THE KARYOTYPES OF FIVE SPECIES OF ODONATA ENDEMIC TO NEW ZEALAND

A.L. JENSEN¹

Zoology Department, University of Canterbury, Christchurch-I, New Zealand

Received April 10, 1979

The chromosome formula, $n \sigma = 13$ (X, m), characterises 4 spp.: Austrolestes colensonis (White) (Lestidae), Uropetala carovei (White) (Petaluridae), Procordulia gravi (Sel.) and P. smithii (White) (Corduliidae). The karyotype of Xanthocnemis zelandica (McLach.) (Coenagrionidae) is described by $n \sigma = 14$ (X). Save for U. carovei none of these spp. have been examined cytologically so far.

INTRODUCTION

The major genetic features of the Order Odonata are well known (cf. for example KIAUTA, 1972). The karyotypes of almost 500 species, representing 20 of the 27 existent families, have been determined. However, most of these records refer to Northern Hemisphere species and little cytological information is available from Australasia. Cytological studies of the many endemic species occurring in both Australia and New Zealand will therefore aid the development of a complete cytophylogenetic picture of the Order, and may also help to indicate the relationships of these species with the world fauna.

Of the 11 Odonata species present in New Zealand, six are endemic. Karyotypes of the five endemic species known to occur in Mid Canterbury, South Island (cf. CROSBY, DUGDALE & WATT, 1976) are presented here.

MATERIAL AND METHODS

Larval, teneral, and mature males were collected from Isaac's Pond (43°28'S, 172°32'E) and/or Lake Sarah (43°03'S, 171°47'E). The testes were removed and fixed in 3:1 absolute alcohol: glacial

¹ Present address: c o K. Andersen, Ludvig Jensensvej 3, DK-3460 Birkerød, Denmark.

A.L. Jensen

acetic acid. After 10 min hydrolysis in 1 N HCl at 60°C, the material was stained in basic fuchsin and squash preparations were made. The slides were examined and photographed using a W¹d Research Photo Microscope (magnification 10x oculars, 100x oil immersion).

OBSERVATIONS AND DISCUSSION

All the species studied have the XX-XO mode of sex determination. The remaining results are presented in Table I.

The karyotypes of five odonate species from Mid Canterbury, endemic to New Zealand			
Species (and family affiliation)	n	m	Other autosomes
Coenagrionidae (Pseudagrioninae)			
Xanthocnemis zelandica	14	—	13 pairs of similar size
Lestidae (Sympecmatinae)			
Austrolestes colensonis	13	+	1 very large pair, 10 pairs of decreasing magnitude
Petaluridae (Petalurinae)			• -
Uropetala carovei	13	+	5 large, 6 medium pairs
Corduliidae (Corduliinae)			
Procordulia gravi	13	+	11 pairs of decreasing magnitude
P. smithii	13	+	11 pairs of decreasing magnitude

Table I

XANTHOCNEMIS ZELANDICA (McLACHLAN) Figure I

Prior to this study the karyotypes of 53 species of Coenagrionidae were known. Of these species, 50 have the haploid chromosome number n = 14. The autosomes are characteristically of similar or slightly decreasing magnitude. An *m*-bivalent occurs in approximately half the species studied.

The chromosome number is apparently constant within the family whereas the presence or absence of *m*-chromosomes varies. Species belonging to the subfamily Pseudagrioninae usually have a pair of *m*-chromosomes; X. zelandica is the only known exception. This may be a feature peculiar to some of the genera and species in this subfamily, and could possibly be useful for phylogenetic studies.

30

Karyotypes of New Zealand Odonata

AUSTROLESTES COLENSONIS (WHITE) Figure 2

Prior to this study the karyotypes of 17 species of Lestidae were known. Of these species 15 have the haploid chromosome number n = 13 and 10 have an unusually large pair of autosomes. The lestid karyotype is apparently stable at the family level, as discussed by KIAUTA & KIAUTA-BRINK (1975). FRASER (1957) split the family into two subfamilies, Lestinae and Sympecmatinae, placing *Austrolestes* in the latter. Only two other species, *Sympecma annulata braueri* (Yakobson & Bianki) and *Indolestes cyanea* (Selys), belonging to this subfamily have been studied cytologically (KIAUTA & KIAUTA-BRINK, 1975; KIAUTA & KIAUTA, 1976).

