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## Two new species of lace bugs from Dominican amber (*Heteroptera: Tingidae, Tinginae*)

**Abstract.** Two new species of lace bugs (*Heteroptera, Tingidae*) are described from the Oligocene-Miocene Dominican amber. They belong to two modern genera: *Leptopharsa* (*L. frater* n. sp.) and *Stephanitis* (*S. rozanovi* n. sp.). The presence of representatives of these genera in the Earliest Neogene allows to assume that most probably the general character of the distribution of the genus *Leptopharsa* and the genus *Stephanitis* points to their Gondwana origin.

**Key words:** *Heteroptera, Tingidae, Leptopharsa frater* sp. nov., *Stephanitis rozanovi* sp. nov., Dominican amber.

### INTRODUCTION

The majority of bugs from the well-known Dominican amber (Hispaniola, Greater Antilles, Dominican Republic) belong to terrestrial cimicomorphan groups (mainly *Reduviidae*) among which a few lace bugs (*Tingidae*) have been described. Unfortunately the exact age of all amber deposits is still not established and conventionally it is designated as the Upper Oligocene (30 Ma)-Middle Miocene (15 Ma) (GRIMALDI, 1995; ITURRALDE & MCPHEE, 1996).

Up till now the following three species of *Heteroptera* (*Tingidae*) from Dominican amber have been described: *Eocader babyrussus* GOLUB & POPOV (2000a) of the tribe *Phatnomini* (*Cantacaderinae*), *Leptopharsa poinari* GOLUB & POPOV (2000b), and *L. evsyunini* GOLUB & POPOV (2000b) of the subfamily *Tinginae*. Altogether 17 species from Oligocene-Miocene are known, some of which have a rather unclear systematic position (GOLUB & POPOV, 1999).

The fossil species of *Heteroptera, Tingidae* described here belong to two widespread modern genera – *Leptopharsa* STÅL and *Stephanitis* STÅL. There are a little over 100 known species of the former genus with the majority (95 species) being of Neotropical kind and with only a few known in Nearctic (8 species), Ethiopian (5 species) and Australian (2 species) regions. The genus *Stephanitis* unites over 70 species mostly in Palearctic (39 species) and Oriental (36 species) regions while the remaining ones are found in Nearctic (3 species), Neotropical (5 species), and Australian (3 species) regions. The presence of the genus *Leptopharsa* in the Oligo-Miocene of West Hemisphere and the absence of its fossil and recent representatives in Palearctic and Oriental areas proves that most probably it has been common in the Western Hemisphere and even has a Neotropical origin.

