

# New Cenozoic Lace Bugs (Heteroptera: Tingidae)

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**Abstract**—Four new species of Tingidae, belonging to three extant genera, Neotropical *Leptopharsa* and Palearctic *Dictyonota* and *Derephysia* are described from the Dominican amber, and from the Oligocene–Miocene of Russia and Spain. The systematic position of the fossil species among related extant taxa is discussed.

## INTRODUCTION

In the modern fauna there are about 2000 species of the family Tingidae distributed worldwide (Schuh and Slater, 1995). Slightly more than 30 tingid species are reliably recognized in the fossil record (Golub and Popov, 1999; Golub and Popov, 2000a, b), including several species not yet described. The oldest member of Tingidae known to date, *Golmonia pater* Yu. Popov, was described based upon several specimens from the Lower Cretaceous of Mongolia, and placed in the monobasic tribe Golmoniini (Popov, 1989). Another representative, *Sinaldocader drakei* Yu. Popov described from the same locality and assigned to Cantacaderinae Phatnomini, most probably belongs to a sister family Thaumastocoridae (Golub and Popov, 1999). The same conclusion was independently reached in the course of general revision of tingoid bugs by Lis (1999). Two more species of another extant Neotropical genus, *Leptopharsa*, are now added to *Eocader babyrussus* Golub and Popov already known from Dominican amber (Golub and Popov, 2000b): *L. poinari* sp. nov. and *L. evsyunini* sp. nov. The lace bug *Derephysia penalveri* sp. nov. described below from the Miocene locality Rubielos de Mora (Teruel) was listed along with other bugs (Corixidae, Notonectidae, Miridae, Reduviidae, Lygaeidae, Coreidae, and Pentatomidae; Peñalver, 1998); one of these bugs was recently described: *Dicyphus rubusensis* Penalver et Baena (Miridae); Peñalver and Baena, 2000).

The material studied is kept in the collections of the Paleontological Institute, Russian Academy of Sciences (PIN), American Museum of Natural History, New York (AMNH), Museo Paleontologico de Valencia, Spain (MPV), and in the collection of G.O. Poinar (HE).

## SYSTEMATIC PALEONTOLOGY

Infraorder Cimicomorpha

Family Tingidae Laporte, 1832

Subfamily Tinginae Laporte, 1832

## Genus *Leptopharsa* Stal, 1873

*Leptopharsa poinari* Golub et Popov, sp. nov.

*Gargaphia dominicana*: Golub and Popov, 1999, p. 37. (nom. nud.)

**Etymology.** In honor of the well-known entomologist and collector of Dominican amber inclusions, Dr. G.O. Poinar.

**Holotype.** AMNH, no. DR-10-1797, well-preserved female (macropterous form); Dominican amber; Oligocene–Miocene.

**Description** (Fig. 1). The body is markedly elongate and quite narrow, 2.6 times as long as wide, yellowish-fuscous from above; the head and pronotal disc are black. The cells of the hemelytra and areolate pronotal structures are mostly large and transparent. The marginal veins of the paranota and hemelytra are covered with minute spinules.

The head is short and broad, 2.8 times as wide as long not counting the frontal spines projecting forwards (1.83 times counting them), with five pale, quite long, slender, acuminate spines (three frontal and two occipital). The paired frontal spines are directed obliquely upwards, conspicuously projecting forwards beyond the clypeal apex; the unpaired one is directed almost vertically upwards; occipital spines are adpressed to the head, extended forwards beyond the eye midlength. The frons is weakly convex. The eyes are markedly convex, weakly projecting laterad and raised above the head surface. The antennal tubercles are small, with the obtusate apex. The antennae are thin and very long, with the second segment twice as long as the first and the third one 3.32 times longer than the fourth (3.57 times as long as the head width, or 0.44 of the body length). The bucculae are closed anteriorly, weakly projecting forwards beyond the clypeal apex, quite high, with at least two distinct horizontal cell rows. The rostral sulcus (see from below) is wide, not crossed by the transverse plate at the boundary between the meso- and metathorax; the mesosternal plates are almost parallel; the metasternal plates posteriorly form a very low transverse rib closing the rostral sulcus. The

