ON THE CHROMOSOMES OF FIVE SPECIES OF DANAIDAE FROM NEPAL HIMALAYA (LEPIDOPTERA ; RHOPALOCERA)

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The present paper deals with the spermatocyte chromosomes of five species of Danaidae collected in Nepal Himalaya by members of the Lepidopterological Research Expedition to Nepal Himalaya, 1963. Cytological techniques used in this study are identical with those applied in our previous work (Saitoh and Abe 1970, in this issue). Each species studied here was identified by Dr. Tomoo Fujioka of Keiô University.

Observations

1. *Tirumala hamata septentrionis* BUTLER

One male (No. 51), taken at Taplejung on July 31, gave counts as follows for 45 nuclei:

First division	
Chr. nos.	No. of nuclei checked
36	2
35	5
34	6
33	12
32	3
31	1
total	29

Second division	
Chr. nos.	No. of nuclei checked
35	4
34	6
33	6
total	16

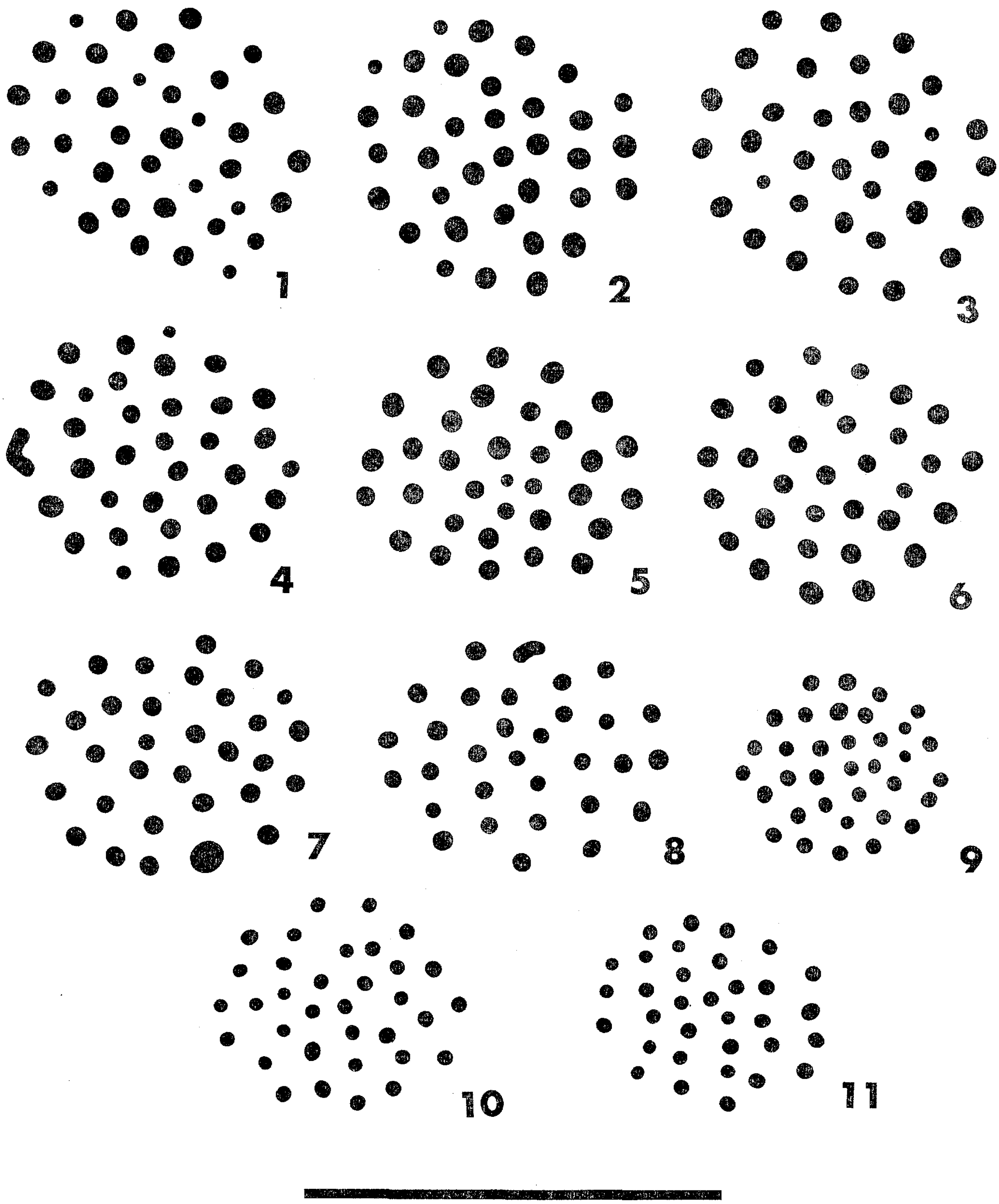
Typical figures of metaphase I of each class are shown in Figs. 1–8, and those of metaphase II in Figs. 9–11. In Fig 4, an element of metacentric nature is observed and in Fig. 8, that of submetacentric nature, too. In one cell a large element is recognized in the complement consisting of 32 chromosomes (Fig. 7). But, no such elements, remarkable in shape and size, are observed in other metaphase spermatocytes under inspection.

