

ON THE RELATIONSHIP OF THE FOSSIL FLEA
SAUROPHTHIRUS LONGIPES PONOMARENKO
(*SIPHONAPTERA* : *INSECTA*)

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(With 1 Text-figure)

INTRODUCTION

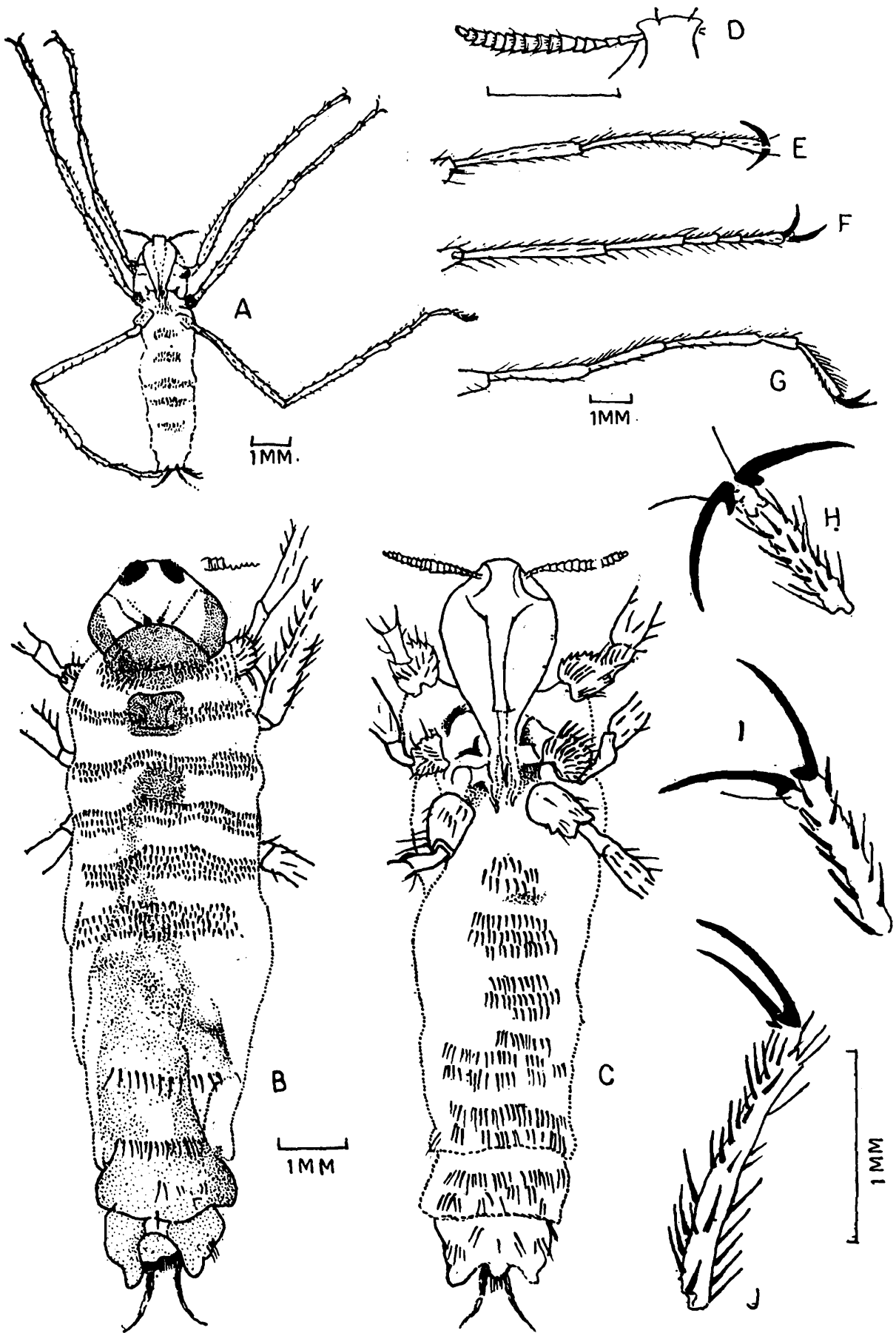
Ponomarenko (1976) described a new fossil genus *et* species, *Saurophthirus longipes* from the Lower Cretaceous beds of the Trans-Baikal Region in Russia as a primitive flea supposed to be parasitic on the flying reptiles, the Pterosauria. Though the author gave fairly detailed description with good figures, several inadvertancies have crept in. Firstly, the generic name with a suffix-*phthirus* connotes a louse and not a flea as the paper would indicate and is thus an unfortunate choice. Secondly, the author also spelt the genus differently in the text and the figures. Thirdly, in the English version on the contents page, the fossil is reported to have come from the Carboniferous instead of the Cretaceous beds as given in the Russian text. Lastly, the placement of the fossil in Siphonaptera itself is wholly erroneous, since its true affinities lie elsewhere.

