

Identity and distribution of two dimorphic oriental fairy moths — *Nemophora decisella* (Walker, 1863) and *Nemophora cantharites* (Meyrick, 1928) (Lepidoptera, Adelidae)

Mikhail V. KOZLOV* & Gaden S. ROBINSON**

* Laboratory of Ecological Zoology, University of Turku, FIN-20500 Turku, Finland

** Department of Entomology, The Natural History Museum, Cromwell Road, London SW7 5BD, UK

Summary

Sexual dimorphism in wing pattern has, historically, caused confusion in the association of males and females of both *Nemophora decisella* (Walker) and *N. cantharites* (Meyrick). The wide distribution of *N. decisella*, from the Russian Primorye to Java, combined with geographical variation in its external characteristics, has provoked repeated descriptions of this species for which eight junior synonyms are established here. One new synonym is established of *N. cantharites*. Data on all primary types are provided, and the species are redescribed. Variation with latitude in eye size, wing length, and the width and position of the forewing medial band is discussed for *N. decisella*.

Résumé

Le dimorphisme sexuel révélé par le dessin des ailes est à l'origine historique de la confusion qui règne dans le groupe des mâles et des femelles de *Nemophora decisella* (Walker) et de *N. cantharites* (Meyrick). La distribution géographique très étendue de *N. decisella*, soit de Primorye (Russie) à Java, s'ajoutant à la variation géographique des caractères extérieurs de ce taxon, en a déclenché des descriptions répétées, contraignant les auteurs à créer huit junior-synonymes dans le présent travail. Pour *N. cantharites* ils établissent aussi un nouveau synonyme. Ils fournissent des renseignements sur les types primaires et redécrivent les deux espèces. Pour *N. decisella*, ils traitent des variations dans les caractères suivants : dimension de l'œil (largeur), longueur des ailes, largeur et position de la bande médiane de l'aile antérieure.

Introduction

Adelidae are small to medium-sized, colourful, frequently diurnal moths with conspicuously elongated antennae. The genus *Nemophora* Hoffmannsegg, 1798 (type species : *Phalaena (Tinea) degeerella* Linnaeus,

1758, by subsequent designation of Hampson, 1918, *Novit. Zool.* 25 : 388 ; for the authorship of the generic name, see Nye & Fletcher, 1991) is one of the most taxonomically complicated groups of Adelidae, and even the identity of the western Palaearctic species is sometimes confused. The eastern Palaearctic and Oriental species of this genus have been neither reviewed nor even listed since Meyrick's (1912) catalogue in *Genera Insectorum*. However, the Japanese species have been considered by Okano (1959) and Moriuti (1983), and the fauna of the Malay archipelago and the Philippines has been revised by Diakonoff (1951, [1968]).

In the course of taxonomic revision of the genus *Nemophora* we recognized that females of two oriental species, *N. decisella* (Walker) and *N. cantharites* (Meyrick), differed in wing pattern from conspecific males. This type of sexual dimorphism has not previously been recorded among *Nemophora* species ; conspecific males and females, even if collected simultaneously, were described as different species. This paper aims to clarify the taxonomy and distribution of these two closely related species.

Materials and methods

In the course of this study all primary types were examined. Following *ICZN* (recommendations 72E, 72F), all original labels of the specimens designated as lectotypes / paralectotypes, as well as old holotypes, are cited in full. Label size is given in millimeters ; the original text of the labels of type specimens is provided within quotation marks ; recent locality names are added in square brackets ; an oblique line (/) is used to separate parts of labels written on different lines. The spelling of locality names, except for the primary types, follows *The Times Atlas of the World* (Comprehensive Edn.), 1968. Localities in Japan were attributed to prefectures following Utech (1980). Altitudes are given in meters above sea level to an accuracy of 50 m.

Male genitalia were investigated as described by Kozlov (1993) ; female genitalia were not considered here. The interocular index was measured following the formula of Davis (1975), being the ratio between the vertical diameter of the compound eye and the interocular distance measured at a point on the frons midway between the base of the antennal sockets and the anterior tentorial pits. Other measurements were made as shown in Fig. 1.

Abbreviations of museums and institutions :

BMNH	The Natural History Museum, London, U.K.
EIHU	Entomological Institute, Faculty of Agriculture, Hokkaido University, Sapporo, Japan.
ELUO	Entomological Laboratory, University of Osaka Prefecture, Osaka, Japan
MINGA	Muzeul de Istoria Naturala 'Grigore Antipa', Bucharest, Rumania
MZH	Zoological Museum in Helsinki, Finland
NML	National Museum of Natural History, Leiden, The Netherlands
NHMW	Natural History Museum, Wien, Austria
USNM	U.S. National Museum of Natural History, Smithsonian Institution, Washington, D.C., U.S.A.
ZIN	Zoological Institute, St. Petersburg, Russia
ZMB	Zoological Museum, Humboldt University, Berlin, Germany
ZMUC	Zoological Museum, University of Copenhagen, Denmark.

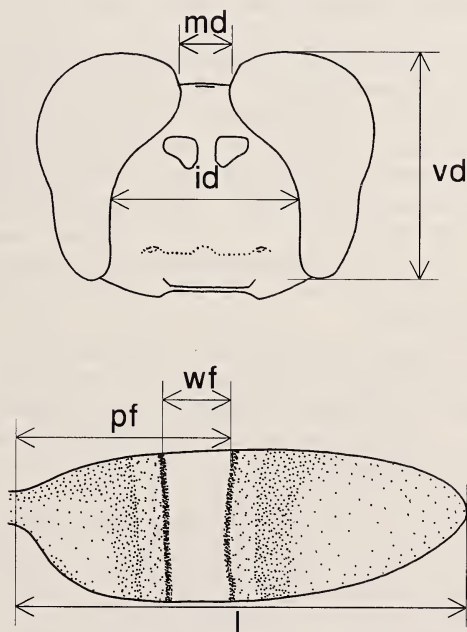


Fig. 1. Measurements of head and forewing : id — interocular distance ; l — forewing length ; md — minimum distance between eyes ; pf — position of outer border of medial yellow band ; vd — vertical eye diameter ; wf — width of medial yellow band.