2. *Tirumala limniace* CRAMER

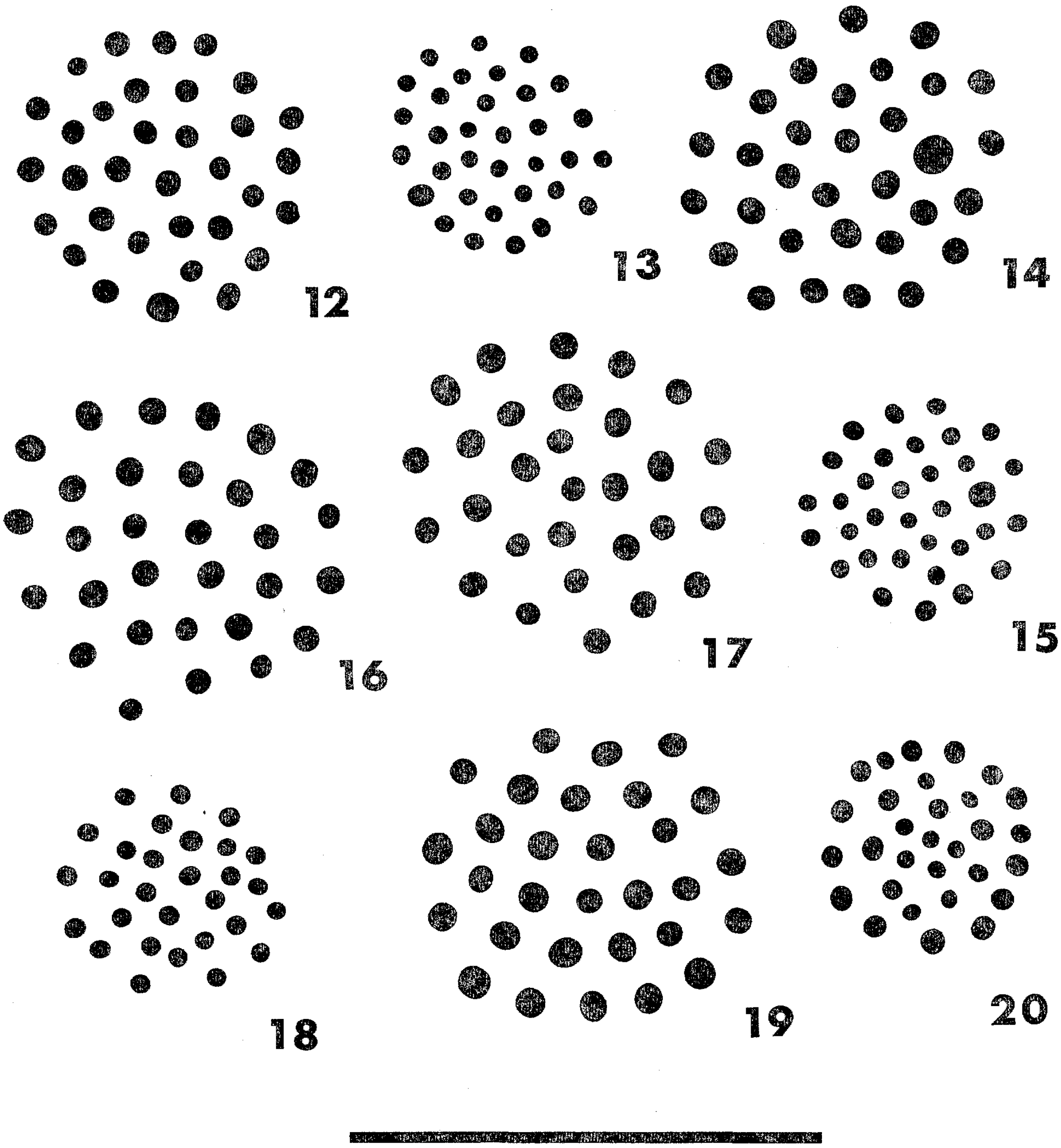
Counts were made in 11 nuclei (I) and 10 nuclei (II) in testes of one male (No. 83), collected at Tombol Bridge on Aug. 7. The base number of this species is 33. One element is larger than the others (Figs. 12 and 13).

