

**Subspecies of *Areas galactina* (Hoeven, 1840) (Lepidoptera, Arctiidae):
25 years after H. Inoue's review**

Vladimir V. DUBATOLOV¹⁾, Patrick G. HAYNES²⁾, Yasunori KISHIDA³⁾

¹⁾ Siberian Zoological Museum, Institute of Animal Systematics and Ecology, SB RAS, Novosibirsk, Russia.

²⁾ Department of Entomology, The Natural History Museum, Cromwell Road, London SW7 5BD, UK.

³⁾ Kitazawa 5-20-1-103, Setagaya, Tokyo, 155-0031 Japan.

Abstract This paper reviews the subspecies of *Areas galactina* Hoeven, 25 years after that of Inoue (1984). In addition to those subspecies recognized by Inoue, three further subspecies are described here as new: *A. g. inouei* subsp. n. from northern Indochina and eastern Yunnan, *A. g. hollowayi* subsp. n. from Borneo and *A. g. owadai* subsp. n. from the Philippines. The melanistic *A. g. khasiana* Daniel from west Yunnan and west Sichuan in China is reviewed. Given the great individual variability of hind wing colouration, *A. g. intermedia* Rothschild is synonymized with *A. g. trigonalis* Snellen van Vollenhoven.

Areas galactina (Hoeven, 1840) is widely distributed in mountainous areas of the Oriental Region from the Himalayas to central China, the Philippines and Indonesia. In addition to the nominotypical subspecies from Java, six further have been described within the region that the species complex is found. Inoue (1984) published a detailed review of these, adding three more from southwest China, Thailand and the Philippines, but without providing formal descriptions or giving them names. In addition to examining the significant geographical variation in wing colouration, we also studied the male genitalia of different subspecies of *A. galactina*. However, these did not show any significant differences at the specific level, although they confirmed subspecific status of some populations.

Abbreviations: BMNH – Natural History Museum (London, U.K.); NSMT – National Museum of Nature and Science, Tokyo; SZMN – Siberian Zoological Museum of the Institute of Animal Systematics and Ecology, SB RAS (Novosibirsk, Russia); IP – Dr I. Pljustsh private collection (Kiev, Ukraine); PGH – Mr P. Haynes' private collection (London, U.K.); RMNH – Nationaal Natuurhistorische Museum (Leiden, Netherlands); VM – the late Prof. V.S. Murzin's private collection (Moscow, Russia); YK – Mr Y. Kishida's private collection (Tokyo, Japan); ZMAN – Universiteit van Amsterdam, Instituut voor Taxonomische Zoologie, Zoologisch Museum, Amsterdam, Netherlands.

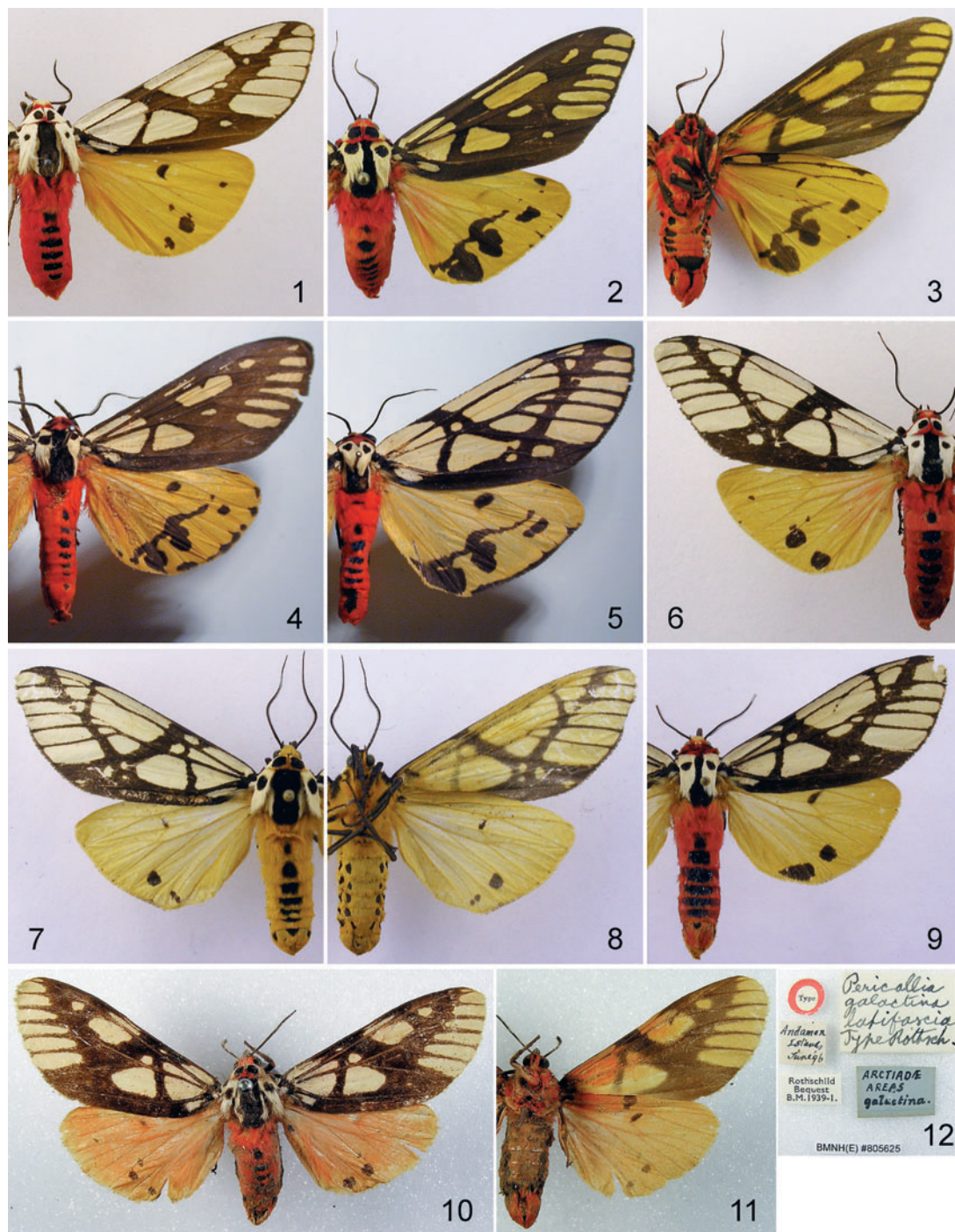
***Areas* Walker, 1855**

Areas Walker, 1855, *List. Specimens lepid. Insects Colln Br. Mus.* 3: 658.

Type species *Areas orientalis* Walker, 1855, by monotypy.

Antennae of males serrate along anterior edge and pectinate along posterior margin, entirely serrate in females; whitish subapically in both sexes. Eyes large, hemispherical, naked. Proboscis slightly longer than head width, not reduced. Palpi stout, porrect, longer than the dense compact hairs on frons. Foretibiae simple, with short epiphysis. Midtibiae with one pair of spurs, hindtibiae with two pairs of short stout spurs. Claws with a slight incision medially. Paronychia as long as the claws. Forewing vein R_2 stalked with R_{3+5} (venation type C of Sotavalta, 1964). Tympanum with small flattened inflations. Frons dark, vertex light. Patagia and tegulae light, with median brown spots. Forewing whitish, with a pattern of longitudinal and oblique brown bands forming a series of triangular and quadrilateral patches.

