Karyomorphological observation on 14 species of subtribe Stanhopeinae, Orchidaceae*

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Abstruct

Fourteen species of the subtribe Stanhopeinae, Orchidaceae, were karyomorphologically observed by aceto-orcein squash method. Chromosome numbers of 11 species in nine genera were revealed for the first time; 2n=38 for *Coeliopsis hyacinthosma* and *Gongora armeniaca*, and 2n=40 for *Acineta barkeri*, *Cirrhaea loddigesii*, *Kegeliella atropilosa*, *Paphinia grandiflora*, *Polycycnis barbata*, *Shlimia alpina*, *Stanhopea cirrhata*, *S. guttulata* and *S. pulla*. Karyotypes of all the 14 species were similar to each other; while chromosome features at resting stage and mitotic metaphase showed slight variations. From the above results, it was suggested that three genera of *Cirrhaea*, *Polycycnis* and *Schlimia* were not closely related among the members of subtribe Stanhopeinae.

Introduction

Karyotype morphology of the living collection at Hiroshima Botanical Garden has been studied (Karasawa 1979, Hashimoto 1982, Sera & Karasawa 1984, Ishida 1990, 2001 Aoyama 1989, Hamatani 2011, etc.). These studies were carried out on Orchidaceae, Araceae, Gesneriaceae, Liliaceae and so on in order to contribute to plant science by revealing the relationship among species and accumulating the basic knowledge about plants.

In this study chromosomal observation has been made on 14 species of 10 genera of Stanhopeinae Bentham, one of a subtribe belonging to the tribe Maxillarieae of the Orchidaceae (Dressler 1993). Chromosomes of three species among the 14 examined here have been reported previously, so that the present survey increases our knowledge about plants as well as a series of studies held at the Hiroshima Botanical Garden.

Material and methods

All the plants examined in this study were grown in cultivation at the Hiroshima Botanical Garden and listed in Table 1.

Chromosome counts and observation were made from the aceto-orcein squash method as same as those of Hamatani and Aoyama (2012). Karyotype morphology in the nuclei at resting and chromosome at mitotic prophase and metaphase were described and classified according to Levan *et al* (1964) and Tanaka (1971, 1980).

Results

Chromosome numbers of the 14 species counted in this study were listed in Table 1 and their karyotypes were described as follows.

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Table 1. Chromosome numbers of 14 taxa of subtribe Stanhopeinae studied

Species	HBG* accession number	Chromosome numbers		References
		Present count (2n)	Previous count (2n)	
Acineta				
barkeri (Bateman) Lindl.	1404	40		
superba (Kunth) Rchb.f.	638	40	40,42	Daker & Jones
Cirrhaea				
loddigesii Lindl.	607	40		
Coeliopsis				
hyacinthosma Rchb.f.	647	38		
Gongora				
armeniaca (Lindl.) Rchb.f.	563	38		
truncata Lindl.	602	38	ca.38	Daker & Jones
Kegeliella				
atropilosa L.O.Williams & A.H.Heller	2699	40		
Paphinia				
grandiflora Barb.Rodr.	2220	40		
Peristeria				
elata Hook.	621	40	40	Daker & Jones
Polycycnis				
barbata (Lindl.) Rchb.f.	730	40		
Schlimia				
trifida Rchb.f.	2819	40		
Stanhopea				
cirrhata Lindl.	2272	40		
guttulata Lindl.	604	40		
pulla Rchb.f.	668	40		

* Hiroshima Botanical Garden.

Acineta barkeri (Bateman) Lindl., HBG1404, Table 1 and 2, Fig. 1.

Chromosome number: 2n=40

Resting stage (Fig. 1A): complex chromocenter type

Mitotic prophase (Fig. 1B): interstitial type

Mitotic metaphase (Table 2, Fig. 1C and D): 2n=40 chromosome complement exhibited a gradual decrease in length from 3.0μm to 1.3μm and a symmetric karyotype with respect to their form. Two satellite chromosomes (Nos. 39 and 40) had the nucleolus organizing region near the centromere as wide heterochromatic gap, which were similar to the description by Daker and Jones (1969) for *Stanhopea* spp.

Acineta superba (Kunth)Rchb., HBG638, Table 1 and 3, Fig. 2.

Chromosome number: 2n=40

Resting stage (Fig. 2A): complex chromocenter type

Mitotic prophase (Fig. 2B): interstitial type

Mitotic metaphase (Table 3, Fig. 2C and D): 2n=40 chromosome complement exhibited a gradual decrease in length from 2.7μm to 1.3μm and a symmetric karyotype with respect to their form. Two satellite chromosomes (Nos.35 and 36) were similar to those of *Acineta barkeri* described above.

Cirrhaea loddigesii Lindl., HBG607, Table 1 and 4, Fig. 3.

Chromosome number: 2n=40

Resting stage (Fig. 3A): simple chromocenter type
Mitotic prophase (Fig. 3B):intermediate between proximal type and interstitial type
Mitotic metaphase (Table 4, Fig. 3C and D): 2n=40 chromosome complement exhibited a gradual decrease in length from 2.4μm to 1.2μm and a symmetric karyotype with respect to their form. Two satellite chromosomes (Nos. 39 and 40) were similar to those of *Acineta barkeri.*

Coeliopsis hyacinthosma Rchb.f., HBG647, Table 1 and 5, Fig. 4.

Chromosome number: 2n=38
Resting stage (Fig. 4A): complex chromocenter type
Mitotic prophase (Fig. 4B): interstitial type
Mitotic metaphase (Table 5, Fig. 4C and D): 2n=38 chromosome complement exhibited a gradual decrease in length from 2.3μm to 0.6μm and a symmetric karyotype with respect to their form. The centromere was not observed in three chromosomes (Nos. 36, 37 and 38).

Gongora armeniaca Rchb.f., HBG563, Table 1 and 6, Fig. 5.

Chromosome number: 2n=38
Resting stage (Fig. 5A): complex chromocenter type
Mitotic prophase (Fig. 5B): interstitial type
Mitotic metaphase (Table 6, Fig. 5C and D): 2n=38 chromosome complement exhibited a gradual decrease in length from 2.9μm to 1.4μm and a symmetric karyotype with respect to their form. The satellite chromosome (Nos. 30) was similar to those of *Acineta barkeri.*

Gongora truncata Lindl., HBG602, Table 1 and 7, Fig. 6.

Chromosome number: 2n=38
Resting stage (Fig. 6A): complex chromocenter type
Mitotic prophase (Fig. 6B): interstitial type
Mitotic metaphase (Table 7, Fig. 6C and D): 2n=38 chromosome complement exhibited a gradual decrease in length from 2.5μm to 1.1μm and a symmetric karyotype with respect to their form. Two satellite chromosomes (Nos. 31 and 32) were similar to those of *Acineta barkeri.*

Kegeliella atropilosa L.O.Williams, HBG2699, Table 1 and 8, Fig. 7.

Chromosome number: 2n=40
Resting stage (Fig. 7A): complex chromocenter type
Mitotic prophase (Fig. 7B): interstitial type
Mitotic metaphase (Table 8, Fig. 7C and D): 2n=40 chromosome complement exhibited a gradual decrease in length from 4.0μm to 1.4μm and a symmetric karyotype with respect to their form. Two satellite chromosomes (Nos. 23 and 24) were similar to those of *Acineta barkeri.*

Paphinia grandiflora Barb.Rodrig., HBG2220, Table 1 and 9, Fig. 8.

Chromosome number: 2n=40
Resting stage (Fig. 8A): complex chromocenter type
Mitotic prophase (Fig. 8B): interstitial type
Mitotic metaphase (Table 9, Fig. 8C and D): 2n=40 chromosome complement exhibited a gradual decrease in length from 2.5μm to 1.2μm and a symmetric karyotype with respect to their form. The centromere was not observed in a chromosome (Nos. 26).

Peristeria elata Hook. , HBG621, Table 1 and 10, Fig. 9.

Chromosome number: 2n=40

Resting stage (Fig. 9A): complex chromocenter type

Mitotic prophase (Fig. 9B): interstitial type

Mitotic metaphase (Table 10, Fig. 9C and D): 2n=38 chromosome complement exhibited a gradual decrease in length from 2.9μm to 1.2μm and a symmetric karyotype with respect to their form.

Polycycnis barbata (Lindl.) Rchb.f., HBG730, Table 1 and 11, Fig. 10.

Chromosome number: 2n=40

Resting stage (Fig. 10A): complex chromocenter type

Mitotic prophase (Fig. 10B): interstitial type

Mitotic metaphase (Table 11, Fig. 10C and D): 2n=40 chromosome complement formed a bimodality in the chromosome alignment in length with a group of chromosomes (Nos. 1-36) ranging from 2.2-1.0μm and with the other group of chromosomes (Nos. 37-40) ranging from 0.5-0.4μm. The centromere was not observed in five chromosomes (Nos. 36-40), though the complement exhibited a symmetric karyotype with respect to their form.

Schlimia trifida Rchb.f., HBG2819, Table 1 and 12, Fig. 11.

Chromosome number: 2n=40

Resting stage (Fig. 11A): complex chromocenter type

Mitotic prophase (Fig. 11B): interstitial type

Mitotic metaphase (Table 12, Fig. 11C and D): 2n=40 chromosome complement exhibited a gradual decrease in length from 2.5μm to 1.0μm and an intermediate karyotype between the symmetric and asymmetric karyotypes with respect to their form. *Schlimia trifida* had eight subterminal chromosomes (Nos. 4-8 and 21-23) which were not found in other species. Thus, the karyotype of this species was clearly different from those of other species. Two satellite chromosomes (Nos. 37 and 38) were similar to those of *Acineta barkeri*.

Stanhopea cirrhata Lindl. HBG2272, Table 1 and 13, Fig. 12.

Chromosome number: 2n=40

Resting stage (Fig. 12A): complex chromocenter type

Mitotic prophase (Fig. 12B): interstitial type

Mitotic metaphase (Table 13, Fig. 12C and D): 2n=40 chromosome complement exhibited a gradual decrease in length from 1.4μm to 0.7μm and a symmetric karyotype with respect to their form. The centromere was not observed in 13 chromosomes (Nos. 10, 20, 23 and 31-40).

Stanhopea guttulata Lindl. HBG604, Table 1 and 14, Fig. 13.

Chromosome number: 2n=40

Resting stage (Fig. 13A): complex chromocenter type

Mitotic prophase (Fig. 13B): interstitial type

Mitotic metaphase (Table 14, Fig. 13C and D): 2n=40 chromosome complement exhibited a gradual decrease in length from 2.3μm to 0.8μm and a symmetric karyotype with respect to their form. Two satellite chromosomes (Nos. 5 and 6) were similar to those of *Acineta barkeri*.

Stanhopea pulla Rchb.f. HBG668, Table 1 and 15, Fig. 14.

Chromosome number: 2n=40

Resting stage (Fig. 14A): complex chromocenter type

Mitotic prophase (Fig. 14B): interstitial type

Mitotic metaphase (Table 15, Fig. 14C and D): 2n=40 chromosome complement exhibited a gradual decrease in length from 1.5μm to 0.8μm and a symmetric karyotype with respect to their form. The centromere was not observed in 17 chromosomes (Nos. 10, 13, 14, 19, 20, 23, 26-28, and 33-40).

