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OBSERVATION ON THE EPICRANIO-ORBITAL COMPLEX OF SOME INDIAN AESHNINAE (ODONATA : AESHNIDAE)

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INTRODUCTION

Diversity of the epicranium resulting from the extent of isolation or contiguity of the compound eyes gained, till date, comparatively little attention in generic or subgeneric classification of Odonates,although such characteristics are of recognised importance in supergeneric classification of the group. Fraser 1936, 1957) mentioned about the presence of extensive variability in the extent of fusion of eyes in the familise Aeshnidae and Libellulidae. Lieftinck (1968) made use of the nature of inter-orbital suture to distinguish various species of *Oligoaeschna* Selys.

In the present paper, the nature of the epicranio-orbital complex of some Indian Aeshnid dragonflies (division Aeshninae) has been discussed with an attempt to analyse their possible taxonomic significance.

MATERIAL AND METHOD

12 Aeshnid species, representing all but one of the seven known genera and approximately half of the total known species of Indian Aeshninae were studied from either or both sexes as represented in the named odonate collection of the Zoological Survey of India. Observation was made by placing the specimens under light binocular microscope with objective 1.8 X and eye piece 6.0 X respectively. The specimens were so placed as to produce best clear view of the interorbital suture. Figures were drawn with the help of camera-lucida drawing apparatus. Attempt has been made to formulate running keys to various genera and species based on the nature of the epicranio-orbital complex.

TREND OF VARIATION OF THE EPICRANIO-ORBITAL COMPLEX OF AESHNINAE DRAGONFLIES AS OBSERVED DURING THE PRESENT STUDY

The compound eyes exhibit considerable variation in their shape in different genera and species, varrying from being oval, rounded, oblong or subtriangular, their lateral margin being occassionally deflected variably. Further, the compound eyes are broadly contiguous with each other over the epicranium along the length of the inter-orbital suture that isolates the occiput from other elements of the epicranium like the vertex, vesicle etc. The interorbital suture varies in extent with a reciprocal variation of the extent of the occiput. The apex of the occiput

fails, when the occiput is too small, to reach the point of maximum width of the head. The anteromedian margin of the orbit just in front of the interorbital suture also varies from being substraight to deeply arquate in nature. These, are in short, the major trend of variation noticed in course of the present study in respect of the epicranio-orbital complex.

LIST OF SPECIES STUDIED

Family AESHNIDAE
Division Aeshninae

1. *Polycanthagyna erythromelas* (MacLachlan) ... ♂ ♀
2. *Aeshna mixta* (Latreille) ... ♂ ♀
3. *Anax guttatus* (Burmeister) ... ♂ ♀
4. *Anax immaculifrons* Rambur ... ♂
5. *Anax imperator* Leach ... ♀
6. *Anax nigrolineatus* Fraser ... ♀
7. *Hemianax ephippiger* (Burmeister) ... ♂ ♀
8. *Anaciaeschna jaspidea* (Burmeister) ... ♂
9. *Gynacantha bainbriggei* Fraser ... ♂
10. *Gynacantha dravida* Lieftinck ... ♂
11. *Gynacantha millardi* Fraser ... ♀
12. *Gynacantha basiguttata* Selys ... ♂

Key to the genera of AESHNINAE

1. Occiput very small, interorbital suture 3.5 to 5.5 times as long as occiput ——— 2

- Occiput large, interorbital suture 1.10 to 2.75 times as long as occiput ——— 3

2. Outer margin of eyes rounded ——— *Anaciaeschna* Selys (Fig. 12)

- Outer margin of eyes oval ——— *Gynacantha* Rambur (Figs. 13 to 16)

3. Occiput very large, interorbital suture less than 1.15 times as long as occiput ; anteromedian margin of orbit substraight ; vesicle protruding beyond the level of anterior margin of orbit ——— *Hemiana* Selys (Figs. 10 and 11)

Occiput moderately large, interorbital suture 1.30 to 2.75 times as long as occiput ; anteromedian margin of orbit usually arquate ; vesicle sunk behind or anteriorly just reaching the anteriormost margin of orbit ——— 4

4. Vesicle thick and large in comparison to frons (Figs. 1 and 2) ; anteromedian margin of orbit deeply arquate ——— *Polycanthagyna* Fraser (Figs. 1 and 2)

- Vesicle, in comparison to frons, small and narrow or moderately large (Figs. 3 to 9) ; anteromedian margin of orbit substraight or mederately arquate ——— 5

5. Eyes shorter than frons in width ; outer margin of eyes rounded and without any deflection ; apex of occiput falling behind the level of maximum width of head _____ *Aeshna* Fabricius (Figs. 3 and 4)

- Eyes usually broader than frons in width ; outer margin of eyes suboval and/or with posterolateral deflection ; apex of occiput extending beyond the point of maximum width of head _____ *Anax* Leach (Figs. 5 to 9)

