

On the nymphs of some lace bugs from the Mongolian People's Republic, with a key to the last instar (Heteroptera, Tingidae)

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The present paper is based on rather limited material of Tingid nymphs collected in 1979 in Mongolia mainly by the author but also on several specimens from the Zoological Explorations made by Dr. Z. Kaszab of the Hungarian natural history museum.

Nymphs of *Acalypta elegans* Horv. (4th instar), *Sphaerista paradoxa* (Jak.) 4th and 5th instars), *Dictyonota salsolae* Gol. (5th instar), *Lasiacantha kaszabi* Hob. (5th instar), *Tingis pilosa antennalis* (Put.) (5th instar) are newly described and figured, and notes on nymphs of *Dictyonota tricornis* (Schrnk.) (5th instar) and *Tingis ampliata* (H.-S.) (4th instar) are given.

Although Mongolian material of Tingid nymphs were previously studied only by Golub (1977) who described nymphs of five species, our knowledge of nymphs of the Mongolian lace bugs represents about 55 % of the Tingid species of the Mongolian fauna. Many of the species have a large area of distribution and many of their nymphs were described from materials from other, predominantly European, countries (Cobben 1958, Lee 1969, Putshkov 1969, 1970, 1974, 1974, Southwood & Scudder 1956, Štusák 1957, 1959, 1960, 1962, 1964, 1971, 1972).

A key to the identification of later instar nymphs of the Mongolian Tingid species, given in the second portion of the paper, represents an attempt to summarize our present knowledge of this problem. Nymphs of 30 species are included in the key, whilst nymphs of about a further 25 Mongolian Tingidae remain undescribed until now. References cited at the end of paragraphs of the key refer to the main original literature where descriptions and figures of the mentioned species are quoted.

Descriptions of nymphs

***Acalypta elegans* Horváth, 1906**

Fourth Instar (Figs. 1, 9, 13)

Broadly oval, about 1.6 times longer than wide, widest in the region of fourth abdominal segment. General colour greyish ochreous as in related spe-

cies; fourth antennal segment blackish brown, apex of third antennal segment, of rostrum and of second tarsal segment moderately darkened. Eyes darkly reddish brown. Except head, body without spines or any tubercles, almost bald.

Head wider than long, with two pairs of tubercle-like processes: The pair of anterior frontal processes is very short, bluntly tubercle-like and only about as large as first tarsal segment, not reaching the level of anterior margin of anteclypeus. Occipital processes also very small, about, as large as the frontal processes, not reaching the level of middle of eyes with their tips. Eyes composed of considerably large facets which are unequal in size. Antennal tubercles blunt, about as large as first antennal segment, not reaching the level of anterior margin of anteclypeus with their apices. Antenna 1.4 times shorter than pronotal width, second and third antennal segments more slender than first or fourth. Rostrum slightly reaching beyond posterior coxae; relation of labial segments in mm: I : II : III : IV = 0.28 : 0.22 : 0.14 : 0.21.

Pronotum considerably transverse, about 3.3 times wider than its median length. Anterior pronotal margin moderately and regularly concave, posterior margin convex with an inconspicuous posterior pronotal corner. Lateral margins of pronotum moderately convex. Mesonotum with small hemelytral lobes only reaching the anterior third of first tergite. Metanotum without alar lobes (as usual in all nymphs of brachypterous *Acalypta* species). Lateral margins of thorax as well as of abdomen rounded and without any tubercles. Posterolateral angles of abdominal segments not prominent. Apex of ninth segment almost rounded and only inconspicuously excised (Fig. 13). Reddish dorsal abdominal gland marked in the region of third tergite medially. The fissure-like aperture of the posterior abdominal gland more than twice as wide as fissure of the anterior gland.

Dorsal surface of head, thorax as well as of abdomen with stellate structure (Fig. 9 a, b) which is more dense on head and thorax. The little stars bear mostly three — four tips (less frequently five tips), the tips being blunt and rounded at their apices. Except these stellate structures, there are tiny setaceous hairs growing from small and low hemispherical tubercles situated sparsely on the whole body surface (including cephalic processes). These tiny hairs are about 0.005—0.007 mm long and they are well visible, especially on body margins. Very small hairs (0.009—0.012 mm) are situated on femora and tibiae and on first to third antennal segments. Longer hairs are situated only on ventral side of tarsi and on apex of fourth antennal segment.

Measurements in mm: Length of body 1.70, maximal width of body 1.07, length of head 0.33, width of head 0.47, length of antenna 0.54 (I : II : III : IV = 0.09 : 0.07 : 0.21 : 0.17), length of pronotum 0.23, width of pronotum 0.76, length of posterior tibia 0.26, length of posterior tarsus 0.13.

Material: Mongolia, Loc. Nr. 57, Central Ajmak, forest-steppe zone, Jaarmag (about 10 km SW of Centre of Ulaan Baatar), in forest (*Picea* sp., groups of *Betula* sp.) on moderate NE exposed slope in moss *Thuidium abietinum* BR., July 5, 1979, leg. J. M. Štusák, 1 fourth instar nymph (♀) together with a single adult ♀.

Distinguishing notes. Although this nymph is very similar to nymphs of the other *Acalypta* species in general shape, colouring, size (except *A. parvula* (Fall.) — fourth instar only 0.9—1.2 mm long) and other characters, it can be distinguished from nymphs hitherto known as follows. It differs from

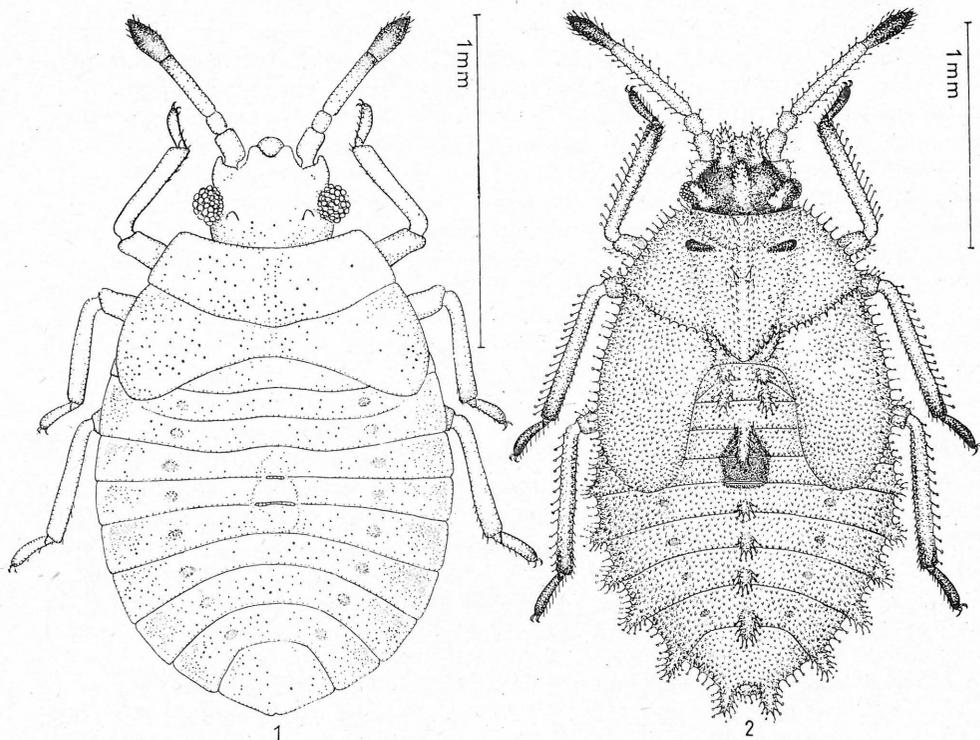


Fig. 1. *Acalypta elegans* Horv., fourth instar nymph. Fig. 2. *Tingis pilosa antennalis* (Put.), fifth instar nymph.