Phylogenetic relationships

There is no subgeneric classification of *Nemophora*, but four species groups, “A”-“D”, were recognized by Meyrick (1912). However, even this classification appears doubtful, and different synonyms of *N. decisella* were included by Meyrick in different species groups.

Our suggestion of a sister-group relationship between the two species discussed here is based on the only synapomorphy (sexual dimorphism in the coloration of the forewing base) that we can recognize. No other *Nemophora* species except *N. heteroxantha* Diakonoff, as we can conclude from examination of primary descriptions and the BMNH collection, share this apomorphy with *N. decisella* and *N. cantharites*. However, validity of *N. heteroxantha* described from E. Java is problematic (see below), and we do not consider this species here. The position of *N. decisella* and *N. cantharites* within the genus *Nemophora* cannot be refined further at present as some two-third of the included species are poorly known.

Nemophora decisella (Walker, 1863) (Figs 2-5, 8, 9, 12-17)

Nemotois decisella Walker, 1863, List Lepid. Het. Brit. Mus. 28 : 505. Holotype ♂ : Indonesia, Sumatra [given erroneously in the original description as “China” — by a curious error the English descriptions and localities of this species and *N. sinicella* were switched in Walker’s publication ; the Latin diagnoses are correct (Meyrick, 1912)] ; labelled : circle diam 8 with red border, print “Type” ; blue-grey circle diam 6, black ink “Sumat/ra”, reverse side “54/76” ; 14 × 24, wide black border, black ink + print “Nemotois / decisella. [Sic!] Wkr. / Cat. Lep. BM. XXVIII p. 505. 1863 / TYPE ♂ descr.” ; 5 × 35, print “22. Nemotois decisella.” (BMNH) [examined].

Nemotois decisella Walker : Meyrick, 1912 : 7 (Sumatra).

Nemophora decisella (Walker) : Diakonoff, 1951 : 173-174 (W Java) ; Robinson *et al.*, 1994 : 23 (Burma, Thailand, W Malaysia, Sumatra, Java, Anambas Is., Brunei, Kalimantan), fig. 33 (male head), plate 3 fig. 2 (male, colour illustration).

Ucetia bifasciella Walker, 1866, List Lepid. Het. Brit. Mus. 35 : 1821. Holotype ♀ [erroneously cited as male in original description] : Indonesia, Java [type locality confirmed from BMNH accession register] ; labelled : circle diam 8 with red border, print “Type” ; 5 × 7, print “60.15 / E[ast]. I[ndian]. C[ompany].” ; 6 × 8, black ink “772” ; 14 × 24, wide black border, black ink + print “Ucetia / bifasciella / Wkr. / Cat. Lep. Het. BM. 35 p. 1815 [Sic!]. 1866 / TYPE ♂ descr. 1/1” ; 5 × 28, print “Ucetia bifasciella” ; 4.5 × 14, print “a. Java” (BMNH) [examined].

Nemotois bifasciella (Walker) : Meyrick, 1912 : 7 (Java).

Nemophora bifasciella (Walker) : Diakonoff, 1951 : 179 (Java).

Nemophora bifasciella irrorata Diakonoff, 1951, Treubia 21 : 179-181. Holotype ♀ : Indonesia, E Java, Tengger Mts ; labelled : 4 × 7, print + black ink "Gen. No. : / 1187"; 5.5 × 15, print + black ink "East Java, 2000 m / Kletak / at light [deleted by ink] 19.V.1941 / A.M.R. Wegner leg." ; 15 × 16, thin black frame, print + black ink "TYPE : ♀ / Nemophora / bifasciella / WALK / subsp. / irrorata / A.Diakonoff 1950"; red 13 × 17, print + black ink "Museum Leiden / Holotype ♀ / Nemophora / bifasciella / irrorata / Diakonoff, 1951 : 179" (NML) [examined]. Paratypes : 1 ♀, labelled : 5.5 × 15, print + black ink "East Java, 2000 m / Kletak / at light [deleted by ink] 6.V.1940 / A.M.R. Wegner leg." ; 15 × 16, thin black frame, print + black ink "PARATYPE : ♀ / Nemophora / bifasciella / irrorata / A.Diakonoff 1950" (NML) [examined]. 1 ♀ : same as previous, except the collecting date (10.VI.1941) (NML) [not examined]. **Syn. n.**

Nemotois paradisea Butler, 1881, Trans. ent. Soc. London : 592. Holotype ♂ : Japan, Honshu ; labelled : circle diam 8 with red border, print "Type"; 5.5 × 10, black ink "Tokei 80-97" [according to the BMNH accession register, this material was collected by Fenton], reverse side "Nemotois / paradiseus / Butler. Type"; 14 × 24, wide black border, black ink + print "Nemotois / paradisea / Btlr. / Tr. Ent. Soc. Lond. 592 (1881) / TYPE ♂ descr." (BMNH) [examined]. **Syn. n.**

Nemotois paradisea Butler : Meyrick, 1912 : 7 (Japan).

