Ho Ting-nung & Liu Shang-wen 1980:
Lomatogoniopsis T. N. Ho & S. W. Liu, a new genus of Gentianaceae. -
Act. Phytotax. Sinica 18: pp. 466-468.

Gentianinae - an exercise in evolutionary classification

by

Áskell Löve and Doris Löve

Department of Environmental, Population and Organismic Biology

University of Colorado, Boulder, Colorado 80302, U. S.A.

Abstract.

This paper constitutes a discussion of the principles of evolutionary classification at the generic level, with emphasis on the significance of basic chromosome numbers as demonstrated within the subtribe Gentianinae of the family Gentianaceae. It is argued that the natural genus is an important evolutionary cluster of related species formed by evolution through linear-branching from a generic prototype and characterized by a single basic chromosome number and incompatibility towards other such groups. It is also concluded that the primary basic number in this family is x = 5, with an ascending dysploid and alloploid series which transects the collective and heterogeneous genera of previous classifications. The acceptance of more restricted and homogeneous genera for the subtribe Gentianinae is advocated by aid of concrete proposals of names to be applied to the evolutionarily distinct groups. The genera adopted are arranged into three supposedly evolutionary lines with information on their basic chromosome numbers, a proposal supplementary to the well conceived phylogenetic tree for the group recently advocated by Toyokuni. It is observed that since species may have been misplaced in sections and genera of the previous system, a more detailed revision of the correct composition of some of the genera may be needed.

Therefore, only a few nomenclatural transfers and emendations are proposed. The new genus *Mehraea* is validated to accomodate the very distinct species *Mehraea phyllocalyx*, formerly *Gentiana phyllocalyx* of the subsection *Phyllocalyx* of the section *Frigida*. Also, the new subgenus *Soogentianella* is described to enclose the sections *Soogentianella* (= *Antarctophila*) and *Andicola* of the genus *Gentianella* from austral regions of the world.

In the family Gentianaceae there have been described more than 1200 species which are met with in almost every situation in all parts of the continents from the equinoctal areas of the warm regions to the cold lands of nightless summers. The taxa of the family are as frequent in dry and sandy soils as they are in marshes and cultivated fields, and they occur in forests and grasslands as well as in moors and on the ocean shore, and many species prefer alpine conditions even close to glaciers. Most taxa grow continuously over large or limited areas, but there are species which seem to be congeneric not only on both the large northern continents but even in two widely disjunct regions further south, as, e.g., the genus Microcala Hoffmsg. & Link of the Mediterranean in Europe and the Californian and Peruvian foothills in North and South America. There are even traces of the same species which are known to inhabit both the sides of the Atlantic Ocean in Africa and South America.

Although the diversity of the family has classically been grouped into 70 (Wagenitz 1964) to 80 (Airy Shaw, in Willis 1966) genera, which have been classified into five tribes and five subtribes, more than half of the species have been included in the subtribe Gentianineae and, actually, in the very collective genus Gentiana, which was accepted by Linnaeus (1753) in the same meaning as given to it by Tournefort (1700). He, in turn, had adopted it from Celsus and Scribonius Largus. The family is represented by many genera in the Balkan Peninsula, but it is not certain that the plant so named from the ancient area of Illyria by Scribonius Largus in commemoration of the ancient King Gentius actually was a Gentiana in the sense of Tournefort and later authors. Since Linnaeus, the genus has been repeatedly split into smaller and supposedly more natural units on basis of morphological differences. However, all such attempts were largely ignored by the last monographer, the Russian botanist Kusnetzov (1895, 1896-1904), who entertained the immense diversity of what he called *Gentiana* in the two subgenera *Gentiana* and *Gentianella* and nineteen sections, to ~~which~~ which Wettstein (1896) soon added the twentieth. This has been accepted ever since, although minor revisions mainly connected with the acceptance of *Gentianella* as a genus and some reduction in the number of sections have been made, at the initiation of Schustler (1923), by Smith (1936, 1961, 1965, in Hylander 1941, 1945, and in Nilsson 1967a).

Some of the difficulties connected with the classification of the large genus into more natural units seem to be caused by the fact, that most of its showy characteristics are met with in every species, probably as a result of a high degree of homozygotization early in the history of the group, which there is reason to believe was formed early in the evolution of higher plants in southeastern Asia. This was especially pointed out by Gilg (1895), who selected pollen characteristics as the best and main basis for the subdivision of the family into tribes and subtribes. Palynological data have also been found to be of significance at lower taxonomic levels in the family (Nilsson 1964, 1967a,b, 1968, 1970a,b), although only a few have been utilized so far for important conclusions at the generic level. The difficulties in delimiting the genera have, however, not been caused as much by confused characteristics as by confused concepts of how to delimit this level in general, because very few taxonomists seem to have followed the learned advice of De Candolle (1813) on the practical convenience of natural genera.

Our modern ideas of natural classification arise from the work of John Ray in the seventeenth century (1674, 1682). He accepted the older philosophical terms of genus and species and gave them the special meaning they have for biologists today. Although he had difficulties in defining these concepts exactly, because knowledge of biological phenomena was limited, he showed how genera and species could be adequately described. On his ideas rests the whole of our interpretation of the relationships of living beings.

Linnaeus, who was concerned essentially with identification, based his classification on that of Ray, who was aiming at a natural classification. He emphasized (Linnaeus 1737, 1751) that the most important categories are the genus and the species. The former unites related species, and elsewhere and later he indicated that all the species of a genus might have developed from a generic prototype. It follows that even in times prior to the acceptance of the facts of evolution, leading taxonomists were of the opinion that all species of a genus must be closely related, whereas distinct genera ought to be clearly different from each other.

As biological taxonomy developed during the late eighteenth and early nineteenth centuries, it was perceived that there appeared to be a natural classification of a linear branching character to which successive subordinate divisions could be easily applied (De Candolle 1813). After Darwin (1859) it was realized that a natural classification of this sort must inevitably be expected following the theory of evolution. In fact, the manner of the origin of species by descent from common ancestors imposes not only a branching linear classification of the very kind which is most easily amenable to our linear logical arguments, but it also requires a clustering of species into increasingly larger categories linearly related back in time.

We place living beings in groups when there is a large class of assertions about any of them in such a way that any other object is very likely to possess almost all of them or almost none at all. Plants are likely either to have almost all the characters we can find in a felwort, or relatively few or none of them. Intermediates in any direction are rare. In this way, felworts and other organisms fall naturally into what we call species. But we also find that in turn certain species can generally be clearly grouped together by the common possession of a collection of characters absent in all other species. For among the exceedingly numerous characters that bind two individuals into a species there is a fairly large number of characters which they share with individuals of certain other species, and these related taxa constitute a unit of a higher order, the genus. A whole set of assertions can be made about all the species comprised in a genus which cannot be made about other species, and so on for higher groups, as tribes, families, orders, and so on. In the natural classification of organisms, these successive classes are arranged in strict subordination, and the whole system branches from a single stem.

A classification convenient and satisfactory to logic requires two basic features. It must be a linear system which can be subjected to logical dichotomies, and the objects to be classified must be capable of precise definition. There is no arbitrary reason why the biological world of which we are aware should not condescend to meet these requirements. As a matter of fact, our natural classification of living beings shows linear subordination of the taxa. Also, it clearly allows us to make precise definitions, although groups of non-evolutionary inclined plant taxonomists continue to gainsay this. However, most taxonomists agree that the species and the genus are natural units of distinct and significant reality, and that the main purpose of scientific taxonomy is to define these and other natural categories and not only to invent means to recognize them in nature and the herbarium (cf. Kirpicznikov 1968; Legendre 1972; Löve 1963, 1964).

Though there are undoubtedly some difficult cases where species are hard to distinguish or even seem to grade into each other, in the very great majority they are quite clear, and when one critical biologist speaks to another about species, he is not talking about something that does not exist. Even Ray (1682) defined species by their incompatibility of interbreeding or by their lack of even potential miscibility, as do modern cytogeneticists and evolutionists (cf. Mayr 1942, 1963; Löve & Löve 1942; Löve 1964; Grant 1963, 1971; Legendre 1972). But subspecies have long been assumed to be potentially capable of interbreeding without reduction in fertility, because they are major geographical races corresponding to those of the human species (Hultén 1968). The differences are inherent in the different evolutionary processes that shape races and species, because the former are produced by gene mutation, probably mainly those creating codominant genes, genetic recombination and natural selection, and genetic recombination requires interfertility. Species, however, are formed by the chromosomal process of rearrangement of large or small segments of the chromosomes, or by polyploidy, both of which prevent or at least counteract fertility that is needed for a proper miscibility which would break down all barriers between such units. Since chromosome number differences are the most obvious indicators of effective reproductive isolation and barriers to miscibility, we regard their discovery as a sufficient warning against including such populations that differ in this respect in the same species.

It is sometimes held that, compared with the species, the genus and higher categories are mere abstractions. But it is significant that even the common man identifies living beings, as belonging to the same genera before experience teaches him to identify species, and Linnaeus himself was originally concerned with self-evident genera or groups of related species.

The Linnaean definition of a genus as a cluster of species that might have developed from the same prototype is not much different from the evolutionary definition that requires that a natural genus includes only species which have evolved from the same original ancestor without dysploid changes in the basic number of chromosomes or genetical changes in the size and morphology of chromosomes. Linnaeus avoided genera that hybridized, and modern taxonomists allow some crossability, not miscibility, between species of a genus, but tolerate no crossability between good genera. From the point of view of evolutionary mechanisms, a genus evolves into few or many species by a differentiation of the chromosomes without changing the basic chromosome number or by various kinds of polyploidy, whereas a new genus is produced by dysploid changes in basic numbers, or by drastic changes in chromosome size and karyotype which create an absolute barrier to crossability with its former relatives and forces it into a new linear evolution of new species by aid of the gradual or abrupt processes mentioned above.