A. gracilis (Fieb.) in total lack of tubercles in median line of abdominal tergites; from *A. parvula* (Fall.) in larger size and in not having the base of third antennal segment pestle-like enlarged. It can be distinguished from all the others *Acalypta* nymphs hitherto described [i. e. *A. brunnea* [Germ.], *A. musci* [Schrnk.], *A. pulchra* Štusák, *A. carinata* (Panz.), *A. platycheila* (Fieb.), *A. marginata* [Wlff.], *A. nigrina* [Fall.], *A. nigrinervis* Stål] by the apex of ninth abdominal segment which is only inconspicuously excised in *A. elegans* Horv. whilst it is much more deeply and narrowly excised in the others.

The species *Acalypta elegans* Horv. is of Siberian distribution and it was recorded from Mongolia only recently by Hoberlandt (1979).

***Sphaerista paradoxa* (Jakovlev, 1880)**
Fourth Instar (Figs. 3, 4)

Longish oval, almost twice as long as wide, lateral margins of body without any processes or tubercles but median line of some abdominal tergites with large unpaired tubercle-like processes. General colour light yellowish brown, head

dark brown, apex of fourth antennal segment, of tarsi and of rostrum dark brown. Body bald except antennae and legs.

Head a little wider than long and dorsally armed with two pairs of tubercle-like processes: Anterior frontal processes rather distant from each other, they hardly reach the level of anteclypeus (they reach the level of base of second antennal segment) and one process is only moderately longer than second antennal segment. Occipital are wider than frontal processes and about equal in length to these, reaching slightly beyond the level of posterior margin of eyes. Antenniferous tubercles rather narrow and pointed being about as long as first antennal segment. Antennae moderately shorter than pronotal width. Third antennal segment suddenly bulbously enlarged at its base, this enlargement being wider than first and second antennal segments. Third antennal segment, and partially also fourth, with conspicuous conical tubercles bearing very short setaceous hairs (Fig. 16). Rostrum reaching between posterior coxae. Relation of labial segments in mm: I : II : III : IV = 0.19 : 0.21 : 0.14 : 0.18.

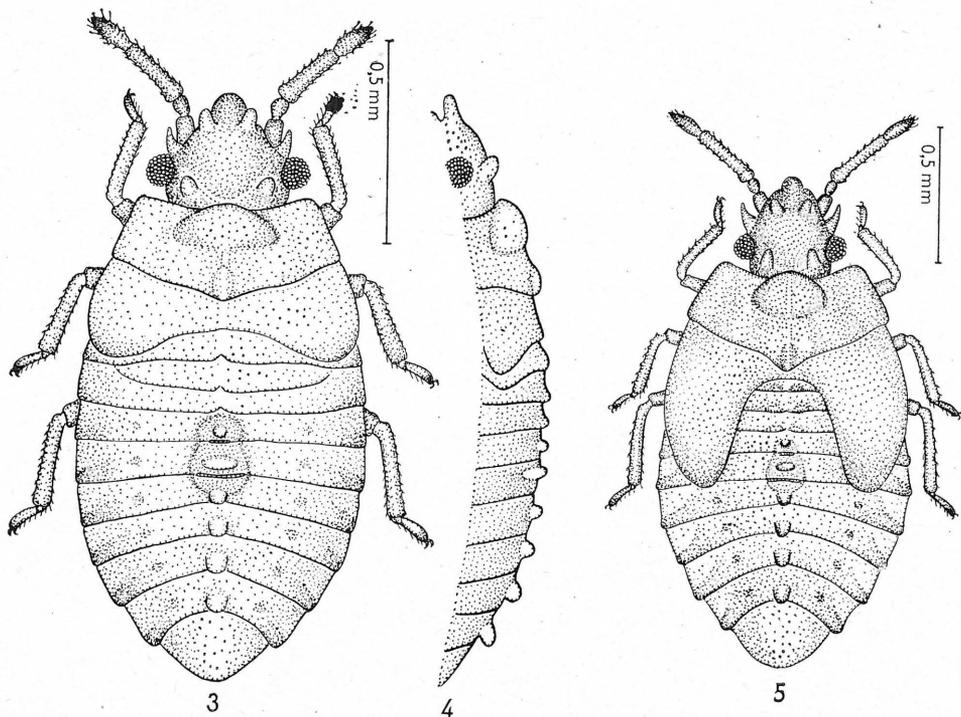
Pronotum approximately 2.5 times wider than its median length, anterior pronotal margin arch-like concave with its middle (foundation of vesicula), projecting inconspicuously forward. Lateral margins almost straight, posterior pronotal corner very small. A very large base of vesicula is situated in the median line of pronotum extending from anterior pronotal margin to the middle of pronotal disc and occupying median half of pronotal width. It is very convex but not very high. Also a convex, rather low, longitudinal elevation is situated on the posterior pronotal corner occupying more than posterior third of median pronotal length. Mesonotum with short hemelytral lobes reaching almost the anterior margin of first tergite. Metanotum without alar lobes.

Lateral margins of abdomen rounded and only posterolateral angles of VIIth and VIIIth segments moderately prominent. Apex of IXth segment broadly convex, not excised. Posterolateral angles of abdominal segments moderately darkened. Median line of mesonotum, metanotum as well as first and second abdominal tergites without distinct tubercles (whilst they are present in fifth instar on first and second tergites). Median line of abdominal tergites III to VIII with unpaired tubercles (one on each tergite), smallest on third (narrower than aperture of first abdominal gland), largest on eight (as wide as aperture of first abdominal gland). IVth tergite with a tubercle which is more than twice as wide as long and wider than aperture of first abdominal gland. Aperture of first abdominal gland narrow, aperture of second gland about 2.5 times wider than aperture of first gland.

Outer margins of tibiae with tiny conical tubercles bearing hairs similar to third antennal segment. Chetotaxy similar to fifth instar (Fig. 10) but the structures less dense.