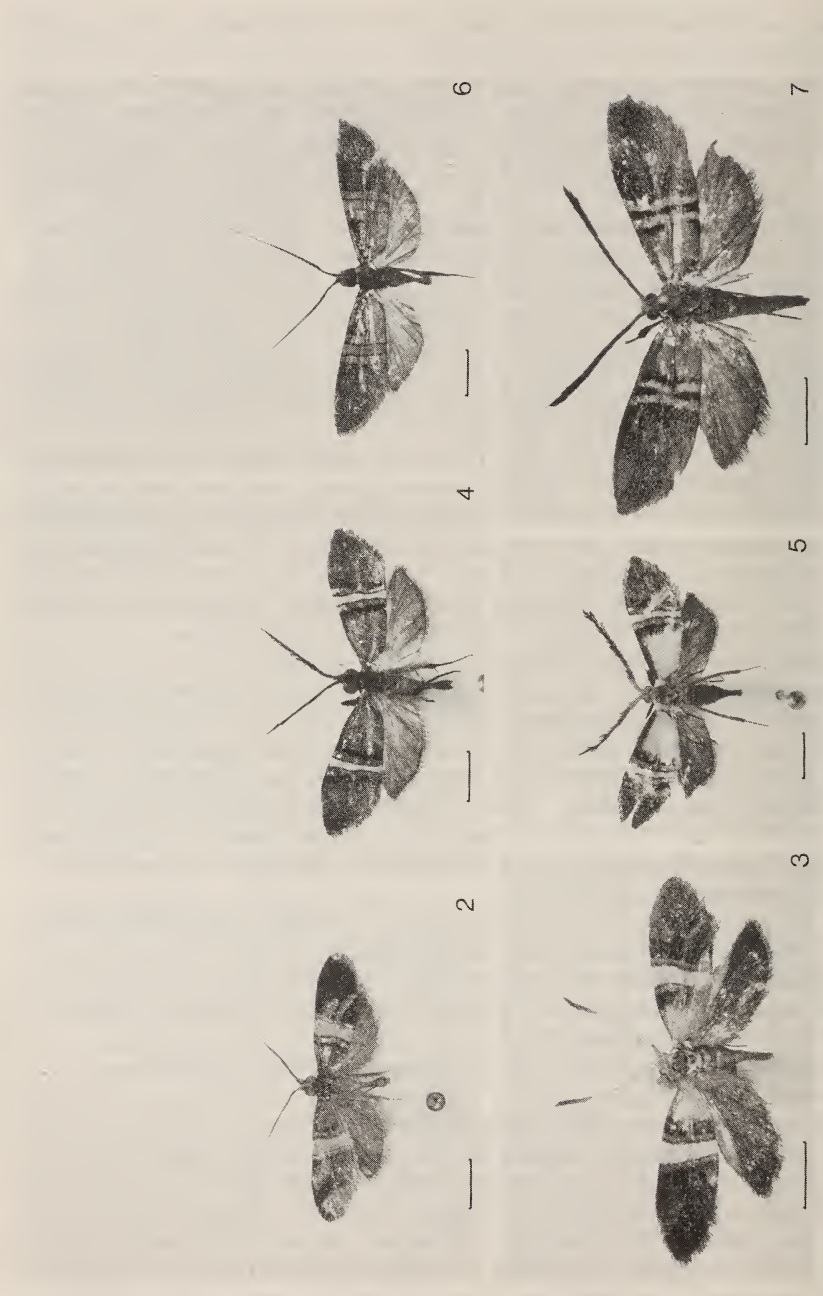
Adela imperialis Rebel, 1900, Iris 13 : 187-188. Lectotype ♂ (here designated) : Russia, "Amur"; labelled : 5 × 7, print "630"; 11 × 23, black ink "Adela Type / imperialis Rbl"; 9 × 15, print + black ink "Stgr. 900 / Amur"; 13 × 18, print + black ink "Lectotype ♂ / Adela / imperialis / Rebel, 1900 / teste M.Kozlov, 1994" (NHMW). Paralectotype ♂ (here designated) : same locality ; labelled : 3 × 7, print "Amur"; 5 × 21, black ink "Imperialis m[ihi]."; 9 × 18, black ink "Nemotois / Paradisea Btl./ Imperialis Stg. i.l./ Sn."; 5 × 14, print "Zool. Mus. / Berlin"; 13 × 18, print + black ink "Paralectotype ♂ / Adela / imperialis / Rebel, 1900 / teste M.Kozlov, 1994" (ZMB). **Syn. n.**

Nemotois imperialis (Rebel) : Meyrick, 1912 : 7 (E. Siberia).

Adela imperialis Rebel : Szent-Ivány, 1945, Fragmenta Faunistica Hungarica 8 (1) : 9 (Hungary) (err. det.).

Nemaphora [sic!] *imperialis* (Rebel) : Gozmany, 1965 : 40 (Budapest) (err. det.).

Adela sythoffi Snellen, 1901, Tijdschr. Ent. 44 : 77, pl. 5 fig. 4. Lectotype ♀ (here designated) : Indonesia, W Java, Preanger ; labelled : 7 × 9, black ink "W. Java / Preanger / 5000 vt / Sythoff ♀"; 13 × 18, print + black ink "Lectotype ♀ / Adela / sythoffi / Snellen, 1901 / teste M. Kozlov, 1994"; red 13 × 17, print + black ink "Museum Leiden / LECTOTYPE ♀ / Adela / sythoffi / Snellen, 1901 : 77" (NML) [examined]. Paralectotype ♀ (here designated) : same locality ; labelled : 7 × 9, black ink "W. Java / Preanger / 5000 vt / Sythoff ♀"; blue



Figs 2-7. Adults of *Nemophora* spp. 2 — *N. decisella*, ♂, Amur reg., Russia; 3 — *N. decisella*, ♀, Ichang, China; 4 — *N. decisella*, ♂, Rampayoh R., Brunei; 5 — *N. decisella*, ♀, Rampayoh R., Brunei; 6 — *N. canthaites*, ♂, Mindanao, Philippines; 7 — *N. canthaites*, ♀, Mindanao, Philippines. Scale: 3 mm.

13 × 17, print + black ink “Museum Leiden / PARALECTOTYPE ♀ / Adela / sythoffi / Snellen, 1901” (NML) [not examined].

Nemotois sythoffi (Snellen): Meyrick, 1912: 7 (as junior synonym of *N. bifasciella*).

Nemotois baibarana Matsumura, 1927, J. Coll. Agric. Hokkaido Imp. Univ., 19: 7. Holotype ♀: Taiwan; labelled: 8 × 12, print “BAIBARA / Y. Saito / Kikuchi”, reverse side, pencil “21 Feb. / 1926”; 9 × 19, black ink “Adela Mats. / baibarana”; red 7 × 16, print “Type / Matsumura”; red 10 × 21, black ink + print “Holo-type / Nemotois / baibarana / MATSUMURA” (EIHU) [examined]. **Syn. n.**