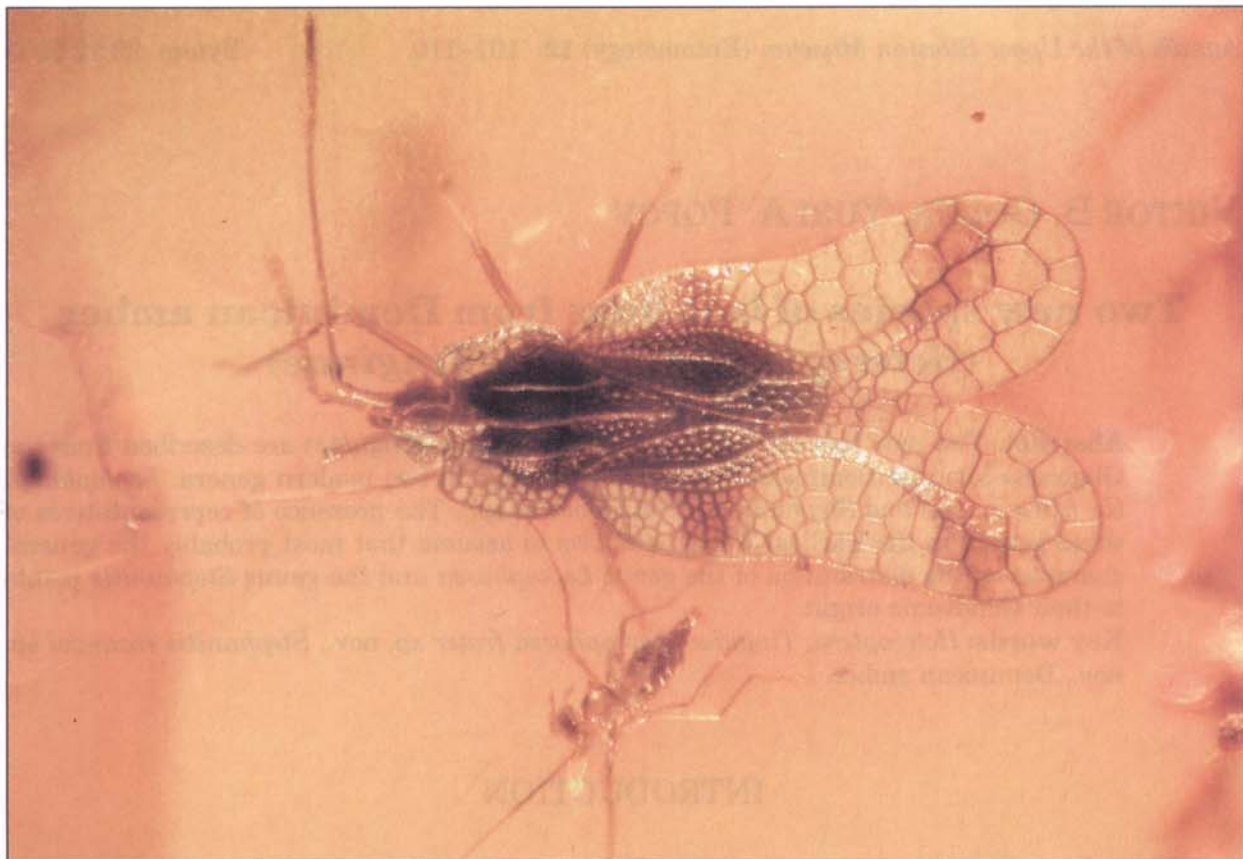


Fig. 1. *Leptopharsa frater* sp. n., dorsal view, holotype, coll. G. O. POINAR, Nr. HE 4-8E.

