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A New Upper Carboniferous Paraplecopteran Insect from South Brazil

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Abstract — The study of one of the most complete wings of Cacurgidae group has permitted a better interpretation of species already described and, consequently, a better comparison among families Narkemidae Handlirch, 1911, Cacurgidae Handlirsch, 1911, Narkemocacurgidae Pinto et Ornellas, 1978, Hapalopteridae Handlirsch, 1906 and Strephoneuridae Martinov, 1940. From this study has resulted the description of a new family Cacurgonarkemidae Pinto and of a new genus *Carpentoptera onzii* Pinto gen. et sp. nov. from Upper Carboniferous of Paraná Basin, Brazil.

Resumo — O estudo de uma das mais completas asas do grupo Cacurgidea permitiu uma melhor interpretação de espécies já descritas e, conseqüentemente, uma melhor comparação entre as famílias Narkemidae Handlirsch, 1911, Cacurgidae Handlirsch, 1911, Narkemocacurgidae Pinto et Ornellas, 1978, Hapalopteridae Handlirsch, 1906 e Strephoneuridae Martinov, 1940. Deste estudo resultou a descrição de uma família nova Cacurgonarkemidae Pinto e de *Carpenteroptera onzii* Pinto gen. et sp. nov. do Carbonífero Superior da Bacia do Paraná.

INTRODUCTION

Some years ago the Geologist Sergio Onzi provided the author with a piece of rock collected in Santa Catarina State, showing a well preserved insect wing, one of the most complete of the group. This condition has allowed both a) a better interpretation of some species already described and b) a better comparison between the families: Narkemidae, Cacurgidae, Narkemocacurgidae, Hapalopteridae and Strephoneuridae (Figs. 1-5).

TAXONOMY

Super Ordo Paraplecopteroidea
Ordo Paraplecoptera
Super Familia Cacurgidea

Familia Cacurgonarkemidae Pinto, fam. nov.

Diagnosis — Veins very strong. SC fuses distally with R; RS originated at 2/5 of the wing length and linked distally to R; MA bifurcates forming two long branches toward the apical border and not fused with RS. CuA fuses with MP for some distance. The tronc of M, MP and Cu forms a basal cell. The veins branches are parallel and linked by several cross-veins. CuP is simple.

Genotype: *Carpenteroptera* Pinto, gen. nov.

Remarks — The new family presents great similarity to the families Narkemidae and Cacurgidae (Fig. 1, 2), but differs from them by the same reasons they differ from Narkemocacurgidae as was pointed out in Pinto et Ornellas, 1978. From Narkemocacurgidae it differs also in having very strong veins RS originated much more basally and is linked distally to R; MA is not linked to RS and CuP is simple (Fig. 3). It presents great similarity to Hapalopteridae Handlirsch, 1906, (Fig. 4), collected near Tremont, Pennsylvania, USA, of Stephanian age, (Carpenter, 1965, p. 183-5, fig. 4), but differs: in size, it is much bigger; in the wing contour, it does not narrowed basally as *Hapaloptera*; the branches of MA (MP of Carpenter, 1965) are both simple; CuP does not furcate distally, and it is simple. Strephoneuridae is quite similar also but SC does not fuses with R (Fig. 5). To this new family another species must be assigned to *Narkemina rochacamposi* Pinto et Ornellas, 1978, from Paraná Basin (Fig. 8), as will be discussed later, on the remarks of the new species. Probably *Paranarkemina velizensis* Pinto et Ornellas, 1981, from the Upper Carboniferous, of Bajo de Veliz, Argentina (Fig. 9), is a new genus and probably belongs to this family also. Another species that must be better studied is *Narkemina genuina* Sharov, 1961, from the Upper Carboniferous of the Kuznetzk Basin, SSSR, that certainly does not belong to the genus *Narkemina* (Fig. 10).

Carpenteroptera Pinto, gen. nov.

Diagnosis — Cacurgonarkemidae having some branches of SC simple, others bifurcated; the cross-veins simple and regularly distributed all over the wing. This new genus is dedicated to Professor Frank M. Carpenter.

Type species: *Carpenteroptera onzii* Pinto, gen. et sp. nov.

