOLLOWAY (1987) identified with *T. hantu*.

Trabala niphanae sp. nov.

(Figs. 6, 18)

Male (Fig. 6). Expanse 38 mm, length of forewing 20 mm.

Small species with rounded wings. Ground colour pale yellowish green, anal portion of hindwing whitish yellow. In forewing, antemedial line brownish green, slender, smoothly excurved; postmedial line brownish green, slender, nearly straight; subterminal line represented by a series of blackish dots on veins, wavy; discocellular dot black, small; cilia brown. In hindwing, coloration of postmedial and subterminal lines and cilia as in forewing, postmedial line slightly excurved.

Female. Unknown.

Male genitalia (Fig. 18). The median pair of processes of tegumen markedly sclerotized, rectangular, medial excavation narrow, V-shaped. Dorsal process of valva slender, well curved, pointed at apex; ventral lobe of valva rather long, smooth, pointed at apex. Aedeagus simple, slender, smoothly arcuate, pointed at apex.

Type series. Holotype ♂, labeled "Thailand, Kanchanaburi, Erawan (ca. 600 m), 27-28. XI. 1985, S. MORIUTI, T. SAITO & Y. ARITA / Lepidopt. Exped. to Thai, 1985, Coll. Ent. Lab., Univ. Osaka Pref. / Genitalia Slide No. NSMT 1992 ♂." The holotype will be preserved in University of Osaka Prefecture.

Distribution. Central Thailand.

Remarks. From the similarity of their male genitalia, this species is considered to be closely related to *T. garuda* ROEPKE, 1951, distributed in Sumatra and Borneo (Fig. 19), though their size is considerably different (expanse 45 mm and length of forewing 25 mm in *garuda*).

In the external characters, this species is similar to *T. pallida* and *T. viridana*,

but can be distinguished from them by the following characters: ground colour pale yellowish green, while it is pale apple green in *pallida* and deep green in *viridana*; in forewing, median area between ante- and postmedial lines not so tinged with white as in *pallida*; subterminal lines of both the wings represented by a series of black dots on veins, but the dots are somewhat continuous in *pallida* and *viridana*.

It is a great pleasure for us to name this pulchritudinous *Trabala* after Dr. Niphan RATANAWORABHAN, a leading ornithologist and ecologist in Thailand.

Trabala krishna ROEPKE

(Figs. 7, 8, 20, 21)

Trabala krishna ROEPKE, 1951, Meded. LandbHoges. Wageningen, **50**: 117–118, pl. 3, fig. 6, pl. 7, fig. 4, pl. 11, fig. 6; HOLLOWAY, 1987, Moths Borneo, (3): 51–52, fig. 66, pl. 6, figs. 6, 7.

Male (Figs. 7, 8). Expanse 40–43 mm, length of forewing 21–24 mm.

Male genitalia (Figs. 20, 21).

Material examined. N. Thailand:— Chiang Mai Prov., 20 km West of Fang (900 m), 1 ♂, 11. IX. 1987, M. OWADA leg. Peninsular Malaysia:— Selangor, Gombak, Ulu Gombak Field Study Centre (200 m), 1 ♂, 27–28. VII. 1987, M. OWADA leg. Borneo:— Sabah, Sandakan, Sepilok, 29. VII. 1981, T. YASUDA leg. N. Palawan:— C. Vicente, 20 km NEE of Roxas (400 m), 1 ♂, 12–17. I. 1988, CERNY & SCHINTLMEISTER leg.

Distribution. Burma, Thailand (new record), Peninsular Malaysia, Sumatra, Borneo, Java and Palawan (new record).

Remarks. Rather small species with light green wings in male, and easily distinguished from the other species of *Trabala* by the large black discocellular mark of forewing in the specimens from Thailand and Sundaland. However, we received a strange specimen (Fig. 8) collected in Palawan. Judging from the genitalic characters (Fig. 21), it can be identified with *T. krishna*, but the discocellular mark is very small and the maculation is similar to that of *T. durga* ROEPKE, 1951. The relationship between them was already discussed by us (OWADA & KISHIDA, 1986). HOLLOWAY (1987) also mentioned three weakly marked males collected in mangrove in Brunei.