DESCRIPTION

The authors have not been able to examine the fossil, but the relationship could be readily established on the basis of the rather detailed description and figures of Ponomarenko (1976).

The following is a brief description of the species and to facilitate easy understanding of our discussion of the true affinity, we reproduce here the redrawn figures of Ponomarenko (*op. cit.*).

The body dorso-ventrally flattened, quite unlike in a flea, heavily clothed with setae, arranged in number of nearly transverse rows on the tergites, the sternites and on legs. The head partly visible from above, but mostly ventrally oriented. Eyes partly dorsad and partly ventrad. Antennae 17-segmented, erroneously stated in the description to be located in ventral fossae, but really not so. Head along with the



Text-fig. 1. *Saurophthirus longipes* :

A. Ventral aspect of the fossil insect. B. Enlarged dorsal view ;
 C. Enlarged ventral view ; D. Enlarged view of the antennae ;
 E-G. Tarsi of the fore, mid and hind legs ; H-J. Enlarged view of
 the fifth tarsus of the respective legs (after Ponamarenko, 1976).

mouth parts drawn into a typical posteriorly directed rostrum, with distinctly biting mouthparts at the tip as in Mecoptera. Thorax three segmented, segments sub-equal. Prothorax partially projecting forwards over the occiput. Apterous, with legs long, slender, of generalized walking type with 5-segmented tarsi bearing a pair of long claws. Abdomen anteriorly as wide as the thorax, posteriorly some what narrowed, the ninth tergite appears quadrate to subquadrate as in Mecoptera. Ventrally two cerci-like or clasper-like lobed appendages are also noticeable in the fossil.

DISCUSSION

The fossil curiously seems to show a number of characters individually suggestive of its apparent relationship to more than one order, but the sum total leaves little doubt about its correct taxonomic placement. For example, the mouthparts superficially appear as sucking type of a bug, a louse, or piercing and biting type of a flea, but in reality of the rostral biting type as in Mecoptera. The legs are of generalized walking type, and not modified for swimming as in aquatic bugs, holding fast as in the louse, and certainly not saltatory as in a flea. The multi-segmented antennae wrongly interpreted as fitting in fossae like those of an Amblycerophthiran louse, or a flea, are really not inserted in a groove; the ventral impressions of the eyes have been mistaken as the antennal fossae by the author (Ponomarenko, 1976). The two styliiform processes at the end of the last abdominal sternite superficially resemble similar structures in Diplura, Plecoptera, the Orthopteroid insects, Embioptera, the caudal filaments of the Hemipteroidea, the gonapophyses (?) of the lice, the abdominal processes of the neuropteroid larvae, but are correctly recognizable as the claspers of the Mecoptera.

The rostral type of the mouthparts clearly excludes its inclusion in Diplura, the cerci-bearing Orthopteroid insects, and the Embioptera. The lack of wings or hemelytra, the non-swimming type of legs coupled with the multi-segmented antennae eliminate its inclusion either in the Hemipteroid or Neuropteroid complex, even if the mouthparts are confused with sucking or piercing type.

Though the unfortunate coining of the generic name denotes a louse, the number of antennal segments, exarate posteriorly directed mouthparts and the number of tarsal segments totally preclude its inclusion amongst the amblycerophthiran lice (with antennae set in fossae), though some of which are with modified piercing mouthparts. The mouthparts, typically mandibulate-piercing type placed at the end of the posteriorly directed rostrum, which with multisegmented antennae

excludes its inclusion in the ischnocerophthiran and rhynchophthiran lice as well, though some of them possess gonoapophyses like the siphunculophthiran lice. The number of antennal segments, tarsi, claws and backwardly directed mouthparts excludes the fossil from the latter group of lice. Therefore, the suffix-*phthirus* to the generic name is quite inapt.