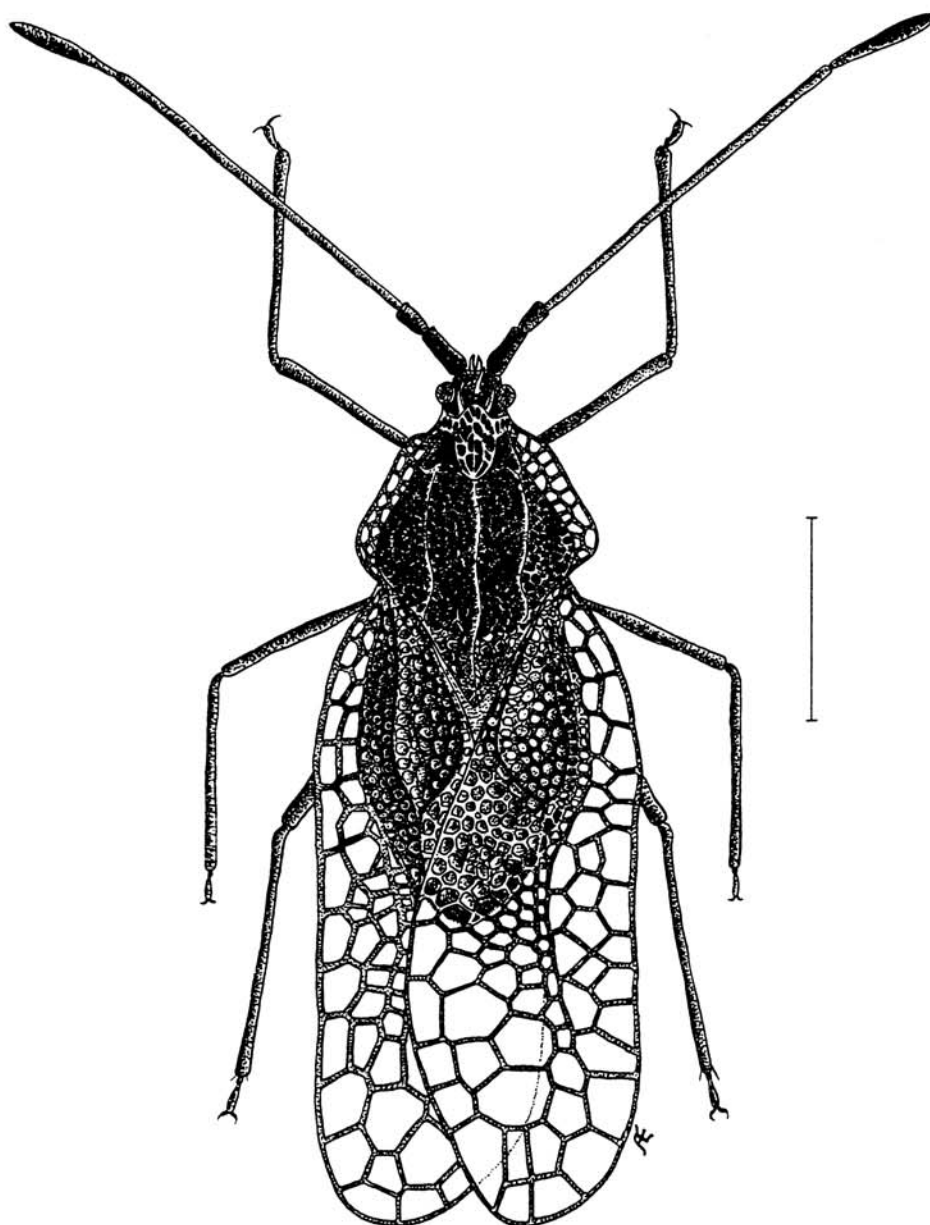


Fig. 1. *Leptopharsa poinari* sp. nov., holotype AMNH, no. DR-10-1797. Scale bar 1 mm in all figures.

rostrum is quite short, not reaching the hind margin of the metathorax.

The pronotal disc is markedly convex, covered with large punctures; the pronotum is provided with three foliaceous, relatively low longitudinal carinae bearing one row of small, mostly rectangular cells; the median carina is highest at the boundary of the disc and posterior pronotal process. The areolate vesicula is tectiform, relatively low and not markedly inflated, somewhat depressed laterally, forming a conspicuous angle projecting forwards but almost not concealing the head from above, with five cells along each side of the mid-line. The paranota are not very wide, quite well deflected dorsad, without projecting anterior angles,

with the outer margin slightly sinuate about midlength, along almost entire length with two rows of moderately large, mostly quadrangular or pentagonal cells. The scent gland openings have an oval peritreme. The areolate posterior pronotal process is well developed, but not very long, with the slightly obtusate apex, leaving the claval apices uncovered from above.

