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CARBONIFEROUS INSECTS-(PROTORTHOPTERA AND PARAPLEOCTERA)
FROM THE GONDWANA (SOUTH AMERICA, AFRICA AND ASIA)

Irajá Damiani Pinto *
Lilia Pinto de Ornellas *

SINOPSE

São descritos novos insetos carboníferos da Bacia do Paraná, Brasil, pertencentes a novas famílias da: Ordem Protorthoptera; Proedischiidae fam. nov. com uma espécie *Proedischia mezzalirai* gen. et sp. nov.; e da Ordem Paraplecoptera, Narkemocacurgidae fam. nov. com as espécies *Narkemina rodendorfi*, sp. nov.; *N. rochacamposi*, sp. nov. e mais quatro espécies indeterminadas de *Narkemina*, sendo uma da África (Madagascar). É discutida a idade do Subgrupo Itararé e apresentados alguns dados para a correlação e paleogeografia do Gondwana.

ABSTRACT

New Carboniferous insects from Parana Basin, Brazil are described they belong to new families of: Ordo Protorthoptera, Proedischiidae fam. nov. with one species *Proedischia mezzalirai* gen. et sp. nov.; and Ordo Paraplecoptera, Narkemocacurgidae fam. nov. with the following species: *Narkemina rodendorfi*, sp. nov., *N. rochacamposi*, sp. nov. and four indeterminate species of *Narkemina*, one being from Africa (Madagascar). It is discussed the age of the Itararé Sub-Group and presented some data for correlation and paleogeography of Gondwana.

INTRODUCTION

Some years ago Dr. Sergio Mezzalira from Instituto Geográfico e Geológico de São Paulo (I. G.G.) announced the finding of fossil insects in cores of drillings made in the town of Boituva, at São Paulo State (Mezzalira, 1968). He knowing the interest of the senior author for the study of these insects, gave him the samples.

Although full studies of them have started to be published only this year, some notes and ideias over them have been already presented (Pinto, 1972a). Besides these insects, another Brazilian fossil insect was found by Margot Guerra Sommer in a field trip with the senior author and Zuleika C. Correa da Silva in Rio Grande do Sul.

This new insect is also described in this paper. It is also registered some data about similar African insects found at Madagascar (Paulian, 1965).

Unfortunately these insects have stratigraphical position not clear and very poorly described and figured. However, as two drawings of wings not determined by Paulian (op. cit.) could represent a very interesting data for stratigraphical correlation, one of them is figured and discussed in this paper.

ACKNOWLEDGMENTS

Very special thanks are due to Dr. Sergio Mezzalira who with self-denial furnished most of the fossil insects under study. The similarity of these insects with the Asiatic ones, and the fact that practically, all specialists in fossil insects were in USSR lead the senior author to accept to visit the Academy of Science of the USSR in order to study them there. The very kind cooperation of those colleagues, specialists in insects, permitted not only to learn about the insects but also to get enough literature to carry on here, in South America, the studies on this subject. So many thanks to the Academy of Science of USSR and colleagues from there, by the opportunity and the help in the study of this entomofaunula. Thanks are due to colleague Ivone Purper for the help during the development to this work, to Mrs. Louise Körner for the patient translation of the Russian papers and to Prof. Renato Andreis for the criticism. Thanks are due also to Conselho Nacional de Desenvolvimento Científico e

Tecnológico do Brasil (CNPq); Fundação de Amparo à Pesquisa do Estado do Rio Grande do Sul (FAPERGS) and Câmara Especial de Pesquisa e Pós-Graduação da Universidade Federal do Rio Grande do Sul for their continuous support to the authors researches.

GEOGRAPHICAL AND STRATIGRAPHICAL DATA (Fig. 1)

The fossil insects from São Paulo State, were found in cores of the Well n.º 2-I.G.G. In order to obtain water, the Well was drilled in the Praça da Bandeira, at the town of Boituva, State of São Paulo. The Well starts at 635m sea-level. Between -75 to -88m -166 to -220m and -228 to -232m.

Ritmites with trails of arthropodes and possibly of worms too were found. The insects were found in ritmites between -200 and -207m.

At -203m and -209m carbonized plant remains and at -205,50m plant remains not carbonized were also found.

These sediments, according Mezzalana, (1968), belong to the Itararé Sub-group, base of the Tubarão Group.

The insect wing from the State of Rio Grande do Sul was found at the locality of Durasnal, Caçapava do Sul County, in yellow siltstones at the base of Itararé Sub-group.

AGE

The age of the sediments containing plants and these groups of insects in Brazil, Argentina and Madagascar have been attributed by several authors to the Upper Carboniferous (Dolianiti, 1954; Daemon et Quadros, 1970; Rigby, 1972). Other authors attribute to the Lower Permian due to appearance of the Glossopteridales that, for them, should mark the beginning of the Permian in the South Hemisphere (Archangelsky, 1971; Arrondo, 1972).

However, the present authors based on the Palynological studies of Daemon (1966) and, specially now, through the presence of insects belonging to groups that have been found exclusively in the Upper Carboniferous, in Asia, in Europe as in North America (Pinto et Ornellas, 1978 a, b) reach to the conclusion that these insects and that Glossopteridales have appeared before the Permian in the Upper Carboniferous.

