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# On the Pterothoracic Interpleural Suture of Mesozoic and Recent Odonata

By

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(With 36 Text-figures)

In his study on the British Liassic dragonflies Tillyard (1925) described a remarkable specimen of large abdomen (B.M.N.H., I 11089) which he identified as *Liassophlebia magnifica* Tillyard or as *L. hopei* Brodie. He stated on page 16, "It shows clearly the sixth to eighth segments inclusive, followed by a confused mass representing the crushed end of the abdomen, on which there can be distinguished what appears to be the rather broad and somewhat truncated inferior appendages of the male."

While I was working in the British Museum (N.H.) in 1953, I had an opportunity to study the fossil dragonflies preserved in the Geological Department. When I examined the same "I 11089" specimen it revealed, to my surprise, that it does not represent the distal portion of the abdomen, but it belongs, on the contrary, the basal four segments and the pterothoracic pleurites! The body of the insect is laterally depressed and the simple rather inflated second abdominal segment suggests that this is a female insect. (Fig. 1)



Fig. 1. ? *Liassophlebia magnifica* Tillyard.  
Lower Lias: Binton, Warwickshire.  
B.M.N.H. I 11089, Photo B.M.N.H. Leg.  
112455.



Fig. 2. Anisozygopteron ?  
Lias: Gloucestershire.  
B.M.N.H. I 12893, Photo  
B.M.N.H. Leg. 11254.

As stated above, Tillyard supposed this species to belong to the Liassophlebiidae of the Permian Anisozygoptera. Judging from the body size, the locality and the geological age of this specimen Tillyard's identification seems highly probable.

There was, among the British Museum collection, another interesting specimen (B.M.N.H., I 12893) being similarly represented by the right side of pterothorax. On the label of this specimen there was a short note which reads "16. Nov. 1896. As I am unable to identify the specimen which you were so good as to send me, and can obtain no definite informations to its character I return the same herewith. . . Geo. C. Crick." (Fig. 2).

I am unable to know who, in a later occasion, correctly placed this specimen in the case of fossil dragonflies, but judging from the similarity to the first specimen, together with the geological age and the locality, the probable systematic position of this specimen will fall in the same family.

Upon closer examination it was revealed that both the thoracic pleurites, which are very close to those of the recent Anisoptera, show the depression of a clear pterothoracic interpleural suture, that is the intersegmental boundary between meso- and metathorax, and is called as the first lateral suture by taxonomists. (Fig. 3, 4.)

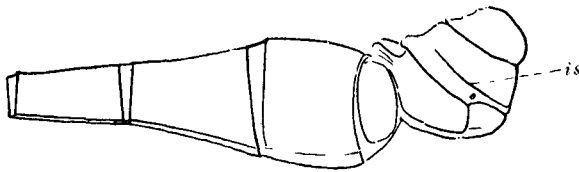


Fig. 3. ? *Liassophlebia magnifica* Tillyard.  
Four basal segments and pterothoracic pleurites.  
Drawn from the Specimen B.M. (N.H.).  
I. 11089. Lower Lias.

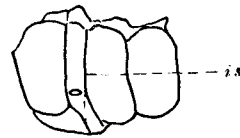


Fig. 4. ? Anisozygopteron.  
Pterothoracic pleurites. Drawn  
from the specimen B.M. (N.H.).  
I. 12893. Lias.

It has been known that the pterothoracic interpleural suture is, apart from its lowermost portion which is only reaching the metathoracic spiracle, disappeared in the recent Odonata, with the only exception of the "Calopterygidae" in sensu lato.

As regards the suture in question Tillyard examined the main families of recent Odonata and tabulated his observation as cited below (Table 1). He further considered the correlation between this suture and the pterothoracic ganglia (1917, p. 131).

So far as I am aware this suture has not been described as regards extinct dragonflies. It is consequently difficult to say when and in what group of the Odonata this suture first definitely disappeared.

