

Zeitschrift:	Candollea : journal international de botanique systématique = international journal of systematic botany
Herausgeber:	Conservatoire et Jardin botaniques de la Ville de Genève
Band:	47 (1992)
Heft:	2
Artikel:	Notes on the genus Comastoma Toyok. (Gentianaceae) from Pakistan and Kashmir
Autor:	Omer, Saood
DOI:	https://doi.org/10.5169/seals-879585

Nutzungsbedingungen

Die ETH-Bibliothek ist die Anbieterin der digitalisierten Zeitschriften auf E-Periodica. Sie besitzt keine Urheberrechte an den Zeitschriften und ist nicht verantwortlich für deren Inhalte. Die Rechte liegen in der Regel bei den Herausgebern beziehungsweise den externen Rechteinhabern. Das Veröffentlichen von Bildern in Print- und Online-Publikationen sowie auf Social Media-Kanälen oder Webseiten ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. [Mehr erfahren](#)

Conditions d'utilisation

L'ETH Library est le fournisseur des revues numérisées. Elle ne détient aucun droit d'auteur sur les revues et n'est pas responsable de leur contenu. En règle générale, les droits sont détenus par les éditeurs ou les détenteurs de droits externes. La reproduction d'images dans des publications imprimées ou en ligne ainsi que sur des canaux de médias sociaux ou des sites web n'est autorisée qu'avec l'accord préalable des détenteurs des droits. [En savoir plus](#)

Terms of use

The ETH Library is the provider of the digitised journals. It does not own any copyrights to the journals and is not responsible for their content. The rights usually lie with the publishers or the external rights holders. Publishing images in print and online publications, as well as on social media channels or websites, is only permitted with the prior consent of the rights holders. [Find out more](#)

Download PDF: 08.08.2025

ETH-Bibliothek Zürich, E-Periodica, <https://www.e-periodica.ch>

Notes on the genus *Comastoma* Toyok. (Gentianaceae) from Pakistan and Kashmir

SAOOD OMER

RÉSUMÉ

OMER, S. (1992). Notes sur le genre *Comastoma* Toyok. (Gentianaceae) du Pakistan et du Cachemire. *Candollea* 47: 539-553. En anglais, résumés français et anglais.

Le genre *Comastoma* Toyok. est révisé pour le Pakistan et le Cachemire. Une espèce nouvelle est signalée: *Comastoma pseudopulmonarium* Omer alors que *C. pulmonarium* est indiquée pour la première fois dans la région. Les grains de pollen sont réticulés avec des muri épais et des lumières minces. De même les graines sont striées avec des striae irrégulières et une disposition indéfinie des stries.

ABSTRACT

OMER, S. (1992). Notes on the genus *Comastoma* Toyok. (Gentianaceae) from Pakistan and Kashmir. *Candollea* 47: 539-553. In English, French and English abstracts.

The genus *Comastoma* Toyok. is revised from Pakistan and Kashmir. One new species, *Comastoma pseudopulmonarium* Omer, is recognized, whereas *C. pulmonarium* is recorded for the first time from the region. The pollen grains are reticulate with a thick muri and thin lumen. Similarly, the seeds are striated with irregular striae patterns and indefinite striae.

Introduction

While studying the genus *Gentiana* L. (s.l.) from Pakistan and Kashmir, it has been shown that there are nine genera in Pakistan and Kashmir, and the genus *Gentiana* L. (s.str.) does not occur in the area under consideration (OMER, 1991; OMER & QAISER, 1992).

Comastoma Toyok. possesses fimbriate corolla throat, with sessile gynoecium and stigma. The fimbriae in the genus are fairly uniform and are arranged in a definite pattern. The genus is fairly close to *Gentianella* Moench (s.str.), but differs on the basis of arrangement of fimbriae, and the absence of gynophore. It is often regarded as congeneric with *Gentianella* Moench (s.l.) by many workers (SMITH, 1967; CHATER, 1982; ZUYEV, 1985; GARG, 1987). TOYOKUNI (1961, 1962); MA (1980); LÖVE & LÖVE (1975) and LÖVE (1986) have pointed out several criteria for separating *Comastoma* Toyok. from *Gentianella* Moench. The genus is annuals or biennials, with long pedicelled flowers, a short calyx tube, sessile stigma and ovary, and corolla lobes with few frimbriate scales. The different morphological characters were also discussed in detail elsewhere (OMER, 1991; OMER & QAISER, 1992). There seems to be no justification in treating *Gentianella* Moench and *Comastoma* Toyok. as a single entity. PHILIPSON (1972) has also pointed out the differences at the sectional levels in anatomy and called the group as sect. *Comastoma* Wettst. TOYOKUNI (1965) has discussed in detail the differences at the generic level. He even pointed out that the chromosome number also differs from the related *Gentianella* Moench. LÖVE (1986) has also indicated that chromosome number also differs in *Comastoma* Toyok. ($2n = 10$ & 30) from that of *Gentianella* Moench ($2n = 36$).

There are studies on pollen morphology of the genus *Gentiana* L. (s.l.), but these studies failed to accept the differences at the generic level (NILSSON, 1967). On the other hand, there are no reports on the seed morphological studies of the genus *Gentiana* L. (s.l.).

A comparative account of different genera have already been discussed (OMER & QAISSER, 1991).

Materials and method

Palyнологic studies

Polleniferous material from 5 taxa belonging to *Comastoma* Toyok. from Pakistan and Kashmir were obtained from herbarium sheets. Wherever possible 25 pollen grains were studied and measured. In most of the cases, more than one specimen was studied. Pollen grains were studied with light and scanning electron microscopy.

Light microscopic studies

Pollen slides were prepared by the usual acetolysis method of ERDTMAN (1952). Measurements of polar axis, length and breadth of the grain, mesocolpium, apocolpium, intercolpi distance and diameter of the pollen grain, alongwith the thickness of exine. PAI (polar area index) was also calculated.

Scanning Electron Microscopy

Mostly acetolysed pollens grains were mounted on metallic (brass) stubs, with the help of double adhesive tape. However, in few cases pollen were directly dusted on stubs. The specimen were coated with gold, by conventional method. The specimens were observed under JSM-T 200 and JSM-T 20 at the Biological Research Center, University of Karachi and Electron microscopy Unit, Plant Science Laboratory, University of Reading, U.K., respectively.

Seed morphology

Seed samples were collected from the field and herbarium specimens. Only healthy and mature seeds were studied. Following parameters were studied.

1. *Seed size.* — Length and breadth of atleast 20 seeds were measured with the help of an ocular micrometer upon a Nikon SE model microscope with an electrical illumination. Length and breadth was taken from end to end and the central part respectively.
2. *Seed shape.* — Seed shapes were determined by the help of ratios obtained by the measurements of length and breadth. The ratios applied for the shape were similar as applied to leaves and other parts of the plant.
3. *Seed surface.* — Seed coat surface patterns were observed by the help of light as well as scanning electron microscope. For light microscopy, a Nikon SE model microscope was used and surface pattern were analyzed. For SEM studies, seeds were mounted on a metallic stub with the help of double adhesive tape and coated with gold for a period of 6 minutes in a sputtering unit of Jeol and observed in SEM Jeol JSM-T 200.

Morphological studies

More than 5000 specimens from the following herbaria were studied: B, BM, CAL, E, G, K, KUH, LE, LINN, O, P, PES, PPFI-B, RAW, RNG and W. The specimens belonged to the collective genus *Gentiana* L. (s.l.). Only specimens belonging to the genus *Comastoma* Toyok. were incorporated here. Similarly, specimens were studied from the entire range of distribution for the geographical assessment.