DISTRIBUTION AND PALEOGEOGRAPHY (Fig. 2)

Insects of the family Narkemocurgidae have been registered in Mendoza County (Bajo de Veliz Formation), Paganzo Basin, Argentina; in Encruziliada do Sul County, Rio Grande do Sul State, in Santa Catarina and in Boituva County, São Paulo State (Subgroup Itararé), Paraná Basin, Brazil; in Mavonono, Madagascar, Africa; in Kuznetsk Basin, URSS, Asia. The Brazilian and Argentinian Carboniferous entomofaunas under study and those already described by Pinto (1972a), Pinto et Ornellas (1978b), Pinto et Purper (1978) present a very strong similarity with that from Africa (Madagascar) registered by Paulian (1965) and especially from those ones of Asia (Kuznetsk Basin of USSR) described by Zalessky, 1931, Sharov, 1961, Rodendorf et alii, 1961. Although similar families have also been described for the Carboniferous of North America (Mazon Creek-USA) by Handlirsh (1911) and in Europe Terrain Houillier of Commeny France) by Brogniart (1893), Meunier (1909) and Laurentiaux (1950) and others, they apparently are not so strongly linked to the Gondwana species as those of the Kuznetsk Basin.

By all these data and also the astonishing similarity of the Brazilian Permian entomofauna (Pinto, 1972) associated with similar paleoflora and specially similarity of Permian and Triassic vertebrates specially after the last discoveries (Barberena 1973; Barberena et Daemon, 1974) with that of the Kuznetsk Basin brought out more data in favour of the idea proposed by Pinto (1972a, b) over the possibility of Asia being part of the Gondwana during the Paleozoic and early Mesozoic.

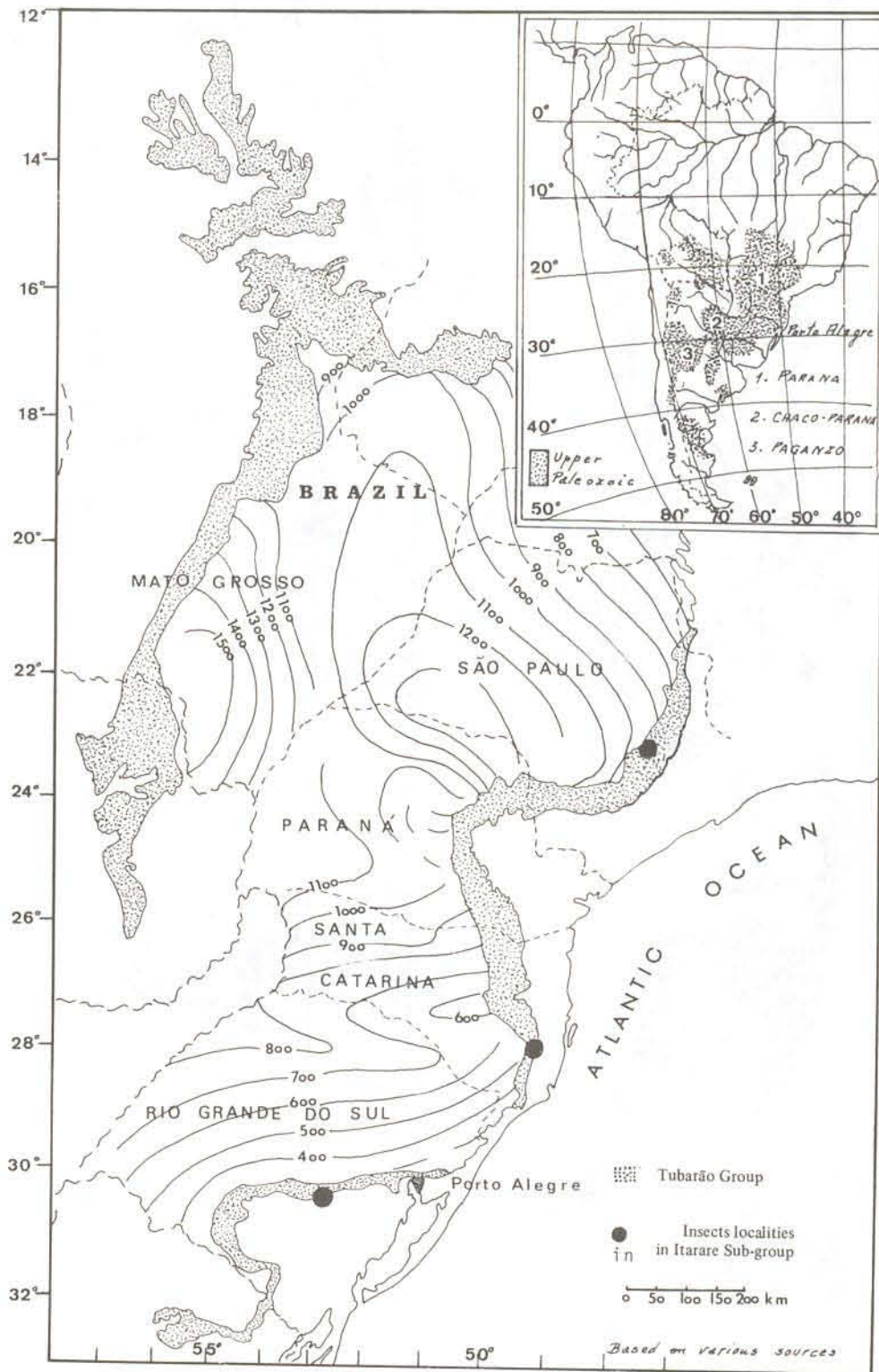


Fig. 1 - Isopach map of the Tubarão Group, showing the places where in the Itarare Sub-group, Carboniferous insects of the Family Narkemocurigidae Pinto et Ornellas, 1978, were found.

