FIREFLY CHROMOSOMES, II. (LAMPYRIDAE: COLEOPTERA)

MARVIN WASSERMAN
Biology Department
Queens College, City University of New York
Flushing, NY 11367

LEE EHRMAN
Division of Natural Sciences
State University of New York at Purchase
Purchase, NY 10577

The karyotypes of sixteen species of eight genera of lampyrid fireflies have been published (Table 1). In this note, we add three additional species, *Photinus consanguineus* (s.s., Lloyd 1969), *Photinus australis* and *Photinus pyralis*. The gonads were fixed in San Felice, sectioned at 10 to 20 micrometers, and stained with Newton's Gentian Violet method (LaCour 1937).

The lampyrids appear to make up a relatively homogeneous group of beetles cytologically. Unfortunately the chromosomes are rather small and unremarkable in form.

TABLE 1. CHROMOSOME COMPLEMENTS OF THE FIREFLIES (LAMPYRIDAE).

Species	Male 2n	Male Karyoformula	Reference
Aspisoma aegrotum Gorh.	19	9 + X	Virkki
Aspisoma laterale F.	19 + S	9 + X	Virkki
Aspisoma ignitum L.		9 + X	Virkki
Aspisoma ignitum L. ?		9 + X	Santiago-Blay & Medina-Gaud
Aspisoma stictica Germ.	19	9 + X	Vidal
Aspisoma hesperum L.	19	9 + X	Pizza (unpublished, according to Smith)
Cratomorpha dorsalis Gyll.		9 + X	Virkki
Diphotus vittatus G. A. Oliv.		9 + X	Virkki
Lucidota diaphanura Gorh.		9 + X	Virkki
Luciola cruciata Motsch.	17	8 + X	Imai
Luciola lateralis Motsch.	15	7 + X	Imai
Photinus heterodoxus L. & M.		9 + X	Virkki
Photinus consanguineus LeConte	19	9 + X	This report
Photinus macdermotti Lloyd	19	8 + X	Ehrman and Wasserman
Photinus australis Green	19	9 + X	This report
Photinus pyralis L.	19 + S	9 + X	This report
Photuris pennsylvanica (DeGeer) #	19	9 + X	Stevens
Photuris congener LeConte	18 (sex?)		Ehrman and Wasserman
Pyractomena galeata E. Oliv.	19	9 + X	Virkki
Pyractomena angulata (Say)		9 + X + S	Smith and Maxwell

S = One or two supernumerary chromosomes.
# = queried as to accuracy of species identification by J. Lloyd (personal communication 1984).

Where reliable observations have been made, there is a postreduction of the X during spermatogenesis, i.e., the X divides during the first meiotic division, not during the second. Moreover, with few exceptions, the chromosome complement of these fireflies are similar in number and form, consisting of 9 pairs of autosomes and an X in the males. The X is always the smallest body. The exceptions are worth mentioning.

Imai (1955) reported that the males of two Japanese species, *Luciola cruciata* and *Luciola lateralis* have 17 and 15 chromosomes, respectively, instead of the 19 found in the other species of this family. Virkki (1962) observed a gonial metaphase with "19 chromosomes plus two bodies weakly stained with fuchsin.." which he interpreted to be supernumerary chromosomes. Here, we have observed in *Photinus pyralis* a spermatogonial metaphase consisting of 20 chromosomes (Fig. 1) in the same follicle with at least one other spermatogonial cell with the usual 19 chromosomes (Figs. 2a and 2b), and with meiotic divisional cells with the usual 9 bivalents and one univalent. Therefore supernumerary chromosomes exist in this species also at least in the spermatogonial cells.

We (Ehrman and Wasserman 1983) have reported that *Photinus congener*, sex unknown, showed 18 chromosomes in a larval gonial division. Since then, we have not been able to acquire more material.

