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A contribution to the knowledge of the tribe Gnorimoschemini of Far East (Lepidoptera, Gelechiidae)

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Although much attention has been paid tc the tribe Gnorimoschemini of Gelechiidae during the last twenty years, practically nothing was known, so far, about its members of Eastern Asia and Japan. A few individuals of the genus *Scrobipalpa* Janse were known from Japan, but no series basic for serious investigations were available. During the recent three years, limited series of moths of this tribe could be concentrated, mainly due to the efforts of Japanese lepidopterists. This material supplemented by a few other individuals is the basis for this paper. It could be objected that compared with materials studied and/or available from other mainly eremic parts of Asia this material is limited. This is certainly true. But this difficulty is obviously caused not only by possibly limited efforts in collecting Gnorimoschemini in Eastern Asia, but also by the fact that both number and density of the species there is limited, too.

The reasons to publish this contribution are mainly two: First, it is evident that especially the synusies of this tribe in the arboreal zone or tier of the Far East show clear taxonomic and biogeographic affinities to the adequate synusies of the Western Palaearctis, mainly of Europe as indicated yet by the investigations in the Gnorimoschemini of Mongolia (Povolný, 1973). Therefore also the species of the genus *Caryocolum* Gregor & Povolný are included, although it was impossible for the time being to identify all of them exactly. Their relation to the European members of this genus seem clear enough to contribute, together with other facts, to the illustration of the generally little known relations between the faunas of the Far East and of Europe. Second, it can be expected that on the basis of such a paper the interest in this difficult group will naturally increase so that more representative material of the tribe will be available. Some specimens remained unidentified.

I feel greatly obliged to the following colleagues for their manysided efforts and help in providing materials, informations and other help: Prof. Dr. Hiroshi Kuroko, Entomological Laboratory, College of Agriculture, University of Osaka, who kindly sent me important series of Gelechiidae from Japan; Prof. Dr. Tosio Kumata, Entomological Institute, Faculty of Agriculture, Hokkaido University; Dr. Toshio Oku, Morioka; Dr. Atsushi Kawabe, Matsudo; Dr. Kaime Yano, Fukuoka; Dr. Hiroshi Inoue, Iruma; Dr. A. Diakonoff, Leiden; Dr. B. Gustavsson, Stockholm; Dr. H. G. Amsel, Karlsruhe; Dr. J. Razowski, Kraków; Dr. John D. Bradley, London.

Gnorimoschema herbichi kamchaticum ssp. n.

(Fig. 14)

Described after a series of well preserved unspread moths. This is a rather large form with spotted forewing, representing a striking subspecies.

Diagnosis: ♂♀ — Head, thorax with tegula and labial palpus dark with individual paler scales which may prevail in some individuals. Frons usually paler. Labial palpus grey with groups of pale scales forming spots or ringlets of various extension. If these paler scales prevail, the palpus is cinereous whitish with traces of darker colouration. Ground colouration of forewing essentially dark, but with more or less extensive groups of cinereous to pale scales expanding over the wing (fig. 14). These cinereous scales may prevail, in some individuals. The trinity of dark stigmata typical of the genus are surrounded or suffused by brownish scales which makes them visible even in rather dark individuals. The combination of dark to blackish ground colouration with groups of pale to whitish scales are responsible for the spotted pattern of the forewing, characteristic of this subspecies. Length of forewing 6.5—7 mm.

The nominate form of Europe is paler with a distinct pattern (Povolný, 1964), whereas the Mongolian subspecies ssp. *mongolica* Pov. is rather uniformly dark with a paler tip of forewing and smaller (Povolný, 1973).

Genitalia: The genitalia of this subspecies do not differ from the genitalia of the known forms.

Material: Holotype ♂, Kamtschatka, Malaise, Riksmuseum Stockholm; Paratypes 3 ♂♂, 2 ♀♀, same data. Holotypus and 1 ♂, 1 ♀ paratypes in Riksmuseum Stockholm, 1 ♂ and 1 ♀ in my collection.

Scrobipalpa atriplicella (Fischer v. Röslerstamm, 1839)