Ponomarenko (*op. cit.*), however, considered it as a flea possibly parasitic on flying reptiles. The antennal shape, erroneously interpreted to be set in grooves, many segmental condition, the rostrate head, apterous condition, pentamerous tarsi, clasper-like abdominal processes might have led the author to confuse it with a flea. The extant and the fossil forms of fleas (Rick, 1970) have usually laterally compressed body, head devoid of eyes and with genal combs or 'ctenidia' on the latero-ventral border, the pronotal comb, and the saltatory hind legs. The dorsoventrally compressed body, presence of distinct and large eyes, absence of ctenidia, walking type of legs emphatically preclude its identification even remotely with a primitive flea. Though, Rick (1970) has reported Lower Cretaceous fleas, Phthiraptera (lice) and Siphonaptera (fleas) which are parasitic on birds and mammals must have evolved only at a later stage when mammals and birds appeared on the evolutionary ladder.

Taking all these facts based on the original description and the figures, we conclude its affinity lies actually with Mecopteroïd stock. In Mecoptera, the anterior region of the head is usually prolonged into a rostrum formed by the elongated parts of the head capsule, the clypeus, labrum and maxillae (Enderlein, 1910 ; Otnes, 1922 ; Seitz, 1928), held perpendicular to the body axis, which when pressed from above by the heavy sediments during fossilization account for the posteriorly directed aspect from a typical mecopteran type of head. The legs are long, walking type, with pentamerous tarsi bearing a pair of claws as in the fossil. In some scorpion-flies (eg. *Panorpa*) the ninth sternite is cleft, the two arms of which look like cerci or styliiform processes with the corresponding ninth tergite also usually of quadrate or subquadrate form. The figures of the fossil fits in well in all these respects with the Mecoptera. Though Mecoptera are generally winged, apterous forms however, are also well known. The absence of the wings in the fossil may be due to true aptery, or the wings might have been lost and not fossilized along with the rest of the body. The Mecoptera are known as fossils from Lower Permian onwards, and the present record from Cretaceous (Carboniferous I), poses no problem for the assumption that it may be a mecopteran. Incidentally, it may be mentioned that Potter (1938) states that Siphonaptera exhibit certain

resemblances with Mecoptera and Diptera. Tillyard (1935) considers fleas belong to part of the *Panorpoid*, complex and they must have been derived directly from Mecoptera rather than from Diptera.

Amongst the Mecoptera, the fossil seems to come very close to Boreidae, in which the claws are double and wings vestigial (brittle and hair-like in males, and scale-like in female). The genus, *Boreus* for example, has the antennae with 16-20 segments (17 in the fossil), large widely separated eyes, ocelli absent, a hypognathous head, elongated as a rostrum pointing downwards with mouthparts, typically of biting type and set at the tip of the rostrum. The three thoracic segments are subequal, with long legs, elongate coxae and pentamerous tarsi as in the fossil. The male with hind margin of the ninth abdominal segment prolonged into a deeply cleft process, the two arms of which are styliform as depicted in Ponomarenko's figure. Since we have not seen the actual fossil, we hesitate to transfer the species *Saurophthirues* to the genus *Boreus*, but undoubtedly it belongs to the family Boreidae.

Carpenter (1930) states that some of the Permian Mecoptera show highly specialized characters that are now present in the extant families. It is also interesting to quote Martynova (1951) that we do not yet know from which ancient scorpionflies the specialized branch Boreidae arose, but the latter type are true Mecoptera. Therefore, we seem fully justified in concluding that *Saurophthirus longipes* Ponomarenko, 1976, actually belongs to the family Boreidae of the order Mecoptera, with which its affinities undoubtedly lie on the basis of the depicted morphology of the fossil.

SUMMARY

This paper discusses the affinities of a fossil flea, *Saurophthirus longipes* Ponomarenko (1976) from the Cretaceous beds of the Trans-Baikal Region of Russia. It is shown in this paper that it is a true Mecopteran instead of a flea.

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