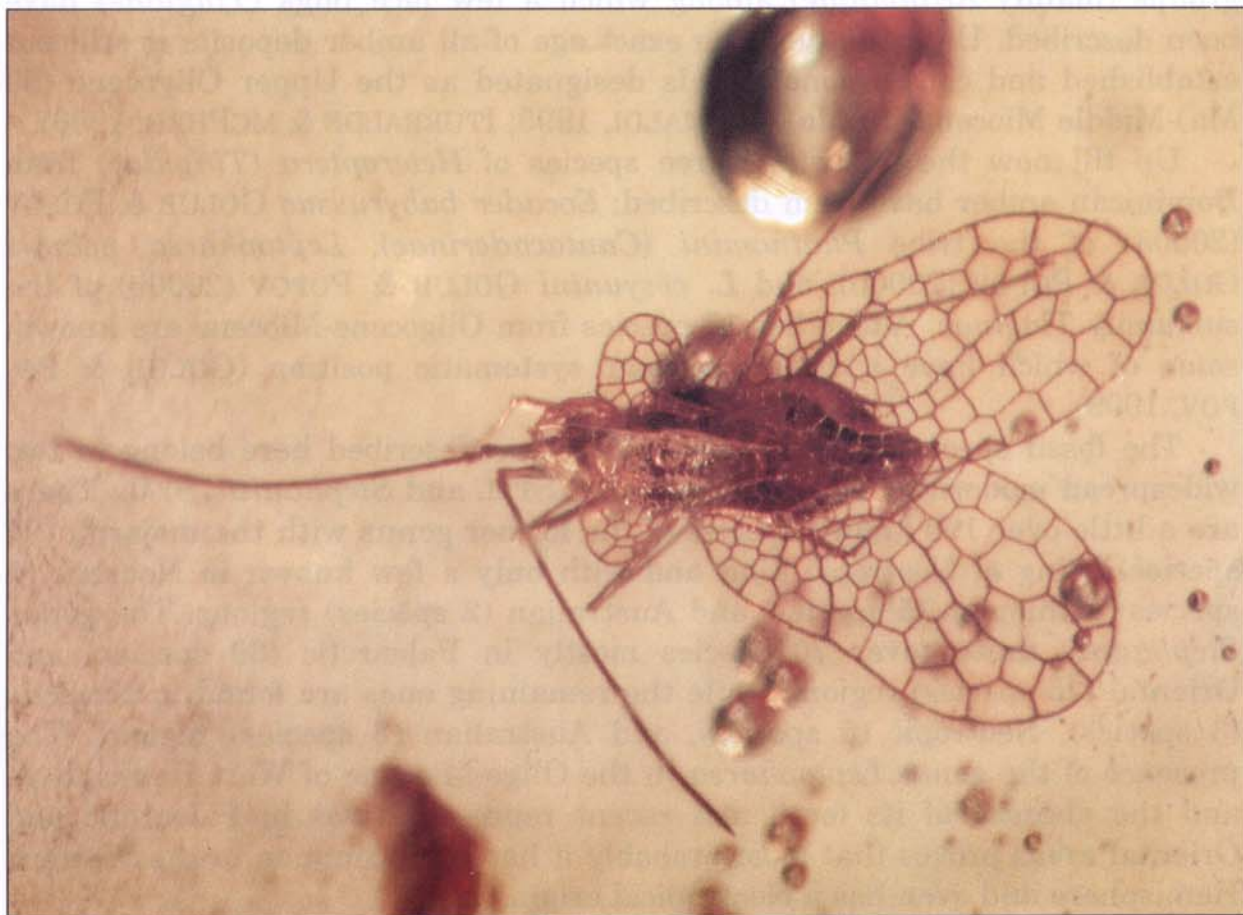


Fig. 2. *Stephanitis rozanovi* sp. n. dorsal view, holotype, coll. G. O. POINAR, Nr. HE 4-8i.

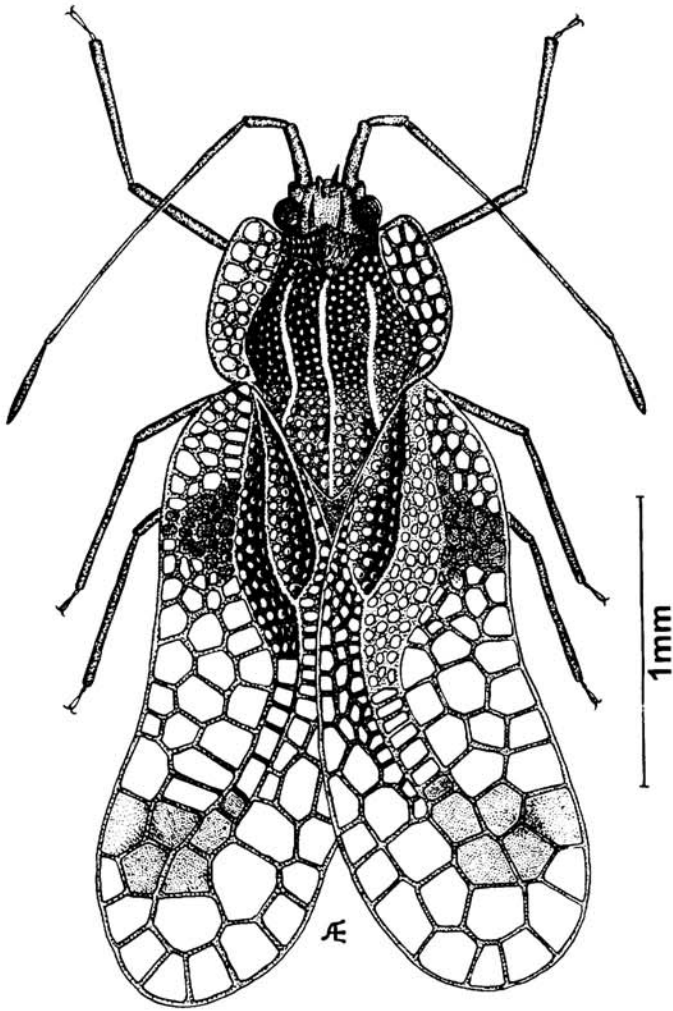


Fig. 3. *Leptopharsa frater* sp. n.,  
dorsal view, holotype.

