

Cantacaderid lace bugs from the Baltic Amber (Heteroptera: Tingidae, Cantacaderinae)

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With 2 plates and 9 text-figures

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Abstract

New fossil representatives of the tingid bug subfamily Cantacaderinae are described from the Baltic amber (Eocene): *Paleocader strictus* n. sp. (Cantacaderini), *Sinalda froeschneri* n. sp., *Intercader weitschati* n. gen. n. sp., *Tingicader cervus* n. gen. n. sp. and the 5th nymphal instar of *Tingicader* sp. prop. *cervus* (Phatnomini). *Paleocader* FROESCHNER and *Sinalda baltica* (DRAKE) are redescribed. Intraspecific variation of a number of external characters is demonstrated for *Paleocader strictus*. The evolution of the ostiolar-stenocostal system is discussed. A key for genera and species of the Cantacaderinae known until now from the Baltic amber is presented.

Zusammenfassung

Einige neue fossile Vertreter von Gitterwanzen (Fam. Tingidae, Subfam. Cantacaderinae) werden aus dem Baltischen Bernstein (Eozän) beschrieben: *Paleocader strictus* n. sp. (Cantacaderini), *Sinalda froeschneri* n. sp., *Intercader weitschati* n. gen. n. sp., *Tingicader cervus* n. gen. n. sp. und das 5te Larvenstadien von *Tingicader* sp. prop. *cervus* (Phatnomini). Von *Paleocader* FROESCHNER und *Sinalda baltica* (DRAKE) wird eine Neubeschreibung erstellt. Auf die intraspezifische Variationsbreite einiger Strukturmerkmale von *Paleocader strictus* n.sp. wird hingewiesen Die Evolution des ostiolar-stenocostal System wird diskutiert. Ein Bestimmungsschlüssel für alle bisher bekannten Gattungen und Arten der Cantacaderinae aus dem Baltischen Bernstein wird erstellt.

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I. Introduction

Tingids, or lace bugs, are a cosmopolitan family of cryptic cimicomorphan bugs which are mainly characterised by the areolate reticulations of the pronotum and the hemelytra, the absence of ocelli, the 4-segmented long rostrum, the subvertical clypeus, the well developed hypocostal lamina of hemelytra, the thoracic sternum with a conspicuous groove, the 2-segmented tarsi with small setiform parempodia, the symmetrical male genitalia and the laciniate ovipositor.

The recent family Tingidae comprises two subfamilies, the Cantacaderinae and the Tinginae, counting more than 250 genera with approximately 2000 species. There is another small neotropical tingoid group which was described as a separate family Vianaididae (KORMILEV, 1955), whereas most later heteropterologists have recognised it on a subfamily rank only. At present time the authors are studying a new tingoid bug from the Upper Cretaceous amber of New Jersey (USA) the main features of this tingid show that it can be placed within the vianaidid bug group as a distinct family (GOLUB & POPOV, in press).

The recent subfamily Cantacaderinae is represented by 35 genera, with 135 species, which are distributed worldwide except North America (FROESCHNER, 1996). *Phatnoma* is the only genus which occurs in both, Eastern and Western Hemisphere (DRAKE, 1950; FROESCHNER, 1996). Most of the recent species are distributed in the tropical and subtropical areas and only the genus *Cantacader* occurs in palearctic regions and it is restricted to the Old World.

Fossil tingids are quite rare among fossil bugs, especially in the mesozoic heteropteran faunas. Their significance is, moreover, greatly increased by the fact that the earliest known members of the extinct Tingidae from the Lower Cretaceous of Mongolia and Transbaikalia and from the Upper Cretaceous of Kazakhstan belong to the cantacaderid tribe Phatnomini (POPOV, 1989), most probably the initial group of the Tingidae. Most of the other fossil tingids are described and mentioned from the Cenozoic of North America (Oligocene, Frorissant, Colorado, U.S.A.) and West Europe (Upper Eocene, Gurnet Bay, Isle of Wight, England; Oligocene, Aix-en-Provence, France; Oligocene, Cereste, Liberon Provence, France; Miocene, Oeningen, Baden, Germany; Miocene, Krotensee, Bohemia, Czech; Miocene, Radoboj, Croatia). A complete list of all fossil tingids is published by A. NEL (1992). It is necessary to add one more tingid described from the Middle Miocene sediments (Shanwang formation) of Western China (Shandong Province) and referred to the modern genus *Agramma* (ZHANG, 1989).

Among the known cenozoic fossil tingids only three species have been described from fossil resins, all from the Eocene Baltic amber and all belonging to the Cantacaderinae: *Paleocader quinquecarinatus* (GERMAR & BERENDT, 1856), *Paleocader avitus* (DRAKE, 1950) and *Sinalda baltica* (DRAKE, 1950). It seems that the most common tingids in the Baltic amber are species of the genera *Paleocader* and *Sinalda*, some inclusions of which are spread among different state and private collections.

II. Systematic descriptions

II.1. Evolution of the ostiolar–stenocostal system (based on FROESCHNER, 1996)

The ostiolar-stenocostal system of the Cantacaderini and its functionality in the transport to the ventral surface of the hemelytra fluid of the internal scent glands have been

described by FROESCHNER (1968; 1996). The essence of this system is as follows: in the process of evolution, a morphological-functional link is established between peritreme (the evaporatory area of the scent-gland opening on the metathorax surface) and the ventral groove-like surface of stenocostal area, formed in Cantacaderini by veins C and Sc. According to FROESCHNER (1996), in Tingidae, in a number of cases, the vestibular duct of scent gland extends laterad. As a result, the pore is located at the edge of the hypocostal lamella of hemelytron. And here the metapleural surface is more laterad than the pore and maybe modified into the so called peritreme. The latter may be either vague or exhibiting a variety of discrete forms. It may look like a trough formed by two closely set parallel or slightly diverging carinae. In the other instance, the veins (or to be more precise, carinae) limiting peritreme are elevated and form an apically closed loop near by or somewhat above the ventral edge of the hypocostal lamina. FROESCHNER (1996) distinguishes three levels of complication of the ostiolar-stenocostal system in the tribe Cantacaderini (in which, contrary to Phatnomini, this system is well developed). In cases, when the system is least developed, its stenocostal part is presented only by a trough across the hypocostal lamella between two thickened subbasal veins of hemelytra just opposite the apex of peritreme when the wings are calm and folded, for instance, in genus *Carldrakeana* FROESCHNER R. In the next stage of complexity of this system, the trough across the hypocostal lamella joins a similar trough formed by the outmost (from the medial line) row of cells on the ventral surface of the costal area between the thick vein C and the thickened Sc (for instance, *Cyperobia* BERGR.). The most complicated stage, according to FROESCHNER, is enhanced by a dorsally distinct differentiation of the outmost row of costal area cells separated by a thickened subcostal vein in the form of a stenocostal field (for instance, *Cantacader* AM. & SERV.). FROESCHNER believes that such interfunctionality structures on two body segments - scent gland peritreme and stenocostal area of wing (metathorax organ) - must be under a multiple gene control and cannot be easily duplicated. All this allows us to consider the Cantacaderini tribe to be a monophyletic group.

In the first description of *P. avitus* (DRAKE, 1950) and in its redescription by FROESCHNER (1996), with the separation of a new genus *Paleocader*, the structure of the ostiolar-stenocostal system could not be described because of the presence of a non-transparent spot around the holotype. However, on the basis of the well seen stenocostal area from above, FROESCHNER concluded that the peritreme, at least in this species, must be well developed and comprises a part of the ostiolar-stenocostal system.

The holotype of *P. strictus* n. sp. is clearly seen from the ventral side, which allowed not only to describe (see above) the ostiolar-stenocostal system of this species (a correspondingly genus *Paleocader* due to a great closeness of *Paleocader strictus* to *P. avitus*), but also to compare its specific features directly concerning the metathoracic peritreme in the fossil genus *Paleocader* (Fig. 3) and the recent one - *Cantacader* (Fig. 4). Of the last genus two species *C. quadricornis* (LEP. & SERV.) (type species) and *C. afzelli* STAL (South Africa) have been studied.

As noted above, when describing the species it was discovered that the peritreme in *P. strictus* n. sp. is narrow, limited from the front and the back by low carinae representing by itself correspondingly an uplifted back margin of epimere of mesothorax and episterne of metathorax (Fig. 3). In the representatives of genus *Cantacader* studied by us the peritreme (Fig. 4) is clearly sunk into the cover and is broader than in *P. strictus* f. *adentatus*. And here from the back margin of the epimerite of the mesothorax is separated backwards a small part of cover with a crest forming the anterior wall of the peritreme. Its posterior wall is a carina

located somewhat behind the anterior margin of the metathoracic episterna. The anterior and posterior walls of the peritreme are dome-like, covering the surface of the peritreme as two folds, but not completely. Thus, the low open peritreme located on the front margin of the episterna of the metathorax in *Paleocader* and covered ("protected"), the peritreme slightly shifted backwards in *Cantacader* can evidently be considered as two evolutionary states (more or less advanced) of this structure. Both states refer to the higher stage of complication of the whole ostiolar-stenocostal system of Cantacaderini. In a similar way one may probably consider the narrow, especially in front, stenocostal area in *Paleocader* (Fig. 3) and broad one in *Cantacader* (Fig. 4) as more or less advanced states of this system.

II.2. Systematic descriptions

Suborder Heteroptera

Infraorder Cimicomorpha

Family Tingidae LAPORTE, 1832

Subfamily Cantacaderinae STAL, 1873

Tribe Cantacaderini STAL, 1873

Genus *Paleocader* FROESCHNER, 1996

Type species: *Cantacader avitus* DRAKE, 1950

Diagnosis (after FROESCHNER, 1996, with some changes and additions) : Rather large, ca 4 mm. Body oblong-oval. Head with 4 spines: 2 jugals and 2 frontals; moderately short, preocular part equal to vertex width; eyes large, globular, strongly projecting laterally of head, its width almost equal to a half of vertex width. Pronotum without areolate inflated cyst, anterior margin concave, pronotal disc with 5 longitudinal carinae, 2 lateral carinae interrupted at calli; posterior margin without distinct triangular posterior projection; scutellum completely or almost completely exposed, latter very small, triangular. Lateral margins of paranota and hemelytra without spines and denticles or only paranota with one very small denticle at lateral angles of pronotum. Hemelytra with very distinct stenocostal area, presented on ventral side by a narrow groove closed in repose of folded wings by its open front edge, with distal open edge of scent gland peritreme; whole peritreme surface open and limited in front by a carinate uplifted posterior edge of mesothoracic epimerite and from behind by same carinate anterior edge of metathoracic episterna; with a well developed ostiolar-stenocostal system. Clavus distinctly separated from mesocorium by a fracture, large, triangular and merging with each other by their inner straight margins forming claval commissure.

