CHROMOSOME NUMBERS IN THE GESNERIACEAE: III

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The following paper reports chromosome counts made in the family Gesneriaceae, almost entirely from Old World species.

The plants studied are from the collection at the Royal Botanic Garden, Edinburgh. Practically all are of known wild origin and the few exceptions are marked with an asterisk in Table I. Specimens of all collections investigated are in the herbarium of the Royal Botanic Garden, Edinburgh, under numbers quoted in Table I. All identifications have been made by B. L. Burtt.

The preparations used were acetocarmine squashes of material which had been fixed in 3 : 1 ethanol : acetic acid. In the case of root tips pretreatment was carried out in a saturated solution of paradichlorobenzene for four to five hours before fixation.

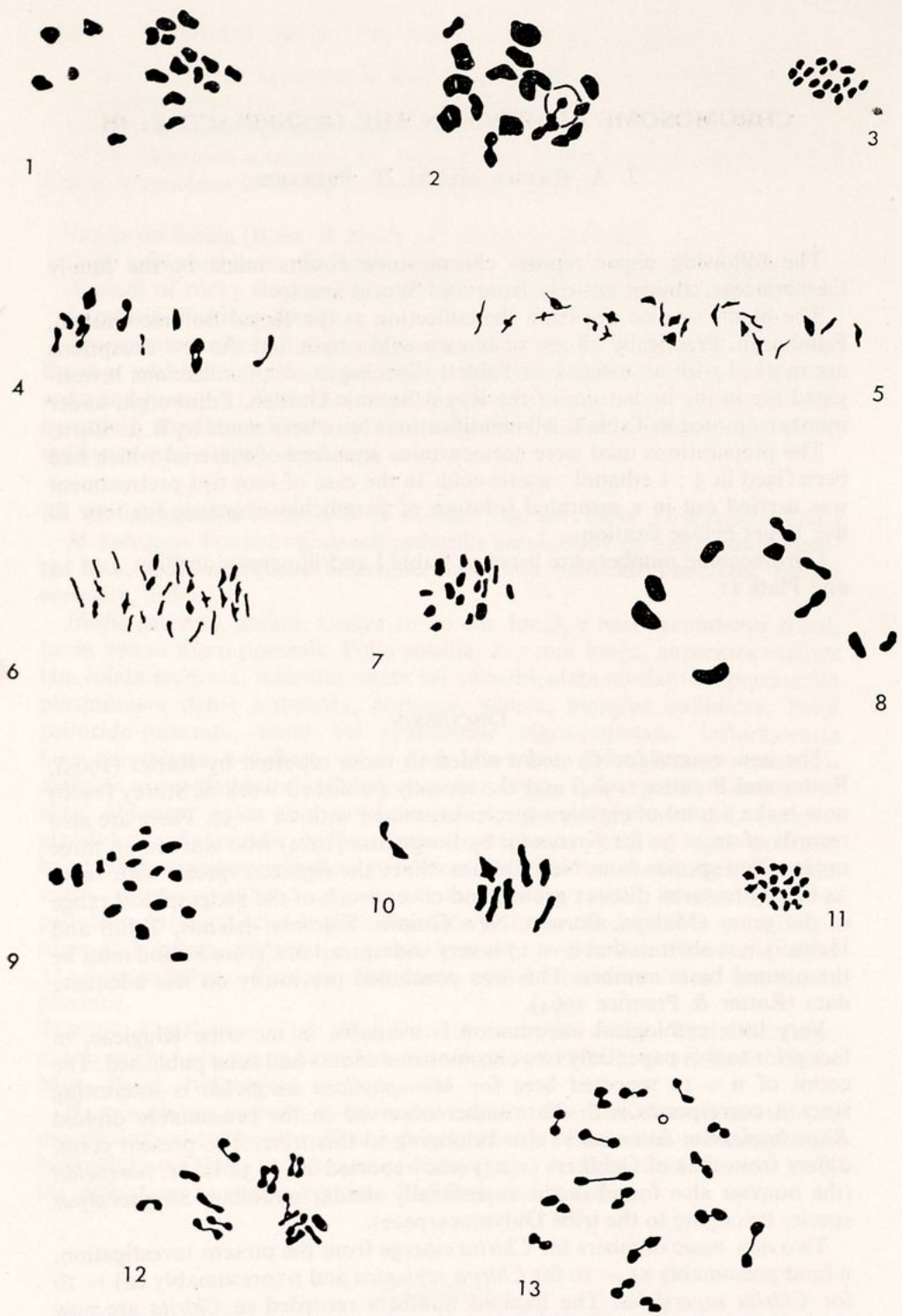
Chromosome numbers are listed in Table I and illustrated in Figs. 1 to 13 and Plate 11.