Fischer v. Röslerstamm, 1839, Schmetterlingskd., 223 *(Gelechia)*

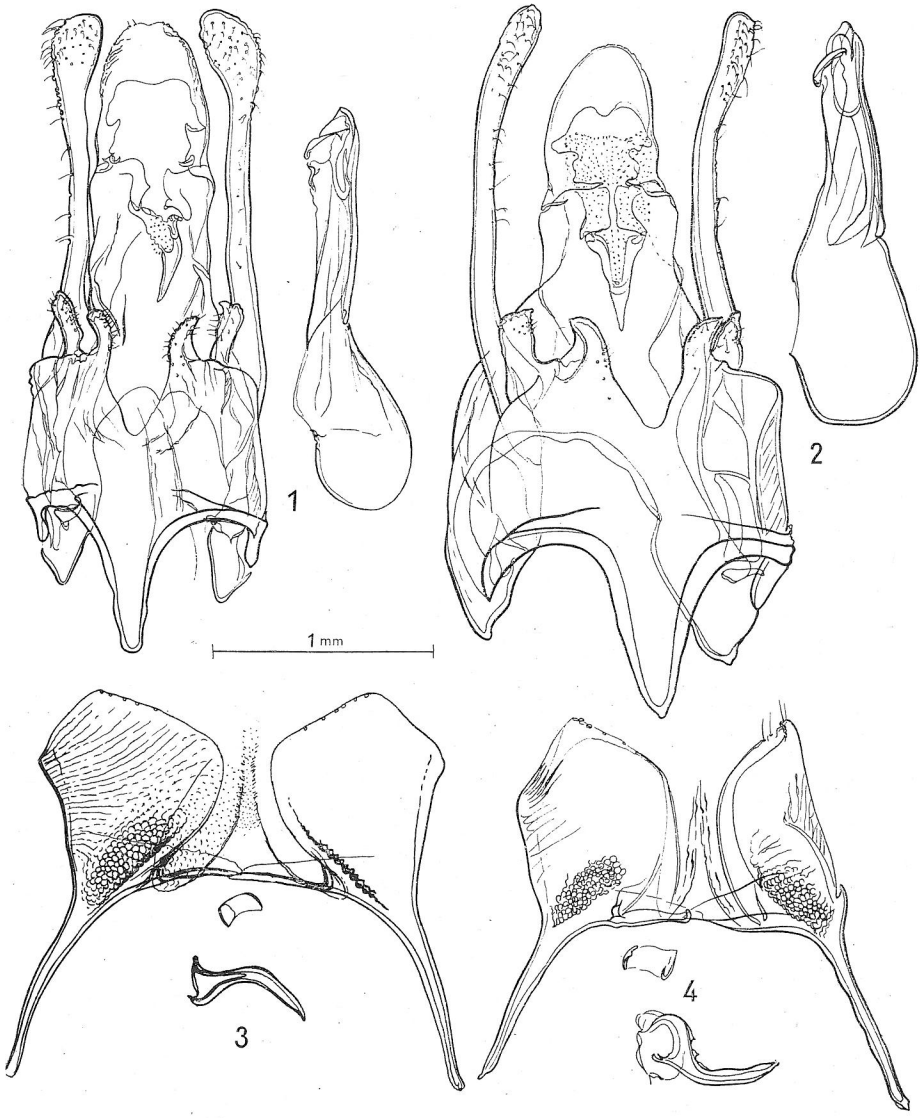
The series of moths from Kamchatka belonging definitely to this species represents a rather stout and comparatively dark form. This is a somewhat surprising discovery since the species — although broadly distributed in Europe where it occurs even in secondary habitats of ruderal Chenopodiaceae and obviously introduced also to the U.S.A. (Povolný, 1967) — was not known to be present outside Europe in the Palaearctic Region, this series being the first to evidence its presence in the Far East of Asia. Contrary to this population, the two specimens from Hokkaido do not substantially differ from individuals usually accompanying ruderal formations of Europe. The specimens from Kamchatka are darker and may well belong to an autochtoneous "wild" population.

Material: 4 ♂♂, 2 ♀♀, Kamtschatka, Malaise, Riksmuseum; 1 ♂, Kotoni, 6. 6. 1961, Hokkaido, T. Kumata; 1 ♀, Toyotomi, 13. 6. 1962, Hokkaido, T. Kumata.

Scrobipalpa kurukoi sp. n.

(Figs. 1, 2, 3, 4, 17)

Described after both reared and captured specimens. This is a medium sized, rather narrow-winged species of nearly uniformly dark colouration.



Figs. 1—4. *Scrobipalpa kurokoi* sp. n. 1, 2 — Two variations of male genitalia, Paratypes, Hikosan-Buzen; 3, 4 — Two variations of female genitalia, Paratypes, Hikosan-Buzen, Nukabira Hokkaido

Diagnosis: ♂ ♀ — Head, thorax and tegula dark with a slight brownish tinge, some scales having paler tips. Frons more or less paler. Labial palpus outwardly of same colouration, inwardly visibly paler to brownish. Tip of third segment and a medial annulus of pale scales indicated. Second segment without annuli.

Forewing general colouration identical with that one of thorax and tegula — uniformly dark with slight brownish tinge, some scales having paler tips. Forewing pattern either completely absent or just poorly indicated in the form of three black stigmata characteristic of the genus and tribe. Forewing apex suffused, in some individuals, by blackish scales or groups of scales some of them having pale tips. These scales form more or less defined dividing lines between the wing margin and the dark brown cilia. Hindwing deep grey to blackish with slightly paler cilia. Legs dark grey shining, inwardly pale, tarsal segments distally with pale annuli. Length of forewing 4.6—4.8 mm.

Genitalia: ♂ — Slender with unculo-teguminal portion prolonged. Valva slender with distinctly swollen tip. Uncus of same width as tegumen, its tip rounded. Gnathos comparatively slender, pendulous. Medial excision of sacculus deep, the paired saccular process of valva slender, longer than tips of saccular process, moderately curved. Saccus comparatively short, not very slender, longer than the broad edges of vinculum. Aedeagus medium-sized, with slender body and a stout swollen caecum. Its tip rounded, subterminal hooklet rather straight, well developed.

♀ — Subgenital plate short and broad with an insular foam-like sculpture near the fore apophysis. Periostial part with a paired sclerotized ledge and a paired membranous sclerite of fine sculpture. Signum bursae is a comparatively big moderately curved hocklet.