Male genitalia (Figs 35–43). The genus is characterized by a broad uncus, with a light apical notch and a longitudinal dorsal keel, broad elongate convex-concave (almost scoop-like) valvae with a truncated apex, and an inward projecting triangular process on the ventral edge. There is a rounded process at the base of costa of valva, which is connected by a membrane with other part of valva. It is



Figs 1–12. *Areas galactina* specimens. 1. *A. g. orientalis* Walker, East India, E Sikkim, 20 km SE of Gangtok, Phidim Rain Forest. 2–5. *A. g. khasiana* Daniel. 2–3: China, Yunnan; 4–5: China, West Yunnan, Haba mts., Hutiao vill. (Hutiaoxia). 6. *A. g. inouei* ssp. n., paratype, North Vietnam, Lao Cai Prov., Sapa. 7–8. *A. g. ochracea* Mell, China, Guangdong, Shaoguan, Nanling. 9. *A. g. formosana* Matsumura, Nantou Hsien, Lushan Spa. 10–12. *A. g. latifascia* (Rothschild), syntype. 1–2, 4–7, 9–10: upperside; 3, 8, 11: underside; 1–4, 6–11: males, 5: female; 12: labels.

also connected with a similar paratergal process on the vinculum. Juxta small, transverse. Aedeagus elongate, with a sclerotized plate apically, covered by small spines. Vesica sac-like, with a constriction medially and a thinly sclerotized patch. The structure of the aedeagus does not show any noticeable geographical variation.

Areas galactina (Hoeven)

Distribution. India: Himalaya Mountains in Himachal Pradesh (Hampson, 1901), Uttar Pradesh (Inoue, 1984), Sikkim, Arunachal Pradesh, Assam, Meghalaya (Khasis), Nagaland (Hampson, 1901; Arora & Chaudhury, 1982); Andaman Islands (Rothschild, 1933); Nepal (Kishida, 1992, 1994, 1998); Bhutan (Strand, 1919; de Toulgoët, 1975); Burma (Tenasserim); Bangladesh: Sylhet (Cotes & Swinhoe, 1887) (this record appears to be erroneous); China: Hubei, Hunan, Guanxi, Guangdong, Sichuan, Yunnan, East Tibet (Fang, 2000), Taiwan (Matsumura, 1930); Vietnam; Laos; Cambodia (Candèze, 1927); Thailand (Inoue, 1984); Malay Peninsula (Rothschild, 1933); Indonesia: Sumatra (Snellen van Vollenhoven, 1863), Java (Strand, 1919); Malaysia: Borneo, Sarawak (Strand, 1919; Holloway, 1988); Philippines: Negros (Inoue, 1984), Mindoro, Luzon, Palawan.

Note. There is a specimen labelled “Ceram” in PGH, but this may be erroneous because the species has not yet been recorded in Sulawesi or the Lesser Sunda Islands.

Areas galactina orientalis Walker (Fig. 1)

Areas orientalis Walker, 1855; *List Specimens lepid. Insecta Colln Br. Mus.* 3: 658–659; type locality: “North India”.

Pericallia galactina: Hampson, 1901, *Cat. Lep. Coll. Br. Mus.* 3: 356–357.

Areas galactina orientalis: Inoue, 1984, *Chô Chô* 7 (1): 3, fig. 3, pl. I, figs 1-2: “N. India ... Nepal ... Khasi Hills”.

Material. INDIA: 1 ♂, Uttar Pradesh [Uttaranchal], Kumaon, Naini Tal Distr., Bhimtal, 3.VII 1973, W.Thomas leg. (PGH); 1 ♂, Bhimtal, 11.VII 1978, anonymous [W.Thomas?] leg. (SZMN); 5 ♀, E Sikkim, 20 km SE of Gangtok, Phidim Rain Forest, 1600m a.s.l., VII 2002, O.Yu. Ammosov leg. (SZMN); NEPAL: 1 ♂, Nagarkot, 27.VI 1994, native collector leg. (SZMN); 2 ♀, Kathmandu, Godavari, VI 1979, V-VII 1973, T. Miyashita leg. (YK); 4 ♀, same locality, 4.V 1990, 9.V 1991, anonymous leg. (YK); 1 ♀, same locality, 6.VII 1996, native collector leg. (SZMN); 3 ♀, Sagarmatha, Okhaldunga 1800m, VI 1989, K. Ito leg. (YK).

Distribution. India: Himalayas in the states of Himachal Pradesh, Uttaranchal and Sikkim, probably also the Himalayan part of West Bengal; Nepal (Kishida, 1992–1998); Bhutan (Strand, 1919).

Diagnosis. The best known subspecies with a typical forewing pattern and a weaker underside pattern. Hindwing ground colour yellow with slight rosy anal region; there are several black spots: a discal spot, several submarginal (the largest is that posterior to vein Cu_2) and one dot of the postmedian row on vein Cu_2 . Compared to the other subspecies, the black spots on tegulae appear to be the smallest and head is whitish, without rose or red coloration.

Remarks. Some specimens from Arunachal Pradesh, Meghalaya (Khasis) and Nagaland (Nágas) exhibit characters not entirely matching typical *A. g. orientalis*. According to the figure in Inoue (1984), a specimen from Khasi Hills (Fig. 14) has wide black spots on the tegulae, although the whitish coloration of the head is a common character with the Himalayan subspecies. Arora & Chaudhury (1982) described a similar specimen from Arunachal Pradesh which also has large black spots on the tegulae (see discussion below).

Male genitalia (Fig. 35). Uncus swollen, contracted before apex. Valvae rather short, strongly convex-concave; noticeably narrowing to apex. Costal angle of apex tapering upwards. Ventral valva margin wavy, more so on right valva. Ventral valva process situated near the middle part of valva. Paratergal processes larger than the adjacent basal-costal processes of valva. Best distinguished from other subspecies by the short valva, presence of the apical process, ventral process situated medially, and by an apical constriction of the uncus. VIII sternite lobes broad and short, about twice the length of VII sternite. In the dried moth, VIII sternite lobes cover the top of the abdomen and do not extend beyond the posterior margin of the VIII tergite.

***Areas galactina khasiana* Daniel, 1943 (Figs 2–5)**

Areas galactina khasiana Daniel, 1943, *Mitt. münch. ent. Ges.* **33** (2/3): 744, Taf. XXI, figs 1-2; type locality: “Likiang”.

Areas galactina subsp.: Inoue, 1984, *Chô Chô 7* (1): 4, fig. 5: “W. China”.

Material. CHINA: 1 ♂, Yunnan (YK); 1 ♀, N. Yunnan, Haba mts., Hutiaoxia, 2400m, 21-26.VI 1996, S. Murzin leg. (VM); 1 ♂, 1 ♀, Yunnan, Haba mts., Hutiao vill., 2100m, 21-26.VI 1996, S. Murzin leg. (SZMN, VM); 1 ♂, Yunnan, Wumeng Shan, 2200m (PGH); 3 ♀, Sichuan, Qingchenghou Shan, 70 km NW Chengdu, 1500 m, 7, 20.VI 2005, S. Murzin leg. (SZMN).

Distribution. CHINA: West Yunnan, West Sichuan; probably northernmost Burma (Myanmar). A specimen from Tibet, Medog (Fang, 2000) may also belong to this subspecies.

Diagnosis. This is the darkest coloured subspecies. Head red with a few yellow scales, patagia and tegulae with large dark brown spots. Abdomen bright red, with one dorsal and two lateral rows of spots. Forewing yellow, often with broad dark pattern along veins and extended dark brown pattern overall; underside pattern weaker than upperside. Hindwings bright yellow, with strong reddish coloration at the base and anal part of the wing. Submarginal and often discal spots large. The presence of hindwing postdiscal band fragments, from vein M2 towards the tornal angle and often fused to a fascia that is better expressed in females, is characteristic of the subspecies. Occasionally there is a continuous marginal band, sometimes fragmented into spots at the end of the veins.