Macropterous form. The hemelytra are very long and extended much beyond the abdominal apex. The common outline of the hemelytra folded in repose is widening from the base towards the apex in the anterior third, then parallel-sided, distinctly (males) or slightly (females) sinuate about midlength, apically rounded (the hemelytral apices not diverging). The hemelytra

are clearly subdivided by the raised veins Hc, R + M, Cu and R + M + Cu into the costal, subcostal, discoidal and sutural areas. The costal area is wide, for most of its length with two rows of large, mostly quadrangular or pentagonal cells, in the widest part (preapical sinus) with 3–4 cells of the third row. The subcostal area in males is very narrow, for most of its length with two rows of small cells, in the apical third with a single row of the rectangular cells turning larger towards the apex, with 1–3 cells of the second row near the apex; in females with two cell rows basally, then (up to the apex of the discoidal area) with three rows of small cells, distally (almost up to the apex) with a single row of rather large cells turning larger towards the apex. The discoidal area is short and rather wide, occupying 0.34 of the hemelytron length, in the widest part with five rows of quite small cells. The vein Cu separating the cubital and sutural areas is nearly arcuate in its distal half. The sutural area about the apex of the discoidal area and just beyond is with 5–6 rows of not large cells (not counting one cell row of the subcostal area continued almost to the hemelytron apex); the row number then decreases up to three and the cells turn larger, and near the apex the subcostal and sutural areas merge (four longitudinal cell rows altogether). The hypocostal lamina is narrow, with a single cell row.

The body is mostly black ventrally; the legs are fuscous; the hind tarsi are blackish apically. The tibiae have very short, suberect hairs becoming longer towards the tibial apex; the fore tibial apex is slightly capitate. The tarsal claws bear a well-developed basal hook-like process.

**Measurements**, mm: holotype: body length, 4.25, its width, 1.62; pronotum length, 1.4, its width, 1.5; head length from posterior eye margin to spine apices 0.29, to clypeal apex 0.19, head width 0.53; length of antennal segments I : II : III : IV = 0.28 : 0.14 : 1.89 : 0.57; length of foreleg segments: femur, 0.93, tibia, 1.16, tarsus, 0.13; middle leg: femur, 0.9, tibia, 0.91; hind leg: femur, 1.0, tibia, 1.0, tarsus, 0.14.

**Comparison.** The general habitus, relatively narrow paranota with two cell rows, hemelytral apices not diverging in repose, three cell rows in the widest part of the costal area are the features indicating that the species in question is close to the recent *L. elegantula* Stal, 1873, the type species of the genus described from Columbia and recorded also in Ecuador, Bolivia and Brazil. The same characters, as well as the margins of hemelytra folded in repose being parallel for most of their length, and three cell rows in the widest part of the costal area show that *L. poinari* is similar to the recent *L. forsteroniae* Drake et Hambl., 1938, described and up to now recorded only from Brazil. The new species is distinct from *L. elegantula* in the much larger size (body length about 3 mm in *L. elegantula*), broader hemelytral membrane and slightly sinuate outer paranotal margin (as judged from the original description and figure: Champion, 1898, p. 60, pl. 2, fig. 8). Distinct

from *L. forsteroniae* in the acuminate head spines, longer third antennal segment, slightly wider paranota with two cell rows at the lateral pronotal angles, and presence of five cell rows in the discoidal area (in *L. forsteroniae* the occipital spines are obtuse, third antennal segment is 2.5 times longer than fourth, paranota at the lateral pronotal angles with a single cell row, and discoidal area with three cell rows: Drake and Hambleton, 1938, p. 51, text-fig. 6).

**Remarks.** The species demonstrates all the diagnostic characters of the large, mostly Neotropical (also recorded from North America, South Africa and Australia) genus *Leptopharsa* described in detail by Hurd (1946): the head with five spines; antennae thin and very long; bucculae closed anteriorly; rostral sulcus (formed by sternal plates) wide; mesosternal plates parallel; transverse plate between meso- and metasternal plates absent; lamellate paranota deflected obliquely dorsad but not bent onto pronotal disc; areolate vesicula somewhat laterally depressed (characteristic of several recent forms); lamellate pronotal carinae not very high, with one cell row; scent gland openings surrounded by evaporatorium (peritreme); hemelytra long; discoidal area short (less than half of hemelytron length).

**Material.** Besides the holotype, paratypes from Dominican amber: HE-4-8A, male (macropterous form, figured in Poinar, 1992, text-fig. 63) and females HE-4-8B, HE-4-8E and HE-4-8K.

*Leptopharsa evsyunini* Golub et Popov, sp. nov.

*Gargaphia vitrea*: Golub and Popov, 1999, p. 37. (nom. nud.)