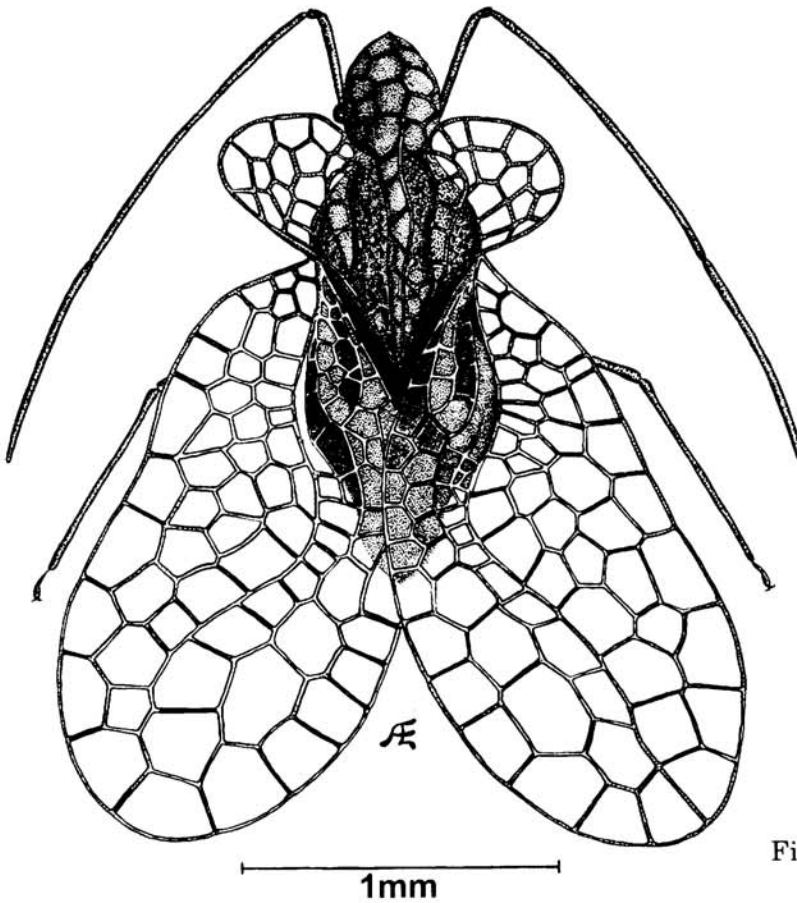


Fig. 4. *Stephanitis rozanovi* sp. n.,  
dorsal view, holotype.

The material studied is kept for the time being in the collection of Dr. Georg O. POINAR (HE) and maintained at Oregon State University, Corvallis, Oregon, U.S.A.

## SYSTEMATICS

Suborder *Heteroptera*

Infraorder *Cimicomorpha*

Family *Tingidae* LAPORTE 1832

Subfamily *Tinginae* LAPORTE, 1832

Genus *Leptopharsa* STÅL, 1873

Type species: *Leptopharsa elegantula* STÅL, 1873

*Leptopharsa frater* GOLUB & POPOV, sp. n.

(Fig. 1; Plate I, Fig. 1)

### HOLOTYPE

Male (macropterous form) from Dominican amber originating from the northern mountain range (Hispaniola); holotype catalogued under collection the code HE 4-8F.

### ETYMOLOGY

From Latin *frater* (brother).

### DESCRIPTION

Body elongate, 1.7 times as long as wide; yellowish-pale from above; cells of costal area, apical half of subcostal and sutural areas of hemelytra large, cells of paranota and other parts of hemelytra much more smaller. Head black-brown, pronotal disc fulvous, callous elevations blackish.

Head 1.7 times as wide as long, with 5 spines (three frontal and two occipital). All three frontal spines directed almost vertically upwards and projecting slightly forwards; unpaired frontal spine somewhat shorter than paired ones and bifurcated at the very apex. Occipital spines long, very thin, adpressed to head, extended the front along inner side of two thirds of eye, twice longer than unpaired frontal spine and 1.5 times longer than paired frontal spines. Bucculae weakly projecting forwards beyond clypeal apex.

