

**CONGQINGIA RHORA GEN. NOV., SPEC. NOV. –
A NEW DRAGONFLY FROM THE UPPER JURASSIC
OF EASTERN CHINA
(ANISOZYGOPTERA: CONGQINGIIDAE FAM. NOV.)**

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The new sp. is described and illustrated from a single specimen (part and counterpart), recovered from the Upper Jurassic Laiyang Formation. The holotype is kept in the Shandong Provincial Museum, Jinan. It clearly shows the complex of characters, combining the body shape of Anisoptera, with the Zygoptera-like wings.

INTRODUCTION

Recently, a large fossil insect assemblage was collected by the author from the Laiyang Formation, located near Nanligezhuang Village, about 21 km SSW of Laiyang City (lat. 36°46'N, long. 120°40'E), in the east of Shandong Province, China. This paper deals with a new species and a new genus of a new family of the Anisozygoptera from this assemblage. The age of the insect-bearing strata has been focus of much discussion among Chinese geologists and paleontologists. The author considers them of Late Jurassic rather than of Early Cretaceous age (ZHANG, 1990).

The Anisozygopteran remains were found in laminated blackish green shales of lacustrine origin together with other insects, consisting of a large number of Coleoptera, Hymenoptera, Diptera, Homoptera, Heteroptera, Trichoptera, Mecoptera, Neuroptera, Raphidiodea, Orthoptera, Dermaptera, Thysanoptera and Blattodea. The dominant species are the aquatic beetle *Coptoclava longipoda* Ping (Coptoclavidae), the aquatic bug *Mesolygaeus laiyangensis* Ping (Mesolygaeidae) and the phantom midges *Chironomaptera gregaria* (Grabau) and *C. vesca* Kalugina (Chaoboridae). The shales of the Laiyang Formation also yield poorly

preserved plant and fish remains.

The geological section of the Third Member of the Laiyang Formation was published (ZHANG, 1990) and the major data on the Late Jurassic lakes, their population and geographical distribution are in the press (ZHANG, 1992, in *Cretaceous Research*).

DESCRIPTIONS OF NEW TAXA

CONGQINGIIDAE FAM. N.

Type genus. — *Congqingia* gen. n.; Upper Jurassic, E. China.

Diagnosis. — Anisozygoptera with a stout body, and of small size; head not transversely elongate but nearly semicircular; eyes large, not as lateral swellings and separated by less than their width in dorsal view. Pronotum large, transversely elongate; synthorax stout, subcircular, mesothorax wider than long. Abdomen flat and wide, at least with basal three segments rather short and wide, the third one slightly longer than wide and somewhat narrower than synthorax. Fore- and hindwings closely similar in shape and venation but quadri-lateral (q) differing in shape, base of wings gradually narrowed, not stalked; nodus (N) distinct, lying less than two-fifths of length of wing from base; only two antenodals (An); IR₃ and R₄₊₅ arising somewhat nearer to arculus (Arc) than to subnodus (Sn); fork of R₂₊₃ well beyond Sn; origin of Arc proximal to level of the second An and farther from N than from the base of the wing; q closed basally, trapezoid and with wide distal angle; subquadrilateral (sq) of fore- and hindwings similar in shape; anal crossvein (Ac) lying mid-way between position of An; anal vein (A) thick, well-developed as a separate vein at extreme base of wings; anterior branch of A (1A) long, reaching margin beyond mid position of wing; anal field of fore- and hindwings narrow but the former just a little narrower than the latter, and with a single row of cells basally and two rows terminally.

Affinities. — With the semicircular head, the enlargement of the eyes which are moderately separated on the frons and wider than length of the synthorax, Congqingiidae fam. n. could be assigned to Anisozygoptera. However, since only wing remains are so far known of the Mesozoic "Anisozygoptera", a comparison between the new and the other extinct families cannot be undertaken. As for wing venation, the new family has some affinity with the Oreopteridae of Oreopteroidea (PRITYKINA, 1968). Both share the following features: fore- and hindwings are narrow and long and closely similar in shape and venation but quadrilateral differing in fore- and hindwings; forewings are not petiolate; hindwings have closed quadrilateral basally; nodus is situated close to base of the wing, barely less than one half of winglength; IR₃ and R₄₊₅ both arise about half-way between arculus and subnodus; arculus is farther from the nodus than from the base of the wing; fork of R₂₊₃ is situated well beyond subnodus; and

cells of wing greatly reduced, especially in anal field. Based on these features mentioned above, the author considers that *Congqingiidae* fam. n. could not be placed in the *Oreopteroidea*, and represents a specialized group at the superfamilial level in the Mesozoic "Anisozoptera".