Since the size of a genus is without limits, some genera are restricted to a single species, whereas others may have developed hundreds or thousands of species without forming any crossability barrier that would have forced them into a specific generic evolution. Sometimes taxonomists have found it convenient to subdivide homogeneous genera, or even to split them into smaller morphologically separable genera which lack the biological barrier to crossability. As long as it is understood that this is done for convenience and in the full comprehension of their not being evolutionary distinct, such a procedure should be permitted, because it is not a sin against evolutionary principles to separate for the reason of taxonomical expediency clusters that are otherwise identical. However, it certainly is a violation of the basic principles of evolutionary classification if evolutionary heterogeneity is included in a category, because this is no convenience and will confuse innocent users who expect species and genera and higher categories to be homogeneous and formed by linear evolutionary processes only.

This carries us back to the family Gentianaceae and its subdivisions. It is evident from a comparison between the classification of the family into tribes and subtribes by Grisebach (1845), Bentham & Hooker (1876) and Gilg (1895) that the family is homogeneous in characteristics conventionally used for such schemes (Hutchinson 1969) and that it is a distinctly natural unit in itself. The need to emphasize pollen morphology as the most safe basis for its subdivision into higher categories, as done by Gilg (1895), substantiates this fact at the same time as it may seem to overlook the possibility to combine more visible characteristics for the recognition of categories of the distinctness expected of tribes and subtribes. At the generic level, the trouble seems to be more that of a lack of definition than of a lack of recognizable differences, as shown by the fact that the number of generic and sectional groups varies considerably with different authors. Although most taxonomists looking closer at the group during two centuries have realized that the genus Gentiana in the sense of Linnaeus (1753) is much too inclusive and unnatural, plenty of attempts at its regrouping into smaller and more natural units since Adanson (1763) and Gleditsch (1764) have been thoroughly ignored so that even the last review (Smith, in Nilsson 1967a) prefers to accept only twelve genera of the largest subtribe Gentianineae, four of which include from two to nine heterogeneous sections. The improvement of the generic classification of this subtribe has actually been negligible since the revision by Grisebach (1845) and especially from that by Kusnetzov (1895, 1896-1904) until the likewise only morphologically conditioned revision by Smith (in Nilsson 1967a).

With the advent of the methods of cytotaxonomy that require a more biological definition of the generic and species categories, a new approach to the classification of the family into natural genera became available. A few and scattered cytological reports on genera of Gentianaceae had been published before 1949 (cf. Rork 1949), but since then these studies have been intensified and their results have become more exact with the introduction of better techniques. Although most authors have been satisfied to report their results without drawing taxonomical conclusions, D. Löve (1953) argued, on basis of extensive studies of boreal taxa and a review of available information, that especially the genera Gentiana and Gentianella in the sense of Kusnetzov and Smith are clearly too inclusive and very heterogeneous groups characterized by a great variation in basic number and karyotype. She strongly advocated a division of these collective taxa into smaller and more natural genera based on intensified investigations. Later authors have substantiated her conclusion in various ways, and then especially Löve & Löve (1956, 1961a,b, 1972), Gillett (1957, 1963), Fabris (1953, 1958, 1960), Toyokuni (1961, 1963, 1965a,b, 1967, 1968), Iltis (1965), Mason & Iltis (1965), Mayer (1954, 1968, 1969), and Holub (1967, 1968, 1970, 1972). Several of these authors have favored smaller and better defined genera for groups of the inclusive genera of the past, and some have proposed preliminary systems of genera to replace the confused sectional division by the last generation. Palynological investigations, which were found to be most important for the classification of the family and its higher subdivisions by Gilg (1895), have also been revitalized and made new observations available for taxonomical studies also at the lower levels, by Nilsson (1964, 1967a,b, 1968, 1970a,b).

It ought to be emphasized that basic chromosome numbers to be used for evolutionary considerations must be the primary numbers for each particular taxon, irrespective of their origin as dysploid changes of older numbers or as the compound numbers for a secondary polyploid series. Such numbers are not necessarily the lowest haploid numbers so far observed within each group, but rather the hypothetical numbers at the monoploid level for a presumed polyploid series, the diploid and lower polyploid numbers of which may be unknown or even extinct. Frequently, the lowest number known for a genus may be the tetraploid one until suddenly a rare species with the diploid number is found to be extant, as recently observed, e.g., in *Gentianella* (Mehra & Vasudevan, in Löve 1972). In a genus with no lower number than, for instance, 2n = 20, a fully fertile species found to have 2n = 30 must be regarded as being a hexaploid and thus a good indication that the monoploid basic number actually is x = 5 and not x = 10 or 15. Likewise, groups with chromosome numbers which are even multiples of, for instance, 10, ought to be regarded as having the basic number x = 5 if 2n = 10 is met with in some closely related genera, because it clearly indicates that the higher numbers are either derived or, more likely, not really the lowest number that is, or at least has been, met with in the group itself. Based on this reasoning, the claim by Löve & Löve (1961b) that the basic number for *Gentiana* s.str. is x = 10 rather than x = 5, as claimed by Favarger (1949), must be ignored despite the support given to the former conclusion by Holub, Měsíček & Javůrková (1970), for the simple reason that the lower number is characteristic also of some other genera of the family. It does not affect this argument that the original diploids may have become extinct in the course of evolution because diploids tend to be selected away by the time factor in old groups of plants (Löve & Löve 1971); and in all groups in which only the higher multiples are presently known there is long a possibility that a rare diploid may turn up when more of the generic diversity is sampled.

Since changes in the basic number of chromosomes clearly is an important factor in evolution, many authors have discussed possible causes of such variations. Important studies have been reviewed by Darlington (1965), Stebbins (1950, 1971), Tischler (1951), and, especially, Tischler & Wulff (1953-1963). It is evident from these reviews, that although the lowest basic number of the most primitive angiosperms may have been x = 7, as maintained by Ehrendorfer, Krendl, Habeler & Sauer (1968), lower and descending numbers could have been produced by aid of unequal translocations, as proposed by Babcock (1947) and strongly advocated by Stebbins (1950, 1971). But it is not excluded that the lowest and primary basic numbers now known have actually always been the lowest ones and that only an ascending series has been produced by aid of centric fragments (Stebbins 1971), or, probably more frequently, by aid of misdivision and duplication of single chromosomes (Lewis & Lewis 1955). It may even seem to be most likely that such an ascending series has been created mainly by a duplication of individual chromosomes to produce a dysploid series x = 2, 3, 5, 7 and that higher numbers have resulted from a simple addition or low polyploidy resulting in the numbers x = 4, 6, 8, 9, 11, 13, etc. It is possible that in genera of families with apparently high secondary basic numbers as, e.g., the Solanaceae, the numbers are the result of ancient polyploidy accompanied by some other less well understood process, and there is also certainly alloploidy originating from very rare crosses between related genera with dysploid basic numbers that must have produced most of the higher basic numbers, especially those of some Brassicaceae (Löve 1961) and the socalled secondary basic number x = 17 characteristic of all Malaceae (Darlington 1965).

It ought to be mentioned that although we and others, who have studied the classification of Gentianaceae in the light of its basic numbers, agree that in this family these characteristics are of the greatest importance for the correct delimitation of genera, this does not necessarily mean that this is an universal rule without exception also for other families. We could easily support a claim for the importance of basic numbers in the classification of many other groups, not least in the Pteridophyta, and in the splitting or subdivision of several notoriously too inclusive families and genera from various parts of the system. However, we are also aware of that in some genera an unduly strict adherance to the recommendation of separating groups with several basic numbers may lead to some difficulties that perhaps would counteract the advantages of such an exact evolutionary classification. In such cases it would perhaps be wisest to be content to begin with some doubts, rather than to risk a later retraction of a classification more optimistic than practical.

In the Gentianaceae no such doubts seem to be valid, since an evolutionary classification supported by basic chromosome numbers is also a practical one. We are aware, however, that more investigations are needed to consolidate the proposals here offered, and to put all the details together in a comprehensive monograph, if it were for nothing else but the fact that species placed even in the same section by previous authors frequently may have to be transferred to various genera. Such a wide reshuffle has, indeed, already been proposed for some species by Smith (1936, 1961, 1965, and in Nilsson 1967a), Toyokuni (1963, 1965a,b, 1967, 1968) and others, and some such changes indicated by the available data will also be mentioned below. We do not feel competent yet to propose such a wholesale series of transfers as will be ultimately needed to completely validate the system to be proposed, but expect that many such adjustments will be made slowly by those concerned with the limited number of species of selected areas when knowledge in this field increases.

This paper is meant to be only a preliminary attempt to solve an old problem at the generic level, a kind of a summary of our opinions on the evolutionary division of this large subtribe in light of available evidence, in the hope that our ideas and possible misjudgements may induce others to add still more to a sensible solution of this problem of evolutionary classification.

Although no cytological data are yet known from some of the genera of Gentianinae information on the morphology and palynology allow no reason to doubt the correctness of the acceptance of generic status for some of the small genera of the subtribe. This seems to be true for the genus *Ixanthus* Griseb., represented by a single species in the Canary Islands; *Crawfurdia* Wall., s.str. with around ten species in the Himalayas; *Latouchea* Franch. which is a monotypic genus from eastern China; and *Veratrilla* Franch. with its two Chinese species.

The monotypic genus *Pterygocalyx* of Maximovicz (1859), known to occur in the Amur and northern China, was accepted as such by Toyokuni (1963) but regarded as a section of *Crawfurdia* by Gilg (1895). Although cytological information still is lacking for this species, we are inclined to follow Marquand (1931) and Smith (1965), who regarded it as a species of the *Crossopetalum* section of *Gentianella*, which we place in the genus *Gentianopsis* Ma, because of its morphological and palynological (Nilsson 1967a) similarity to other species of this genus. Also, we agree with Smith (1965) in regarding *Tripterospermum* Blume with its about twenty species in southeastern Asia as a genus in its own right and not as a subgenus only of *Crawfurdia* as maintained by Gilg (1895). The only chromosome number report for this genus is that by Wada (1966), who reported 2n = 46 chromosomes, a number indicating, if exact, the basic number x = 23. It also ought to be mentioned here that we feel there are sufficiently strong morphological and palynological indications that the section Stenophora of Gentiana would be most adequately accomodated under the genus Tripterospermum, although cytological evidence is missing.