Paleocader avitus (Drake)

- 1950 *Cantacader avitus* DRAKE, 1:161.
- 1960 *Cantacader avitus*: DRAKE & RUHOFF, 112: 11
- 1965 *Cantacader avitus*: DRAKE & RUHOFF, 243: 24
- 1988 *Cantacader avitus*: SPAHR, (B)144:
- 1992 *Cantacader avitus*: NEL, 5: 102
- 1996 *Paleocader avitus*: FROESCHNER, 574: 14

Paleocader quiquecarinatus (GERMAR & BERENDT)

- 1856 *Tingis quiquecarinatus* GERMAR & BERENDT, 2: 23-24
1890 *Eotingis quiquecarinata*: SCUDDER, 13: 357, 359
1921 *Tingis quiquecarinata*: COCKERELL, 8: 542.
1960 *Cantacader quiquecarinatus*: DRAKE & RUHOFF, 112: 10
1965 *Cantacader quiquecarinatus*: DRAKE & RUHOFF, 243: 27
1978 *Tingis quiquecarinata*: LARSSON, 1: 72
1982 *Eotingis quiquecarinata*: KEILBACH, 29: 228
1988 *Cantacader quiquecarinatus*, SPAHR, (B), 144: 15
1988 *Eotingis quiquecarinata*: SPAHR, (B), 144: 15
1988 *Tingis quiquecarinata*: SPAHR, (B), 144: 16
1992 *Cantacader quiquecarinatus*: NEL, 5: 102
1996 *Paleocader quiquecarinatus*: FROESCHNER, 574: 14-15

Paleocader strictus n. sp.

These species are described until now from the Baltic amber.

Paleocader strictus n. sp.

(pl. I, fig. 1, 2; text-figs. 1-3)

H o l o t y p e : Male from Baltic amber (plate I, fig. 1, text-fig. 1); Coll. Bayerische Staatssammlung für Paläontologie und Historische Geologie, München (Coll. BACHOFEN-ECHT); Nr. 0.130.

D e r i v a t i o n o m i n i s : From *strictus* (lat.) = narrow.

S t a t e o f p r e s e r v a t i o n a n d a c c o m p a n y i n g f o s s i l s : The holotype is well preserved in a clear piece of amber (3.5 cm x 2.0 cm); only in a small part of the dorsal side some structures are obscured by an air bubble. In addition to the tingid the piece contains a spring tail, a mite and lot of stellate hairs.

P a r a t y p e s : Two females from Baltic amber (text-fig. 2-3); Coll. M. KOTASHEVICH, Kaliningrad ; Nr. 14/3 and 14/8.

D e s c r i p t i o n : Rather large, body-length about 4 mm. Generally oblong, female oblong-oval: male 2.22 times longer than wide, females 2.08-2.11 longer than wide. Head, from above, strongly rugous punctuate, relatively weakly elongate; male 1.14 times and female 1.1 times as wide a long (in view of bucculae protruding beyond clypeal tip); moderately elongate in front of eyes; antecular region equal to vertex width, 2.07- 2.19 times shorter than head width and 1.62-1.75 times longer than eye width. Eyes large, strongly protrude laterally; from above almost globular; vertex of male 1.62 times and female 1.72 times wider than eye. Head with 4 long tapering spines, a jugal and a frontal pair, projecting oblique toward and upward and slightly diverge (especially in two specimens). All spine lengths nearly equal about 0.29 mm. Frons and vertex almost flat; frons gradually proceeds to clypeus base, dorsal surface of which in basal half almost horizontal and in distal part smoothly decurved. Bucculae distinctly protruding towards beyond apex of clypeus, converging and not touching each other. Antenniferous tubercles straight, cut at the top, with an external hooklike pointed inside (incurved) tubercle. Antennae thin, 3rd joint very long: 3.78 times (male) or 3.0-3.2 times (females) longer than head wide; 4th joint clavate, covered with delicate hairs, apical part darker.

P r o n o t u m (text-figs. 1-2) relatively short and moderately wide (relation length/width about 1.0 -1.23), rather strongly narrowing from humeral angles of posterior lobe to anterior

margin: relation between maximum width (at humeral angle level) and width of anterior margin 2.23 (male) and 1.91-2.14 (females). Head 1.11-1.23 times wider than anterior margin of pronotum. Pronotal disc convex, strongly rugose and deeply punctate; anterior pronotal lobe (in front of disc) smoothly raising upward, covering with deep, fine, rounded and irregular shape cells; cell size approximately equal or slightly larger to diameter of discal punctation. Anterior margin concave. Pronotum with 5 longitudinal carinae; median carina and two inner lateral ones pass along the full pronotum length, lateral carinae interrupted at the level of callous disc elevation; another pair of outer lateral carinae (suprahumeral) much shorter stretching from posterior margin of pronotum forward, i.e. holotype (male) and

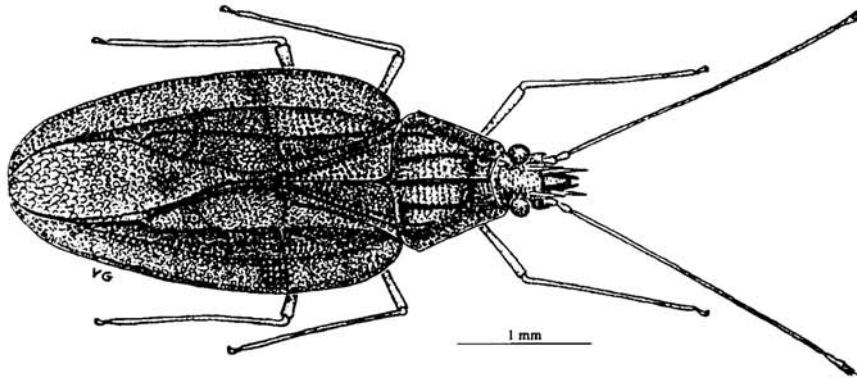


Fig. 1: *Paleocader strictus* n. sp. Holotype; male from Baltic amber; Coll. Bayerische Staatssammlung für Paläontologie und Historische Geologie, München (BACHOFEN-ECHT); Nr. 0.130.

one female approximately by one third of pronotum, in another female (forma *adentatus*) - by one third of the length; lateral carinae very weakly S-like curved or practically straight, suprahumeral carinae of holotype and of one female (forma *adentatus*) shortened and straight; median and lateral carinae with one row of small but clear-cut cells; cells of the suprahumeral carinae rudimentary, hardly visible. Paranotum moderately wide, in frontal half with three rows of small cells or with one more cell of the fourth row (better seen from beneath), backwards narrowing and at level of humeral angles in holotype and in one female with two rows of cells while in other female (forma *adentatus*, fig. 2 with one row; in male external edge of paranota straight, in both females slightly S-like curved; in holotype (male) and in one female outer edge of paranota at level of lateral angles of pronotum - with one very small angle-like protrusion (denticule), in female (forma *adentata*) absolutely smooth without denticules. Posterior edge of pronotum more or less rounded without a pronounced triangle projection or with an extremely insignificant one leaving open a very small triangular scutellum, except of the very base.

Macropterous form in all three studied specimens, both pairs of wings protrude far backwards beyond top of abdomen. Hemelytra at base gradually and slightly broadening towards top, with small cells; cells of costal area and of apical half of sutural area somewhat larger than cells of rest of hemelytra. Stenocostal area almost vertical, narrow especially at the base of hemelytra and not distinctly separated from costal area from above by vein Sc, slightly protruding from above only in back half, along whole length with one row of very small cells, which in front half of hemelytra (seen from above) like very small punctuation dots; in base of hemelytra veins C and Sc from above practically not differentiated and from below well pronounced and protrude rather far but located near to base of hemelytra very close to each other. Costal area broad, in broadest place (closer to the base) with 6 rows of

cells or with single cells of the 7th row, in greater part of length with 5 or 6 rows, in female (forma *adentatus*) in narrowest place (in the front third of length, closer to its middle) on short stretch even with 4 rows; approximately in middle of length, costal area crossed by broad brown belt with washed out edges. Subcostal area slightly slanting, in broadest place in holotype (male) with 6 and in both females with 7 rows of cells or in addition with single cells of 8th row at a distance of approximately one third of length of hemelytra, from its base area crossed by a sharply protruding transverse vein; moreover, rather weakly expressed, but more or less evident 1 or 2 transverse veins located backwards of subcostal area (the most backward of them is least well expressed than the others). Discoidal area stretching

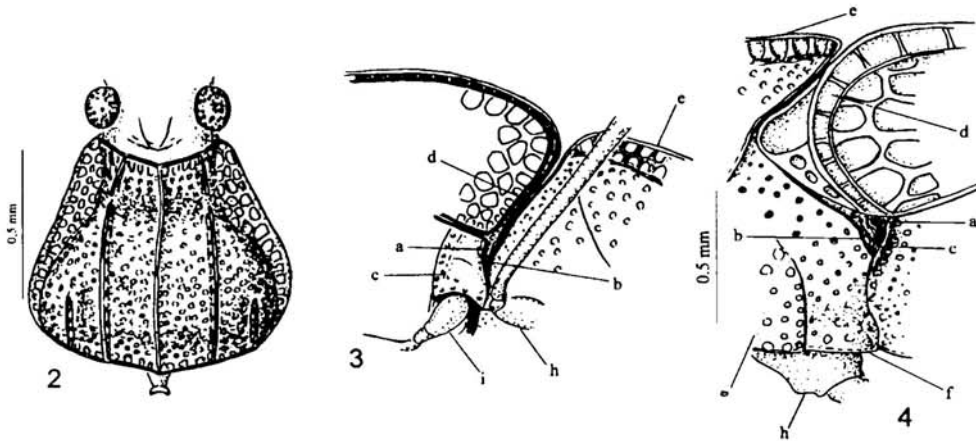


Fig. 2: *Paleocader strictus* forma *adentatus*, *paratype*, female from Baltic amber; Coll. M. KOTASHEVICH (Kaliningrad), Nr. 14/3; Pronotum, dorsal view.

Fig. 3: *Paleocader strictus* n. sp; holotype, Ostiolar-stenocostal system (right side, lateral view). a - peritreme of scent gland; b - elevated posterior margin of mesepimerite; c - elevated posterior margin of metepisternite; d - stenocostal area; e - stenocostal area; f - mesepimer; g - mesepistern; h - middle coxa; i - hind coxa.