Discussion and conclusion

Chromosome numbers of 11 species; 2n=38 in *Coeliopsis hyacinthosma* and *Gongora armeniaca*, 2n=40 in *Acineta barkeri*, *Cirrhaea loddigesii*, *Kegeliella atropilosa*, *Paphinia grandiflora*, *Polycycnis barbata*, *Schlimia trifida*, *Stanhopea cirrhata*, *S. guttulata* and *S. pulla* were revealed in this observation for the first time. Chromosome numbers of 2n=40 and 42 in *Acineta superba* and 2n=ca.38 in *Gongora truncata* reported by Daker and Jones (1969) were verified to 2n=40 and 2n=38, respectively. Thus, the subtribe Stanhopeinae included two different chromosome numbers of 2n=38 (three species in two genera) and 2n=40 (11 species in eight genera).

The chromosome complements of most species studied showed commonly the complex chromocenter type at resting stage, the interstitial type of chromatin condensation at mitotic prophase and the gradual and the symmetric karyotypes at mitotic metaphase. In contrast, that of *Cirrhaea loddegesii* showed the simple chromocenter type at resting stage and the intermediate type between the proximal type and the interstitial type at mitotic prophase, that of *Polycycnis barbata* showed the bimodal karyotype including four small chromosomes, and that of *Schlimia trifida* showed the intermediate karyotype between the symmetric and the asymmetric karyotypes with respect of eight subterminal chromosomes. Satellite chromosome was observed in eight species of six genera. This is characterized by wide heterochromatic region near the centromere and somewhat difficult to be recognized as mentioned by Daker and Jones (1969), so it may have been missed in some species examined in this study.

Chromosome morphologies through mitotic cycle were varied among 14 taxa and it was suggested karyomorphologically that three genera of *Cirrhaea*, *Polycycnis* and *Schlimia* may not be closely related among the members of the subtribe Stanhopeinae.

References

Aoyama, M. 1989. Karyomorphological studies in *Cymbidium* and its allied genera, Orchidaceae. Bull. Hiroshima Bot. Gard. 11: 1-121.

Daker, M.G. & Jones, K. 1969. The chromosomes of Orchids: V Stanhopeinae Benth. (Gongorinae auct.). Kew Bull. 24: 457-459.

Dressler, R.L. 1993. Phylogeny and classification of the Orchid family. 314pp. Dioscorides Press. Portland, Oregon.

Hamatani, S. 2011. Characterization of *Lachenalia*, the Liliaceae based on karyomorphological, molecular phylogenetical and molecular cytogenetical studies. Bull. Hiroshima Bot. Gard. 29: 1-90.

Hamatani, S. & Aoyama, M. 2012. Karyomorphological studies of six species of subtribe Catasetinae, Orchidaceae. Bull. Hiroshima Bot. Gard. 30: 15-30.

Hashimoto, K. 1981. Chromosome count in *Dendrobium* 1. 87 species. Bull. Hiroshima Bot. Gard. 4: 63-80.

Ishida, G. 1990. Karyomorphological studies in *Calanthe*, Orchidaceae. Bull. Hiroshima Bot. Gard. 12: 1-69.

Ishida, G. 2001. Karyomorphological observations on some Aroids cultivated in the Hiroshima Botanical Garden 1. *Alocasia*. Bull. Hiroshima Bot. Gard. 20: 1-33.

Karasawa, K. 1979. Karyomorphological studies in *Paphiopedilum*, Orchidaceae. Bull. Hiroshima Bot. Gard. 2: 1-149.

Levan, A., Fredga, K. and Sandberg, A. 1964. Nomenclature for centromeric position on chromosomes. Hereditas 52: 201-220.

Sera, T. & Karasawa, K. 1984. Karyomorphological studies on 22 species of *Saintpaulia*, Gesneriaceae. Bull. Hiroshima

Bot. Gard. 7: 1-30.
Tanaka, R. 1971. Types of resting nuclei of Orchidaceae. Bot. Mag. Tokyo 84: 118-122.
Tanaka, R. 1980. The karyotype (in Japanese). Kihara, H. (ed.) Plant Genetics I, pp.335-358. Shokabo Co., Tokyo.

ラン科スタンホペア亜族14種における染色体観察

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要　約

ラン科，マクシラリア族のスタンホペア亜族に属する 10 属 14 種において，アセトオルセイン押しつぶし法による染色体の観察を行った．その結果，9 属 11 種の染色体数を初めて明らかにし，3 属 3 種の染色体数については，以前の報告を確認した．14 種の核型は互いによく似ていたが，静止期核ではキルハエア属が，体細胞分裂中期ではポリキクニス属とスクリミア属が他の属とは異なる型を示した．従って，これら 3 属がスタンホペア亜族の他の属と，核形態学的に類縁関係が遠い可能性のあることが示唆された．

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Table 2. Measurements of somatic chromosomes at mitotic metaphase in *Acineta barkeri*, HBG1404, 2n=40

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	1.4+1.6=3.0	3.6	1.14	m
2	1.3+1.7=3.0	3.6	1.31	m
3	1.3+1.6=2.9	3.5	1.23	m
4	1.3+1.5=2.8	3.4	1.15	m
5	1.2+1.4=2.6	3.2	1.17	m
6	1.1+1.5=2.6	3.2	1.36	m
7	1.1+1.4=2.5	3.0	1.27	m
8	1.1+1.4=2.5	3.0	1.27	m
9	1.1+1.3=2.4	2.9	1.18	m
10	1.2+1.2=2.4	2.9	1.00	M
11	1.2+1.2=2.4	2.9	1.00	M
12	1.0+1.3=2.3	2.8	1.30	m
13	0.8+1.5=2.3	2.8	1.88	sm
14	0.8+1.5=2.3	2.8	1.88	sm
15	1.1+1.2=2.3	2.8	1.09	m
16	1.0+1.2=2.2	2.7	1.20	m
17	1.0+1.1=2.1	2.6	1.10	m
18	1.0+1.1=2.1	2.6	1.10	m
19	0.7+1.4=2.1	2.6	2.00	sm
20	0.7+1.4=2.1	2.6	2.00	sm
21	0.9+1.1=2.0	2.4	1.22	m
22	0.9+1.1=2.0	2.4	1.22	m
23	0.8+1.1=1.9	2.3	1.38	m
24	0.9+1.0=1.9	2.3	1.11	m
25	0.7+1.2=1.9	2.3	1.71	sm
26	0.5+1.3=1.8	2.2	2.60	sm
27	0.7+1.1=1.8	2.2	1.57	m
28	0.7+1.1=1.8	2.2	1.57	m
29	0.8+0.9=1.7	2.1	1.13	m
30	0.7+1.0=1.7	2.1	1.43	m
31	0.6+1.1=1.7	2.1	1.83	sm
32	0.8+0.9=1.7	2.1	1.13	m
33	0.8+0.8=1.6	1.9	1.00	M
34	0.8+0.8=1.6	1.9	1.00	M
35	0.7+0.8=1.5	1.8	1.14	m
36	0.6+0.8=1.4	1.7	1.33	m
37	0.4+1.0=1.4	1.7	2.50	sm
38	0.4+0.9=1.3	1.6	2.25	sm
39*	0.4+1.0=1.4	1.7	2.50	sm
40*	0.4+0.9=1.3	1.6	2.25	sm

* Satellite chromosome (chromosome with wide heterochromatic region).

Table 3. Measurements of somatic chromosomes at mitotic metaphase in *Acineta superba*, HBG638, 2n=40

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	1.1+1.6=2.7	3.2	1.45	m
2	1.1+1.5=2.6	3.1	1.36	m
3	1.2+1.4=2.6	3.1	1.17	m
4	1.2+1.4=2.6	3.1	1.17	m
5	1.1+1.5=2.6	3.1	1.36	m
6	1.2+1.4=2.6	3.1	1.17	m
7	0.9+1.6=2.5	3.0	1.78	sm
8	0.9+1.6=2.5	3.0	1.78	sm
9	1.0+1.5=2.5	3.0	1.50	m
10	1.1+1.4=2.5	3.0	1.27	m
11	1.1+1.4=2.5	3.0	1.27	m
12	1.2+1.3=2.5	3.0	1.08	m
13	1.1+1.3=2.4	2.9	1.18	m
14	1.1+1.3=2.4	2.9	1.18	m
15	1.1+1.2=2.3	2.7	1.09	m
16	1.0+1.3=2.3	2.7	1.30	m
17	1.0+1.2=2.2	2.6	1.20	m
18	0.9+1.3=2.2	2.6	1.44	m
19	1.0+1.1=2.1	2.5	1.10	m
20	1.0+1.1=2.1	2.5	1.10	m
21	0.9+1.2=2.1	2.5	1.33	m
22	0.9+1.1=2.0	2.4	1.22	m
23	0.7+1.3=2.0	2.4	1.86	sm
24	0.7+1.3=2.0	2.4	1.86	sm
25	0.9+1.1=2.0	2.4	1.22	m
26	0.9+1.1=2.0	2.4	1.22	m
27	0.8+1.1=1.9	2.3	1.38	m
28	0.8+1.0=1.8	2.1	1.25	m
29	0.9+0.9=1.8	2.1	1.00	M
30	0.8+1.0=1.8	2.1	1.25	m
31	0.8+1.0=1.8	2.1	1.25	m
32	0.8+1.0=1.8	2.1	1.25	m
33	0.7+1.1=1.8	2.1	1.57	m
34	0.7+1.0=1.7	2.0	1.43	m
35*	0.7+0.9=1.6	1.9	1.29	m
36*	0.6+0.8=1.4	1.7	1.33	m
37	0.6+0.9=1.5	1.8	1.50	m
38	0.6+0.8=1.4	1.7	1.33	m
39	0.6+0.8=1.4	1.8	1.33	m
40	0.6+0.7=1.3	1.7	1.33	m

* Satellite chromosome (chromosome with wide heterochromatic region).

Table 4. Measurements of somatic chromosomes at mitotic metaphase in *Cirrhaea loddigesii*, HBG607, 2n=40

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	1.1+1.3=2.4	3.3	1.18	m
2	1.0+1.4=2.4	3.3	1.40	m
3	1.0+1.3=2.3	3.1	1.30	m
4	1.0+1.3=2.3	3.1	1.30	m
5	1.1+1.1=2.2	3.0	1.00	M
6	1.0+1.2=2.2	3.0	1.20	m
7	1.0+1.2=2.2	3.0	1.20	m
8	0.9+1.3=2.2	3.0	1.44	m
9	0.8+1.4=2.2	3.0	1.75	sm
10	0.8+1.4=2.2	3.0	1.75	sm
11	0.7+1.4=2.1	2.9	2.00	sm
12	0.7+1.4=2.1	2.9	2.00	sm
13	1.0+1.1=2.1	2.9	1.10	m
14	1.0+1.1=2.1	2.9	1.10	m
15	0.8+1.1=1.9	2.6	1.38	m
16	0.8+1.1=1.9	2.6	1.38	m
17	0.7+1.2=1.9	2.6	1.71	sm
18	0.7+1.2=1.9	2.6	1.71	sm
19	0.9+0.9=1.8	2.5	1.00	M
20	0.8+1.0=1.8	2.5	1.25	m
21	0.8+0.9=1.7	2.3	1.13	m
22	0.8+0.9=1.7	2.3	1.13	m
23	0.6+1.1=1.7	2.3	1.83	sm
24	0.6+1.1=1.7	2.3	1.83	sm
25	0.6+1.1=1.7	2.3	1.83	sm
26	0.6+1.1=1.7	2.3	1.83	sm
27	0.6+1.1=1.7	2.3	1.83	sm
28	0.6+1.1=1.7	2.3	1.83	sm
29	0.6+1.1=1.7	2.3	1.83	sm
30	0.6+1.1=1.7	2.3	1.83	sm
31	0.5+1.1=1.6	2.2	2.20	sm
32	0.5+1.1=1.6	2.2	2.20	sm
33	0.5+1.0=1.5	2.0	2.00	sm
34	0.5+1.0=1.5	2.0	2.00	sm
35	0.5+0.9=1.4	1.9	1.80	sm
36	0.5+0.9=1.4	1.9	1.80	sm
37	0.6+0.8=1.4	1.9	1.33	m
38	0.6+0.8=1.4	1.9	1.33	m
39*	0.4+0.8=1.2	1.6	2.00	sm
40*	0.4+0.8=1.2	1.6	2.00	sm

* Satellite chromosome (chromosome with wide heterochromatic region).