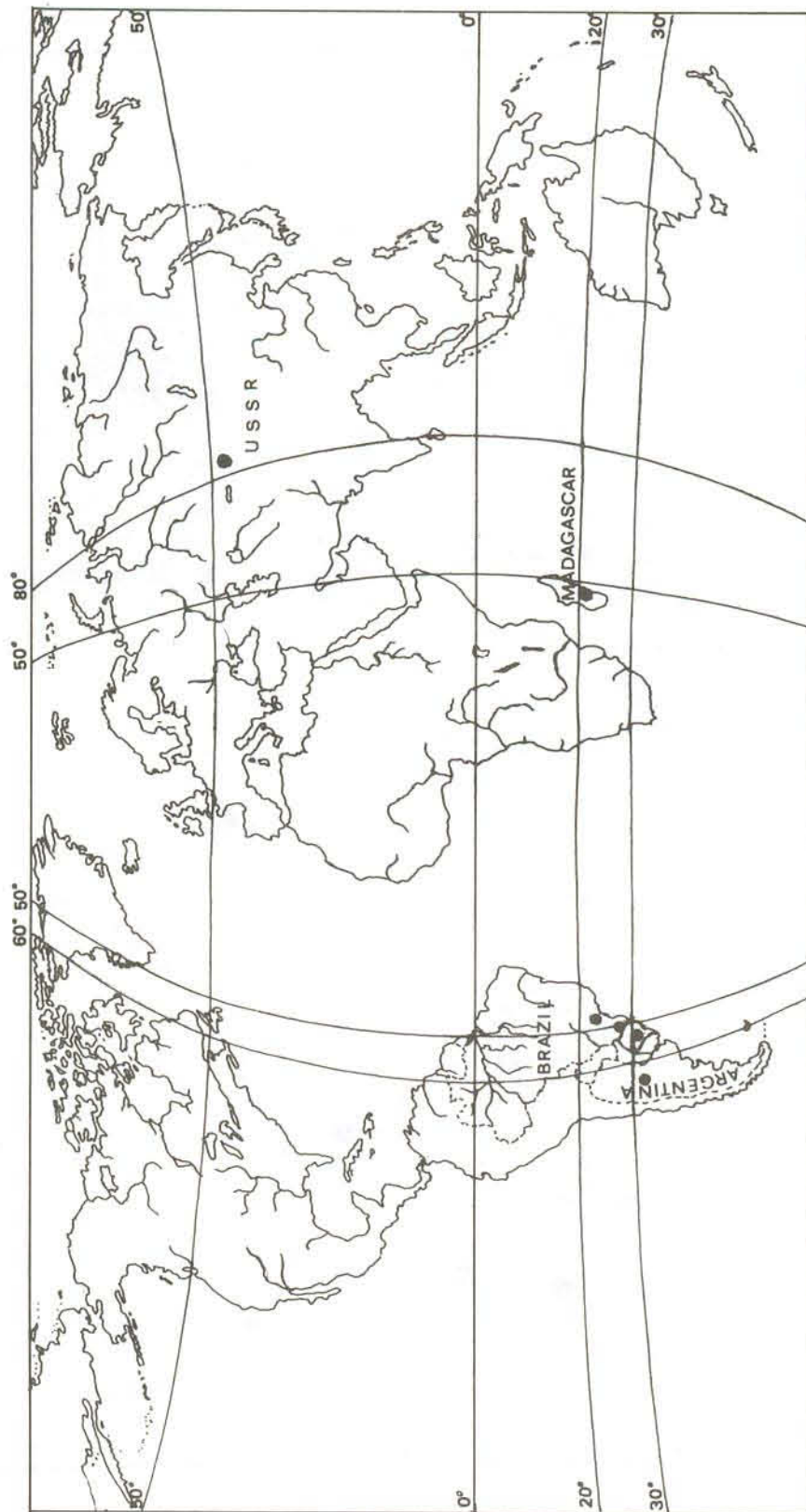


Fig. 2. — Geographical distribution of Paleozoic Insects of the Family Narkemocacurgidae Pinto et Ornellas, 1978

SYSTEMATICS

Classis Insecta
Super-Ordo Orthopteroidea
Ordo Protorthoptera

Familia Proedischiidae Pinto et Ornellas fam. nov.

Diagnosis: Submarginal costa with few veinlets very difficulty seen, forming a small precostal area; anterior branch of MA anastomosed to the tronc of Rs; MA₂ begins much closer to the origin of MP than the anastomosis of MA₁ with Rs; CuA linked directly to M at 1/4 of the length from the base, and been fused for a long distance with MP; CuP and A branched.