Although the wing venation looks *Zygoptera*-like, this new family is easily separated from all the extinct and extant families of *Zygoptera*. (For more details cf. the "Discussion").

Remarks. — Unfortunately, terminal segments of the abdomen are missing in both part and counterpart; hence the characters of the genitalia are unknown.

CONGQINGIA GEN. N.

Type species. — *Congqingia rhora* sp. n.; Upper Jurassic, E China.

Etymology. — Derived from the Chinese "congqing" - "dragon-damselfly".

Diagnosis. — A late Jurassic genus of *Congqingiidae* with forewings longer than hindwings and quadrilateral shorter in forewings than in hindwings.

Species included. — Type species.

CONGQINGIA RHORA SP. N.

Figures 1-4

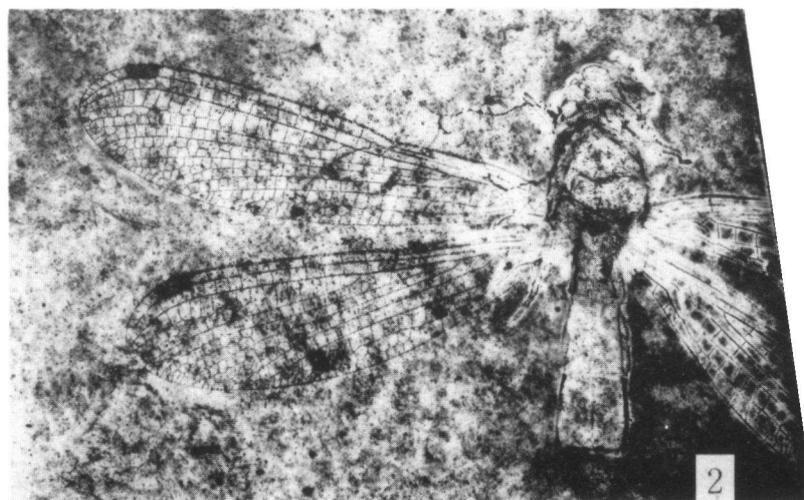
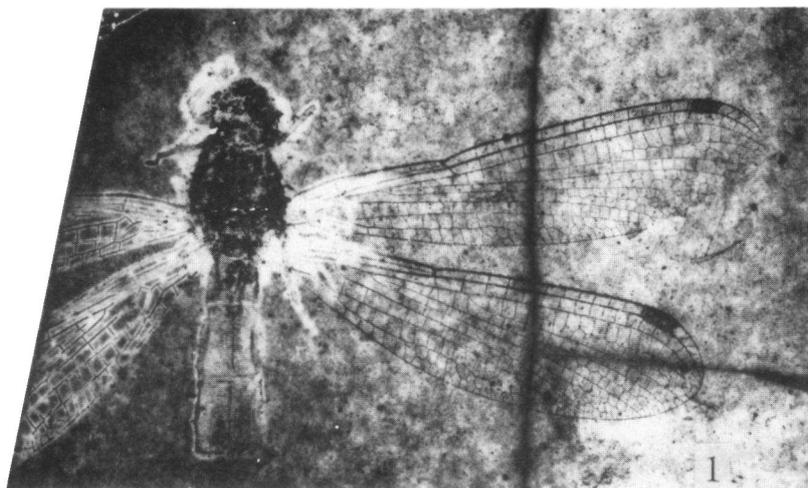
Material. — **Holotype:** collection of the Shandong Provincial Museum, China, registration No.: L88758, L88759, part and counterpart, adult with head, thorax and basal three segments of abdomen, complete right fore- and hindwings and basal part of left fore- and hindwings.