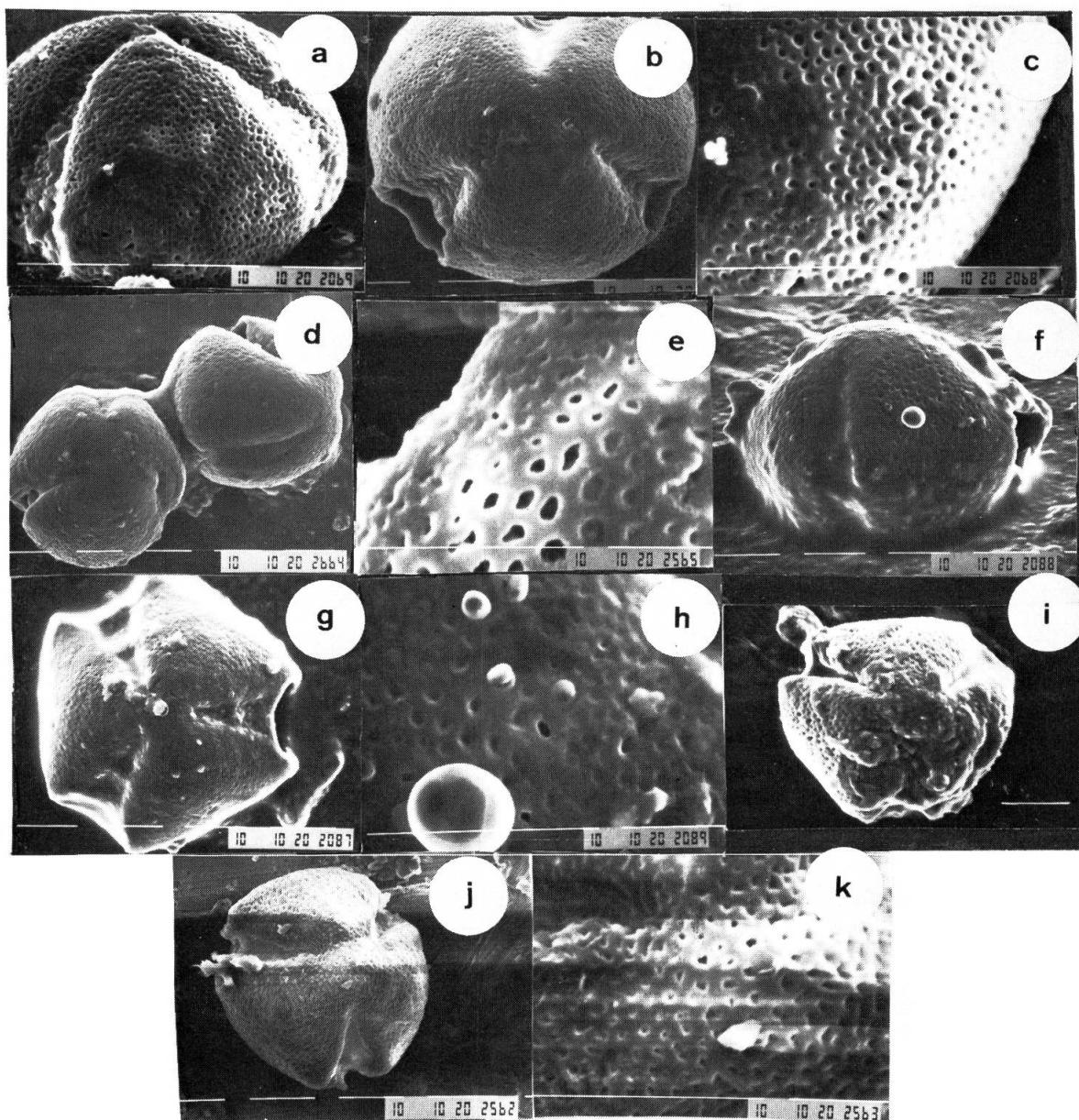


Fig. 1. — SEM pollen micrographs of *Comastoma*.
a-c, *C. falcatum* (Koelz 2527, NY); d-e, *C. pulmonarium* (R. R. Stewart 9847a, NY); f-h, *C. pseudopulmonarium* (Duthie II822, O); i-k, *C. borealis* (Omer & Qaiser 2648, KUH).

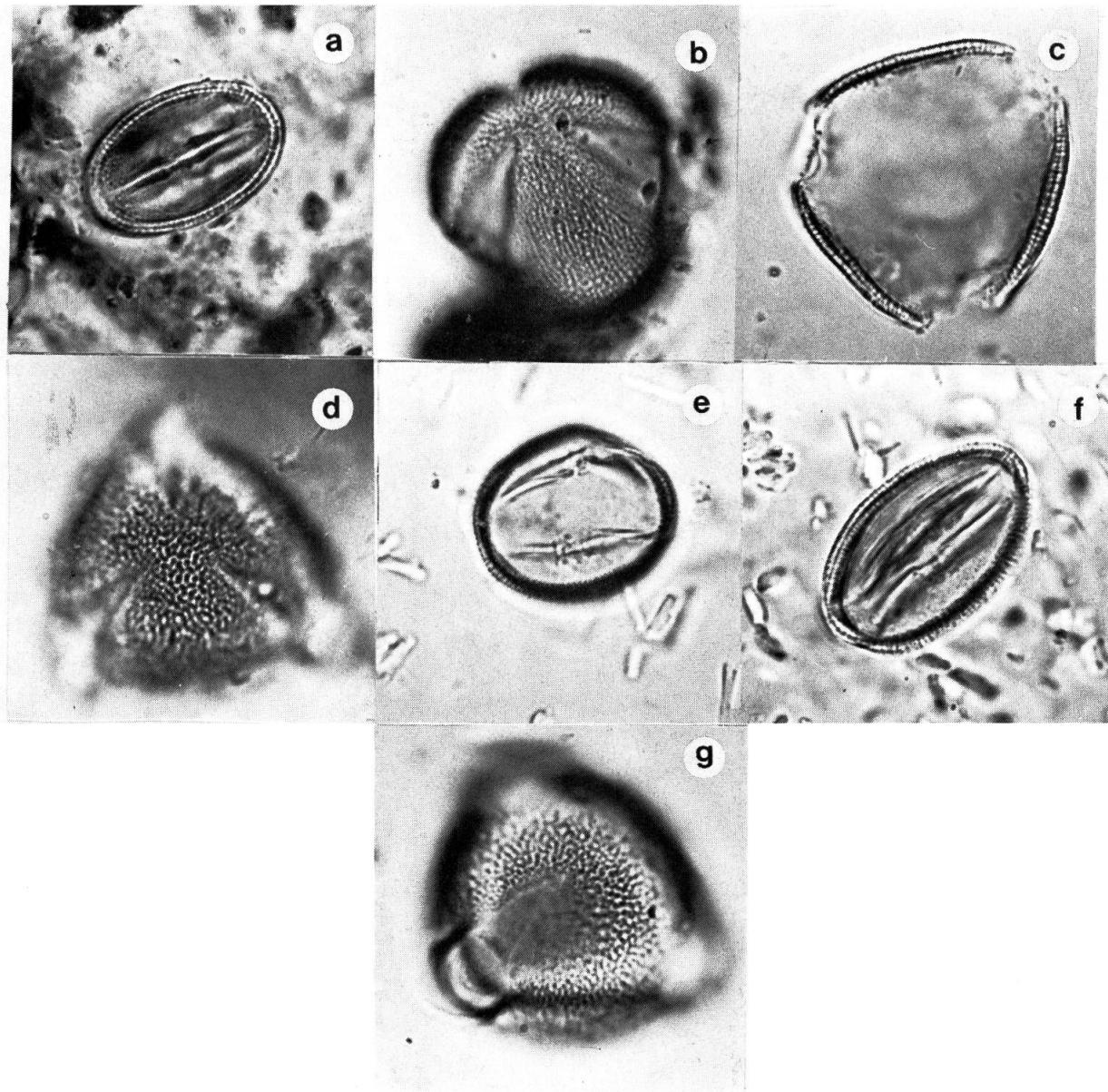


Fig. 2. — LM micrographs of *Comastoma*.
a-b, *C. falcatum* (Koelz 2527, NY); **c-d**, *C. pulmonarium* (R. R. Stewart 9847a, NY); **e**, *C. pseudopulmonarium* (Duthie 11822, O); **f-g**, *C. pedunculata* (R. R. Stewart 12935, K).

