

A FOSSIL INSECT-WING FROM THE ROOF OF THE COAL-SEAM IN THE SYDNEY HARBOUR COLLIERY.

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(One text-figure.)

In the Journal and Proceedings of the Royal Society of New South Wales, Vol. xlv., 1911, p.554, Mr. W. S. Dun records the occurrence of a species of *Tæniopteris* in the roof of the Coal-seam in the Sydney Harbour Colliery at Balmain (Upper Permian). An excellent figure of the actual specimen, reproduced from a photograph, is given in Plate xli., in the same paper. The writer concludes with the following note:—"Associated with the leaf is the impression of an insect's wing, a description of which will be submitted later."

Recently Mr. Dun has very kindly passed this specimen over to me for description, and I desire to thank him for the opportunity of studying it.

The wing lies upon the smooth surface of a very dark, hard shale. Its position is best located by the following note. Measure 18 mm. from the distal preserved end along the mid-rib of the frond of *Tæniopteris*, and, from the point so obtained, erect a perpendicular on the side on which the centre of curvature of the frond lies. The distal end of the insect-wing lies at a distance of 20 mm. along this perpendicular.

The wing can be actually seen in the reproduction mentioned above, but it is so faint in outline that it would not be noticed unless some measurements were given to assist one in locating it. The same may be said to be the case with the actual specimen. Once it has been located, a careful examination with a hand-lens will show the presence of the main veins, and, in certain lights, of cross-veins also. All of these, except only the

radius, are exceedingly delicate in outline, so that it is by no means easy to make an accurate drawing of the fossil.

The portion preserved consists of a considerable part (probably about three-fifths) of a slender wing, with the costal margin well marked right up to the apex. The posterior border is missing, except for a short piece lying towards the base of the fossil. The space between the radius and the costal margin is distinctly coloured brownish. This is almost certainly due to the preservation of brown pigment originally located in this area of the wing.

In attempting to place this fossil correctly, I have had to rely upon only two or three important characters, since the base of the wing, which may be presumed to have held the most definite venational structures, is missing. First of all, I have relied upon the absence of the subcostal vein from all the distal portion of the costal space. Secondly, the well-marked radius, evidently very strongly built, has running below and parallel to it a well-developed radial sector, giving off obliquely descending branches at fairly wide intervals. Combining these characters with a third, viz., that the cross-veins are fairly wide apart, regular, and somewhat oblique, we should have little difficulty in making a very close comparison between this fossil and the interesting family *Elcanidae*, of the Order Orthoptera, from the Mesozoic strata of England and Germany.

Handlirsch defines the *Elcanidae* as follows* (his text is in German):—This family is characterised by the possession of long, typical Locustoid antennæ, well-developed jumping legs, and also, in the female, a long ovipositor. On the other hand, up to the present, no wing has been found with a stridulating organ.

The wing-venation resembles in many respects that of the Acridioidea more than that of the Locustoidea existing to-day.

The forewing is characterised by a costal vein slightly removed from the border, and, therefore, by a precostal area. The subcosta is greatly shortened; the radius is free, and sends branches towards the free anterior border; its sector arises near the base,

* Die Fossilen Insekten, p.412.

and runs nearly parallel with the main stem towards the tip; it sends a variable large number of branches sharply from below towards the apical border. Media and cubitus strongly reduced, consisting of small branches. Anal field somewhat small, with few veins.

The hindwing is similar to the fore in respect of the structure of the radius, media, and cubitus, but appears to have undergone a vast reduction of the subcosta, and to possess no precostal area. Its anal field is large and fan-like.

Stiff cross-veins divide the wing-areas into quadrilateral cells. Most of the wings are spotted.

It will be seen that, owing to the fragmentary nature of the wing, many of the above characters are not available as tests. On the other hand, the part preserved agrees very closely with the definition. The small portion of the posterior border preserved is of some value to us, since it points to the fossil representing a *forewing*. For, in the hindwing, we should have expected to see, in this position, part of the anal fan which is so conspicuous in this family, but which is evidently absent here.

Handlirsch lists forty species of the family *Elcanidæ* from the Lias, and twelve from the Upper Jurassic. All but one of these are placed in the genus *Elcana* Giebel, the only other genus being *Parelcana* Handl. I propose to place the fossil here described in a new genus, *Elcanopsis*, with the characters given below.

Order ORTHOPTERA.

Family ELCANIDÆ.