Measurements in mm: Length of body 1.45, maximal width of body 0.75, length of head 0.31, width of head 0.39, distance between eyes 0.26, length of antenna 0.41 (I : II : III : IV = 0.06 : 0.04 : 0.17 : 0.14), length of pronotum 0.24, width of pronotum 0.59, length of posterior tibia 0.26, length of posterior tarsus 0.11.

Material: Mongolia, Loc. Nr. 18, Sharga Mort (about 25 km NW of Ulaan Baatar), stony steppe on a slope of a hill, June 16, 1979, leg. J. M. Štusák, one fourth instar nymph together with fifth instar nymphs and adults on *Artemisia frigida* Willd. (Asteraceae).

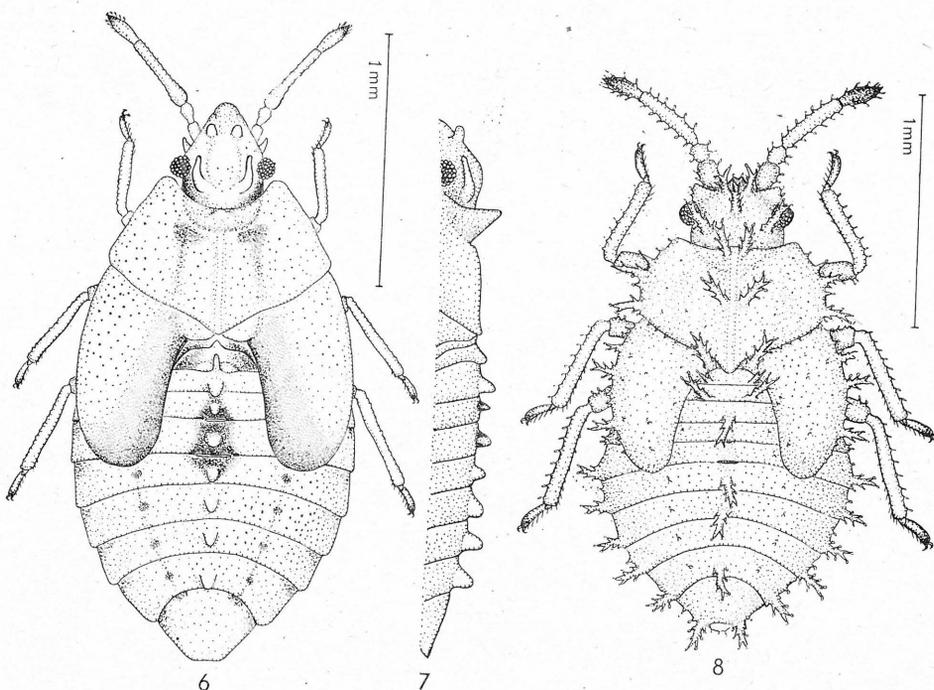


Figs. 3—5. *Sphaerista paradoxa* (Jak.). 3 — Fourth instar nymph. 4 — Fourth instar nymph, lateral view of dorsal body side. 5 — Fifth instar nymph.

Fifth Instar (Figs. 5, 10, 16)

Longish oval, almost twice as long as wide, body margins without any processes or tubercles, head armed with two pairs of processes, median line of abdominal tergites with unpaired tubercles, foundation of vesicula very large. General colour yellowish brown, head, antennae, rostrum, subcoxal plates, legs, anterior portion of foundation of vesicula, transverse spots on pronotum, posterior portion of pronotal corner, posterolateral angles of pronotum and abdominal segments, apices of hemelytral lobes and abdominal tubercles dark brown; head darkest; apical portion of fourth antennal segment, apices of tarsi and rostrum blackish brown. The intensity of shade depends on age of the specimen (before or after ecdysis).

Head wider than long, dorsally armed with two pairs of processes: Anterior frontal processes directed divergently sideways being about as long as their basal width (as second antennal segment). They are situated relatively far from each other, distance between them as wide as tylus and reaching level of apices of antennal tubercles (apex of first antennal segment). Occipital processes distinctly longer than anterior frontal processes. Apices of both anterior and occipital processes broadly rounded. Antennal tubercles narrow and pointed at their apices, twice as long as second antennal segment. Base of third antennal segment markedly bulbously enlarged, the enlargement being wider than



Figs. 6—7. *Dictyonota salsolae* Gol. 6 — Fifth instar nymph. 7 — Fifth instar nymph, lateral view of dorsal body side. Fig. 8. *Lasiacantha kaszabi* Hob., fifth instar nymph.

first and second antennal segments. Antennae (especially third segment) covered with noticeable small conical tubercles bearing short setaceous hairs [Fig. 16]. Rostrum reaching posterior margin of hind coxae. Relation of labial segments in mm: 0.27 : 0.28 : 0.17 : 0.23.

Pronotum 1.9—2.1 times wider than its median length. Lateral pronotal margins almost straight (insignificantly convex), anterolateral angles of pronotum rounded. Anterior pronotal margin concave with the fairly large foundation of vesicula running forward at the middle of anterior pronotal margin. Foundation of vesicula rather convex, wider than long, occupying median two fourths of pronotal width and anterior half of pronotal length. Posterior pronotal corner hardly reaching posterior margin of mesonotum, and with a longitudinal (more than twice as long as wide) bulge occupying the last quarter of median pronotal length. Mesonotum with large hemelytral lobes reaching fifth tergite, without any tubercles medially. Metanotum without alar lobes in brachypterous specimens, similar to brachypterous nymphs of *Acalypta* species, at its posterior margin with one pair of very small and low (sometimes less distinct) tubercles situated near each other in median line.

All abdominal tergites, except ninth, with tubercles in median line as follows: Tergite I with one pair of small and low tubercles (situated close to each other) which are wider than long, tergite II with one unpaired wide and low tubercle. Tergites III—VIII with unpaired tubercles of which the tubercle

of IIIth tergite is smallest and lowest (narrower than aperture of first abdominal gland) and the tubercle of VIIIth tergite is largest and longest (wider than aperture of first abdominal gland). The tubercle of IVth tergite is minimally twice wider than long (wider than aperture of first gland), i. e. widest of all the tubercles. Aperture of second abdominal gland 2.5 times wider than aperture of first gland. Lateral margins of abdomen smooth, posterolateral angles of abdominal segments not prominent sideways but the darkly pigmented portions of posterolateral angles are somewhat upwardly convex. End of body convexly rounded (not excised) or almost straight (indistinctly concave) in largest specimens.