Male genitalia (Fig. 36). Uncus long, elongate, without a constriction before the apex. Valvae slightly elongate, convex-concave, not narrowing to the apex. Apical part of valva nearly rectangular or slightly trapezoidal, with rounded angles. Ventral valva margin concave, not wavy. Apex of the ventral process situated at one-third from the base. Paratergal processes equal to the adjacent basal-costal processes of valva. VIII sternite lobes narrower and longer than in the previous subspecies; in the dried moth, VIII sternite lobes extend noticeably beyond the posterior margin of the VIII tergite, often with a visible hollow between them.

Remarks. There is a great discordance between the name of this subspecies and its distribution, due mainly to the incorrect determination of this taxon by Daniel (1943). Although, the first author of the name was Rothschild (1914), he proposed it only as an aberration of *galactina*. Daniel wrongly considered that Rothschild had described a subspecies and thus erroneously cited this taxon as: “ssp. *khasiana* Rothschild, Seitz X p. 257 (1914)”. He then presented a good description of specimens from Yunnan. As Daniel was the first to use this name for a subspecies, and according to ICZN Article 45.5.1 he is to be considered as its author. Unfortunately, the association now implied between the subspecies’ distribution and its name is both incorrect and misleading as this subspecies does not occur either in Khasi Hills (Meghalaya) or the southeastern Himalayas. Inoue (1984) figured a female of this subspecies (text-fig. 5), from “W. China” as “*A. galactina* subsp.” and noted that it was known also from “Szechuan and Yunnan, SW. China.”

***Areas galactina inouei* Dubatolov, Haynes & Kishida, **subsp. nov.** (Fig. 6)**

Pericallia galactina, Fang, 1982; *Iconographia Heterocerorum Sinicorum* : 222, pl. 71, fig. 1633 (... Sichuan, Yunnan); Fang, 1985; *Economic Insect Fauna of China* **33**: 72, pl. VII, fig. 109a: “Sichuan (Huili, Emeishan), Yunnan”.

Areas galactina subsp., Inoue, 1984; *Chô Chô 7* (1): 4, pl. I, fig. 5: “N. Thailand ... Doi Inthanon”.

Areas galactina, Fang, 2000; *Fauna Sinica. Insecta* **19**: 359-360, pl. VI, fig. 16a: “Sichuan (Huili, Xichang, Dukou, Emeishan), Yunnan, ...”.

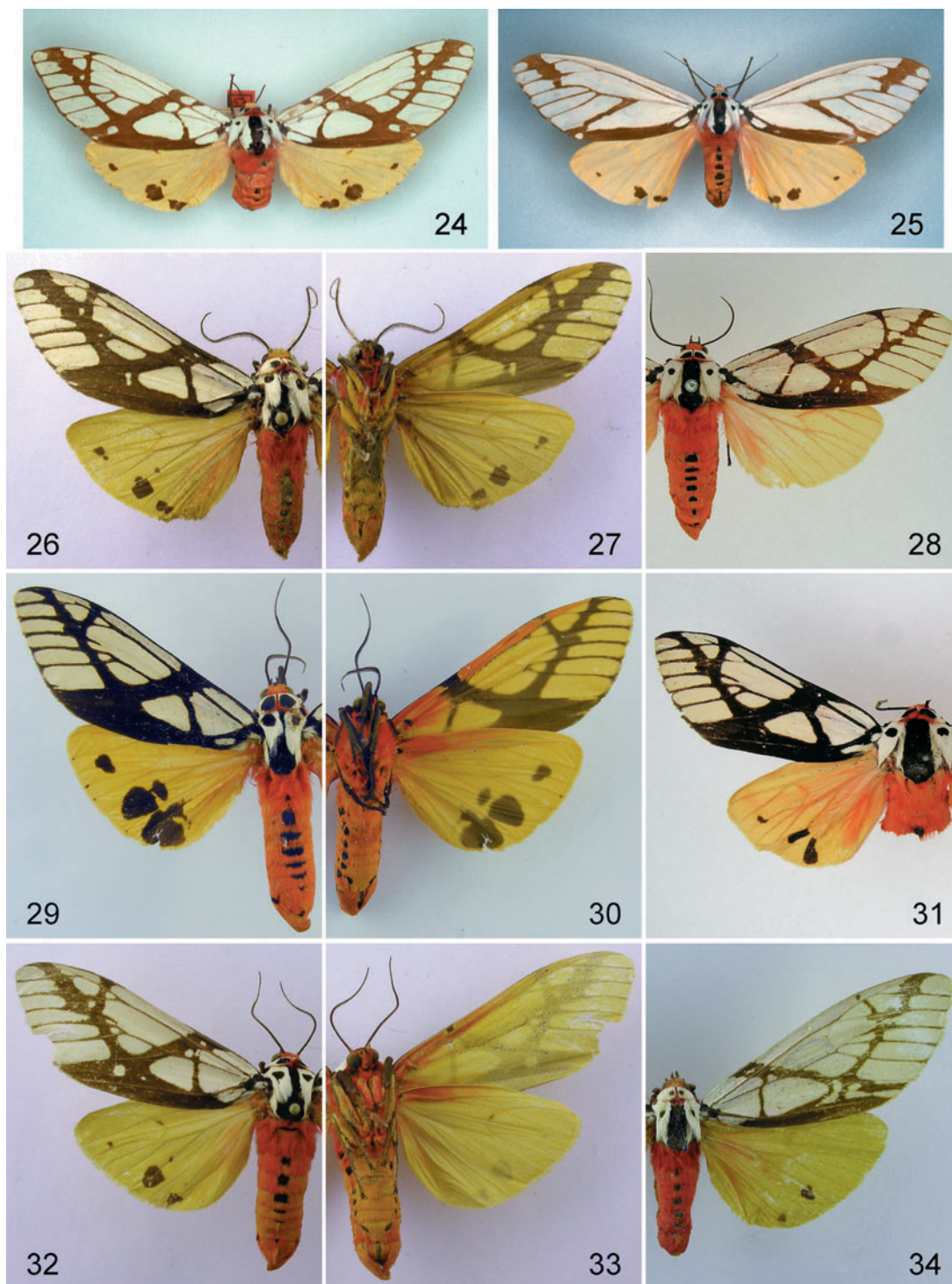
Type material examined. HOLOTYPE – ♀, VIETNAM, Lao Cai Prov., Sapa, VI 1999, anonymous leg. (SZMN). PARATYPES: 2 ♀, North VIETNAM, Lao Cai, Sapa, 20.VI 1999, anonymous leg. (SZMN); 3 ♀, same locality, 3-6.VIII 2000, Y. Kishida leg. (YK); 1 ♀, same locality, 25-28.V 1997, B. Tanaka leg. (YK); 1 ♀, Ninh Binh, Gia Vien, Cuc Phuong, 160m, 20-21.III 1998, K. Yazaki leg. (YK); CHINA: 6 ♀, E Yunnan, West Yanshan, Dabao Mt., 2263m, V 2000, native collector leg. (SZMN, YK).



Figs 13–23. *Areas galactina intermedia* specimens. 13: syntype of *trigonalis*, Indonesia, Sumatra, by courtesy of R. de Vos; 14: *trigonalis*, figure from the original type description. 15–17: holotype of *Areas cana* Druce, Indonesia, Sumatra; 18–20: holotype of *Pericallia galactina intermedia* Rothschild, Malaysia, Penang; 21–23: Malaysia, 75 km N from Kuala-Lumpur, Fraser's hill. 13–15, 18, 21, 23: upperside; 16, 19, 22: underside; 13, 18–22: males; 15–16, 23: females; 17, 20: labels.