Fig. 4: *Cantacader quadricornis* (LEP. & SERV.) (recent). Ostiolar-stenocostal system.

long towards apex of hemelytra by 0.65-0.72 of its length, in broadest place — with 7 rows of cells, crossed by 2 protruding transverse veins, first of them located slightly frontal of the front transverse vein of subcostal area, while 2nd is located approximately at level of the second transverse vein of subcostal area. Vein R+M limiting discoidal area from outside with weak breaks in the places of fusion with transverse veins; from behind, closed to place of merging with Cu vein R+M protrudes significantly weaker than on rest of its length. Vein Cu also with slight breaks in the places of fusion with it of transverse veins of discoidal area, inner (claval) area along clavus from base of latter and up to its top equally narrow with one row of cells; at level of front transverse vein of discoidal area, slightly broadening and here with 2 rows of veins, which in female continue backwards beyond top of cuneus, while in male again comes down to 1 row; at some distance backwards from top of cuneus, membrane gradually, but rather strongly, broadens and in the broadest place with 10 or 11 rows of veins. Clavus big, clearly separated from mesocorium by commissura, triangular with broad base and 5-6 longitudinal rows of veins; number of rows of veins diminishes in direction to top; outermost row of veins separated from others by a protruding vein parallel to the external edge of clavus.

Rostrum long, its top reaching posterior margin of 4th abdominal sternite or slightly going beyond it from behind. Bucculae long, almost reaching posterior edge of head, at

greater part of its length almost parallel, near its posterior margin significantly diverging and strongly broadening backwards (see slantly from the side and from beneath), curving outward in form of broad, areolate plates, reaching with external edges lower margin of eyes, in very small cells as punctuated dots, which in broadest place (from behind) are located in 6 rows. Surface of prothorax from below small-celled (in form of punctuated dots); prothoracic plates limiting rostrum from sides low, with 1 row of small cells. Covers of mesothorax are punctuated (dots of punctation similar to cells of prothorax, but smaller); part of covers closer to the median line smooth and darker than rest punctuated part of surface of mesothorax. Covers of metathorax also punctuated and punctuation close to hind coxae strongly smoothed. Parts of covers forming edges of all the three pairs of coxal cavities slightly cover the base of coxae. Meso- and metasternal bucculae lowering towards their anterior and posterior edges, converge from each side, forming a single meso- metasternal plate by one row of small cells; plates slightly diverge towards back.

Ostiolar-stenocostal system (terminology according to FROESCHNER, 1996) well developed (text-figs. 3-4). Peritreme (evaporatory area of scent-gland opening) developed as narrow trough cutting anterior margin of metapleurite, limited from front and back by very low carinae, significantly diverging outwards; thus peritreme broadens to its outer margin. Carina limiting peritreme in front, with slightly uplifted posterior edge of epimerite of mesothorax preserving traces of punctuation; carina limiting peritreme from behind - with uplifted anterior edge of episterne of metathorax. Thus, peritreme located in fact at border of meso- and metapleurites. There described trough-like peritreme, when wings overlapping in repose, joins its open external edge to a trough similarly opened in front which is ventral surface of stenocostal area. Extremely low carinae limiting peritreme and practically covering it from above: peritreme open and narrow. Stenocostal area very narrow at bottom, but clearly limited by strongly protruding veins C and Sc; closer to base, veins located, as noted above, very close to each other, forming a very narrow trough. Location of ostiolar-stenocostal system in scheme of evolutionary transformations of ostiolar-stenocostal system proposed by FROESCHNER (1996), allowing to specify it, is described in "Evolution of the ostiolar-stenocostal system" (see above).

Femur and tibia of all pairs of legs are long, femura rather thin and slender. Tarsi short.

Dimensions in mm: Body-length from apex of hemelytra 3.88 (male) and 4.0-4.22 (females), width 1.75 (male) and 1.95-2.0 (females); length of head from posterior margin of eyes to clypeus apex 0.44 (male) and 0.5 (female); bucculae protruding forward beyond clypeus tip by 0.03-0.06, thus complete head length 0.5 (male) and 0.54-0.56 (females); length of anteocular part (from anterior margin of eyes to apex of bucculae 0.31 (male) and 0.32-0.34 (females); width of head 0.57 (male) and 0.58-0.61 (females); width of vertex 0.26 (male) and 0.28 (female); width of eye 0.155 (male) and 0.14 - 0.165 (females); length of head spines 0.29; ratio of antennomeres 1-4 0.125: 0.11: 2.18: 0.275 (male) and 0.13: 0.1: 1.78-1.8: 0.21 (females); pronotum length 0.88 (male) and 0.95-1.04 (females), maximum width 1.08 (male) and 1.03-1.1 (females); width of anterior margin of pronotum 0.57 (male) and 0.5-0.56 (females); maximum width of costal area at base of hemelytrae 0.32 (male) and 0.36-0.37 (females); width of costal area at middle part of its length 0.29 (male) and 0.29-0.3 (females); maximum width of discoidal area 0.28 (male) and 0.33-0.34 (females); length of discoidal area 1.97 (male) and 2.07-2.1 (females); rostrum length 1.07-1.2; length of femora: fore 0.78 (male) and 0.84 (female), middle 0.78 (male) and hind 0.97 (male) and 0.84-1.07 (females); length of tibiae: fore 1.37 (male) and abt. 0.9 (female), middle abt. 1.2, (male) and 0.86 (female) and hind 1.36 (male) and 1.38 (female).

C o m p a r i s o n : The described new species can be assigned to the genus *Paleocader* by all its main features: the narrow but well expressed (especially ventrally) stenocostal area separated from the rest of the hemelytra by a subcostal vein strongly

protruding from beneath (text-fig.3-4); the absence of an expressed posterior projection, resulting in an open (except the very base) scutellum; the absence of a well expressed and the longer spines and protrusions on the lateral margins of the paranota and the hemelytra (except a very small denticle on each of the paranota of the male holotype and one female paratype, Nr.14/8); the 5 carinae (text-fig.2) on pronotum, the lateral ones of which are interrupted in the place of a callous disc elevation; the costal area, gradually broadening from the base having in the broadest place not more than 6 rows of cells and the contour of the hemelytra continuing the contour of the pronotum; a relatively short head, preocular part of which is approximately 2.1-2.2 times shorter than the width of head and only 1.62-1.72 times longer than the width of the head.

The new species is closely related to the type species of genus *P. avitus* (DRAKE, 1950), a detailed description and a high-quality drawing of which were done by FROESCHNER (1996). *P. strictus* n. sp. differs from *P. avitus* by a pronotum narrowing forward rather strongly (maximal width of it at the level of its lateral angles is 1.91-2.23 times greater than the width of its anterior margin), and here the head is slightly (1.11-1.23 times) broader than the anterior margin of the pronotum. In *P. avitus*, judging by the drawing in the first description (DRAKE, 1950; fig.3), the maximal width of the pronotum is approximately 1.5-1.6 times greater than the width of its anterior margin, and judging by a more detailed drawing of the redescription of the species (FROESCHNER, 1996, fig.10), this ratio comprises only 1.3-1.4 times: in accordance with the drawing of the first description, the anterior margin of the pronotum is 1.1 times broader than the head, while after the drawing of FROESCHNER it is 1.3 times broader; in any case the head of *P. avitus* is narrower than the anterior margin of the pronotum. The discoidal hemelytron area in *P. strictus* has 7 rows of cells in the broadest place (in male and female), while in *P. avitus* there are 5-6 rows (FROESCHNER, 1996: 13); moreover, judging by both drawings of *P. avitus*, the discoidal area in this species is not only more narrow but also shorter than in *P. strictus*. The 3rd joint of the antenna is clearly longer in the new species than in *P. avitus*. Although in both descriptions of this species the size of the antennae are not given, it is clearly shown in a reconstructed form, i.e. with their natural length with the 3rd joint of antenna twice as long as the width of the head. In *P. strictus* it is 3 times longer. The bucculae of *P. avitus* in front are almost fused (FROESCHNER, 1996), and according to DRAKE (1950)- are even fully fused; in *P. strictus* they are weakly converging forward and clearly do not fuse. The rostrum in the new species is evidently longer than in *P. avitus*, almost reaching the top the middle of the abdomen length. In addition, in both descriptions and drawings of *P. avitus* there is no indication of the presence of an even slight denticle on the lateral margin of the paranotum (although this specificity may not be important for taxonomy).

A careful comparative analysis with *P. quinquecarinatus* (GERMAR & BERENDT, 1856: 23, fig.19), another fossil species of this genus, could not be done because of evident contradictions in important details of some structures shown in the drawing of the first description of this species. As noted earlier by FROESCHNER (1996: 14) features typical of Cantacaderinae shown in the drawing of the holotype from the dorsal side (without head), are combined with some features not typical for this subfamily, shown in the drawing of its ventral side (with head!). The five carinae on the pronotum, the absence of any protrusions or spines on the lateral margins of paranotum and the hemelytra, a characteristic form of hemelytra- all this definitely points not only to the belonging to the Cantacaderinae but also to a closeness to the genera *Paleocader* and *Cantacader* (even the absence in the drawing of the stenocostal area can easily be explained by its poor visibility in the inclusion). In the

drawing of the ventral part of the body, however, a very short head is drawn slightly elongated in front of the eyes, which absolutely does not correspond with Cantacaderinae features. Furthermore the 2nd joint of the antennae is shown to be very long, almost equal to the 3rd joint. Yet this may be due to the drawback of the inclusion. FROESCHNER suspects that there might have been a mistake in the positioning of the non-characteristic head of the insect to the rest of the body of *P. quinquecarinatus* when reconstructing the specimen in the process of its drawing. If the head of the holotype of this species is really absent, then it will not only become impossible to compare other species with it, but also its systematic position may remain open.

V a r i a b i l i t y : Two of the three studied specimens belonging to the type series (holotype male and paratype female, Nr.14/8) have complete and uniform morphological features allowing to refer them to one taxon even of an infraspecies rank. Beside the features common for all three specimens, these two specimens are very similar due to the presence of a very small denticle on the lateral margin of the paranotum, of the comparatively long suprahumeral carinae (practically of the same length in both specimens equal to approximately one third of the length of pronotum), of the presence of two rows of cells on the paranotum at the level of lateral (humeral) angles of the pronotum and of the five or six rows of cells in the costal area of the hemelytra in its median part (without taking into account one row of the stenocostal area).