Lateral margins of tibiae and dorsolateral margins of femora with small conical tubercles bearing short hairs directed apically, similar to those on third antennal segment. Dorsal body surface including processes covered with tiny tubercles (0.006—0.007 mm), some of them bearing tiny setaceous hairs (0.005 mm). Among this fundamental structure there are typical star-shaped structures generally distributed (except on processes), the little stars being mostly five-tipped (but some three- or four-tipped) with sharply pointed, relatively long tips. Third antennal segment, tibiae and femora with very short setaceous hairs (about 0.015 mm) situated on small conical tubercles. Only fourth antennal segment, under margin of tarsi and apex of tibiae with longer setaceous hairs.

Measurements in mm (smallest male and largest female measured): Length of body 1.68—2.02, maximal width of body 0.86—1.05, length of head 0.35—0.41, width of head 0.45—0.49, synthlipsis 0.27—0.30, length of antenna 0.52—0.61 (I : II : III : IV = 0.09—0.10 : 0.05 : 0.23—0.28 : 0.15—0.18), length of pronotum 0.34—0.42, width of pronotum 0.72—0.81, length of posterior tibia 0.32—0.36, length of posterior tarsus 0.13—0.14. Nymphs of males are usually smaller than nymphs of females (as is normal in adults).

Material: Mongolia, Loc. Nr. 18, Sharga Mort (about 25 km NW of Ulaan Baatar, stony steppe on a slope of a hill, June 16, 1979, 8 specimens; Loc. Nr. 26, Central Ajmak, Bajandzürch (about 30 km SE of Ulaan Baatar), insolate stony steppe, June 17, 1979, 2 specimens; Loc. Nr. 27, the same locality, June 18, 1979, 2 specimens; Loc. Nr. 56, Central Ajmak, Jaarmag (about 10 km SW of centre of Ulaan Baatar), July 5, 1979, 1 specimen. In all 13 fifth instar nymphs together with adults on *Artemisia frigida* Willd. (Asteraceae), leg. J. M. Štusák.

Distinguishing notes. The nymphs of the genus *Sphaerista* Kiritshenko, 1951 are somewhat similar to nymphs of some species of the subgenus *Dictyonota* Curtis, 1827 in having four processes on head, in similar structure of the body surface, in tuberculated antennae and legs and in having unpaired tubercle-like processes on the median line of abdomen. They also somewhat resemble the nymph of *Acalypta gracilis* (Fieber, 1844) in which the base of third antennal segment is also bulbously enlarged and which has also the characters mentioned above except tuberculated legs and antennae. The nymphs of *Sphaerista* species, however, differ considerably from all the Tingid nymphs hitherto known especially in having a very large, pile-like foundation of vesicula. The nymph of related species *Sphaerista emeljanovi* Kerzhner, 1964 (U. S. S. R. — Astrachan district, Kazakhstan, Uzbekistan) was very briefly mentioned by Putshkov (1974). He quotes, inter alia: „head with well developed anterior and weakened (not so developed) posterior spines“ in *S. emel-*

janovi. It seems, thus, that the nymph of *S. paradoxa* differs from the nymph of *S. emeljanoi* in not having the occipital processes of head smaller and less developed than the anterior frontal processes but they are considerably larger in *S. paradoxa*.

***Dictyonota salsolae* Golub, 1975**

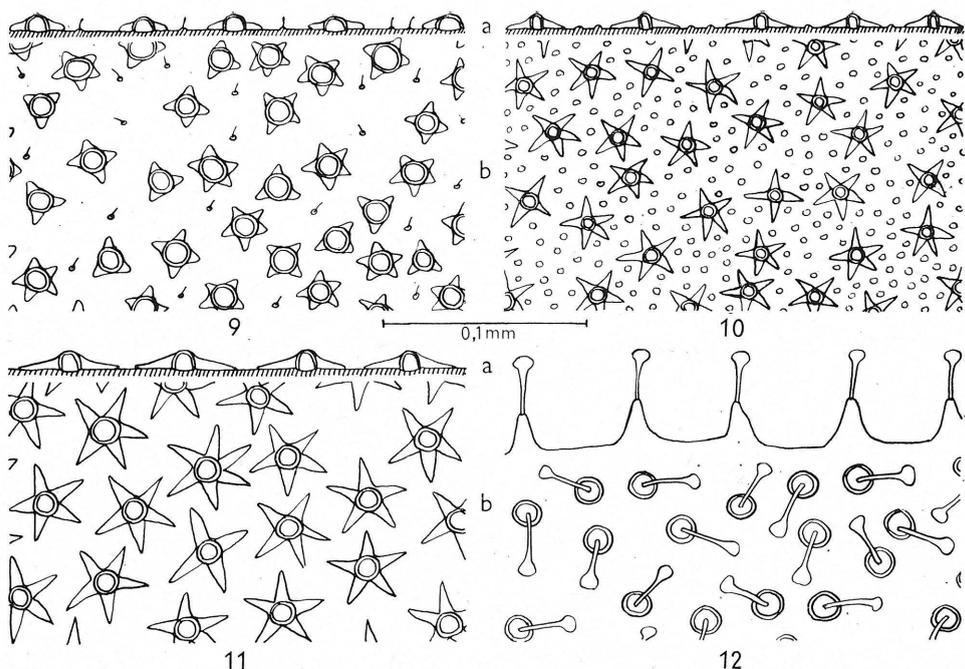
Fifth Instar (Figs. 6, 7, 11)

Longish oval, about 1.9 times longer than wide. General colour yellowish white with dark brown markings situated as follows. Extreme apices of fourth antennal segments, second tarsal segments and tip of rostrum, head behind eyes posterolaterally, lateral portions of foundation of vesicula and longitudinal bands behind vesicula on pronotal disc (in places where lateral carinae will be situated in the adult), mesonotum, metanotum and first tergite except their median portions, inner halves of hemelytral lobes and their apices, median portion of third to fifth tergites (region of dorsal abdominal glands), rounded spots situated between median line and lateral margins of fifth to eighth tergites. Also anterolateral angles of fifth to ninth tergites darker. Median line of body with small tubercle-like processes.

Head about as long as wide, anterior margin of head reaching level of base of third antennal segment. Head dorsally armed with two pairs of processes. Anterior frontal processes a little shorter than second antennal segment, about as long as wide at their bases, situated at level of anterior margin of antennal tubercles and reaching level of apex of first antennal segment. Occipital processes pressed to surface of head, wider and more than three times as long as anterior frontal processes reaching anterior margin of eyes with their tips. Antennal tubercles very small (half the size of second antennal segment). Third antennal segment considerably widened at its base and here as wide as fourth antennal segment. Segments I and II narrower than base of third antennal segment. Especially third antennal segment with very small tubercles bearing short setaceous hairs directed almost parallel with longitudinal axis of the segment. Rostrum broken in specimen studied.