Nemotois honei Meyrick, 1935, Mat. Microlepid. Chin. Prov.: 94. Lectotype ♀ (here designated): China, Nanking; labelled: circle diam 8 with violet border, print “Lecto-/type”; 4.5 × 9.5, black ink “Nanking / China / H[ö]ne]. 15.8.[19]33”; 13 × 16, black ink + print “Nemotois / hoeneella / Car. & Meyr. / E. Meyrick det. / in Meyrick Coll.”; 6 × 13, print “Meyrick Coll. / B. M. 1938-290”; 3 × 18, black ink “hoeneella Car.”; 12 × 20, print “Erroneously labelled / by Meyrick — specimens / of *honei* and *honeella* / were switched in the / Meyrick collection. / Teste M. Kozlov, 1994”; 13 × 18, print + black ink “Lectotype ♀ / Nemotois / honei / Meyrick, 1935 / teste M. Kozlov, 1994” (BMNH) [examined]. Paralectotypes (designated by A. Popescu-Gorj, see Comments): same locality; 1♂, labelled: blue 5 × 20, print “Nanking (China) / 15.6.1933 H. Höne”; 13 × 22, black ink “Nemotois / hoenei [sic!] Car / sp. nov.”; 9 × 13, black ink “Type”; 14 × 20, red margins, print + black ink “România [along the left margin] / LECTOTYPE / Nemotois ♂ / honei / Car. & Meyr. DES. / Dr. A. POPESCU-GORJ”; 11 × 18, black ink “Lectotype ♀ in / BMNH design. by / Kozlov & Robinson / 1995; this speci- / men is paralectotype”, reverse side “M. Kozlov, 1995”. 1♀, labelled: blue 5 × 20, print “Nanking (China) / 15.6.1933 H. Höne”; 9 × 7, black ink “28.”; 14 × 20, violet margins, print + black ink “România [along the left margin] / ALLOLECTOTYPE / Nemotois ♀ / honei / Car. & Meyr. DES. / Dr. A. POPESCU-GORJ”. 2♀♀, labelled: blue 5 × 20, print “Nanking (China) / 15.6.1933 H. Höne”; 14 × 20, green margins, print + black ink “România [along the left margin] / PARALECTOTYPE / Nemotois ♀ / honei / Car. & Meyr. DES. / Dr. A. POPESCU-GORJ”. 1♂, labelled: 7 × 17, black ink “Nanking, China / 15.VI.1933. H.Höne” [recent label added by A. Popescu-Gorj to the unlabelled specimen]; 14 × 20, green margins, print + black ink “România [along the left margin] / PARALECTOTYPE / Nemotois ♀ / honei / Car. & Meyr. DES. / Dr. A. POPESCU-GORJ”; 9 × 17, black ink “Incorrect recent / labelling - ♂ type / from Mokanshan. / M. Kozlov, 1995” (MINGA) [examined]. **Syn. n.**

Adela aurantibasella Caradja, 1938, Stettiner Ent. Ztg. 99: 252-253. Holotype ♀: China, Shaowu [erroneously or alternatively cited as Lackbaumpass in the original description]; labelled: 9 × 17, black frame, black ink “Shaowu / Fukien / 14.6”; 9 × 17, blue ink “Nu este tip [Not a type,

Romanian] / DP Gorj"; 15 × 25, black frame, black ink "Adela / aurantibasella / Type ♀ Car"; 13 × 18, black ink "This specimen / was considered / as HOLOTYPE of / Adela auranti- / basella Caradja / by M. Kozlov, 1995" (MINGA) [examined]. **Syn. n.**

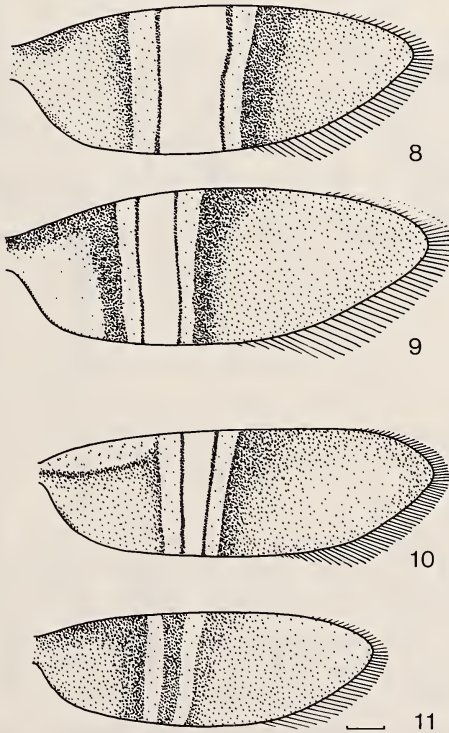
Redescription

MALE : Forewing length 7.0-10.6 mm ; wing expanse 15-23 mm. Vertex yellowish brown, sometimes with ochreous tint ; frons yellow. Proboscis and palpi light yellow to light brown. Labial palpus short (about 0.3 × vertical eye diameter) ; maxillary palpus very short, about half length of labial palpus. Compound eye enlarged, interocular index 0.9 to 1.8 ; occipital distance less than 0.45 × vertical eye diameter. Antenna 2.1-2.5 × length of forewing, with simple inwardly directed pegs. Scape and proximal region of flagellum (about 0.6 × forewing length) with cupreous brown or blackish slightly raised scales ; distal region of flagellum silver white to grey. Tegula and thorax brown, greyish brown or bronze. Forewing with yellow transverse band bordered on both sides by a single row of dark brown scales followed by 3 to 5 rows of silver scales ; ground colour surrounding silver bands darker brown than at base and apex of forewing, but this difference obvious only in fresh specimens ; basal field with dark brown coloration spreading from medial fascia along costal margin, sometimes creating the impression of a separate dark, iridescent costal spot near wing base. Width of yellow band variable, from very narrow, as wide as silver-grey bands, to 2.0-2.5 × width of these bands. Most specimens with margins of yellow medial band almost parallel, but in some examples the yellow band is slightly narrower at costa than at termen ; exceptionally it can be 1.5 times wider at costa than at termen ; forewing ground colour proximal to fascia similar to that of thorax and tegula ; distal area of forewing suffused with yellow scales and slightly paler. Cilia brown, bronze at apex. Hindwing light brown ; costal area grey ; cilia brownish-grey. Legs brown with purple iridescence, bases of tarsomeres yellow. Fore tibia with apical tuft of blackish scales ; epiphysis at two-fifths length of tibia, not reaching its tip. Abdomen brownish grey to yellowish.