The second female (paratype, Nr.14/3) differs by the absence of even a microscopic denticle on the lateral edge of the paranotum, by a shorter suprahumeral carinae, the stretching forward from the back margin of the pronotum by only one fourth of its length, by the presence of only one row of cells of the paranotum at the level of the lateral angles (text-fig. 2) and only four rows of cells in the narrowed part of the middle of the costal area (a little closer to the base). This particular specimen corresponds more than others to the drawing of the dorsal side in *P. quinquecarinatus* (GERMAR & BERENDT, 1856). Nevertheless, because it is impossible to make a detailed comparison with the holotype of the last species, and because it has features not typical of the Cantacaderinae as a whole, we preferred to include this female in *P. strictus* n. sp. denoting it as one of the paratypes and distinguishing it as an infraspecies form without a taxonomic status - *P. strictus* n. sp. forma *adentatus*.

Tribe Phatnomini DRAKE & DAVIS, 1960

Genus *Sinalda* DISTANT, 1904

D i a g n o s i s (for fossil species of the genus) : Body oval, moderately or very wide, quite large: 3.2-4 mm. Head long, with 8 quite short spines: unpaired clypeal and dorsomedial spines and paired jugal, frontal and occipital spines. Rostrum very long, at least in *Sinalda baltica* (DRAKE) reaching its apex to anterior margin of VIII sternite. Pronotum with 3 carinae, with areolate concave anterior margin and almost straight posterior margin in the middle of which may be more or less prominently extended backwards extremely small triangular posterior projection covering base of scutellum. Paranota belobed. Hemelytra without stenocostal area, with wide costal area.

C o m p o s i t i o n : 14 recent species and 2 fossil ones from Baltic amber.

Sinalda baltica (DRAKE, 1950)

(pl. I, fig. 3; text-fig. 5)

1950 *Phatnoma baltica* DRAKE, 1: 153, fig.1 (new design.)

1949 Tingidae: BACHOFFEN-ECHT: 165 (photo 160)

- 1960 *Phatnoma baltica*: DRAKE & RUHOFF, 112: 11
 1965 *Phatnoma baltica*: DRAKE & RUHOFF, 243: 35
 1962 *Phatnoma baltica*: BECKER-MIGDISOVA (err. *Phantoma*), :216, fig.642
 1982 *Phatnoma baltica* KEILBACH, (err. *Phantoma*), 29:228
 1988 *Phatnoma baltica* SPAHR, 144: 16
 1989 *Phatnoma baltica* POPOV, 3: 68
 1992 *Phatnoma baltica* NEL, 5: 102
 1996 *Sinalda baltica* FROESCHNER, 574: 35 (new comb.)

This species was described on a single specimen from the Baltic amber (DRAKE, 1950). Together with other tingid material from the Baltic amber we obtained one male and two females of *S. baltica*. This enables us to give a redescription taking into account an infraspecific variation and a differentiation between sexes.

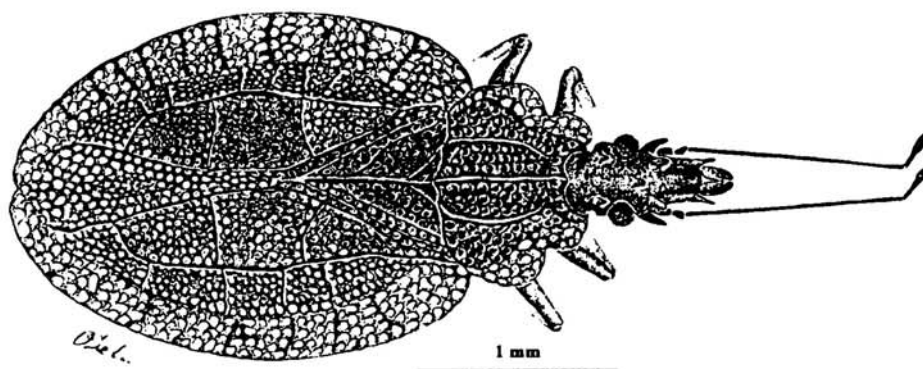


Fig. 5: *Sinalda baltica* (DRAKE), female from Baltic amber; Coll. Bayerische Staatssammlung für Paläontologie und Historische Geologie, München, (Coll. SCHEELE), Germany; Inv. Nr. I. 12.

Material: Two specimens; Coll. Bayerische Staatssammlung für Paläontologie und Historische Geologie München, one male (Sammlung A. BACHOFEN-ECHT) ; Inv. Nr. 0.10; one female (Sammlung A.W. SCHEELE), Germany; Inv.Nr. I.12.; one female, Coll. Geologisch-Paläontologisches Institut und Museum, Universität Hamburg, Germany (Coll.SCHEELE, Nr.1479).

Redescription: Rather large, body length with wings ca. 4 mm, oval, light-brown on the surface. Head strongly elongate, especially extending in front of eyes (preocular), approximately 1.5 times longer than wide, covered with large punctuation, with 8 rather short spines (or tubercles); along base of clypeus laterally with a pair of short and several somewhat elongated, conical, lateral jugal spines; among them with an unpaired clypeal spine directed obliquely upwards and forwards; in front of eyes, at a distance approximately equal to the diameter of eye, with a pair of conical or almost cylindrical frontal spines, thicker than jugal directed upwards and diverging; a single small, tubercle-like or conic-like dorsomedial spine with obtuse tip between eyes, nearer to their anterior margins; behind eyes at a distance equal to approximately 0.3 - 0.5 diameter of eye (on inner line of eyes) with paired conical occipital spines stretching obliquely upwards and forwards or nearly vertically. Occipital region with rather strong transversal elevations behind eyes. Antenniferous tubercles diverge obliquely, their apex thin and more or less curved; antennae long, very thin, especially 3rd joint 4.17-5 times longer than the 4th one. Bucculae distinctly protruding beyond apex of clypeus, directed to each other anteriorly and not touching, stretching to

posterior margin of head; with one row of cells along full buccula length. Rostrum very long, reaching almost anterior margin of VIII abdominal sternite or slightly surpassing it.

Pronotum rather short and wide, in male 1.25, in females 1.28-136 times wider than long, covered with rough punctuation; disc convex, with 3 longitudinal lower carinae bearing 1 row of minute cells; lateral carinae weakly S-like curved or nearly parallel and slightly curved inside by anterior and posterior ends, stretching from posterior margin of vesicula (elevation of anterior areolate part of pronotum) to posterior edge of pronotum; vesicula with strong emarginate anterior margin and with one well expressed row of rectangle cells along it, and behind with 1-2 rows of indistinct cells; paranota (flattened or lamellate areolate sides of pronotum) rather wide and in the anterior third of its length (on level of callous elevation of pronotal disc) with deep emargination, i.e. looking like bilobed expansion with a wider and longer hind lobe. In male, paranota almost along the whole length (except apex and base) with 2 rows of cells; beside, in widened parts of lobes cells transversally elongated and larger. In female, anterior and posterior lobes, as narrow as parts of paranota with well expressed two rows of cells or with single minute cells of 3rd row. Paranota smoothly narrowing towards base and here with 1 row of cells; paranotal cells mainly of pentagonal size. Posterior margin of pronotum on the whole nearly straight, only hardly convex and slightly elevated in form of boss with 1 row of almost rectangle cells, larger than punctuation of disc; in middle of posterior margin length with very small or hardly visible angle-like projection (initial posterior triangular process); two very small projections laterally from median one with lateral carinae covering them have also been found in female. Scutellum small, with low longitudinal median crest along the whole length; scutellum base may be slightly covered with vestigial posterior projection of pronotum.

Hemelytra (submacropterous form) distinctly passing behind abdominal apex, without stenocostal area; costal area wide, in female very wide, in the widest place at base with 5 rows of cells or with single cells of 6th row; costal area narrowing backward with 4 rows of cells along most of its length, near apex of hemelytra, number of rows sharply decreases to three, two and one; cells of costal area tetra-pentagonal of irregular and rounded form. Subcostal area inclined, in the widest place with 6 - 7 rows of small cells or with single cells of the 8th row; cells mainly rounded and of irregular angled form; costal area with 8-12 and subcostal area with 7 transversal veins elevating further than other veins and located not altogether symmetrically in respect to longitudinal axis of body; some of such elevated veins of costal area bifurcate at costal edge; RM delimiting subcostal and discoidal areas sharply rises and forms a low crest with one row of cells of rectangular and round form, which are much larger than the cells of adjoining areas. Discoidal area wide with a great number of small cells of irregular and round form of 9 to 10 irregular rows or almost sporadically; discoidal area of each hemelytron with two elevated transverse additional veins not altogether parallel in respect to each other. Clavus well expressed, triangular, separated from the rest of hemelytron by slanting break in respect to the longitudinal axis of body, in broadest place at base- with 5 almost regular rows of cells of different forms: irregular pentagonal, almost rectangular and oval. The inner, sutural area, in the very base at the level of clavus base in male with two and in female with two or three rows of oval cells; backward, along clavus and along line of hemelytra fusion, up to the base of membrane with one row of rounded and almost rectangular cells. Membrane, in the broadest place, in male with 7 and in female with 8 irregular rows of cells of angular, irregular form; membranes of both hemelytra completely overlap each other.

Dimension in mm: Length of body 3.9-3.98, width: male 1.8, females 1.99-2.15; length of head (from its apex to posterior margin of eyes): male 0.54, females 0.57 - 0.63; general length of head (from its apex to anterior margin of pronotum): male 0.66, females 0.86-0.87; width of head: male 0.5, females 0.59-0.63; width of vertex: male 0.26, females 0.3; diameter of eye: male 0.12, female 0.145-0.165; ratio of antennomeres of females 1-4 as 0.11: 0.07-0.08: 0.96-1.2 : 0.23-0.24; length of pronotum: male 0.86, females 0.86-0.98, width: male 1.08, female 1.17-1.26; length of hemelytra: male 2.65, females 2.58-2.6; width of costal area in middle part of hemelytra: male 0.21, females 0.21-0.3; width of discoidal area in largest place: male 0.41, females 0.45-0.48; length of foreleg: femur 0.57-0.7, tibia 0.75-0.9, tarsus 0.13-0.14; length of middle leg: femur 0.55-0.7, tibia 0.75-0.9, tarsus 0.15; length of hind leg: femur 0.65-0.71, tibia 0.85-1.06, tarsus 0.13-0.15.

Sinalda froeschneri n. sp.