The karyotypes of the three sympecmatine species are similar to those of the majority of the Lestinae species studied. It is, therefore, unlikely that comparisons between species karyotypes will aid phylogenetic studies within this family.



Figs. 1-5. Spermatocyte chromosomes of five Odonata species endemic to New Zealand (Feulgen squash): (1) Xanthocnemis zelandica (McLach.), late diakinesis; — (2) Austrolestes colensonis (White), late diakinesis (note the unusually large bivalent); — (3) Uropetala carovei (White), late diakinesis; — (4) Procordulia grayi (Sel.), late diakinesis; — (5) P. smithii (White), metaphase I.

A.L. Jensen

UROPETALA CAROVEI (WHITE) Figure 3

Further work has supported the preliminary observations previously reported (JENSEN & MAHANTY, 1978). The haploid chromosome number $n\sigma = 9$ as determined by WOLFE (1953) is erroneous. The correct count is $n\sigma = 13$.

Karyotypes are known for an additional three species of Petaluridae. Two of these have haploid chromosome numbers of n=9. The remaining species has n=10. The haploid chromosome number of *U. carovei* is higher than that of any petalurid previously studied. Further records are, however, needed before a type number can be established for the family. Because the Petaluridae are believed to be amongst the most ancient and primitive of the living dragonflies (KIAUTA, 1972) it is important to attempt to determine a family type number. Karyotype analyses may also help to indicate species relationships within the Petaluridae.

PROCORDULIA GRAYI (SELYS) and P. SMITHII (WHITE) Figures 4-5

Prior to this study the karyotypes of 18 species of Corduliidae were known. Of these species 14 have a haploid chromosome number of n = 13. The autosomes are characteristically of similar or slightly decreasing magnitude. A pair of *m*-chromosomes occurs in half the species; in the remaining species the X-chromosome is the smallest in the set.

This study represents the first cytological record for corduliids from the Southern Hemisphere. The karyotypes of the two New Zealand *Procordulia* species are of the type found in the majority of corduliids previously examined. One feature was noted which consistently differentiated the two species. The *m*bivalent of *P. gravi* was only observed in end-to-end association, whereas an interstitial chiasma occurred during diakinesis in the *m*-bivalent of *P. smithii*. This feature may be useful for determining relationships within this genus, which is distributed throughout the Eastern Pacific (LIEFTINCK, 1977).

ACKNOWLEDGEMENTS

I thank Dr. H.K. MAHANTY for helpful advice and for the use of the Wild Research Photo Microscope (purchased by a grant from the Nuffield Foundation). I am grateful to Dr K. DEACON for reading the manuscript.

REFERENCES

- CROSBY, T.K., J.S. DUGDALE & J.C. WATT, 1976. Recording specimen localities in New Zealand: an arbitrary system of areas and codes defined. N.Z. Jl Zool. 3: 69.
- FRASER, F.C., 1957. A reclassification of the order Odonata. R. Zool. Soc. N.S.W., Sydney.
- JENSEN, A.L. & H.K. MAHANTY, 1978. A preliminary note on the chromosome number of Uropetala carovei (White) (Anisoptera: Petaluridae). Odonatologica 7: 385-386.
- KIAUTA, B., 1972. Synopsis of the main cytotaxonomic data in the order Odonata. Odonatologica 1: 63-130.
- KIAUTA, B. & M.A.J.E. KIAUTA, 1976. The chromosomes of some dragonflies from the Langtang Valley, Central Nepal. Odonatologica 5: 347-354.
- KIAUTA, B. & M.A.J.E. KIAUTA-BRINK, 1975. The chromosomes of the dragonfly Sympecma annulata braueri (Yakobsen & Bianki, 1905) from the Netherlands, with a note on the classification of the family Lestidae (Odonata: Zygoptera). Genen Phaenen 18: 39-48.
- LIEFTINCK, M.A., 1977. New and little known Corduliidae (Odonata: Anisoptera) from the Indo-Pacific region. Oriental Insects 11: 157-179.
- WOLFE, L.S., 1953. A study of the genus Uropetala Selys (Order Odonata) from New Zealand. Trans. R. Soc. N.Z. 80: 245-275.