Pronotum about 1.8 times wider than its median length, with low but well marked median carina and with short foundation of vesicula running into a high and narrow, upwardly directed pointed cone. Anterior pronotal margin deeply arch-like concave. Anterolateral angles of pronotum rounded and lateral margins almost straight. Posterior pronotal corner reaching posterior margin of mesonotum. Hemelytral lobes moderately reaching beyond anterior margin of fifth tergite. Posterior margins of mesonotum, metanotum and first tergite with rather deep triangular incisions medially, the narrowest incision is that of first tergite. Posterolateral margins of these incisions moderately tubercle-like elevated, especially those of first tergite where two small, closely associated tubercles originate in this way.

Lateral margins of abdomen without any spines or tubercles, posterolateral angles of segments only moderately prominent and rounded. End of body straight without distinct incision. Median line of abdominal tergites II—VIII with one unpaired tubercle on each tergite. The tubercles are rather large, much more robust (but not longer) than occipital processes, only inconspicuously



Figs. 9—12. Microstructure of dorsal body surface of nymphs in transmitted light. a — lateral view, b — dorsal view. 9 — *Acalypta elegans* Hörv. 10 — *Sphaerista paradoxa* [Jak.]. 11 — *Dictyonota salsolae* Gol. 12 — *Tingis pilosa antennalis* [Put.],

longer than wide at their bases and smooth. Largest tubercles are these of second and eighth tergites, smallest on third tergite.

Body surface covered with characteristic stellate structure of four- to six-tipped (mostly five-tipped) little stars (Fig. 11).

Measurements in mm: Length of body 2.21, maximal width of body 1.15, length of head 0.43, width of head 0.45, synthlipsis 0.31, length of antenna 0.65 (I : II : III : IV = 0.09 : 0.07 : 0.32 : 0.17), length of pronotum 0.53, width of pronotum 0.94, length of posterior tibia 0.49, length of posterior tarsus 0.13.

Material: Mongolia, Gobi-Altai Ajmak, Zachuj Gobi, 10 km N of Chatan Chajrchan Mts., 1150 m, June 27, 1966, Exp. Dr. Z. Kaszab 1966, Nr. 591, one fifth instar nymph (♀).

***Dictyonota tricornis* (Schrank, 1801)**

Fifth Instar (Figs. 14, 15)

The nymphs of Mongolian specimens agree in general with description and figure given by Štusák (1964) and Putshkov (1974) from European materials. The nymphs, however, from Mongolia differ by longer rostrum which reaches anterior margin of third sternite, whilst rostrum only reaches between posterior coxae in the European specimens. The Mongolian specimens differ

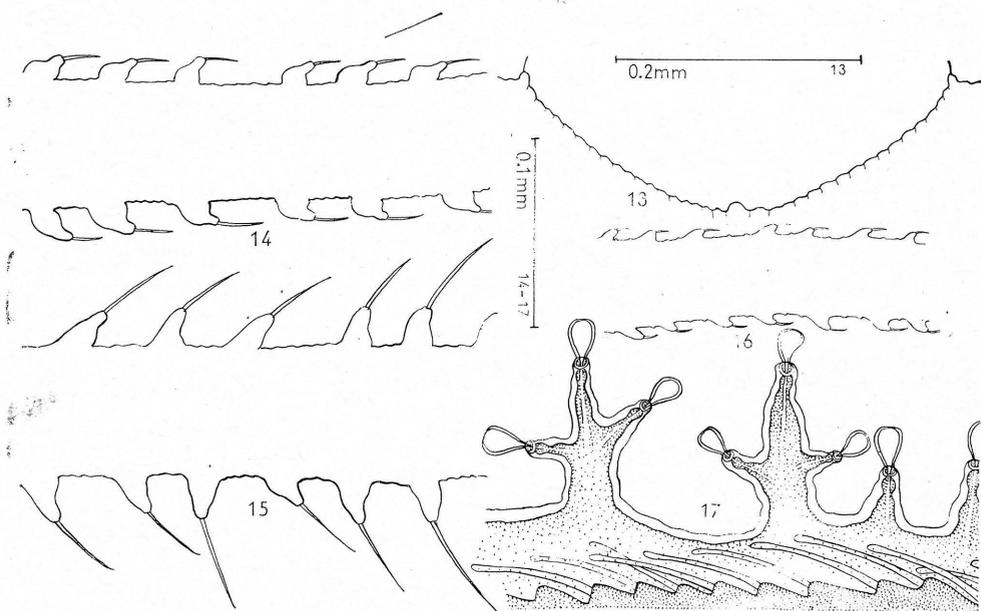


Fig. 13. *Acalypta elegans* Horv., apex of ninth abdominal segment of fourth instar nymph. Figs. 14–16. Portion of third antennal segment of fifth instar nymphs. 14 — *Dictyonota tricornis* [Schrnk.], specimen from Czechoslovakia. 15 — *Dictyonota tricornis* [Schrnk.], specimen from Mongolia. 16 — *Sphaerista paradoxa* [Jak.]. Fig. 17. *Lasiacantha kaszabi* Hob., portion of lateral margin of left hemelytral lobe of fifth instar nymph in transmitted light; the nymph is just before ecdysis and lateral margin of hemelytron of adult stage is clearly visible inside the larval tegument.

also by differently shaped conical tubercles of third antennal segment and by much longer hairs growing on these tubercles and projecting obliquely sideways (Fig. 15). The conical tubercles of third antennal segment are more curved apically, the hairs growing on the tubercles are much shorter and projecting in the same direction as the longitudinal axis of the antennal segment in the European specimens (Fig. 14). Also antennal tubercles are somewhat less divergent in the Mongolian specimens.

Material: Mongolia, Loc. Nr. 42, Archangaj Ajmak, Cagaan davaany ar, sandy steppe, June 28, 1979, leg. J. M. Štusák, 3 fifth instar nymphs at base of *Artemisia vulgaris* L. (Asteraceae).

***Lasiacantha kaszabi* Hoberlandt, 1979**

Fifth Instar (Figs. 8, 17)

Oval, about 1.7 times longer than wide, head, lateral margins and median line of body with long ramified spiniform processes. General colour light ochreous with a tinge of greenish grey. Fourth antennal segments (except their bases), apices of second tarsal segments, tip of rostrum, pronotal callosities,

lateral portions of head behind eyes, median portion of mesonotum, apices of hemelytral lobes, fifth tergite medially (around the spiniform process and base of it) dark brown. Eyes reddish brown, first dorsal abdominal gland reddish orange.

Head short, wider than long, dorsally armed with five spiniform processes which are not as long as first and second antennal segments together. Anterior frontal processes reaching beyond level of anteclypeus by almost half the length being only moderately longer than first antennal segment. Median frontal process approximately reaching level of anterior margin of anteclypeus. Occipital processes directed obliquely sideways above the eyes but not reaching beyond lateral margins of head, being hardly as long as first and second antennal segments together. Rostrum reaching anterior margin of middle coxae, relation of labial segments in mm: I : II : III : IV = 0.25 : 0.18 : 0.08 : 0.12.