Additional material. CHINA: 3 ♂, SE-Sichuan, Gaomushan, about 1900m, Guling, near west Guizhou border, VII 2002, Ying et al. leg. (SZMN, YK); VIETNAM: 2 ♀, [L_m_ông], Bao Lôc, 800m, 1-5.V 2000, T. Mano leg. (YK); 1 ♂, Trung Yen, 950 m, Mai Chau, 1.V 1996, anonymous leg. (YK); LAOS: 3 ♀, North Laos, Louang, Namtha circ., 20-29.IV 1996, I. Pljuschch leg. (IP); 1 ♀, Xieng Khouang, 16-19.VI 1995, anonymous leg. (YK); THAILAND: 5 ♀, Chiang Rai, Wiang Papao, 1.V 2002, K. Eda leg., 29.IV-3.V 2002, T. Mano leg. (YK); 1 ♀, North Thailand, Chiang Mai, Fang, V 1988 (PGH), 3 ♀, 1 ♂, the same locality, III-VI 1985, anonymous leg. (YK); 1 ♀, Doi Step [Doi Suthep], 22.V 1987, S. Nitta leg. (YK).

Distribution. China: east Yunnan, east Sichuan; north Vietnam; north Laos; north Thailand. Probably



Figs 24–34. *Areas galactina* specimens. 24–28. *A. g. galactina* (Hoeven). 24: syntype, by courtesy of R. de Vos; 25: holotype of *Pericallia galactina* f. *walshiae* Roepke, by courtesy of R. de Vos; 26–27: Indonesia, East Java, Mt. Argapura; 28: Indonesia, S.W. Sumatra, North Korintji Valley. 29–31. *A. g. hollowayi* ssp. n. 29–30: holotype, East Malaysia, Sabah, Mt. Kinabalu, Park Head Quarters; 31: East Malaysia, Sabah, Mt. Kinabalu. 32–34. *Areas g. owadai* ssp. n., paratypes, Philippines. 32–33: North Luzon, Mountain Prov., Sagada [=Sadanga!]; 34: Philippines. 24–26, 28–29, 31–32, 34: upperside; 27, 30, 33: underside; 24–25, 34: females; 26–33: males.

also mainland Burma, but no specimens were available for study.

Diagnosis. Similar to *A. g. orientalis* in appearance but differs in the rather larger spots on the tegulae and the red or rose-yellow head. Hindwings without a wide postdiscal line, dark forewing pattern never broad. This coloration resembles form *intermedia* of *A. g. trigonalis* (see below), but with less orange on the hindwings (see remarks below).

Male genitalia (Fig. 37). Uncus long, elongate, without a constriction before the apex. Valvae considerably elongate, convex-concave, not narrowing to apex. Apical part of valva almost trapezoidal, more tapering on the costa. Ventral valva margin concave, not wavy. Apex of ventral process situated at one-third from base and projecting beyond costal margin. Paratergal processes larger than the adjacent basal-costal processes of valva. VIII sternite lobes noticeably longer than VIII tergite, often with a visible hollow between them. Very similar to the genitalia of the former subspecies, but differs in the longer valvae, larger ventral processes, and ventral process projecting beyond the costal margin.

Remarks. For types, we designate the studied populations from North Vietnam and the southern part of Yunnan. Populations in peripheral regions, for example in North Thailand and South Vietnam, have more orange than yellow hindwings and with a reddish base; this is the transitional phenotype of the *intermedia-trigonalis* group. Specimens from Khasi Hills (Inoue, 1984: pl. 1, fig. 3) and Central Yunnan, Lanniqingshan, Eshan, 2500 m, VII 2000, native collector leg. (SZMN) may be transitional between *A. g. orientalis*, *A. g. khasiana* and *A. g. inouei* but insufficient specimens were available to offer any positive conclusions (see discussion below).

Areas galactina ochracea Mell (Figs 7–8)

Areas galactina ochracea Mell, 1922, *Dt. ent. Z.* **1922**: 126; type locality: “Süd- und Nordgebiet der Provinz Kuangtung”; Inoue, 1984, *Chô Chô* **7** (1): 3, fig. 4: “S. China”; Fang, 2000, *Fauna Sinica*, Insecta **19**: 360, pl. VI, fig. 16b: “Hunan (Hengshan), Hubei (Xianfeng, Lichuan), Guangxi (Longsheng), Guangdong”.

Pericallia galactina ochracea: Fang, 1985, *Economic Insect Fauna of China* **33**: 72, pl. VII, fig. 109b (Hunan: Hengshan, Guanxi: Longsheng).

Material. CHINA: 2 ♀, E. Hunan, Yizhang, Hongxingqian Shan, 1600m, IV 2001, native collector leg. (SZMN, YK); 1 ♀, Hunan, Jiucui Ling, 1300m (PGH); 1 ♂, Guangdong, Shaoguan, Nanling, 700-1300m, 11-15.VI 2005, Wang M. et al. leg. (YK).

Distribution. China: Guangdong, Guangxi, Hunan, Hubei.

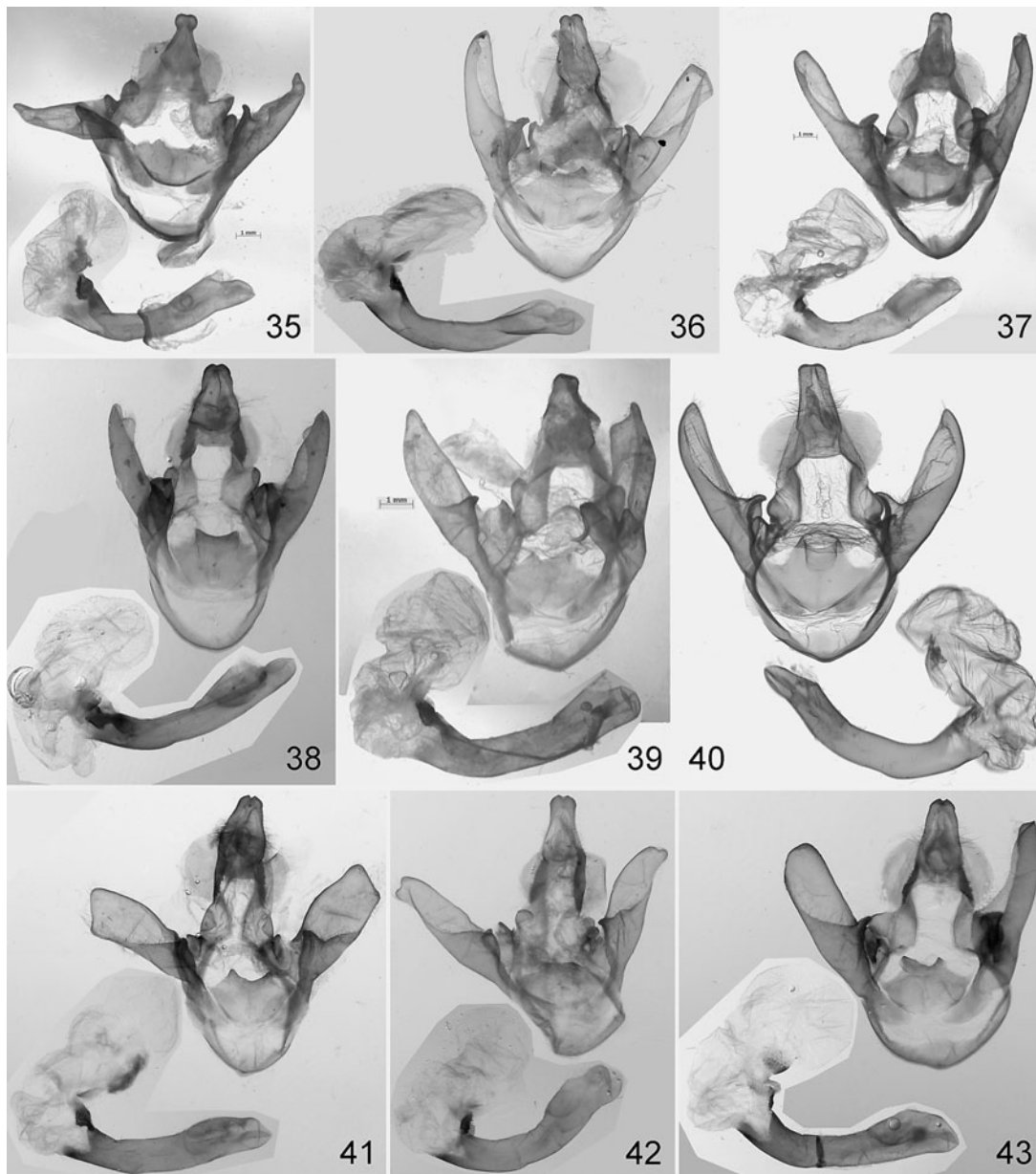
Diagnosis. The most diagnostic character of this subspecies is the yellow abdomen; but the forewing and hindwing pattern is similar to *A. g. orientalis*, although dark spots on the tegulae are large, and the head and thorax lack rose or red scales. Forewing underside pattern only slightly weaker than upperside. A minor distinguishing character on the forewing is the darker and narrower brown bands; the latter better expressed in the apical half of the wing.