Smith and Maxwell (1953) and Virkki (1962) stated that all of the bivalents in the primary spermatocytes of the lampyrids almost invariably show only a single chiasma and therefore are dumbbell shaped at metaphase. In the four species we have examined, this appears to be true only for *Ph. pyralis*. The species, *Ph. consanguineus*, *Ph. macdermotti* and *Ph. australis* usually have two large, ring-shaped, bivalents which we interpret as resulting from two terminalized chiasmata in each of the two bivalents (Ehrman and Wasserman 1983).

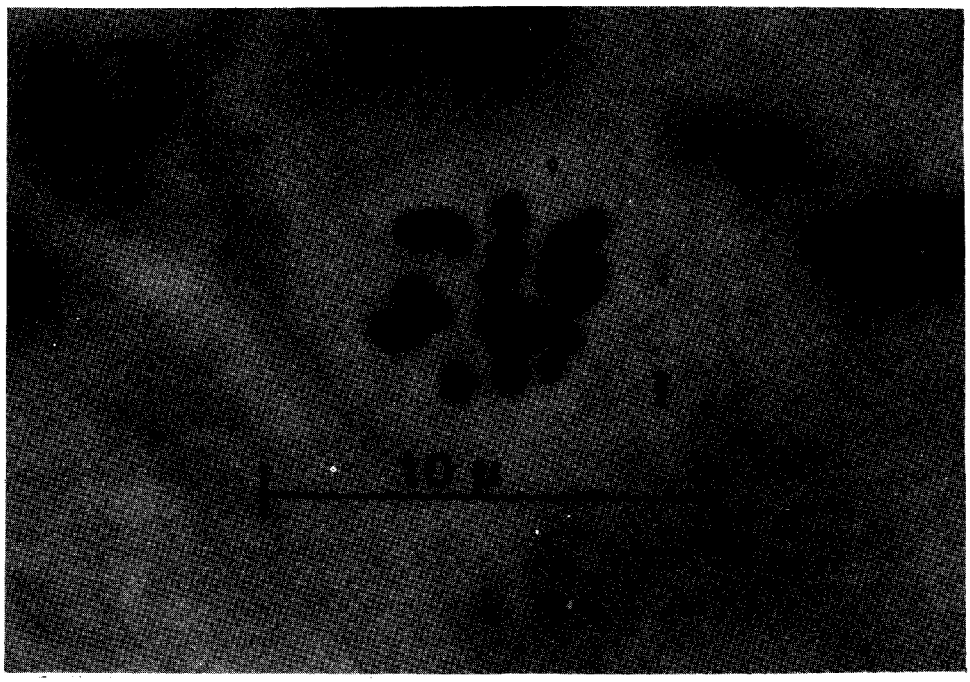


Fig. 1. Photomicrograph of a spermatogonial metaphase of *Photinus pyralis* showing 20 chromosomes, one of which must be a supernumerary.

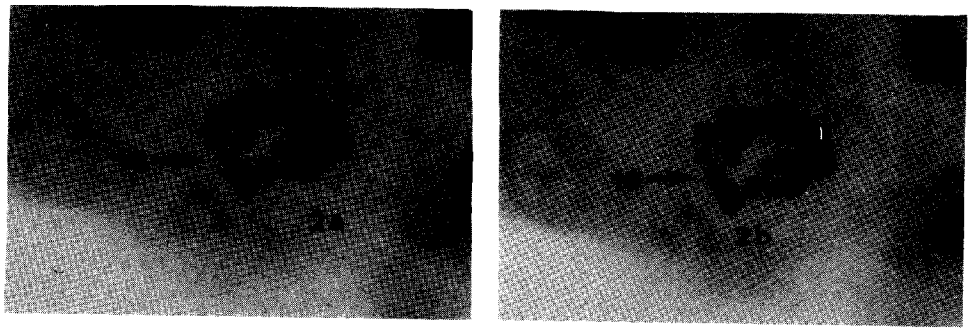


Fig. 2. Photomicrographs of a spermatogonial metaphase of *Photinus pyralis* from the same testicular follicle as the one shown in Figure 1: a) The cell clearly showing 18 chromosomes plus one chromosome out of focus; b) The same cell with the 19th chromosome brought into focus.