Table 1 (After Tillyard, 1917)

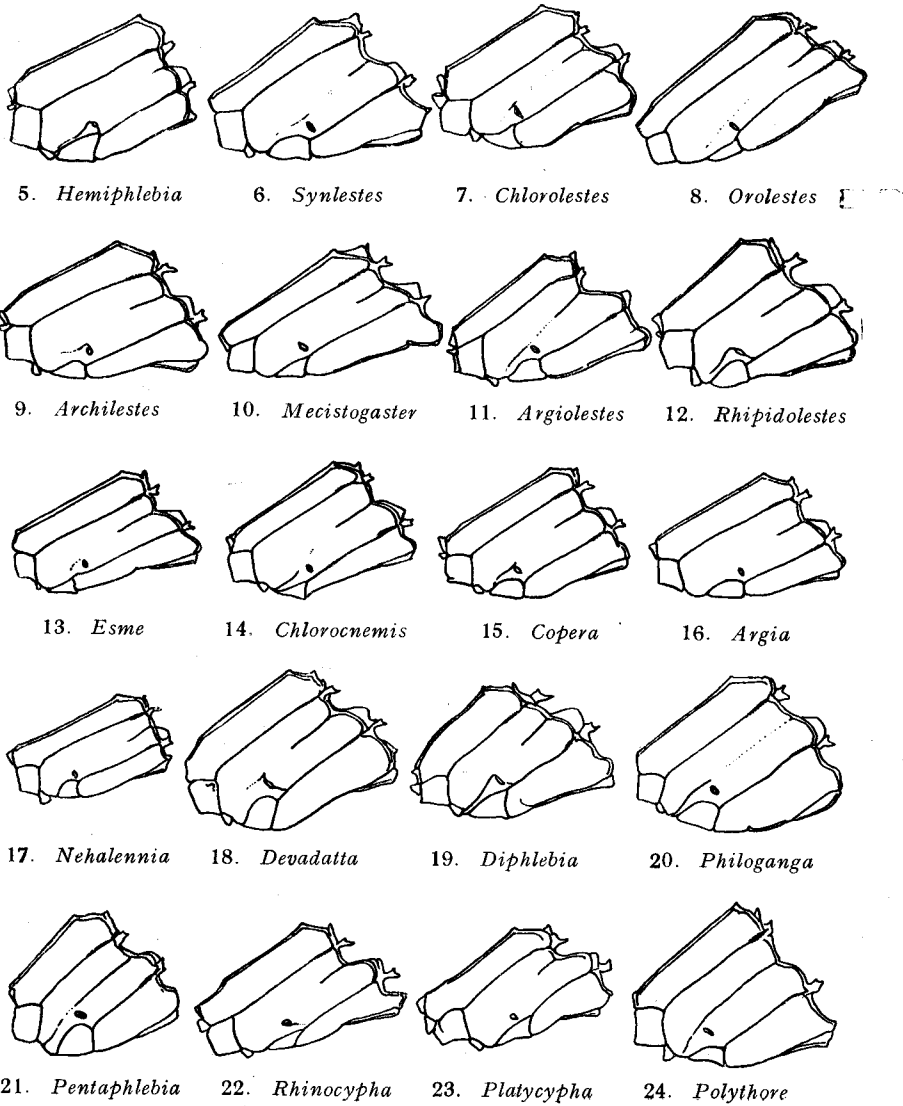
Stage	First lateral suture	Syntoracic ganglion	Groups
1	Complete	Distinct	Calopterygidae
2	Partly obliterated	Distinct	Petalurinae, Aeschninae
3	Partly obliterated	Fused	Gomphinae, Libellulidae, Lestidae, Agrionidae

The following table was presented in an attempt to find out some idea in regard to this problem among recent Odonate families. (Figs. 5-36) As was known by Sargent (1937) and by my previous paper (1954) the interpleural suture of Odonata shows neither particular internal ridge nor phragma at the dorsal two third of its length, it is slightly thickened and has no large muscle attachment thereupon.