**Etymology.** In honor of the entomologist A.A. Evsyunin.

**Holotype.** AMNH, no. DR-10-44, male (macropterous form); Dominican amber, El Valle locality; Oligocene–Miocene.

**Description** (Fig. 2). The body is elongate, 2.26 times as long as wide, yellowish-fuscous from above; the head is black. The cells of hemelytra and areolate pronotal structures are large and transparent. The marginal veins of the paranota and hemelytra are scabrous.

The head is short and broad, 1.73 times as wide as long not counting the frontal spines projecting forwards (1.48 times counting them), with five pale, long, acuminate spines (three frontal and two occipital), all about half as long as the first antennal segment. The frontal spines are directed obliquely upwards (unpaired one almost vertical), conspicuously projecting forwards beyond the clypeal apex; occipital spines are nearly adpressed to the head, directed obliquely dorsomedial and extended nearly to the anterior eye margin. The frons is convex. The eyes are convex, quite well projecting laterad. The antennal tubercles are small, with the apices curved mediad. The antennae are thin and long, with the first segment narrowed beyond midlength and then widened towards the apex.

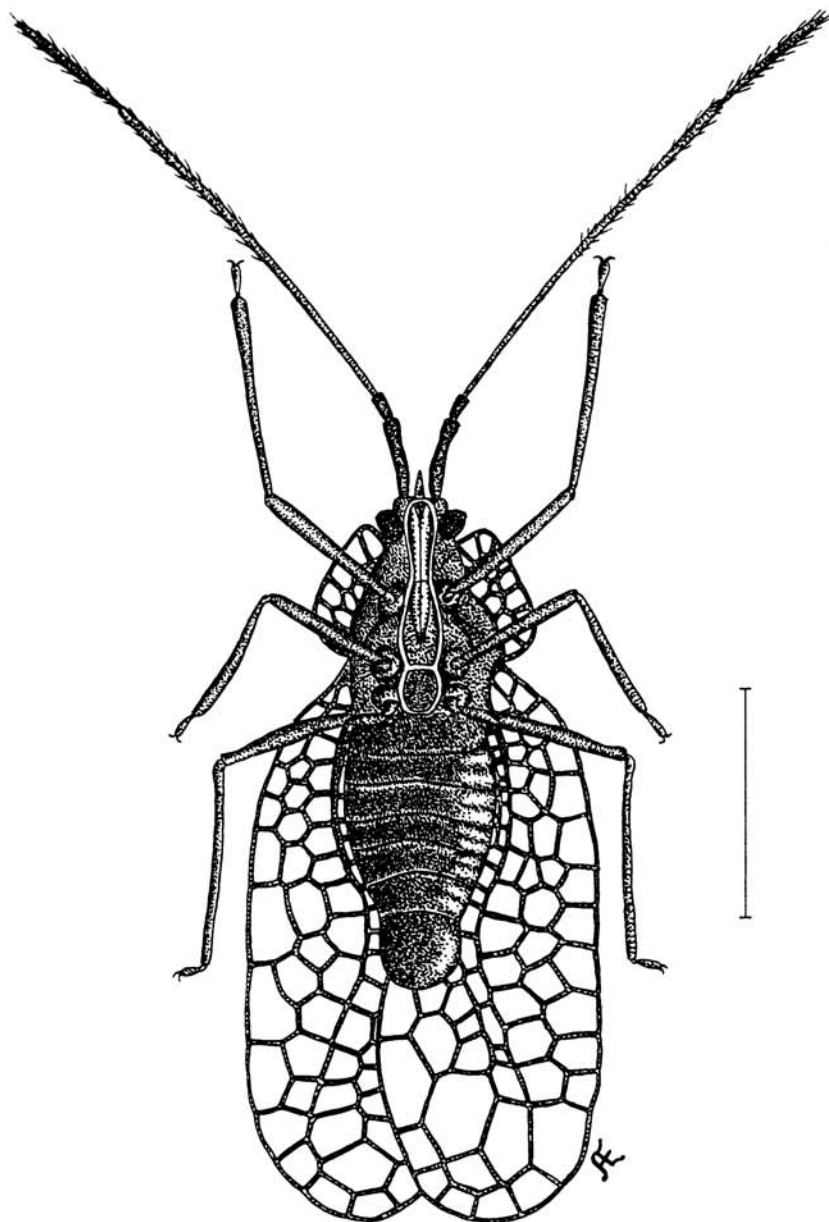


Fig. 2. *Leptopharsa evsyunini* sp. nov., holotype AMNH, no. DR-10-44.