Pronotal disc markedly convex and brownish, covered with large punctures; pronotum provided with three, relatively low longitudinal carinae bearing one row of minute cells conspicuously visible only at anterior ends of lateral carinae; lateral carinae S-like weakly curved. Areolate vesicula rather

small, tectiform, somewhat depressed laterally, its apex remote from apex of anterior angles of paranota, its upper margin almost horizontal. Paranota moderately wide and slightly elevated, with projecting towards and rounded anterior angles; right paranotum of holotype with three rows of cells in the widest part, left paranotum with some smaller cells of two inner rows; outer margins almost straight, right margin slightly rounded. Triangular areolate posterior pronotal process quite long, with the acuminate apex, concealing claval apices almost entirely.

#### MACROPTEROUS FORM

Hemelytra very long and extended much beyond abdominal apex, with some what diverging apices; their lateral margins in middle part distinctly sinuate about midlength, apically rounded. Vitreous hemelytra with brownish vittae at pronotal hind projecting level and distinct spot in distal part of wing. Costal area in widest part, towards for most of its length with three rows of mostly quadrangular or pentagonal cells turning larger towards apex; basal part narrowing, size of cells smaller and number of rows increases to 4-5 and decreases to 3 rows near base; costal area turning narrower towards apex, cells remain large and number of rows decreases to three, two and one at apex of hemelytra. Subcostal area in broadest place with 3 rows of rather small cells of the same size. Discoidal area flat, occupying 0.36 of hemelytron length, rather narrow, in widest part with 4 rows of small cells. Veins R+M continued into R+M+Cu of both hemelytra form X-like figure in repose. Sutural area at apical level of discoidal area with 4 rows of rather small cells; size of cells turning larger towards apex, then number of their rows gradually decreases to 2 rows.

LEGS (including femora) slender, rather long, tibiae very thin.

#### MEASUREMENTS (in mm)

Holotype; body length, 2.85; general width of hemelytra folded in repose in broadest place (near apex) 1.68 and narrowest place (outline slightly sinuate about midlength) 1.22; head length 0.21, head width 0.36; vertex width 0.16; length of antennal joints I: II: III: IV = 0.27: 0.1: 1.04: 0.43; pronotum length 0.95, pronotum width 0.83; hemelytra length 2.13, length of discoidal area 0.77; length of all femora near 0.5, of fore tibia 0.7.

#### REMARKS

New species quite similar to the recent neotropical *Leptopharsa cognata* DRAKE & HAMBLETON (1934) has been described and is known only from Brasilia.

This species, as well the Miocene species described here, have comparatively narrow paranota with weakly rounded lateral margins, hemelytra with diverging apex, concave exterior margin in the middle of their length, and with a broad costal area with large cells within the concave outer margin. R+M veins, turning backwards into R+M+C, both hemelytra when

closed in repose comprising an X-like figure. Vesicula is relatively small and not swelled into bubbles.

At the same time both species distinctly differ in a number of features. *L. cognata* has a different ratio of the lengths of frontal spines: unpaired frontal spine is very long, 2.5 or 3 times as long as the short paired ones. Occipital spines are not adjacent to the head, obliquely protruding ahead and upwards, approximately 1.5 times as short as the unpaired frontal spine. Vesicula is strongly flattened from sides with the top directed forward and upwards; the apex of vesicula is much higher than the highest point of the middle carina of pronotum (see from aside). Cells of costal area of hemelytra in its broadest place and in the front half do not differ much in dimensions. Discoidal area is groove-like and concave. Cells of the outer row of subcostal area are smaller than cells of the inner rows. The new species is also characterized by brownish color of pronotal disc, vittae and spots of hemelytrae, which are absent in two other extinct *Leptopharsa* from Dominican amber: *L. poinary* GOL. & POP. and *L. evsyunini* GOL. & POP. (GOLUB & POPOV, 2000).

### Genus *Stephanitis* STÅL, 1873

Type species: *Acanthia pyri* FABRICIUS, 1775

*Stephanitis rozanovi* GOLUB & POPOV, sp. n.