We are most grateful to Professor James Lloyd of the University of Florida at Gainesville who kindly identified the specimens of *P. pyralis* and collected, identified, and sent us specimens of *Ph. consanguineus*, and *Ph. australis*. We also wish to thank Dr. N. Virkki for his comments.

References Cited

EHRMAN, L. AND M. WASSERMAN. 1983. Firefly chromosomes (*Photinus, Photuris:* Lampyridae). Florida Ent. 66: 35.

IMAI, H. 1955. On the chromosomes in some Lampyridae. Japan J. Genet. 30: 169.

LACOUR, L. 1937. Improvements in plant cytological techniques. Bot. Rev. 5: 241-258.

SMITH, S. G. 1960. Chromosome numbers of Coleoptera. II. Canadian J. Genet. Cytol. 2: 66-88.

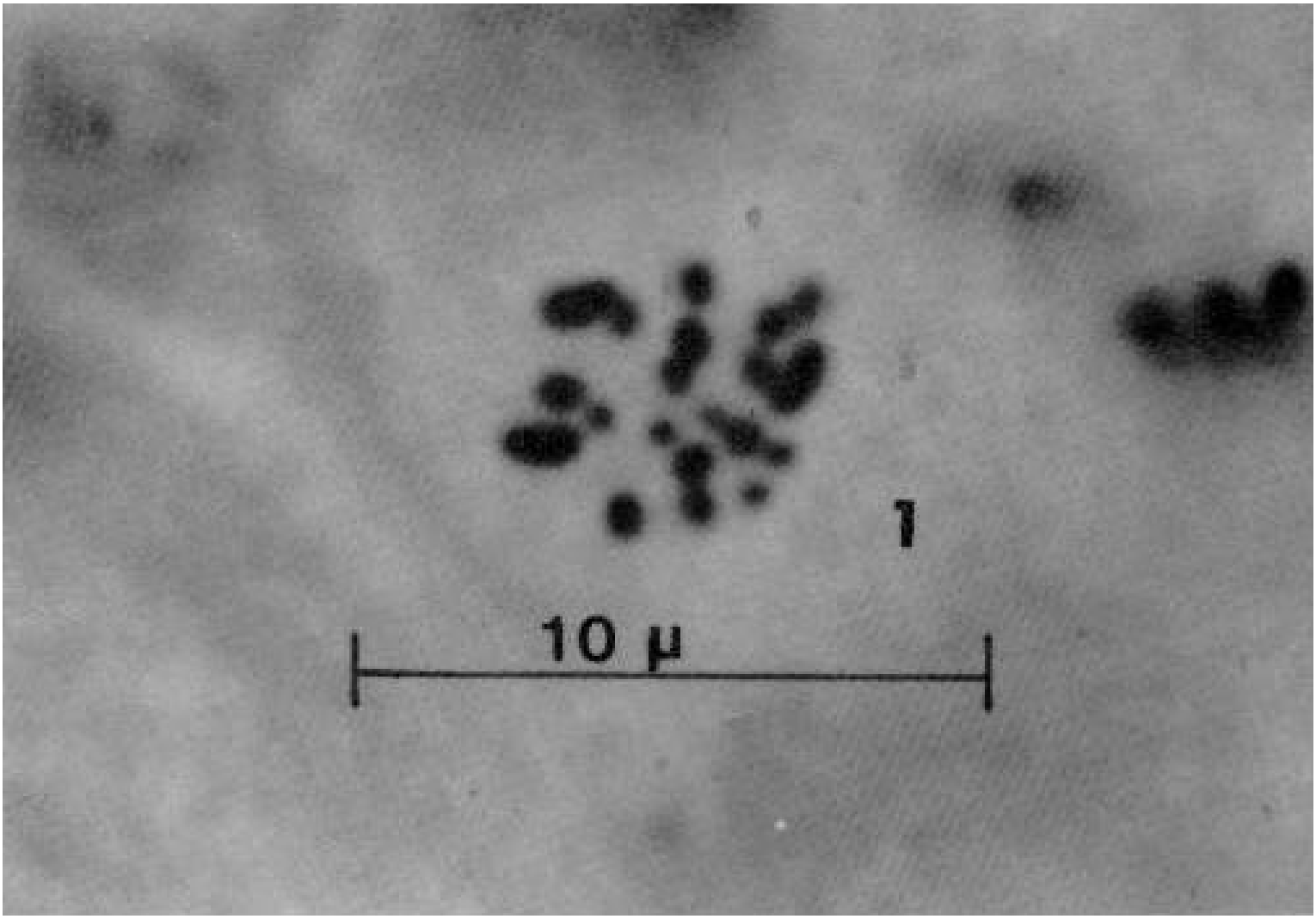
SMITH, S. G., AND D. MAXWELL. 1953. Postreduction of the X chromosome and complete chiasma interference in the Lampyridae (Coleoptera). Canadian J. Zool. 31: 179-192.