Male genitalia (Fig. 38). Uncus not elongate, without a constriction before the apex. Valvae convex-concave, not narrowing to apex. Apical part of valva of curved rectangular-like section with rounded angles. Ventral valva margin straight or slightly concave, not wavy. Apex of the ventral process situated at two-fifths from the base. Paratergal processes larger than the adjacent basal-costal processes of valva. Very similar to the genitalia of *A. g. khasiana*, but differs in the slightly curved and shorter valvae, and larger paratergal processes. In the dried moth, the VIII sternite lobes cover the top of the abdomen but do not extend beyond the posterior margin of the VIII tergite.

Areas galactina formosana Okano (Fig. 9)

Areas galactina formosana Okano, 1960, *Rep. Gakugei Fac. Iwate Univ.* **16** (2): 18-19, pl. 8, fig. 10; type locality: “Jen-ai-hsiang, Nantow-hsien, Central Formosa”; Inoue, 1984, *Chô Chô* **7** (1): 3-4, pl. I, fig. 4: “Taiwan”.

Material. TAIWAN: 7 ♀, 1 ♂, Taipei hsien, Wulai, 30.III 1977, Y. Kishida leg. (YK); 1 ♀, Nantou Hsien, Lushan Spa., 1200m, 29.IV-1.V 1984, H. Yoshimoto leg. (SZMN); 1 ♀, Nantou Hsien, Nanshanchi, 25.III 1980, J. Kaneko leg. (YK); 2 ♀, Shihtzutau, 28.III 2000, 29.III 2001, T. Mano



Figs 35–43. Male genitalia of *Areas galactina* (Hoeven). 35. *A. g. orientalis* Walker, India, E Sikkim, 20 km SE of Gangtok, Phidim Rain Forest. 36. *A. g. khasiana* Daniel, China, Yunnan, Haba mts., Hutiao vill. 37. *A. g. inouei* ssp. n., holotype, Vietnam, Lao Cai, Sapa. 38. *A. g. ochracea* Mell, China, Guangdong, Shaoguan, Nanling. 39. *A. g. formosana* Matsumura, Taiwan, Nantou Hsien, Lushan Spa. 40. *A. g. trigonalis* (Snellen van Vollenhoven), Malaysia, Fraser's hill. 41. *A. g. galactina* (Hoeven), Indonesia, East Java, Mt. Argapura. 42. *A. g. hollowayi* ssp. n., holotype, East Malaysia, Borneo, Sabah, Mt. Kinabalu, Park Head Quarters. 43. *A. g. owadai* ssp. n., holotype, Philippines, North Luzon, Mountain Prov., Sagada.

leg. (YK).

Distribution. Taiwan.

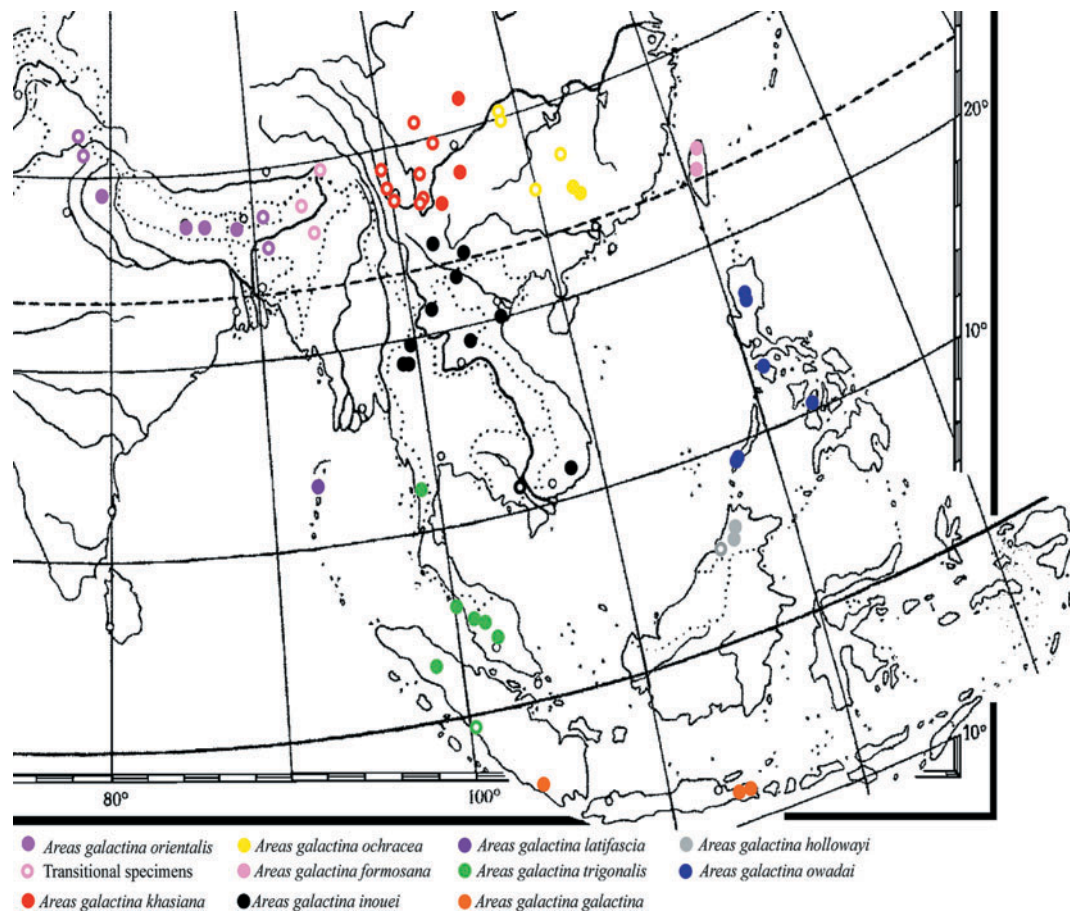


Fig. 44. Distribution map of the *Areas galactina* subspecies. Closed circles: material studied; open circles: literature data.