Relation: The species seems to be related to *Scrobipalpa acuminatella* (Sirc.) as indicated both habitually, in form of genitalia structures and food plant. The type specimens are uniformly dark with slight brownish tinge, whereas *S. acuminatella* is characterized by a wide scale of individual and population variability. In male genitalia the most important difference seems to be the larger size and a different form of the paired medial saccular process and a slenderer aedeagus, in female genitalia the characteristic foam-like sculpture of subgenital plate.

Material: ♀ Holotype, (Kyushu) Hikosan-Buzen, 9. 6. 59, H. Kuroko, Host: Cirsium spicatum; Paratypes 1 ♀, same data, 5. 6. 59; 1 ♂ same data, 6. 6. 59 (coll. Kuroko); 1 ♂, 1 ♀ same data, 25. 6. 54 and 2. 7. 54 (gen. slides K. S. 181 d and 166 c); 2 ♀♀, Nukabira Hokkaido, 14. 7. 59, T. Kumata. Holotype and 1 ♂, 3 ♀♀ Paratypes in coll. Kuroko, 1 ♂, 2 ♀♀ Paratypes in my collection.

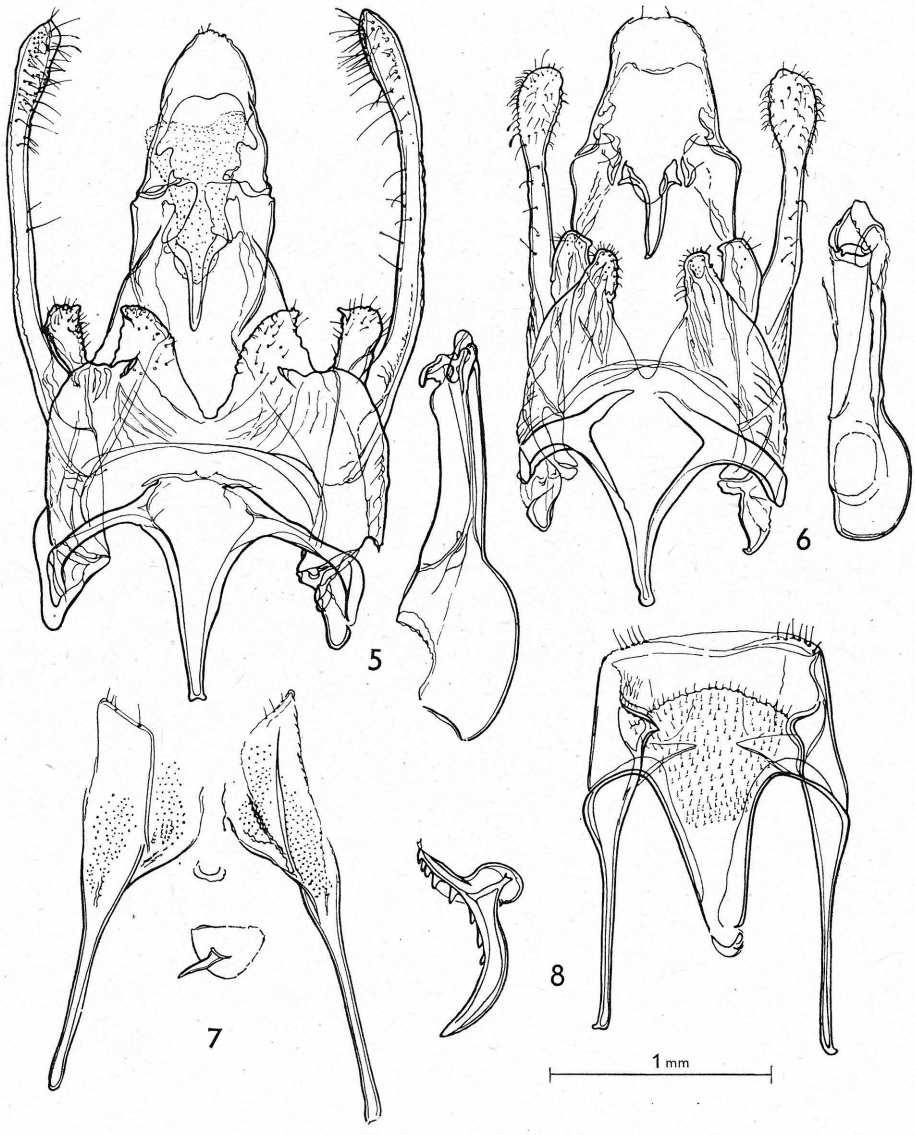
Scrobipalpa synurella sp. n.

(Figs. 5, 19)

Described after one well preserved specimen. A rather large and broad-winged species of leather-brown colouration.

Diagnosis: ♂ — Thorax and tegula covered by essentially brownish scales mixed with darker ones which indicate three longitudinal lines on thorax and cover the base of tegula. Head covered by dense deeply ash grey to dark erect scales forming a crown. Frons not paler. Labial palpus of same colouration, prominent, second segment with erect scales, third segment smooth. Dorsal and inward side pale to cream, third segment with only a few darker scales subapically.