(Fig. 2; Plate I, Fig. 2)

#### HOLOTYPE

Male (macropterous form) from Dominican amber originating from the northern mountain range (Hispaniola); holotype catalogued under the code HE 4-8i.

#### ETYMOLOGY

Named after the outstanding Russian paleontologist Prof. Dr. A. YU. ROZANOV, the Director of Paleontological Institute RAS in Moscow and an old friend of one of the authors (YU. A. POPOV), for his permanent support of our paleontological investigations.

#### DESCRIPTION

Body 1.2 times as long as the maximal total width of hemelytra in repose (close to their apex). Surface is light, areolate structures glass-like, transparent, predominantly large cells with very thin veins dividing them; ventral side of body brown or dark brown.

Head dark brown, short, 1.4 times as wide as long with frontal spines which are seen through the transparent vesicula and protruding forward beyond the apex of clypeus only by two long spines converging and touching each other by apices. The presence of medial frontal and occipital sutures under vesicula covering head could not be established. Bucculae do not

protrude much beyond the apex of clypeus; they converge towards the front and practically touch each other by their apices. Rostrum rather short reaching about middle of third abdominal sternite. Antennae bare, long and very thin, their 3<sup>rd</sup> joint is 1.46 times as long as the 4<sup>th</sup> one.

Pronotum is with well developed, rather long hind triangular projection overlapping the inner basal parts of hemelytra, so clavi are not seen from above. Vesicula is bubble-like, high, almost fully covering head from above with only laterally protruding eyes and tops of bucculae seen. In the broadest part of vesicula in transverse direction, on each side from the middle line to the bottom, there are 5 cells that diminish outwards. Some veins of vesicula have extremely short light bristles. The boundary between vesicula and the median carina of pronotum with rather deep emargination. Paranota are broad, strongly protruding on the sides of pronotum, slightly uplifted, with strongly rounded lateral margins. In the broadest part of the holotype the right pronotum has 3 rows of cells, the left one – with one more cell in the 4<sup>th</sup> row. Pronotum with 3 rows of cells; median carina very high, in the greater part of its length with 2 rows of cells, close to the apex – with 2 cells of only one row; the upper margin of carina is hump-like, its upper point is on the same level as the upper point of vesicula; lateral carinae of pronotum approximately 2.5 times lower than the median carina, the highest ones in the frontal third of their length gradually lowering backwards. Metathoracic scent glands openings with small distinct, elevated peritreme (evaporatory area) of oval form.

Hemelytra strongly diverge backwards, their outer margins significantly emarginated about midlength. Costal area of hemelytra in median part of its length very broad, in holotype in its broadest part the right hemelytron with 4 rows of cells, the left one – with one more cell of 5<sup>th</sup> row. Cells of costal area mainly large, quadrangular or pentagonal. Subcostal area rather narrow, at base with single row of cells, at the level of discoidal area and at some distance from it with 2 rows of cells, in posterior half of it – with one row of rectangular cells enlarging towards apex. Discoidal area very short and narrow, occupying only 0.3 of hemelytron length, in holotype in its right and widest part with 2 rows of cells, in the left one – with one more cell in 3<sup>rd</sup> row. Subcostal and discoidal areas not strongly elevated. R + M veins of both hemelytra turn into R+M+C and when hemelytra are closed in repose they comprise X-like figure. Sutural area gradually and strongly widened from base to apex: from base and at approximately 3/4<sup>th</sup> of the length of discoidal area with 1 row of cells of a rectangular form, further backwards and up to the top of hemelytra – with 2 rows of cells of predominantly pentagonal form; the dimensions of cells increase towards apex. Cells on the top of hemelytra are very large.

Legs, including femora, thin and rather long.

#### MEASUREMENTS (in mm)

Body length 2.45 (from clypeal apex to hemelytra apex) and 2.52 (from frontal spine apices to hemelytral apex); width of hemelytra closed in repose

(near their apices) 2.05; length of antennal joints I : II : III : IV = 0.36 : 0.07 : 1.04 : 0.71; pronotum length 1.06, width 1.04; vesicular length 0.36, width 0.33; pronotum median carina length 0.7; pronotal disc width 0.56; hemelytra length 1.81, discoidal area length 0.54; length of foreleg segments: femur 0.43, tibia 0.64; middle leg: femur 0.57, tibia 0.64; hind leg: femur 0.57, tibia 0.74, tarsus 0.13.