Table 5. Measurements of somatic chromosomes at mitotic metaphase in *Coeliopsis hyacinthosma*,HBG647, 2n=38

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	1.0+1.3=2.3	3.7	1.30	m
2	1.0+1.2=2.2	3.5	1.20	m
3	0.7+1.5=2.2	3.5	2.14	sm
4	0.7+1.5=2.2	3.5	2.14	sm
5	1.0+1.1=2.1	3.3	1.10	m
6	0.8+1.3=2.1	3.3	1.63	m
7	0.7+1.4=2.1	3.3	2.00	sm
8	0.7+1.3=2.0	3.2	1.86	sm
9	0.6+1.4=2.0	3.2	2.33	sm
10	0.6+1.4=2.0	3.2	2.33	sm
11	0.8+1.1=1.9	3.0	1.38	m
12	0.8+1.1=1.9	3.0	1.38	m
13	0.8+1.1=1.9	3.0	1.38	m
14	0.7+1.2=1.9	3.0	1.71	sm
15	0.6+1.3=1.9	3.0	2.17	sm
16	0.6+1.2=1.8	2.9	2.00	sm
17	0.6+1.2=1.8	2.9	2.00	sm
18	0.6+1.2=1.8	2.9	2.00	sm
19	0.8+1.0=1.8	2.9	1.25	m
20	0.8+1.0=1.8	2.9	1.25	m
21	0.6+1.1=1.7	2.7	1.83	sm
22	0.6+1.1=1.7	2.7	1.83	sm
23	0.8+0.8=1.6	2.5	1.00	M
24	0.6+1.0=1.6	2.5	1.67	m
25	0.5+1.0=1.5	2.4	2.00	sm
26	0.5+1.0=1.5	2.4	2.00	sm
27	0.6+0.8=1.4	2.2	1.33	m
28	0.6+0.8=1.4	2.2	1.33	m
29	0.6+0.8=1.4	2.2	1.33	m
30	0.6+0.8=1.4	2.2	1.33	m
31	0.5+0.8=1.3	2.1	1.60	m
32	0.4+0.8=1.2	1.9	2.00	sm
33	0.5+0.7=1.2	1.9	1.40	m
34	0.5+0.6=1.1	1.7	1.20	m
35	0.4+0.7=1.1	1.7	1.75	sm
36*	0.9	1.4		
37*	0.7	1.1		
38*	0.6	1.0		

* The centromere was not observed.

Table 6. Measurements of somatic chromosomes at mitotic metaphase in *Gongora armeniaca*, HBG563, 2n=38

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	1.2+1.7=2.9	3.7	1.42	m
2	1.2+1.7=2.9	3.7	1.42	m
3	1.1+1.6=2.7	3.4	1.45	m
4	1.0+1.7=2.7	3.4	1.70	m
5	1.1+1.5=2.6	3.3	1.36	m
6	1.2+1.4=2.6	3.3	1.17	m
7	0.8+1.8=2.6	3.3	2.25	sm
8	0.9+1.7=2.6	3.3	1.89	sm
9	1.1+1.4=2.5	3.2	1.27	m
10	1.2+1.2=2.4	3.0	1.00	M
11	0.8+1.5=2.3	2.9	1.88	sm
12	0.8+1.5=2.3	2.9	1.88	sm
13	1.1+1.2=2.3	2.9	1.09	m
14	1.1+1.2=2.3	2.9	1.09	m
15	0.8+1.5=2.3	2.9	1.88	sm
16	0.8+1.4=2.2	2.8	1.75	sm
17	0.9+1.2=2.1	2.7	1.33	m
18	0.9+1.2=2.1	2.7	1.33	m
19	0.7+1.3=2.0	2.5	1.86	sm
20	0.7+1.4=2.1	2.7	2.00	sm
21	0.7+1.3=2.0	2.5	1.86	sm
22	0.7+1.3=2.0	2.5	1.86	sm
23	0.8+1.2=2.0	2.5	1.50	m
24	0.8+1.1=1.9	2.4	1.38	m
25	0.7+1.2=1.9	2.4	1.71	sm
26	0.7+1.2=1.9	2.4	1.71	sm
27	0.7+1.2=1.9	2.4	1.71	sm
28	0.6+1.1=1.7	2.2	1.83	sm
29	0.8+0.8=1.6	2.0	1.00	M
30*	0.8+0.8=1.6	2.0	1.00	M
31	0.8+0.8=1.6	2.0	1.00	M
32	0.7+0.9=1.6	2.0	1.29	m
33	0.7+0.8=1.5	1.9	1.14	m
34	0.6+0.9=1.5	1.9	1.50	m
35	0.6+0.8=1.4	1.8	1.33	m
36	0.6+0.8=1.4	1.8	1.33	m
37	0.6+0.8=1.4	1.8	1.33	m
38	0.6+0.8=1.4	1.8	1.33	m

* Satellite chromosome (chromosome with wide heterochromatic region).

Table 7. Measurements of somatic chromosomes at mitotic metaphase in *Gongora truncata*, HBG602, 2n=38

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	1.1+1.4=2.5	3.9	1.27	m
2	1.2+1.2=2.4	3.7	1.00	M
3	0.9+1.6=2.5	3.9	1.78	sm
4	0.9+1.6=2.5	3.9	1.78	sm
5	0.7+1.6=2.3	3.6	2.29	sm
6	0.7+1.6=2.3	3.6	2.29	sm
7	1.0+1.2=2.2	3.4	1.20	m
8	1.0+1.2=2.2	3.4	1.20	m
9	0.7+1.3=2.0	3.1	1.86	sm
10	0.7+1.3=2.0	3.1	1.86	sm
11	0.9+1.1=2.0	3.1	1.22	m
12	0.9+1.1=2.0	3.1	1.22	m
13	0.9+1.1=2.0	3.1	1.22	m
14	0.8+1.2=2.0	3.1	1.50	m
15	0.8+1.2=2.0	3.1	1.50	m
16	0.8+1.1=1.9	3.0	1.38	m
17	0.6+1.0=1.6	2.5	1.67	m
18	0.6+1.0=1.6	2.5	1.67	m
19	0.7+1.0=1.7	2.6	1.43	m
20	0.7+1.0=1.7	2.6	1.43	m
21	0.6+0.8=1.4	2.2	1.33	m
22	0.6+0.8=1.4	2.2	1.33	m
23	0.6+0.8=1.4	2.2	1.33	m
24	0.6+0.8=1.4	2.2	1.33	m
25	0.4+1.0=1.4	2.2	2.50	sm
26	0.4+1.0=1.4	2.2	2.50	sm
27	0.6+0.8=1.4	2.2	1.33	m
28	0.6+0.8=1.4	2.2	1.33	m
29	0.6+0.6=1.2	1.9	1.00	M
30	0.6+0.6=1.2	1.9	1.00	M
31*	0.6+0.6=1.2	1.9	1.00	M
32*	0.6+0.6=1.2	1.9	1.00	M
33	0.3+0.9=1.2	1.9	3.00	sm
34	0.3+0.9=1.2	1.9	3.00	sm
35	0.5+0.6=1.1	1.7	1.20	m
36	0.5+0.6=1.1	1.7	1.20	m
37	0.5+0.6=1.1	1.7	1.20	m
38	0.5+0.6=1.1	1.7	1.20	m

* Satellite chromosome (chromosome with wide heterochromatic region).

Table 8. Measurements of somatic chromosomes at mitotic metaphase in *Kegeliella atropilosa*, HBG2699, 2n=40

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	1.9+2.1=4.0	4.4	1.11	m
2	1.6+1.7=3.3	3.6	1.06	m
3	1.1+2.1=3.2	3.5	1.91	sm
4	1.0+2.1=3.1	3.4	2.10	sm
5	1.5+1.6=3.1	3.4	1.07	m
6	1.2+1.8=3.0	3.3	1.50	m
7	1.2+1.7=2.9	3.2	1.42	m
8	1.3+1.4=2.7	3.0	1.08	m
9	0.7+2.0=2.7	3.0	2.86	sm
10	0.9+1.7=2.6	2.9	1.89	sm
11	0.8+1.8=2.6	2.9	2.25	sm
12	0.8+1.8=2.6	2.9	2.25	sm
13	1.2+1.3=2.5	2.8	1.08	m
14	1.1+1.4=2.5	2.8	1.27	m
15	1.1+1.3=2.4	2.6	1.18	m
16	1.1+1.3=2.4	2.6	1.18	m
17	0.8+1.5=2.3	2.5	1.88	sm
18	0.6+1.6=2.2	2.4	2.67	sm
19	0.6+1.6=2.2	2.4	2.67	sm
20	0.6+1.6=2.2	2.4	2.67	sm
21	1.0+1.2=2.2	2.4	1.20	m
22	1.0+1.2=2.2	2.4	1.20	m
23*	0.8+1.4=2.2	2.4	1.75	sm
24*	0.7+1.5=2.2	2.4	2.14	sm
25	0.8+1.3=2.1	2.3	1.63	m
26	0.8+1.3=2.1	2.3	1.63	m
27	0.8+1.2=2.0	2.2	1.50	m
28	0.8+1.3=2.1	2.3	1.63	m
29	0.8+1.0=1.8	2.0	1.25	m
30	0.8+1.0=1.8	2.0	1.25	m
31	0.7+1.0=1.7	1.9	1.43	m
32	0.8+0.9=1.7	1.9	1.13	m
33	0.8+0.9=1.7	1.9	1.13	m
34	0.7+1.0=1.7	1.9	1.43	m
35	0.7+0.9=1.6	1.8	1.29	m
36	0.7+0.8=1.5	1.7	1.14	m
37	0.6+0.9=1.5	1.7	1.50	m
38	0.6+0.8=1.4	1.5	1.33	m
39	0.6+0.8=1.4	1.5	1.33	m
40	0.6+0.8=1.4	1.5	1.33	m

* Satellite chromosome (chromosome with wide heterochromatic region).