Remarks: The new family presents characteristics of Sthenaropodidae (Protorthoptera) and of Oedischiidae (Orthoptera) however differs from them in the following aspects:

- 1) the costal area, not very well preserved, apparently is short, as in the Sthenaropodidae (Protorthoptera), and with veinlets as in the Oedischiidae (Orthoptera)
- 2) a) in Oedischiidae MA₂ originate between the origin of MP and Rs origin very near to MP
b) in the new family MA₂ originate exactly at midway between MP and Rs origins
c) in Sthenaropodidae is Rs that originate between MP and MA₂ origins. On this character the New Family is different from the other two but more approached to Oedischiidae
- 3) MA₂ is parallel to MP + CuA in Oedischiidae, a little divergent in the New Family and more divergent in Sthenaropodidae. On this character the New Family stays exactly at the middleway.
- 4) a) in the Oedischiidae CuP is simple; A₁ is simple
b) in the New Family CuP presents very short and weak branches; A₁ is branched
c) in the Sthenaropodidae CuP is branched, A₁ is branched. On this character the New Family approached much more to the Sthenaropodidae.

Type genus *Proedischia* Pinto et Ornellas, gen. nov.

Proedischia Pinto et Ornellas, gen. nov.

Diagnosis: Large forewing; Rs branching before midlength; the tronc of MA₁ anastomosed with the tronc of Rs by an almost vertical short cross-vein; anterior branch of Rs fused distally with R; Rs, MA₁, MA₂ and MP with few branches but more than two; Cup with two short distal branches; A₁ bifurcates after the level of M-CuA fusion and presenting in each branch, two to three twigs; many simple cross-veins except distally between CuA and CuP where it is formed a small archdictyon.

Proedischia mezzalirai Pinto et Ornellas, gen. et sp. nov.

Pl. I fig. 1, Pl. II fig. 1.

Derivatio nominis: In honour to Dr. Sergio Mezzalira of the Instituto Geográfico e Geológico de São Paulo.

Holotypus: an almost complete forewing. M.P. U.F.R.G.S., n.º MP-I-5282 a,b.

Locus typicus: -205,50m at the Well n.º 2-IGG, Boituva town, São Paulo, Brazil.

Stratum typicum: Itararé, SubGroup, Carboniferous, Paraná Basin, Brazil.

Diagnosis: A large wing being 83mm long and 18mm wide; costal and subcostal area narrow, being the costal area little larger than the subcostal; costal area normally with simple cross-veins, few bifurcated; subcostal area with many simple cross-veins being the distal ones S-shaped. Between the branches of CuA and CuP, S-shaped cross-veins that distally are modified forming an archdictyon.

Description: Forewing elongate, narrowing towards the apex. Sc long ending at C. R almost straight reaching the apex, and presenting distally several S-shaped veinlets, after the end of Sc Rs deriving from R before midlength, presenting distally four branches, the anterior one fused with R forming between Rs and R a close cell with many vertical cross-veins (about 20); N runs basally parallel to R and curves slightly backward and connects to Cu at 1/4 of length; MA has a short tronc parallel to Rs that divides in two long almost horizontal veins: "MA₁, anastomoses with the long tronc of Rs, somewhat after the midlength; it forks at the same level of the forking of Rs and its posterior branch fork again; MA₂ forks before the level of the anastomosis; its anterior branch forks distally, and the posterior branch forks pretty soon; the anterior branch forks again resulting in five branches of MA₂. MP deriving from M at 1/4 of the length, where M fuses with CuA; MP is fused with CuA for a long distance and separates from it after the level of the origin of Rs, forming two branches which presents distally two twigs each. CuA simple. CuP with two short and weak branches distally is straight, parallel to CuA and separate from it by a wide space occupied by S-shaped cross-veins that near the posterior margin forms an archdictyon; A bifurcates just after the bifurcation of M and form distally four or five twigs.

Remarks: Disregarding the similar species of Sthenaropodidae and Oedischiidae from which it differs as was explained before, it presents strong similarity with *Anepitedius giraffa* Handlirsh, 1911 (p. 318, 19 - 23-25) from the Carboniferous of Mazon Creek, but differs from it in having the origin of Rs more distal and after the level of the bifurcation of MA.

Occurrence: In ritmites, of a core drilling at -205,50m depth, at Well n^o 2, IGG. The Well begging at 635m sea level, at Praça da Bandeira, Boituva, São Paulo.
Collectors: Dr. Sergio Mezzalira and Eng. Sizenando M. Chaves.

Super Ordo Plecopteroidea
Ordo Paraplecoptera

Familia Narkemocacurgidae Pinto et Ornellas, fam.nov.

Diagnosis: Sc ending in R; dividing near the base; MA with two parallel branches; MP fuses for some distance with CuA. The troncs of M, MP and Cu form a basal cell. The anterior steep curved branch of MP linked to the tronc of MA or to the posterior branch of it; MA, MP, MP + CuA and the anterior branch of MP form a normally large, central cell. The branches of Rs, MA, MP and CuA are oblique and parallel directed postero-apically. CuA send-off its branches apically; CuP branched.