Pronotum about 1.5 times wider than its median length, its anterior margin moderately concave. Lateral pronotal margins convex and armed with three larger spiniform processes on each side (except small spinulae), their anterior process being smallest and posterior (situated in posterolateral pronotal angles) largest. Median line of pronotum armed with two pairs of processes, first pair situated at the anterior pronotal margin on a very low foundation of vesicula, second pair at the middle of pronotal disc. Each of lateral margins of hemelytral lobes with three spiniform processes (except small spinulae). Posterolateral angles of abdominal segments IV—IX with long spiniform process in each, posterolateral angles of third abdominal segment without long process but with only a very short rudiment. Median line of mesonotum, metanotum and first tergite armed with paired processes, largest of which being on mesonotum and smallest on metanotum. Median line of abdominal tergites II, V, VI and VIII with one unpaired process on each tergite.

Surface of body with stellate structure of three-tipped little stars, similar to related *Lasiacantha* species. Lateral margins of pronotum, hemelytral lobes and abdomen with high conical tubercles (spinulae) bearing typical, strongly club-shaped glandular hairs. Similar spinulae are situated on abdominal tergites in one row running longitudinally half way between lateral margin and median line on each side of body and also occurring sporadically on hemelytral lobes and pronotal disc. Much smaller conical tubercles with club-shaped hairs are situated on anteclypeus, antennal tubercles, antennal segments, anterior margins of femora and on outer margins of tibiae. Setaceous hairs present on apices of fourth antennal segments, on apices of tibiae and on tarsi.

Measurements in mm (without spiniform processes): Length of body 1.95, width of body 1.13, length of head 0.33, width of head 0.50, synthlipsis 0.29, length of antenna 0.74 (I : II : III : IV = 0.12 : 0.09 : 0.32 : 0.21), length of pronotum 0.56, width of pronotum 0.86, length of posterior tibia 0.50, length of posterior tarsus 0.18. The eight specimens measured are very uniform in size.

Material: Mongolia, Loc. Nr. 62, Central Ajmak, Jaarmag (about 10 km SW of Centre of Ulaan Baatar), in a stony ravine in a steppe, foot of a hill, July 15, 1979, leg. J. M. Štusák, 8 specimens on *Thymus gobica* — (Lamiaceae).

Distinguishing notes. The nymph of *L. kaszabi* Hob. is similar to nymphs of the other Palaearctic *Lasiacantha* species hitherto described (i. e. *L. capucina* [Germ.] [Štusák 1957], *L. gracilis* [H.-S.] [Putshkov 1974], *L. haplophylli* Gol. [Golub 1977]) in its general appearance, in placing, general charac-

ter of spiniform processes as well as in chetotaxy and microstructure. It differs from nymph of *L. gracilis* in having foundation of vesicula much lower and in fact that there is no substantial difference in the length of spiniform processes of lateral margins of pronotum, hemelytral lobes and of abdominal margins, while the processes of pronotal lateral margins and hemelytral lobes are distinctly shorter than the processes of posterolateral angles of abdominal segments in *L. gracilis* according to Putshkov [1974]. The nymph of *L. kaszabi* differs from the nymph of *L. capucina* in having all the spiniform processes of body much shorter and in having the spinulae (conical tubercles with glandular hairs) situated on spiniform processes and on lateral body margins much lower. The length of all processes of head are conspicuously longer than first and second antennal segments together (paired anterior frontal processes about $\frac{1}{5}$ longer) in *L. capucina*, whilst all the head processes are shorter than first and second antennal segments together (anterior frontal processes about $\frac{1}{3}$ shorter) in *L. kaszabi*. The nymph of *L. haplophylli* is unknown to me; judging according to Golub's (1977) description, there is no substantial difference except the body length which he quotes 2.2—2.4 mm, which is about $\frac{1}{5}$ more on average than in *L. kaszabi*.

Note. The spiniform processes of body occurring only in nymphal stage of some Tingidae were named imaginifugal by Seidenstücker [1954] as they disappear and are quite absent in the adult stage. Although this fact has been already known a rather long time, it was not sufficiently clear to what degree these processes may participate in forming part of the body of the adult stage. The studied nymphs of *Lasiacantha kaszabi* were evidently just about to perform an ecdysis, so that adult lateral body portions, especially lateral margins of paranota, hemelytra and abdomen were quite well visible inside the larval tegument. In the material studied it was quite evident that the larval spiniform processes do not in any way participate in forming the paranota or hemelytra of the adult stage (Fig. 17). This fact was also briefly mentioned by Štusák & Stehlik (1980).

Tingis ampliata (Herrich—Schaeffer, 1838)

Fourth Instar

The specimen studied quite corresponds to the descriptions given by Southwood & Scudder [1956], Putshkov [1974] and Lee [1969], and also to the specimens of Czechoslovak origin.

Material: Mongolia, Bajanchongor Ajmak, Oase Echin gol, 90 km NE of Gaganbulag, 950 m, Exp. Dr. Z. Kaszab, 1967, Nr. 855, June 27—28, 1967, 1 specimen.

Tingis pilosa antennalis (Puton, 1879)

Fifth Instar (Figs. 2, 12)

Longish oval, almost 1.9 times longer than wide, lateral margins of pronotum and hemelytral lobes without processes; head, median line of thorax and abdomen, and posterolateral angles of abdominal segments armed with short processes. Whole body densely covered with tiny high conical tubercles bearing club-shaped glandular hairs (spinulae). General colour brown, dorsal

side of head (except processes, antennal tubercles and anteclypeus), pronotal callosities, region of dorsal abdominal glands, apices of tibiae, tarsi, majority of fourth antennal segments and tip of rostrum blackish brown.

Head wider than long, armed with five rather stout, light processes. Anterior frontal processes moderately longer than first antennal segment, reaching beyond level of anterior margin of anteclypeus by almost one third of their length. Median frontal process a little shorter (but wider) than anterior processes reaching the base of them. Occipital processes hardly as long as anterior frontal processes. Rostrum slightly reaching beyond middle coxae. Relation of labial segments in mm: I : II : III : IV = 0.26 : 0.31 : 0.17 : 0.24.

Pronotum about 1.5 times wider than its median length, anterior margin very moderately concave, lateral margins almost straight. Pronotal margins without processes, with only small spinulae. Median line of pronotum with two pairs of very simple processes (at the anterior margin and at the middle of pronotal disc), but these processes are very small, in shape quite similar to other spinulae (they are only insignificantly larger) so that they almost disappear among the others spinulae densely covering the whole body surface. Hemelytral lobes reaching fifth tergite, their margins without processes, only with spinulae. Median line of mesonotum, metanotum and first abdominal tergite each armed with one pair of rather stout processes which are as wide as the processes of head but somewhat shorter than these. Processes of metanotum shortest.