Forewing essentially leather-brown but with important portions of scales having blackish tips. These concentrate mainly along the costa, near wing base and they form two to three marginal rows in the apex. Marginal spotting indicated. They are



Figs. 5—8. Male and female genitalia of: 5 — *Scrobipalpa synurella* sp. n. (♂), Holotype; 6 — *Scrobipalpa japonica* sp. n. (♂), Holotype; 7 — *Scrobipalpa caryocoloides* sp. n. (♀), Holotype; 8 — *Caryocolum junctellum* (♀)

also present in and between the three stigmata characteristic of this genus, which — being brownish — disappear in the dark brownish colouration. Contrary to groups of black scales, the brownish scales tend to form longitudinal veins subapically, where shades of blackish scales prevail. On the whole, the pattern is formed by

a mixture of brown and blackish scales, which concentrate into groups difficult to define. Hindwing plumbic shining with darker veins and margins, cilia deep grey. Legs dark with pale annuli, paler inwardly. Length of forewing 7.3 mm.

Genitalia: ♂ — Rather big having slender unculo-teguminal portion and long slender valva without striking swollen tip reaching over the moderately tapered uncus. Gnathos slender and pendulous. Paired process of sacculus broad but tapering towards a short sharp tip. Its inward ledges distinctly convex. Medial excision narrow and deep. Parabasal process of valva of same length as saccular process. It is not too broad and has a visible subterminal spine on its inner edge. Saccus slender with shortly prolonged tip slightly longer than the vincular edges. Aedeagus compared to the size of genitalia not too strong, caecum moderately inflated, subterminal hooklet distinct. The figure of genitalia is based on a slide in which the genitalia are visibly dorsoventrally compressed causing that they lost their natural tridimensional proportion being flattened. Irrespective of this fact it is obvious that a characteristic species is concerned.

Relation: The specimen resembles a large form of *S. ocellatella* (Boyd), but its genitalia with their slender unculo-teguminal portion and valva and, especially, the broad paired saccular process indicate the relation to the *S. chrysanthemella, S. brahmiella, S. rancidella* — group of species all having some relation to *S. acuminatella*. On the other hand, the species has, however, its own quite specific characters, especially concerning the size of genitalia and form of the paired saccular process. Its food plant belongs to Asteraceae as in the related species.

Material: Holotype ♂, 3. 2. 1966, Tateshima Heights, Nagano Pref., (gen. slide K. Sattler 696), Host: Synurus palmatopinnatifidus, H. Kuroko. Holotype in coll. Kuroko.

Scrobipalpa japonica sp. n.

(Figs. 6, 16)

Described after one slightly worn specimen. A medium-sized greyish moth without distinct pattern of forewing.

Diagnosis: Head, thorax and tegula covered by greyish scales with cinereous tips. On thorax, three longitudinal lines seem to be indicated. Frons paler. Labial palpus cinereous, paler inwardly. Dark tip of third labial segment indicated. Forewing rather uniformly grey cinereous. Groups of darker scales indicate especially the marginal spots in the apex. The generically characteristic trinity of stigmata poorly indicated similarly as possibly additional spots. It is possible that in fresh specimens of this species darker longitudinal venation or a prolonged axial stigma stretching towards the wing apex are present. Hindwing grey with slightly paler cilia. Length of forewing 6.5 mm.

Genitalia: ♂ — Medium-sized but stout and well sclerotized. Uncus narrower than tegumen, but its tip well rounded and much taller than the swollen tip of valva. Both saccular and parabasal process of valva broad and stout. The paired saccular process with a rounded tip and with an apparent sculpture of longitudinal sclerotized ledges, medial excision of saccular fold rather deep. Parabasal process comparatively broad, sculptureless, its outside ledge visibly convex. Saccus short with a slender tip longer than edges of vinculum. Aedeagus strong stout parallel-sided, tip and caecum not very prominent.

Relation: The species is obviously related to and, at the same time, specifically different from *Scrobipalpa rebeli* (Preiss.) (fig. 15, 16) known, so far, from Austria only. The moth and its genitalia are generally similar, but the uncus is more rounded, paired saccular process with an obtuse tip and parabasal process of valva not so broad as in S. rebeli.

Material: Holotype ♂, Yuni, 24. 5. 61, Hokkaido, T. Kumata. Holotype in coll. Kumata.

Scrobipalpa caryocoloides sp. n.
(Figs. 7, 18)

Described after one well preserved female. A small, cinereous moth with an indistinct wing pattern.

Diagnosis: ♀ Head, thorax and tegula covered by cinereous scales with grey tips, frons whitish. Labial palpus cinereous with individual blackish scales, third segment with two indistinct blackish annuli, the first being broader and basal, the second narrower and subterminal. Forewings cinereous grey with a comparatively well developed trinity of blackish scrobipalpoid stigmata. Additional blackish spot is posited axially near wing base, the second one is costal and may fuse with the first two stigmata. Subapical transverse band is indicated by paler scales. No subterminal spots. Hindwings grey with paler bases, cilia grey. Legs grey, tarsi darker with paler rings. Length of forewing 4.5 mm.

Genitalia: ♀ — At a first sight, the female subgenital plate is scrobipalpoid, slightly longer than broad, with comparatively short apophyses and a membranous paired periostial part. Between the lateral sclerites and the periostial membranous part there is a sclerotized ledge. All these structures have a very fine dotted sculpture. The signum appears to be quite atypical of a *Scrobipalpa*-species, consisting of a triangulate plate, of which medially a short hooklet arises. Such signa are characteristic of the genus *Ephysteris* Meyrick or of some of the species of the genus *Caryocolum* Gregor & Povolný.