Table 9. Measurements of somatic chromosomes at mitotic metaphase in *Paphinia grandiflora*, HBG2220, 2n=40

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	1.0+1.5=2.5	3.5	1.50	m
2	1.0+1.5=2.5	3.5	1.50	m
3	0.8+1.7=2.5	3.5	2.13	sm
4	0.8+1.6=2.4	3.3	2.00	sm
5	0.6+1.7=2.3	3.2	2.83	sm
6	0.5+1.8=2.3	3.2	3.60	t
7	0.9+1.3=2.2	3.1	1.44	m
8	0.9+1.3=2.2	3.1	1.44	m
9	0.9+1.2=2.1	2.9	1.33	m
10	0.9+1.2=2.1	2.9	1.33	m
11	0.6+1.5=2.1	2.9	2.50	sm
12	0.6+1.4=2.0	2.8	2.33	sm
13	0.8+1.1=1.9	2.6	1.38	m
14	0.8+1.1=1.9	2.6	1.38	m
15	0.6+1.3=1.9	2.6	2.17	sm
16	0.6+1.3=1.9	2.6	2.17	sm
17	0.6+1.3=1.9	2.6	2.17	sm
18	0.6+1.3=1.9	2.6	2.17	sm
19	0.7+1.2=1.9	2.6	1.71	sm
20	0.5+1.3=1.8	2.5	2.60	sm
21	0.5+1.3=1.8	2.5	2.60	sm
22	0.5+1.3=1.8	2.5	2.60	sm
23	0.7+1.1=1.8	2.5	1.57	m
24	0.7+1.1=1.8	2.5	1.57	m
25	0.5+1.2=1.7	2.4	2.40	sm
26*	1.6	2.2		
27	0.7+0.9=1.6	2.2	1.29	m
28	0.6+1.0=1.6	2.2	1.67	m
29	0.6+0.9=1.5	2.1	1.50	m
30	0.6+0.9=1.5	2.1	1.50	m
31	0.6+0.9=1.5	2.1	1.50	m
32	0.7+0.7=1.4	1.9	1.00	M
33	0.5+0.8=1.3	1.8	1.60	m
34	0.6+0.7=1.3	1.8	1.17	m
35	0.6+0.7=1.3	1.8	1.17	m
36	0.6+0.7=1.3	1.8	1.17	m
37	0.4+0.8=1.2	1.7	2.00	sm
38	0.4+0.8=1.2	1.7	2.00	sm
39	0.6+0.6=1.2	1.7	1.00	M
40	0.5+0.7=1.2	1.7	1.40	m

* The centromere was not observed.

Table 10. Measurements of somatic chromosomes at mitotic metaphase in *Peristeria elata*, HBG621, 2n=40

Chromosome	Length(μm)	Relative length	Arm ratio	Form
1	1.3+1.6=2.9	3.8	1.23	m
2	1.2+1.6=2.8	3.7	1.33	m
3	1.0+1.4=2.4	3.2	1.40	m
4	1.0+1.3=2.3	3.1	1.30	m
5	1.1+1.2=2.3	3.1	1.09	m
6	1.0+1.3=2.3	3.1	1.30	m
7	0.9+1.4=2.3	3.1	1.56	m
8	0.9+1.4=2.3	3.1	1.56	m
9	0.8+1.4=2.2	2.9	1.75	sm
10	0.8+1.4=2.2	2.9	1.75	sm
11	0.9+1.2=2.1	2.8	1.33	m
12	0.8+1.3=2.1	2.8	1.63	m
13	0.7+1.4=2.1	2.8	2.00	sm
14	0.7+1.4=2.1	2.8	2.00	sm
15	0.9+1.1=2.0	2.7	1.22	m
16	0.9+1.1=2.0	2.7	1.22	m
17	0.9+1.1=2.0	2.7	1.22	m
18	0.8+1.1=1.9	2.5	1.38	m
19	0.8+1.1=1.9	2.5	1.38	m
20	0.9+1.0=1.9	2.5	1.11	m
21	0.6+1.3=1.9	2.5	2.17	sm
22	0.6+1.3=1.9	2.5	2.17	sm
23	0.6+1.2=1.8	2.4	2.00	sm
24	0.6+1.2=1.8	2.4	2.00	sm
25	0.7+1.1=1.8	2.4	1.57	m
26	0.7+1.1=1.8	2.4	1.57	m
27	0.8+1.0=1.8	2.4	1.25	m
28	0.7+1.1=1.8	2.4	1.57	m
29	0.6+1.1=1.7	2.3	1.83	sm
30	0.6+1.0=1.6	2.1	1.67	m
31	0.6+0.9=1.5	2.0	1.50	m
32	0.6+0.9=1.5	2.0	1.50	m
33	0.6+0.8=1.4	1.9	1.33	m
34	0.6+0.8=1.4	1.9	1.33	m
35	0.5+0.9=1.4	1.9	1.80	sm
36	0.5+0.9=1.4	1.9	1.80	sm
37	0.6+0.6=1.2	1.6	1.00	M
38	0.5+0.7=1.2	1.6	1.40	m
39	0.5+0.7=1.2	1.6	1.40	m
40	0.5+0.7=1.2	1.6	1.40	m

Table 11. Measurements of somatic chromosomes at mitotic metaphase in *Polycycnis barbata*, HBG730, 2n=40

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	1.0+1.2=2.2	3.9	1.20	m
2	0.9+1.2=2.1	3.7	1.33	m
3	0.9+1.1=2.0	3.6	1.22	m
4	0.7+1.2=1.9	3.4	1.71	sm
5	0.7+1.2=1.9	3.4	1.71	sm
6	0.8+1.0=1.8	3.2	1.25	m
7	0.8+0.9=1.7	3.0	1.13	m
8	0.8+0.9=1.7	3.0	1.13	m
9	0.8+0.9=1.7	3.0	1.13	m
10	0.8+0.9=1.7	3.0	1.13	m
11	0.8+0.9=1.7	3.0	1.13	m
12	0.7+1.0=1.7	3.0	1.43	m
13	0.6+1.1=1.7	3.0	1.83	sm
14	0.6+1.1=1.7	3.0	1.83	sm
15	0.7+0.9=1.6	2.8	1.29	m
16	0.6+1.0=1.6	2.8	1.67	m
17	0.7+0.8=1.5	2.7	1.14	m
18	0.7+0.8=1.5	2.7	1.14	m
19	0.6+0.9=1.5	2.7	1.50	m
20	0.6+0.9=1.5	2.7	1.50	m
21	0.5+0.9=1.4	2.5	1.80	sm
22	0.5+0.9=1.4	2.5	1.80	sm
23	0.5+0.8=1.3	2.3	1.60	m
24	0.5+0.8=1.3	2.3	1.60	m
25	0.5+0.8=1.3	2.3	1.60	m
26	0.5+0.8=1.3	2.3	1.60	m
27	0.6+0.7=1.3	2.3	1.17	m
28	0.6+0.7=1.3	2.3	1.17	m
29	0.6+0.7=1.3	2.3	1.17	m
30	0.6+0.6=1.2	2.1	1.00	M
31	0.6+0.6=1.2	2.1	1.00	M
32	0.5+0.7=1.2	2.1	1.40	m
33	0.5+0.5=1.0	1.8	1.00	M
34	0.5+0.5=1.0	1.8	1.00	M
35	0.4+0.6=1.0	1.8	1.50	m
36*	1.0	1.8		
37*	0.5	0.9		
38*	0.5	0.9		
39*	0.4	0.7		
40*	0.4	0.7		

* The centromere was not observed.

Table 12. Measurements of somatic chromosomes at mitotic metaphase in *Schlimia trifida*, HBG2819, 2n=40

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	0.8+1.7=2.5	3.6	2.13	sm
2	0.8+1.7=2.5	3.6	2.13	sm
3	0.7+1.8=2.5	3.6	2.57	sm
4	0.6+1.9=2.5	3.6	3.17	st
5	0.6+1.9=2.5	3.6	3.17	st
6	0.6+1.9=2.5	3.6	3.17	st
7	0.5+1.7=2.2	3.2	3.40	st
8	0.5+1.7=2.2	3.2	3.40	st
9	0.6+1.4=2.0	2.9	2.33	sm
10	0.6+1.3=1.9	2.8	2.17	sm
11	0.5+1.4=1.9	2.8	2.80	sm
12	0.5+1.4=1.9	2.8	2.80	sm
13	0.5+1.3=1.8	2.6	2.60	sm
14	0.5+1.3=1.8	2.6	2.60	sm
15	0.7+1.0=1.7	2.5	1.43	m
16	0.7+1.0=1.7	2.5	1.43	m
17	0.5+1.2=1.7	2.5	2.40	sm
18	0.5+1.2=1.7	2.5	2.40	sm
19	0.5+1.2=1.7	2.5	2.40	sm
20	0.5+1.2=1.7	2.5	2.40	sm
21	0.4+1.3=1.7	2.5	3.25	st
22	0.4+1.3=1.7	2.5	3.25	st
23	0.4+1.3=1.7	2.5	3.25	st
24	0.4+1.2=1.6	2.3	3.00	sm
25	0.6+1.0=1.6	2.3	1.67	m
26	0.6+1.0=1.6	2.3	1.67	m
27	0.7+0.8=1.5	2.2	1.14	m
28	0.6+0.9=1.5	2.2	1.50	m
29	0.6+0.9=1.5	2.2	1.50	m
30	0.6+0.9=1.5	2.2	1.50	m
31	0.6+0.8=1.4	2.0	1.33	m
32	0.5+0.9=1.4	2.0	1.80	sm
33	0.5+0.8=1.3	1.9	1.60	m
34	0.5+0.7=1.2	1.7	1.40	m
35	0.5+0.7=1.2	1.7	1.40	m
36	0.5+0.6=1.1	1.6	1.20	m
37*	0.5+0.6=1.1	1.6	1.20	m
38*	0.5+0.6=1.1	1.6	1.20	m
39	0.4+0.6=1.0	1.5	1.50	m
40	0.4+0.6=1.0	1.5	1.50	m

* Satellite chromosome (chromosome with wide heterochromatic region).

Table 13. Measurements of somatic chromosomes at mitotic metaphase in *Stanhopea cirrhata*, HBG2272, 2n=40

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	0.7+0.7=1.4	3.4	1.00	M
2	0.7+0.7=1.4	3.4	1.00	M
3	0.6+0.8=1.4	3.4	1.33	m
4	0.6+0.8=1.4	3.4	1.33	m
5	0.5+0.9=1.4	3.4	1.80	sm
6	0.5+0.8=1.3	3.2	1.60	m
7	0.5+0.8=1.3	3.2	1.60	m
8	0.4+0.8=1.2	2.9	2.00	sm
9	0.4+0.8=1.2	2.9	2.00	sm
10*	1.2	2.9		
11	0.5+0.6=1.1	2.7	1.20	m
12	0.4+0.7=1.1	2.7	1.75	sm
13	0.4+0.7=1.1	2.7	1.75	sm
14	0.4+0.7=1.1	2.7	1.75	sm
15	0.4+0.6=1.0	2.5	1.50	m
16	0.4+0.6=1.0	2.5	1.50	m
17	0.3+0.7=1.0	2.5	2.33	sm
18	0.5+0.5=1.0	2.5	1.00	M
19	0.4+0.6=1.0	2.5	1.50	m
20*	1.0	2.5		
21	0.4+0.5=0.9	2.2	1.25	m
22	0.4+0.5=0.9	2.2	1.25	m
23*	0.9	2.2		
24	0.4+0.5=0.9	2.2	1.25	m
25	0.4+0.5=0.9	2.2	1.25	m
26	0.4+0.5=0.9	2.2	1.25	m
27	0.4+0.5=0.9	2.2	1.25	m
28	0.4+0.5=0.9	2.2	1.25	m
29	0.4+0.5=0.9	2.2	1.25	m
30	0.4+0.5=0.9	2.2	1.25	m
31*	0.9	2.2		
32*	0.9	2.2		
33*	0.9	2.2		
34*	0.9	2.2		
35*	0.8	2.0		
36*	0.8	2.0		
37*	0.8	2.0		
38*	0.8	2.0		
39*	0.7	1.7		
40*	0.7	1.7		

* The centromere was not observed.