Diagnosis. Similar to *A. g. orientalis*, but differs in having an entirely yellow hindwing ground colour, without red or rosy tints along the anal margin. The brown pattern of the forewing is noticeably darker than in *A. g. orientalis* and *A. g. galactina*; underside pattern is slightly weaker than upperside. Spots on tegulae are large, as in *A. g. ochracea*. Patagiae is red with large brown spots.

Male genitalia (Fig. 39). Uncus not elongate, without a constriction before the apex. Valvae convex-concave, not narrowing to apex. Valva apical margin angled up, longer at costa. Ventral valva margin straight or slightly concave, not wavy. Apex of the ventral process situated at two-fifths from the base. Paratergal processes slightly larger than the adjacent basal-costal process of valva. Very similar to genitalia of the previous subspecies, but differs by skewed apical margin of the valva, longer at costa. In the dried moth, VIII sternite lobes cover the top of the abdomen and do not extend beyond the VIII tergite.

***Areas galactina latifascia* (Rothschild) (Figs 11–12)**

Pericallia galactina latifascia Rothschild, 1933, *Ann. Mag. nat. Hist.* (10) **11**: 186; type locality: “Andaman Islands”.

Areas galactina latifascia: Inoue, 1984, *Chô Chô* **7** (1): 4, figs 8-9: “Andaman Islands”.

Type material examined. Syntype, , “Type”, “Andaman / Island, / June’ 96”, “*Pericallia* /

galactina / latifascia / Type Rothsch.”, “ARCTIADÆ / AREAS / galactina.”, “Rothschild / Bequest / B.M.1939-1.” The female was figured by Inoue (1984: 10, fig. 9).

Distribution. India: Andaman Is.

Diagnosis. Known only from the type series. It was described as: “ . – Nearest to *galactina trigonalis* Voll., and has the same salmon-red hind wings. Differs abundantly by the chocolate bands and stripes of the fore wing being much broader”. Figured by Inoue (1984: 10, Figs 8-9) in monochrome, and now here (Figs 21-22) in colour. Forewing differs markedly from other subspecies in the much broader chocolate-brown bands and stripes of the fore wing. Otherwise, similar to *A. g. intermedia*, with a reddish head, large black spots on patagia and tegulae, the former white with red scales, the latter white. Wing underside pattern only slightly weaker than the upperside.

Remarks. Some specimens from Java (Inoue, 1984: 9, fig. 1) show a similar extended brown pattern on the forewing, but the head is not bright red and the apical white marginal spot between veins R₄ and R₅ is small and not noticeably longer than the width. In *A. g. latifascia* this spot is long both in male (Fig. 21) and female (Inoue, 1984: 10, fig. 9).

Areas galactina trigonalis (Snellen van Vollenhoven) (Figs 13–23)

Numenes trigonalis Snellen van Vollenhoven, 1863, *Tijdschr. Ent.* **6**: 140, t. 10, f. 1; type locality: “Sumatra” (Figs 24-25).

Areas cana Druce, 1899, *Ann. Mag. Nat. Hist.* (7) **3**: 234; type locality: “Sumatra” [Pedang in West Sumatra, according to the type label] (Figs 28-30).

Pericallia galactina intermedia Rothschild, 1933, *Ann. Mag. nat. Hist.* (10) **11**: 186, **syn. nov.**; type locality: “Government Hill, Penang, 2500ft.” [now – Penang Hill, Penang Is.] (Figs 31-33).

Areas galactina intermedia: Inoue, 1984, *Chô Chô* **7** (1): 4: “Penang”.

Areas galactina trigonalis: Inoue, 1984, *Chô Chô* **7** (1): 4, pl. I, fig. 8-9: “Sumatra ... Taiping, Malaya”.

Type material examined. *Numenes trigonalis*, syntype, “Dr. B. Hagen, Toba-Meer, (Sumatra intér.)”, “TYPE. S.v.V.” (blue label), “Arctia Trigonalis S.v.V.”, “ ” (RMNH). *Areas cana*, holotype, “Type / HT”, “Pedang / Sumatra / Bock”, “Areas / Cana / type Druce”, “Presented by / J.J.Joicey Esq. / Brit.Mus.1931-444.” (BMNH). *Pericallia galactina intermedia*, holotype, “Type”, “Govrmt. Hill, / Penang, / 2500 ft. / 30.III.98. / (Curtis).”, “Pericallia / galactina / intermedia / Type Rothsch.” (BMNH).

Additional material. INDONESIA: 1 , 1 , North Sumatra, Karo Highlands, 900 m, III 1978, T. Hasegawa leg. (YK); MALAYSIA: 1 , 1 , 75 km N from Kuala-Lumpur, Fraser’s hill, 8-9.IX 1989, W.J.Tennent leg. (PGH); 5 , Malay Peninsula, Cameron Highlands, 29.XII 1971, Y.Kishida leg., no data, anonymous leg., 30.IV 1994, T. Tanabe leg. (YK); 1 , same locality, 610 m, 26.IX.1996 (PGH); 1 , Perak, Taiping, VII 1989, anonymous leg. (YK); MYANMAR (BURMA): 1 , south part of country, Tenasserim (PGH).

Distribution. Indonesia: north Sumatra; Malaysia: Malay Peninsula; south Myanmar (Burma).

Diagnosis. The hindwing coloration of this subspecies varies from bright orange, often with a red tint at the base to entirely bright red; females usually have much more red hindwings than males. Form *intermedia* (probably only a rare variety), has less red on the hindwings, with a light orange tint at the base, but all neighbouring populations are more similar to form *trigonalis*. Consequently, we decided to synonymize *intermedia*. Subspecies *trigonalis* has the reddest hindwing colour of all the subspecies. The head is bright red, tegulae and patagia white, with median black spots; hind margin of patagia with red scales. Forewing underside with narrow dark pattern that is only slightly weaker than the upperside. In some specimens from Sumatra (form *cana*) the hindwing underside pattern is sometimes pale, but this is possibly only a rare variety.

Male genitalia (Fig. 40). Uncus long, elongate, without a constriction before the apex. Valvae convex-concave, not narrowing to apex. Apical part of valva rounded ventrally, without any noticeable posterior angle. Ventral valva margin smoothly concave, not wavy. Apex of ventral process situated at one-third from the base and projecting well beyond the costal margin. Paratergal

processes equal to the adjacent basal-costal processes of valva. The long and elongate uncus, is similar to the neighbouring continental subspecies *A. g. inouei* and *A. g. khasiana*. Differs from other subspecies in the rounded ventral edge of valva apex, without any posterior angle or process. In the dried moth, VIII sternite lobes extend beyond the VIII tergite.

***Areas galactina galactina* (Hoeven) (Figs 24–28)**

Chelonia galactina Hoeven, 1840, *Tijdschr. Nat. Gesch. Physiol.* 7: 280, t. 6, fig. 5; type locality: “Brazilii” [Java] (Inoue, 1984) (Fig. 42).

Pericallia galactina f. *walshiae* Roepke, 1938, *Ent. Z.* 52: 157-160; type locality: “Westjava” (Fig. 43).

Areas galactina galactina: Inoue, 1984, *Chô Chô* 7 (1): 3, fig. 102, pl. I, fig. 6: “Java”.

Type material examined. *Chelonia galactina*, syntypes, 2, “COTYPE: *Chelonia galactina* 1840 v.d. Hoeven”, “1938 don. J.J. de VOS tot Nederveen Cappel, coll. Dr. M.C. VerLoren van Themaat: ex coll. A.J. van Eyndhoven”, “COTYPE” (red label) (ZMAN). *Pericallia galactina walshiae*, holotype, “Perbawatee, 26 Nov. 1937, W.-Java Walsh”, “Holotypus” (rose label), “Typus Holo-Roepke” (purple label), “f. *walshiae* Rpk” [handwriting of W. Roepke], “Museum Leiden, verzameling W K J Roepke” (RMNH).