The genus Megacodon H. Sm. of Smith (1936) includes two Himalayan species the cytology of which remains unknown. Toyokuni (1965a) argued that this taxon would be better placed as a subgenus of Gentiana, close to its typical section. Since palynological evidence (Nilsson 1967a) is clearly in favor of a separate status for these species, they ought to be kept as a distinct genus for a time.

The small genus Jaeschkea Kurt with three species in the Himalayas, of which one species is known to be tetraploid with 2n = 20 chromosomes (x = 5), is closely related to Gentiana s.str., although clearly distinct from it.

Several reports of the basic number x = 11 from various species of the genus Halenia Borckh., which includes perhaps fifty species of mountains and tundras of Asia and both the Americas, indicate that this is a natural genus, despite various subdivisions proposed by Grisebach (1845), Gilg (1917), and Allen (1933).

The genus Swertia L. traditionally includes more than one hundred species inhabiting alpine regions of Eurasia, North America and Africa. It is a confused group as far as its morphology goes, and Nilsson (1967a) found great heterogeneity in the pollen morphology even within some of the accepted sections. The genus has been divided into ten genera by various taxonomists of the last two centuries (Agathodes D. Don, Anagallidium Griseb., Frasera Walt., Henricea Lem., Monobothrium Hochst., Ophelia D. Don, Rellesta Turcz., Sczukinia Turcz., Stellera Turcz., and Swertia L.) of which the monographer Grisebach (1845) regarded five as acceptable. Most later authors have ignored this and accepted only the genus Swertia including three sections, as proposed by Gilg (1895), although a more moderate and perhaps sensible solution is that of Grossheim (1952), who accepts Anagallidium Griseb., Ophelia D. Don. and Swertia L. for the taxa met with in the Soviet Union.

From the cytological point of view, Swertia in the wide sense includes various karyotypes and various degrees of polyploidy from the basic chromosome numbers x = 5, 6, 7, 8, 9, 13, though some of the numbers seem to be inexact or doubtful. A closer analysis may indicate that Swertia s.str. as restricted, e.g., by Grossheim (1952) circling around the Linnaean taxon S. perennis, has a uniform karyotype and is characterized by the basic number x = 7. North American species of Swertia s.lat., excluding S. perennis L., however, are characterized by the basic chromosome number x = 13, and they deviate distinctly in chromosome morphology and in their morphological and palynological characteristics from Swertia s.str. These North American species have been included in the genus Frasera Walt. The cytological and other distinction of Frasera clearly refutes the conclusion by Knoblauch (1894), Gilg (1895) and St. John (1941) who reduced it to synonymy only of Swertia, but supports the opinion by Card (1931), Post (1958) and Gillett (1963) that Frasera is a good natural genus. Morphologically and palynologically certain Asiatic species of the widely conceived Ophelia section of Gilg (1895) are also closely related to Frasera, according to Toyokuni (1965b) and Nilsson (1967a). Since those of these taxa which are safely known cytologically are also characterized by the basic chromosome number x = 13 and a similar karyotype, there seems a good reason to propose their transfer to the genus Frasera although it was originally described to accomodate only American species. It may even be suggested that the S. volkensii group from Africa studied by Hedberg (1957) may ultimately belong as a subgenus or section of Frasera, since its palynology is rather similar, the gross morphology not much different from that of some of the North American species, the basic chromosome number is the same, and the morphology and size of the chromosomes is similar or identical.

Another group of the collective genus Swertia has the basic chromosome number x = 5 and pollen morphology and gross morphology that indicates a much closer relationship with Lomatogonium A. Br. Indeed, Smith (in Nilsson 1964, 1967a) concluded that this group of Asiatic Swertiae actually belongs to the latter genus and so he transferred a selected number of these species to Lomatogonium. According to Nilsson (1967a), the East African species named as the S. crassiuscula-group by Hedberg (1957) are more or less identical in their pollen morphology to certain species of Lomatogonium; since they are also characterized by the same basic chromosome number, x = 5, and a similar chromosome morphology, in addition to several gross morphological traits, a transfer of this group to Lomatogonium seems to be well conceived.

As far as cytological information goes, the group accepted as the genus Ophelia D. Don in a restricted sense by Grossheim (1952) is characterized by the basic number x = 6, although only tetraploid species have been studied so far. It seems to be wise to retain this group as a distinct genus and to transfer only its section Dimaculatae to Frasera rather than the entire genus as proposed by Toyokuni (1965a), since this would secure homogeneity of both genera. The monotypic Siberian genus Anagallidium Griseb., which was retained by Grossheim (1952), is cytologically and palynologically unknown, so its systematic position remains insecure.

These alterations would reduce Swertia s.str. to a genus of perhaps less than fifty species of alpine situations from East Africa and Central Europe through southern and eastern Asia to western North America. The genus Frasera would include more than thirty species distributed from East Africa and South Asia to eastern North America. The genus Ophelia includes about twenty species of Asiatic mountains, and one Central Asiatic species belongs to Anagallidium.

The distinction of the genus *Lomatogonium* A. Br. (cf. Fernald 1919) has never been questioned, although there have been some discussions in recent decades as to its delimitation (Smith 1926, 1936, and in Nilsson 1967a; Löve & Löve 1956, 1961a; Toyokuni 1961,1962; and others). In its present circumscription it includes some fifty species which occur in alpine areas of East Africa, parts of Eurasia, and North America, from the subtropical mountains to the arctic zone. It is among the most primitive genera of the family, characterized by the basic chromosome number x = 5 and including species known to have from the diploid to the octoploid number. *Lomatogonium* may include the most primitive representatives of the Gentianaceae and stand close to the hypothetical genus *Progentiana* with its assumed double corolla and double stamens and reticulate pollen grains. The genus seems to be most closely related to the genus *Comastoma*, but it is also kindred to *Gentiana* s.str. and then especially to its section or subgenus *Coilanthe*.

This carries us to the genus *Gentiana* in the sense of Kusnetzov (1895, 1896-1904), or perhaps rather to the genera *Gentiana* and *Gentianella* in the sense of Smith (in Nilsson 1967a). Both these genera are divided into several sections by Smith and other authors, and both are heterogeneous assemblages of taxa of various relationships if looked at from morphological, palynological (Nilsson 1967a, 1970b), or cytological (D. Löve 1953) points of view, though the latter group is less so than the former. The most primitive species of *Gentianella* s.lat. are met with in the section *Comastoma* Wettst., which is morphologically related to *Lomatogonium* with which it also shares the basic chromosome number x = 5 and somewhat similar pollen grains which resemble also those of *Halenia*, although in that latter characteristics they are not identical (Nilsson 1967a). Löve & Löve (1956) concluded from this resemblance observed already by Wettstein (1896) that *Comastoma* ought to be transferred to *Lomatogonium*, whereas Toyokuni (1961, 1962) demonstrated that *Comastoma* is actually more correctly placed as a genus separate from other Gentianae though it is related to Lomatogonium and shares with it the status as one of the most primitive groups in the complex. Comastoma as a genus includes less than twenty species, which are known to occur mainly in the eastern Asiatic mountains, although the genus is also represented in European and North American alpine regions and even in the arctic zone.

Although we accept here the genus Comastoma as distinct from Lomatogonium, we are aware of the fact that the arguments for its separation may not be valid. The morphological and cytological similarities used by Löve & Löve (1956) as a basis for uniting both groups as sections of a single genus Lomatogonium are perhaps as inconclusive as are the opposite arguments based on the same observations, for the simple reason that similarities tell less in logic than do dissimilarities, although the differences between these groups remain no greater than between two species of Lomatogonium. Nilsson (1967a) studying the palynology of the family, claims, on his p. 88, that "pollen morphology does not support Löve & Löve's combination", whereas on the very next page he reports on a plant, tentatively named as the genus and species Phyllostoma concinna by Smith, that "shows similarities both with Gentianella sect. Comastoma and Lomatogonium", in morphology as well as in pollen morphology. The occurrence of such an intermediate group strongly supports the logical conclusion that these taxa actually belong to a single natural genus, with two or three subgenera or sections, rather than to two or three separate genera. Experiments on the crossability of these taxa are needed for a final solution of the question of their status. However, we prefer to accept them as distinct genera for the time being, following the rule that it is wiser and evolutionarily more correct to separate taxa that may be similar than to unite those which are possibly distinct.

Another of the sections of Gentianella of Smith (in Nilsson 1967a), section Crossopetalum Froel., also deviates considerably from the other groups in general and floral morphology (Lindsay 1940), in pollen morphology and in cytological characteristics, as pointed out by D. Löve (1953) and Nilsson (1967a). Although it had been recognized and named as a genus by previous authors, as Anthopogon by Necker (1790) which is an invalid name according to the present Code (Stafleu & alii 1972), and Crossopetalum by Roth (1827), which has an earlier homonym in the Celastraceae, its valid name is Gentianopsis, as described by Ma (1951). Its basic chromosome number is x = 11 as pointed out by D. Löve (1953) and Löve & Löve (1961a, b), who also mentioned the need to verify the basic number x = 13 which had been reported from two North American species which otherwise do not deviate much from other species of the genus. Later studies have confirmed these doubts (Löve & Löve, unpubl.) since the species in question were found to have 2n = 88 rather than 78 chromosomes as previously reported. The genus includes about 70 species of mainly Asiatic and North American distribution and is represented by a few species also in alpine and subarctic Europe (Iltis 1965; Mason & Iltis 1965).