<i>Species</i>	<i>Length</i>	<i>Breadth</i>	<i>P/E</i>	<i>Shape</i>	<i>Colpi Length</i>	<i>Colpi Breadth</i>	<i>Exine μm</i>	<i>Meso-colpium</i>	<i>Apocolpium</i>	<i>Colpi-colpi</i>	
1. <i>C. pulmonarium</i>	44.148 sx + cv	42.246 1.546 .410 3.659	104.50	sub-spheroidal (pro-spher)	36.414 1.552 .448 4.262	5.470 .356 .102 6.508	2.766 .221 .064 7.989	30.821 .954 .275 3.095	.735 .212 11.653	6.307 .735 .212 11.653	10.232 1.468 .424 14.347
2. <i>C. pseudo-pulmonarium</i>	36.652 .824 .476 2.248	27.608 3.297 1.903 11.942	132.75	prolate	27.608 3.297 1.903 11.942	1.666 .412 .238 24.729	2.618 .206 .119 7.868	25.228 .824 .476 3.266	6.668 .824 .476 12.364	10.948 .824 .475 7.526	
3. <i>C. pedunculata</i>	34.518 2.991 .902 8.665	32.402 2.859 .862 8.823	106.53	sub-spheroidal (pro-spher)	26.223 1.944 .578 7.413	1.460 .107 .032 7.328	2.781 .144 .043 5.159	26.742 1.440 .434 5.384	6.620 .720 .217 10.876	9.087 1.155 .348 12.710	

Table 1. — Pollen morphology data of *Comastoma Toyok.*

Observations and results

Palynology

The overall palynological studies have revealed the existence of four broad groups within *Gentiana* L. (s.l.) from Pakistan and Kashmir (OMER, 1991). The pollen grains are reticulate with variation in the type of reticula. The reticulum is variable in relation to the size of muri and lumen. *Comastoma* Toyok. falls under a broad group named after itself. The size of muri is thick and lumen is small (Fig. 1, 2), and all the five species investigated belongs to this group. Apart from that, genus *Jaeschkeia* Kurz is also a constituent of the group. The detailed measurements of three species are indicated in Table 1.

Seed morphology

Seeds circular or rounded, 0.5-0.96(-1.0) mm in diameter, reddish brown or brown, glabrous; surface areolate with middle of the areoles elevated with a punctae in middle, areoles uneven and usually at intervals, surface sometimes with a depression. Areole walls very thin, running up and down over the uneven rugulate undersurface with a light impression thus forming an areole, many areolar walls uniting at one point and forming a knot. Hilum scar prominent with a depression.

The seed surface in *Comastoma* Toyok. is striate. The striations are irregular without any particular pattern. The size of striations are very small in this category in comparison to the other groups. The seed size of *Comastoma* Toyok. and *Aloitis* Rafin. is similar and ranges between

Species	Length μm	Breadth μm
1. <i>C. falcatum</i>520	499
sd	0.46	.044
error	.011	.011
cv	8.846	8.817
r		.170
t		.622
correlation		none
2. <i>C. pseudo-pulmonarium</i>		
	.654	.587
	.050	.009
	.028	.005
	7.64	1.533
		.8848
		3.206
		significant
3. <i>C. pedunculata</i>		
	.723	.596
	.039	.052
	.015	.021
	5.394	8.724
		.848
		3.206
		significant
4. <i>C. borealis</i> ...		
	2.659	2.101
	.2009	.196
	.070	.069
	.070	.069
	7.521	9.328
		-.233
		-.587
		none

Table 2. — Seed measurement in *Comastoma* Toyok.

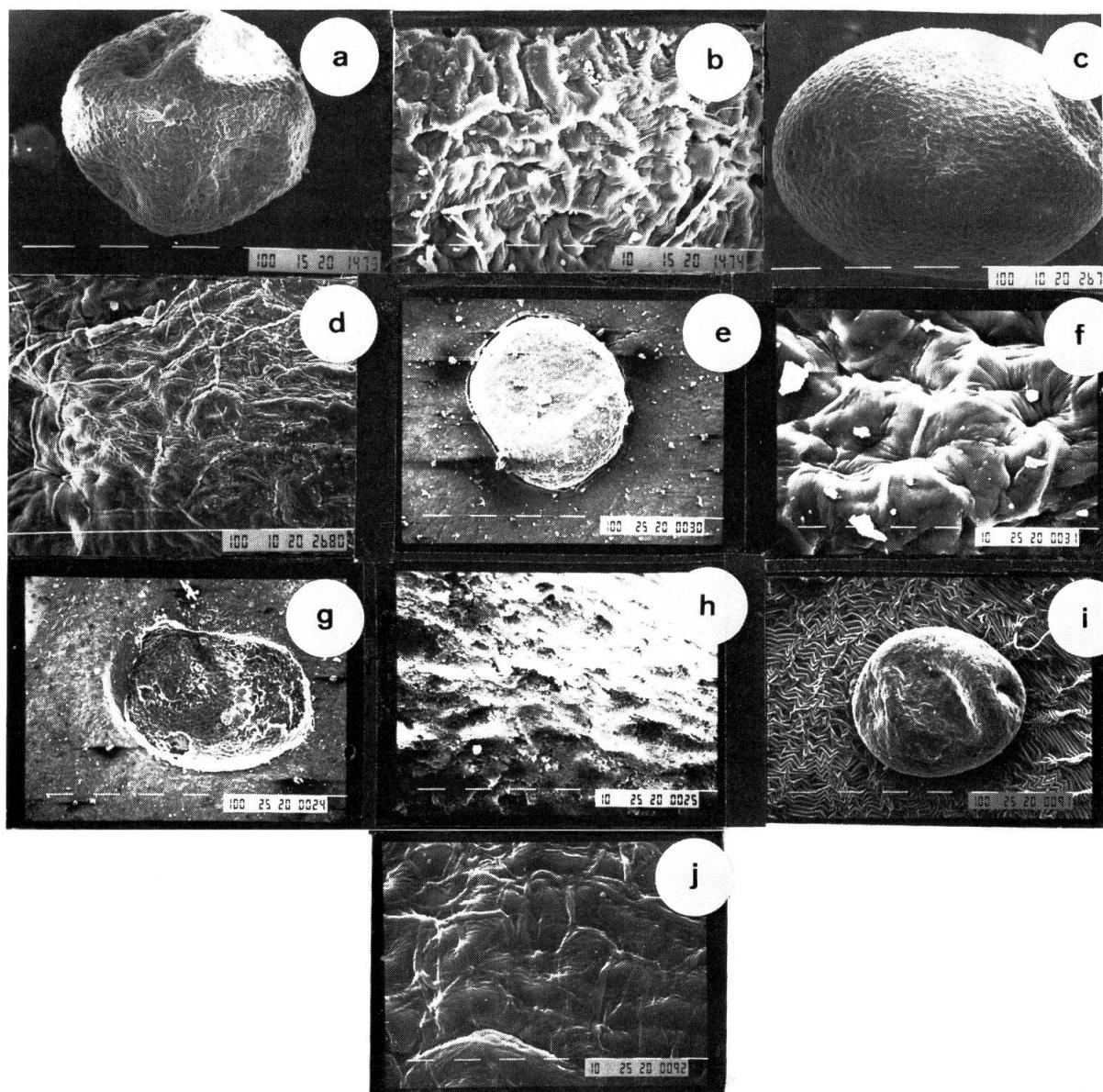


Fig. 3. — SEM seed micrographs of *Comastoma*.
a-b, *C. falcatum* (Abedin & Qaiser 9018, KUH); c-d, *C. pulmonarium* (Permanand II70, NA); e-f, *C. pseudopulmonarium* (Steane 52, E); g-h, *C. pedunculatum* (Thomson s.n., K); i-j, *C. borealis* (R. R. Stewart 26516, RAW).