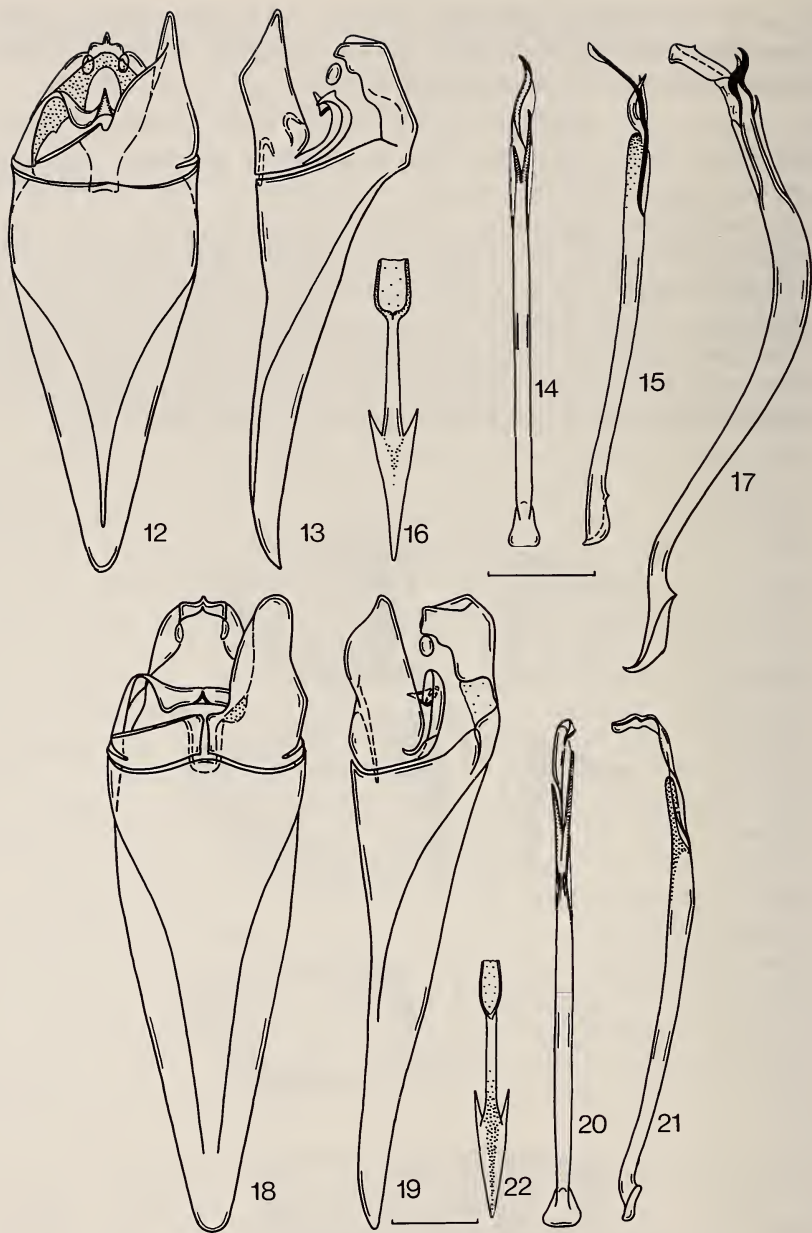
FEMALE : Forewing length 6.5-11.6 mm, wing expanse 14-24 mm. Eye enlarged ; interocular index 0.7-0.8. Antenna 0.9-1.2 × length of forewing, with basal region of flagellum thickened by raised scales which are ochreous-yellow in the basal third to purplish-brown in the distal third ; extent of raised scales along antenna varying from 0.5 to 0.7 length of forewing ; tip of flagellum yellow, with dark brown

ring at apex of each flagellomere. Thorax and tegulae yellow to light brown. Basal one-fifth of forewing yellow, except for very narrow dark brown costal area. Otherwise similar to male.

MALE GENITALIA : Tegumen dome-shaped, with prominent medial ridge. Socii small, slightly less than diameter of aedeagus. Vinculum often with long cylindrical posterior region (up to 1/4 of total length), almost triangular anteriorly; posterior margin usually prominent medially. Valva significantly longer than tegumen, with prominent lobe on ventral margin; tip very narrow, pointed; dorsal margin slightly emarginate; viewed laterally, the valva appears almost rhomboidal. Valvae fused medially. Aedeagus straight to bowed, with pair of lateral carinae near apex; base slightly swollen. Juxta short (about 0.6 × aedeagus length), the arrow-head very narrow, with pointed apex.



Figs 8-11. Forewing pattern: 8, 9 — *Nemophora decisella*; 10, 11 — *N. cantharites*. 8, 10 — males; 9, 11 — females. Scale: 1 mm.



Figs 12-22. Male genitalia: 12-16 — *Nemophora decisella*, Amur reg.; 17 — *N. decisella*, Sumatra; 18-22 — *N. cantharites*, Mindanao. 12, 18 — genital complex, ventral view; 13, 19 — same, lateral view; 14, 20 — aedeagus, ventral view; 15, 17, 21 — same, lateral view; 16, 22 — juxta. Scale: 0.25 mm.

BIOLOGY : In the northern part of its range this appears to be a late summer species, adults having been collected from August to October. In the south, specimens were collected in all months except November. It is likely that *N. decisella* in SE Asia has more than one generation. In Japan it inhabits mountain regions (Okano, 1959) ; in SE Asia it has been collected in lowland and montane primary forest to 2030 m (Robinson *et al.*, 1994). The difference in temperature between these habitats is extreme and suggests that this species has remarkable plasticity.