Discussion

The new counts for *Cytandra* added to those reported by Ratter (1963), Ratter and Prentice (1964) and the recently published work of Storey (1966) now make a total of eighteen species examined with $2n = 34$. There are also records of $2n = 32$ for *Cyrtandra* by Borgmann (1964) who worked on three unidentified species from New Guinea. Since the eighteen species with $2n = 34$ belong to seven distinct groups and cover much of the geographical range of the genus (Malaya, Borneo, New Guinea, Solomon Islands, Tahiti and Hawaii) it is obvious that $n = 17$ is very widespread in *Cyrtandra* and must be the normal basic number. This was concluded previously on less adequate data (Ratter & Prentice 1964).

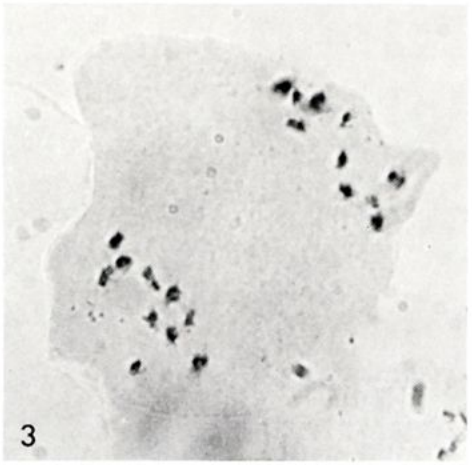
Very little cytological information is available in the tribe Klugieae, in fact prior to this paper only two chromosome counts had been published. The count of $n = 10$ reported here for *Monophyllaea horsfieldii* is interesting since it corresponds with the number observed in the presumably diploid *Rhynchoglossum notonianum* also belonging to this tribe. The present count differs from that of Oehlkers (1923) who reported $2n = 32$ in *M. horsfieldii* (the number also found in the superficially similar unifoliate *Streptocarpus* species belonging to the tribe Didymocarpeae).

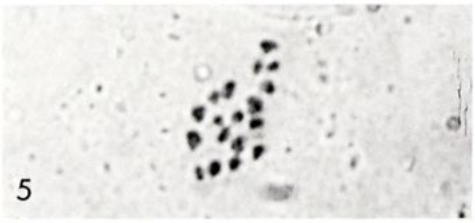
Two new basic numbers for *Chirita* emerge from the present investigation, n (and presumably x) = 10 for *Chirita zeylanica* and n (presumably 2x) = 16 for *Chirita asperifolia*. The haploid numbers recorded in *Chirita* are now $n = 4, 9, 10, 16, 17, 18$. It will be interesting to see if $n = 8$ is discovered in *Chirita* in the future since occurrence of $n = 16, 17$ and 18 suggests that two basic series with $n = 8$ and 9 might have been involved in the production of

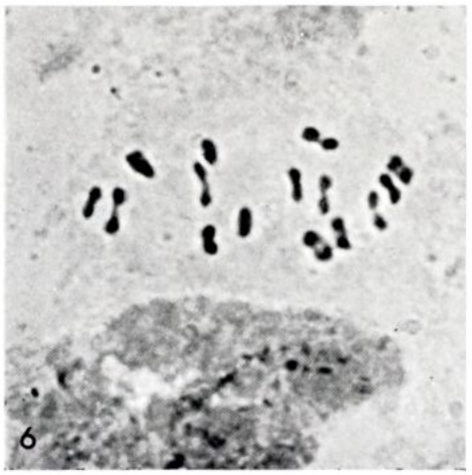


FIGS. 1–13. Camera lucida drawings of squash preparations, × 1200. (Unless otherwise stated figures are of 1st mei. met. in P.M.C.).

1. *Cyrtandra oblongifolia* 17_{11}; 2. *Cyrtandra* sp. C. 4376 17_{11}; 3. *Aeschynanthus obconicus* n=16 (one pole of a 1st mei. telo.); 4. *Rhynchoglossum notonianum* 10_{11}; 5. *Rhynchoglossum* sp. C. 4152 21_{11}; 6. *Rhynchoglossum papuae* 27_{11}; 7. *Chirita asperifolia* 16_{11}; 8. *Chirita zeylanica* 10_{11}; 9. *Didymocarpus purpureus* 16_{11}; 10. *Boea lawesii* 8_{11}; 11 *Paraboea capitata* n = 18 (one pole of a 1st mei. telo.); 12. *Streptocarpus prolixus* 16_{11} (n.b. secondary pairing); 13. *Streptocarpus polyanthus* subsp. *comptonii* 16_{11} 1_1 (the univalent is shown in outline).