Other sections of Gentianella of Smith (in Nilsson 1967a), i.e., Gentianella (= Amarella Griseb.), Arctophila Griseb., Antarctophila Griseb., are cytologically (x = 9, 2n = 18, 36, 54) and palynologically uniform and so ought to be kept in the genus Gentianella Moench, s.str. The genus so circumscribed includes about 200 species, the majority of which belong to the subgenus Gentianella with its boreal to arctic circumpolar section Gentianella typified by G. amarella (L.) Börner and including about eighty Eurasiatic-North American species, and the smaller arctic-alpine and temperate-boreal-subarctic section Arctophila Griseb. typified by G. aurea (L.)H.Sm which includes somewhat more than twenty species. The two other sections from austral mountains are apparently closely related (Nilsson 1967a) though doubtlessly representatives of the genus Gentianella according to their morphology and palynology and also by virtue of their chromosome numbers despite of that the cytological reports are scanty. Therefore, the doubts expressed by Allan (1961) as to the belonging of the New Zealand species to this genus were clearly unfounded. These groups seem to be correctly retained as different sections at the same time as they need to be united in the subgenus Soogentianella Löve & Löve described below. That new subgenus is named in honor of Professor Rezsö Soó of Budapest, one of the foremost plant systematists of his generation and an author of countless contributions to the study of the evolution, sociology and taxonomy of the Central European flora. The subgenus is typified by the species G. montana (Forst.f.) Löve & Löve, making it necessary to sink the sectional name Antarctophila into the synonymy of the section Soogentianella. That section is a group of perhaps more than fifty species of Australia, New Zealand and southernmost South America. The other section, Andicola, includes close to one hundred species of the mountains of South America from Colombia to Tierra del Fuego and the Falkland Islands.

In connection with a preliminary classification of the genus Gentiana as restricted by Schustler (1923) and Smith (1936) into more exactly defined genera, Löve & Löve (1961a,b) proposed the resusciation of the genera Ericoila Ren. (more correct Ericala Ren.; S.F.Gray, cf. Burtt 1966) to accomodate the species of the sections Chondrophylla Bge. and Thylacites Ren., and Hippion F.W.Schmidt for the section Cyclostigma Griseb., leaving the sections Gentiana (=Coelanthe), Pneumonanthe, Otophora, Stenogyne, Frigida, and Aptera in the restricted but still clearly heterogeneous genus Gentiana. More recent cytological and palynological data added to the older morphological observations now make possible an additional revision which at least seems to leave most of these taxa in a state of greater homogeneity (Holub 1972).

The genus *Gentiana* L. s.str. is based on *G. lutea* L. (cf. Hitchcock & Green, in Briquet 1935). The genus is a small but rather uniform group of five species of widely separated alpine regions in Eurasia. They are all tetraploid and characterized by the basic number x = 5 and a similar pollen morphology, although the species *G. lutea* L. differs sufficiently in flower morphology and pollen type from the other four species to form a subgenus of its own, subg. *Gentiana* whereas the other species have been distinguished as the subgenus *Coilantha* (Borckh.) Holub, by Holub (1970).

Another taxon, which is well-defined morphologically, cytologically and palynologically, is composed of the united sections *Aptera* Kusn. and *Pneumonanthe* Link, provided that the species *G. asclepiadea* L. and its relatives are eliminated from the group. (D. Löve 1953; Nilsson 1967a). The pollen morphology of these taxa is similar, and they are characterized by the basic chromosome number x = 13 and a homogeneous karyotype. As a genus this group must be named *Tretorhiza* Adans. (cf. Dandy 1967). Although there can be no doubt that these two former sections of *Gentiana* must remain congeneric under this name, we believe that they are more distinct than the sectional category implies, morphologically and biologically. Therefore, we propose a subgeneric status for *Pneumonanthe* when transferred to the new group, as validated below. It follows, that the section *Aptera* Kusn. automatically becomes the subg. *Tretorhiza*, since the type species of the genus is *G. cruciata* L. which becomes *T. cruciata* (L.) Löve & Löve as validated below. The subgenus *Tretorhiza* seems to include some thirty species mainly from central and eastern Asia but also from Siberia and Europe, whereas the subgenus *Pneumonanthe* is represented by about fifteen species in Eurasia and about twenty species in North America.

The species G. asclepiadea L. of western Asiatic and central and south European mountains was included in the section Pneumonanthe by Kusnetzov (1895, 1896-1904) and Smith (in Nilsson 1967a). It stands, however, apart from all the other species of this group not only morphologically but also palynologically and cytologically, with its basic chromosome number x = 11. Grossheim (1952) placed it in a distinct series Asclepiadeae of the section Pneumonanthe together with the west Asiatic G. schistocalyx C. Koch and the east Asiatic G. scabra Bge. He distinguished this group from other taxa of his section Pneumonanthe usually with winged seeds by aid of the corolla plaits being short and either entire or toothed, the leaves elongate-acuminate, and the flowers large, blue, and 5-merous. Although G. scabra is similar to the other two species in these characters, it can be distinguished without difficulty by its terminal cluster of bracteolate flowers with well developed plaits, as contrasted to the flowers of the other species which are in the leaf axils, always without bracteoles and with short plaits. G. scabra also differs in its pollen morphology, and since it is known to have 2n = 26 chromosomes, it seems most reasonable to retain it in the restricted section Pneumonanthe of the genus Tretorhiza, as T. scabra (Bge.) Löve & Löve which is validated below. The other species of Grossheim's series Asclepiadeae are characterized by the basic chromosome number x = 11 and distinctly smaller chromosomes, in addition to morphological and palynological differences that set them apart as a genus in its own right. The valid name available for this group is Dasystephana Adans. (Dandy 1967) in its original and restricted sense when species other than D. asclepiadea (L.) Borckh. included in it by Borckhausen (1796) are excluded. As far as we are aware, the only other species to be included in the genus Dasystephana is the western Asiatic D. schistocalyx (C. Koch) Löve & Löve, as transferred below.

The two small Chinese sections *Otophora* Kusn. (five species) and *Stenogyna* French. (ten species) of the genus *Gentiana* of both Kusnetzov (l.c.) and Smith (l.c.) are cytologically unknown. It is, however, evident from morphological and palynological observations that they belong to widely separate evolutionary lines. Although later cytological studies may prove this wrong, we are of the opinion that their characteristics strongly indicate that the species of *Stenogyne* would fit well as a subgenus of *Tripterospermum* Blume, as argued above, whereas the species of *Otophora* seem to be more correctly placed as a subgenus of the genus *Gentianodes* Löve & Löve. These transfers and changes in status are validated below.

The section *Frigida* Kusn. was divided into the subsections *Typicae*, with most of the species, and *Phyllocalyx* and *Froelichii* with one species each, by Kusnetzov (1895, 1896-1904), whereas Smith (in Nilsson 1967a) divided it into the subsections *Monopodiae* and *Sympodiae*, without descriptions. Since the latter seem to be rather unnatural groups of heterogeneous taxa, they are ignored here, but the section *Typicae* was shown, in a recent paper by Löve & Löve (1972), to be best classified as a distinct genus, *Gentianodes* Löve & Löve, characterized among others by the basic chromosome number x = 6 and including about forty species. These taxa have mainly an eastern Asiatic distribution, although a few reach westward to the mountains of Central Europe and eastward to the Rocky Mountains of North America. In addition to its typical subgenus *Gentianodes*, the section *Otophora* Kusn. forms another subgenus of this group, as mentioned above. The subsection *Froelichii* Kusn., or subsection *Froelichiella*, a superfluous name recently proposed by Pawlowski (1970) who was apparently unaware of the explanation on p. 258 of Kusnetzov (1896-1904), is regarded as a separate genus, *Favargera* Löve & Löve, the single species of which, *F. froelichii* Löve & Löve, is endemic in the eastern Alps of Europe. It has the hexaploid chromosome number 2n = 42 of the basic number $x = 7$. In addition to morphological differences, these genera also differ slightly in pollen morphology.

The monotypic subsection *Phyllocalyx* of the section *Frigida* has pollen reminding of that of *Crawfurdia* (Nilsson 1967a), in addition to several morphological differences that seem to set it between *Favargera* and *Tretorhiza*, rather than between the former genus and *Gentianodes*. Löve & Löve (1972) therefore hesitated to select a place for the unique eastern or southern Asiatic species *G. phyllocalyx* C. B. Clarke among the other species of the former section *Frigida*, especially because its chromosome number was unknown. We have now studied more herbarium material of this plant, and by aid of seeds from India: Sikkim, Gangtok-Pakyong, *B. Carrick, s.n.*, it has also been possible to count the number $2n = 26$ for the species. Although the number had to be determined in a single cell only, we regard it as safe to conclude that the basic number of *G. phyllocalyx* is $x = 13$, as contrasted to $x = 6$ for *Gentianodes* and $x = 7$ for *Favargera*. Added to the morphological and palynological distinctions, it seems, therefore, logical to conclude that also this subsection of Kusnetzov's section *Frigida* would be correctly regarded as a genus of its own, for which we propose the name *Mehraea* Löve & Löve, as validated below. This new genus is named in honor of Professor P. N. Mehra of Chandigarh, an ardent student of the cytology of Himalayan higher and lower plants. The sole species of the genus is *Mehraea phyllocalyx* (C.B.Clarke) Löve & Löve, as also validated below. Although it has the same basic number as does *Tretorhiza*, with which it also shares some few characteristics, we believe this is only incidental and not caused by evolutionary relationship. It may, however, seem feasible to suggest that the new genus may have been formed as an alloploid derivative of a hybrid between a diploid or tetraploid species of *Gentianodes* and an extinct diploid or tetraploid of *Favargera*, although no such species is known of the latter group and both genera presently grow as far apart as the Himalayas and the Alps except for a single species of Gentianodes that also reaches the Alps. However, other less farfetched explanations are possible and perhaps more likely, since the new genus may have been badly misplaced with the section Frigida to which it could be completely unrelated.

The section Chondrophylla Bge. was tentatively united with the section Thylacites Ren. in the genus Ericoila Ren. (correct Ericala Ren.; S.F.Gray, cf. Burtt 1966), by Löve & Löve (1961a,b). The former section includes a small group of perennial species represented by G. pyrenaica L. and G. grandiflora Laxm., and a large group of annual species of which G. prostrata Haenke is typical. Recent cytological studies have revealed that this distinction is accompanied by a profound difference in chromosome morphology and basic number, so that while the annual group has x = 9 (2n = 18, 36), as does also Thylacites, the perennial taxa have x = 13. The about sixty boreal and South American species of the annual Chondrophylla and Thylacites combined belong together in the genus Ciminalis Adans. (cf. Holub 1972), whereas the about ten Eurasiatic, North and South American perennial Chondrophylla can at least preliminarily be accomodated in the genus Ericala Ren.; S. F. Gray when restricted by typification with E. pyrensica (L.) G. Don.