500-850 µm. The two genera can be separated from one another on the basis of definite pattern of striations in *Aloitis* Rafin., whereas the walls of the striations are not well formed in *Comastoma* Toyok. (Fig. 3). The details of different dimensions indicated in Table 2. The observations of the seeds of *Comastoma* Toyok. are also elucidated below. All the taxa represented in Pakistan, were investigated.

Taxonomy

The present studies have revealed the existence of five taxa with one new species and a new record from Pakistan and Kashmir. The genus *Comastoma* Toyok. is treated here as follows.

Comastoma Toyok. in Bot. Mag. (Tokyo) 74: 198. 1961; in Acta Phytotax. Geobot. 20: 136. 1962;
 Ma in Fl. Intramongolica 5: 81. 1980; Ho in Fl. Rep. Pop. Sin. 62: 300. 1988.
 = *Gentiana* L. sect. *Endotricha* Froel., Gent. 86. 1796.
 = *Gentiana* L. sect. *Comastoma* Wettst. in Österr. Bot. Z. 46: 174. 1896.
 = *Lomatogonium* A. Br. sect. *Comastoma* (Wettst.) Löve & Löve in Acta Horti Gothob. 20: 117. 1956.
 = *Gentianella* Moench subgenus *Comastoma* (Wettst.) Gill. in Ann. Missouri Bot. Gard. 44: 262. 1967.

Biennial-perennial, glabrous, erect herbs. Basal leaves in a rosette; caudine leaves opposite, loosely arranged. Inflorescence solitary, terminal. Flowers pedunculate, peduncle long; tetramerous-pentamerous; bisexual, actinomorphic-zygomorphic, mostly campanulate-tubular. Calyx divided mostly upto the base, sometimes not forming a tube, not provided by an inner membrane. Corolla campanulate, sometimes tubular, variously coloured: blue purple, violet, red, pink or white; plicae or subsidiary lobes of the corolla absent, throat fimbriate; fimbriae linear-lanceolate or filiform, entire, acute or obtuse, arising from a crown inserted near the corolla tube. Stamens corresponding the number of and alternating the petals. Anthers strictly versatile, with filaments running down approximately to the base of tube. Nectaries present at the base of the corolla, two each on a petal. Ovary superior, unilocular with numerous ovules and parietal placentation, sessile; stigmas 2, sessile or stipitate, dehiscing septicidally from apex. Seeds light to dark brown, with ovoid or circular shape, mostly smooth, rarely reticulate.

A genus of ca. 10 species, distributed in the colder or alpine regions of Asia, Europe and America. Represented in Pakistan by 5 species.

Key to the species of *Comastoma*

1. Calyx and corolla tetramerous **5. C. borealis**
- 1a. Calyx and corolla pentamerous 2
2. Corolla lobes acute. Veins on calyx parallel **2. C. pulmonarium**
- 2a. Corolla lobes obtuse. Veins on calyx not parallel 3
3. Veins on calyx lobes numerous and very finely reticulated **4. C. pedunculata**
- 3a. Veins on calyx lobes few and not finely reticulated 4
4. Stem short and branched from base. Calyx marginate or rimmed **1. C. falcatum**
- 4a. Stem branched, from middle or above. Calyx emarginate or unrimmed
3. C. pseudopulmonarium

- 1. Comastoma falcatum** (Turcz. ex Kar. & Kir.) Toyok. in Bot. Mag. (Tokyo) 74: 198. 1961; Ma in Fl. Intramongolica 5: 81. 1980; Ho in Fl. Rep. Pop. Sin. 62: 306. 1988.
- = *Gentiana falcata* Turcz. ex Kar. & Kir. in Bull. Soc. Nat. Moscou 15: 404. 1842; Grossh. in Shishkin & Babrov (eds.), Fl. URSS 18: 617. 1952; Stewart in Nasir & Ali (eds.), Ann. Cat. Vasc. Pl. Pak. Kashm.: 555. 1972.
 - = *Gentianella falcata* (Turcz. ex Kar. & Kir.) Smith in Nilsson, Grana Palynol. 7: 107. 1967; Chater in Hara & al., Enum. Fl. Pl. Nep. 3: 94. 1982. **Syntypes:** In humidis alpis Nuchusaban, 1834, *Turczaninow* (LE-Photo!); in lapidosis summarum alpium Alatau ad Sazchan et Aksu, *Karelin & Kiriloff* 1712 (LE-Photo!).
 - = *Gentiana tenella* Fries var. *falcata* Griseb. in Gent.: 249. 1839; Clarke in Hook. f., Fl. Brit. Ind. 4: 110. 1883.

Specimens examined. — Gilgit: 74°30'E, 36°5'N, 15.000', 12.8.1961, *Flower-Ellis R-9* (K); Hazara-Gilgit: 14 km from Babusar village on way to Babusar top, 5.9.1988, *Omer & Qaiser 2678 & 2681* (KUH); Kashmir: Ladakh, above Choretren Chen, 17.000', 19.8.1931, *Koelz 2664* (NY); Baltistan: Lal Pir, 13.500', 10.8.1936, *Koelz 9542* (NA, NY, RAW); Karakorum glacier, near corner camp, 13.830', *Conway 266* (K); Thalle La, 15-16.000', 18.8.1940, *Stewart 20758* (NY, RAW); Talala (Thalle La), 13.000', *Koelz 9740* (NA, NY); Kichih Kundan glacier, 16.500', 28.7.1929, *Ludlow 576* (BM); Ladak, Zingpoche, 18.000', 3.8.1931, *Koelz 2527* (NY); Sasis pass, 15.000', Karakorum trade route, Ladak, 11.8.1928, *Ludlow 477* (BM); Shish nag, E. Lidder valley, ± 12.000', 16.8.1946, *Vaid s.n.* (NY); Apharwat, 13.000', 11.8.1919, *Rich 1251* p.p. (K).

Distribution. — USSR, Afghanistan, Pakistan, China, India, Bhutan, Tibet and Nepal (Fig. 5).

An Irano-Turanian element, which extend into Sino-Japanese region in Nepal and in Kashmir.

Fl. Per. — August-September.

Flowers fairly late in the months of August and September.

Ecology. — Grows in alpine meadows in dry areas, among grasses at an elevation of 12-18.000'.

- 2. Comastoma pulmonarium** (Turcz.) Toyok. in Bot. Mag. (Tokyo) 74: 198. 1961; Ho, l.c., 307.

- = *Gentiana pulmonaria* Turcz. in Flora, Beibl. 1: 19. 1834 (nom. nud.); in Bull. Soc. Nat. Moscou 22: 317. 1849; Grossh., l.c., 616. **Type:** In rupestribus jugo subalpinis prope terram ten Tschultau 1829. *Turczaninow* (Holo & Iso LE, Photo!).

Specimens examined. — Kashmir: Sakti, Ladak, alt. 13.000', 4.8.1931, *Koelz 2538e* (NY); Luderwas Mt., Sonamarg, 13.000', 11.8.1928, *Stewart 9874a* (NY); Haramukh, 1.8.1940, *Ludlow & Sherriff 7894* (BM).