Horizon and type locality. — Laiyang Formation, Upper Jurassic, near Nanligezhuang Village, Laiyang City, Shandong Province, People's Republic of China. The specimen was collected by the author in 1989.

Etymology. — From the Greek "rhoros" - "strong".

Diagnosis. — As for genus.

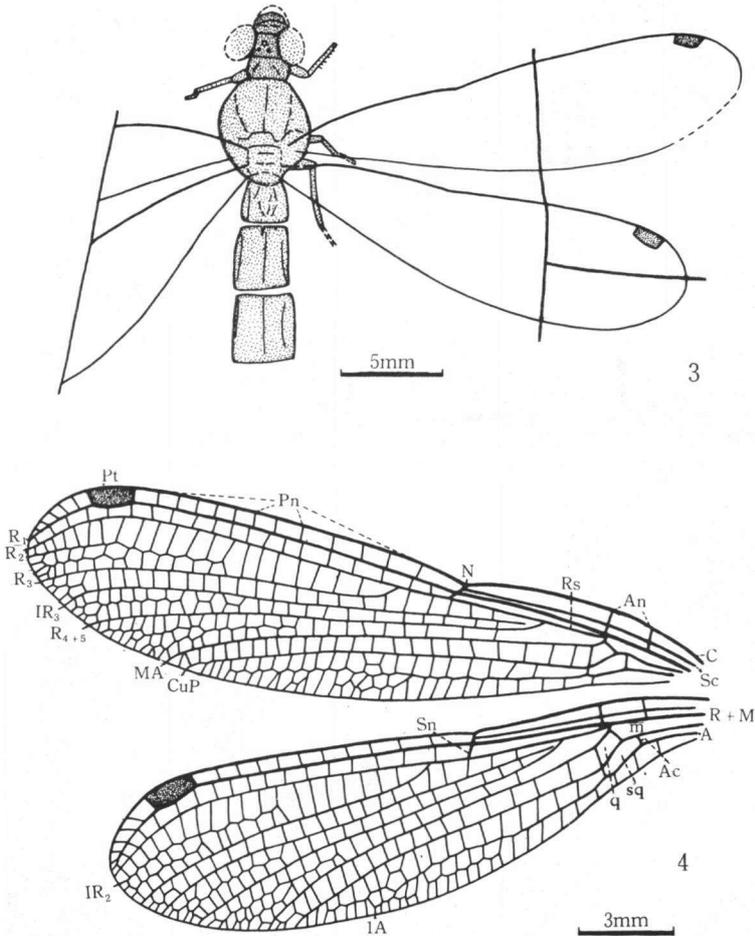
Description. — Body length as preserved 17.8 mm; forewing length 21.9 mm, width 5.5 mm; hindwing length 19.8 mm, width 5.6 mm. Head including eyes slightly narrower than synthorax; labrum large, nearly semicircular; postclypeus short; frons transversely elongate; vertex subquadrate; eyes oval, each a little wider than vertex; median and lateral ocelli distinct. Pronotum transversely elongate, twice as wide as long; synthorax with dorsal carina and mesopleural sutures well defined. Legs short and slender, anterior tibiae with spines. Abdomen gradually widening terminally, the first segment wider than long, the second and the third slightly longer than wide and striated with a longitudinal medial keel. Characters of wing venation shown as Figure 4.



Figs 1-2. *Congqingia rhora* sp. n. adult, dorsal view, (x2.9); Upper Jurassic, Laiyang Formation, Nanligezhuang Village, Laiyang, Shandong: (1) holotype, part, L88758; – (2) holotype, counterpart, L88759.