Table 14. Measurements of somatic chromosomes at mitotic metaphase in *Stanhopea guttulata*, HBG604, 2n=40

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	1.0+1.3=2.3	3.9	1.30	m
2	0.8+1.5=2.3	3.9	1.88	sm
3	0.9+1.2=2.1	3.5	1.33	m
4	0.8+1.2=2.0	3.4	1.50	m
5*	0.6+1.4=2.0	3.4	2.33	sm
6*	0.6+1.4=2.0	3.4	2.33	sm
7	0.9+1.0=1.9	3.2	1.11	m
8	0.9+1.0=1.9	3.2	1.11	m
9	0.8+0.9=1.7	2.9	1.13	m
10	0.8+0.9=1.7	2.9	1.13	m
11	0.6+1.1=1.7	2.9	1.83	sm
12	0.7+1.0=1.7	2.9	1.43	m
13	0.7+0.9=1.6	2.7	1.29	m
14	0.7+0.9=1.6	2.7	1.29	m
15	0.7+0.9=1.6	2.7	1.29	m
16	0.7+0.8=1.5	2.5	1.14	m
17	0.7+0.8=1.5	2.5	1.14	m
18	0.6+0.9=1.5	2.5	1.50	m
19	0.6+0.9=1.5	2.5	1.50	m
20	0.7+0.7=1.4	2.4	1.00	M
21	0.6+0.8=1.4	2.4	1.33	m
22	0.6+0.8=1.4	2.4	1.33	m
23	0.6+0.8=1.4	2.4	1.33	m
24	0.5+0.8=1.3	2.2	1.60	m
25	0.5+0.8=1.3	2.2	1.60	m
26	0.5+0.8=1.3	2.2	1.60	m
27	0.5+0.8=1.3	2.2	1.60	m
28	0.5+0.8=1.3	2.2	1.60	m
29	0.5+0.8=1.3	2.2	1.60	m
30	0.6+0.7=1.3	2.2	1.17	m
31	0.6+0.7=1.3	2.2	1.17	m
32	0.6+0.6=1.2	2	1.00	M
33	0.5+0.7=1.2	2	1.40	m
34	0.5+0.6=1.1	1.8	1.20	m
35	0.5+0.6=1.1	1.8	1.20	m
36	0.5+0.6=1.1	1.8	1.20	m
37	0.4+0.6=1.0	1.7	1.50	m
38	0.4+0.5=0.9	1.5	1.25	m
39	0.4+0.4=0.8	1.3	1.00	M
40	0.4+0.4=0.8	1.3	1.00	M

* Satellite chromosome (chromosome with wide heterochromatic region).

Table 15. Measurements of somatic chromosomes at mitotic metaphase in *Stanhopea pulla*, HBG668, 2n=40

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	0.6+0.9=1.5	3.4	1.50	m
2	0.7+0.8=1.5	3.4	1.14	m
3	0.6+0.8=1.4	3.2	1.33	m
4	0.6+0.8=1.4	3.2	1.33	m
5	0.6+0.7=1.3	3.0	1.17	m
6	0.6+0.7=1.3	3.0	1.17	m
7	0.5+0.8=1.3	3.0	1.60	m
8	0.5+0.8=1.3	3.0	1.60	m
9	0.5+0.8=1.3	3.0	1.60	m
10*	1.3	3.0		
11	0.4+0.9=1.3	3.0	2.25	sm
12	0.4+0.9=1.3	3.0	2.25	sm
13*	1.2	2.7		
14*	1.2	2.7		
15	0.5+0.7=1.2	2.7	1.40	m
16	0.5+0.7=1.2	2.7	1.40	m
17	0.5+0.6=1.1	2.5	1.20	m
18	0.5+0.6=1.1	2.5	1.20	m
19*	1.1	2.5		
20*	1.1	2.5		
21	0.5+0.6=1.1	2.5	1.20	m
22	0.5+0.6=1.1	2.5	1.20	m
23*	1.1	2.5		
24	0.5+0.5=1.0	2.3	1.00	M
25	0.4+0.6=1.0	2.3	1.50	m
26*	1.0	2.3		
27*	1.0	2.3		
28*	1.0	2.3		
29	0.4+0.5=0.9	2.0	1.25	m
30	0.4+0.5=0.9	2.0	1.25	m
31	0.4+0.5=0.9	2.0	1.25	m
32	0.4+0.5=0.9	2.0	1.25	m
33*	0.9	2.0		
34*	0.9	2.0		
35*	0.9	2.0		
36*	0.8	1.8		
37*	0.8	1.8		
38*	0.8	1.8		
39*	0.8	1.8		
40*	0.8	1.8		

* The centromere was not observed.

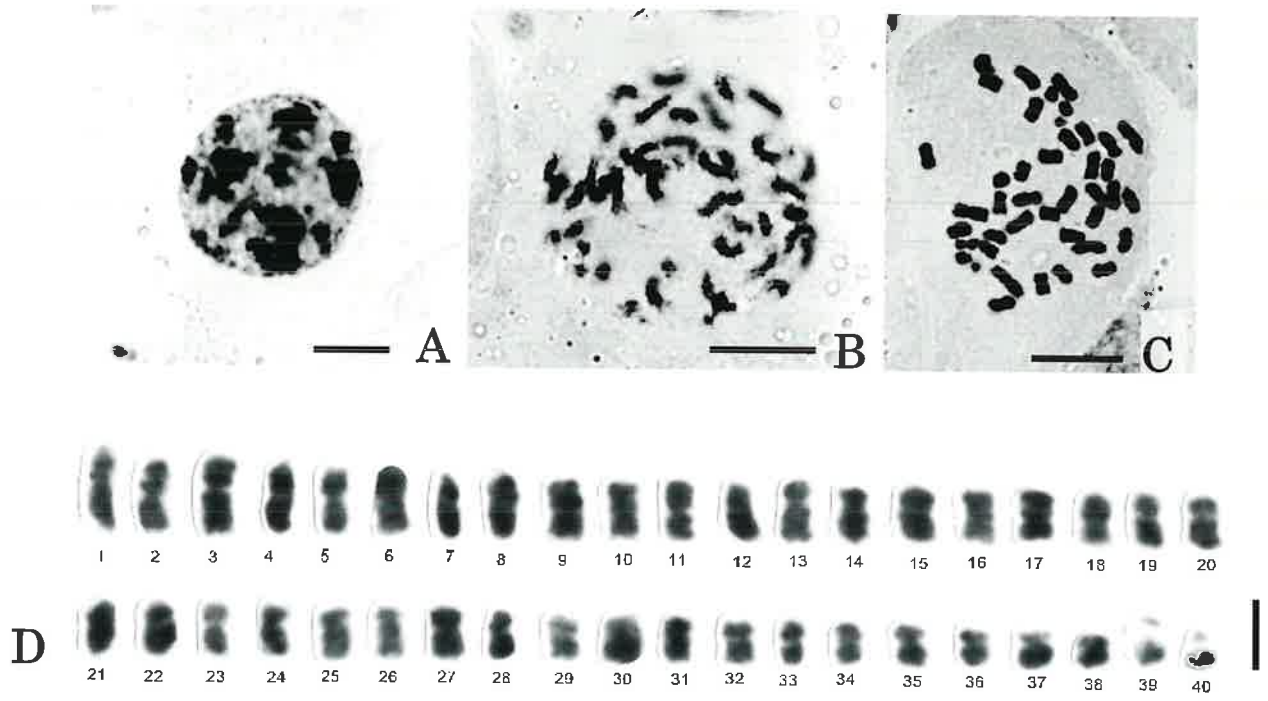

Fig. 1. Chromosomes of *Acineta barkeri*, HBG1404, 2n=40. A, resting stage. B, mitotic prophase. C and D, mitotic metaphase. Bars indicate 5μm in A-C and 2μm in D.

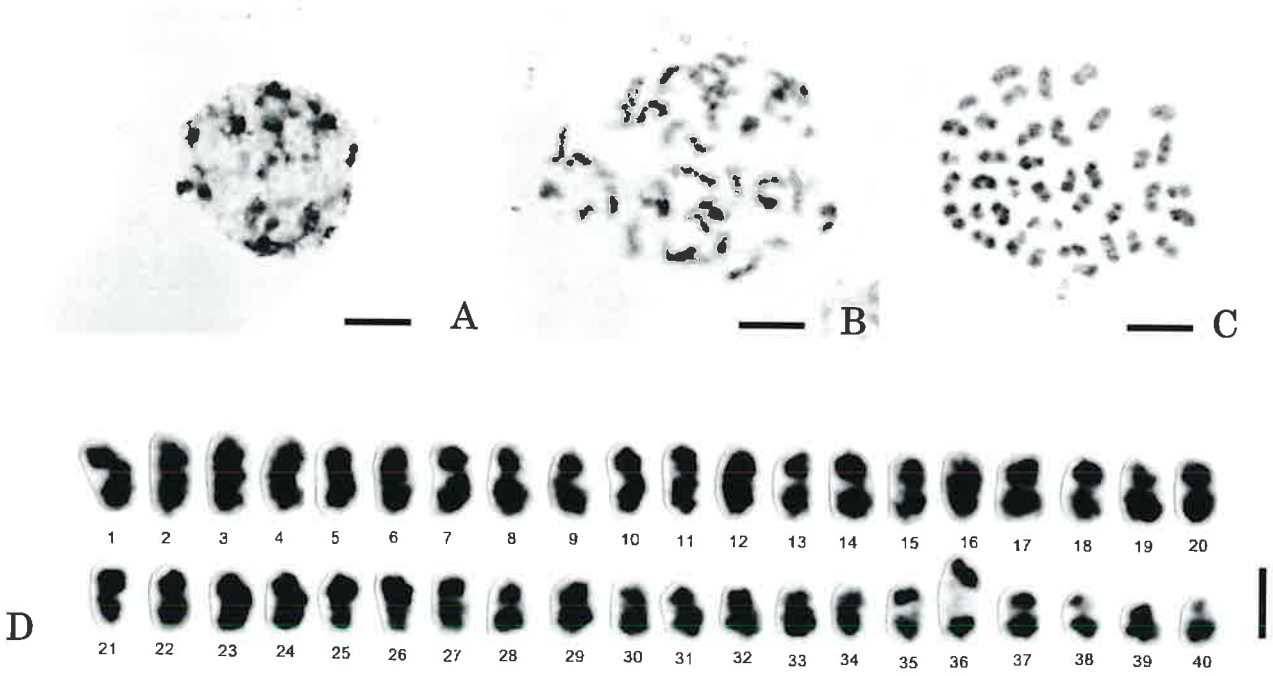

Fig. 2. Chromosomes of *Acineta superba*, HBG638, 2n=40. A, resting stage. B, mitotic prophase. C and D, mitotic metaphase. Bars indicate 5μm in A-C and 2μm in D.