Distribution. — USSR, China, Pakistan, India and Tibet (Fig. 5).

An Irano-Turanian element.

Fl. & Fr. Per. — August.

Ecology. — A herb of alpine meadows, growing at an elevation of 12-18.000'.

A new record for Pakistan.

- 3. Comastoma pseudopulmonarium** Omer, spec. nov. (Fig. 4). **Type:** Bashahr State, Labrang to Runang pass, 19.8.1890, *J. H. Lace 540* (Holo-E!; Iso-E!).

Herba biennis, glabra, viridis, usque ad 15(-20) cm alta, ramosa. Caulis evolutus, ramus quisque flore terminatus. Folia basalia rosulata, 0.8-1.3 × 0.4-0.7 cm, elliptico-ovata, acuta, integra; folia caulina biformia; ea ramos axillares fulcrantia majora: 0.8-2.0 × 0.4-0.75 cm, ovata, acuta, integra, sessilia; ea ramos floriferos fulcrantia: 0.3-1.0 × 0.1-0.25 cm, lineari-lanceolata, acuta, integra, sessilii. Flores solitarii, pentameri, pedunculo usque ad 8 cm longo, suffulti; flores 0.8-2.0 cm longi, campanulati. Calyx 5-lobus, lobi inaequilongi, paribus binis inter se aequalibus;

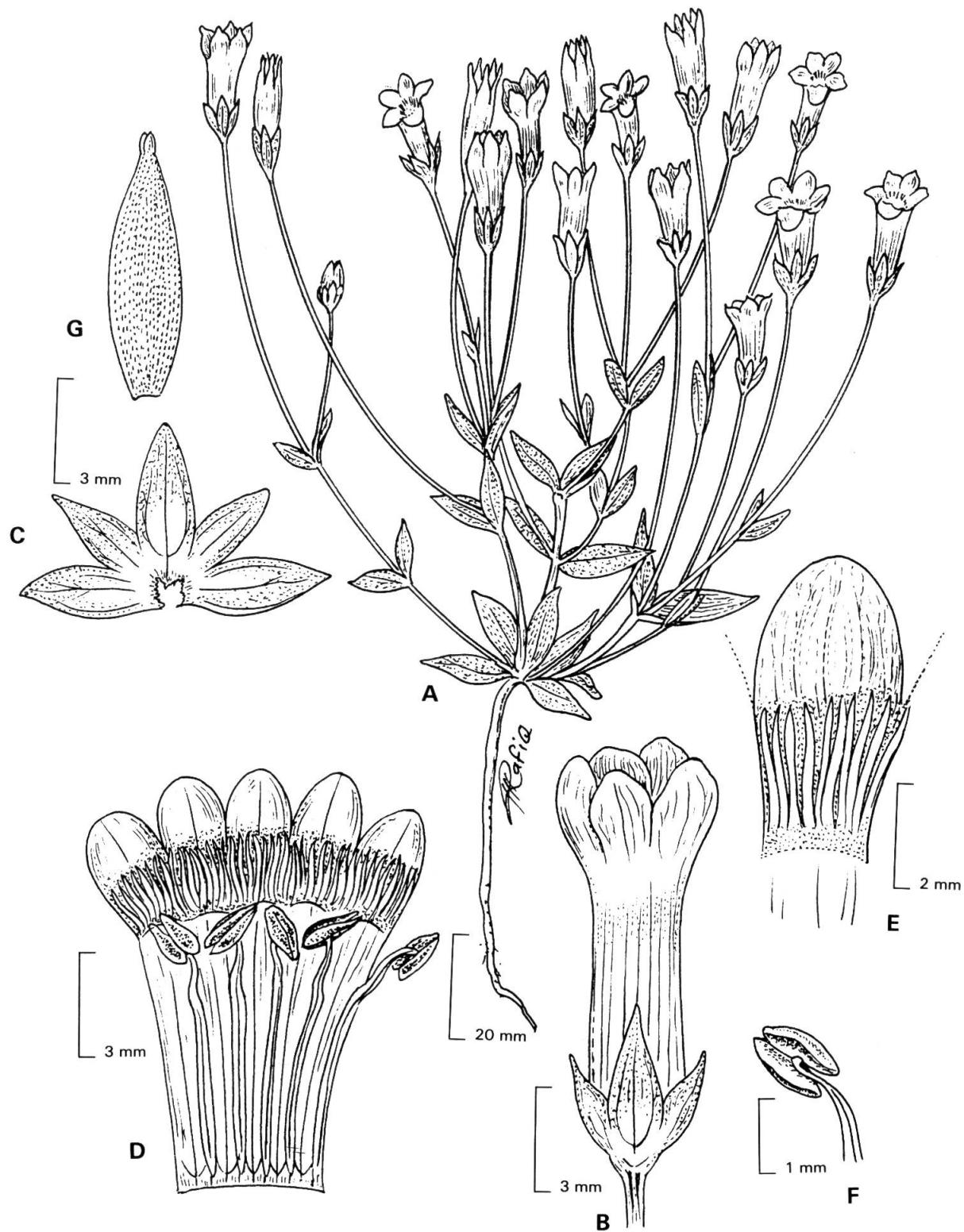


Fig. 4. — *Comastoma pseudopulmonarium*.
a, habit; b, flower; c, calyx; d, opened corolla; e, enlarged portion of corolla lobe to show fimbriae; f, stamen; g, ovary (Lace 1245, E).