1.94 times longer than the second, and the third one 2.92 times longer than fourth (4.8 times as long as the head width, or 0.56 of the body length). The bucculae are closed anteriorly, weakly projecting forwards beyond the clypeal apex, quite high. The rostral sulcus (see from below) is quite wide, not crossed by the transverse plate at the boundary between the meso- and metathorax; the mesosternal plates are almost parallel, slightly arched outwards; the metasternal plates posteriorly form a very low, W-shaped transverse rib closing the rostral sulcus. The rostrum is quite short, but slightly extended beyond the middle of mesothorax.

The pronotal disc is markedly convex, with not large punctures; the pronotum is provided with three longitu-

dinal carinae bearing one row of quite large, rectangular cells; the median carina is highest, about 1.5 times higher than the lateral ones. The areolate vesicula is tectiform, quite high, depressed laterally, forming a conspicuous angle projecting forwards but only slightly concealing the occiput from above, with four cells along each side of the midline and with eight transverse cell rows in the widest part. The paranota are quite wide, distinctly deflected dorsad, with weakly projecting, rounded anterior angles, rounded outer margin, with three cell rows in the widest (anterior) half and with two in posterior half. The scent gland openings are not visible in the holotype due to the thickness of the amber piece. The areolate posterior pronotal process is

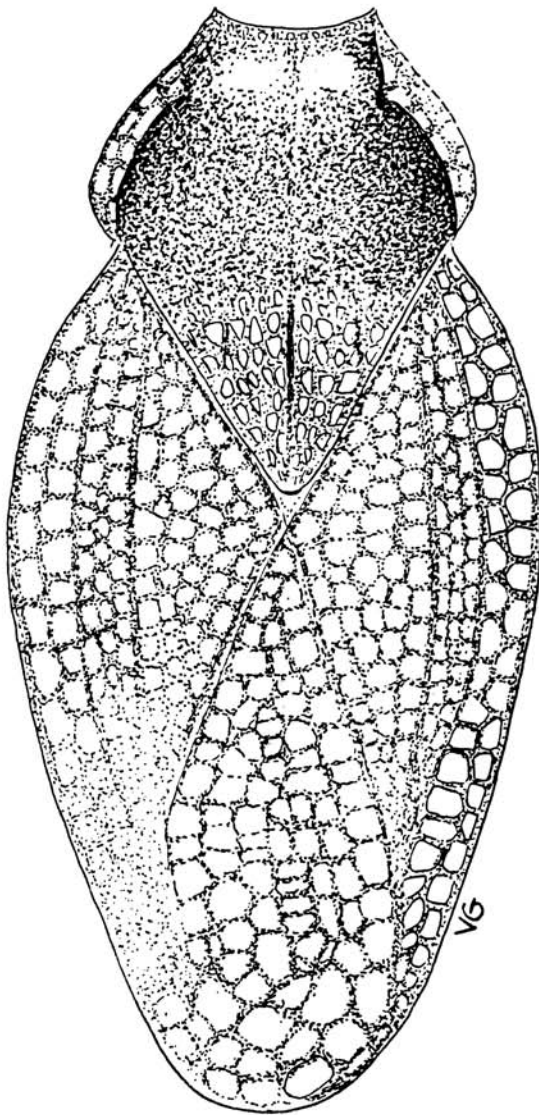


Fig. 3. *Dictyonota petrifacta* sp. nov., holotype PIN, no. 3136/94.

quite long, with the acuminate apex, concealing the claval apices from above.

Macropterous form. The hemelytra are very long and extended much beyond the abdominal apex (hemelytral apices diverging), clearly subdivided by the raised veins Hc, R + M, Cu and R + M + Cu into the areas. The costal area is wide, for most of its length with three rows of mostly quadrangular or pentagonal cells turning larger towards the apex (sometimes a single cell in the fourth row: left hemelytron of the holotype). The subcostal area is from near the base up to beyond the apex of the discoidal area mostly with two, then with a single row of quadrangular or pentagonal cells turning larger towards the apex. The discoidal area is short, occupying 0.35 of the hemelytron length, in the widest part with three rows of the angulate, moderately large cells. The sutural area about the preapical sinus of cos-

tal area and just beyond is with three cell rows (not counting one cell row of the subcostal area continued along the sutural area), near the apex with only two rows of the very large cells (plus third row from the subcostal area merging to sutural). The hypocostal lamina is narrow, with a single row of the small cells.

The body is fuscous black ventrally; the genital segment bears a wide median fuscous stripe; the legs are long and slender, yellowish fuscous; the tarsi are blackish apically. The tibiae are slightly thickened apically.