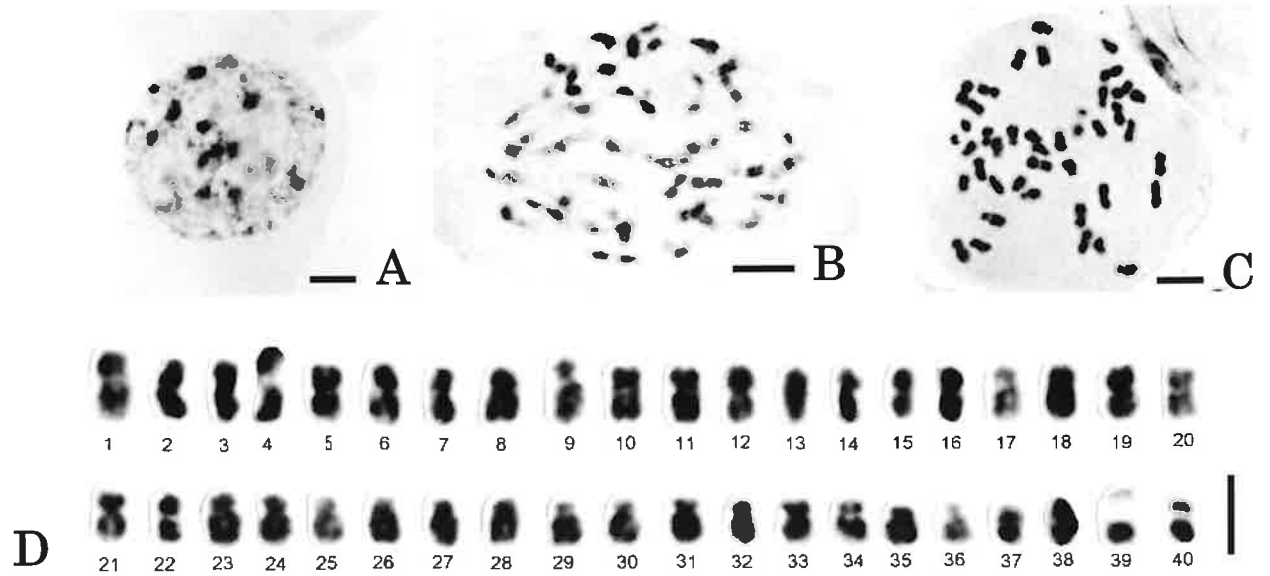

Fig. 3. Chromosomes of *Cirrhaea loddigesii*, HBG607, 2n=40. A, resting stage. B, mitotic prophase. C and D, mitotic metaphase. Bars indicate 5μm in A-C and 2μm in D.

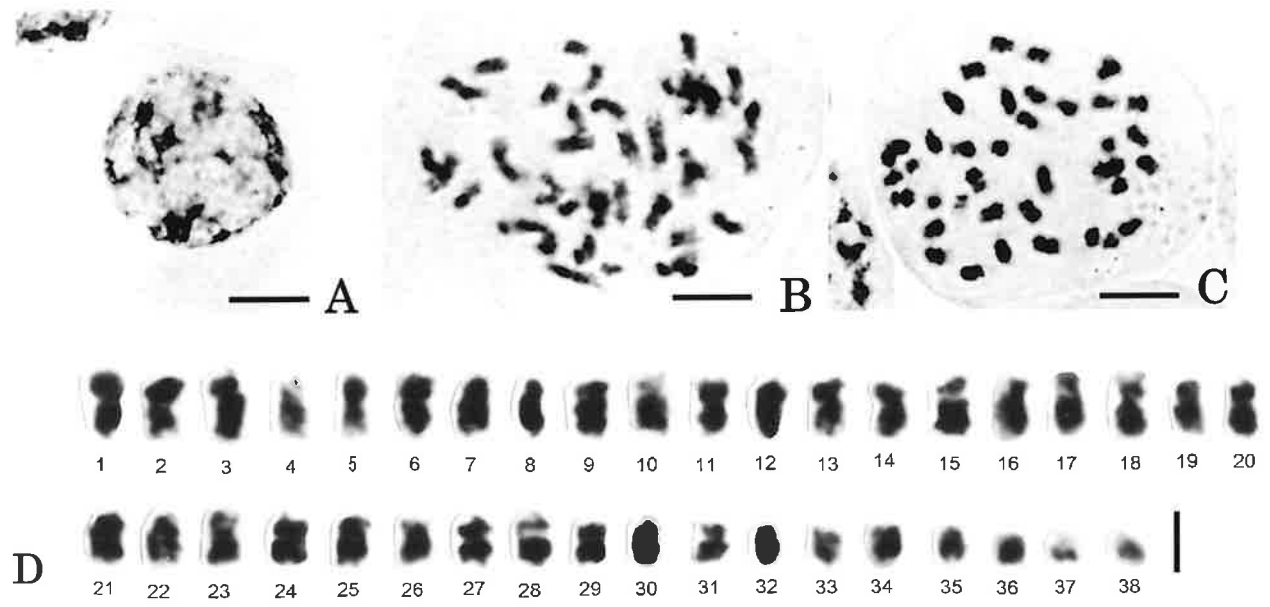

Fig. 4. Chromosomes of *Coeliopsis hyacinthosma*, HBG647, 2n=38. A, resting stage. B, mitotic prophase. C and D, mitotic metaphase. Bars indicate 5μm in A-C and 2μm in D.

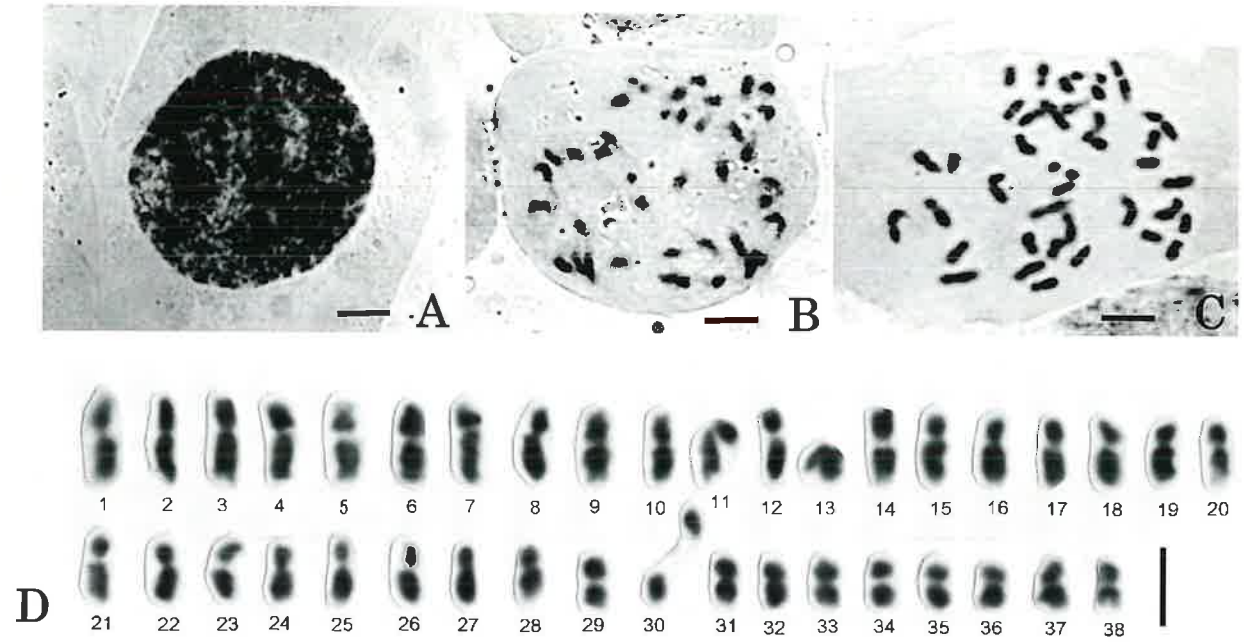

Fig. 5. Chromosomes of *Gongora armeniaca*, HBG563, 2n=38. A, resting stage. B, mitotic prophase. C and D, mitotic metaphase. Bars indicate 5μm in A-C and 2μm in D.

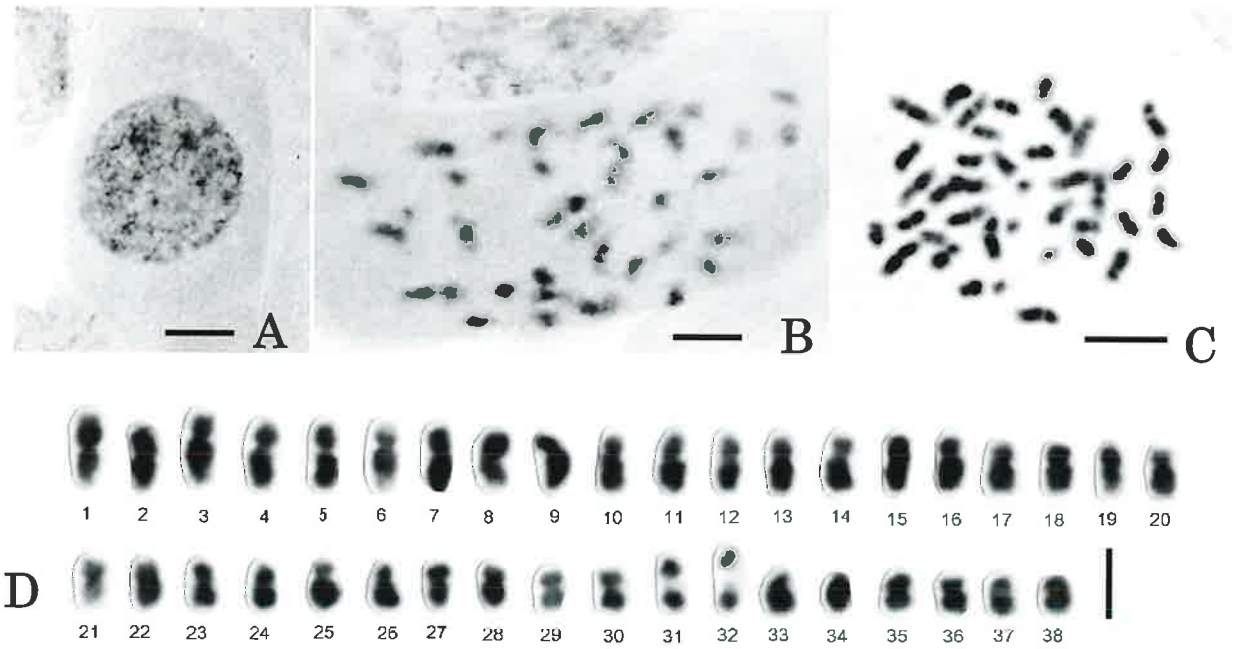

Fig. 6. Chromosomes of *Gongora truncata*, HBG602, 2n=40. A, resting stage. B, mitotic prophase. C and D, mitotic metaphase. Bars indicate 5μm in A-C and 2μm in D.

