CHROMOSOME NUMBERS OF SOME BUTTERFLIES (LEPIDOPTERA-RHOPALOCERA)

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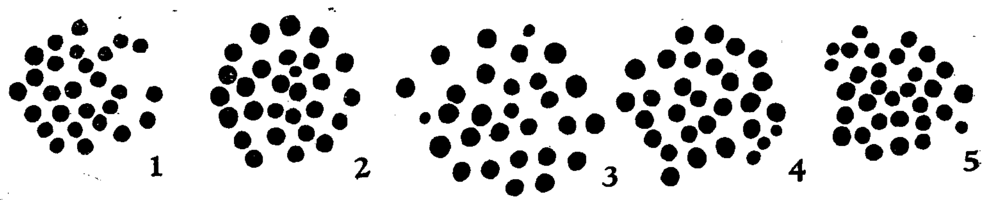
The order Lepidoptera has long furnished a favorite material for cytology, and the extensive study of chromosomes has been made from the cyto-taxonomic stand-point. With reference to the chromosome list published by Makino (1951), it is clear that chromosome research of the Heterocera, a group of the moth, has much advanced on a large scale including about 170 species, while in the Rhopalocera, a group of the butterfly, the investigation has comparatively less extended than in the Heterocera, the chromosomes of some 150 species having been reported so for. The comparative studies of the European butterflies have been published by Beliajeff (1930), Federley (1941), Lorkovic (1941) and some others. Our knowledge on the chromosomes of the Japanese butterflies is very poor. The present author has undertaken since this spring chromosome investigation of butterflies obtainable in the vicinity of Sapporo, and made clear the chromosome number of 31 species which represent 3 species of Papilionidae, 5 species of Pieridae, 16 species of Nymphalidae, 3 species of Satyridae, 1 species of Libytheidae, 2 species of Lycaenidae and 1 species of Hesperidae. In most cases, the adult testes furnished the material for this study. For the fixatives, Allen's P.F.A.-3 solution, Allen's B-3 solution, Allen-Bouin mixture and Carnoy's fluid were used. The sections were made according to the paraffin method and stained with Heidenhain's iron-haematoxylin with a counter-stain of light -green.

In all species studied here, the author failed to observe the spermatogonial chromosomes owing to the inadequate material. The haploid chromosomes in both primary and secondary spermatocytes came under study.



Figs. 1–5. Variation of chromosomes in *Pieris melete*. Primary spermatocytes. ×3300. 1, 27 chroms. 2, 28 chroms. 3, 29 chroms. 4, 30 chroms. 5, 31 chroms.

The chromosome number of the studied species ranges from 14 to 31; between these extremes the following numbers, 24, 25, 26, 27, 28, 29, 30 are represented. The species having 31 chromosomes (n) are most frequent, being 42%. Those with 30 chromosomes

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rank second. The numerical condition found in the present study is quite similar to that occurred in moths. But, whether the number, 31, represents the ancestral type is not yet clear. Among the species concerned here, there is no evidence for the presence of polyploidy.

Especially noticeable is the fact that the chromosome number of *Pieris melete* shows a variation ranging from 27 to 31, as shown in Figs. 1-5. The basic number of this species seems to be 27. The cause of the numerical variation lies in the presence of the supernumerary chromosome. The supernumeraries vary from 1 to 4 in number and are represented by a minute element.

The species coming under study and the chromosome numbers established are listed in Table 1 :

Table 1. The species studied and their chromosome numbers

Species	Chrom.-No. ♂, *n*	Species	Chrom.-No. ♂, *n*
Libytheidae		*Polygonia c-album*	31 (I , II)
Libythea celtis	31 (I , II)	*Sasakia charonda*	29 (I , II)
Lycaenidae		*Vanessa indica*	31 (I , II)
Celastrina argiolus	25 (I)	Papilionidae	
Neozephyrus taxila	24 (I)	*Papilio xuthus*	30 (I)
Nymphalidae		,, *machaon*	31 (I)
Argynnis aglaja	29 (I , II)	,, *maackii*	30 (I , II)
,, *laodica*	31 (I)	Pieridae	
,, *paphia*	29 (I)	*Pieris rapae*	26 (I , II)
Aglais urticae	31 (I)	,, *napi*	25 (I , II)
Apatura ilia	31 (I)	,, *melete*	27, 28, 29, 30, 31 (I , II)
Araschnia burejana	31 (I)	*Calias hyale*	31 (I , II)
,, *levana*	31 (I)	*Aporia crataegi*	25 (I)
Brenthis ino	14 (I)	Satyridae	
Hestina japonica	30 (I)	*Lethe diana*	29 (I)
Limenitis camilla	30 (I , II)	*Neope goschkevitschii*	28 (I)
Neptis aceris	30 (I , II)	*Yuthima argus*	29 (I)
Nymphalis io	31 (I , II)	Hesperidae	
,, *xanthomelas*	31 (I , II)	*Halpe varia*	31 (I)

♂ (I) = primary spermatocyte. ♂ (II) = secondary spermatocyte.

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