Each posterolateral angle of abdominal segments IV—IX with one wide and short process, the processes gradually increasing in length from IVth to IXth segment: shortest in the posterolateral angles of IVth and Vth segments (shorter than their basal width), longest in angles of VIIIth and IXth segments (moderately longer than their basal width). Median line of abdominal tergites II, V, VI, VII and VIII armed with stout unpaired processes. The process of IInd tergite is longest (about twice longer than its basal width), process of Vth tergite shortest (shorter than its basal width).

Whole body surface covered with high and sharp conical tubercles bearing strongly club- to pestle-shaped glandular hairs (spinulae). Ground plans of these spinulae form a circular structure in transmitted light (Fig. 12). Antennae and legs with similar but smaller tubercles and pestle-shaped hairs.

Measurements in mm (without processes): Length of body 2.48, maximal width of body 1.32, width of head 0.58, length of head 0.32, length of first antennal segment 0.12, length of second segment 0.10 (third and fourth segments missing), length of pronotum 0.71, width of pronotum 1.08, length of posterior tibia 0.68, length of posterior tarsus 0.22.

Material: Mongolia, Suchebaatar Ajmak, 44 km SSW of Baruun urt, 1050 m, Aug. 2—3, 1965, Exp. Dr. Z. Kaszab, No. 349, 1 specimen.

Note. The nymph of the nominate form of *Tingis pilosa* Humm, was shortly described and figured by Putshkov (1974) from the Ukraine. The studied Mongolian specimen agrees in general with his description. Unfortunately, more detailed characters could not be compared with his description.

A key to last nymphal instars of Mongolian Tingidae hitherto known

- 1 (18) Lateral margins of pronotum, hemelytral lobes as well as of abdomen with long spiniform processes which are minimally twice longer than their basal width.
- 2 (11) Microstructure of dorsal body surface stellate.
- 3 (10) Each lateral margin of pronotum as well as of hemelytral lobes with 3—4 long spiniform processes. The spiniform processes covered with large and high conical tubercles bearing large glandular hairs, so that the processes seem to be ramified. Median line of pronotum with two pairs of large processes.
- 4 (5) Processes on lateral margins of pronotum and hemelytral lobes markedly shorter than those on posterolateral angles of abdominal segments. Foundation of vesicula larger and higher. On *Linum* sp. (Putshkov 1974).
Lasiacantha gracilis (H.—S.)
- 5 (4) Processes on lateral margins of pronotum and hemelytral lobes about as long as those on posterolateral angles of abdominal segments. Foundation of vesicula smaller and lower.
- 6 (7) All spiniform processes of body longer, anterior frontal processes of head markedly (about one fifth) longer than first and second antennal segments measured together. Small conical tubercles on body and on spiniform processes higher. On *Thymus* spp. (Štusák 1957).
Lasiacantha capucina (Germ.)
- 7 (6) All spiniform processes of body shorter, anterior frontal processes of head markedly (about one third) shorter than first and second antennal segments together. Small conical tubercles on body and on spiniform processes lower.
- 8 (9) Smaller, body length 1.9—2.0 mm., on *Thymus* spp. (Fig. 8).
Lasiacantha kaszabi Hob.
- 9 (8) Larger, body length 2.2—2.4 mm., on *Haplophyllum dauricum*. (Golub 1977).
Lasiacantha haplophylli Gol.
- 10 (3) Each lateral margin of pronotum as well as of hemelytral lobes with only one long spiniform process situated rather posterolaterally. The spiniform processes of body almost smooth, without high conical tubercles and without large glandular hairs. Median line of pronotum with rather or very small rudimentary processes (only one pair of processes marked). (Cobben 1958, Putshkov 1969, 1974).
Physatocheila smreczynski China
- 11 (2) Microstructure of dorsal body surface circular.
- 12 (17) Each lateral margin of pronotum and hemelytral lobes with only one long spiniform process. Median line of pronotum with roundish bulges and paired spiniform processes.
- 13 (14) Spiniform processes of median line of abdominal tergites growing out of dark areae. (Putshkov 1974).
Galeatus cellularis Jak.
- 14 (13) Spiniform processes of median line of abdominal tergites do not grow out of dark areae as the abdomen is almost unicolorous.
- 15 (16) Two oval bulges situated beside each other at the middle of pronotal disc. One pair of long spiniform processes situated near their inner margins. Rostrum reaching between middle coxae. (Štusák 1962).
Galeatus affinis (H.—S.)
- 16 (15) Two oval bulges situated behind each other in the median line of pronotal disc. The anterior bulge is larger and extends from the anterior pronotal margin almost to the middle of pronotal disc. the posterior bulge is smaller and extends from the middle of pronotal disc to the apex of posterior pronotal corner. One pair of long spiniform processes situated in place where both bulges touch. Rostrum reaching between posterior coxae. (Štusák 1959).
Galeatus scrophicus Saund.
- 17 (12) The lateral margins of pronotum and hemelytral lobes each with more than one spiniform process (usually with 3—4 processes). Median line of pronotum without any bulges. (Putshkov 1971, 1974).
Dictyla montandoni (Horv.)
- 18 (1) Lateral margins of body with only short processes or tubercles which are not twice as long as their basal width, or lateral body margins without any processes or tubercles.
- 19 (36) Microstructure circular or almost indistinct.