3. *Parantica aglea melanoides* Moore

This is new to cytology. Counts were made in 20 nuclei (I) and 36 nuclei (II) in testes of one male (No. 40), taken at Lelep on July 30. The base number is 33. One element is larger than the others (Figs. 14 and 15).



Figs. 1–11. Spermatocyte chromosomes of *Tirumala hamata septentrionis*
1 : I, $n = 36$. 2 : I, $n = 35$. 3 : I, $n = 34$. 4 : I, $n = 34$. 5 : I, $n = 33$.
6 : I, $n = 32$. 7 : I, $n = 32$. 8 : I, $n = 31$. 9 : II, $n = 35$. 10 : II, $n = 34$.
11 : II, $n = 33$. Bottom bar : 10 μ.



Figs. 12–20. Spermatocyte chronosomes
12 : *Tirumala limniace* (I). 13 : Same (II). 14 : *Parantica aglea melanoides* (I). 15 : Same (II). 16 : *Euploea mulciber mulciber* (I, $n=30$). 17 : Same (I, $n=29$). 18 : Same (II, $n=29$). 19 : *Euploea core core* (I). 20 : Same (II). Bottom bar : 10μ.

4. *Euploea mulciber mulciber* CRAMER

This is new to cytology. Counts were made in 81 nuclei (I) and 53 nuclei (II) in testes of two males (Nos. 45 and 46), taken at Lelep on July 30. With the exception of a single nucleus (I) in which 30 chromosomes make their appearance (Fig. 16), 29 chromosomes are observed with certainty in other nuclei under examination (Figs. 17 and 18). This strongly suggests that the base number of this species is 29.

5. ***Euploea core core*** CRAMER

This is also new to cytology. Counts were made in 19 nuclei (I) and 22 nuclei (II) in testes of one male (No. 100), taken at Dharan on Aug. 8. The testes of this male were abundant in metaphase secondary spermatocytes. Therefore, only 22 plain figures came under examination. The base number of this species is 30 (Figs. 19 and 20).

Remarks

As far as the danaids of the Indo-Nepal area are concerned, only one species of India, *Limnas* (*Danais*) *chrysippus*, has hitherto been studied cytologically (Gupta 1964). Our knowledge on the chromosome cytology of danaid butterflies of this area is thus very meagre at present. Recently, Maeki et al. (1965) and Maeki and Ae (1966) reported the chromosome numbers of nine species of Formosan danaids. These species cover 5 genera including *Tirumala*, *Parantica* and *Euploea*. A comparison of the chromosome numbers is made here between the five species of the Nepal danaids above dealt with and the related species of Formosa.

Table 1. The haploid chromosome numbers of five species of Himalayan danaids

Species	Haploid chromosome numbers
Tirumala hamata septentrionis	36, 35, 34, 33, 32, 31(I), 35, 34, 33(II)
Tirumala limniace	33(I, II)
Parantica aglea melanoides	33(I, II)
Euploea mulciber mulciber	30, 29(I), 29(II)
Euploea core core	30(I, II)

(I) : Primary spermatocyte. (II) : Secondary spermatocyte.

A remarkable variation of the chromosome number is observed in *Tirumala hamata septentrionis* from Nepal. A similar tendency is observed also in the Formosan specimens of this danaid (Maeki and Ae 1966). This may allow us to speculate that the chromosome constitution in the Formosan and Himalayan populations of this species concerned is unstable, due probably to an incompletion of speciation. As stated above, the base number of *Tirumala limniace* from Nepal is 33 but, that of *T. limniace limniace* from Formosa is 37 (Maeki and Ae 1966). The significance of this discrepancy in the haploid number should be considered, after getting more materials from Nepal.

The haploid number of the chromosomes of *Parantica aglea melanoides* (*n*, 33) differs largely from that of *Parantica melaneus swinhoei* (*n*, 22) from Formosa (Maeki and Ae 1966). This suggests that the characteristic basic number for this genus is 11.