Carpenteroptera onzii Pinto, gen. et sp. nov.
Figures 6 and 7

Designatio nominis: In honour of the Geologist Sergio Onzi.
Holotypus: One complete wing. UFRGS MP-I-6608.
Locus typicus: Fazenda Juca. 14 km from Anitápolis,

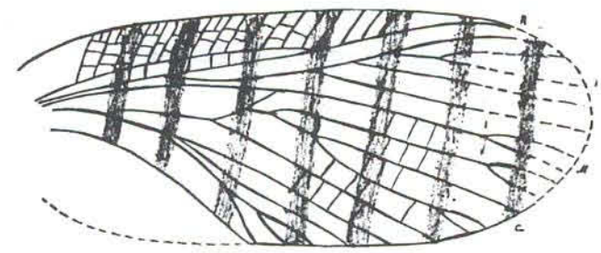
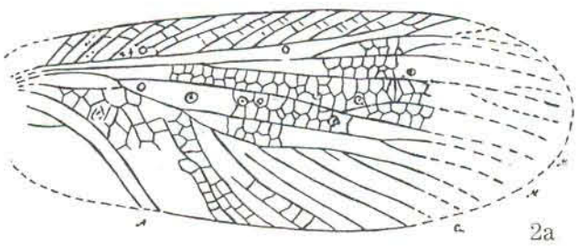
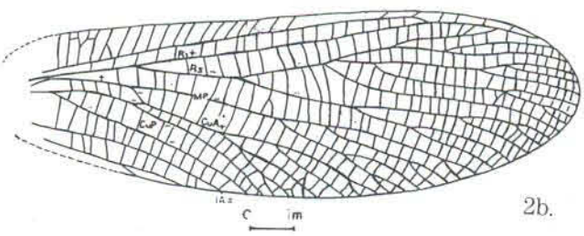


Figure 1 — Familia Narkemidae Handlirsch, 1911
Narkema toeniatum Handlirsch, 1911. Upper Carboniferous, Mazon Creek, USA. Length 46.0 mm

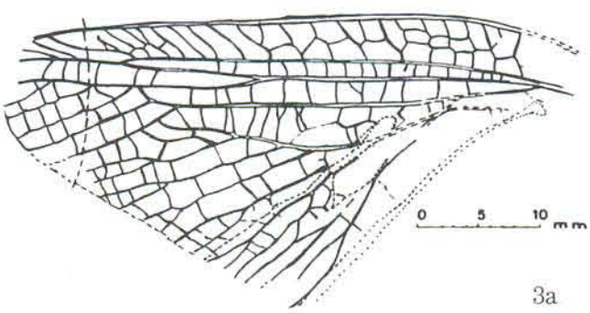


2a

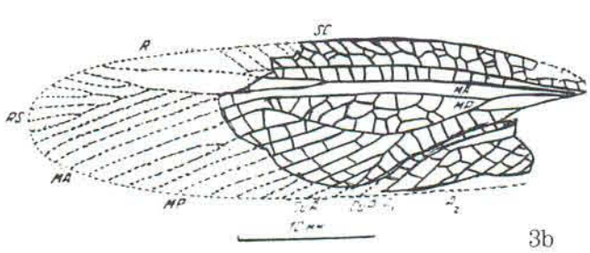


2b.

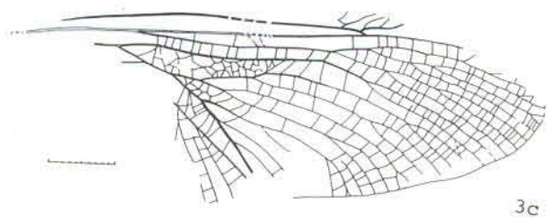
Figure 2 — Familia Cacurgidae Handlirsch, 1911
2a. *Cacurgus spilopterus* Handlirsch, 1911. Upper Carboniferous, Mazon Creek, USA. Length 38.0 mm
2b. *Heterologus langferdorum* Carpenter, 1943. Upper Carboniferous, Illinois, USA. Length 69.0 mm



3a



3b



3c

Figure 3 — Familia Narkemocacurgidae Pinto et Ornellas, 1978
3a. *Narkemina rodendorfi* Pinto et Ornellas, 1978. Upper Carboniferous, Boitúva, São Paulo State, Brazil. Length 42.0 mm
3b. *Narkemina angustiformis* Sharov, 1961. Upper Carboniferous, Jalty Jar, Kuznetzk Basin, SSSR. Length inferred 41.0 mm
3c. *Paranarkemina kurtzi* Pinto et Ornellas, 1980. Upper Carboniferous, Bajo de Veliz, Argentina. Length 82.0 mm

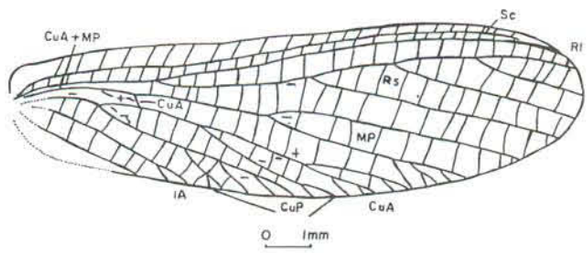


Figure 4 — Familia Hapalopteridae Handlirsch, 1906
Hapaloptera gracilis Handlirsch, 1906. Upper Carboniferous, USA. Length 14.0 mm