Remarks: This new family presents some characteristics of Narkemidae and others of Cacurgidae, but differs from both exactly by having the typical characteristic of both, associated. It is similar to:

- a) Narkemidae in having: Sc fused with P and the presence of a close central area, but differs in having M, MP and CuA forming a basal cell and MP and CuA fused.
- b) Cacurgidae in having MP and CuA fused and M, MP and CuA forming a broad cell, but differs in having: Sc fused with R; a central cell and CuP branched.

Differs from both families, yet, in having CuA, sending off its branches apically; while these two families have them directed basally.

All species of the genus *Narkemina* Martinov, 1931 are taken out from Narkemidae and two of them *N. angustata* Martinov, 1931 and *N. angustiformis* Sharov, 1961 are put under this new family because they have CuA linked to MP forming a basal cell what is characteristic of Cacurgidae and that is not present in typical Narkemidae as was characterized by Handlirsch (1911). *Narkemina genuina* did not belong to the genus *Narkemina* because it did not form the central cell, as will be presented by the authors in another paper in preparation. The name given to the new family is a combination of the names of the two families because the species present a combination of characters of both families.

Type-genus *Narkemina* Martinov, 1931

Occurrence: Lower Balachonian, Kuznetsk basin, USSR, Itararé Group, Parana basin, Brazil; Bajo de Veliz Form, Paganzo basin, Argentina; and probably at the “? serie à charbon”, Mavonono river, Madagascar.

Genus *Narkemina* Martinov, 1931 emend. Pinto et Ornellas

Diagnosis: Forewing rather narrow; hindwing broad; Sc ending on R about 5/7 of the length; Rs deriving from R at about 3/5 of the wing length and forming a row of four to six branches simple, eventually branched. The area between R and Rs broad, narrower in its end-portion. MA running parallel to R and forming two long branches parallel and similar to the branches of Rs; upper branch connected with Rs by a short cross-vein. Between MA and the long steep curved MP vein connected to the posterior branch of MA there exists a broad triangular space. CuA separates after some distance from MP and send off two to three branches almost parallel to the branches of MP, M and Rs.

Type-species: *Narkemina angustata* Martinov, 1931
from the Carboniferous of the Kuznetsk Basin, USSR

Remarks: Based on the well preserved new species, *N. rodendorfi*, sp.nov., it was possible to do a better interpretation of the genus *Narkemina* and to think that *Narkemina angustiformis* Sharov (1961, fig.94) is not the forewing, but probably the hindwing and that it has not the distal part as was reconstructed. It is probably almost identical with the *N. rodendorfi*, sp.nov., here described.

Stratigraphical range and geographical distribution: Lower Balachonian, Upper Carboniferous of Kuznetsk Basin, USSR; It rare Sub-group, Upper Carboniferous, Parana Basin, Brazil; “Serie a Charbon”, ? Lower Permian, Mavonono River, Madagascar.

Narkemina rodendorfi Pinto et Ornellas, sp.nov.
Pl.I, fig.4,5; Pl.II fig.2,3.

Derivatio nominis: in honour of Dr. Boris Rodendorf from the Academy Nauk SSSR

Holotypus: one almost complete hindwing. M.P. U.F.R.G.S., n.^o MP-I-5283a, b.

Paratypus: basal part of an hindwing M.P. U.F.R.G.S., n.^o MP-I-5275

Locus typicus: -205,50m at the Well n.^o 2-IGG, Boituva, São Paulo, Brazil.

Stratum typicum: Itararé Formation, Carboniferous, Paraná Basin, Brazil.

Diagnosis: Large hindwing lacking the basal part; 45mm long and 24mm wide; inferred size based also on another basal part of wing: 49mm. Sc links to R just after the level where the branches of Rs begin; MP curves anteriorly reaching the basal part of the posterior branch of MA and presents three parallel branches, each one with a distal fork; CuA also with three branches, forking at the distal end. Central area of wing broad elongate with cross-veins simple or anastomosed.

Description: A large incomplete hindwing, 45mm long and 24mm wide, lacking the basal part. Costal margin almost straight, clearly curved backward at the base; apical margin rounded; posterior margin strongly convex. Sc linked to R after 3/4 of the length and just after the origin of the first branch of Rs; Rs originated just a after midlength with three to four simple inclined parallel branches; MA originate near the base and forks at midway, between the origin of Rs and the anastomosis of Sc with R, in two simple branches, parallel to the branches of Rs; MP originate near the base and fuses pretty soon to CuA, separating from it at midlength, curving strongly to the anterior side and direct forward and links to the posterior branch of MA; it sends off three parallel branches that bifurcate distally; CuA originate basally, having a short tronc parallel to R which Teaches MP there CuA fuses with MP for some distance; CuA has three branches apparently each one bifurcated distally; the anal areas was lost. The costal area has several irregular cross-veins many of them linked by transversal veins; the subcostal area with more than fifteen simple cross-veins; between R and Rs and between R and MA few simple cross-veins; at the close cellule formed by MA, MP + CuA and MP are few simple cross-veins and some forming cellules; between the parallel branches of Rs, MA, MP and CuA simple cross-veins regularly disposed.

Remarks: Another specimens shows only the basal part (24mm) that appears to belong to the same species Paratype MP-1-5375. This specimen shows: a short, costal veins forming a small costal area; the base of the veins Sc, R, M, MP and CuA is well seen; between CuA and CuP there are basally an archidictyon and distally simple cross-veins; CuP is curved and branched basally.