Measurements, mm: holotype: body length, 3.2, its width, 1.41; pronotum width, 0.9; head length from posterior eye margin to spine apices 0.31, to clypeal apex 0.21, head width 0.37; length of antennal segments I : II : III : IV = 0.31 : 0.16 : 1.78 : 0.61; length of fore femur, 0.75, of tibia, 0.93, of middle femur, 0.76, of hind femur, 0.76, of tibia, 0.93; length of all tarsi, 0.11–0.13.

Comparison. Quite similar to *L. poinari* sp. nov., and in some characters to the recent *L. elegantula*, *L. forsteroniae* and *L. posoqueriae* Drake et Hambleton, 1938 (the latter like *L. forsteroniae* described and known only from Brazil). Distinct from these species in the wider paranota with rounded outer margin and three cell rows in their anterior half; from *L. poinari*, *L. forsteroniae* and *L. posoqueriae* distinct also in the slightly diverging hemelytral apices and presence of only two cell rows in the subcostal area.

Material. Besides the holotype, paratype female HE-8H.

#### Genus *Dictyonota* Curtis, 1827

*Dictyonota petrifacta* Golub et Popov, sp. nov.

**Etymology.** From Greek *petra* (stone) and Latin *facere* (make).

**Holotype.** PIN, no. 3136/94, moderately preserved insect (head and legs missing, sex unknown, part and counterpart); near Velikaya Kema, Ternei District, Primorskii Region, Russia; the deposits are correlated to coal-bearing Kkhutsin Formation of Sikhote-Alin' Mountains and dated as the Upper Oligocene–Lower Miocene (Bersenev et al., 1969).

**Description** (Figs. 3, 5a). The body is oval, quite elongate, slender. The cells of hemelytra and areolate pronotal structures (paranota and triangular posterior process) are not very large, on the vesicula small, rounded; the cells of the costal area are much larger than all the other cells.

The pronotum has a ring-like vesicula at the anterior margin, narrow in longitudinal direction, bearing one transverse cell row; the anterior pronotal margin concave. The paranota have no projecting anterior angles, rounded at the outer margin, with two cell rows. The triangular areolate posterior pronotal process is well developed, not very long, rounded apically, not covering the clavi entirely from above. The pronotum apparently bears three parallel carinae, the median one well

preserved, the lateral ones scarcely traceable in the impression.

**Macropterous form.** The costal area is moderately wide, along its entire length (except for the very base and apex) with two rows of quite large, mostly quadrangular or pentagonal cells. The subcostal area is in the widest, quite long part with three rows of angulate cells. The discoidal area is with five cell rows in the widest part, all cells of the area being of similar size. The hemelytral membrane is rather wide, with seven cell rows in the widest part. The clavi are preserved split from the hemelytra, almost entirely (except the apices) concealed by the posterior pronotal process.

**Measurements, mm:** body length (excluding head) 3.6, its width 1.72; pronotum length 1.57, its width 1.38; length of hemelytra 2.82.

**Comparison.** The shape of paranota with their rounded outer margins and two cell rows, the shape and degree of development of the posterior pronotal process not covering the clavi entirely, the cell row number in subcostal, discoidal and sutural areas, and the shape and size of paranotal and hemelytral cells are the features relating *D. petrifacta* sp. nov. to *D. dlabolai* Hob., 1974, whereas its narrow vesicula and rather large body size are similar to *D. pulchricornis* (Kerzh. et Jos., 1966) (both are East Palearctic species). Distinct from *D. dlabolai* in the narrower ring-shaped vesicula having no more than two cell rows along the body axis, the presence of two complete cell rows in the costal area (in *D. dlabolai* the vesicula is swollen bladder-like, with five cell rows along the body midline, the costal area in the narrowest part about midlength with at least short uniserial section; also *D. dlabolai* is distinctly smaller: body length excluding head 2.88–3.1 mm). Distinct from *D. pulchricornis* in the smaller hemelytral cells, more uniform cells of the discoidal area, absence of projecting anterior angles of pronotum (in *D. pulchricornis* the hemelytral cells are much larger, some peripheral cells of discoidal area are twice to thrice larger than the cells of inner rows, the anterior pronotal angles are distinctly projecting and extended beyond the vesicula apex; also *D. pulchricornis* is somewhat smaller: body length excluding head 3.3–3.4 mm).

**Remarks.** Despite the head being missing in the holotype, the shape of paranota, vesicula and posterior pronotal process, the shape and areolation pattern of hemelytral areas clearly indicate that the species belongs to the subendemic Palearctic genus *Dictyonota*.