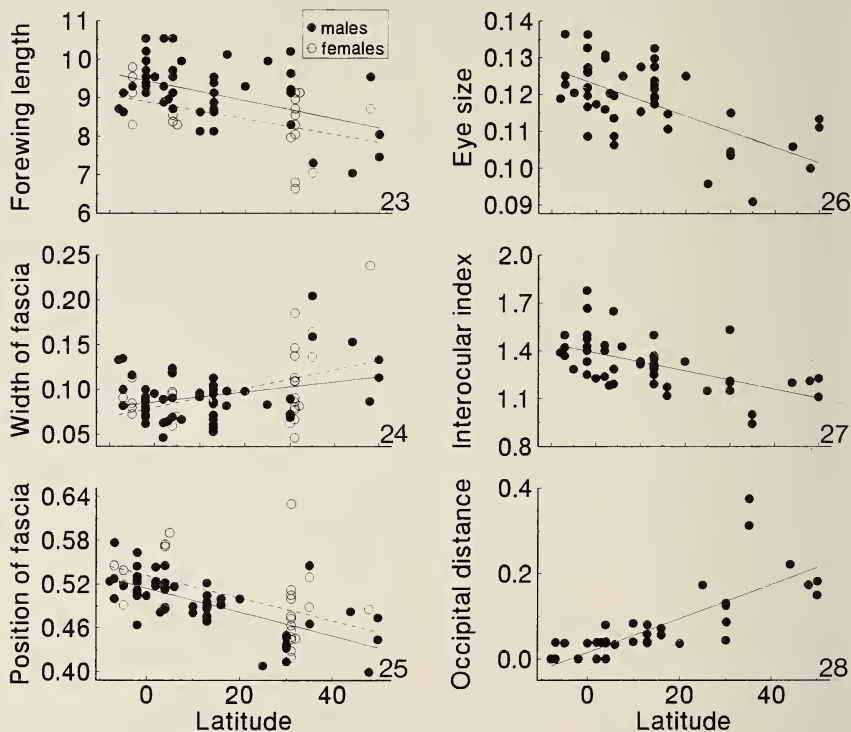
This is normally a diurnal species, but a very few specimens have also been collected at mercury-vapour light in Borneo in the early evening.

DISTRIBUTION (Fig. 29) : Russia (Khabarovsk reg., Primorye), Japan (Honshu, Shikoku, Kyushu, Tsushima), Korea, China (incl. Taiwan), Burma, Thailand, West Malaysia (incl. Langkawi), Indonesia (Sumatra, Java, Anambas Is, Kalimantan), Brunei, East Malaysia (Sarawak, Sabah).

GEOGRAPHICAL VARIATION : Although specimens of *decisella* from its two most widely separated known localities, the Amur region and Java, look very different, all the characteristics investigated (see Fig. 1 for explanations) show clinal latitudinal variation. Forewing length in both males and females (Fig. 23), the relative size of the compound eyes (Fig. 26) and the interocular index in males (Fig. 27) are greater the further south the origin of the specimen. Concomitant with an increase in male eye size, the occipital distance between the eyes decreases from 0.25-0.45 \times vertical eye diameter in specimens from the Amur region and Japan to zero or almost zero in specimens from near the equator (Fig. 28). The relative width of the forewing yellow band decreases southwards (Fig. 24) while the position of the fascia, basal in northern specimens, becomes progressively closer to the middle of the wing (Fig. 25). No variation in these traits correlate with the longitude of collecting-localities.

Variation in male genital structure is expressed mainly in the form and extent of the medial lobe of the valva, the shape of the aedeagus, and the relative size of the lateral carinae on the aedeagus. Since only a few specimens were dissected, any geographical trend in variation is difficult to quantify ; however, the southern populations seem to have larger and better sclerotized lateral carinae (cf. Figs 9 and 11). Observed variation concerns only the relative size of some structures, and is not unusual in comparison with the intraspecific variation observed in other *Nemophora* species.

COMMENTS : Due to its wide range, geographic variation and sexual dimorphism, this species has been described under at least nine different names, the oldest being *N. decisella* (Walker, 1863) based on a single male from Sumatra. The next available name, *N. bifasciella* (Walker, 1866), is based on a single female from Java. It should be noted that Walker misidentified the sex of the type specimen of *bifasciella*. However, the specimen labelled as the type in the BMNH collection corresponds completely to Walker's description. *N. sythoffi*, described from Java by Snellen (1901), was synonymized with *N. bifasciella* by Meyrick (1912). Other descriptions of this remarkable species were based on specimens from the Russian Far East, Japan and China. In Japanese publications (Okano, 1959 ; Moriuti, 1982) the species is known under the name *N. paradisea* (Butler).



Figs 23 — 28. Variation of external characters of *Nemophora decisella* in relation to the latitude of localities : 23, forewing length, mm (l, see Fig. 1) ; 24, relative width of medial yellow band (wf/l) ; 25, position of outer border of medial yellow band in forewing (pf/l) ; 26, relative size of male compound eye (vd/l) ; 27, male interocular index (vd/id) ; 28, male occipital distance (md/vd). Each dot corresponds to one specimen.

N. heteroxantha Diakonoff, 1951, described from Kletak Pass, Tenger Mts in E Java (the type locality of *N. bifasciella irrorata*), is probably also a synonym of *N. decisella*. No males of *N. heteroxantha* are known, and females differ in some traits from *N. decisella*. Since we did not consider variation in female genitalia of *N. decisella*, the taxonomic value of differences pointed out by Diakonoff (1951) remains unclear and at the recent level of knowledge we consider *N. heteroxantha* as a distinct species.

Rebel (1900) in his original description of *Adela imperialis* (based on two males from the Amur region of Russia) cited Staudinger (*in litt.*) as the author of the species, and mentioned the name '*paradisea* B.-Haas *in litt.*' as a junior synonym. Thus, most probably, Rebel based his description of *imperialis* on specimens that had already been correctly determined as *N. paradisea* Butler by Bang-Haas or Staudinger. *N. imperialis* (Rebel) was listed by Meyrick (1912) as a valid species and then completely forgotten until the name was used again by Szent-Ivány (1945) and then by Gozmany (1965) for an erroneously determined melanic specimen of *N. degeerella* (L.) from Hungary (Küppers, 1980 : 263).

The two specimens identified here as syntypes of *Adela imperialis* were discovered in the collections of NHMW and ZMB. We designate the specimen from NHMW as lectotype because it was already marked as "Type" and many of Rebel's types are already located in Wien.

N. honei (Meyrick) was described from seven specimens, two males and five females. We designate the female specimen in BMNH as lectotype. Although most of Caradja's material is housed in MINGA, Bucharest, Meyrick states explicitly in the introduction to his paper (Meyrick, 1935) that he retained the primary type of each new species unless stated otherwise.