This new species is quite similar to *Narkemina angustiformes* Sharov, 1961 (Pl. 1 fig.3) from the Lower Balachonian of the Kuznetsk basin that must be the hindwing and not the forewing and the part that was missing must be different from the reconstruction presented (Sharov, 1961 fig.94). It presents great similarity in the network of the veins of the costal area; in the cross-veins of the subcostal area; in the form and disposition of MA, MP + Cu; in the medial area and in the way of bifurcation of MP + Cu. However it differs in the presence of cross-veins in the radial area (this difference could be only a matter of observation because they are too weak); in being slightly bigger and in having Sc linked to R after the level of bifurcation of Rs; MP with three branches only; central area without the three honey comb.

Occurrence: In ritmites between-200 to-205,50m depth in a core drilling from Well n.º 2-IGG, that beginning at 635m sea level, at Praça da Bandeira, Boituva, São Paulo.

Collectors: Dr. Sergio Mezzalira and Eng. Sizenando M. Chaves.

Narkemina rochacamposi Pinto et Ornellas, sp.nov.

Pl.I Fig.6; Pl.II Fig. 4a,b

Derivatio nominis: In honour of Prof. Dr. Antonio Carlos Rocha Campos from the Universidade de São Paulo.

Holotypus: an incomplete wing M.P., U.F.R.G.S., n.º MP-I-5286 RGS.

Locus typicus: Durasnal, Caçapava do Sul, Rio Grande do Sul, Brazil.

Stratum typicum: Itararé Sub-group, Carboniferous, Paraná basin, Brazil.

Diagnosis: An incomplete wing 42mm long, 18mm wide; distal costal veinlets branched and with irregular transverse cross-veins; Rs originating at midlength of the wing connecting to R distally; and presenting MA dividing in two branches before the first branch of Rs; MP with two branches.

Description: An incomplete wing 42mm long, 18mm wide; costal margin almost straight; costal area with irregular bifurcates veinlets with several transverse cross-veins; Sc links to R. just after the origin

of the first branch of Rs; Rs originated at midlength of the wing, has two branches and connects distally with R; MA divides a somewhat after the midlength between the level of the origin of Rs and the anastomosis of Sc with R; MP curves steeply anteriorly and reaches the basal part of the posterior branch of MA forming an elongate almost triangular central cell. MP has three branches. Unfortunately the basal part and the posterior margin were destroyed.

Remarks: This species is similar to *Narkemina angustiformis* and to *N. rodendorfi* sp.nov. but differs from them by having Rs linked distally to R; Rs with only two branches and more complex veinlets at the costal area.

Occurrence: At Durasnal, Encruzilhada do Sul County, Rio Grande do Sul State, Brazil.
Collector: Margot Guerra Sommer and Irajá Damiani Pinto.

Narkemina sp. A
Pl.I fig.7; Pl.II fig.5

Hypotypus: The distal part of a wing MP., UFRGS, n.^o MP-I-5289

Locus: Boituva town, Well I.G.G. n.^o 2 at – 207,50m. São Paulo.

Stratum: Itararé, Subgroup, Carboniferous

Description: A small distal part of a wing, 16mm long, showing Sc linked to R; Rs with three branches and linked distally to R.

Remarks: It is quite similar to *N. rochacamposi* Pinto et Ornellas, sp.nov., from Rio Grande do Sul State, differing from it, only in having one more branch in Rs.

Occurrence: In ritmites of the Well IGG n.^o 2 at – 207,50m at Boituva town, São Paulo, Brazil.
Collector: Sergio Mezzalira and Sizenando M. Chaves.

Narkemina sp. B.
Pl. I fig. 8; Pl. II fig.6.

Hypotypus: Anterior distal half of a wing. M.P., UFRGS n.^o MP-I-5287

Locus: Boituva town, Well I.G.G. n.^o 2 at – 205,50m, São Paulo.

Stratum: Itararé, Subgroup, Carboniferous.

Description: Anterior distal half of a wing, 40mm long, showing Sc linking to R; Rs forming a cell distally; M is partially destroyed; MP and CuA forking soon and partially destroyed.

Remarks: This species is quite similar to *N. rochacamposi* sp.nov. differs only in the presence of a cell in Rs, and as it is represented by small part of the wing it is leaved as a species indeterminate. It was found associated with *N. rodendorfi* Pinto et Ornellas, sp.nov.

Occurrence: In ritmites of the Well I.G.G. n.^o 2 at – 205m at Boituva town, São Paulo, Brazil.
Collector: Sergio Mezzalira and Sizenando M. Chaves.

Narkemina sp. C
Pl. I fig. 9; Pl. II fig. 7

Hypotypus: Distal part of a wings M.P., UFRGS,
n.º MP-I-5288

Locus: Boituva Town, Well I.G.G. n.º 2 at – 207m

Stratum: Itararé Subgroup, Carboniferous

Description: A distal part of a wing, 32mm long, showing Sc linked to R; Sc and R simple and forked veinlets toward the costa; R apparently with a faible fork distally; Rs apparently with six branches, two of them forking soon.

Remarks: The preserved part is quite similar to *Narkemina* sp. D: the Mecopteroide of Paulian, 1965 (p.4030 fig.2) Pl. I fig.10.