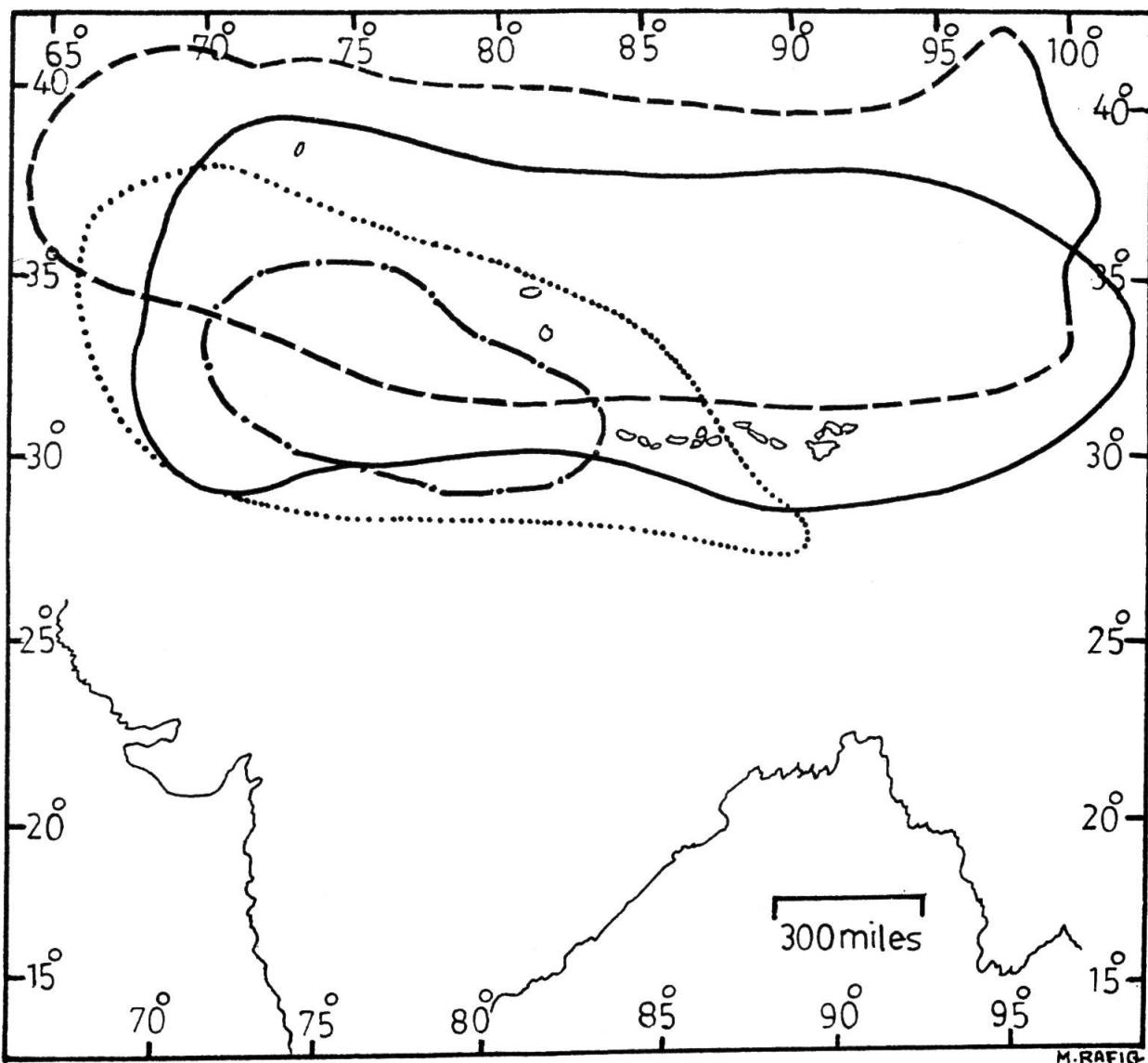


Fig. 5. — Distribution pattern of *Comastoma falcata* (— — —); *C. pulmonarium* (—); *C. pseudopulmonarium* (· — · — · — ·) and *C. pedunculata* (· · · ·).

per minimum: $0.3\text{-}0.6 \times 0.1\text{-}0.2$ cm, lanceolatum, acutum, integrum; per maximum: $0.4\text{-}0.7 \times 0.15\text{-}0.3$ cm, lanceolatum, acutum, integrum; per quintum maximum: $0.45\text{-}0.8 \times 0.15\text{-}0.35$ cm, late lanceolatum, acutum, integrum, omnia obsolete parelleli nervosa. Corolla 0.8-2.0 cm longa, tubus quam lobi duplo longior (0.5-)0.6-1.5 cm longus; lobi 0.4-0.8 \times 0.2-0.45 cm, obovati, obtusi, integri, fimbriati, fimbriis aequilongis, subexsertis, linearibus, acuminatis. Stamina 5; filimenta filiformia, corollae fauci in vel supra medium adnata; antherae dorsifixae, bicellulares, ovatae. Nectaria ad corollae faucem sita. Capsula subexerta vel exserta, 1.5-2.0 \times 0.35-0.55 cm, lanceolata. Semina numerosa, non striata.

Specimens examined. — Kashmir: Apharwat, 10.000' upward, Sept. 1929, Steans 52 (E); Shish Nag, upper Lidder valley, 12.000', 31.8.1925, Stewart 8391a (NA); Baltistan: Shingo valley, near Gulteri, 11-12.000', 5.7.1892, Duthie 11822 (E, O); Chogolisa glacier, August 1955, Francis 45 (RAW).

Distribution. — Himalayas and Karakorum (Fig. 5).
An Eastern Irano-Turanian element.

Fl. & Fr. Per. — July-September.

C. pseudopulmonarium Omer comes very close to *C. pulmonarium* (Turcz.) Toyok. and *C. pedunculata* (Royle ex D. Don) Holub. The general habit of *C. pseudopulmonarium* Omer is identical to the habit of *C. pulmonarium* (Turcz.) Toyok. whereas the flower size and shape exactly matches the *C. pedunculata* (Royle ex D. Don) Holub. From *C. pulmonarium* (Turcz.) Toyok., it differs on shape and size of flower, and differs from *C. pedunculata* (Royle ex D. Don) Holub on the basis of general habit.

4. *Comastoma pedunculata* (D. Don) Holub in Folia Geobot. Phytotax. Praha 3: 218. 1968; Ho, l.c., 310.

- = *Eurythalia pedunculata* D. Don in Lond. Edinb. Philos. Mag. J. Soc. 8: 76. 1836.
- = *Gentiana pedunculata* Royle ex G. Don, Gen. Syst. 4: 182. 1837; Stewart, l.c., 557.
- = *Gentianella pedunculata* (D. Don) Smith in Nilsson, Grana Palynol. 7: 144. 1967; Chater in Hara & al., l.c. 94. **Type:** Habitat in Chachemire et Kunawur, *Royle* (LIV!).
- = *Gentiana tenella* auct. non Rottb.: Clarke in J. Linn. Soc. 14: 434. 1875; in Hook. f., Fl. Brit. Ind. 4: 109. 1883.

Specimens examined. — Chitral: Drosh, Beorai Gol, 12.000', 28.7.1958, *Bowes-Lyon* 212 (BM); Gilgit: Manu Gah nala, 12.500', 31.8.1950, *Thornley* 22 (BM); Kashmir: Yamharu pass, 13-14.000', 13.8.1893, *Duthie* 13569 (BM, E, K); id., 14.000', Sept. 1931, *Stewart* 12935 (K); Sonamarg, 9000', 5.9.1917, *Stewart* 3626 1/2 (K, NY); id., 18.8.1928, *Stewart* 9898a (K); Thajiwas, Sonamarg, 13.000', 13.8.1940, *Ludlow & Sherriff* 7930 (BM, E); Rajparyan sanctuary, 10.500', 13.8.1943, *Ludlow & Sherriff* 9296 (BM, E); Zoji-Matayan, Ladak road, 29.8.1922, *Stewart* 7545 (K); Zoji La, 11.500-12.000', 27.8.1940, *Ludlow & Sherriff* 8033 (BM, E); Gumbo nullah, Zoji La, 12.000', 25.8.1940, *Ludlow & Sherriff* 8017 (BM); Apharwat, 13.000', 12.8.1956, *Polunin* 56/223 (BM, E); id., 11.8.1919, *Rich* 1251 p.p. (K); Kolahoi valley, 11-12.000', 8.8.1893, *Duthie* 13518 (K); id., 11.000', 26.8.1956, *Polunin* 56/509 (BM); id., 14.200', 27.8.1956, *Polunin* 56/545 (BM); id., Sept. 1913, *Mrs. Evershed* s.n. (BM); Shingo valley, near Gurais, 11-12.000', 5.7.1892, *Duthie* II822 (BM); Top of Apharwat, 13.000', 27.8.1933, *Venning* K-70 (K); Tilail, 12.000', 24.8.1876, *Clarke* 30718A (K); 30718B (BM); Vishansar, 12.000', 17.8.1940, *Pinfold* 365 (BM); Gulmarg, 10.000', Sept. 1922, *Barbour* s.n. (BM); Panamils, Nubra valley, 10.400', 13.8.1928, *Ludlow* 488 (BM); Kimi, upper Nubra valley, 11.050', 26.7.1947, *Schomburg* 17 (BM); Nund Koi, 11.500', 14.8.1940, *Pinfold* 285 (BM); Zojpal, Sept. 1913, *ibid. s.n.* (BM); Tibet, Shingtsakbi, on the left side of the Mustak glacier below Tsoka, 19.8.1956, *Schlangintweit* 6030 (BM); Nubra, Kartas to Kharand, 15.8.1856, *ibid.* 2429 (BM); Astonmarg, 10.500', August 1936, *Timins* 205a (BM); Rama valley, S.W. of Astore, 13.000', 3.8.1967, *Lankaster & Prescott* TEL 1383 (BM); id., 12.000', 9.8.1967, *ibid.* TEL 1469 (BM).