- 20 (21) Head as well as other body parts without any processes or tubercles except the median line of abdominal tergites II and V where a small, indistinct tubercle is situated on each tergite. (Putshkov 1974). *Galeatus inermis* (Jak).
- 21 (20) Head always armed with four or five processes or tubercles, lateral body margins and median line of body with or without short processes or tubercles.
- 22 (23) Posterolateral (humeral) angles of pronotum with one small, short, blunt, sidewardly prominent tubercle-like process; remaining lateral margins of body without any tubercles. (Štusák 1960). *Oncochila scapularis* (Fieb.)
- 23 (22) Posterolateral angles of pronotum without a prominent tubercle-like process, or each of lateral pronotal margins with more than one tubercle-like processes.
- 24 (25) Black or blackish brown coloured. (Štusák 1971, Putshkov 1971, 1974). *Dictyla platyoma* (Fieb.)
- 25 (24) Yellowish white to light brown coloured.
- 26 (29) Lateral margins of body i. e. also posterolateral angles of abdominal segments without processes or tubercles as well as the median line of thorax. Median line of some abdominal tergites with only small and low, sometimes indistinct tubercles. Body surface almost bald.
- 27 (28) All the spiniform processes of head reaching far beyond margins of head; median line of abdominal tergites II, V, VI and VIII with one very low, mostly dark pigmented tubercle on each tergite. Larger. (Southwood & Scudder 1956, Putshkov 1974). *Tingis (Tingis) ampliata* (H.—S.)
- 28 (27) Only anterior frontal processes of head reaching far beyond anterior margin of head, median frontal process as well as occipital processes very short, tubercle-like, not reaching margins of head. Small and low tubercle on each of II—VIII tergites in median line. Smaller. (Golub 1977). *Tingis (Tingis) scutigerula* Gol.
- 29 (26) Lateral margins of abdomen (posterolateral angles of abdominal segments) with processes which are sometimes very low. Median line of pronotum, mesonotum, metanotum and 1st tergite with paired processes, median line of further abdominal tergites with only unpaired processes or tubercles. Body surface with large pestle-shaped glandular hairs, dense also on the processes.
- 30 (31) Unpaired, well visible and large spiniform processes situated in median line of tergites II, V and VI. Sometimes the process of the VIth tergite may be absent. VIIIth tergite without process or with only small rudimentary process. Median line of pronotum with only one median pair of small rudimentary processes. 2.8—2.9 mm. (Golub 1977). *Tingis (Tingis) robusta* Gol.
- 31 (30) Unpaired, well visible processes situated in median line of tergites II, V, VI, VII and VIII, the process of VIIIth tergite is not smaller than processes on preceding tergites. Median line of pronotum with two pairs of very small, often indistinct processes; first pair at the anterior margin, second pair medially.
- 32 (33) Paired processes of mesonotum large and blackish, also unpaired process of Vth tergite black. Tergites VII, VIII and IX with a dark spot medially. 2.4—2.5 mm. (Golub 1977). *Tingis (Tingis) curvipilis* Gol.
- 33 (32) All processes of body light, tergites VII, VIII and IX without any spot medially.
- 34 (35) Anterior frontal processes shorter than first antennal segment. Paired processes in median line of pronotum, mesonotum, metanotum and 1st tergite as well as unpaired processes on abdominal tergites very small, indistinct in dorsal view. Processes in posterolateral angles of abdominal segments shorter than their basal width. (Putshkov 1974). *Tingis (Neolasiotropis) pauperata* Put.
- 35 (34) Anterior frontal processes longer than first antennal segment. Paired processes in median line of mesonotum, metanotum and 1st tergite as well as unpaired processes on abdominal tergites II, V—VIII are larger, well visible also in dorsal view. Processes in posterolateral angles of abdominal segments moderately longer than their basal width (Fig. 12). *Tingis (Neolasiotropis) pilosa antennalis* (Put.)
- 36 (19) Microstructure in shape of little three to five-tipped stars or of formations with two tips cut apically (Figs. 10,11).

- 37 [38] Head dorsally with five processes, i. e. median frontal process developed even if only small and low. *Elasmotropis distans* Jak.
- 38 [37] Head with only four processes dorsally, i. e. median frontal process always absent.
- 39 [40] Lateral margins of thorax and abdomen as well as whole dorsal body surface with tiny conical, densely situated tubercles bearing long hairs. Median line of abdominal tergites with very small, often almost indistinct tubercles situated close to each other (one pair on each tergite). (Štusák 1957).
Derephysia foliacea (Fall.)
- 40 [39] Lateral margins of thorax and abdomen without tiny conical tubercles bearing hairs. Tubercle-like processes in median line of abdominal tergites, if developed, always unpaired (except on first tergite).
- 41 [54] Antennae, especially their third segments, with pronounced conical tubercles bearing long hairs directed strongly apically. Body shape more elongate.
- 42 [43] Median line of thorax and of abdominal tergites without any processes or tubercles. (Štusák 1964, Putshkov 1974).
Dictyonota (Kalama) tricornis (Schrnk.)
- 43 [42] Median line of body (at least of abdominal tergites) with processes or tubercles.
- 44 [45] Foundation of vesicula very large and extensive, situated in median 2/4 of pronotal width and in anterior half of pronotal length. Posterior pronotal corner with a convex longitudinal bulge (Figs. 3—5).
Sphaerista paradoxa (Jak.)
- 45 [44] Foundation of vesicula much smaller not extending to anterior half of pronotal length, maximally situated in anterior fourth or indistinct. Posterior pronotal corner without any bulge.
- 46 [47] All abdominal tergites except ninth armed with processes or tubercles. Foundation of vesicula upwardly produced into a high and pointed cone. Base of third antennal segment enlarged (Figs. 6, 7).
Dictyonota (Dictyonota) salsolae Golub
- 47 [46] Fourth tergite always without any process or tubercle medially. No foundation of vesicula visible at the anterior pronotal margin. Base of third antennal segment not enlarged.
- 48 [49] Microstructure in shape of little stars mainly three-tipped. Median line of tergites II, V, VI, VII and VIII with an unpaired tubercle-like process on each tergite. (Štusák 1959).
Agramma laetum (Fall.)
- 49 [48] Microstructure in shape of ribbon-shaped two — tipped formations.
- 50 [51] Third antennal segment 1.5—1.6 times longer than fourth. General colour yellowish. Also third and seventh tergites with tubercle-like process medially. (Tubercles on tergites II, III, V, VI, VII and VIII). Body length 2.4—2.6 mm in fifth instar. (Štusák 1972).
Agramma atricapillum Flor
- 51 [50] Third antennal segment about as long as fourth segment. General colour brown. Third and seventh tergites without tubercle-like process medially. (Tubercles on tergites II, V, VI and VIII). Body length 1.6—1.9 mm in fifth instar.
- 52 [53] Anterior frontal processes and distal margins of antenniferous tubercles light yellowish. (Lee 1969).
Agramma nexile (Drake)
- 53 [52] Anterior frontal processes and distal margins of antenniferous tubercles dark brown as other portions of head. (Štusák 1964).
Agramma minutum Horv.
- 54 [41] Antennal segments without pronounced conical tubercles bearing hairs. Body shape more wide.
- 55 [56] Median line of tergites III—VIII with one unpaired tubercle on each tergite. Base of third antennal segment suddenly bulbously enlarged. (Štusák 1964).
Acalypta gracilis (Fieb.)
- 56 [55] Median line of tergites without any processes or tubercles. Base of third antennal segment not suddenly enlarged.
- 57 [58] End of body (apex of IXth abdominal segment) only very shallowly excised (Fig. 13).
Acalypta elegans Horv.
- 58 [57] End of body deeply excised.
Acalypta nigrina (Fall.)

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Abstract

Nymphs of five Mongolian Tingidae, namely *Acalypta elegans* Horv. (4th instar), *Sphaerista paradoxa* [Jak.] (4th and 5th instars), *Dictyonota salsolae* Gol. (5th instar), *Lasiacantha kaszabi* Hob. (5th instar), *Tingis pilosa antennalis* (Put.) (5th instar) are newly described and figured, and notes on nymphs of *Dictyonota tricornis* (Schrnk.) (5th instar) and *Tingis ampliata* (H.—S.) (4th instar) are given. A key to identification of older instar nymphs of 30 Tingid species is included, which represents about 55 % of species of Tingidae known from the territory of Mongolia. The fact that larval spiniform processes do not in any way participate in the formation of paranota or hemelytra of the adult stage is ascertained from materials of nymphs of *Lasiacantha kaszabi* Hob.

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