SALIENT FEATURES OF THE EPICRANIO-ORBITAL COMPLEX IN DIFFERENT GENERA AND SPECIES STUDIED

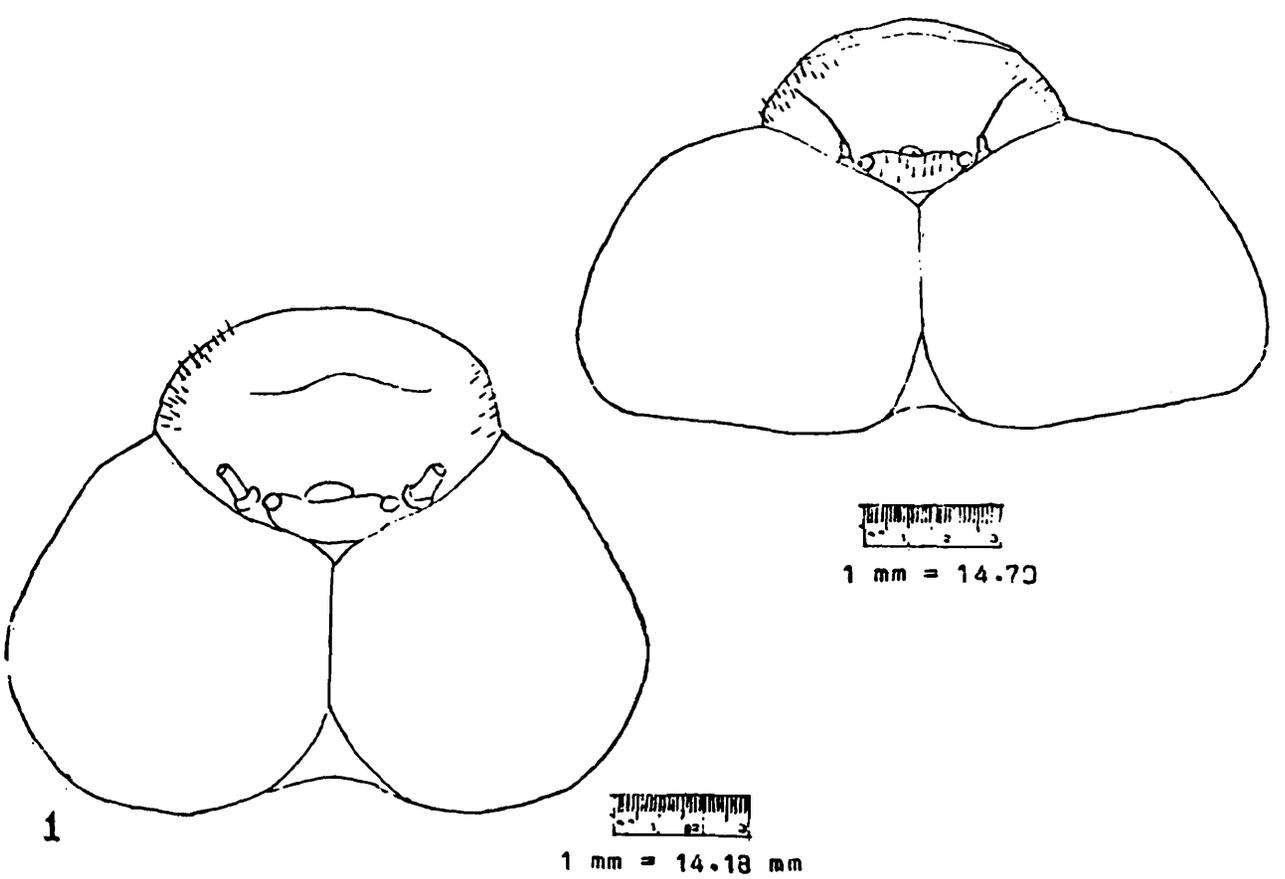
Genus **Polycanthagyna** Fraser 1933
(Figs. 1 and 2)

Vesicle rather thick and large in comparison to frons. Anteromedian margin of orbit deeply arquate, shape of eyes variable. Occiput large. Interorbital suture 1.58-1.60 times the lenght of occiput.

Polycanthagyna erythromelas (Maclachlan 1896)
(Figs. 1 and 2)

Material studied : 1♂, INDIA : JAMMU AND KASHMIR, Poonch, 10.x.1972, coll B.D. Sharma ; 1 ♀, INDIA : JAMMU AND KASHMIR, Balli Nala, 11.ix.1964, coll Raj Tilak.

Male : Eyes subtriangular, broader than long, outer margin of eyes suboval with subsqare posterolateral angle.