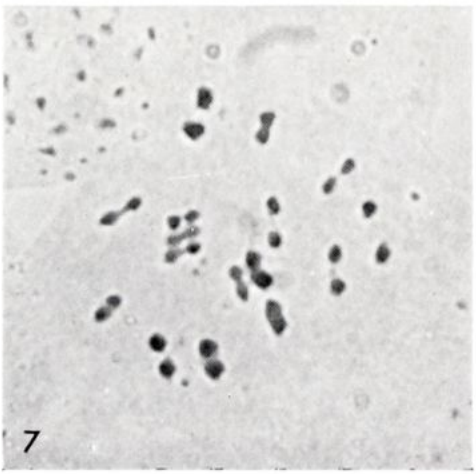


PLATE 11. Unless otherwise stated figures are of 1st meiotic metaphase in P.M.C.; 1, 4, 5, 6 & 7 × 1,600, 2 & 3 × 1,000.

1. *Cyrtandra* sp. near *C. biflora* 17_{II}; 2. *Dichrotrichum* sp. C. 4045 16_{II}; 3. *Monophyllaea horsfieldi* n=10, 1st mei. telo.; 4. *Didymocarpus* sp. C. 4304 2n=28, mitosis in anther tissue; 5. *Dichiloboea speciosa* 18_{II}; 6. *Streptocarpus kirkii* 15_{II}; 7. *Streptocarpus grandis* 16_{II} (the uppermost bivalent has already undergone disjunction), n.b. secondary pairing.

the tetraploids, the n = 17 representing chromosome doubling after hybridization between the two lines. On the other hand n = 17 and n = 16 might be hypotetraploids derived originally from n = 18.

In *Didymocarpus* there is obviously a considerable polyploid series with some variation in basic numbers. So far species with n = 12, 14, 16, 27, 28 and ± 45 have been discovered.

The *Streptocarpus* chromosome counts conform to the pattern discovered by Lawrence et al. (1939): n = 15 in the caulescent subgenus *Streptocarpella* and n = 16 in subgenus *Streptocarpus*. Secondary pairing as described by Lawrence et al. was observed in pollen mother cells of many of the species. The plant of *S. polyanthus* subsp. *comptonii* examined had an extra chromosome which could be observed as a univalent at 1st meiotic metaphase (fig. 13). A few exceptional pollen mother cells also occurred in this plant with 15 bivalents and three univalents at MI. Normal bivalent formation occurred at meiosis in the interspecific hybrid *S. cyaneus* x *wilmsii*.

It is interesting to note that in the large genera *Chirita* and *Didymocarpus* where there is great variation in morphology there is also considerable variation in basic numbers and ploidy, whereas in *Streptocarpus* (subgenus *Streptocarpus*) where morphology of the large number of species is relatively similar the chromosome number is nearly uniform.

Negria rhabdothamnoides like *Rhabdothamnus solandri*, the only other member of the tribe Coronanthereae for which cytological information is available, is a high polyploid with minute chromosomes. So far only high polyploid numbers have been discovered in the tribes Coronanthereae and Mitrarieae and this is possibly correlated with the occurrence of their species as isolated relicts (see Ratter, 1963, for chromosome counts in the Mitrarieae).