Table 2

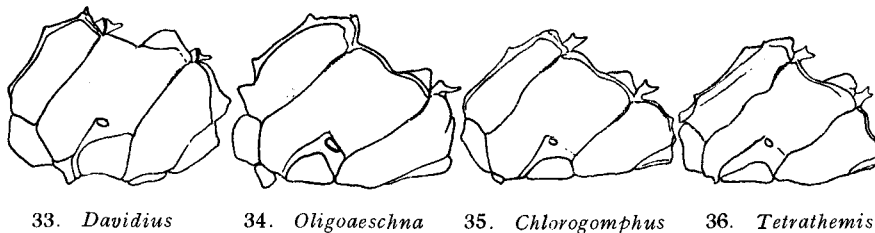
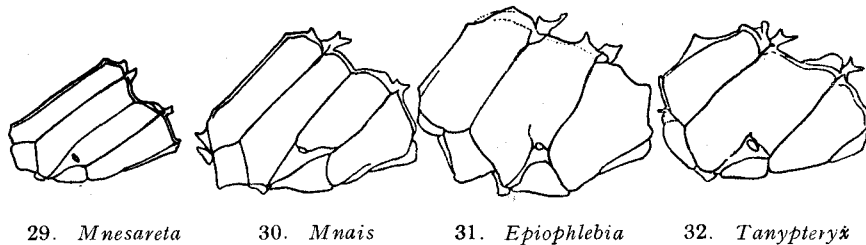
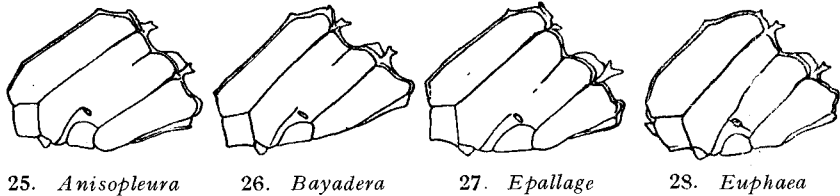
Family	Interpleural suture formed at :	Material examined
Hemiphlebiidae	dorsal 1/10 & metastigmal area	<i>Hemiphlebia</i>
Synlestidae	dorsal 1/5	<i>Synlestes</i>
"	"	<i>Chlorolestes</i>
Lestidae	dorsal 1/5	<i>Orolestes</i>
"	dorsal 1/4	<i>Archilestes</i>
Pseudostigmatidae	dorsal 1/5	<i>Mecistogaster</i>
Megapodagrionidae	dorsal 1/3 & ventral 1/5	<i>Argiolestes</i>
"	dorsal 1/3 & ventral 1/3	<i>Rhipidolestes</i>
Protoneuridae	dorsal 1/3	<i>Esmé</i>
"	dorsal 1/3 & ventral 1/5	<i>Chlorocnemis</i>
Platycnemididae	dorsal 1/4 & ventral 1/4	<i>Coperu</i>
Agrionidae	dorsal 1/5	<i>Argia</i>
"	"	<i>Nehalennia</i>
Amphipterygidae	dorsal 2/5	<i>Devadatta</i>
"	dorsal 1/3 & ventral 1/3	<i>Diphlebia</i>
"	ventral 1/3	<i>Philoganga</i>
"	"	<i>Pentaphebia</i>
Libellaginidae	dorsal 1/3?	<i>Rhinocypha</i>
"	dorsal 1/4?	<i>Platycypha</i>
Polythoridae	complete	<i>Polythore</i>
Epallagidae	dorsal 1/5 & ventral 1/4	<i>Anisopleura</i>
"	dorsal 1/5 & ventral 1/3	<i>Bayadera</i>
"	dorsal 1/4 & ventral 1/3	<i>Epallage</i>
"	complete	<i>Euphaea</i>
Calopterygidae	"	<i>Mnesareta, Hetaerina</i>
"	"	<i>Mnais, Umma, Sapho,</i>
"	"	<i>Phaon, Calopteryx,</i>
"	"	<i>Vestalis, Neurobasis,</i>
"	"	<i>Matrona, Echo,</i>
"	"	<i>Caliphaea.</i>
Epiophlebiidae	ventral 1/3	<i>Epiophlebia</i>
Petaluridae	ventral 1/3	<i>Tanypteryx</i>
Gomphidae	ventral 1/3	<i>Davidius</i>
Aeschnidae	ventral 1/3	<i>Oligoaeschna</i>
Cordulegasteridae	ventral 1/3	<i>Chlorogomphus</i>
Libellulidae	ventral 2/5	<i>Tetrathemis</i>

In the suborder Zygoptera, so far as my material is concerned, the feature of a complete or an incomplete interpleural suture is not always so simple. It is almost absent in the very archaic family Hemiphlebiidae, whereas it equally disappeared in the dominant and great family Agrionidae. In the Amphipterygidae and Epallagidae which are regarded to be rather primitive and transitional



the suture is variable for each genus. It is quite complete throughout in the family Calopterygidae including Hetaerinae. We would assume from an entirely different view point that the suture in question has developed when the pterothorax is laterally depressed as in Calopterygidae or in several Epallagid genera, while it has been obliterated when the pterothorax becomes thick and globulous as seen in Libellaginidae and Agrionidae.