Additional material. INDONESIA: 2, E. Java, Nongkodjadjar, 4000', I 1934, A.M.R. Wegner (BMNH); 1, Java, Tugu [?Malang], 3.VI 1973, J.A.C. Greenwood leg. (PGH); 5, E. Java, Mt. Argapura, Apr. 1995, native collector leg. (YK); 2, Java, G. Merapi, 1996, nativ. coll. leg. (YK); 1, S.W. Sumatra, North Korintji Valley, 5000 ft, IX-X 1921, C., F., & J. Pratt leg. (BMNH).

Distribution. INDONESIA: Java, south Sumatra.

Diagnosis. Similar to *A. g. orientalis*, especially those from northern Indochina, but differs mainly in having large spots on the tegulae, yellow head, and also the brighter colour of the abdomen. In specimens from south Sumatra the head is a brighter, rose-red colour. Forewing underside pattern is weaker than upperside. Hindwings yellow, with a red anal margin which is better expressed than in *A. g. orientalis*. Hardly distinguishable from *A. g. inouei* by appearance only, but strongly differs from the neighbouring *A. g. trigonalis* from north Sumatra and Malay Peninsula.

Male genitalia (Fig. 41). Uncus not elongate, without a constriction before the apex. Valvae slightly convex-concave, not narrowing to apex. Apical part of valva nearly rectangular. Costal valva margin slightly convex. Ventral valva margin straight or slightly concave, not wavy. Apex of the ventral process situated approximately one-third from the base. Paratergal processes slightly smaller than the adjacent basal-costal process of valva. The nominotypical subspecies differs from *A. g. inouei* in the noticeably shorter uncus and valvae, less convex-concave valvae, convex (not straight) costa of valva. In the dried moths, VIII sternite lateral lobes only slightly longer than the VIII tergite, without a hollow between them.

***Areas galactina hollowayi* Dubatolov, Haynes & Kishida, *subsp. nov.* (Figs 29–31)**

Pericallia galactina trigonalis: Holloway, 1976, *Moths of Borneo with special reference to Mount Kinabalu*: 4: “BT [Bundu Tuhan 1200m] 4 [specimens], HQ [Mt. Kinabalu, Park H. Q. [Head Quarters] 1620m] 2 [specimens], PS [Mt. Kinabalu. ‘Power Station’ 1930m] 1 [specimen]”.

Areas galactina: Holloway, 1988, *Moths of Borneo* 6: 50, pl. 3, fig. 19: “G. Kinabalu and ...G. Api in Sarawak”.

Material. HOLOTYPE – , East MALAYSIA, Sabah, Mt. Kinabalu, Park Head Quarters, 19-22.X 1980, Shinji Nagai leg. (SZMN). PARATYPES: MALAYSIA, BORNEO: 3, the same locality and data (SZMN); 4, Mt. Kinabalu, Sabah, Bundu Tuhan, 1200 m, VII-IX 1965, H.J. Banks, H.S. Barlow & J.D. Holloway leg. (BMNH); 4, 1, Sabah, near Keningau, 1400 m, 10-20.X 1988, M. Ito leg. (YK).

Distribution. MALAYSIA, Borneo: Sabah, Sarawak. Probably occurring in Indonesia, Kalimantan (= Borneo).

Diagnosis. Similar in appearance to the nominotypical subspecies but the red tone on the hindwings is more extensive and reaches the discal cell; nevertheless the red tone is not as strong as in *A. g.*

trigonalis. Moreover, the black spots on the tegulae and patagia are noticeably larger, and the head is red, not yellow.

Male genitalia (Fig. 42) are most characteristic in this subspecies. Uncus not elongate, without a constriction before the apex. Valvae elongate, long, slightly convex-concave. Apical valva margin tapering at ventral angle. Costal valva margin slightly wavy or convex. Ventral valva margin straight or slightly concave, not wavy. Apex of ventral process situated about one-fourth from the base and projecting slightly beyond the costal margin. Paratergal processes nearly equal to adjacent basal-costal process of valva. Lateral VIII sternite lobes of the new subspecies are the largest in the species; approximately three times longer than the length of the VII sternite. In the dried moths, they strongly project distally beyond the VIII tergite, with a deep hollow between them. Characterized by the longest valvae, which are very slightly convex-concave, valva apex tapering at ventral angle, the most basal position of ventral process, and the long lateral lobes of the VIII sternite.

***Areas galactina owadai* Dubatolov, Haynes & Kishida, *subsp. nov.* (Figs 32–34)**

Areas galactina subsp.: Inoue, 1984, *Chô Chô* 7 (1): 4, pl. I, fig. 7: “Negros Island”.

Material. HOLOTYPE – , PHILIPPINES, N. Luzon, Mountain Prov., Sagada [=Sadanga!] 1550 m, 21-22. vi. 1985, M. Owada leg. (NSMT). PARATYPES: PHILIPPINES: LUZON: 1 , North Luzon, Mountain Prov., Sagada, 1,550m, 21-23.VII 1985, M. Owada leg. (NSMT); 5 , Ifugao, Mt. Polis, VI 2004, anonymous leg. (YK); 3 , Banaway [Banahay], 1.V 1986, 20.V 1986, anonymous leg. (YK); NEGROS: 1 , 1 , Mt. Canlaon, 20.IV 1997, IX 1997, anonymous leg. (YK); 1 , 1 , Valleucia, 5.VI 1989, I. Nihira leg. (YK); 1 , 1 , Manbucal [Mambucal], VII 1990, anonymous leg. (YK); MINDORO: 1 , 1 , Mt. Halcon, VI 2002, anonymous leg. (YK); PALAWAN: 1 , Bataraza, Malihud, primary forest 4 km N, 530m, 8°43'07" N 117°33'47"E, MV-lamp, 9-11.V 2000, S. Verdeprado & A. Zwick leg. (PGH); 1 , Mt. Mantalingahan, abandoned village; 950m, 8°46.99' N 117°42.11'E, MV-lamp, 14.III 1999, S. Verdeprado & A. Zwick leg. (PGH); 1 , Mt. Mantalingahan, cold, open rainforest; 1400m, 8°48.27' N 117°41.86'E, MV-lamp, 18-19.III 1999, A. Zwick & S. Verdeprado leg. (PGH); 1 , 1 , Palawan, VII 1979, 28.XII 1980, anonymous leg. (YK); 1 , ‘Philippines’.

Distribution. PHILIPPINES: Luzon, Negros, Mindoro, Palawan (see remarks below).

Diagnosis. There are no noticeable characters in the upperside forewing pattern except for the lightly tinted brown pattern. The hindwing upperside is similar to both *A. g. orientalis* and *A. g. galactina*: its ground colour is yellow with reddish anal and basal part. The most distinguishable character for the new subspecies is its extremely pale pattern of wing underside. The brown pattern is so light, that it is barely visible; the upperside wing dark pattern is only faintly noticeable from the underside. This is not so in most other known subspecies and is the best distinguishing character of the new subspecies. However, in a few populations (for example, from Mindoro), the forewing underside greyish pattern is visible as in some pale specimens of other subspecies. In addition, there is the red colouration between costa and vein Sc+R on hindwing underside.