Although a specimen of *honei* was labelled as lectotype in the MINGA collection by A. Popescu-Gorj, this species was omitted from his catalogue (Popescu-Gorj, 1992) and the designation is unpublished ; the five MINGA syntypes are therefore paralectotypes. One of these specimens (male) had no original data label, and a recent label "Nanking, China / 15.VI.1933 H.Höne" has been added by A. Popescu-Gorj. However, according to the original description, the second male syntype originated from Mokanshan, and therefore this recent label should be considered incorrect.

Popescu-Gorj (1992) was unable to find the holotype of *N. aurantibasella* (Caradja) in the MINGA collection, and we can confirm that no female

specimen of *decisella* is labelled “Lackbaumpass, 12.5” as in the original description. However, one female specimen fits perfectly the original description, particularly in its exceptionally small (14 mm) wing expanse. This specimen bears a type label of *aurantibasella* hand-written by Caradja, but is labelled “Shaowu, 14.6”. The loss of a unique type from the Caradja collection would be unprecedented, and we suggest the alternative explanation, that the label data was wrongly cited (or a geographic alternative given) in the original description. We consider this female to be the holotype of *aurantibasella*.

MATERIAL EXAMINED: **Russia:** 1 ♂, Khabarovsk (ZMUC); 3 ♂♂, 2 ♀♀, “Amur” (Staudinger) (ZIN); 1 ♂, same label (NML); 2 ♂♂, “Amur” (BMNH); 2 ♀♀, Khabarovsk reg., Khingan mt., 28.VII.1877 (ZIN); 3 ♂♂, 3 ♀♀, S Primorye, Vladivostok, Okeanskaya, 26.VII-4.VIII.1950 (Zagulajev) (ZIN); 1 ♂, 1 ♀, S Primorye, 20 km SE Ussurijsk, Gornotaezhnoye, 1-3.VIII.1966 (Zabello) (ZIN); 1 ♂, S Primorye, Khasan distr., Sidemi (Jankowski) (BMNH); 1 ♂, 2 ♀♀, S Primorye, Khasan distr., 3 km SE Andreevka, 1-11.VIII.1985 (Sinev) (ZIN). **Japan:** 3 ♂♂, Honshu, Fucusima Pref., Bantai Mt., 5.VIII.1927 (Issiki) (USNM); 1 ♂, Honshu, Fukui Pref., Tsuruga, 4.IX.1917 (Roshkovskij) (ZIN); 1 ♀, Honshu, Gifu Pref., Katayama, 8.VIII.1920 (Takeuchi) (USNM); 1 ♂, Honshu, Kyoto Pref., Hanase, 28.VIII.1953 (Issiki) (USNM); 1 ♀, Honshu, Shiga Pref., Yogo-cho, Kanzanji, 28.VIII.1993 (Hirowatari) (MZH); 1 ♂, 2 ♀♀, Honshu, Osaka Pref., Iwawaki Mt., 19.VIII.1920 (Issiki) (USNM); 1 ♂, 1 ♀, Honshu, incomplete data, 1886 (Pryer) (BMNH); 1 ♀, Kyushu, Kagoshima Pref., Kanoya, 11.IX.1895 (Wileman) (BMNH); 1 ♀, Kyushu, Kagoshima Pref., Takakumayama, 13.IX.1895 (Wileman) (BMNH). **South Korea:** 1 ♂, incomplete data (ZIN); 1 ♂, VI.1926 (Issiki) (USNM). **China:** 3 ♂♂, 11 ♀♀, Ichang, Chang-Yang, 1200-1800 m, VIII.1886 (Leech) (BMNH); 2 ♂♂, Kia-Ting-Fu, V-VII.1891 (Leech) (BMNH); 2 ♂♂, 1 ♀, Sztschwan, Tai-tou-ho (Déjean) (BMNH); 1 ♂, Taiwan, Musya, 19.VII.1925 (Issiki) (USNM); 1 ♂, Taiwan, VII.1947 (Li) (USNM); 1 ♂, Taiwan, Koshun, 25.IV-25.V.1918 (Sonan, Miyake & Yoshina) (USNM); 1 ♂, 1 ♀, Taiwan, Parasan, 27.VII.1943 (Issiki) (USNM). **Burma:** 2 ♂♂, King Island [Kadan Kyun], Mergui, 7.II.1924 (Archibald) (BMNH); 11 ♂♂, Mergui, Tenasserim, 1888 (Doherty) (BMNH); 1 ♂♂, incomplete data, 2.X.1895 (Hampson) (BMNH). **THAILAND:** 2 ♂♂, Uthai Thani Distr., Khao Nang Rum, 400 m, 1.III.1986 (Allen) (BMNH). **West Malaysia:** 1 ♂, Pahang, Fraser’s Hill, 400 m, 1.VII.1933 (Pendlebury) (BMNH); 1 ♂, Kedah, Langkawi Is., 15.IV.1928 (Pendlebury) (BMNH); 1 ♂, Pahang, Cameron Highlands, Gunung Brinchang, 1980 m, 14.V.1939 (Pendlebury) (BMNH); 1 ♂, 1 ♀, Perak, Padang Rengas, low country, 1891 (Doherty) (BMNH); 1 ♂, 1 ♀, Perak (Doherty) (BMNH); 1 ♂, Trong, II.1899 (Abbott) (USNM); 1 ♂, KhowSaiDow Mt. 350 m, II.1899 (Abbott) (USNM). **East Malaysia:** 2 ♂♂, Sarawak, Kuching, I.1907 (J. H[ewitt]) (BMNH); 1 ♂, same locality, 16.IV.1900 (J. H[ewitt]) (BMNH); 1 ♂, Sabah, Gunong Monkobo, 945 m, dipterocarp forest, 14-23.VIII.1987, collected at light (Tuck) (BMNH). **Brunei:**