Occurrence: In ritmites of the Well I.G.G. n.º 2 at – 207m, at Boituva town, São Paulo, Brazil.
Collector: Sergio Mezzalira and Sizenando M. Chaves.

Narkemina sp D
Mecopteroide (?) Paulian, 1965 p.4030 fig. Pl.I, fig.10

Hypotypus: A distal anterior part of a wing *Locus*

Locus: Right margin of the Mavonono, Madagascar.

Stratum: “? Série à Charbon” just above the “Formation glaciaire”, ? Lower Permian.

Description: An anterior distal part of the wing, 30mm long showing Sc linked to R; Sc with simple veinlets, R with forked veinlets toward the costa; R apparently with a faible fork distally. Rs apparently with six branches, two of them forking distally.

Remarks: This specimen is represented by Paulian, 1965 p.4030, fig.2 and signaled to Mecopteroide (?) doubtly. Quite certainly it belongs to the genus *Narkemina* and it is quite close to the form C from São Paulo (Pl. I, fig.9, Pl. II fig.7).

The other specimen of Paulian (op.cit.) fig.3 presented also as Mecopteroide (?) is very similar to species from São Paulo, very close to *N. genuina* Sharov, 1961, which possibly, did not belongs to the genus *Narkemina*, but to a new genus: fig. 1b a very bad photography where it is possible to get only the outline and few others data on it, i.e., the size; that Sc. is ending in R, and that there are many cross-veins. It must belongs to these groups of insects also.

Occurrence: On the paper ti is not furnished the exact geographical position Paulian (op.cit.) wrote that according to Mr. M. Appert they were found “sur la rive droite de la Mavonono, dans la continuation des couches dites à charbon”? “Permien inferieur”. These beds are just above the “Formation glaciaire” and associated to these fossils were found *Glossopteris indica*, *Gangamopteris major* and *Gangamopteris cyclopteroides* “selon d’anciennes determinations à revoir”.