(pl. I, fig. 4; text-fig. 6)

H o l o t y p e : ? female from Baltic amber (pl. I, fig. 4; text-fig. 6); Coll. G. HERRLING, Engter (NW-Germany); Inv. Nr.HT1.

D e r i v a t i o n o m i n i s : Named after the outstanding American hemipterologist Prof. Dr. Richard C. FROESCHNER, who made a great contribution to the study of Heteroptera and especially of tingid bugs.

D e s c r i p t i o n : Body very wide, only 1.6 times long than wide; general shape of hemelytra with equal longitudinal and transversal diameters; above yellow, almost stramineous, veins of hemelytra brownish.

Head strongly elongated, especially preocular part, 1.33 times longer than wide; above macropunctated, with 8 short spines with obtuse tip; along base of clypeus laterally with a pair of jugal spines directed obliquely diverge and upwards; among them with an unpaired clypeal tubercle-like spine; in front of eyes, at a distance approximately equal to diameter of eye, somewhat inside, with a pair of slightly conical frontal spines directed practically vertically upwards; with a single thick, tubercle-like dorsomedial spine arising between eyes; behind eyes at a distance equal to approximately 0.5 diameter of eye paired with an almost cylindrical occipital spines stretching vertically upwards. Occipital region with rather small transversal elevations immediately behind eyes and transversal impression between

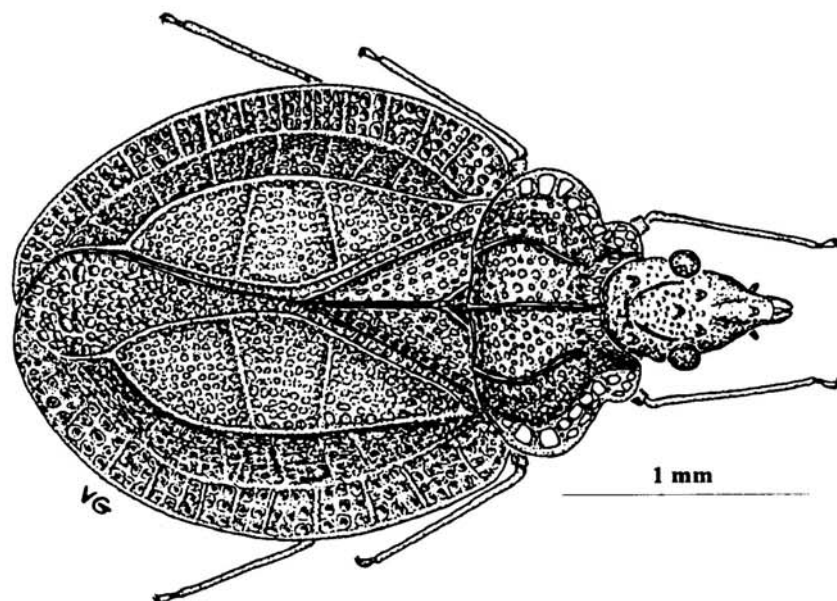


Fig. 6: *Sinalda froeschneri* n. sp., holotype, ? female, Baltic amber; Coll. G. HERRLING Engter (NW-Germany); Inv. Nr.HT1.

paired occipital spines. Lateral margins of head in area of antenniferous bucculae not visible. Antenna (only left antenna is preserved, hidden under body preventing a carefully study) yellow, thin and perhaps not very long. Bucculae distinctly protruding beyond apex of clypeus, directed to each other anteriorly and not touching. Rostrum long and rather thick, its apex reaching almost VI abdominal sternite.

Pronotum wide, 1.64 times wider than long, covered with rough punctuation; pronotal disc convex, with 3 longitudinal low carinae, median of which bears hardly visible one row of minute indistinct cells; cells absent on lateral carinae; median carina stretch along of all pronotal length; median carinae weakly arched curving inside by anterior and posterior ends, stretching from posterior margin of vesicula to posterior edge of pronotum; anterior part of pronotum distinctly elevated as collar-shaped vesicula with strongly concave anterior margin and 2 transversal rows of cells along it: anterior row consist of very distinct rectangle cells, posterior row indistinct. Paranota moderately wide, directed by its external margin oblique upwards; bilobed with considerable shorter anterior lobe; along most of length with 2 rows of cells, at level of lateral angles of pronotum with 1 cell row; cells of paranota mainly penta- and tetragonal form. Posterior margin of pronotum weakly concave; narrow transversal stripe of pronotum along posterior margin flattened in form of small plate with 1 row of round and almost tetragonal cells; in a middle of posterior margin with a very small, hardly visible, triangular projection extending backwards as small fingerlike process.

Hemelytra (submacropterous form): very wide, sharply widened from base making up general contour in form of very wide oval, surpassing somewhat beyond apex of abdomen. Costal area wide, in the very wide base with 4-5 rows of cells; number of rows quickly diminishing backwards - up to four, and then three, preserved along most part of costal area; near hemelytron apex number of rows of cells diminishing to two and in the very tip - to one; cells of costal area more or less tetragonal, pentagonal and irregular angled and rounded form, larger than cells of other parts of hemelytra; costal area with approximately 12-14 transversal veins elevating more than other veins of this area. Subcostal (lateral) area inclined, wide, in the widest place with 7 rows of small cells, with 6-7 transversal strongly elevated veins and located not fixed position in both hemelytra. Discoidal (middle) area wide, in the widest place with 9-10 incompletely regular rows of cells of irregular angular size; discoidal area of each hemelytron with two elevated transverse additional veins not altogether parallel in respect to each other. RM delimiting subcostal and discoidal areas strongly elevated and rather thick. Clavus well expressed, triangular, separated from corium by oblique commissure; in broadest place at base - with 5 more or less regular rows of cells; external row consist of cells of almost regular tetragonal form, other rows - of cells mainly oval size. Sutural (inner) area in the very base with 2 rows of oval cells; backward, along clavus with one row of rectangular cells; behind clavus apex sutural area sharply widened forming areolate membrane which in broadest place with approximately 8 irregular rows of cells of angular size. Membrane of both hemelytra completely each other.

Dimension in mm: Body length 3.22, width 2.0; length of head (from apex to posterior margin of eyes) 0.57, general length of head (from apex to anterior margin of pronotum) 0.76, width 0.57; width of vertex 0.27; diameter of eye 0.15; length of 4th antennal joint 0.27; length of pronotum 0.71, width 1.17; length of hemelytron 1.14, width of discoidal area (in broadest place) 0.47; length of fore femur ca. 0.54 and tibia 0.75; length of middle femur ca. 0.57 and tibia 0.75; length of hind femur ca. 0.58 and tibia 0.88.

C o m p a r i s o n : From the following morphological features the described species can be attributed to the genus *Sinalda* DISTANT: 8 head spines (and here is a dorsomedial

spine); paranota directed slightly obliquely upwards without any spines or protrusions on its external margin, with 2 rows of cells. Unfortunately it was impossible to examine in detail the scent gland openings; however clear features of a well developed peritrema are absent. Bilobed paranota, the form and ratio of the dimensions of the lobes as well as the number of cell rows and their location on clavus of hemelytra are the features that considerably bring together *S. froeschneri* n. sp. with *S. baltica* (DRAKE), that have recently been transferred from genus *Phatnoma*. The new species differs quite well from the latter by the proportions of body, primarily by a very wide, almost round body, a relatively broader pronotum, shorter head spines, convergence of eyes and post-ocular elevation, absence of cells in lateral carinae of pronotum, as well as by other specific features.

Genus *Intercader* n. gen.

Type species: *Intercader weitschati* n. sp.

Derivatio nominis: Combined from *inter* (lat.) = between and *cader*, part of the generic name *Cantacader* (the type genus of Cantacaderini).

Diagnosis: Small, ca. 2 mm. Head strongly elongated, with 5 tubercles: single clypeal and jugal (sometimes very small) and frontal pairs. Interocular area distinctly depressed; eyes strongly protruding and directed obliquely upwards. Bucculae anteriorly not contiguous and not surpassing apex of clypeus. Pronotum anteriorly more or less elevated, with 1-2 rows of small cells, anterior margin emarginate; pronotal disc with 3 or 5 low carinae. Paranota quite narrow, at broadest point with 2 rows of cells. Hemelytra without stenocostal area; hypocostal lamina not crossing transverse subbasal vein in form of furrow stretching from scent gland opening to costal area under overlapping hemelytra in repose. Costal area approximately narrow, with 2 rows of cells; clavus almost fused with corium and separated from it by weakly prominent vein.

Comparison: The new genus *Intercader* combines some morphological characters of both tribes of the Cantacaderinae. The rather narrow paranota and costal area, the presence of two pairs of carinae brought together from each side in such a way that one can suppose that they have originated by the break down and divergence of fragments of only the first pair of carinae (the broken down lateral carinae are a specific feature of many cantacaderins), the location of the transverse veins on the subcostal and the discoidal areas of the hemelytra are features that bring *Intercader* closer to *Carldrakeana* FROESCHNER (Cantacaderini), especially with the Australian *C. tindalei* (HACKER).

Most other the specific features point out that the new genus belongs to the tribe Phat- nomini. Here one should primarily mention the absence of the stenocostal area and the ostiolar-stenocostal system of the metathoracal scent glands. There are medial clypeal tubercles which is absent in the Cantacaderini and is contrary, characteristic of the Phatnomini.

The depressed interocular area of the head, obliquely directed upward strongly protruding eyes and the strongly elongated head are features that allow, to some extent, to bring together the described genus with the neotropical genus *Eocader* (type species is *E. vergrandis* DRAKE & HAMBELTON; Brazil). It differs from the neotropical one by the number and the related location of the carinae on the pronotum (in *Eocader* there are one or three carinae), the presence of the jugal spines, the different form of all head spines, the configuration of the costal area (in *Eocader* it sharply broadens at the base) and other specific features.

Intercader weitschati n. sp.

(pl. II, fig. 1; text-fig. 7)

H o l o t y p e : Male (subbrachypterous form), from Baltic amber (pl. II, fig. 1; text-fig.7); Coll.Geologisch-Paläontologisches Institut und Museum (Coll. A. SCHEELE, Nr.33); Typ. Kat.Nr.3800.

D e r i v a t i o n o m i n i s : Named after Dr. Wolfgang WEITSCHAT, the well known palaeontologist and keeper of the excellent amber collection in the Geological-Palaeontological Institut und Museum, University of Hamburg.

S t a t e o f p r e s e r v a t i o n a n d a c c o m p a n y i n g f o s s i l s : The specimen is well preserved in a clear piece of amber (3.5cm x 1.5cm); because of oxidation the colour has changed to more red. Some structures of the ventral part are obscured by a small air bubble. Beside the tingid only some stellate hairs are enclosed in the piece of amber.