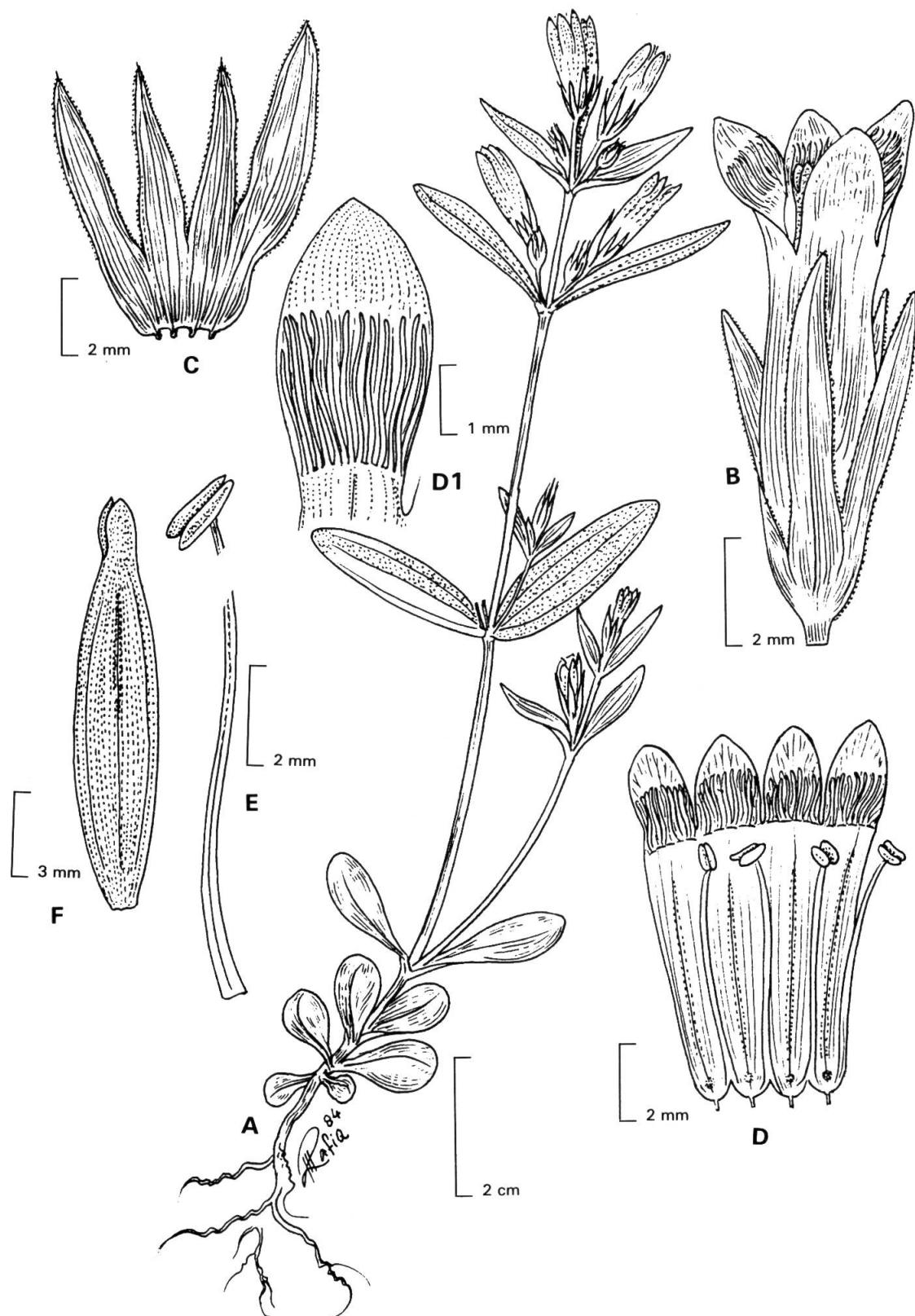
Distribution. — Pakistan, India and Nepal (Fig. 5).

A Sino-Japanese element, penetrating in Irano-Turanian region also.

Fl. Per. — August-September(-November).

Ecology. — Grows near the water channels or in the moist grass lands, at an elevation of 8-14.000'.

The type is based upon Royle's collection (LIV!), which was actually described by D. Don (1836). Earlier, it was assumed that type specimen is at K. However, present investigations cleared these doubts.

Fig. 6. — *Comastoma borealis*.

a, habit; **b**, flower; **c**, calyx; **d**, opened corolla; **d1**, enlarged portion of corolla lobe to show fimbriae; **e**, stamen; **f**, ovary (R. Stewart 26516, RAW).

5. *Comastoma borealis* (Bunge) T. N. Ho (Fig. 6).

- = *Gentiana borealis* Bunge in Nouv. Mém. Soc. Imp. Nat. Moscou 1: 251. 1829; Clarke in Hook. f., l.c., 109; Stewart, l.c., 554. **Type:** Habitat ad sinum Kotzebuensem Americae borealis, ubilecta, *Chamisso & Eschscholtz* (LE).
- = *Gentiana ajanensis* Murb. in Act. Hort. Berg. 2(3): 24. 1892.

Specimens examined. — Gilgit: Naltar valley, 11.000', 23.7.1954, *Stewart* 26516 (BM, RAW); id., 11-12.000', 4.8.1892, *Duthie* 12415 (BM); Minapin glacier, Nagar state, 10.000', 1.8.1961, *Lloyd & Megan* 23 (BM); Gilgit, 74°30'S, 36°5'N, 15.000', 12.8.1961, *Flower-Ellis* R-7 (K); Gilgit-Hazara: 8 km from Babusar village on way to Babusar top, 5.9.1988, *Omer & Qaiser* 2648 (KUH); Kashmir: Cachemire, Imit, 3600 m, 2-3.8.1954, *Schmid* 2082 (BM, RAW); East of Sekambaris glacier, 13.000', 8.8.1939, *Scott-Russel* 1547 (BM); Yengutsa glacier, 13.000', south of Hispar village, 23.8.1960, *Polunin* 6382 (BM); Baltistan: above Skardo, 10.000', 16.8.1936, *Koelz* 9640 (NA); Skardo to Satpar valley (South of Skardo), 2.9.1856, *Schlagintweit* 5548 (E); Thalle La to Bagmaharal, 30.8.1856, *Schlagintweit* 5935 (BM); Karpuchu nala, 11-12.000', 9.7.1892, *Duthie* 11943 (E); Shigar Nulla, 10.000', 22.8.1936, *Koelz* 9708 (NA).

Distribution. — Pakistan (Kashmir, Hazara, Gilgit, and Baltistan) America(?) (Fig. 7).