The last group of Gentiana in the sense of earlier authors belongs to the section Cyclostigma Griseb., preliminarily identified with the genus Hippion F. W. Schmidt by Löve & Löve (1961a,b). It includes about ten species of high--alpine and arctic regions in the boreal zone. Recent studies have revealed that the oldest correct name available for this taxon at the generic level is Calathiana Delarbre (Holub 1972), with the type species C. nivalis (L.) Delarbre The basic chromosome number of this genus is x = 7, of which diploid, tetraploid and hexaploid multiples are known. There seems to be no palynological indication of heterogeneity within this taxon, so some deviating chromosome numbers reported for some taxa need verification.

The proposals above are selfexplanatory and so need no further discussion. Or perhaps it would be more appropriate to say that they are based on an approach so fundamentally different from what has been previously done for this family and other such groups, that the discussion we could possibly make would require such an amount of evaluations that it would fill a book. Therefore, we prefer to leave it to the imagination of the initiated reader and trust that his judgement will be consistent with the facts presented, although we do not expect him to agree with all the conclusions we have drawn.

It would also have been desireable to include here a complete list of new combinations required at the species and lower levels in order to demonstrate the complete effect of the proposal on the entire group involved. A few new combinations are proposed at the end of the paper, although we realize their limitation. It would not be too difficult to transfer directly every one of the species previously listed under sectional and other headings by other authors. However, we think we have a reason to doubt that all such listings have been entirely correct, and so we refrain from such a wholesale transfer mainly because we want to avoid repeating mistakes that may look detrimental to the system, because time is insufficient to perform all the detailed studies needed to secure the correct placing of every taxon. And we trust that others will continue where we concluded.

Although we are aware of the preliminary nature of our proposals, which perhaps are only a small improvement from those of past generations, it is to the benefit of both the producers and consumers to get some comparative review of the old systems and of the alterations which the new system requires. Therefore, we list, in Table I, the groupings and their arrangement as made by Grisebach (1845), Kusnetzov (1895, 1896-1904), and Smith (in Nilsson 1967a), and make a linear arrangement of our own proposals. It should be emphasized, however, that the arrangement ought to be linear-branching, because all evolution has been in that way, and a drawing of a phylogenetic tree would have been more appropriate. Such a drawing based on fewer genera has recently been furnished by Toyokuni (1965a). There is no doubt that the available data need to be much extended, especially with information on chemical compounds which seem to be more appropriate as an indication of an evolutionary course than are any other biological data, because such compounds seem to evolve irreversibly in a single direction. However, we believe that the cytological and palynological observations made strongly indicate that the phylogenetic tree presented by Toyokuni (1965a) is correct in its general outlines, and that improvements will add details rather than fundamental changes. As to the additions that we expect, these are likely to emphasize that the phylogeny of the family in general and of the subtribe Gentianinae in particular must be considered on basis of more morphological and cytogenetical studies that emphasize combinations of supposedly primitive characters as contrasted to those we believe are advanced. All such studies must, however, be consistent with the basic chromosome numbers because the chromosomes certainly are evolutionarily more important than any morphological or chemical character, for the simple reason that they determine the characters, not the other way around. Changes in the chromosomes determine the evolutionary processes at all levels and they also determine the future expectations of living beings at any taxonomical level.

It is our impression that the basic number in the subtribe Gentianineae, and also in the family Gentianaceae as a whole, must originally have been x = 5, and that other numbers have been derived from this by simple dysploid chromosome additions and later alloploidy. This was originally proposed by D. Löve (1953) and later accepted by Khoshoo & Tandon (1963) in connection with studies on <u>Swertia</u>, and is apparently also favored by Perry (1971) who studied the genus *Sabatia* that belongs to another tribe of Gentianaceae. None of these authors seem to favor the proposal by Favarger (1949) who assumed that fusion of chromosomes had played a strong role in the creation of the variable basic numbers of the family. Therefore, the descending series of basic numbers characterizing the genera of Gentianinae may be regarded as a safe indicator of an evolutionary progression from lower basic numbers to higher ones. In our sentiment this sequence has been in at least three and perhaps more directions, forming evolutionary branches that all begin with *Progentiana*, or even *Lomatogonium*, with their x = 5 basic chromosome number. Since neither we nor anybody else can pretend to adequate knowledge over more than parts of such a subject as is basic for such speculations, it requires apology to deal with such a proposal. But that is no reason to leave it undiscussed, and even the fact that genera with other basic numbers important as steps to towards the present state may have become extinct, is not an excuse for avoiding such a conclusion. Therefore, we would like to propose, as an addition to the good phylogenetic tree drawn by Toyokuni (1965a), that in the Gentianinae the following three branches give a vague indication as to the possible direction of the evolutionary processes that have shaped the complex:

(A), the *Gentiana* line: *Gentiana* (x = 5), *Gentianodes* (x = 6), *Favargera* (x=7), *Calathiana* (x = 7), *Ciminalis* (x = 9), *Dasystephana* (x = 11), *Ericala* (x = 13), *Mehraea* (x = 13), *Tretorhiza* (x = 13), *Ixanthus* (x = ?), *Tripterospermum* (x = 23?).

(B), the *Gentianella* line: *Lomatogonium* (x = 5), *Comastoma* (x = 5), *Jaeschkea* (x = 5), *Megacodon* (x = ?), *Gentianella* (x = 9), *Gentianopsis* (x = 11), *Crawfurdia* (x = ?).

(C), the *Swertia* line: *Anagallidium* (x = ?), *Ophelia* (x = 6), *Swertia* (x = 7), *Halenia* (x = 11), *Frasera* (x = 13), *Veratrilla* (x = ?), *Latouchea* (x = ?).

We present this new system of the subtribe Gentianineae as an humble exercise in evolutionary plant taxonomy, a kind of a guideline that we hope is likely to lead to a more fertile solution of problems concerning the monographers of critical families. It seems to us that the utilization of this and other kinds of data related to the chromosomes would in most cases improve the classification arrived at and secure that it rests not on fallacious assumptions about the relative age of morphological characters but on characteristics of an undoubtedly most important evolutionary significance. To ignore the chromosomes in the classification of categories at any level and in the construction of more or less hypothetical phylogenetic trees certainly would be not a slight but a fatal misunderstanding of the basic principles of evolutionary biology.

Nomenclatural changes.

Dasystephana Adans., to be restricted by the selection of the type species D. asclepiadea (L.) Borckh.

Dasystephana schistocalyx (C. Koch) Löve & Löve, comb. nov., based on Gentiana schistocalyx C.Koch, in Linnaea 17 (1943) 282.

Ericala Ren.; S.F.Gray, to be restricted by the selection of the type species E. pyrenaica (L.) Borckh.

Gentianella Moench

subgenus Soogentianella Löve & Löve, subg. nov.

Calyx integer, in tubum connexus. Corolla rotata, plicis glandulisque destituta. Antherae versatiles, liberae. Stylus nullus vel subnullus, stigmatibus duabus distinctis. Capsula sessilis. Testa exalata.

Radix annua vel perennis. Species in plagis temperatis hemisphaerii australis.

Typus subgeneris: Gentianella montana (Forst. f.) Löve & Löve.

Gentianella montana (Forst. f.) Löve & Löve, comb. nov., based on Gentiana montana Forst.f.,Flor.Ins.Austr.Prodr.(1786) 21.

47 III Gentianodes Löve & Löve

subgenus Otophora (Kusn.) Löve & Löve, stat. & comb. nov., based on Gentiana sect. Otophora Kusnetzov, in Engler & Prantl, Pflanzenfam. IV,2 (1895) 82; cf. also Acta Horti Petrop. 15(1896-1904).

Gentianodes otophora (Franch.) Löve & Löve, comb. nov., based on Gentiana otophora Franchet, ex Hemsley in Journ. Linn. Soc. London 26 (1890) 130.

Gentianopsis Ma

subgenus Pterygocalyx (Maxim.) Löve & Löve, comb. nov.,

based on Pterygocalyx Maximovicz, in Prim.Fl.Amurensis (1858)198 & t. 9.

Gentianopsis volubilis (Maxim.) Löve & Löve, comb. nov.,

based on Pterygocalyx volubilis Maximovicz, in Prim. Fl. Amurensis (1858) 198 & t. 9.

Mehraea Löve & Löve, gen. nov.,

based on Gentiana sect. Frigida subsect. Phyllocalyx Kusnetzov, in Acta Horti Petrop. 15 (1898) 287 - 289.

Mehraea phyllocalyx (C.B.Clarke) Löve & Löve, comb. nov.,

based on Gentiana phyllocalyx C.B. Clarke, in Hooker, Fl. Brit. India IV (1883) 116.

Tretorhiza Adans.

subgenus Tretorhiza

Tretorhiza cruciata (L.) Löve & Löve, comb. nov.,

based on Gentiana cruciata L., Sp. pl. (1753) 231.

subgenus Pneumonanthe (Link) Löve & Löve, stat. & comb. nov.,

based on Gentiana sect. Pneumonanthe Link, Enum. I (1821) 258.

Tretorhiza pneumonanthe (L.) Löve & Löve, comb. nov.,

based on Gentiana pneumonanthe L., Sp. pl. (1753) 228.

Tretorhiza scabra (Bge.) Löve & Löve, comb. nov.,

based on Gentiana scabra Bunge, Verz. Alt. (1836) 21.

Tripterospermum Blume

subgenus Stenogyne (Franch.) Löve & Löve, stat. & comb. nov.,

based on Gentiana sect. Stenogyne Franchet, in Bull. Soc. Bot. France 31 (1884) 375.

Bibliography.

ADANSON, M. (1763): Familles des plantes. - Paris.

ALLAN, H. H. (1961): Flora of New Zealand. Volume I. - Wellington.