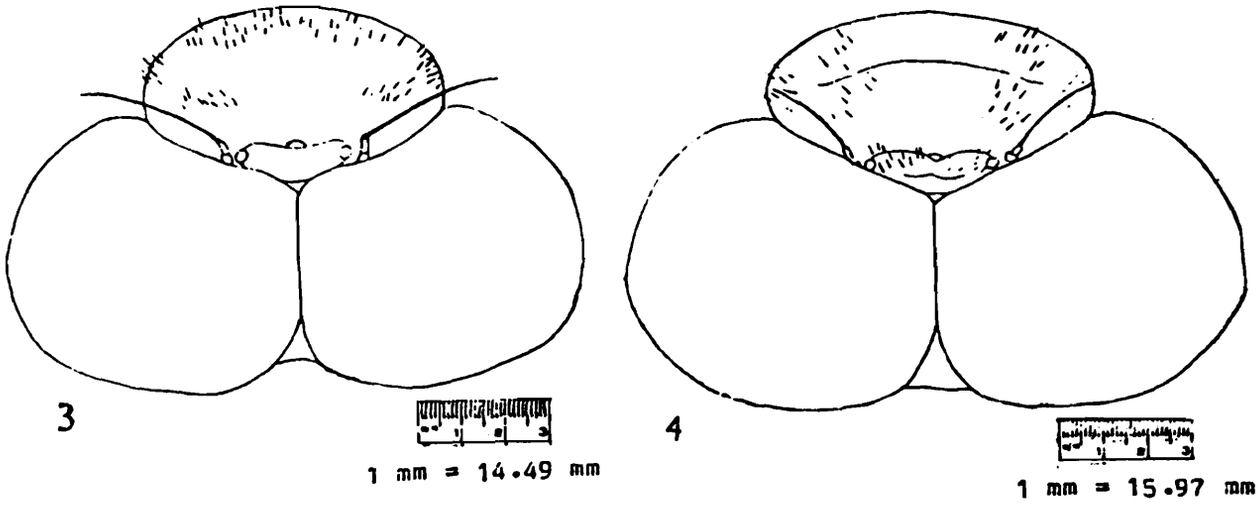
Figs. 1 & 2 : *Polycanthagyna erythromelas* (MacLachlan) 1. Female, 2. Male.

Female : Eyes globular, longer than broad, outer margin subrounded with feeble median deflection.

Note : The species is recorded here for the first time from Jammu and Kashmir.

Genus **Aeshna** Fabricius 1775
(Figs. 3 and 4)

Vesicle moderately large in comparison to frons, Anteromedian margin of orbit arquate. Occiput rather large, interorbital suture nearly twice the length of occiput. Eyes oblong, subequal to or shorter than frons in width with subrounded outer margin. Apex of occiput falling behind the level of maximum width of head.



Figs. 3&4 : *Aeshna mirta* Latreille 3. Male, 4. Female.

Aeshna mixta Latreille 1805
(Figs. 3 and 4)

Material studied : 8 exs, JAMMU AND KASHMIR, coll S.K. Gupta and party ; 2♂♂, Shalimar, Srinagar, 19.x.1976 ; 2♂♂, Anantanag, 2.xi.1976 ; 2♂♂, 2 ♀♀, Achabal, Jogigund, 7.xi.1976.

Eyes equal to and slightly shorter than the frons in width in male and female respectively. Other details as for the genus.

Genus **Anax** Leach 1815
(Figs. 5 to 9)

Usually vesicle narrow in comparison to frons and anteromedian margin of orbit arquate. Occiput large, interorbital suture 1.29 to 3.20 times the length of occiput. Eyes oval, oblong or subtriangular, subequal to or broader than frons in width. Outer margin of eyes variably suboval and posterolateral angle of the same variably rounded or subsquare. Apex of occiput extending to the level of maximum width of head.

Key to the species of genus **Anax** Leach

Male

Occiput small, interorbital suture about 3.2 times as long as occiput (Fig. 5) ___ *A. guttatus* (Burmeister)

Occiput large, interorbital suture about 2.09 times as long as occiput (Fig. 7) _ *A. immaculifrons* Rambur