The type locality of *Comastoma borealis* inadvertently indicated as North America, “boreali America”. As there are no reports from North America and seems to be confined in Kashmir and

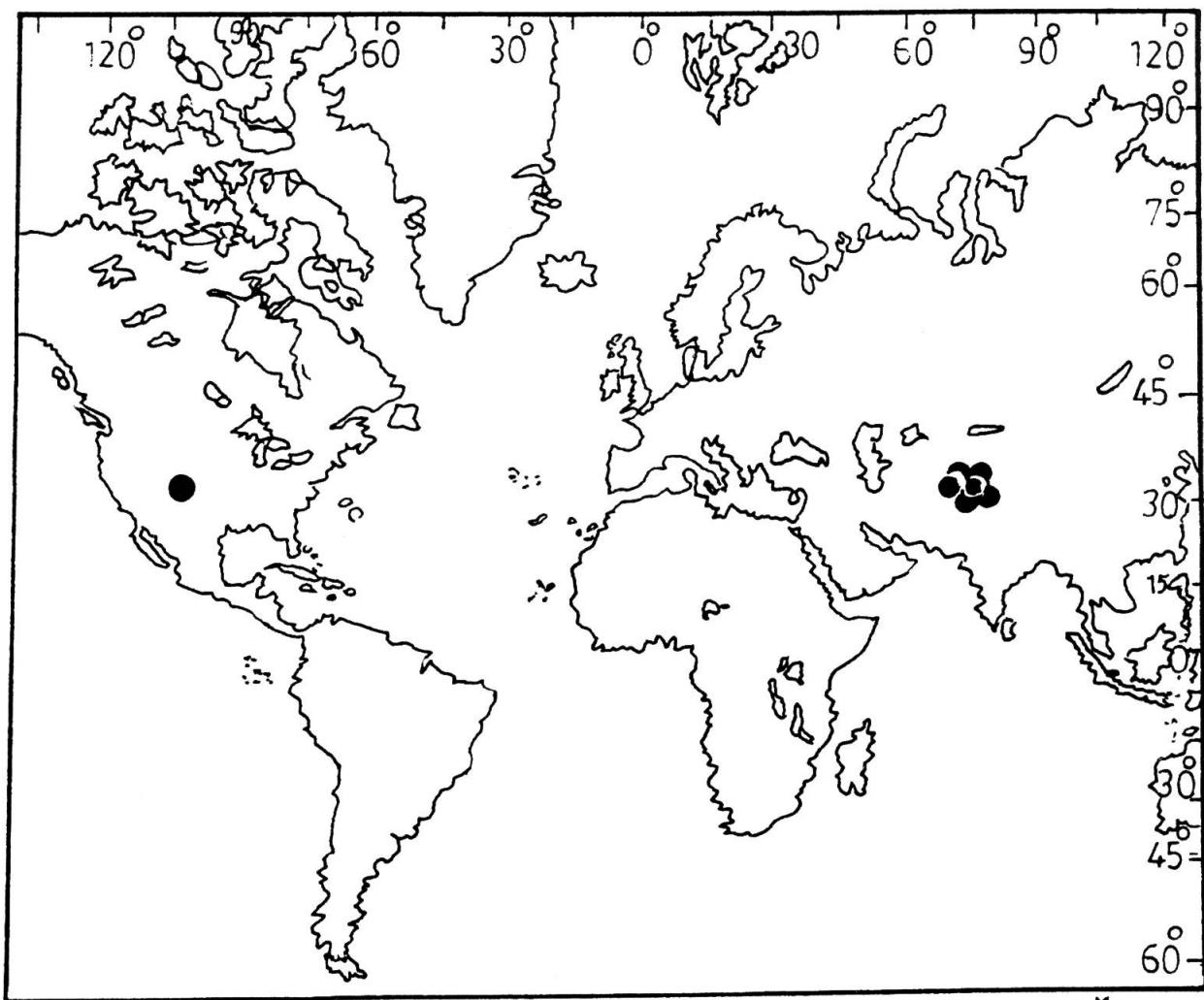


Fig. 7. — Distribution pattern of *Comastoma borealis* (●).

Baltistan. However, the type specimen is untraceable and the concept is strictly based on the original description and the figure supplied by BUNGE (1829).

Fl. Per. — July-September.

GILLET (1957) has treated this taxon as conspecific with *Comastoma tenellum* (Rottb.) Toyok. But it differs from it in several respect. In *C. borealis* (Bunge) Ho, the flowers are very shortly pedunculate, whereas the flowers are borne on long peduncles in *C. tenellum* (Rottb.) Toyok. The flowers are pentamerous and long pedunculate in *C. tenellum* (Rottb.) Toyok.

A formal combination of the species has not been proposed. Though, in "An Enumeration of the Vascular Plants of Xizang (Tibet)", published by Academia Sinica (year of publication is not known), it is indicated that a combination exist, which was proposed by T. N. Ho.

ACKNOWLEDGEMENTS

The author is thankful to Professors M. Qaiser and S. I. Ali (KUH) for the help and encouragement during course of study. The latin description of the new species is provided by Prof. Dr. K. H. Rechinger (W), for which the author is extremely thankful. I am also thankful to Prof. Dr. H. W. Lack, Dr. M. I. Hakki (B); Mr. I. C. Hedge, D. J. Long, Dr. R. R. Mill (E); Dr. R. K. Brummitt, Dr. D. Goyder, Dr. K. Vollesen (K); Dr. S. L. Jury, Prof. Dr. J. B. Harborne (RNG); Dr. C. E. Jarvis and Mr. R. Vickory (BM). The loan of material and the facilities extended during the visit to the following herbaria is also acknowledged: B, BM, CAL, E, G, K, KUH, LE, LINN, O, P, PES, PPFI-B, RAW, RNG and W. The financial assistance from USDA and ODA is also acknowledged here.

REFERENCES

- BUNGE, A. de (1829). Conspectus generis Gentianinae, imprimis specierum Rossicarum. *Mém. Soc. Imp. Moscou* 1: 197-256.
 CHATER, A. O. (1982). Gentianaceae. In: HARA & al. (eds), *An Enum. Fl. Pl. Nep.* 3: 90-95.
 ERDTMAN, G. (1952). *Pollen Morphology and Plant Taxonomy*. Almqvist and Wiksell, Stockholm.
 GARG, S. (1987). *The Gentianaceae of North West Himalayas*. Todays and Tomorrow Printers, New Delhi.
 GILLET, J. M. (1957). A revision of the North American species of Gentianella Moench. *Ann. Missouri Bot. Gard.* 44: 195-269.
 LÖVE, A. (1986). In: LÖVE, A. (ed.), Chromosome number reports, XCIII. *Taxon* 35: 897-903.
 LÖVE, A. & D. LÖVE (1975). The Spanish Gentians. *Anales Inst. Bot. Cavanilles* 32: 221-232.
 MA, Y. C. (1980). Gentianaceae. In: MA, Y. C. (ed), *Fl. Intramongolica* 5: 66-95.
 NILSSON, S. (1967). Pollen morphological studies in Gentianaceae-Gentianinae. *Grana Palynol.* 7: 46-145.
 OMER, S. (1991). *Biosystematic study of Gentiana L. (s.l.) from Pakistan and Kashmir*. Ph. D. Thesis, University of Karachi.
 OMER, S. & M. QAISER (1991). Aliopsis Omer & Qaiser, a new genus of Gentianaceae. *Willdenowia* 21: 189-194.
 OMER, S. & M. QAISER (1992). The generic limits in Gentiana L. (s.l.) from Pakistan and Kashmir. *Pak. J. Bot.* 24 (in press).
 PHILLIPSON, W. R. (1972). The generic status of southern hemisphere Gentians. *Adv. Pl. Morph.*: 417-422.
 SMITH, H. (1967). Appendix. In: NILSSON, S., Pollen morphological studies in Gentianaceae-Gentianinae. *Grana Palynol.* 7: 144-145.
 TOYOKUNI, H. (1961). Séparation de Comastoma, genre nouveau, d'avec Gentianella. *Bot. Mag. (Tokyo)* 74: 198.
 TOYOKUNI, H. (1962). Further remarks on the genus Comastoma Toyok. *Acta Phytotax. Geobot.* 20 (Spec. No.): 136-138.
 TOYOKUNI, H. (1965). Systema Gentianinarum Novissimum — Facts and speculations relating to the phylogeny of Gentiana, sensu lato and related genera. *Symbolae Asahikawensis* 1: 147-158.
 ZUYEV, V. V. (1985). On the systematics of the representative Siberian genus Gentiana s.l. (Gentianaceae). *Bot. Zhurn.* 70: 916-923.