#### REMARKS

All features of the new species indicate that it belongs to the genus *Stepanitis*: hemelytra and cell structures of pronotum are glassy and transparent, the cells are large; bucculae converge to the front and are practically closed, hence the place where rostrum is attached is not seen from the front; scent-gland openings with well expressed peritreme; antennae long and thin, especially it is true of the third long joint; the first joint is also rather long, and the ratio of the lengths of antennae joints is quite characteristic of the modern species of this genus; vesiculars is ballooned; median carina of pronotum very high with rather large cells; discoidal and subcostal areas form a roof-like hill. Judging from the general form of body, hemelytra strongly diverging backwards with large cells and wide costal areas; x-like figure formed by R+M veins changing over to R+M+Cu, and the presence of 3 carinae of pronotum, as well as wide and strongly rounded paranota, the new species is rather close to the recent neotropical *S. (Stephanitis) olyrae* DRAKE & HAMBL. and *S. (S.) farameae* DRAKE & HAMBL. (DRAKE & HAMBLETON, 1935), which have been described and known only in Brazil.

However, the new Miocene species presented here are rather distinct from both described neotropical species. In particular, *S. olyrae* is much bigger: body length is 4.4 mm, width – 3 mm. Besides that, contrary to *S. rozanovi*, in *S. olyrae* antennae are covered by rather thick and long hairs, costal area is broader and in the widest place has 5 or 6 rows of cells, the exterior margin of hemelytra is not emarginated, the hind rectangular projection of pronotum rather short and it does not fully cover the basis of hemelytra from above.

*S. farameae* is also somewhat bigger than *S. rozanovi*: 3.22 mm, antennae with rather thick hairs, vesicula compressed laterally, posterior projection of pronotum short, costal area of hemelytra in its broadest part with 5 or 6 rows of cells.

#### DISCUSSION

The large genus *Leptopharsa*, whose modern fauna includes over 100 species, is mainly represented in the Neotropical zoogeographic region (DRAKE & RUHOFF 1960; 1965). There are no less than 95 species. Approximately 8 species even penetrate Nearctic. Moreover, 5 species have been described from the Ethiopian and 2 from Australian regions. Thus, most probably the general character of the genus distribution points to its Gondwana origin.



The findings of 3 fossil species from the earliest Neogene in Dominican amber also indicate that such distribution is ancient. The fact that of five species (all belonging to modern genera), described from Dominican amber, three belong to *Leptopharsa* allows to come to the conclusion that Neotropic represented by itself one of the centers of species diversity and probably of the species formation of this genus. The formation of this center has begun presumably in Late Oligocene and continues till present.

As for the large genus *Stephanitis*, the south-east of Palearctic (about 40 species) and the Oriental (not less than 35 species) Region are the present territories of its species formation. And here one should note that in the west and central parts of Palearctic only 4 species are found within its subboreal and subtropical belts and only one species – in the boreal belt. In other zoogeographical areas there are a few species as well: in Nearctic – 3, in Neotropic – 5, and in Australia – 3 (and of the latter two species might have been imported). The genus is completely absent in the Ethiopian region.

The presence of the genus *Stephanitis* in the early stages of Neotropic and the wide exchange of fauna between continents in Paleogene shows that it has existed on the continent – a fragment of Gondwana since ancient times. The absence of any plesiomorphic features in the Miocene *S. rozanovi* and its closeness to the modern species of the genus indicate that *Stephanitis* has undoubtedly originated in Paleogene. In the modern fauna of the southeast of Palearctic and the east of Oriental Region one can see considerable interspecies differences and representation of all the three subgenera of it. Most probably there was a long period when these two adjoining territories in the southeast of Eurasia served as a center of species formation that did not change much since the Tertiary period of climatic and biocenotic conditions. It is this center of special richness and species formation that has most probably served and continues to serve as a source for further introduction of species of *Stephanitis* fauna not only to other territories of Eurasia, but also to other continents.

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