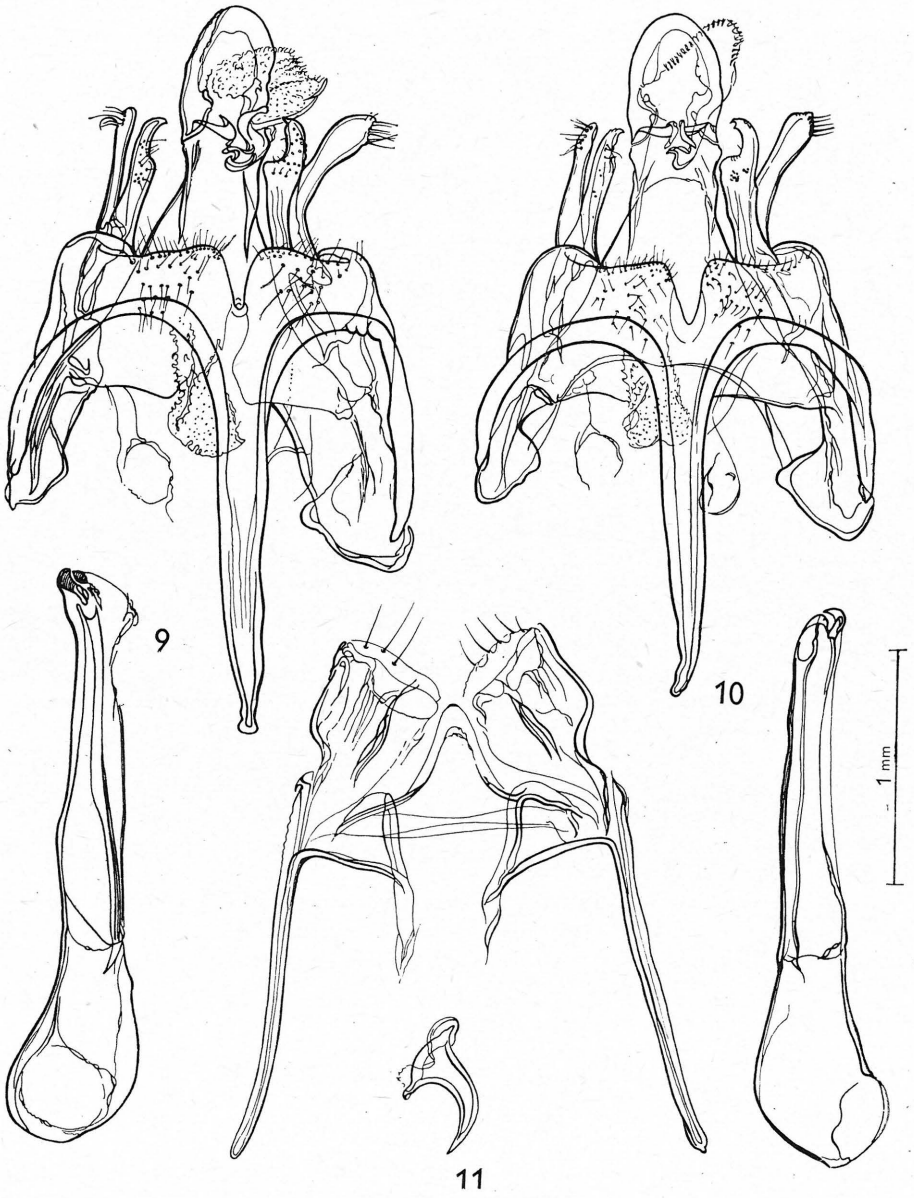
Relation: The species is obviously isolated in the frame of the genus *Scrobipalpa* Janse, its signum indicating that possibly a special subgeneric taxon is concerned. As long as the male sex is unknown this question remains open.

Material: Holotype ♀, Sapporo, 22. 6. 1967, Hokkaido, T. Kumata. Holotype in coll. Kumata.

Genus **Caryocolum** Gregor & Povolný, 1954

Gregor & Povolný, 1954, *Folia zool. et ent.*, **17** (2) : 87

The revision and the necessary monograph of this extensive Holarctic genus, one of the largest of the tribe, is lacking. The taxonomy and nomenclature of the comparatively best known European species remains open in many instances due to the problems combined with the loss or unknown stay of many type specimens. On the other hand, it is obvious that the species available reflect clear taxonomic relations to the known European forms of this genus. Corresponding the wishes of the collectors of the material and in order to give the desirable brief outline of the relations between the synusies of the tribe in the Far East and in Europe, it appeared



Figs. 9—11. Male and female genitalia of: 9, 10 — Two variations of *Caryocolum junctellum* (♂♂); 11 — *Caryocolum pr. pullatellum* (♀)

inevitable to choose the treatment of this material parallel to that one I have chosen in the case of the Mongolian members of this genus. The necessary figures of genitalia and forewing pattern are to avoid any possible mistakes.

Caryocolum junctellum (Douglas, 1850)
(Figs. 8, 9, 10, 21)

Douglas, 1850, *Trans. Ent. Soc. Lond.*, (2), **1** : 125 *(Gelechia)*

This determination offers no doubts and the material available does not substantially differ from the European specimens of this species, although some individuals seem to have a very distinctive pattern of forewing. The species is obviously present in the Arboreal of Eastern Siberia and of Hokkaido in Japan so that its presence in the corresponding habitats between Eastern Asia and Europe could be accepted.