Male genitalia (Fig. 43). Uncus broad, without a constriction before the apex. Valvae slightly elongate, slightly convex-concave. Valva apex nearly oval. Costal valva margin straight. Ventral valva margin straight or slightly concave, not wavy. Apex of the ventral process situated nearly at nearly one-third from base; not projecting beyond the costa on right valva and only slightly beyond on left valva. Paratergal processes nearly equal to the adjacent basal-costal process of valva. VIII sternite lateral lobes not very long. Characterized mainly by the oval valva apex.

Remarks. Without exception specimens examined from the Philippines were found to be different from those examined from Borneo. The two most notable differences are the very pale wing undersides and the much shorter VIII sternite lateral lobes.

Discussion

All subspecies of *A. galactina* across their known range of distribution have been examined. We

consider the data obtained sufficiently robust to confirm current and herein designated subspecies. However, there remains some questions concerning the status of what may be described as transitional taxa. Specimens from Arunachal Pradesh, Khasis and Nagas show some characters of both *A. g. inouei* and *A. g. orientalis*, and *A. g. inouei* from North Thailand and South Vietnam may be an *intermedia* – *trigonalis* transitional group. However, the examples studied do not show clinal evidence and in some cases distribution appears disjunct – either due to distance or simply the lack of available specimens from intervening areas.

Dedication

This paper is dedicated in memory of Professor Hiroshi Inoue whose work is and will remain an inspiration to us all.

Acknowledgements

Authors are grateful to Dr R. de Vos (Amsterdam, Netherlands) for preparing photographs of the type specimens of *A. galactina*, *A. g. walshiae*, *A. g. trigonalis*, and for permission to publish them; to Dr I. Pljstsh (Kiev, Ukraine) for photographs of specimens from Laos. In the BMNH we thank Dr J. Holloway for permission to study his specimens from Borneo; Dr I. Kitching for helpful advice, and Mr Geoff Martin and Mr Martin Honey for their help and allowing access to specimens and type material in the BMNH collection. Our thanks are due to Dr Mamoru Owada, NSMT for permitting us to study the collection under his curation. We wish to express our sincere thanks to Dr Wang Min, Dr P. Kuatt, Messrs K. Yazaki, T. Mano, S. Nitta, K. Eda, H. Yoshimoto, J. Kaneko, T. Tanabe, S. Nagai, I. Nihira, the late B. Tanaka and the late T. Haruta for their kind help in many ways.

References

- Arora, G. S. & Chaudhury, M., 1982. On the lepidopterous fauna of Arunachal Pradesh & adjoining areas of Assam in North-East India: family Arctiidae. *Technical Monograph of the Zoological Survey of India* **6**: 1–65.
- Cotes, E. C. & C. Swinhoe, 1887–1889 [1887]. *A catalogue of the Moths of India*. Part 2, Bombyces: 41–255. Trustees of the Indian Museum, Calcutta.
- Daniel, F., 1943. Beiträge zur Kenntnis der Arctiidae Ostasiens unter besonderer Berücksichtigung der Ausbeuten H.Höne's aus diesem Gebiet (Lep., Het.). II Teil. Hypsinae, Micrarctiinae, Spilosominae, Arctiinae. *Mitt. münch. ent. Ges.* **33** (2/3): 673–759, T. 14–22.
- Druce, H., 1899. Descriptions of some new species of Heterocera from tropical America and the Eastern islands. *Ann. Mag. nat. Hist.* (7) **3**: 228–236.
- Fang, C., 1982. Arctiidae. *Iconographia heterocerorum sinicorum* **2**: 190–277. Beijing. (In Chinese).
- Fang, C., 1985. Lepidoptera: Arctiidae. *Economic insect fauna of China* **33**. 100 pp., 10 pls. Science Press, Beijing. (In Chinese).
- Fang, C., 2000. Lepidoptera. Arctiidae. *Fauna Sinica*. Insecta. **19**. 590 pp., 20 pls. Science Press, Beijing.
- Hampson, G., 1901. Catalogue of the Arctiidae (Arctiinae) and Agaristidae in the collection of the British Museum (Natural History). *Catalogue of the Lepidoptera Phalaenae in the collection of the British Museum (Natural History)* **3**. XII+609 pp., pls 36–54. London.
- Hoeven, J. van der., 1840. Beschrijving eeniger nieuwe of weinig bekende uitlandsche soorten van Lepidoptera. *Tijdschr. Natuurl. Ges. Physiol.* **7**: 276–283.
- Holloway, J. D., 1976. *Moths of Borneo with special reference to Mount Kinabalu*. 264 pp. Malayan Nature Society, Kuala Lumpur, Malaysia.
- Holloway, J. D., 1988. *The Moths of Borneo. Part 6. Family Arctiidae, subfamilies Syntominiinae, Euchromiinae, Arctiinae; Noctuidae misplaced in Arctiinae (Camptoloma, Aganainae)*. 101 pp. figs 8–168, 19 pls+6 col. pls.
- Inoue, H., 1984. On geographic variation of *Areas galactina* (Hoeven) (Lepidoptera: Arctiidae). *Chô Chô* **7** (1): 2–10.
- ICZN 1999. *International Code of Zoological Nomenclature*. Fourth Edition, adopted by the International Union of Biological Sciences. xxix + 306 pp. The International Trust for Zoological Nomenclature, c/o The Natural History Museum, London.
- Kishida, Y., 1992. Arctiidae. In Haruta, T. (Ed.), *Moths of Nepal*. Part 1. *Tinea* **13** (Suppl. 2): 72–75, pls 17–18.
- Kishida, Y., 1994. Arctiidae. In Haruta, T. (Ed.), *Moths of Nepal*. Part 3. *Tinea* **14** (Suppl. 1): 66–71, pl. 79.

- Kishida, Y., 1998. Arctiidae. In Haruta, T. (Ed.), Moths of Nepal. Part 5. *Tinea* **15** (Suppl. 1): 32–35, pl. 132.
- Matsumura, S., 1930. A catalogue of the Arctiidae of the Japanese Empire. *Insecta matsum.* **5**: 58–94, pl.1.
- Mell, R., 1922. Neue südchinesische Lepidoptera. *Dr. ent. Z.* **1922** (4): 113–129.
- Okano, M., 1960. New or little known moths from Formosa (4). *Rep. Gakugei Fac. Iwate Univ.* **16** (2): 9–20, 16 fig., 2 pl.
- Roepke, W., 1938. Ueber Indomalayische Nachfalter (Lep. Heteroc.). *V. Ent. Z.* **52**: 157–160. Frankfurt am Main.
- Rothschild, W., 1914. Arctiidae, subfamilie Arctiinae. In Seitz, A. (Ed.), *Die Gross-Schmetterlinge der Erde* **10**: 236–263. Alfred Kernen, Stuttgart.
- Rothschild, W., 1933. New species and subspecies of Arctiinae. *Ann. Mag. nat. Hist.* (10) **11**: 167–194.
- Snellen van Vollenhoven, S. C., 1863. Description de quelques nouvelles especes de lepidopteres des indes orientalis. *Tijdschr. Ent.* **6**: 129–144, pls 8–10.
- Sotavalta, O., 1964. Studies on the variation of the wing venation of certain tiger moths (Lep. Arctiidae, Subfam. Arctiinae). *Annls. Acad. Sci. fenn. Ser. A. IV. Biologica.* 42 pp. Helsinki.
- Strand, E., 1919. Arctiidae: subfam. Arctiinae. In Wagner, H. (Ed.), *Lepidopterorum Catalogus* **22**. 416 pp. S. W. Yunk, Berlin.
- Toulgoët, H. de., 1975. Ergebnisse der Bhutan-Expedition 1972 des Naturhistorisches Museum in Basel. Lepidoptera: Fam. Arctiidae. *Entomologica basiliensia* **1**: 113–117.
- Walker, F., 1855. *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum* **3**: 583–775. London.