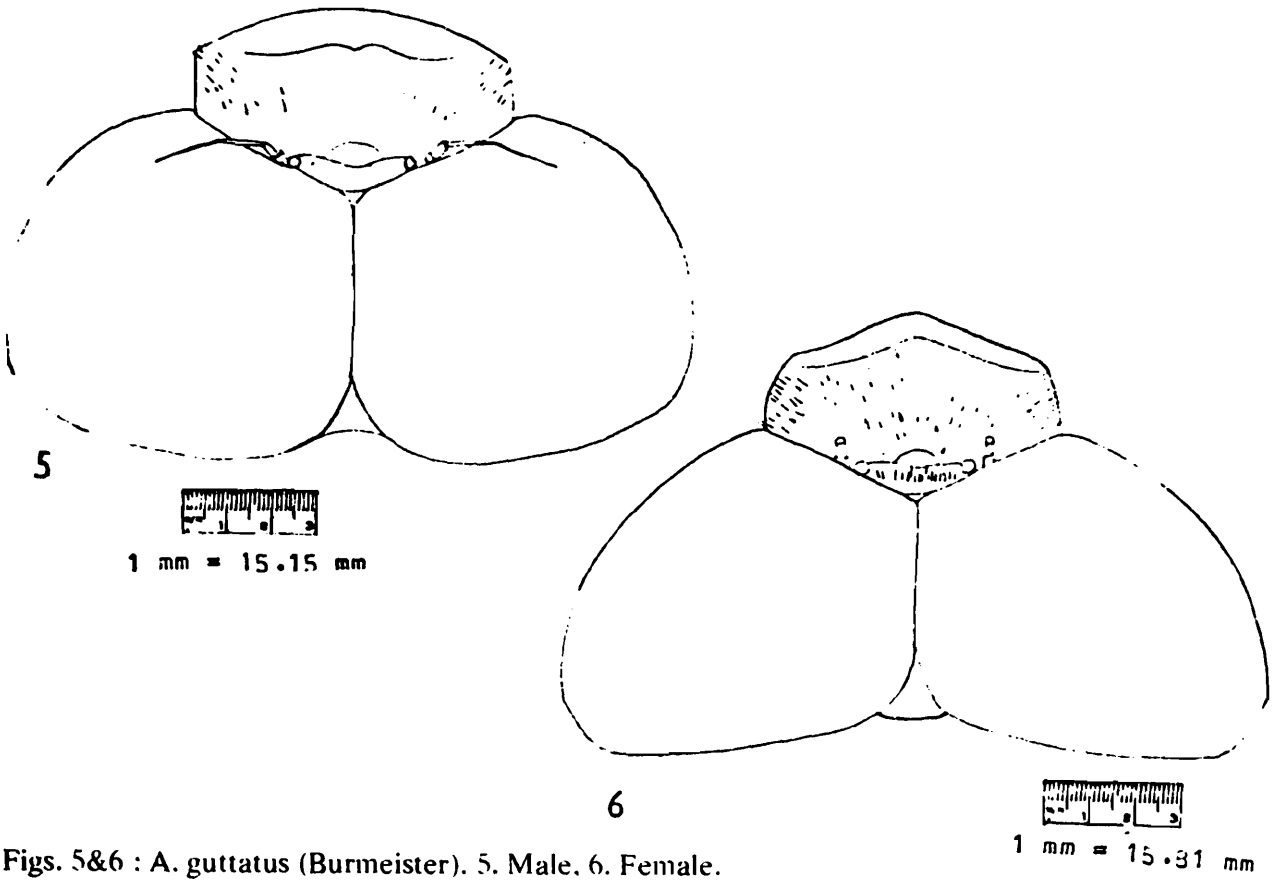
Female

1. Anteromedian margin of orbit substraight (Fig. 8) ___ *A. imperator* Leach

- Ateromedian margin of orbit arquate (Figs 6 and 9) ___ 2

2. Occiput small, interorbital suture 2.75 times the length or occiput (Fig. 6) ; posterior margin of occiput convex ___ *A. guttatus* (Burmeister)

- Occiput comparatively larger, interorbital suture 1.29 times the length of occiput (Fig. 9) ; posterior margin of occiput concave *A. nigrolineatus* Fraser



Figs. 5&6 : A. guttatus (Burmeister). 5. Male. 6. Female.

Anax guttatus (Burmeister 1839)
(Figs. 5 and 6)

Material studied : 5 exs ; 1 ♀, INDIA : WEST BENGAL : Jaipur Forest, Purulia, 9.x.1983, coll A.K. Hazra and party ; 3 exs, ORISSA : 1 ♂, Barkuda, 28.viii.1919, coll S.L. Hora ; 2 ♀♀, Barsasan, Keonjhargarh, 27.ix.1972, coll K. Rai and party ; 1 ♂, TAMIL NADU : on board the ship "City of Karachi", 18 miles off Cape Comorin, 25.xi.1927, coll J.A.R. Gockerell.

Male : Eyes subsquare, nearly as long as broad (Figs. 5) with weakly subsquare posterolateral angle ; occiput with concave posterior margin ; interorbital suture 3.2 times the length of occiput. Anteromedian margin of eyes arquate.

Female : Eyes subtriangular, visibly broader than long (Fig. 6), with subsquare posterolateral angle ; occiput small with concave posterior margin ; interorbital suture 2.75 times as long as occiput.