ALLEN, C. K. (1933): A monograph of the American species of the genus *Halenia*. - Ann. Missouri Bot. Garden 20, 119 - 222.

BABCOCK, E. B. (1947): The genus *Crepis*. - Univ. Calif. Publ. Bot. 21-22,1-1030.

BENTHAM, G. & HOOKER, J. D. (1876): Genera plantarum. Volume 2. - London.

BORCKHAUSEN, D. M. B. (1796): Ueber Linnés Gattung *Gentiana*. - Römer: Archiv f.d. Bot. 1, 23 - 30.

BRIQUET, J. (1935): International rules of botanical nomenclature. - Jena.

BURTT, B. L. (1966): Notes, chiefly nomenclatural, on Gentianaceae of Pakistan and India. - Notes Roy. Bot. Gard. Edinb. 26, 269 - 278.

CARD, H. H. (1931): A revision of the genus *Frasera*. - Ann. Missouri Bot. Garden 18, 245 - 282.

DANDY, J. E.(1967): Index of generic names of vascular plants 1753 - 1774. - Regnum Vegetabile 51, 1 - 130.

DARLINGTON, C. D. (1965): Cytology. - London.

DARWIN, C.(1859): On the origin of species by means of natural selection. - London.

DE CANDOLLE, A. P. (1813): Théorie élémentaire de la botanique. - Paris.

EHRENDORFER, F., KRENDL, F., HABELER, E. & SAUER, W. (1968): Chromosome numbers and evolution in primitive angiosperms. - Taxon 17, 337 - 353.

FABRIS, H. A. (1953): Sinopsis preliminar de las Gencianaceas Argentinas. - Bol. Soc. Argent. Bot. 4, 233 - 259.

FABRIS, H. A. (1958): Notas sobre *Gentianella* del Peru. - Bol. Soc. Argent. Bot. 7, 68 - 93.

FABRIS, H. A. (1960): El género *Gentianella* en Ecuador. - Bol. Soc. Argent. Bot. 8, 160 - 192.

FAVARGER, C. (1949): Contribution à l'étude caryologique et biologique des Gentianacées. - Ber. Schweiz. Bot. Ges. 59, 62 - 86.

FERNALD, M. L. (1919): *Lomatogonium* the correct name for *Pleurogyne.* - Rhodora 21, 193 - 198.

GILG, E. (1895): Gentianaceae. - Natürl. Pflanzenfam. 4(2), 50 - 108.

GILG, E. (1917): Die südamerikanischen Arten der Gattung *Halenia*. - Beibl. Bot. Jahrb. 118, Vol. 54, 93 - 122.

GILLETT, J. M. (1957): A revision of the North American species of *Gentianella* Moench. - Ann. Missouri Bot. Garden 44, 195 - 269.

GILLETT, J. M. (1963): The gentians of Canada, Alaska and Greenland. - Res. Branch, Canada Dept. of Agric., Publ. 1180, 1 - 99.

GLEDITSCH, J. G. (1764): Systema plantarum a staminum situ. - Berlin.

GRANT, V. (1963): The origin of adaptations. - New York.

GRANT, V. (1971): Plant speciation. - New York and London.

GRISEBACH, A. H. R. (1845): Gentianaceae. - De Candolle: Prodromus 9, 38 - 141.

GROSSHEIM, A. A. (1952): Gentianaceae Dumort. - Flora SSSR 18, 525 - 640.

HEDBERG, O. (1957): Afroalpine vascular plants. A taxonomic revision. - Symb. Bot. Upsal. 15(1), 1 - 411.

HEGNAUER, R. (1966): Chemotaxonomie der Pflanzen. Bd. 4. - Basel.

HOLUB, J. (1967): Neue Namen innerhalb der Gattungen *Gentianella* Moench, *Gentianopsis* Ma und *Comastoma* (Wettst.) Toyokuni. - Folia Geobot. et Phytotaxon. 1, 115 - 120.

HOLUB, J. (1968): Einige neue nomenklatorische Kombinationen innerhalb der Gentianaceae. - Folia Geobot. et Phytotaxon. 3, 217 - 218.

HOLUB, J. (1970): New names in Phanerogamae. I. - Folia Geobot. et Phytotaxon. 5, 435 - 441.

HOLUB, J. (1972): New names in Phanerogamae. II. - Folia Geobot. et Phytotaxon. 7, ...

HOLUB, J., MĚSÍČEK, J. & JAVŮRKOVÁ, V. (1970): Annotated chromosome counts of Czechoslovak plants (1 - 15). (Materials for a Flóra ČSSR - 1). - Folia Geobot. et Phytotaxon. 5, 339 - 368.

HULTÉN, E. (1968): Flora of Alaska and neighboring territories. - Stanford.

HUTCHINSON, J. (1969): Evolution and phylogeny of flowering plants. Dicotyledons: Facts and theory. - London and New York.

HYLANDER, N. (1941): Förteckning över Skandinaviens växter. 1. Kärlväxter. - Lund.

HYLANDER, N. (1945): Nomenklatorische und systematische Studien über nordische Gefässpflanzen. - Uppsala Univ. Årsskr. 1945, 7, 1 - 337.

ILTIS, H. H. (1965): The genus Gentianopsis (Gentianaceae): transfers and phytogeographic comments. - Sida 2, 129 - 154.

KHOSHOO, T. N. & TANDON, S. R. (1963): Cytological, morphological and pollination studies on some Himalayan species of Swertia. - Caryologia 16, 445 - 477.

KIRPICZNIKOV, M. E. (1968): K kontseptsii roda u tsvetkovjkh rasteniy. - Bot. Zhurn. 53, 190 - 202.

KNOBLAUCH, E. (1894): Beiträge zur Kenntnis der Gentianaceae. - Bot. Centralbl. 60, 385 - 401.

KUSNETZOV, N. (1895): Gentiana Tournef. - Natürl. Pflanzenfam. 4(2, 80 - 86.

KUSNETZOV, N. J.(1896-1904): Subgenus Eugentiana Kusnez. generis Gentiana Tournef.- Acta Horti Petrop. 15, 1 - 507.

LEGENDRE, P. (1972): The definition of systematic categories in biology. - Taxon 21, 381 - 406.

LEWIS, H. & LEWIS, M.(1955): The genus Clarkia. - Univ. Calif. Publ. Bot. 20: 241 - 392.

LINDSAY, A. A. (1940): Floral anatomy in the Gentianaceae. - Amer. Journ. Bot. 27, 640 - 652.

LINNAEUS, C. (1737): Critica botanica. - Leyden.

LINNAEUS, C. (1751): Philosophia botanica. - Stockholmiae.

LINNAEUS, C. (1753): Species plantarum. - Holmiae.

LÖVE, Á. (1961): Hylandra - a new genus of Cruciferae. - Svensk Bot. Tidskr. 55, 211 - 217.

LÖVE, Á. (1963): Cytotaxonomy and generic delimitation. - Regnum Vegetabile 27, 45 - 51.

LÖVE, Á. (1964): The biological species concept and its evolutionary structure. - Taxon 13, 33 - 45.

LÖVE, Á. (1972): IOPB chromosome number reports. XXXVI. - Taxon 21, 333 - 346.

54. LÖVE, Á. & LÖVE, D. (1942): Chromosome numbers of Scandinavian plant species. - Bot. Notiser 1942, 19 - 59.

LÖVE, Á. & LÖVE, D. (1956): Cytotaxonomical conspectus of the Icelandic flora. - Acta Horti Gotob. 20, 65 - 291.

LÖVE, Á. & LÖVE, D. (1961a): Some nomenclatural changes in the European flora. I. Species and supraspecific categories. - Bot. Notiser 114, 33 - 47.

LÖVE, Á. & LÖVE, D. (1961b): Chromosome numbers of Central and Northwest European plant species. - Opera Botanica 5, 1 - 581.

LÖVE, Á. & LÖVE, D. (1971): Polyploïdie et géobotanique. - Natural. Canad. 98, 464 - 494.

LÖVE, Á. & LÖVE, D. (1972): _Favargera_ and _Gentianodes_, two new genera of alpine Gentianaceae. - Bot. Notiser 125, ...

LÖVE, D. (1953): Cytotaxonomical remarks on the Gentianaceae. - Hereditas 39, 225 - 235.

MA, Y.-C. (1951): _Gentianopsis_: a new genus of Chinese Gentianaceae. - Acta Phytotaxon. Sinica 1, 5 - 19.

MARQUAND, C. V. B. (1931): New Asiatic gentians: II. - Kew Bull. Misc. Inf. 2, 68 - 88.

MASON, C. T. & ILTIS, H. H. (1965): Preliminary report of the flora of Wisconsin. No. 53. Gentianaceae and Menyanthaceae. - Trans. Wisc. Acad. Sci., Arts and Lett. 54, 295 - 329.

MAXIMOVICZ, C. J. (1859): Primitiae florae amurensis. Versuch einer Flora des Amur-Landes. - St. Petersburg.

MAYER, E. (1954): Pripravljalna dela za floro Slovenije. 1. _Gentiana_ L. sect. _Endotricha_ Froel. - Slov. Akad. Znanosti in Umetnosti, Cl. IV, Razprava 92, 47 - 74.

MAYER, E. (1968): Zur Kenntnis der Gattung _Gentianella_ Moench in Jugoslawien. II. Der _G. aspera_-, _G. germanica_- und _G. austriaca_-Komplex. - Biol. Vestnik 16, 23 - 28.

MAYER, E. (1969): Zur Kenntnis der Gattung _Gentianella_ Moench in Jugoslawien. I. Der _G. anisodonta_-Komplex. - Österr. Bot. Zeitschr. 116, 393 - 399.

MAYR, E. (1942): Systematics and the origin of species. - New York.

MAYR, E. (1963): Animal species and evolution. - Cambridge, Mass.

NECKER, N. J. (1790): Elementa botanica. 2. - Neuwind.

NILSSON, S. (1964): On the pollen morphology in Lomatogonium A. Br. - Grana Palynol. 5, 298 - 329.