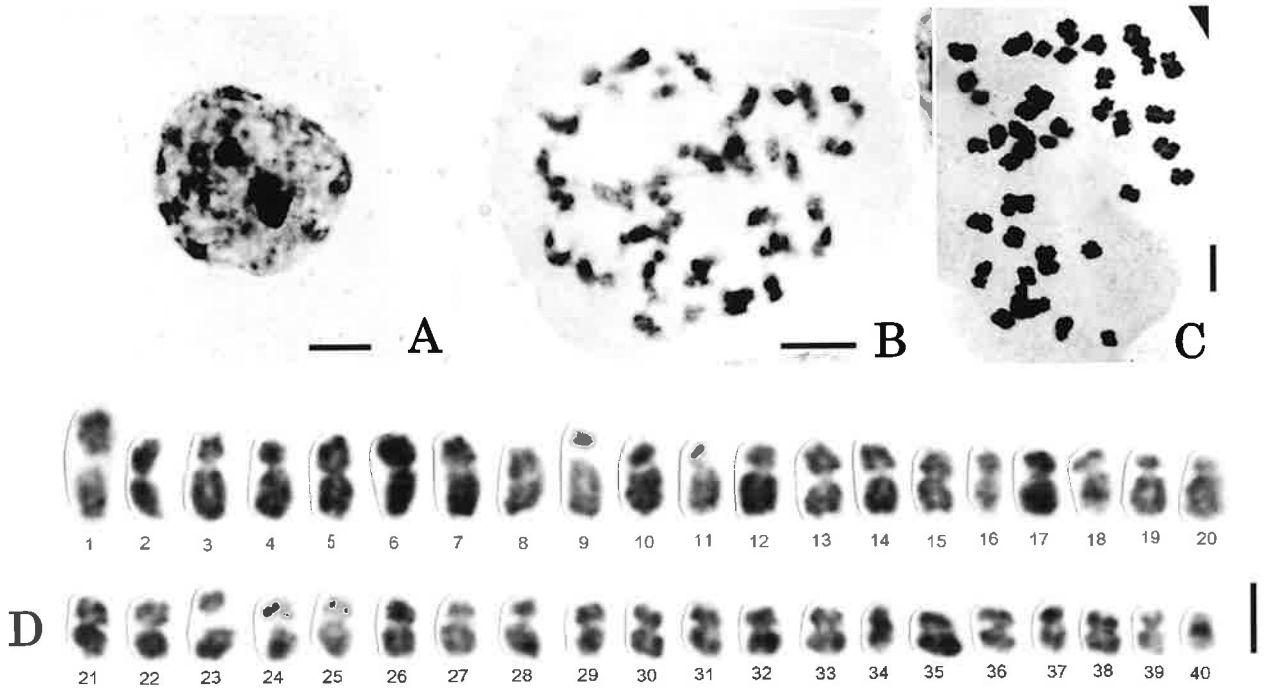

Fig. 7. Chromosomes of *Kegeliella atropilosa*, HBG2699, 2n=40. A, resting stage. B, mitotic prophase. C and D, mitotic metaphase. Bars indicate 5μm in A-C and 2μm in D.

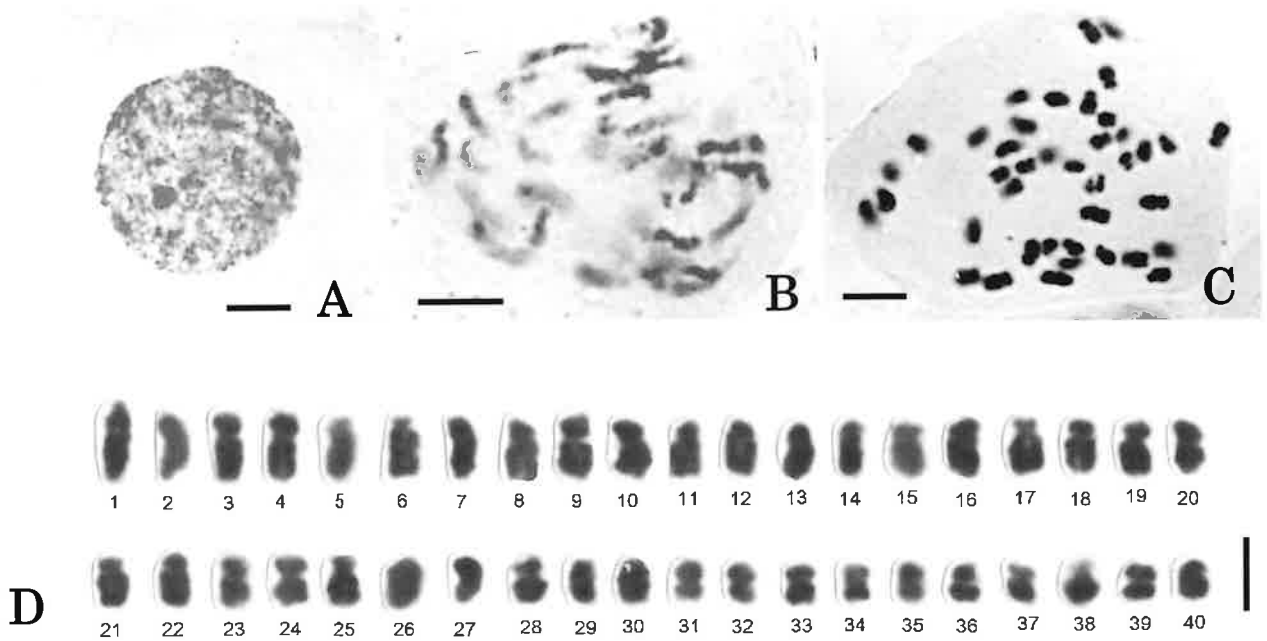

Fig. 8. Chromosomes of *Paphinia grandiflora*, HBG2220, 2n=40. A, resting stage. B, mitotic prophase. C and D, mitotic metaphase. Bars indicate 5μm in A-C and 2μm in D.

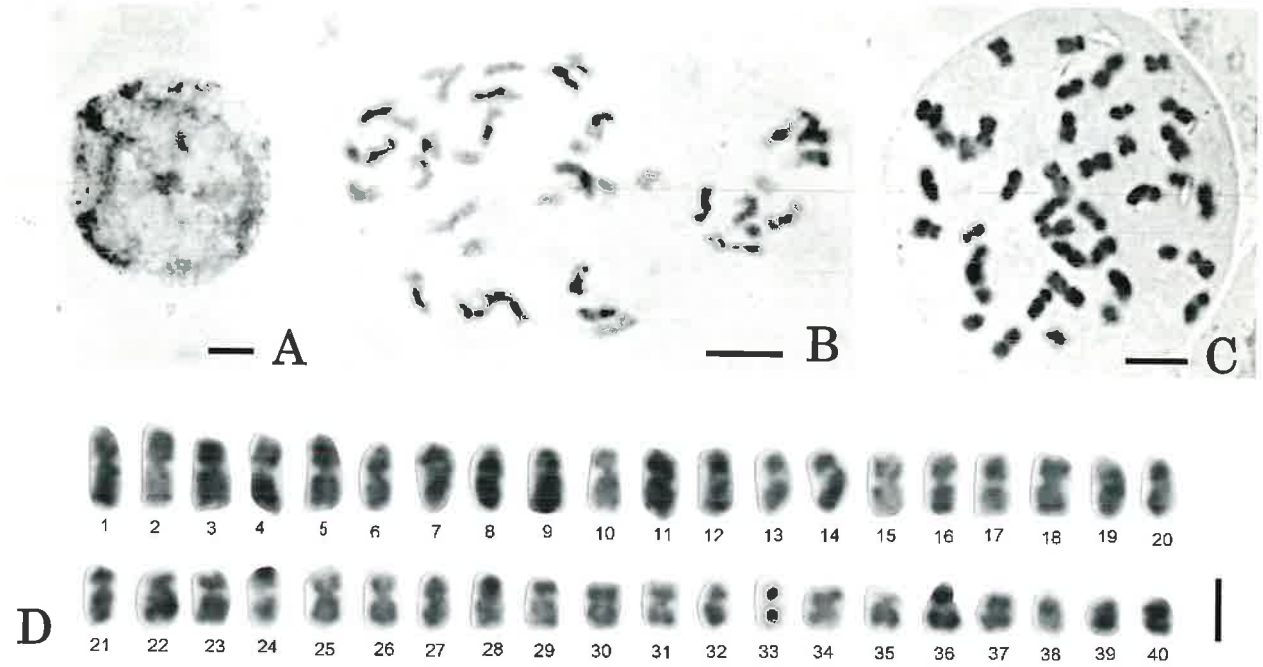

Fig. 9. Chromosomes of *Peristeria elata*, HBG621, 2n=40. A, resting stage. B, mitotic prophase. C and D, mitotic metaphase. Bars indicate 5μm in A-C and 2μm in D.

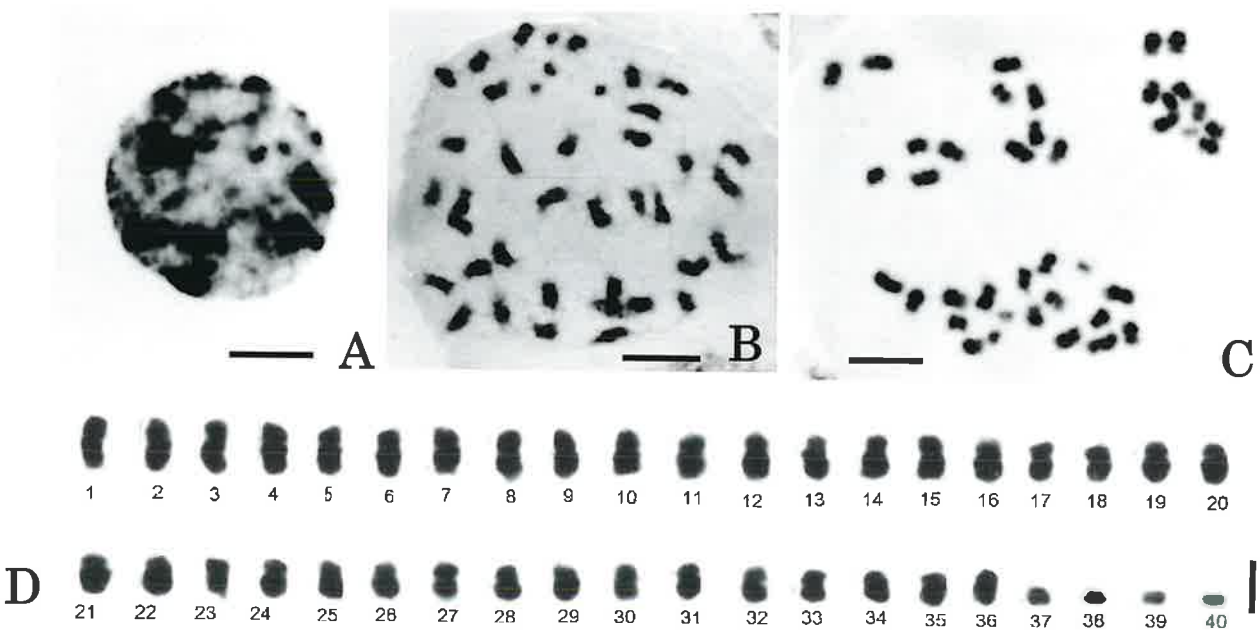

Fig. 10. Chromosomes of *Polycycnis barbata*, HBG730, 2n=40. A, resting stage. B, mitotic prophase. C and D, mitotic metaphase. Bars indicate 5μm in A-C and 2μm in D.