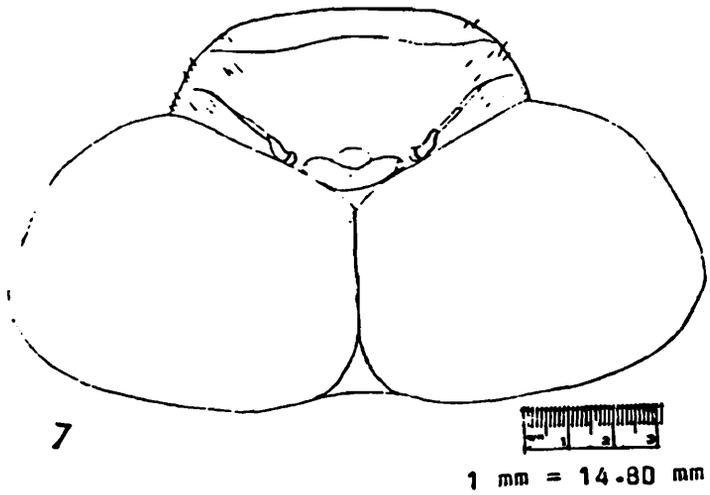


Fig. 7 : *I. immaculifrous* Ramber, Male.

Anax immaculifrons Rambur 1842
(Fig. 7)

Material Studied : 4♂♂, INDIA ; 1 ex, MAHARASHTRA : Panchgoni, ? date, coll E. Blatter and J. Fernandez ; 1 ex, UTTAR PRADESH : Rishikesh, 5.x.1976, coll R. K. Vershney ; 1 ex, PUNJAB : Choa, 15-21.x.1930, coll S.L. Hora and party ; 1 ex, ? : Bhimsankar forest bunglow, 3.v.1965, coll B.S. Lamba and party.

Male : Eyes suboval, longer than broad (Fig. 7), with lateral margin smoothly oval ; occiput small with substraight posterior margin ; interorbital suture 2.09 times the length of occiput. Anteromedian margin of eyes arquate.

Note : The species is recorded here for the first time from Punjab and Uttar Pradesh.

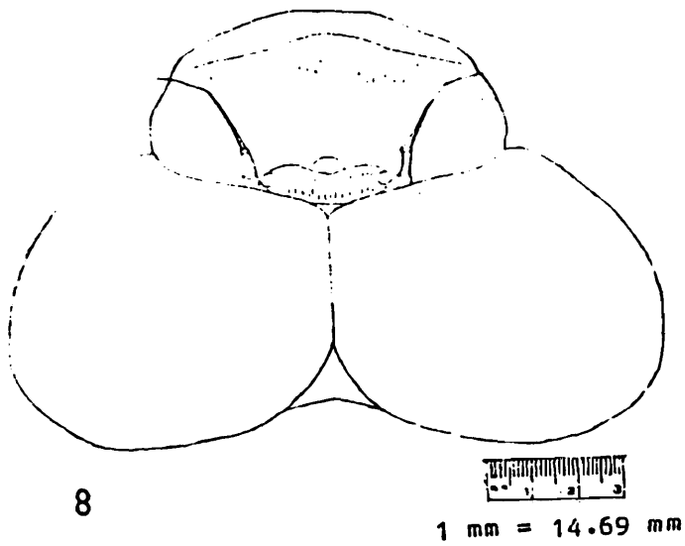


Fig. 8 : *A. imperator* Leach, Female.

Anax imperator Leach 1815
(Fig. 8)

Material studied : 1 ♀ INDIA : PUNJAB : Dalhousie, May, 1927, coll. S.L. Hora.

Female : Eyes suboval, broader than long (Fig. 8), with lateral margin smoothly oval. Occiput moderately large with concave posterior margin ; interorbital suture about twice as long as occiput.

Note : The species has ben recorded for the first time from Punjab.

Anax nigrolineatus Fraser 1935
(Fig. 9)

Material studied : 1 ♀, INDIA : SIKKIM : Lachan, 4.vi.1959, coll A.G.K. Menon.

Female : Eyes subtriangular, broader than long (Fig. 9), with posteriorly deflected outer margin. Occiput large with concave posterior margin. Interorbital suture 1.29 times as long as occiput.

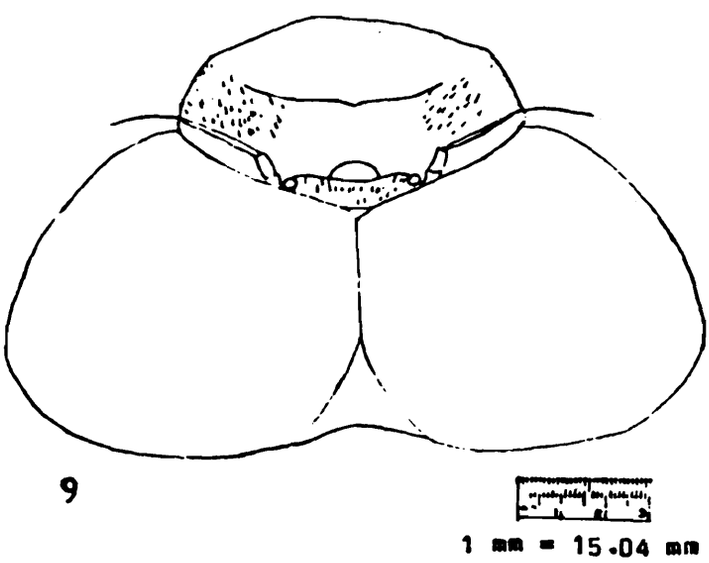


Fig. 9 : *A. nigrolineatus* Fraser, Female.