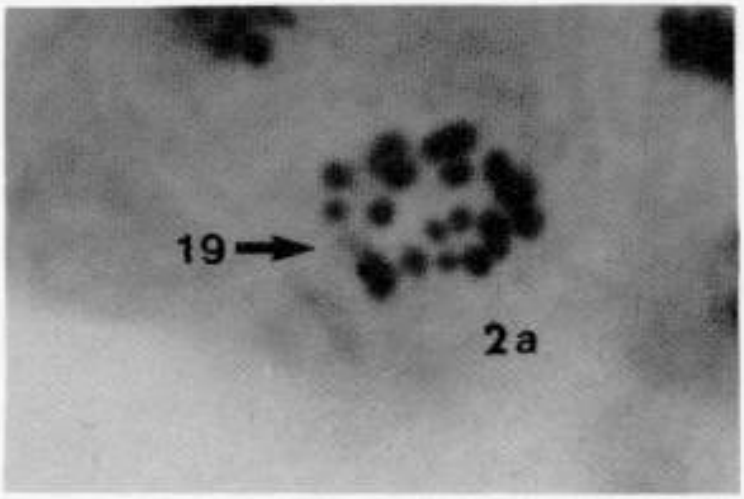
SMITH, S. G., AND N. VIRKKI. 1978. Animal cytogenetics 3. Insecta 5. Coleoptera, Ed., Borntraeger, Stuttgart.

STEVENS, N. M. 1909. Further studies on the chromosomes of the Coleoptera. J. Exp. Zool. 6: 101-113.

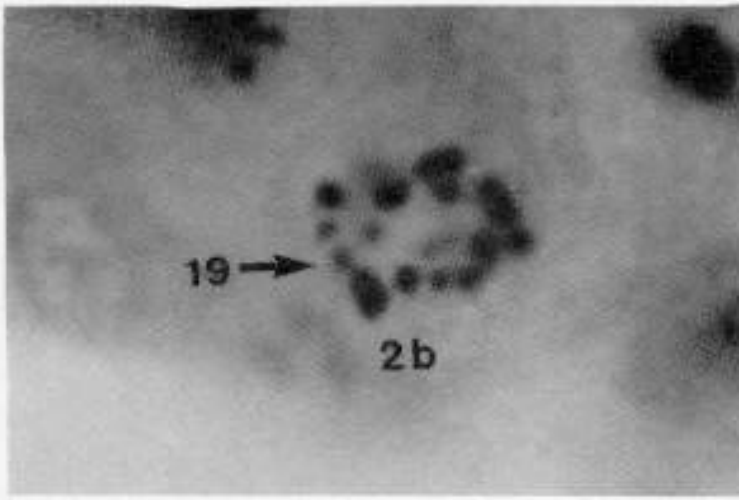
VIDAL, O. R. 1984. Chromosome numbers of Coleoptera from Argentina. Genetica 65: 235-239.

VIRKKI, N. 1962. On the cytology of some Neotropical Cantharoids. Ann. Acad. Fenn. A IV. 65: 3-18.


1
10 µ



2a



2b