1 ♀, Rampayoh R. (north), LP 195, lowland forest, 1-3.III.1982 (Robinson) (BMNH). **Indonesia** : 11 ♂♂, Kalimantan, Riam Kiwa, 150-350 m, 1891 (Doherty) (BMNH); 1 ♂, 1 ♀, E Kalimantan, Tabang, Bengen River, 125 m, 20.IX.1956 & 26.X.1956 (Wegner) (NLM); 1 ♂, Anambas Is., P[ulau] Jemaja, Letung (Chasen / Raffles Mus.) (BMNH); 1 ♂, W Sumatra, Lebong Tandai 1920-1923 (Brooks) (BMNH); 1 ♂, 2 ♀♀, SW Sumatra, Marang, sea level, VIII-IX.1890 (Doherty) (BMNH); 1 ♀, SW Sumatra, Liwa, 1000-1350 m, VII-VIII.1890 (Doherty) (BMNH); 1 ♀, Java, Telawa, 6.XII.1937 (Kalshowen) (NLM); 1 ♂, W Java, mt. Megamendung, 700 m, 14.IX.1952 (Wegner) (NLM); 1 ♂, W Java, Ujung Kulon, Njewaän, 18.VII.1955 (Wegner) (NLM); 1 ♂, E Java, Nongkodjadjar, 1350 m, V.1934 (Kalis) (BMNH); 1 ♂, S Java, Kalipari, 350 m, 1891 (Doherty) (BMNH); 1 ♂, Java, incomplete data (BMNH). **Unidentified localities** : 1 ♂, Lambiden, V.1892 (D[oherty]) (BMNH); 1 ♀, Japan, Kurigehara, 6.VIII.1881 (Lewis) (BMNH).

Nemophora cantharites (Meyrick, 1928) (Figs 6, 7, 10, 11, 18-22)

Nemotois cantharites Meyrick, 1928, Exotic Microlepidoptera 3 : 464. Holotype ♀ : Philippines, Mindanao, Kolambugan ; labelled : circle diam 8 with red border, print "Holo-/type" ; 5 × 10, black ink "Mindanao / Philippines / B[anks]. .6.[19]17" ; 3 × 20, black ink "cantharites Meyr." ; 13 × 16, black ink + print "Nemotois / cantharites / Meyr. / E. Meyrick det. / in Meyrick Coll." ; 6 × 13, print "Meyrick Coll. / B. M. 1938-290" (BMNH) [examined].

Nemophora cantharites (Meyrick) : Diakonoff, [1968] : 294, fig. 797 (female wing pattern) (Mindanao).

Nemotois heliochalca Meyrick, 1928, Exotic Microlepidoptera 3 : 464-465. Holotype ♂ : Philippines, Mindanao, Kolambugan ; labelled : circle diam 8 with red border, print "Holo-/type" ; 5 × 10, black ink "Mindanao / Philippines / B[anks]. .6.[19]17" ; 13 × 16, black ink + print "Nemotois / heliochalca / Meyr. / E. Meyrick det. / in Meyrick Coll." ; 6 × 13, print "Meyrick Coll. / B. M. 1938-290" ; blue 4 × 13, print "Abdomen / missing" ; 3 × 21, black ink "heliochalca Meyr." (BMNH) [examined]. **Syn. n.**

Nemophora heliochalca (Meyrick) : Diakonoff, [1968] : 294, figs 468-469 (male genitalia), 799 (male wing pattern) (Mindanao) ; Robinson *et al.*, 1994 : 23 (Philippines).

Redescription

MALE : Forewing length 9.4-10.3 mm ; wing expanse 19-23 mm. Vertex and frons ochreous to ferruginous. Proboscis and palpi light brown. Labial palpus short (about 0.3 × vertical eye diameter) ; maxillary palpus of same length as labial palpus, with terminal segment elongated, slender apically. Compound eye enlarged, interocular index about 1.5 ;

occipital distance $0.05-0.08 \times$ vertical eye diameter. Antenna $2.4-2.5 \times$ length of forewing, with simple inwardly directed pegs. Scape and flagellum uniformly brown; basal region of flagellum (about $0.3-0.4 \times$ forewing length) with cupreous brown or blackish slightly raised scales. Thorax bronze; tegulae cupreous brown. Forewing with narrow bright ochreous transverse band at two-fifths, bordered on both sides by a single row of dark brown scales followed by 4 to 7 rows of light golden scales; ground colour surrounding golden bands darker brown than at base and apex of forewing, but this difference obvious only in fresh specimens; basal field with dark coloration spreading along radial stem, costal area bronze, terminal zone light brown; ground colour of distal region of forewing light brown, suffused with golden scales. Cilia bronze. Hindwing brown; costal area grey; cilia brownish-grey. Legs brown, tibiae cupreous brown. Fore tibia with apical tuft of blackish scales; epiphysis at one-half of the tibia, not reaching its apex. Abdomen brownish grey to yellowish.

FEMALE: Forewing length 8.6-9.5 mm, wing expanse 18-21 mm. Eye enlarged; interocular index about 0.9. Antenna about $1.2 \times$ length of forewing, with basal third thickened by raised blue-purple to black scales; tip of flagellum grey, with dark grey rings at apex of each flagellomere. Thorax and tegulae dark indigo-green. Ground colour of forewing dark brown, with indigo-green iridescence; medial fascia dark brown, bordered by light golden bands as in male. Cilia dark brown. Hindwing dark brown, cilia brown. Legs dark brown, with indigo-green iridescence. Otherwise similar to male.

MALE GENITALIA: Tegumen dome-shaped, with prominent medial ridge. Socii small, slightly less than diameter of aedeagus. Vinculum almost triangular. Valva of same length as tegumen, with prominent lobe on ventral margin; tip widely rounded; dorsal margin straight. Valvae not fused medially. Aedeagus with apical sclerotized band almost perpendicular to longitudinal axis (in lateral view); base of aedeagus wide, almost triangular (in dorsal view). Juxta short (about $0.5 \times$ aedeagus length), the arrow-head very narrow, with elongate pointed apex.

DISTRIBUTION (Fig. 29): Philippines (Mindanao).

COMMENTS: Although the description of *N. cantharites* is based on a single specimen which must be considered the holotype, a female in the USNM collection is labelled as a paratype (Diakonoff, [1968]); it has no type status.



Fig. 29. Distribution of *Nemophora decisella* (dots) and *N. cantharites* (triangle).

MATERIAL EXAMINED : *Philippines* : 23 ♂♂, 6 ♀♀, Mindanao, Kolambugan, 25.V-20.VI.1914 (Wileman) (BMNH) ; 4 ♂♂, 2 ♀♀, same locality, VI.1914 (Banks) (USNM).

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