Genus **Hemianax** Selys 1883
(Figs. 10 and 11)

Vesicle moderately large in comparison to frons. Anteromedian margin of eyes substraight. Occiput large and almost as long as the interorbital suture. Eyes oblong, a little longer than frons in width with posteriorly deflected outer margin. Apex of occiput extending to the level of maximum width of head.

Hamianax ephippiger (Burmeister 1839)
(Figs. 10 and 11)

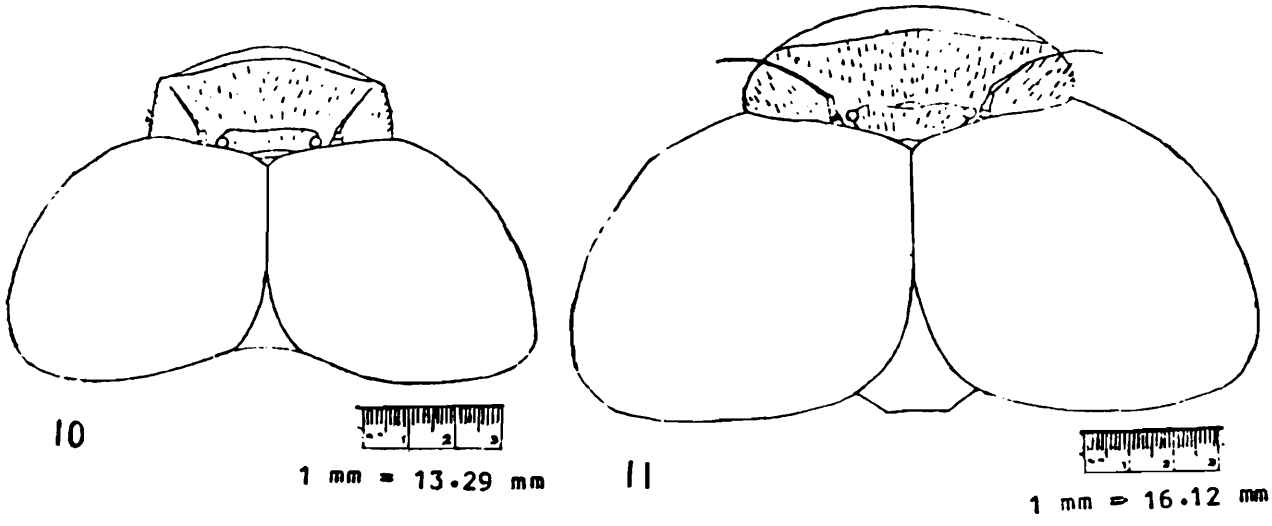
Material studied : 4 exs, INDIA ; 1 ♂, RAJASTHAN, Pali, 4.xii.1956, coll B. Biswas ; 2 exs, BIHAR ; 1 ♂ , Patna, 5.viii.1967, coll K.K. Mukherjee ; 1 ♀ , Ranchi

collector and date of collection unknown ; 1 ♀, MAHARASHTRA, Tarapora village, ? date, coll Kewetramani.

Mate : Occiput narrower than vesicle in width and a little shorter than the interorbital suture in length with sinuous posterior margin (Fig. 10).

Female : Occiput subequal to vesicle in width also subequal to the interorbital suture in lingth ; posterior margin of occiput squarely produced backwards (Fig. 11).

Note : The species has here been recorded for the first time from the states of Bihar and Rajasthan in India.



Figs. 10&11 : *Hamianax ephippiger* (Burmeister) 10. Male, 11. Female.

Genus **Anaciaeschna** Selys 1878
(Fig. 12)

Vesicle moderately large in comparison to frons. Anteromedian margin of eyes deeply arquate. Occiput very small, interorbital suture more than five times the length of occiput. Eyes globular, broader than frons in width with nearly rounded outer margin. Apex of occiput falling behind the level of maximum width of head.