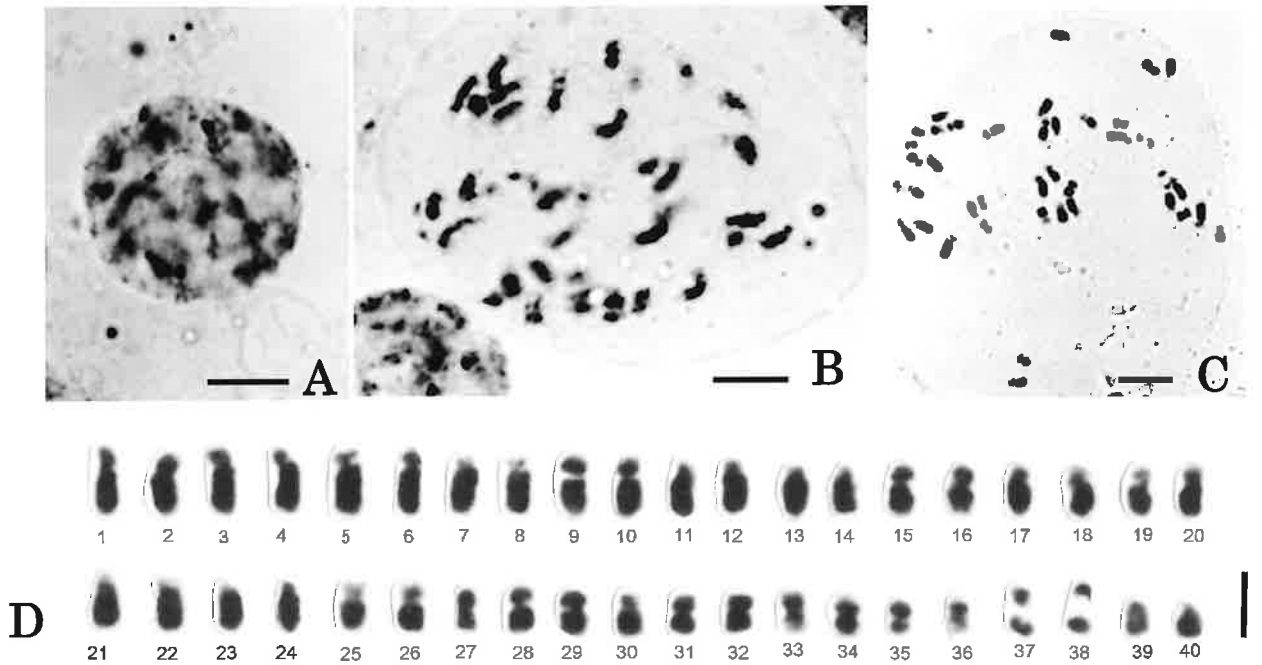

Fig. 11. Chromosomes of *Shlimia trifida*, HBG2819, 2n=40. A, resting stage. B, mitotic prophase. C and D, mitotic metaphase. Bars indicate 5μm in A-C and 2μm in D.

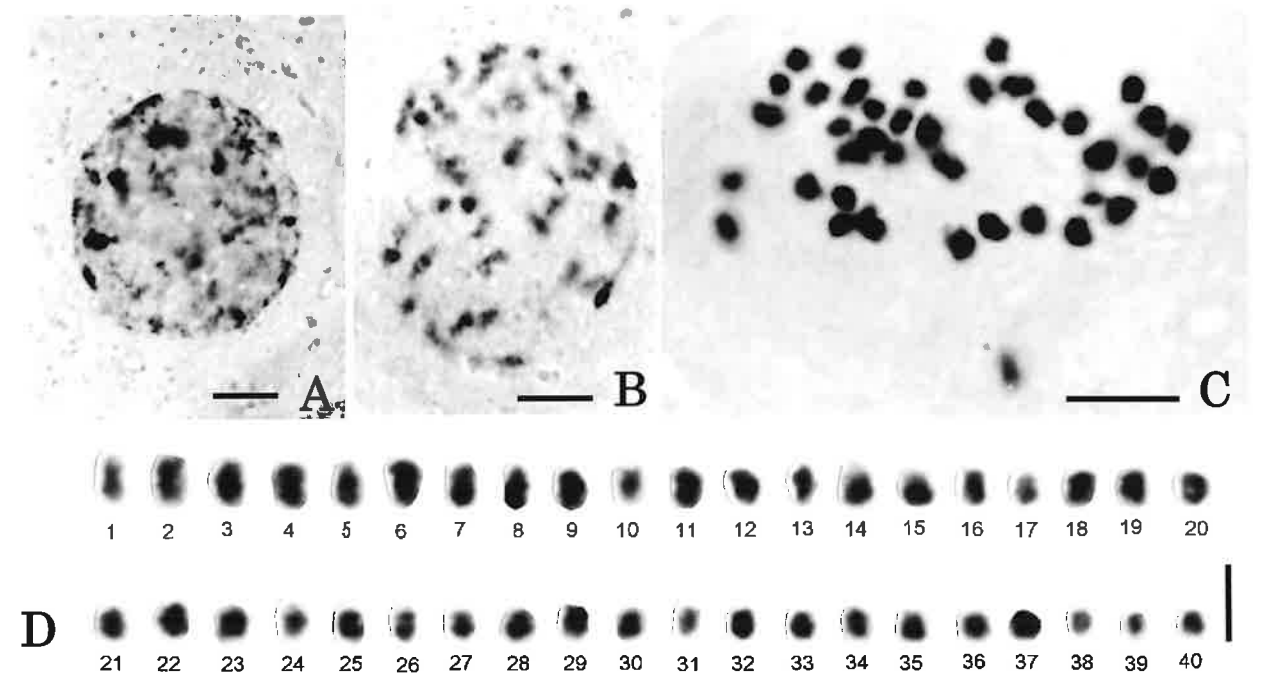

Fig. 12. Chromosomes of *Stanhopea cirrhata*, HBG2272, 2n=40. A, resting stage. B, mitotic prophase. C and D, mitotic metaphase. Bars indicate 5μm in A-C and 2μm in D.

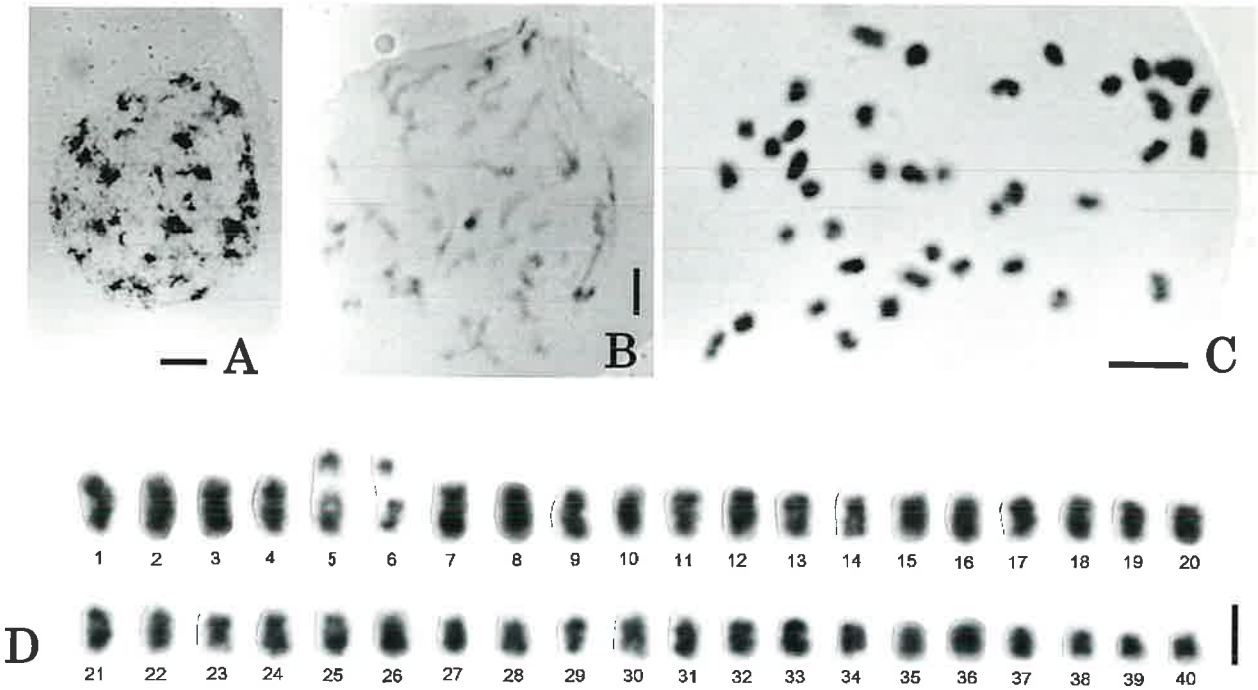

Fig. 13. Chromosomes of *Stanhopea guttulata*, HBG604, 2n=40. A, resting stage. B, mitotic prophase. C and D, mitotic metaphase. Bars indicate 5μm in A-C and 2μm in D.

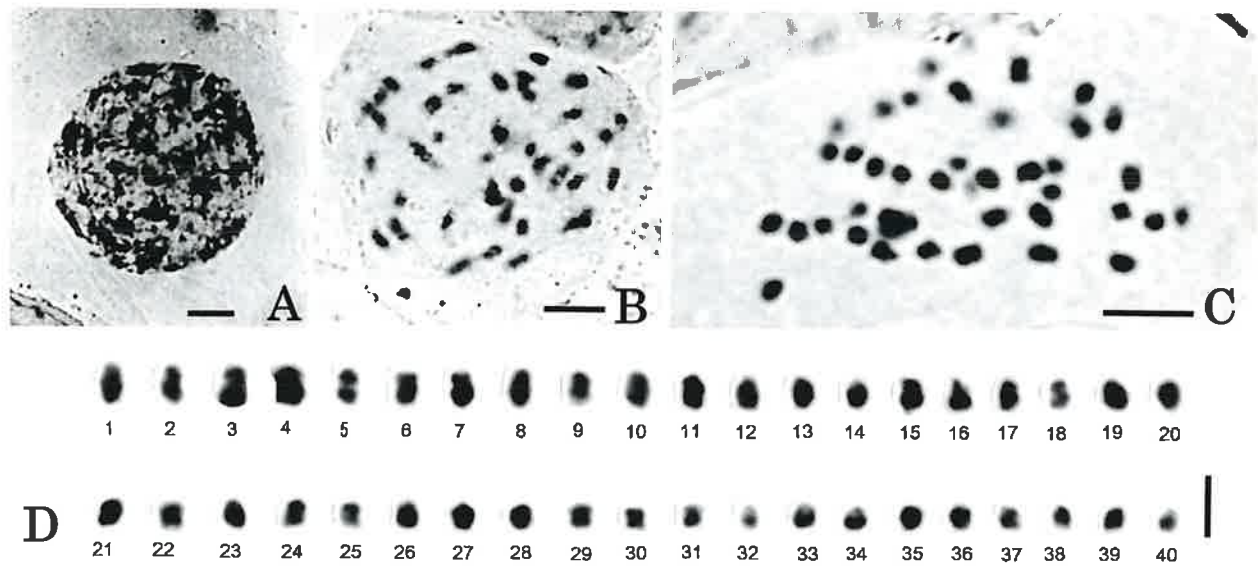

Fig. 14. Chromosomes of *Stanhopea pulla*, HBG668, 2n=40. A, resting stage. B, mitotic prophase. C and D, mitotic metaphase. Bars indicate 5μm in A-C and 2μm in D.