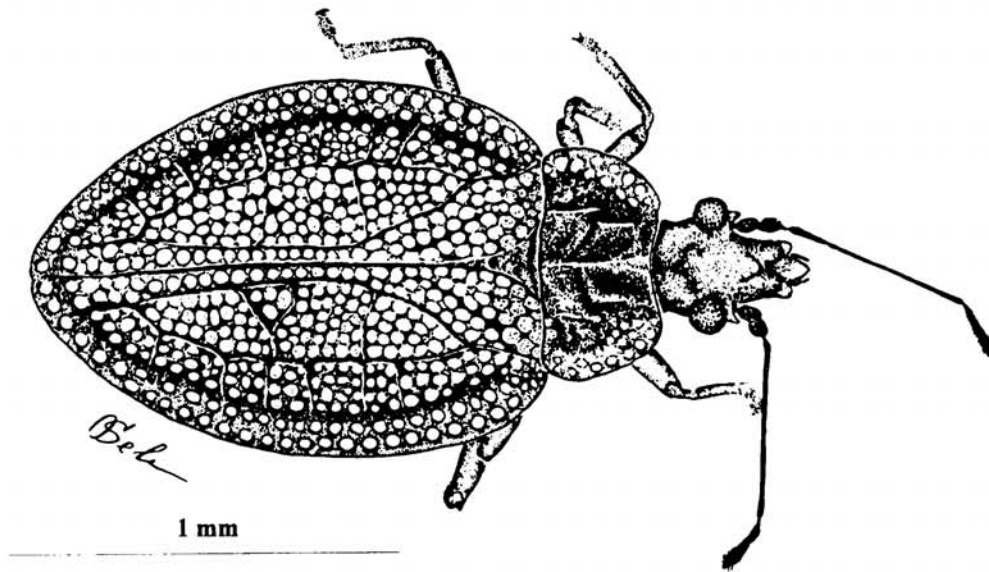


Fig. 7: *Intercader weitschati* n. gen. n. sp., holotype, male, forma subbrachypterous, from Baltic amber; Coll. Geologisch-Paläontologisches Institut und Museum der Universität Hamburg (Coll. SCHEELE, Nr.33); Typ.Kat.Nr.3800.

D e s c r i p t i o n : Small, shorter than 2 mm. Body oval, above and below bare, brownish; head dark-brownish, long, especially preocular part (comprising 0.9 of its width), interocular area depressed; eyes strongly projecting laterally and clearly obliquely upwards. Head with 5 tubercles: single clypeal, jugal pair and frontal pair; clypeal tubercle forming a large conical projection, broadest at clypeal base and equal to width of clypeus, overlapping clypeus from above by its apex and covering it completely; jugal tubercles forming a short, round spine with obtuse apex and tightly adjoining lateral margins of clypeal tubercle; frontal tubercles thick, almost cylindrical, with obtuse apex diverging from each other by their apices; located in front of eyes at a distance of more than eye diameter; antenniferous tubercles with tips curving towards head; bucculae adjoin lateral margins of clypeus and slightly converging forward, widely opening at apex. Rostrum slightly surpassing anterior margin of IV sternit of abdomen.

Pronotum rather short, without triangular posterior projection; anterior margin clearly emarginated, posterior edge practically straight; anterior part of pronotum slightly elevated but without bulbous areolate cyst; anterior pronotal margin with 1 row of rather fine, almost

rectangular cells.; pronotal disc almost flattened, punctuated, with 5 longitudinal low carinae: one median stretching from anterior to posterior margins of pronotum and two pairs of parallel lateral carinae situated one after another; in this case anterior pair of lateral carinae shorter and located nearer to median line (inner carinae) stretching from almost anterior margin of pronotum to posterior lateral carinae; posterior pair of lateral carinae nearly reaching posterior margin of pronotum (outer carinae); posterior lateral carinae approximately twice longer than anterior ones; paranota with 2 rows of medium size cells of irregular and round form; lateral margins of pronotum weakly rounded. Scutellum of equal length and width.

Hemelytra (subbrachypterous form) distinctly surpassing apex of abdomen, touching by their inner margins without overlapping in repose; Sc exteriorly rough; costal area equal to width almost along all its length, with 2 rows of moderate size cells of different form: pentagonal (with slightly rounded angles), rounded and irregular; cells of external row clearly larger than cells of internal row; hypocostal vein (Hc) dividing costal and subcostal areas very thick; subcostal area with 6 transverse additional veins, at broadest point with 4 rows of cells, cells of external row slightly elongated and cells of other rows more rounded; vein R+M dividing subcostal and discoidal areas distinctly elevating in the form of irregular keel; discoidal area very long, in broadest point with 5 rows of mostly rounded cells and some single cells of the 6th row, with additional transverse, weakly prominent veins located differently on different hemelytra; discoidal area separated from sutural (inner) area by an irregular, weakly prominent vein; sutural area in basal part bordering clavus and located parallel to it, mainly with 2 rows of cells and single cells of 3rd row; along discoidal area and most of its length - with 1 row of cells, near somewhat widened apex with 2 rows of round and irregular form; clavus practically fused with corium separated from it by weakly exposed vein (claval commissure absent), at basal part with 3 rows of cells located parallel to external margin of clavus.

Dimensions in mm: Body length 1.8, width 0,87; length of head (from apex of clypeus to posterior margin of eyes) 0.28, width 0.31; width of vertex 0.13; diameter of eye 0.09; ratio of antennomeres 1-4 as 0.064: 0.057: 0.44: 0.16; length of rostrum 0.98; length of pronotum 0.28, width 0.54; length and width of scutellum 0.14; length of hind femur 0.33 and length of tibia 0.33.

Genus *Tingicader* n. gen.

Type species: *Tingicader cervus* n. sp.

Derivatio nominis: Combined from the genus name *Tingis* FABRICIUS (type genus of the subfamily Tinginae) and the non descriptive- *cader* from the generic name *Cantacader* AMYOT & SERVILLE (type genus of the subfamily Cantacaderinae).

Diagnosis: Imago: Body elongated. length abt. 2.5mm. Head short, almost twice as short as wide, with very long, branched spines, jugal pair and frontal pair bearing several curved sharp spines of 2nd series (rank). Frons and vertex with scarce stout spiniform hetae. Bucculae short and anteriorly open. Rostrum rather short, reaching middle coxae. Lateral margins of pronotum and hemelytrae with sharp long spines bearing apical hetae. Antennae long and rather thin. Pronotum transverse, nearly rectangle form, with 3 longitudinal low carinae bearing 1 row of fine cells and 2-3 short sticking hetae on their upper margins; lateral carinae shorter and slightly diverge forward; vesicula rather low, with strongly emarginate anterior margin.

Paranota anteriorly wide, posteriorly strongly and sharply narrowing. Pronotum without posterior projection, but distinctly arched convex between hind ends of lateral carinae.

Scutellum exposed, trapeziform, elongated to apex. Clavus large, triangular, clearly separated by commissura from corium. Vein R+M separating subcostal and discoidal areas high elevated in form thin and lamellate carina with 1 row of cells and scarce sticking on its upper margin. Stenocostal area absent.

Nymph of 5th stage (exuviae): Body elongate. Head short, ca. 2.5 times wider than long, with 4 very long sharp spines, jugal pair and frontal pair bearing several sharp spines of 2nd series. Frons with some rather long sharp spiniform hetae. Rostrum rather short, possibly not surpassing backwards middle coxae. Pronotum transverse, nearly rectangle form, with 4 very long stout spines in anterior and posterior angles and also several sharp spines of 2nd series. Lateral margins of pads covered with long common spines, without spines of 2nd series. Posterior-lateral angles of abdominal segments bearing 2-3 sharp spines of 2nd rank. Tip of head, lateral pronotal and abdominal spines with short hetae. Pronotum, pads and abdominal segments covering with rather long sharp spines and stout hetae.

C o m p a r i s o n : *Tingicader* has a unique combination of morphological features, the majority of which are characteristic features of Cantacaderinae, while some of the features are typical for Tinginae. The features of Cantacaderinae, in particular Phatnomini, include: the absence in imago of a well expressed posterior triangular projection of the pronotum; the exposed scutellum; the clavus clearly separated from corium by commissura; the absence of stenocostal area. The presence of jugal spines is also one of the distinguishing features of Cantacaderinae (and here the jugal spines are present both in the imago and the nymph of the described genus) and the spines in the imago limiting the lateral edges of the pronotum and the hemelytra (in the nymph, analogous spines are located on the anterior and the posterior angles of the pronotum, on the lateral margins of the hemelytral pads and on the posterior-lateral angles of the abdominal segments). The following morphological features of the new genus, not typical of Cantacaderinae and, on the contrary characteristic of most recent Tinginae (except *Dictyonota*, some species of *Kalama* and some other genera) are: a short head which in the imago of *Tingicader cervus* n. sp. is almost two times and in the nymph sp. prope *cervus* n. sp. approximately 2.5 times broader than its length. In addition, in the imago of *T. cervus* there is also a tendency toward the formation of a posterior median projection of the pronotum in form of a rounded-convex posterior margin between the lateral carinae. The new genus is brought closer to Tinginae by the presence of an areolate vesicula (although it is low and has a concave anterior margin). Moreover, in the imago the form of the paranotum is always similar (although it is evidently convergent) with that of a number of species of Tinginae, in particular, of individual species of *Tingis*.

Taking into account the combination of features most of which referring to Cantacaderinae and in fact the only, but very important - to Tinginae, we believe that the described genus occupies to a certain extent an intermediate position in the system of Tingidae between Cantacaderinae and Tinginae, yet belonging to the former subfamily. In Phatnomini tribe, the described genus occupies a special place not connected by close relative links with any other genera and it is possible that this tribe deserves to be separated into a special tribe.

Tingicader cervus n. sp.

(pl. II, fig. 2; text-fig. 8)

H o l o t y p e : Male, forma macroptera from Baltic amber (pl. II, fig. 2; text-fig. 8); Coll. Geologisch-Paläontologisches Institut der Universität Hamburg; Typ.Kat.Nr.3801.

Derivatio nominis: The specific name was suggested by the very branched spine associating with the branched horns of a deer (*Cervus elaphus*).

State of preservation and accompanying fossils: The specimen is preserved in a small clear piece (2.5cm x 1.5cm) of yellow amber. Some of the ventral structures are obscured by a milky covering. Beside the tingid a termite, a lepidopteran larve and some stellate hairs are enclosed in the piece of amber.