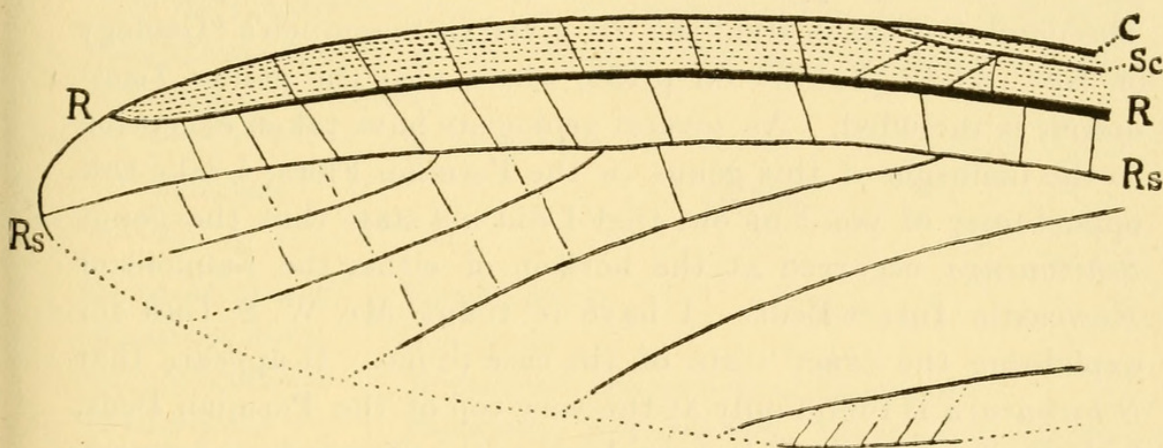
Genus ELCANOPSIS, n.g. (Text-fig.1).

Characters of forewing as in *Elcana* Giebel, except the following:—Sc towards its distal end lies very close to C, not nearer to R as in *Elcana*. Wing not spotted, but marked with brown pigment along the costal space. Branches of Rs few in number, and placed fairly wide apart. Cross-veins not very numerous or close together.

Genotype, *Elcanopsis sydneyensis*, n.sp. (Upper Permian : Balmain Colliery, Sydney Harbour).

The occurrence of an Elcanid genus in the Upper Permian is

of considerable interest, since the insect-fauna already known from the Upper Permian of Newcastle, New South Wales, contains only types which would be regarded as of Mesozoic age if they had been found in the Northern Hemisphere. It is also interesting to note that the Upper Jurassic members of the family approach, in their venational type, the *Acridiidae* of the present day, whereas the Liassic species differ more widely from these last, in that the number of branches of the radial sector, and the number of cross-veins, is considerably less, and the species are of a smaller size. In these characters, the new genus is the most reduced of all; so that the supposition now naturally arises that the modern Acridioid type of venation may have been formed by addition of new elements to what was originally a much simpler and more open type of venation.



Text-fig. 1.

Elcanopsis sydneyensis, n.g. et sp., portion of forewing; ($\times 13.5$). Upper Permian Coal-Measures: Balmain Colliery, Sydney Harbour. C, costal border; R, radius; Rs, radial sector; Sc, subcosta; the area covered by the brown pigment is shaded.

ELCANOPSIS SYDNEIENSIS, n.sp. (Text-fig. 1).

Total length of fragment, 7 mm. Greatest breadth, 2.7 mm.

Forewing with the distal end of Sc preserved, and apparently ending up on C at about the middle of the costal border. R very strongly built, very gently curved, the tip slightly turned upwards. Apparently six very poorly preserved cross-veins between R and C, beyond the end of Sc, and two oblique ones between Sc and R basad from these. Nine or ten cross-veins preserved between R and Rs; some of these fairly distinct. Rs

a slender but well-preserved vein, parallel to R, and having four descending branches placed somewhat wide apart. The cross-veins between these branches mostly not visible, but indications of them here and there in a good light. A portion of a fairly strong vein is preserved near the posterior border, but this vein cannot be named with certainty. It appears to be connected with the border by means of a series of oblique cross-veins.

Type, in Coll. Geological Survey of New South Wales, Sydney.

Postscript (added June 14th, 1918).—In my paper on the "Permian and Triassic Insects from New South Wales, in the Collection of Mr. John Mitchell," These Proceedings, 1917, xlii., Pt. iv., p.725, I named *Schizoneura* as one of the genera of the fossil flora of the Upper Coal-Measures of the Newcastle District. The name was taken from the list given in Süssmilch's "Geology of New South Wales," on p.135, where also the genus *Tæniopteris* is included. As several geologists have taken exception to the inclusion of this genus in the Permian Flora, I take this opportunity of pointing out that I did *not* state that the genus *Schizoneura* occurred at the horizon of either the Belmont or Newcastle Insect-Beds. I have to thank Mr. W. S. Dun for explaining the exact state of the case to me. It appears that *Schizoneura* is found only at the very top of the Permian Beds, in beds that might well be considered as the passage-beds between the Permian and Triassic, but which should be classed as Permian as long as we define the presence of *Glossopteris* as the criterion by which to separate the Palæozoic from the Mesozoic in Australia. The same is true of *Tæniopteris*, which is associated with the insect-wing described in this paper; it should be noted especially that the species, though unnamed, is certainly *not* *T. Daintreei* McCoy, (= *T. spatulata* McClelland), which is characteristic of the Jurassic. The horizon of the wing described in this paper is, therefore, some 600 feet vertically above that of the Belmont Insects previously described, and more than 800 feet above that of the Newcastle Insects. Whether, therefore, *Elcanopsis* be considered to be a Permian genus or not, there can be no question that these other insects are such.—R.J.T.



Tillyard, R. J. 1918. "A fossil insect wing from the roof of the coal-seam in the Sidney harbour colliery." *Proceedings of the Linnean Society of New South Wales* 43, 260–264.

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