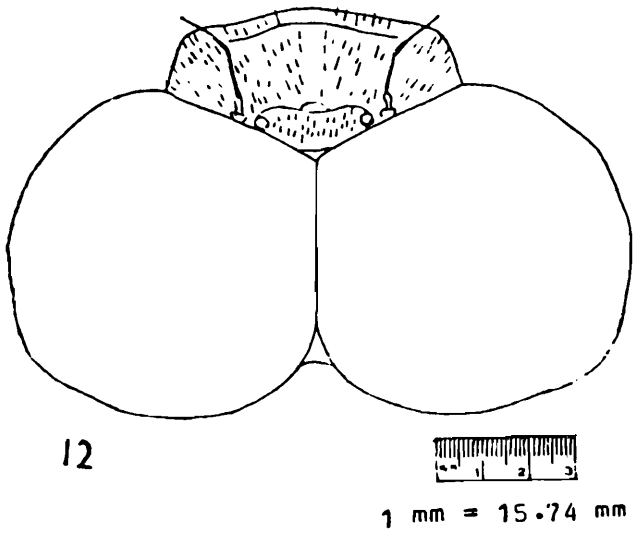


Fig. 12 : *Anaciaeschna jaspidea* (Burmeister), Male.

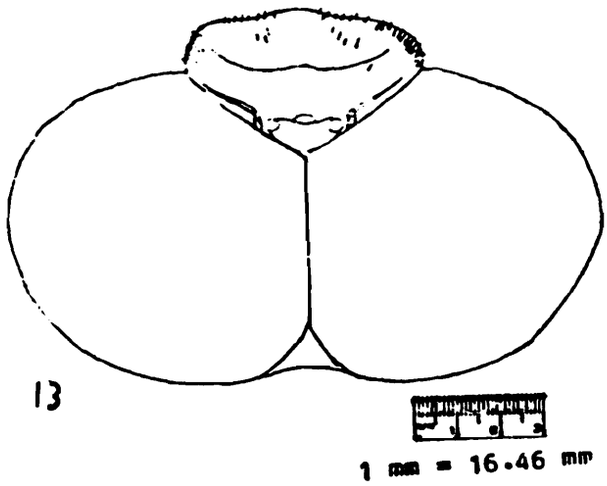


Fig. 13 : *Gynacantha bainbriggei* Fraser, Male.

Gynacantha basiguttata Selys 1882
(Fig. 16)

Material studied : 2 ♀♀, INDIA ; 1 ex, MEGHALAYA, Songook, 1g. 1x-1975, coll N. Muralidharan ; 1 ex., ARUNACHAL PRADESH, Tirap district, Deban, 11.xii.1982, coll S. Biswas.

Female : Occiput very small, shaped as an isolateral triangle. Interorbital suture more than five times as long as the occiput.

Note : The species has been recorded here for the first time from Arunachal Pradesh and Meghalaya states of the Indian Union.

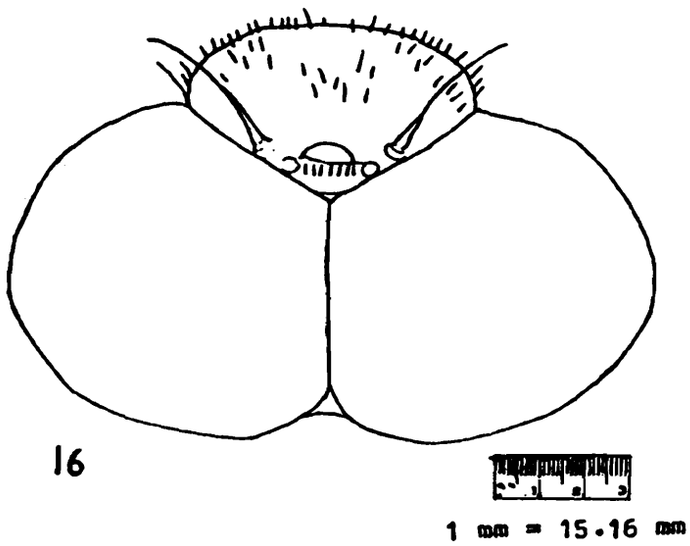


Fig. 16. *G. basiguttata* Selys, Female.

Gynacantha dravida Lieftinck 1960
(Fig. 14)

Material studied : 1 ♂, INDIA : WEST BENGAL, Calcutta, -.ix.1928, coll R.B.S. Swell.

Anaciaeschna jaspidea (Burmeister 1839)
(Fig. 12)

Material studied : 3♂♂, INDIA ; 1 ex, MEGHALAYA, Garo hills, Rongram, 25.iv.1976, coll N. Muralidharan ; 2 exs. WEST BENGAL, Calcutta ; 1 ex, Jabakusum House building, 21.iii.1965, coll S. Manjhi ; 1 ex. Horticulture garden, 11.x.1973, coll J. Ram.

Male : Eyes as long as wide with outer margin very weakly deflected posteriorly. Occiput with sinuous posterior margin.

Note : The species is recorded here for the first time from Meghalaya and the plains of West Bengal.

Genus **Gynacantha** Rambur 1842
(Figs. 13 to 16)

Vesicle rather small in comparison to frons. Anteromedian margin of eyes deeply arquate. Occiput small, interorbital suture 3.5 to 5.5 times as long as occiput. Eyes oval, broader than frons in width. Apex of occiput falling behind the point of maximum width of head.