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TABLE 1

	Herbarium Specimen Number	*Meiotic Count PMC*	*Mitotic Count Root Tip 2n*
SUBFAMILY CYRTANDROIDEAE ENDL.			
TRIBE CYRTANDREAE			
Cyrtandra oblongifolia (Bl.) C.B. Cl.	C4026	17_{11}[a]	
Cyrtandra paludosa Gaud.	C4874	17_{11}[a]	
Cyrtandra radiciflora C.B. Cl.	C4917		34
Cyrtandra sp. near C. biflora J. R. & G. Forst.	C4084	17_{11}	34
Cyrtandra sp. (from New Guinea)	C4376	17_{11}	
TRIBE TRICHOSPOREAE K. FRITSCH			
Aeschynanthus obconicus C.B. Cl.	C4591	16_{11}	
Dichrotrichum sp. (from Sarawak)	C4045	16_{11}[b]	
TRIBE KLUGIEAE K. FRITSCH			
*Rhynchoglossum notonianum (Wall.) B. L. Burtt	C4913	10_{11}[c]	
Rhynchoglossum papuae Schlechter	C4151	27_{11}	
Rhynchoglossum sp. (from Thailand)	C4152	21_{11}	
Monophyllaea horsfieldii R. Br.	C4112	n=10 (2 mei. met.[d])	
TRIBE DIDYMOCARPEAE ENDL.			
*Petrocosmea parryorum C.E.C. Fisch.	C1674	n=17 (2 mei. met.[e])	
*Chirita asperifolia (Bl.) B. L. Burtt	C4032	16_{11}	32
Chirita caliginosa C.B. Cl.	C4283	9_{11}	
Chirita macrophylla Wall.	C4221	9_{11}	18
Chirita zeylanica Hook.	C4694	10_{11}	
Didymocarpus purpureus Ridl.	C4149	16_{11}	
Didymocarpus innominatus B. L. Burtt	C4286	16_{11}	32 (mitosis in anther tissue)
Didymocarpus tomentosus Wight	C4027	n=±45 (2 mei. telo.[f])	± 90
Didymocarpus sp. (from Thailand)	C4304		28 (mitosis in anther tissue)
Paraboea capitata Ridl.	C4087	n=18 (1 mei. telo)	
Paraboea vulpina Ridl.	C3980		± 36
Orinithoboea wildeana Craib	C3977	n=±16 (1 mei. telo.)	
Boea lawesii (F. Muell.) H. O. Forbes	C4233	8_{11}	16
Boea lawesii (F. Muell.) H. O. Forbes	C4232	8_{11}	
Boea sp. (from Sarawak)	C4918	16_{11}	
Dichiloboea speciosa (Ridl.) Stapf	C4081	18_{11}	
Streptocarpus hilsenbergii R. Br.	C4619	n=15 (2 mei. met.)	
*Streptocarpus kirkii Hook. f.	C4214	15_{11}[g]	
Streptocarpus confusus Hilliard	C4215	16_{11}	
Streptocarpus cooksonii B. L. Burtt	C4374	16_{11}[g]	
Streptocarpus cyaneus S. Moore	C4742	16_{11}	
Streptocarpus cyanandrus B. L. Burtt	C3674	16_{11}	
Streptocarpus davyi S. Moore	C3970	16_{11}	
Streptocarpus denticulatus Turrill	C4212	n=16 (1 & 2 mei. telo.)	
Streptocarpus eylesii S. Moore	C4903	n=16 (2 mei. met.)	
*Streptocarpus grandis N.E. Br.	C4920	16_{11}[g]	
Streptocarpus haygarthii N.E. Br.	C4922	16_{11}[g]	
Streptocarpus micranthus C.B. Cl.	C3677	16_{11}	
Streptocarpus molweniensis Hilliard	C4746	16_{11}	
Streptocarpus polyanthus subsp. comptonii (Mansf.) Hilliard	C4919	16_{11} 1_1 (also 15_{11} 3_1[g])	
Streptocarpus prolixus C.B. Cl.	C4019	16_{11}	

	Herbarium Specimen Number	*Meiotic Count PMC*	*Mitotic Count Root Tip 2n*
Streptocarpus rimicola Story	C4921	16_{11}	
Streptocarpus saundersii Hook.	C4671	$16_{11}{}^{h}$	
Streptocarpus umtaliensis B. L. Burtt	C4645	16_{11}	
Streptocarpus sp. nr. S. primulifolius Gard.	C4634	n=16 (1 mei. ana.)	
Streptocarpus cyaneus S. Moore X wilmsii Engl.	C4669	16_{11}	32 (mitosis in anther tissue)
Streptocarpus fanniniae Harve. ex C.B. Cl. X gardenii Hook.	C4018		32 (mitosis in anther tissue)
SUBFAMILY GESNERIOIDEAE			
TRIBE CORONANTHEREAE K. FRITSCH			
Negria rhabdothamnoides F. Muell.	C4627	$\pm$ 45_{11}	$\pm$ 90

Footnote

* Collections not of known wild origin

Previous Counts are noted by the small letters

a. Ratter & Prentice (1964) 2n=34 (root tip).
b. Ratter & Prentice (1964) 2n=32 (root tip).
c. Eberle (1956) n=10 (meiosis), 2n=20 (root tip).
d. Oehlkers (1923) n=16 (meiosis), 2n=32 (root tip).
e. Fussell (1958) 2n=34 (root tip).
f. Thathachar (1942) n=27 (meiosis).
g. Lawrence et al (1939). All counts accord with ours except *S. polyanthus* subsp. *comptonii* (*S. comptonii*) where our plant has a single extra chromosome.
h. Suguira (1940) n=16 (meiosis).
i. Storey (1966) 2n=34 (root tip).