Trabala viridana JOICEY et TALBOT

(Figs. 9, 22)

Trabala viridana JOICEY et TALBOT, 1917, Ann. Mag. nat. Hist., (8), **20**: 8; ROEPKE, 1951, Meded. LandbHoges. Wageningen, **50**: 116, pl. 7, fig. 8; HOLLOWAY, 1987, Moths Borneo, (3): 52, fig. 59, pl. 6, figs. 9, 10.

Trabala indra ROEPKE, 1951, Meded. LandbHoges. Wageningen, **50**: 123–124, pl. 1, fig. 11; HOLLOWAY, 1982, in BARLOW, Introd. Moths South East Asia, p. 200, fig. 25, pl. 13, fig. 10.

Male (Fig. 9). Expanse 35 mm, length of forewing 19 mm.

Female. Expanse 66–70 mm, length of forewing 36–37 mm.

Male genitalia (Fig. 22).

Material examined. S. Thailand:— Ranon, Kapur, Khlong Nakha (50 m), 1 ♂, 12–13. VIII. 1987, M. OWADA leg. Peninsular Malaysia:— Tapah, 1 ♀. Bali Island:— West part, 1 ♀, II. 1985, *ex* S. MORINAKA. Borneo:— Sabah, Kundasan 1,300 m, 1 ♂, VIII. 1987, K. MARUYAMA leg.

Distribution. Thailand (southern part, new record), Peninsular Malaysia, Sumatra, Borneo and Bali (new record).

Remarks. Small species with deep green coloration, originally described from New Guinea. On the other hand, ROEPKE (1951) described *T. indra* on the basis of female specimens from Sumatra and Borneo. Later, HOLLOWAY (1982) coupled males to *T. indra*, and then, synonymized it with *T. viridana*, and the type area, New Guinea, was considered to have been mislabelled (HOLLOWAY, 1987).

Acknowledgements

We wish to express our sincere thanks to the staff of the Thailand Institute of Scientific and Technological Research, Bangkok, for conducting our research project in Thailand, especially to Dr. Niphan RATANAWORABHAN who arranged our collecting permission and aided many ways, to Mr. Jarujin NABHITABHATA who participated in our trips to southern and northern Thailand, and Mr. Nivesh NADEE who aided us in the trip to central and northeastern Thailand. Our gratitude is also extended to Professor YONG Hoi-Sen, Universiti Malaya, for his kind aid in carrying out our field survey in Malaysia.

We are deeply indebted to Dr. Hiroshi KUROKO and Dr. Sigeru MORIUTI, University of Osaka Prefecture, Sakai, for giving us the privilege of examining the collections from the Lepidopterological Expedition to Thailand, 1983, 1985 and 1987, to Professor Tosiyo YASUDA of the same university for the material from Borneo, to Mr. and Mrs. Shusei and Akiko SAITO, Matsudo, for the material from Sumatra and Peninsular Malaysia, to Mr. Katsumi YAZAKI, Hachiôji, for the Malayan specimen, to Mr. Tatsuya TANABE, Ôgaki, and Mr. Hiroshi YOSHIMOTO, Tokyo, for Taiwanese material, to Mr. A. SCHINTLMEISTER, DDR, for the Palawan specimen, to Dr. Jeremy D. HOLLOWAY, C·A·B International Institute of Entomology, London, for his invaluable advice, and to Mr. Shigero SUGI, Tokyo, and Dr. Hiroshi INOUE, Otsuma Women's University, Iruma, for their kind aid in many ways.

We have to express our gratitude to the members of the expedition for their kind aid in the field: Dr. Masatsune TAKEDA, under whose leadership our expedition was carried out, Dr. Mizuko YOSHIYUKI and Dr. Hirotugu ONO, of our museum, Professor Masataka SATÔ, Nagoya Women's University, Dr. Tsukané YAMASAKI, Tokyo Metropolitan University, and Dr. Shigemitsu SHOKITA, University of the Ryukyus.

Finally, but not to the least, our deep thanks are also expressed to Dr. Shun-ichi UENO, of our museum, for reading and criticizing the manuscript.

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