In the Anisoptera the interpleural suture is always incomplete missing the dorasl portion above the spiracle. In the recent Anisozygoptera, viz., in *Epiophlebia superstes* Selys, the suture represented by mere ventral portion has consequently attained to a complete Anisopteric stage. In this character, therefore, the superfamily Epiophlebioidea can readily be differentiated from the supposed fossil members of Anisozygoptera.



As for the correlation between the development of the interpleural suture and the pterothoracic ganglia I can not say, for the present, anything definite. As shown in my previous work where the thoracic ganglia of *Epiophlebia* (Anisozygoptera), *Davidius* (Anisoptera), and *Mnais* (Zygoptera) are compared, the

correlation as considered by Tillyard seems rather questionable, because in a Calopterygid, *Mnais*, both the meso- and metathoracic ganglia are not separated in particular, but there is, on the contrary, a tendency of uniting of the ganglia as shown by its metathoracic and first abdominal ganglia.

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### References

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### Explanation of figures 5-36

Pterothoracic suture, left side.

5. *Hemiphlebia mirabilis* Selys (Hemiphlebiidae), ♀, Victoria, Australia.
6. *Synlestes weyeri* Selys (Synlestidae), ♂, N. S. W.
7. *Chlorolestes longicauda* Burmeister (Synlestidae), ♂, Natal.
8. *Orolestes Wallacei* Kirby (Lestidae), ♂, Sumatra.
9. *Archilestes grandis* Rambur (Lestidae), ♂, Texas.
10. *Mecistogaster linearis* Fabricius (Pseudostigmatidae), ♂, Brazil.
11. *Argiolestes icteromelas* Selys (Megapodagrionidae), ♂, N. S. W.
12. *Rhipidolestes nectans* Needham (Megapodagrionidae), ♀, Chekiang, China.
13. *Esme cyaneovitta* Fraser (Protoneuridae), ♀, S. India.
14. *Chlorocnemis elongata* Selys (Protoneuridae), ♂, Tanganyika.
15. *Copera tokyoensis* Asahina (Platycnemididae), ♀, Japan.
16. *Argia apicalis* Say (Agrionidae), ♂, Tennessee.
17. *Nehalennia irene* Hagen (Agrionidae), ♀, Michigan.
18. *Devadatta argioides* Selys (Amphipterygidae), ♂, Sumatra.
19. *Diphlebia lestoides* Selys (Amphipterygidae), ♂, N. S. W.
20. *Philoganga montana* Selys (Amphipterygidae), ♂, Sikkim.
21. *Pentaphlebia stahli* Forester (Amphipterygidae), ♂, Kamerun.
22. *Rhinocypha fenestrata* Burmeister (Libellaginidae), ♂, Java.
23. *Platycypha caligata* Selys (Libellaginidae), ♂, Natal.
24. *Polythore picta* Rambur (Polythoridae), ♂, Amazon.
25. *Anisopleura comes* Selys (Epallagidae), ♂, Nepal.
26. *Bayadera brevicauda* Fraser (Epallagidae), ♀, Formosa.

27. *Epallage fatime* Selys (Epallagidae), ♂, Turkey.
28. *Euphaea impar* Selys (Epallagidae), ♂, Sumatra.
29. *Mnesareta pudica* Hagen (Calopterygidae), ♀, Brazil.
30. *Mnais strigata* Selys (Calopterygidae), ♂, Japan.
31. *Epiophlebia superstes* Selys (Epiophlebiidae), ♂, Japan.
32. *Tanypteryx pryeri* Selys (Petaluridae), ♂, Japan.
33. *Davidius nanus* Selys (Gomphidae), ♂, Japan.
34. *Oligoaeschna pryeri* Selys (Aeschnidae), ♂, Japan.
35. *Chlorogomphus brunneus costalis* Asahina (Cordulegasteridae), ♂, Japan.
36. *Tetrathemis polleni* Selys (Libellulidae), ♂, Tanganyika.