**Material.** Holotype.

### Genus *Derephysia* Spinola, 1837

*Derephysia penalveri* Golub et Popov, sp. nov.

**Etymology.** In honor of paleoentomologist Dr. E. Peñalver Mollá.

**Holotype.** MPV-1072-RM (MPV-2020-RM), female(?), macropterous form, impression with large

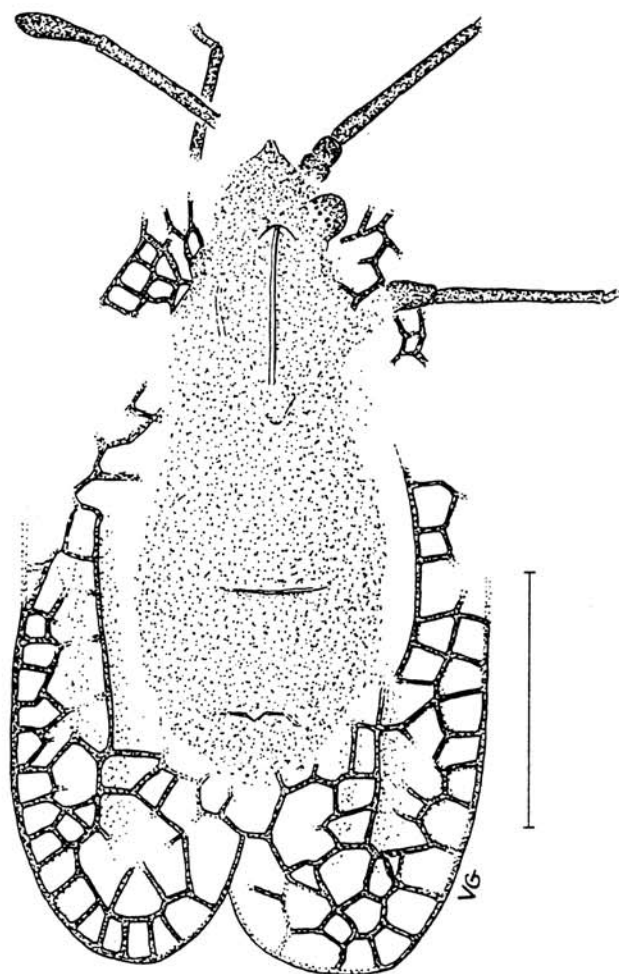


Fig. 4. *Derephysia penalveri* sp. nov., holotype MPV-2020-RM.

fragments of chitinous cuticle preserved; Rubielos de Mora, Teruel Province, Spain; Lower Miocene, Lower Aragonian.

**Description** (Figs. 4, 5b). The body is oval, 1.76 times as long as wide; the hemelytra folded in repose have nearly parallel margins. The paranotal and hemelytral cells are large, angulate.

The head is short and wide, twice as wide as long. The bucculae are apparently weakly projecting beyond the clypeal apex. The eyes are large, quite well projecting laterad. The antennae are thickened. The shape and number of the head spines is untraceable.

The pronotum is wide, about 1.2–1.3 times as wide as long, with three longitudinal carinae. The vesicula is quite short, concealing only the occiput from above. The paranota are wide, for a considerable part of their length with two cell rows, in the widest part with a single third row cell, their outer margins broadly rounded for entire length. The posterior triangular pronotal process (as judged from its preserved apex) is not very long.