Key to the species of Genus **Gynacantha** Rambur

Male

Eyes broader than long and widest at a point a little below the middle of their length (Fig. 14) _____ *G. dravida* Lieftinck

Eyes as long as wide and widest at a point a little above the middle of their length (Fig. 13) _____ *G. bainbriggei* Fraser

Female

Occiput very small, interorbital suture more than five times as long as occiput (Fig. 16) _____ *G. basiguttata* Selys

Occiput larger, interorbital suture less than four times as long as occiput (Fig. 15) _____ *G. millardi* Fraser

Gynacantha bainbriggei Fraser 1922
(Fig. 13)

Material studied : 1 ♂, INDIA : WEST BENGAL, Calcutta, 27.vii. 1972, coll unrecorded.

Male : Eyes as long as wide and widest at a point a little above the middle of their own length. Occiput as wide as the vesicle.

Note : The species has been recorded here for the first time from West Bengal.

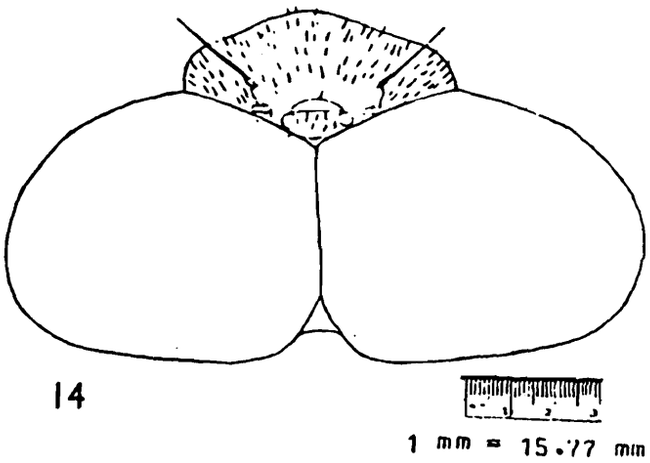


Fig. 14. *G. dravida* Lieftinek, Male.

Male : Eyes broader than long and widest at a point a little below the middle of their own length ; occiput narrower than vesicle in width.

Note : The species has been recorded here for the first time from Northern India.

Gynacantha millardi Fraser 1920
(Fig. 15)

Material studied : 2 ♀♀, INDIA ; 1 ex. ORISSA, Balangir, Harisankar road, 17.xii.1972, coll A.K. Mondal and party ; 1 ex, MAHARASHTRA, Poona, N.C.L. compound, -.-.1962, coll B.K. Halder.

Female : Occiput small with sides a little longer than the hind margin. Interorbital suture less than four times the length of occiput.

Note : The species has been recorded here for the first time from Orissa.

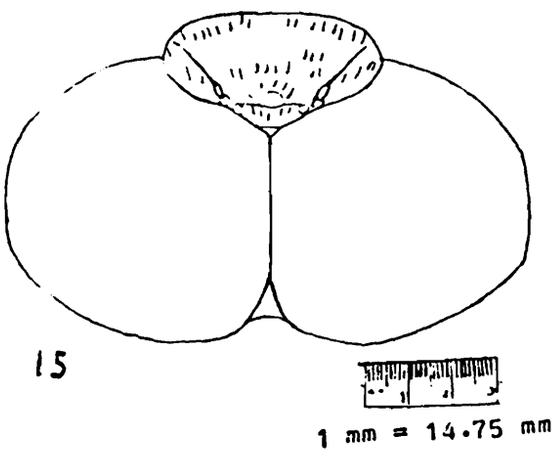


Fig. 15. *G. millordi* Fraser, Female.

SUMMARY

Nature of the epicranio-orbital complex has been discussed for twelve Indian Aeshninae dragonflies viz. *Polycanthagyna erythromelas* (MacLachlan), *Aeshna mixta* (Latreille), *Anax. guttatus* (Burmeister), *A. immaculifrons* Rambur, *A.*

imperator Leach, *A. nigrolineatus* Fraser, *Hemianax ephippiger* (Burmeister), *Anaciaeshna jaspidea* (Burmeister), *Gynacantha bainbriggei* Fraser, *G. dravida* Lieftinck, *G. millardi* Fraser and *G. basiguttata* Selys. The trend of variation has been discussed and tentative generic and species keys based on such studies have been provided.

ACKNOWLEDGEMENT

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LITERATURE CITED

Fraser, F.C. 1936. *Fauna of British India, Insecta : Odonata. 3* : xi + 461 pp., Figs. & Pls., Taylor and Francis, London.

Fraser, F.C. 1957. A reclassification of the order Odonata. 133 pp. *Royal Zoological Society of New Southwales, Sydney.*

Lieftinck, M.A. 1968. A review of the genus *Oligoaeschna* Selys in South east Asia. *Tijdschr. Ent.*, **111**(5) : 137-186