NILSSON, S. (1967a): Pollen morphological studies in the Gentianaceae--Gentianinae. - Grana Palynol. 7, 46 - 145.

NILSSON, S. (1967b): Notes on pollen morphological variation in Gentianaceae--Gentianinae. - Pollen et Spores 9, 49 - 58.

NILSSON, S. (1968): Pollen morphology in the genus Macrocarpaea (Gentianaceae) and its taxonomical significance. - Svensk Bot. Tidskr. 62, 338 - 364.

NILSSON, S. (1970a): Pollen morphological contributions to the taxonomy of Lisianthus L. s.lat. (Gentianaceae). - Svensk Bot. Tidskr. 64, 1 - 43.

NILSSON, S. (1970b): Pollen morphological studies in the Gentianaceae. - Acta Univ. Upsaliensis, Abstr. of Uppsala Diss. in Sci. 165, 1 - 18.

PAWLOWSKI, B. (1970): Remarques sur l'éndemisme dans la flore des Alpes et des Carpates. - Vegetatio 21, 181 - 243.

PERRY, J. D. (1971): Biosystematic studies in the North American genus Sabatia (Gentianaceae). - Rhodora 73, 309 - 369.

POST, D. M. (1958): Studies in Gentianaceae. 1. Nodal anatomy of Frasera and Swertia perennis. - Bot. Gazette 120, 1 - 14.

RAY, J.(1674): The specific differences of plants. - Proc. Roy. Soc. London 1674.

RAY, J. (1682): Methodus plantarum nova. - London.

RORK, C. L. (1949): Cytological studies in the Gentianaceae. - Amer. Journ. Bot. 36, 687 - 701.

ROTH, A. W. (1827): Enumeratio plantarum phanerogamarum in Germania sponte nascentium. - Leipzig.

SCHUSTLER, F. (1923): Some remarks to the system of Gentianae. - Vestn. 1. Sjezdu Českoslov. Bot. v Praza. I, 32 - 34.

SMITH, H. (1926): Anzeiger Akad. Wiss. Wien, Math.-naturw. Kl. 63, 105.

SMITH, H. (1936): Gentianaceae. - Symb. Sinica 7, 950 - 988.

SMITH, H. (1961): Problems relating to the Gentiana cachemirica of the Flora of British India. - Kew Bull. 15, 43 - 55.

SMITH, H. (1965): Notes on Gentianaceae. 1. The status of Crawfurdia and Tripterospermum. - Notes Roy. Bot. Gard. Edinb. 26, 237 - 258.

STAFLEU, F. A. & alii (eds.) (1972): International code of botanical nomenclature.- Regnum Vegetabile 82, 1 - 426.

STEBBINS, G. L. (1950): Variation and evolution in plants. - New York.

STEBBINS, G. L. (1971): Chromosomal evolution in higer plants. - London.

ST. JOHN, H. (1941): Revision of the genus Swertia of the Americas and the reduction of Frasera. - Amer. Midl. Natural. 26, 1 - 29.

TISCHLER, G. (1951): Allgemeine Pflanzenkaryologie. 2. Hälfte: Kernteilung und Kernverschmelzung. - Handb. d. Pflanzenanat. II, 1 - 1040.

TISCHLER, G. & WULFF, H. D. (1953 - 1963): Allgemeine Pflanzenkaryologie: Angewandte Pflanzenkaryologie. - Handb. d Pflanzenanat. II, Ergbd. 1 - 1227.

TOURNEFORT, J. P. DE,(1700): Institutiones rei herbariae, editio altera.-Paris.

TOYOKUNI, H. (1961): Séparation de Comastoma, genre nouveau, d'avec Gentianella. - Bot. Mag. Tokyo 74, 198.

TOYOKUNI, H. (1962): Further remarks to the genus Comastoma. - Acta Phytotaxon. et Geobot. 20, 136 - 138.

TOYOKUNI, H. (1963): Conspectus Gentianacearum japonicarum. - Journ. Fac. Sci. Hokkaido Univ. Ser. 5 (Bot.) 7, 137 - 159.

TOYOKUNI, H. (1965a): Notes on Megacodon (Gentianaceae). - Symb. Asahikaw. 1, 143 - 146.

TOYOKUNI, H. (1965b): Systema Gentianinarum novissimum. Facts and speculation relating to the phylogeny of Gentiana, sensu lato, and related genera. - Symb. Asahikaw. 1, 147 - 158.

TOYOKUNI, H. (1967): Notes on Gentianopsis with special reference to Japanese species. Part 1. - Symb. Asahikaw. 2, 57 - 72.

TOYOKUNI, H. (1968): Notes on Gentianopsis with special reference to Japanese species. Part 2. - Symb. Asahikaw. 2, 137 - 146.

WADA, Z. (1966): Cytological studies in Gentianaceae. - A Bounty of Nagao Pref. 1965, 1 - 2.

WAGENITZ, G. (1964): Gentianales. - In A. Engler: Syllabus der Pflanzenfamilien, 12. Aufl., herausgegeb. v. H. Melchior, II, 405 - 424.

WETTSTEIN, R. v. (1896): Die Gattungszugehörigkeit und systematische Stellung der Gentiana tenella Rottb. und G. nana Wulf. - Österr. Bot. Zeitschr. 46, 172 - 176.

WILLIS, J. C. (1966): A dictionary of the flowering plants and ferns. 7th ed. revised by H. K. Airy Shaw. - Cambridge.

(To the editor: Please, print the Table I in four columns, one below the name of each author referred to, preferably with petit or ultrapetit letters).

TABLE I.

Systematic position of genera of Gentianinae

Grisebach (1845)

- Gentiana Tournef.
  - Sect. Asterias Ren.
  - Sect. Andicola Griseb.
  - Sect. Imaicola Griseb.
  - Sect. Amarella Griseb.
  - Sect. Antarctophila Griseb.
  - Sect. Arctophila Griseb.
  - Sect. Crossopetalum Froel.
  - Sect. Cyclostigma Griseb.
  - Sect. Chondrophylla Bunge
  - Sect. Eurythalia Griseb.
  - Sect. Pneumonanthe Neck.
  - Sect. Thylacites Ren.
  - Sect. Coelanthe Ren.
  - Sect. Dasystephana Griseb.
  - Sect. Tretorrhiza Ren.
- Eudoxia G. Don
- Crawfurdia Wall.
- Tripterospermum Blume
- Centaurella Michx.
- Pleurogyne Eschsch.
- Anagallidium Griseb.
- Stellera Turcz.
- Ophelia Don
  - Sect. Euophelia Griseb.
  - Sect. Neurophelia Griseb.
  - Sect. Agathodes Griseb.
- Exadenus Griseb.
- Halenia Borckh.
- Frasera Walt.
- Swertia L.

Table I, second column:

Gilg (1895) and Kusnetzov (1895)

Crawfurdia Wall.
- Subg. Pterygocalyx (Maxim.) Gilg
- Subg. Dipterospermum C. B. Clarke
- Subg. Tripterospermum (Blume) C.B. Clarke

Jaeschkea Kurz

Gentiana Tournef.
- Subg. Eugentiana Kusn.
  - Sect. Coelanthe Ren., emend. Kusn.
  - Sect. Pneumonanthe Neck.
  - Sect. Otophora Kusn.
  - Sect. Stenogyne Franch.
  - Sect. Frigida Kusn.
    - Subsect. Frigidae Kusn.
    - Subsect. Froelichii Kusn.
    - Subsect. Phyllocalyx Kusn.
  - Sect. Aptera Kusn.
  - Sect. Isomeria Kusn.
  - Sect. Chondrophylla Bge
  - Sect. Thylacites Ren.
  - Sect. Cyclostigma Griseb.
- Subg. Gentianella Kusn.
  - Sect. Dasystephana Griseb.
  - Sect. Andicola Griseb.
  - Sect. Imaicola Griseb.
  - Sect. Stylophora C. B. Clarke
  - Sect. Megacodon Hemsley
  - Sect. Amarella Griseb.
  - Sect. Antarctophila Griseb.
  - Sect. Arctophila Griseb.
  - Sect. Crossopetalum Froel.

Ixanthus Griseb.

Pleurogyne Eschsch.

Swertia L.
- Sect. Ophelia (Don) Benth. & Hook.
- Sect. Euswertia C. B. Clarke
- Sect. Poephila C. B. Clarke
- Sect. Veratrilla Baill.

Halenia Borckh.

Table I, third column:

H. Smith (in Nilsson 1967a)

- *Ixanthus* Griseb.
- *Jaeschkea* Kurz
- *Crawfurdia* Wall.
  - Sect. *Protocrawfurdia* H. Sm.
  - Sect. *Crawfurdia* H. Sm.
- *Tripterospermum* Blume
- *Gentiana* L.
  - Sect. *Coelanthe* Ren.; emend Kusn.
  - Sect. *Pneumonanthe* Neck.
  - Sect. *Otophora* Kusn.
  - Sect. *Stenogyne* Franch.; emend. Kusn.
  - Sect. *Frigida* Kusn.
    - Subsect. *Monopodiae* H. Sm.
    - Subsect. *Sympodiae* H. Sm.
  - Sect. *Aptera* Kusn.
  - Sect. *Chondrophylla* Bge.
  - Sect. *Thylacites* Ren.
  - Sect. *Cyclostigma* Griseb.
- *Gentianella* Moench
  - Sect. *Crossopetalum* Froel.
  - Sect. *Arctophila* Griseb.
  - Sect. *Amarella* Griseb.
  - Sect. *Comastoma* Wettstein
  - Sect. *Andicola* Griseb.
- *Lomatogonium* A. Br.
- *Swertia* L.
  - Sect. *Ophelia* (Don) Benth. & Hook.
  - Sect. *Euswertia* C. B. Clarke
- *Latouchea* Franch.
- *Veratrilla* Baill.
- *Megacodon* (Hemsley) H. Sm.
- *Halenia* Borckh.