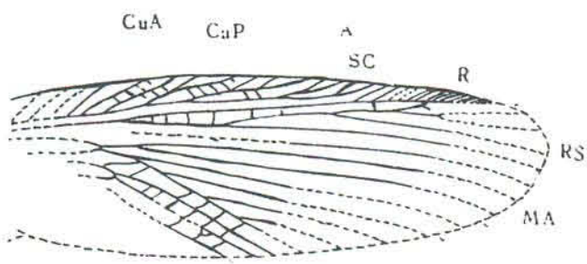


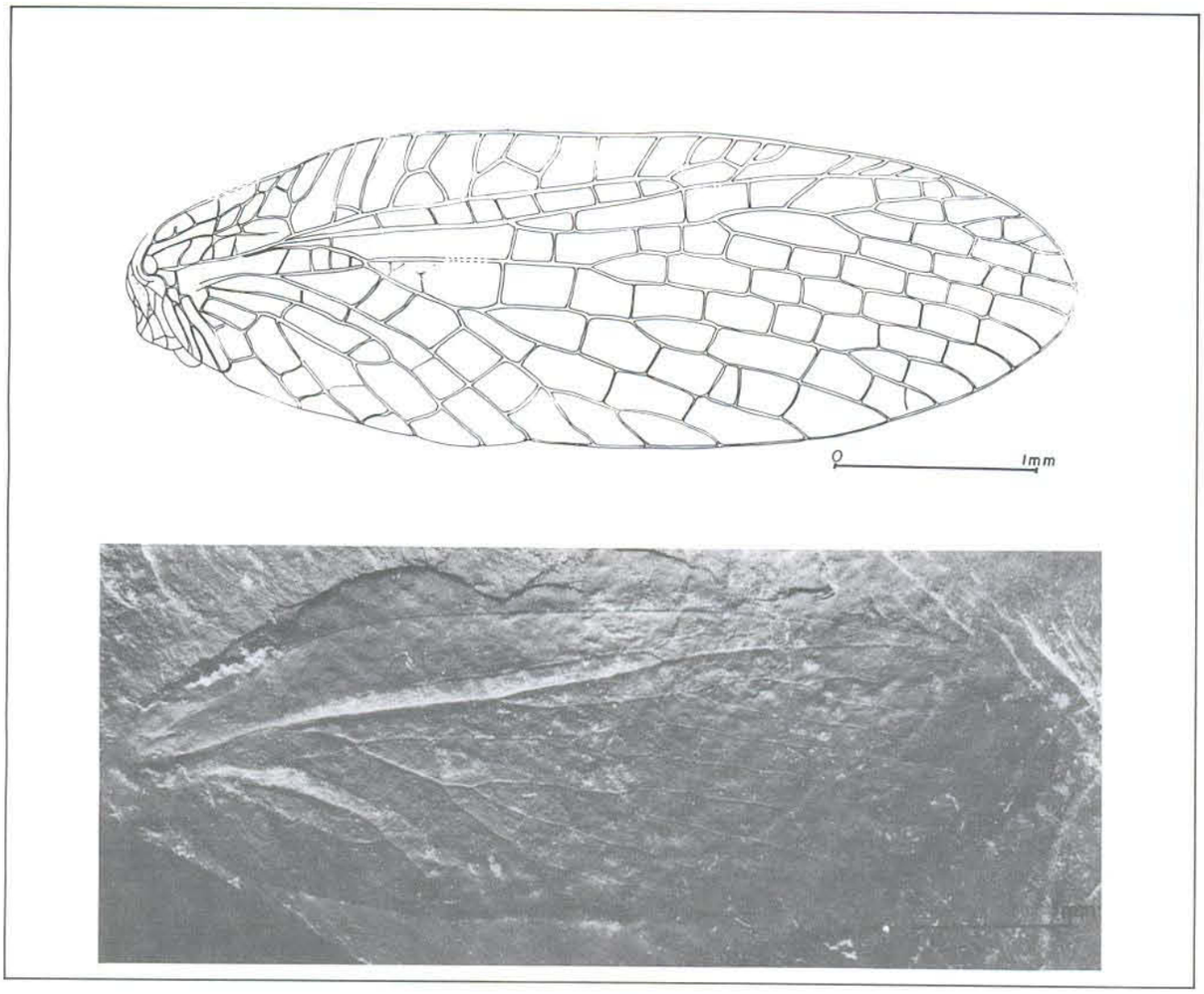
Figure 5 — Familia Strephoneuridae Martinov, 1940
Strephoneura robusta Martinov, 1940. Permian Thekarda, SSSR. Length of the fragment 35.0 mm, inferred size of the wing 50.0 mm

Santa Catarina State, Brazil.
Stratum typicum: Itararé Subgroup. Upper Carboniferous.