Description: Body below brown, femora dark brown; ventral side of body covered by rather long, erected, light hairs, in some places of thorax they are brown and longer than width of tibia. Head short, 1.86 times wider than long, with 4 very long branched spines: 2 parallel jugal spines located at laterally base of clypeus and directed slightly upwards and 2 almost horizontal frontal spines diverging under obtuse angle each other; all head spines bearing curved stout sharp and rather long spines of 2nd series (rank); jugal and frontal spines with apical brownish hetae; frons and vertex setting by approximately ten light stout sharp chetae in the form of thin spines of different length, spreading disordered and directed obliquely upward and forward; apex of clypeus with several very thin short hetae; eyes strongly laterally prominent; antenniferous tubercles not visible; antennae dark brownish, thin and very long, 3rd and 4th joints covered by rather long erecting hairs, 2-2,5 times longer than thickness of 3rd joint; clypeus moderately protruding.

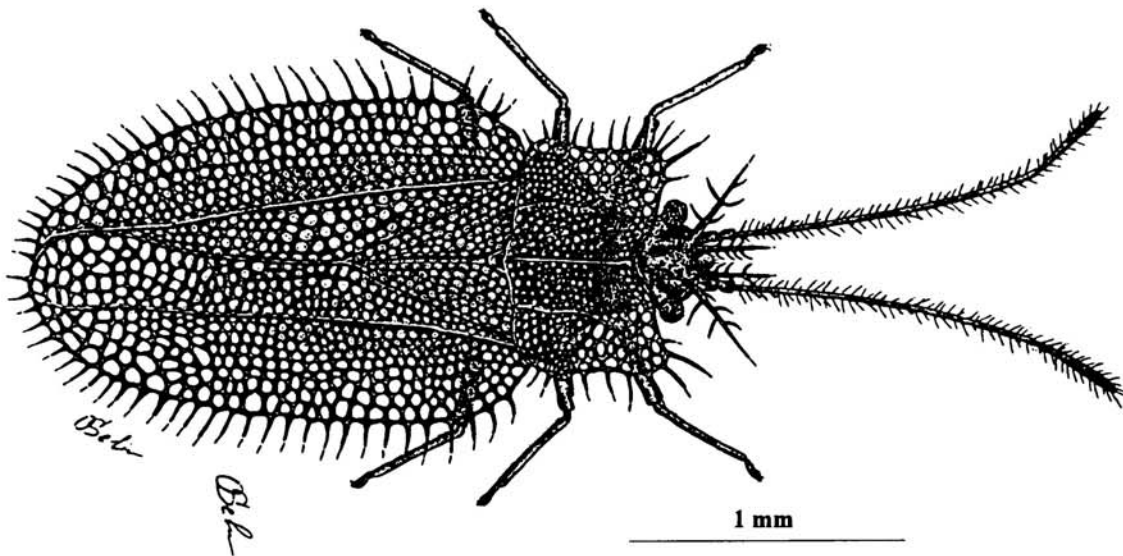


Fig. 8: *Tingicader cervus* n. gen. n. sp., holotype, male, forma macroptera, from Baltic amber; Coll. Geologisch-Paläontologisches Institut und Museum der Universität Hamburg; Typ.Kat.Nr.3802.

Pronotum transverse, 1.36 times wider than long (length of spines disregarding), almost true rectangle form with practically parallel lateral margins, with 3 low longitudinal carinae bearing 1 row of fine cells and 2-3 vertically erecting short dark brown chetae; lateral carinae in almost whole most length slightly diverged forward and curved outside (Fig.8); disc convex, with large punctuation dots of which moderately enlarging backwards and become not large cells; anterior part of pronotum elevated in the form of low part of vesicula with strongly emarginating anterior margin; paranota anteriorly wide with 4 (left paranotum) and 5 (right paranotum) rows of cells, round and irregular in form; paranota narrowing strongly backward due to widening of pronotal disc and constancy of parallel lateral margins of paranota; on level of humeral angles paranota with 1 row of cells; lateral margins of paranota with 10-11 spines, very long at anterior part of pronotum and somewhat shortening

backwards; apex of spines with chetae; posterior margin of pronotum slightly wavy, with weakly exposed 3 round lobes: 1 median lobe between hind ends of lateral carinae and 2 lateral lobes; scutellum exposed, very small, elongate–trapeziform, with truncated apex.

Hemelytra surpassing far behind abdominal tip; membrane completely overlapping in repose; lateral margins of hemelytra very weakly bent curved and setting by row of rather long spines bearing apical chetae, length of spines shortening to hemelytral apex; costal area mainly wide, with 4 rows of cells, narrowing gradually to apex, in middle part of length with 3 rows of cells and 2 rows near apex; cells of costal area larger than other parts of wing, except apex of membrane; subcostal area very weakly inclined; hypocostal vein weakly expressed, especially in hind part of hemelytron; at widest point costal area with 6 rows of normal size cells; carina separating costal and subcostal areas forming by elevated vein R+M lamellate, with 1 row fine, oval and almost square cells, setting by scarce, short, erected chetae; clavus well expressed, clearly separated from corium by commissura, in the form of nearly true right–angled triangle; claval commissure quite long, stretching from base of hemelytra to base of membrane; at the broadest point clavus with 6 rows of rather small, round cells; rows of claval cells setting parallel along of outer edge of clavus; sutural area rather narrow, on level of claval apex with 5 rows of rather small round cells; near apex of membrane with 6 rows of larger angular cells. Hypocostal lamina forming by vein Hc strongly protruding below in the form of carina and lowing backwards with 1 row small cells; ostiolar–stenocostal system absent. Rostrum quite short reaching hind coxae. Claws of tarsi sharply curved almost at right angle.

Dimensions in mm: Body length 2.36, width 1.05; length of head (from apex of clypeus to posterior margin of eyes) 0.21, width 0.39; width of vertex 0.23; diameter of eye 0.08; antennal joints I : 0.08, II : 0.07, III : 1.04, IV : 0.3; length of frontal spines (together with apical chetae) 0.36; length of jugal spines 0.28; rostrum length abt. 0.54; length of pronotum 0.56, width (without calculation of length spine) 0.76; distance between anterior ends of lateral pronotal carinae 0.38, of posterior ends 0.36; width of paranota in the broadest place 0.18; length of spines in anterior angles of pronotum 0.18; length of largest spines situating at lateral sides of hemelytra 0.13; length of genital segment 0.31, width 0.43; length of fore leg: femur 0.34, tibia 0.38, tarsus (together with claw) 0.13; length of hind leg: femur 0.4, tibia 0.41, tarsus 0.13.

Tingicader sp. prope *cervus* n. sp.

(pl. II, fig. 3-4; text-figs. 9a, b)

M a t e r i a l: Nymph of Vth stage from Baltic amber; Coll. Geologisch-Paläontologisches Institut der Universität Hamburg (Coll. SCHEELE, Nr.14); Typ-Kat.Nr.3802 (Nymphenhaut von *Tingis* sp. (Tingitidae), det. E. OTTEN, Mai 1939; A2i).

State of preservation and accompanying fossils: The specimen is exceptionally well preserved in a small piece of amber (1cm x 1cm). Due to oxidation the colour has changed to more reddish. Beside of the tingid the piece contains no other fossils.

D e s c r i p t i o n: Body elongated, length ca. 2 mm, 2 times longer than wide. Head and edges of body with long sharp spines some branching on head and segments of abdomen; besides dorsal part, body covered by rather long sharp spines and stout chetae.

Head short, 2.54 times wider than long, with 4 long spines, thick at base and sharp in apex bearing short chetae; every spine has 6-8 short, thin, sharp, curved spine. One pair of jugal spines located laterally from clypeus and directing forward and somewhat diverge; other pair of frontal spines joint or almost joint at their bases with jugal spines and directed forward and diverging approximately of 45° to longitudinal axe of body and weakly curved

inside. Jugal spines and frontal spines of nearly equal length, 2.3-2.4 times longer than head and hardly shorter its width. Besides of 4 large spines with 2 rows of shorter and thin, curved spines setting by 3 in every row; several thinner and shorter spines in form of chetae located on each side from rows of frontal spines. Vertex and occiput destroyed during moulting. Pronotum transverse, 2.34 times wider than long, rectangular, anterior margin somewhat emarginated, almost right, with 4 very long sharp spines, single on anterior and

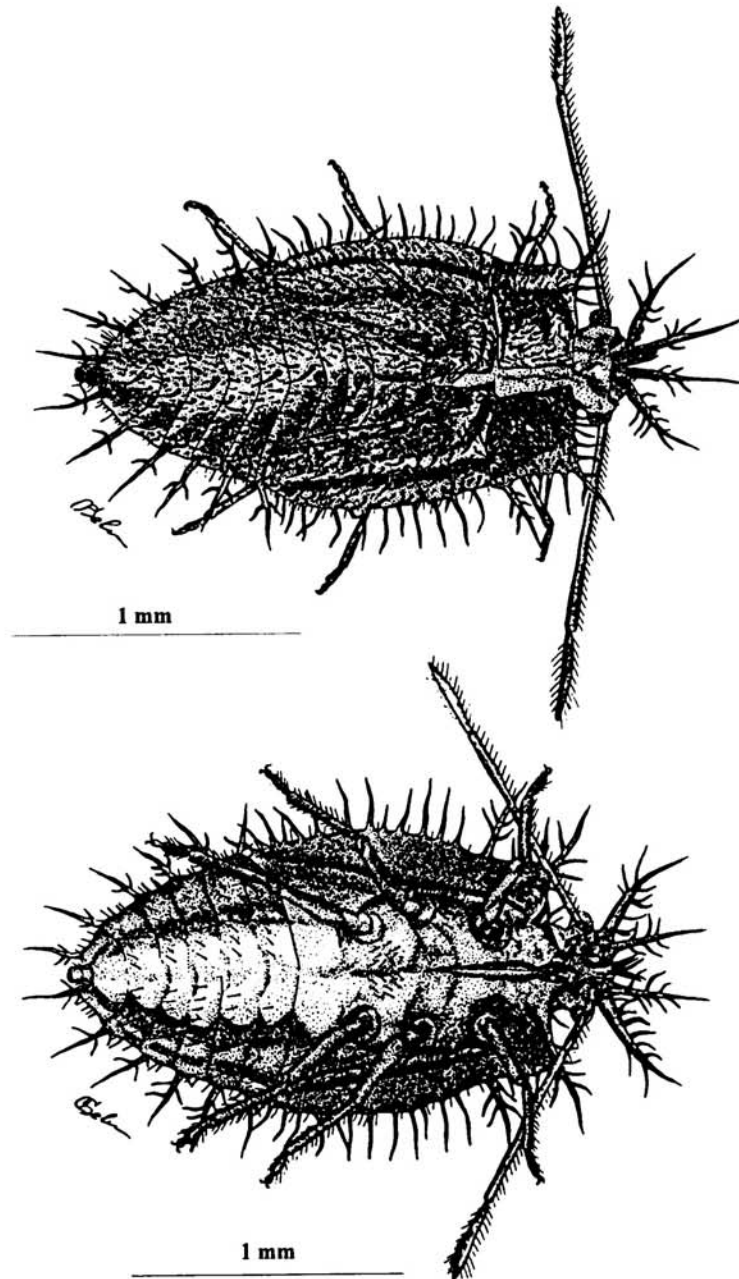


Fig. 9 a, b: *Tingicader* sp. *prope cervus* n. sp., nymph, Vth stage, from Baltic amber; Coll. Geologisch-Paläontologisches Institut und Museum der Universität Hamburg (Coll. SCHEELE); Typ.Kat.Nr.3802, a: dorsal, b: ventral.

posterior angles; every spine with 3-4 shorter, thin and sharp spines of 2nd series bearing one apical chetae; angular pronotal spines branching and shorter head branched spines directed laterally and obliquely upwards. Besides, lateral margins of pronotum with 3-4 shorter, common (not branched), curved, sharp spines. Dorsal surface of pronotum covered by sharp, curved, common spines and erected chetae.