Material: 1 ♀, Siberia or., Schilka, Stretonsk, 7. 5. 1877, v. Hedem.; 3 ♂♂, 1 ♀, Sapporo Maru-Yama, 19. 5. 1961, Hokkaido, T. Kumata. 1 ♂, 4 ♀♀, Sapporo Hokkaido, 20. 4. 59, T. Kumata; 1 ♀ Kenebetu Nemuro, 3. 8. 1962, T. Kumata.

Caryocolum pr. pullatellum (Tengström, 1847)
(Figs. 11, 20)

Tengström, 1847, Finl. Fjäril., 126 *(Gelechia)*

Although no males were available, a comparison with the figure of the female genitalia by Hackman, 1946 and Klimesch, 1954 shows that either the same species or some other but related form is concerned. Therefore, the figure of the female genitalia and of the forewing pattern are enclosed.

Material: 1 ♀, Kenebetu Nemuro, 9. 8. 1962, Hokkaido; 1 ♀, Apoi, 4. 7. 1963, Hokkaido; 1 ♀, Apoi-dake, Hidaka Ms., Hokkaido Japonia, 29. 6. 1973 — all these specimens leg. T. Kumata; 1 ♀, Sarobetu Hokkaido, 23. 7. 1965, T. Nakashima, T. Kumata et. al.

Caryocolum pr. marmoreum (Haworth, 1828)
(Figs. 12, 23)

Haworth, 1828, Lep. Brit., 4 : 553 *(Recurvaria)*

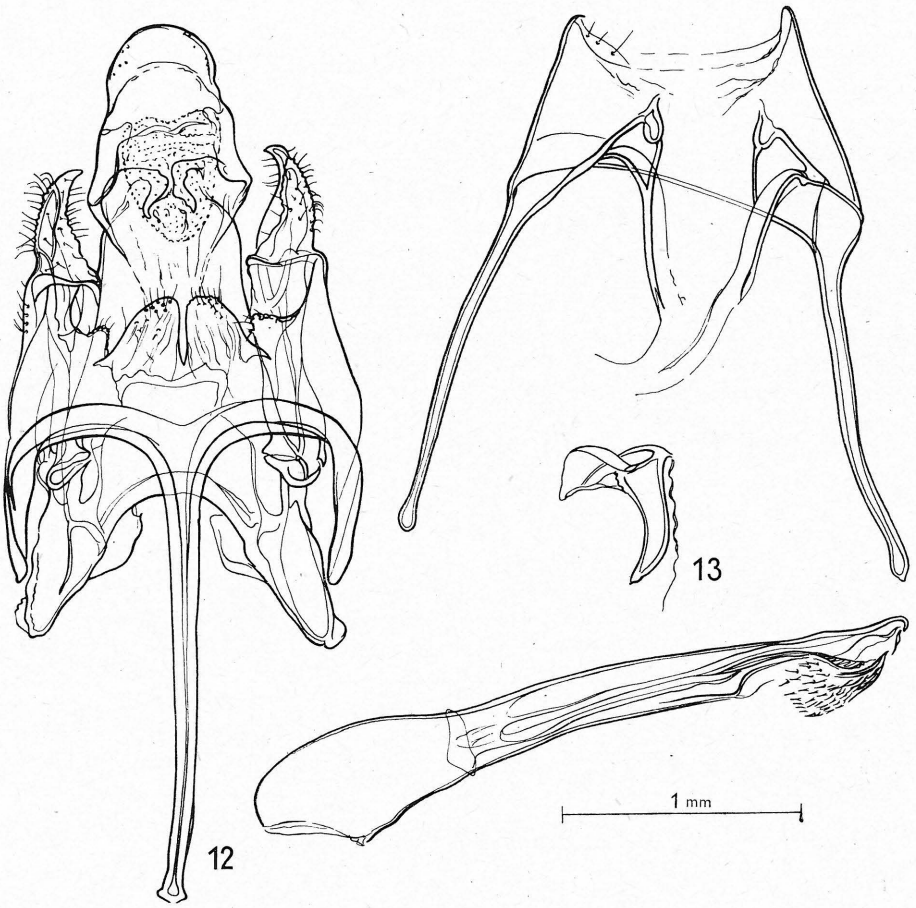
The two males available are rather worn, but the genitalia are similar to those of this European species so that either a subspecies or a closely related species is concerned. Additional material is necessary to solve this problem.

Material: 2 ♂♂, Trap C 5—12, Chiyoda-mura, Ibaragi Pref., 16. 10. 1974, T. Ando.

Caryocolum pr. huebneri (Haworth, 1827)
(Figs. 13, 22)

Haworth, 1827, Lep. Brit., 4 : 551 *(Recurvaria)*

The only female resembles greatly to this European species. It represents, however, a smaller form with a distinctive pattern of the forewing. In the female genitalia the sclerotization of the wall of ductus bursae is absent and signum bursae is stout. These relations are a clear indication that this form has definitely some relation to the *Caryocolum huebneri* (Haw.)-group of this genus (sensu Klimesch, 1954).