Diagnosis — Large forewing, 46.0 mm long, 15.3 mm wide; SC linked to R a little before RS start to branch; MA bifurcated just before midlength; MP bifurcates just after it separates from CuA.

Description — A large elongate forewing 46.0 mm long and 15.3 mm wide. Costal margin almost straight, curving abruptely backward basally; apical margin acutely rounded, posterior margin slightly convex. Costal area large at 1/4 of the wing length, narrowing forward and abruptely backward; costal vein not clearly showed. SC vein originated basally it is slightly convex and linked to R after midlength, just before the first branching of RS and presenting a series of rami direct-

ed to the costal margin, some simple, others branched; distally it sends a branched ramus to the anterior margin; R almost straight with three apical rami inclined forward to the anterior margin RS originated from R at 3/8 of the length and linked to it distally forming a long narrowed cell. It sends apically five branches, two anterior direct to the apical margin and three obliquelly backward to the apex; M with slightly convex trunk originated at the base of the wing bifurcating at 1/4 of the wing length, the anterior branch MA bifurcates just before midlength a little after the origin of RS; forming two long parallel branches, slightly inclined backward and reaching the apical border; MP fuses in its origin with CuA running for some distance fused with it and separates from it little before 3/8 of the length, MP bifurcates just after the separation from CuA, the anterior branch forks twice and the posterior is simple, all them are parallel, obliquely inclined to the posterior margin; CuA originated at the wing base and at 1/4 of the wing length fuses with MP for some distance, after separating from MP it forkes twice distally; CuP is simple and is originated a little after 1/8 of the wing length and curves slightly, to the posterior margin running parallel to the branches of CuP; M, MP, CuA and Cu form a basal cell. Anal area occupies 3/8 of the wing length. The anal veins are obliquely inclined posteriorly and



Figures 6, 7 — *Carpenteroptera onzii* Pinto, gen. et sp. nov. Holotypus: UFRGS MP-I-6608 from Itararé Subgroup, Paraná Basin, Upper Carboniferous, Anitápolis, Santa Catarina State, Brazil. Lenght 46.0mm

parallel to all other veins. Apparently a jugal area is present. A series of straight regular cross-veins all over the wing is present also.

Remarks — This species presents some similarity to *Narkemina rochacamposi* Pinto et Ornellas, 1978 p. 312, 313 fig. 6, fig. 4a, b. They present the same strong veins with the same general pattern. They differ from *N. rochacamposi* because in the later the origin of RS is more basal, MP branches one at further distance of the separation from CuA, and the cross-veins are branched and irregularly disposed. *Narkemina rochacamposi* certainly belongs to a new genus and to this new family (Fig. 8).

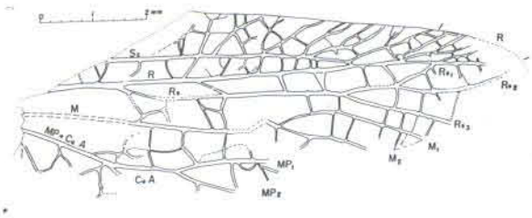


Figure 8 — *"Narkemina" rochacamposi* Pinto et Ornellas, 1978. Holotypus: UFRGS, MP-I-5286, Itararé Subgroup Paraná Basin, Upper Carboniferous, from Durasnal, Encruzilhada do Sul, Rio Grande do Sul State, Brazil. Length 42.0 mm.

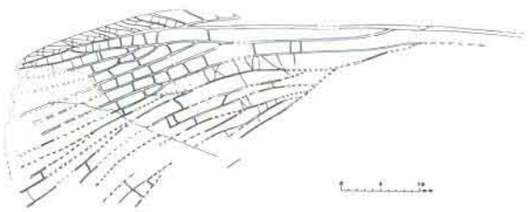


Figure 9 — *"Paranarkemina" velizensis* Pinto et Ornellas, 1981. Holotypus: Fragment of wing, Mus. Univ. Cordoba, Cord-PZ-81. Pallero Member, Upper Carboniferous, Bajo de Veliz, Argentina. Length 64.0 mm.

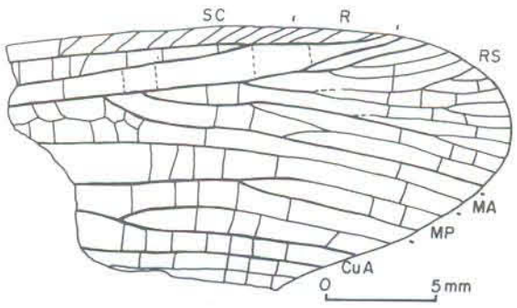


Figure 10 — *"Narkemina" genuina* Sharov, 1961. Holotypus: I.P., SSSR PIN Nº 742/61 Lower Balaconian Kuznetzk Basin, SSSR. Length of fragment 27.0 mm. Size inferred 41.0 mm.

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