Lateral hemelytral pads with 13-14 long, sharp spines, erected laterally and obliquely upwards; spine approximately 1.5 times shorter than angular pronotal branched spines; chetae on apes absent. Dorsal surface of hemelytral pads with numerous sharp spines, much shorter than lateral spines and erected chetae and approximately 3 times shorter than lateral spines.

Posterior–lateral angles of abdominal segments with very long branched spine bearing 2-4 shorter, sharp, curved spine of 2nd series and having apical chetae; length of posterior–lateral spines approximately equal to angular pronotal spines. Besides, surface of abdominal tergites covered with shorter, sharp spines and erected chetae. Apex of IXth segment with small conical appendage, i.e. anal tube.

Body ventrally covered by thin erected hairs. Rostrum rather short, possibly not surpassing backward hind coxae (located obliquely in amber).

Dimensions in mm: Body length 2.03, width 0.97; length of head (from apex of frons to posterior margin of eyes) 0.16, width 0.41; antennal joints III : 0.85, IV : 0.33 (position of Ith and IInd joints not allowing measurements); length of pronotum 0.33, width 0.77.

C o m p a r i s o n : All the main morphological features of the described nymph correspond to the features of the above described imago of *Tingicader cervus* n. sp. (strange as it may seem taking into account the scarcity of paleontological material). Following features can be referred to them: a short head, which is much wider than long (in imago almost twice and in nymph- 2.5 times); 4 “tree-like” spines at the head (with spines of the second order) ending at the top with chetae - 2 jugal and 2 frontal spines, and here the mutual location and the form of the spines are identical in the imago and in the nymph; the presence of spines on the frons in the form of robust chetae (analogous, but thinner chetae are present in imago as well); the transverse rectangular pronotum with practically parallel lateral margins with spines with the humeral ones among them ending with chetae; the flattened lateral parts of the pronotum to a great extent corresponding by form to imago; the presence of spines on the hemelytral pads; the presence of spines on the posterior lateral angles of the abdominal segments (which are not directly connected with imaginal features), bearing at their top chetae, which evidently reflects the common genetic basis of the presence of such chetae on spines of different parts of the body (head, pronotum and abdomen). The 3rd joint of antennae is almost of the same length in imago 1.07 in nymph - 1.18 mm. A short rostrum is an important feature of imago and nymph, its top being approximately at the level of middle coxae.

All the common features of the imago spinosus and nymphae mentioned above allow to refer it, with a sufficient confidence, to at least the genus *Tingicader*. Besides, the short head of the imago and the nymph belonging to this genus confirms that *Tingicader* occupy an intermedial position in the system of Tingidae between Phatnomini and Tinginae, and it may also be one of the intermedial stages in the evolution of this family.

III. Key to the Cantacaderinae genera from the Baltic amber

(Included are all species investigated here, and *Paleocader avitus*, whose good re-description and a high-quality drawing are given by FROESCHNER, 1996).

- 1(4) Hemelytra with stenocostal area clearly seen at least from ventral side as a narrow groove between veins C and Sc. Head without medial spines, and here paired spines are always simple not bearing secondary spines (Tribe Cantacaderini).

- 2(3) Pronotum narrowing towards relatively weakly: its maximum width 1.3-1.6 times more than width of anterior margin of pronotum; the latter 1.1-1.3 times more than head width. III antennal joint 2 times longer than head width (measurements made on drawings in accordance with the first descriptions: DRAKE, 1950, fig.7; FROESCHNER, 1996, fig.10). Discoidal area of hemelytra in the broadest place with 5-6 rows of cells. 3.0-3.9 mm.....*Paleocader avitus* (DRAKE)
- 3(2) Pronotum narrowing towards rather strongly: its maximum width 1.9-2.2 times more than width of anterior margin; width of pronotum ca. 0.8-0.9 of head width. III antennal joint 3 times as long as head wide. Discoidal area in the broadest place with 10 rows of cells. 3.9-4.2 mm (text-fig.1)*P. strictus* n. sp.
- 4 (1) Hemelytra without stenocostal area. Head with 1 or 2 medial spines, if they are absent then each longest spine bears several small spines (Tribe Phatnomini).
- 5(10) Head with 1 or 2 medial single spines. Head spines rather short and simple, without additional spines. Lateral margins of pronotum and hemelytra without spines.
- 6(7) Head with 5 tubercles (spines): single clypeal, paired jugals (very small and hardly visible) and frontals. Dorsal part of head between eyes and behind them depressed. Costal area rather narrow, clavus only with 2 rows of cells. Clavus almost fused with corium and separated from it by only a feebly prominent vein. Not more than 2 mm.....*Intercader weitschati* n. sp.
- 7(6) Head with 8 tubercles (short spines): unpaired clypeal and dorsomedial ones, paired jugals, frontals and occipitals. Dorsal part of head not concave. Costal area wide, along most of length with 3-5 rows of cells. Clavus separated from corium by commissura. Longer than 3 mm (Genus *Sinalda*).
- 8(9) Body distinctly elongated, 2.0-2.2 longer than wide, contour of overlapping hemelytra in repose in form of a strongly elongated oval. Pronotum 1.25-1.35 times wider than long. Large: 3.9-4 mm (text-fig.5).....*S. baltica* (DRAKE)
- 9(8) Body very wide, only 1.6 times longer than wide; contour of overlapping hemelytra in form of a very wide oval. Pronotum 1.65 times wider than long. Small: ca. 3.2 mm (text-fig.6)*S. froeschneri* n. sp.
- 10(5) Head without medial spines, with 2 pairs of very long and branched jugal and frontal spines bearing acute lateral spines. Lateral margins of pronotum and hemelytra with rows of long acute spines bearing apical cheta. ca. 2.35 mm.....*Tingicader cervus* n. gen n. sp.

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Plate I

Fig. 1: *Paleocader strictus* n. sp.; holotype; male from Baltic amber; Coll. Bayerische Staatssammlung für Paläontologie und Historische Geologie München, Germany; (Coll. BACHOFEN-ECHT), Nr.0.130.

Fig. 2: *Paleocader strictus* forma *adentatus*; female from Baltic amber; Coll. M. KOTASHEVICH; (Kaliningrad, Russia), Nr. 14/3.

Fig. 3: *Sinalda baltica* (DRAKE), female from Baltic amber; Coll. Bayerische Staatssammlung für Paläontologie und Historische Geologie München, Germany, (Coll. SCHEELE); Nr. I 12.

Fig. 4: *Sinalda froeschneri* n. sp., holotype; ?female from Baltic amber; Coll. G. HERRLING (NW-Germany), Inv. Nr.HT 1.

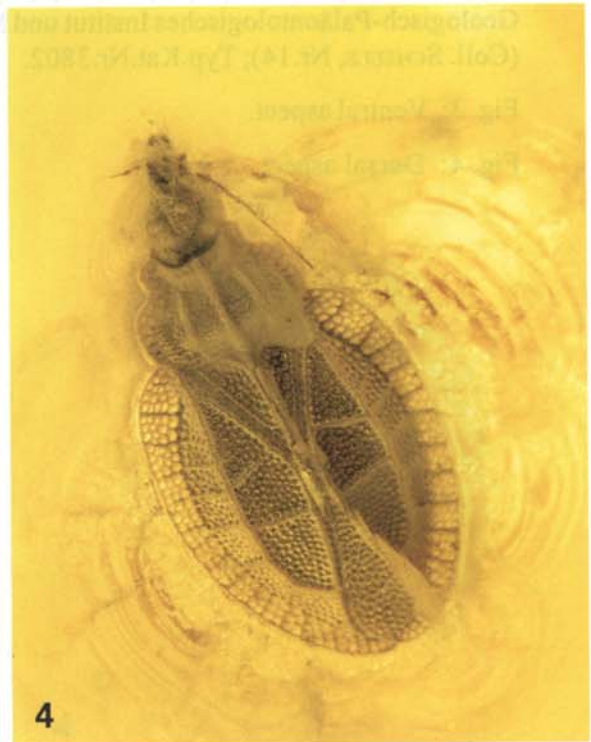


Plate II

Fig. 1: *Intercader weitschati* n. gen. n. sp., holotype, male, forma subbrachypterous, from Baltic amber; Coll. Geologisch-Paläontologisches Institut und Museum der Universität Hamburg, Germany; (Coll. SCHEELE, Nr.33); Typ.Kat.Nr.3800.

Fig. 2: *Tingicader cervus* n. gen. n. sp., holotype, male, forma macroptera, from Baltic amber; Coll. Geologisch-Paläontologisches Institut und Museum der Universität Hamburg; Germany; Typ.Kat.Nr.3801.

Fig. 3-4: *Tingicader* sp. prope n. sp., nymph, Vth stage, from Baltic amber; Coll. Geologisch-Paläontologisches Institut und Museum der Universität Hamburg, Germany; (Coll. SCHEELE, Nr.14); Typ.Kat.Nr.3802.

Fig. 3: Ventral aspect.

Fig. 4: Dorsal aspect.