Figs. 12—13. Male and female genitalia of: 12 — *Caryocolum pr. marmoreum* (♂); 13 — *Caryocolum pr. huebneri* (♀)

Material: 1 ♀, Kenebetu Nemuro, 3. 8. 1962, Hokkaido, T. Kumata.

Two more species of the tribe Gnorimoschemini are known to me to occur in Japan, viz.: *Scrobipalpa ergasima* (Meyrick, 1916) (Povolný, 1966 a) and *Phthorimaea operculella* (Zeller, 1873). *S. ergasima* was described from Japan, as *Gnorimoschema pervada* Clarke, 1964, of which my type revision (Povolný, 1966 a) has shown that *G. pervada* Cl. was a younger synonym of *S. ergasima* (Meyr.). *Ph. operculella* is a wide-spread pest of potato, tomato (and other Solanaceae) occasionally introduced and established in the cultures of mainly tropical and subtropical zone elswhere in the Palaearctic Region being doubtlessly of American origin. *S. ergasima* is also a secondary pest of Solanaceae (mainly *S. melongena*) spread widely throughout the tropical and subtropical zone of Eurasia and Africa. The origin of *S. ergasima* appears to be rather unclear, some facts indicating that it could be perhaps autochtonous in the Oriental Region.

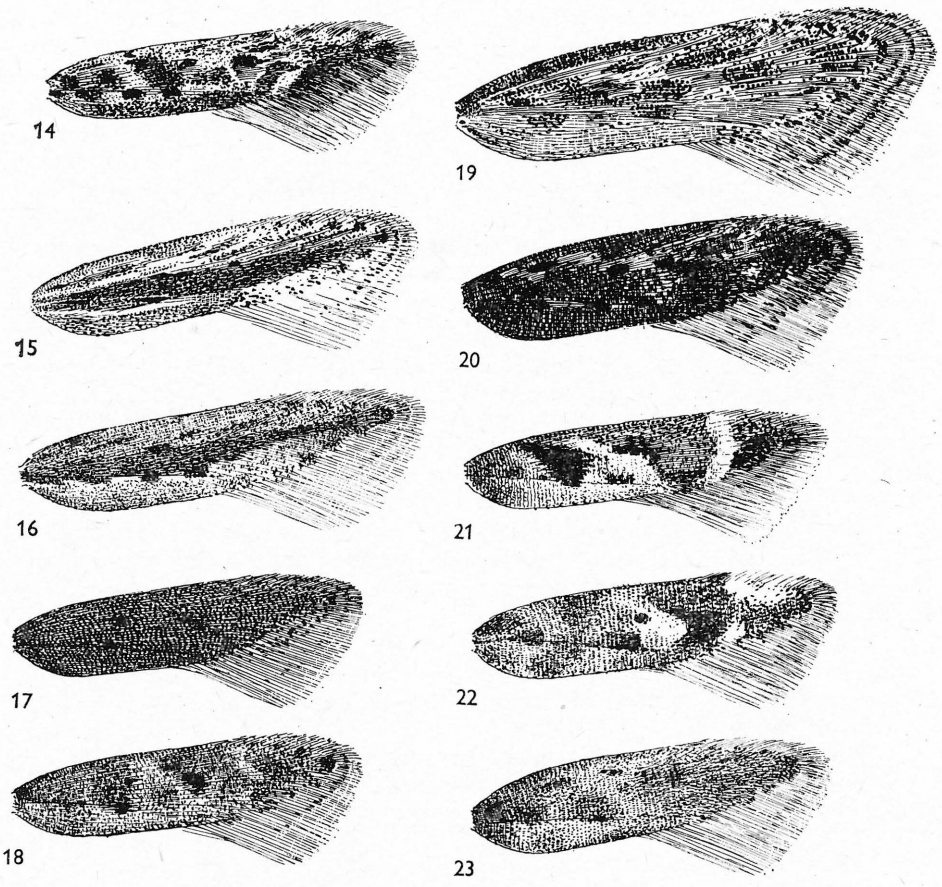


Table I, Figs. 14—23. Pattern of forewing: 14 — *Gnorimoschema herbichi kamchaticum* ssp. n., 15 — *Scrobipalpa rebeli* (Preiss.); 16 — *Scrobipalpa japonica* sp. n.; 17 — *Scrobipalpa kurokoi* sp. n.; 18 — *Scobipalpa caryocoloides* sp. n.; 19 — *Scrobipalpa synurella* sp. n.; 20 — *Caryocolum pr. pullatellum* (Tengstr.); 21 — *Caryocolum junctellum* (Dougl.); 22 — *Caryocolum pr. huebneri* (Haw.); 23 — *Caryocolum pr. marmoreum* (Haw.).

CONCLUSIONS

Since it is obvious that the Gnorimoschemini of Far East treated in this paper clearly reflect important relations to the synusies of this tribe in the Arboreal of Europe, an attempt is made to evaluate preliminary the material available from this point of view. Although the material is comparatively limited, this general statement is in a far-reaching agreement with relations evidenced for the Arboreal of Mongolia (Povolný, 1973), which were based on substantially rich material. The following preliminary statements seem to characterize the present limited knowledge of the Far East Gnorimoschemini:

1. Of 10 species treated 3 are specifically identical or only subspecifically different from their European counterparts viz. *Scrobipalpa atriplicella* (F. v. R.), *Caryocolum junctellum* (Dougl.) and *Gnorimoschema herbichi kamtchaticum* ssp.n. Further 3 species of the genus *Caryocolum* are clearly related to identical with their European counterparts (*Caryocolum pr. pullatellum* /Tgstr./, *C. pr. marmoreum* /Haw./ and *C. pr. huebneri* /Haw./).