DISCUSSION

Our knowledge of the fossil Odonata has, to a great extent, been based on the remains of fore- and/or hindwings, or larvae; complete preservation of adults is rare. The well preserved fossil described here is therefore significant, comprising



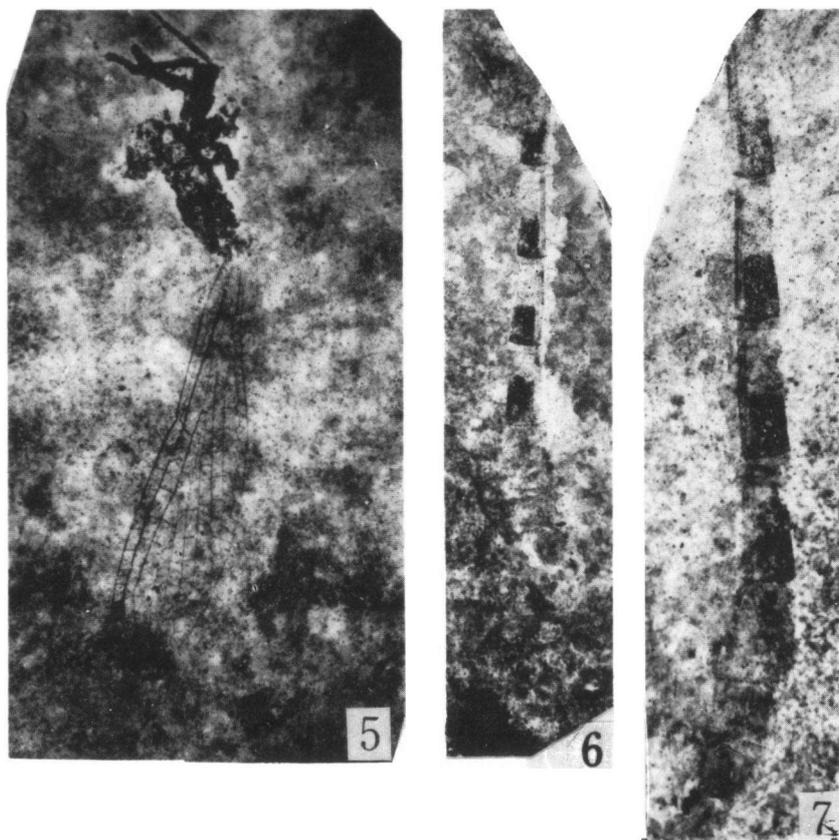
Figs 3-4. *Congqingia rhora* sp. n. adult; Upper Jurassic, Laiyang Formation, Nanligezhuang Village, Laiyang, Shandong: (3) holotype, part, L88758, adult, dorsal view, with venation of fore- and hindwings omitted; — (4) holotype, counterpart, L88759, fore- and hindwings.

complete fore- and hindwings and a large part of the body.

As the *Congqingiidae* is a specialized group, having a rare body form as well as the *Zygoptera*-like wing venation, the subordinal position may seem doubtful and hence requires some explanation in detail. It should be pointed out that the biofacies of the fine find reflects basically the original characteristics that pre-

vailed when this anisozygopteran lived, and a distinct distortion of the body, due to compression, had seemingly not occurred.

A large insect collection from the laminated shales of the Laiyang Formation, including the forms with rather soft body, such as mosquitos, wasps, snakeflies, lacewings, scorpionflies, etc., has recently been recovered, and none of them have been distorted (ZHANG, 1985, 1990, 1991; ZHANG et al., 1986). From the same formation, fortunately, two other odonates have also been recovered. One of these is an adult, with a forewing, head, thorax, and legs, but missing the abdomen, while the other is represented by an almost complete adult abdomen. The former clearly shows a large transverse head, obviously wider than long,