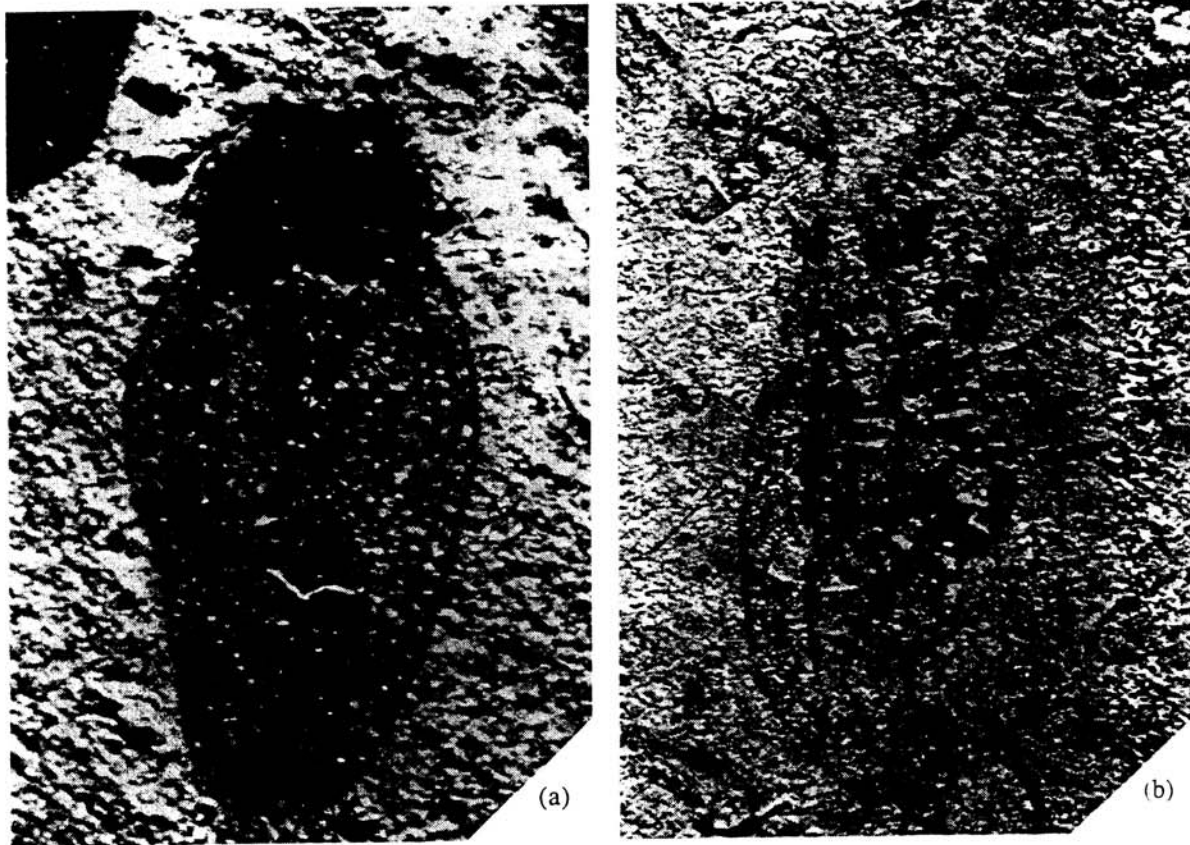


Fig. 5. New fossil Tingidae: (a) *Dictyonota petrifacta* sp. nov., holotype PIN, no. 3136/94; (b) *Derephysia penalveri* sp. nov., holotype MPV-2020-RM.

Macropterous form. The hemelytra extend well beyond the abdominal apex, clearly subdivided by raised veins Hc and R + M into the costal and subcostal areas. The vein R + M + Cu dividing the discoidal and sutural areas is of the same width as the other hemelytral veins. The costal area is wide, for most part of its length with two rows of mostly quadrangular and pentagonal cells. The subcostal and discoidal areas as judged from the three-dimensional preservation of their impression are raised roof-like together. The subcostal area is with one row of mostly quadrangular cells. The discoidal area in the distal part visible in the impression has three cell rows (the basal parts of discoidal and sutural areas is untraceable being superimposed onto the dark chitinous abdomen impression). The sutural area in the distal part has one cell row.

At the anterior margin of the IX abdominal segment there is a quite distinct impression of the small triangular sclerite, apparently the subgenital plate of female.

**Measurements.** mm: body length, 3.38, its width, 1.92; pronotum length 0.55–0.6, its width 0.7–0.72; head length from apex of projecting bucculae to posterior eye margin, 0.37, head width, 0.74 (obviously exaggerated); lengths of antennal segments I : II : III : IV = 0.13 : 0.11 : 0.76 : 0.24; length of fore tibia, ca. 0.48–0.5, of fore tarsus, 0.11, of middle tibia, ca. 0.58–0.6, of middle tarsus, 0.11.

**Comparison.** Two cell rows in paranota (with a single third row cell in the widest part) and in costal area as well as the body size relate the new species to *D. foliacea* (Fall., 1807). The fossil species is distinct at least in the shorter vesicula (in *D. foliacea* it covers almost the entire head from above).

**Remarks.** Some diagnostic characters visible in the impression confirm that the new species belongs to the genus *Derephysia* and to its nominate subgenus: the overall shape of the body, pronotum, and outline of folded hemelytra; large cells of paranota and hemelytra; moderately but clearly thickened antennae; presence of three pronotal carinae; wide paranota with outer margin entirely rounded; wide costal area; subcostal plus discoidal areas raised together; discoidal area not clearly separated from sutural one.

**Material.** Holotype.

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