2. Of 4 newly described species 3 have clear relations to the European species: *Scrobipalpa kurokoi* sp.n. is related to *S. acuminatella* (Sirc.), *S. japonica* sp.n. to *S. rebeli* (Preiss.) and *S. synurella* sp.n. to the *S. rancidella* (H.-Sch.)- group of Europe.

3. Only 1 species appears to be rather isolated and possibly endemic (*Scrobipalpa caryocoloides* sp.n.).

4. Two next species occurring in Japan as pests of Solanaceae *(Phthorimaea operculella* and *Scrobipalpa ergasima)* are obviously secondary invaders to subtropical culturos of Solanaceae.

5. The majority of the species studied manifests chorological relations to the Palaearctic Arboreal. This statement agrees with similar relations evidenced by rich material of the tribe Gnorimoschemini from the Arboreal of Mongolia (Povolný, 1973). Similar relations are also known in other groups of Lepidoptera (e.g. some groups of Papilionoidea, Geometridae, Sesiidae etc.). This idea postulated especially by de Lattin, 1967 seems to be true also in the case of the Oreotundral Lepidoptera (e.g. in the genus *Psodos* Treitschke — Povolný & Moucha, 1958), and obviously more species of transpalaearctic distribution may be expected to occur within the Palaearctic Arboreal and Oreotundral. Moreover, these two biocoenological formations have their continuation in the corresponding parts of the Nearctic Region so that, in many instances, obviously Holarctic distribution is involved (e.g. in Geometridae — see Rindge, 1975).

It is striking that even limited material of the tribe Gnorimoschemini from Eastern Asia supports statements based on rich materials of other well explored groups of Lepidoptera. It remains to hope that this paper will inspire the lepidopterists of the Far East to devote more time to this neglected group. We may expect that more species of transpalaearctic Gnorimoschemini are present in both the continental part of Far East and in Japan. On the other hand, the more southern islands of Japan may be expected to harbour species having affinities to more endemic faunistical wholes of Continental Asia, especially in the relation to its eremic zone.

REFERENCES

De Lattin G., 1967: Grundriss der Zoogeographie, 1—602. VEB Gustav Fischer Verlag Jena

Gaede M., 1937: Gelechiidae in Lep. Cat., 1—630. Verlag G. Feiler, Neubrandenburg

Hackman W., 1946: Neue Phthorimaea-Arten (Lepid. Gelechiidae) aus Ostfennoskandien. *Not. ent.*, **26** : 59—64

Klimesch J., 1953/54: Die an Caryophyllaceen lebenden europäischen Gnorimoschema Busck (= Phthorimaea Meyr.) — Arten. *Zeitschr. Wien. ent. Ges.*, **38** : 225—239, 275—319, **39** : : 273—362

Kloet G. S. & Hincks W. D., 1972: A Check List of British Insects, Part 2: Lepidoptera. Roy. Ent. Soc. Lond., 1—153

Meyrick E., 1925: Fam. Gelechiadae (Lep., Het.) in Gen. Ins., Fasc. 184, 1—170, Bruxelles

Povolný D., 1964: Gnorimoschemini trib. nov. — eine neue Tribus der Familie Gelechiidae nebst Bemerkungen zu ihrer Taxonomie (Lep.). *Acta Soc. ent. Čechoslov.*, **61** : 330—359

Povolný D., 1966a: A type revision of some Old-World species of the tribe Gnorimoschemini with a special regard to pests (Lepidoptera). *Acta ent. bohemoslov.*, **63** : 128—148
Povolný D., 1966b: Die taxonomisch geklärten palaearktischen Gnorimoschema-Arten (Lep. Gel.) nebst Beschreibung einer neuen Art. *Ark. f. Zool.*, **18** (15) : 393—404
Povolný D., 1967: Ein kritischer Beitrag zur taxonomischen Klärung einiger paläarktischer Arten der Gattung Scrobipalpa (Lep. Gel.). *Acta Sc. Nat. Brno*, **1** : 209—250
Povolný D., 1969: Gnorimoschemini (Lep. Gel.) der Ausbeute von F. Brandt aus Iran, 1936 bis 1938. *Ent. Tidskr.*, **90** (1—2) : 1—13
Povolný D., 1973: Ergebnisse der zoologischen Forschungen von Dr. Z. Kaszab in der Mongolei (Nr. 267) (Tribus Gnorimoschemini, Lep. Gelechiidae). *Acta Sc. Nat. Brno*, **7** (2) : 1—42
Povolný D. & Moucha J., 1958: Kritischer Nachtrag zur Kenntnis der Taxonomie und Zoogeographie der Gattung Psolos Tr. (Lep. Geom.). *Acta ent. Mus. Nat. Pragae*, **32** : 181—188
Rindge F. H., 1975: A revision of the New World Bistonini (Lep., Geom.). *Bull. Amer. Mus. Nat. Hist.*, **156** (2) : 71—155