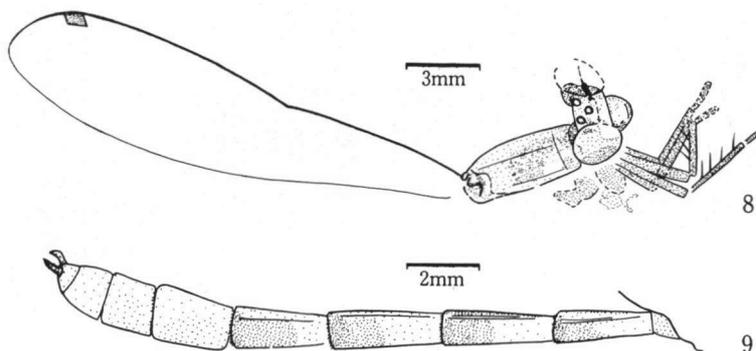


Figs 5-7. Unnamed Zygoptera: (5) adult, dorsal view, (X 3.0); Upper Jurassic, Laiyang Formation, Nanligezhuang Village, Laiyang, Shandong, L88760; — (6-7) abdomen, adult, lateral view; Upper Jurassic, Laiyang Formation, Nanligezhuang Village, Laiyang, Shandong: L88761 (X 3.9) (Fig. 6), — and its counterpart, L88762 (X 6.2) (Fig. 7).

with eyes strongly projecting from the sides of the head and almost stalked; rather narrow and long synthorax, nearly twice as long as wide; slender and long legs, tibiae with elongate spines (cf. Figs 5, 8). Its wing venation has been examined by the author, and resembles, more or less, that of Coenagrionidae. It is undoubted that this unnamed fossil is a zygopteran and its body shape cannot be compared with that of *Congqingia rhora*, not even at the subordinal level. The latter shows distinctly narrow and long segments 3-6 and gradually shortening and swelling from segment 7-10, the apex of the abdomen has a pair of appendages (cf. Figs 6, 7, 9). The author believes that it is a typical zygopteran-like abdomen, which has no relationships to the new species described in this paper. Meanwhile, the various, structurally greatly different types indicate two interesting facts, viz. there occurred a number of distinctly different odonate groups in the late Mesozoic of the Laiyang district, and, from the point of view of taphonomy, these fossils were deposited unerringly and give an unflattering portrait of the Mesozoic odonate assemblage.

The abdominal shape of *Congqingia rhora* is also interesting: each of the basal three segments is flat, short and wide, and with a longitudinal median keel on the last two. With these characters it differs from all known Odonata except for certain species of Libellulidae, such as e.g. *Crocothemis servilia* (Dru.), *Deiella phaon* (Sel.), *Neurothemis fulva* (Dru.) etc. Nevertheless, the similarity does not imply affinities between them.

As far as the wing venation is concerned, although having zygopteran-like fore- and hindwings, Congqingiidae sharply differs from all the known extinct and extant families of Zygoptera. If any, the author thinks that the Lestidae is more or less similar to the present new family, but may be easily differentiated from the latter in the following aspects: the wings are strongly petiolate; the arculus is as near to the nodus as to the base of the wing; postnodal crossveins



Figs 8-9. Unnamed Zygoptera: (8) drawn from L88760, showing features of the body shape (wing venation omitted); — (9) abdomen, drawn from L88762.

are completely in line with the crossveins below them; R_{4+5} and IR_3 both arise closely to the arculus. In addition, the Lestidae have a typical Zygoptera body shape and cannot be compared with the Congquingiidae. All things considered, this new family has a stronger resemblance in the wing venation to the Mesozoic Oreopteridae than to recent Lestidae. Owing to their remarkable similarity with the Zygoptera, PRITYKINA originally (1968, 1980a) regarded the Oreopteridae as a family in that suborder, but later placed them into Anisozygoptera, (PRITYKINA 1981, 1986). It is interesting to note that in Congquingiidae and Oreopteridae wing venation is similar to that in Zygoptera, rather than to the Mesozoic and Cenozoic Anisozygoptera, such as Tarsophlebiidae, Stenophlebiidae, Isophlebiidae, Sieblosiidae (HANDLIRSCH, 1906-1908) and Karatawiidae (MARTYNOV, 1925). They differ from the other families of "Anisozygoptera" by the position of the nodus (proximal to the mid-way), by the great reduction of cells (especially in the anal field), by having only 2 or 3 antenodals, and by the absence of others at least between costa and subcosta.

It is hardly surprising that, due to lack of adult remains other than wings, different opinions exist in defining the Mesozoic "Anisoptera" and "Zygoptera" (ROHDENDORF, 1962; PRITYKINA, 1980b; HENNIG, 1981; CARLE, 1982). The author tends to believe that on the sole basis of venation, it is at least in certain groups impossible to distinguish between the two.

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