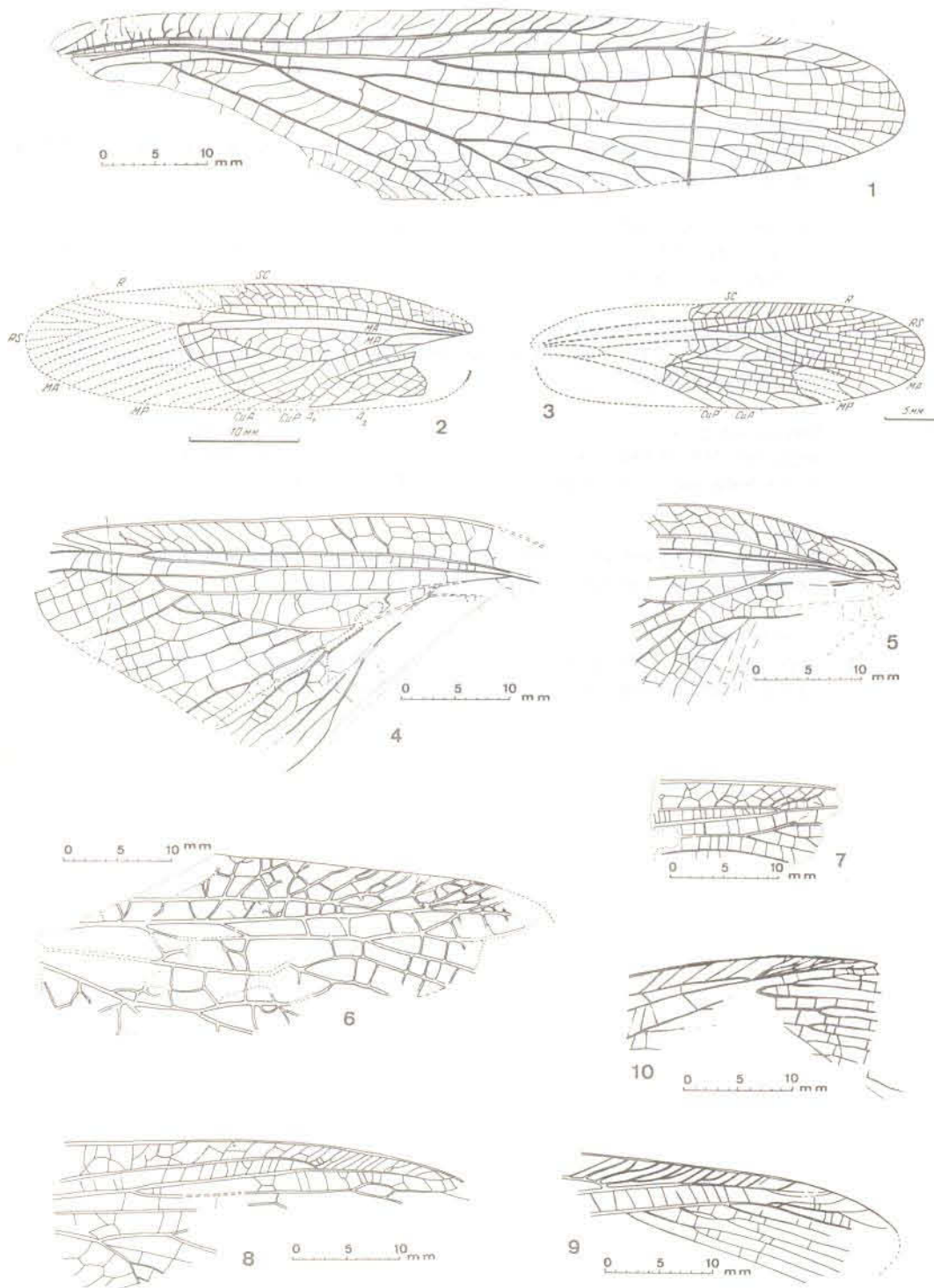
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- Fig. 1 – *Proedischia mezzalirai* Pinto et Ornellas, gen. et sp. nov.
Holotype M.P., UFRGS, n.º MP-I-5282a,b from Boituva town, Well IGG n.º 2, -205,50m; Itararé Subgroup, Upper Carboniferous, São Paulo, Brazil.
- Fig. 2 – *Narkemina angustiformis* Sharov, 1961
Holotype Col. PIN n.º 1281/249 from Jalty Jar, Lower Balachonian, Upper Carboniferous, Kuznetsk basin, USSR.
- Fig. 3 – *Narkemina angustata* Martinov, 1931
Holotype Col. PIN n.º 1079/25 (26) from Verxotomskoie, Sub-Form. Alykaievsk, Lower Balachonian, Upper Carboniferous, Kuznetsk Basin, USSR.
- Fig. 4 – *Narkemina rodendorfi* Pinto et Ornellas, sp. nov.
Holotype MP., UFRGS, n.º MP-I-5283a,b from Boituva town, Well IGG n.º 2, -205,50m; Itararé Subgroup Upper Carboniferous, São Paulo, Brazil.
- Fig. 5 – *Narkemina rodendorfi* Pinto et Ornellas, sp. nov.
Paratype MP. UFRGS, n.º MP-I-5275, from Boituva town, Well IGG n.º 2, -200m; Itararé Subgroup, Upper Carboniferous, São Paulo, Brazil.
- Fig. 6 – *Narkemina rochacamposi* Pinto et Ornellas, sp. nov.
Holotype MP., UFRGS, n.º MP-I-5286 from Durasnal, Encruzilhada do Sul, Itararé Subgroup, Upper Carboniferous, Rio Grande do Sul, Brazil.
- Fig. 7 – *Narkemina* sp. A
Hypotype, MP., UFRGS, n.º MP-I-5289, from Boituva town, Well IGG n.º 2, -207,50m.
- Fig. 8 – *Narkemina* sp. B
Hypotype, MP. UFRGS, n.º MP-I-5287 from Boituva town, Well IGG n.º 2, -205,50m, Itararé Subgroup, Upper Carboniferous, São Paulo, Brazil.
- Fig. 9 – *Narkemina* sp. C
Hypotype, MP, UFRGS, n.º MP-I-5288 from Boituva town, Well IGG n.º 2, - 207m, Itararé, Subgroup, Upper Carboniferous, São Paulo, Brazil.
- Fig. 10 – *Narkemina* sp. D (? Mecopteroide of Paulian, 1965)
From Mavonono, "Serie à Charbon?" Permian, Madagascar.



Pl. II

- Fig. 1 – *Proedischia mezzalirai* Pinto et Ornellas, gen et sp. nov.
Holotype MP., UFRGS n.º MP-I-5282 from Boituva town, Well IGG n.º 2, -205,50m;
Itararé Subgroup, Upper Carboniferous, São Paulo, Brazil.
- Fig. 2 – *Narkemina rodendorfi* Pinto et Ornellas, sp. nov.
Holotype MP., UFRGS n.º MP-I-5283 from Boituva town, Well IGG n.º 2, -205,50m;
Itararé Subgroup, Upper Carboniferous, São Paulo, Brazil.
- Fig. 3 – *Narkemina rodendorfi* Pinto et Ornellas, sp. nov.
Paratype MP., UFRGS n.º MP-I-5275 from Boituva town, Well IGG n.º 2, -200m; Ita-
raré Subgroup, Upper Carboniferous, São Paulo, Brazil.
- Fig. 4a,b – *Narkemina rochacamposi* Pinto et Ornellas, sp. nov.
Holotype MP., UFRGS n.º MP-I-5286 from Durasnal, Encruzilhada do Sul County, Rio
Grande do Sul, Brazil.
- Fig. 5 – *Narkemina* sp. A
Hypotype MP., UFRGS n.º MP-I-5289 from Boituva town, Well IGG n.º 2, -207,50m;
Itararé Subgroup, Upper Carboniferous, São Paulo, Brazil.
- Fig. 6 – *Narkemina* sp. B
Hypotype MP., UFRGS n.º MP-I-5287 from Boituva town, Well IGG n.º 2, -205,50m;
Itararé Subgroup, Upper Carboniferous, São Paulo, Brazil.
- Fig. 7 – *Narkemina* sp. C
Hypotype MP., UFRGS n.º MP-I-5288 from Boituva town, Well IGG n.º 2, -207m;
Itararé Subgroup, Upper Carboniferous, São Paulo, Brazil.