There are two groups in four *Euploea*-species so far studied ; the base number in three of them is 29, whereas *E. leucosticto hobsoni* only is characterized by having *n*, 30 chromosomes (Maeki et al. 1965, Maeki and Ae 1966). The same situation is seen in the present material from Nepal ; *E. mulciber mulciber* seems to belong to the former group, but *E. core core* is apparently a member of the latter group.

Résumé

Spermatocyte chromosomes were studied in five danaid species of Nepal, with some reference to their size relations. Of these, three are new to cytology. The species and their haploid chromosome numbers established are set out in Table 1.

A remarkable variation in the haploid number is observed in *Tirumala hamata septentrionis* (Table 1).

The population of *Tirumala limniace* from Nepal here dealt with is distinct in *n* from the Form-

osan population of *T. limniace limniace*; the base number is 33 in the former and 37 in the latter.

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要　約

ネパール・ヒマラヤ産マダラチョウ科5種の染色体研究

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日本鱗翅学会ヒマラヤ蝶蛾調査隊(1963)によつてえられたマダラチョウ科5種の染色体を観察した。インド，ネパール産のマダラチョウ科の細胞学的研究は僅かに Gupta (1964) がインド産カバマダラを調べているにすぎないから，今回のネパール・ヒマラヤ産5種についてえられた細胞学的知見は今後の研究に資する所があろうかと思われる。中華民国（台湾）産のマダラチョウ科の染色体がこれまで9種において調べられているのでヒマラヤ産の関連種と比較してみた。所検種の同定は慶応義塾大学藤岡知夫博士が行ない，材料の細胞学的処理方法，観察方法および観察結果の記述様式は本誌所載の筆者らの別報に記してある通りである。

観察結果

1　コモンアサギマダラ (*Tirumala hamata septentrionis*; 1♂, Taplejung, 7月31日)

染色体数に変異が認められた。合計45ヶの細胞で中期染色体を観察した結果，詳細は次表の通りである。

第 1 分 裂	
染色体数(n)	観察細胞数
36	2
35	5
34	6
33	12
32	3
31	1
	29

第 2 分 裂	
染色体数(n)	観察細胞数
35	4
34	6
33	6
	16

各クラスの中期像を図1—8(第1分裂),図9—11(第2分裂)に示してあるが,図4および8は特別な形の染色体1ケを含む n=34, n=31の中期像であり,図7は大型の1ケを含む n=32の像である。所検の範囲内では,第2分裂中期にはこのような染色体は認められない。

台湾産のコモンアサギマダラ(*T. hamata septentrionis*)でも第1分裂で染色体数の変異がみられている。

2 ウスコモンアサギマダラ(*Tirumala limniace*; 1♂, Tombol Bridge, 8月7日)

染色体数は n=33(I, II)で大型の染色体1ケを含む(図12, 13)。台湾産ウスコモンアサギマダラ(*T. limniace limniace*)は n=37であるが,ヒマラヤ産の材料を更にえて精査する必要がある。

3 ヒメコモンアサギマダラ(*Parantica aglea melanoides*; 1♂, Lelep, 7月30日)

染色体が調べられたのは今回がはじめてである。前種同様に染色体数は n=33(I, II)である。33ケ中の1ケは大型であるために他の染色体と区別される(図14, 15)。

この属のタイワンアサギマダラ(*P. melaneus swinhoei*)は n=22であるから,*Parantica* 属では染色体数に11の倍数関係があるかも知れない。

4 ツマムラサキマダラ(*Euploea mulciber mulciber*; 2♂♂, Lelep, 7月30日)

この種の染色体はこれまで調べられていなかつた。1ケの細胞では30ケの染色体が観察されたが(図16),他の細胞での観察からすればこのヒマラヤ産のツマムラサキマダラは染色体数が n=29(I, II)と考えられる(図17, 18)。

台湾産ツマムラサキマダラ(*E. mulciber barsine*)でも n=29であることが知られている。

5 ルリマダラ属の1種(*Euploea core core*; 1♂, Dharan, 8月8日)

この種の染色体は今回はじめて調べられた。染色体数は n=30(I, II)である(図19, 20)。

これまでに台湾のルリマダラ属(*Euploea*)は4種が細胞学的に調べられ,染色体数が n=29のグループ(ルリマダラ,ツマムラサキマダラ,ホリシヤルリマダラ)と n=30のグループ(マルバネルリマダラ)に分けられる。今回調べたヒマラヤ産のルリマダラ属の2種でもこの関係が認められたことになる。