Table I, fourth column:

Löve & Löve

- Gentiana L.
  - Subg. Gentiana (x = 5)
  - Subg. Coilantha (Borckh.) Holub (x = 5)
- Gentianodes Löve & Löve
  - Subg. Gentianodes (x = 6)
  - Subg. Otophora (Kusn.) Löve & Löve (x = ?)
- Favargera Löve & Löve (x = 7)
- Calathiana Delarbre (x = 7)
- Ciminales Adans. (x = 9)
- Dasystephana Adans. (x = 11)
- Ericala Ren.; S. F. Gray (x = 13) Holubogentia + Kuepferella (x = 10).
- Mehraea Löve & Löve (x = 13)
- Tretorhiza Adans.
  - Subg. Tretorhiza (x = 13)
  - Subg. Pneumonanthe (Link) Löve & Löve (x = 13)
- Ixanthus Griseb. (x = ?)
- Tripterospermum Blume
  - Subg. Tripterospermum (x = 23?)
  - Subg. Stenogyne (Franch.) Löve & Löve (x = ?)

- Lomatogonium A. Br. (x = 5)
- Comastoma Toyokuni (x = 5)
- Jaeschkea Kurt (x = 5)
- Megacodon H. Sm. (x = ?)
- Gentianella Moench
  - Subg. Gentianella
    - Sect. Gentianella (x = 9)
    - Sect. Arctophila Griseb. (x = 9)
  - Subg. Soogentianella Löve & Löve
    - Sect. Soogentianella (x = 9)
    - Sect. Andicola Griseb. (x = 9)
- Gentianopsis Ma
  - Subg. Gentianopsis (x = 11)
  - Subg. Pterygocalyx (Maxim.) Löve & Löve x = ?)
- Crawfurdia Wall. (x = ?)

- Anagallidium Griseb. (x = ?)
- Ophelia D. Don (x = 6)
- Swertia L. (x = 7)
- Halenia Borckh. (x = 11)
- Frasera Walt. (x = 13)
- Veratrilla Franch. (x = ?)
- Latouchea Franch. (x = ?)

Continued:

Jaeschkea gentianoides Kurz: 2n = 26: Koul & Gohil (1973)

Koul, A.K. & Gohil, R.N. 1973: Cytotaxonomical conspectus of the flora of Kashmir. (I) Chromosome numbers of some common plants. — Phyton 15: 57–66.

(To the editor: Please, print the Table I in four columns, one below the name of each author referred to).preferably with petit or ultrapetit letters).

Appendix I

TABLE I.

Systematic position of genera of Gentianineae

Grisebach (1845)

Gentiana Tournef.
    Sect. Asterias Ren.
    Sect. Andicola Griseb.
    Sect. Imaicola Griseb.
    Sect. Amarella Griseb.
    Sect. Antarctophila Griseb.
    Sect. Arctophila Griseb.
    Sect. Crossopetalum Froel.
    Sect. Cyclostigma Griseb.
    Sect. Chondrophylla Bunge
    Sect. Eurythalia Griseb.
    Sect. Pneumonanthe Neck.
    Sect. Thylacites Ren.
    Sect. Coelanthe Ren.
    Sect. Dasystephana Griseb.
    Sect. Tretorrhiza Ren.
Eudoxia G. Don
Crawfurdia Wall.
Tripterospermum Blume
Centaurella Michx.
Pleurogyne Eschsch.
Anagallidium Griseb.
Stellera Turcz.
Ophelia Don
    Sect. Euophelia Griseb.
    Sect. Neurophelia Griseb.
    Sect. Agathodes Griseb.
Exadenus Griseb.
Halenia Borckh.
Frasera Walt.
Swertia L.

Rafin. Med. Repos. II, 5:352, 1808.
cf. Gillett, p. 53.

Gentianopsis, s. str. x = 11
Gentianopsis s. lato, x = 11, 13.
x = 13: Dencheа Rafin.
D. crinita (Froel.) Rafin. [illegible] 2n=78
D. serrata (Froel.) ... 2n=78.
[illegible]

Table I, second column:

Gilg (1895) and Kusnetzov (1895)

Crawfurdia Wall.
Subg. Pterygocalyx (Maxim.) Gilg
Subg. Dipterospermum C. B. Clarke
Subg. Tripterospermum (Blume) C.B. Clarke
Jaeschkea Kurz
Gentiana Tournef.
Subg. Eugentiana Kusn.
Sect. Coelanthe Ren., emend. Kusn.
Sect. Pneumonanthe Neck.
Sect. Otophora Kusn.
Sect. Stenogyne Franch.
Sect. Frigida Kusn.
Subsect. Frigidae Kusn.
Subsect. Froelichii Kusn.
Subsect. Phyllocalyx Kusn.
Sect. Aptera Kusn.
Sect. Isomeria Kusn.
Sect. Chondrophylla Bge
Sect. Thylacites Ren.
Sect. Cyclostigma Griseb.
Subg. Gentianella Kusn.
Sect. Dasystephana Griseb.
Sect. Andicola Griseb.
Sect. Imaicola Griseb.
Sect. Stylophora C. B. Clarke
Sect. Megacodon Hemsley
Sect. Amarella Griseb.
Sect. Antarctophila Griseb.
Sect. Arctophila Griseb.
Sect. Crossopetalum Froel.
Ixanthus Griseb.
Pleurogyne Eschsch.
Swertia L.
Sect. Ophelia (Don) Benth. & Hook.
Sect. Euswertia C. B. Clarke
Sect. Poephila C. B. Clarke
Sect. Veratrilla Baill.
Halenia Borckh.

Table I, third column:

H. Smith (in Nilsson 1967a)

Ixanthus Griseb.
Jaeschkea Kurz
Crawfurdia Wall.
    Sect. Protocrawfurdia H. Sm.
    Sect. Crawfurdia H. Sm.
Tripterospermum Blume
Gentiana L.
    Sect. Coelanthe Ren.; emend Kusn.
    Sect. Pneumonanthe Neck.
    Sect. Otophora Kusn.
    Sect. Stenogyne Franch.; emend. Kusn.
    Sect. Frigida Kusn.
        Subsect. Monopodiae H. Sm.
        Subsect. Sympodiae H. Sm.
    Sect. Aptera Kusn.
    Sect. Chondrophylla Bge.
    Sect. Thylacites Ren.
    Sect. Cyclostigma Griseb.
Gentianella Moench
    Sect. Crossopetalum Froel.
    Sect. Arctophila Griseb.
    Sect. Amarella Griseb.
    Sect. Comastoma Wettstein
    Sect. Andicola Griseb. → Antarctophila Griseb.
Lomatogonium A. Br.
Swertia L.
    Sect. Ophelia (Don) Benth. & Hook.
    Sect. Euswertia C. B. Clarke
Latouchea Franch.
Veratrilla Baill.
Megacodon (Hemsley) H. Sm.
Halenia Borckh.

Appendix I

Table I, fourth column:

Löve & Löve

(5) Gentiana L.
Subg. Gentiana (x = 5)
Subg. Coilantha (Borckh.) Holub (x = 5)
(40) Gentianodes Löve & Löve
Subg. Gentianodes (x = 6)
(5) Subg. Otophora (Kusn.) Löve & Löve (x = ?)
(1) Favargera Löve & Löve (x = 7)
(10) Calathiana Delarbre (x = 7)
(60) Ciminalea Adans. (x = 9)
(2) Dasystephana Adans. (x = 11)
~~Ericala Ren.; S. F. Gray (x = 13)~~
(1) Mehraea Löve & Löve (x = 13)
(20) Tretorhiza Adans.
~~Subg.~~ Tretorhiza (x = 13)
(15) ~~Subg.~~ Pneumonanthe (Link) Löve & Löve (x = 13)
(1) Ixanthus Griseb. (x = ?)
(20) Tripterospermum Blume
Subg. Tripterospermum (x = 13)
(10) Subg. Stenogyne (Franch.) Löve & Löve (x = ?)
(50) Lomatogonium A. Br. (x = 5)
(20) Comastoma Toyokuni (x = 5)
(3) Jaeschkea Kurt (x = 5)
(2) Megacodon H. Sm. (x = ?)
Gentianella Moench
(100) Subg. Gentianella
80 Sect. Gentianella (x = 9)
20 Sect. Arctophila Griseb. (x = 9)
~~Subg. Seogentianella Löve & Löve~~
(250?) Sect. Seogentianella (x = 9)
Sect. Andicola Griseb. (x = 9)
(70) Gentianopsis Ma
~~Subg.~~ Gentianopsis (x = 11)
(1) ~~Subg.~~ Pterygocalyx (Maxim.) ~~Löve & Löve~~ (x = ?)
(10) Crawfurdia Wall. (x = ?)
(1) Anagallidium Griseb. (x = ?)
(20) Ophelia D. Don (x = 6)
(50) Swertia L. (x = 7)
(50) Halenia Borckh. (x = 11)
(30) Frasera Walt. (x = 13)
(2) Veratrilla Franch. (x = ?)
(1) Latouchea Franch. (x = ?)

sect. Dimaculatae — see p. 17

+ Ophelia sect. Dimaculatae

+ Swertia ... group (cf. p. 16).

Ixanthus Griseb. x = . .
Jaeschkea Kurz x=5 (2n=20)
Pterygocalyx Maxim. x = → Gentianopsis (Toyokuni 1963, Nilsson 1970a, p. 8).
Crawfurdia Wall. x =
Tripterospermum Blume x = 23 ?
Gentiana L. x = 5
Pneumonanthe Adans. x = 13
sect. Pneumonanthe
sect. Pneumonanthe (Link) L. & L.
sect. Otophora (Kusn.) L. & L.
sect. Stenogyne (Franch.) L. & L.
Dasystephana Adans. x = 11
Gentianodes Löve & Löve x = 6
Favargera Löve & Löve x = 7
Mehraea Löve & Löve x = 13
Ciminalis Adans. x = 9
Ericala S.F. Gray x = 13
Calathiana Delarbre x = 7
Gentianopsis Ma x = 11
Gentianella Moench x = 9
sect. Gentianella
sect. Arctophila Griseb.
sect. Antarctophila Griseb.
sect. Andicola Griseb.
Comastoma (Wettst.) Toyokuni x = 5
Lomatogonium A. Br. x = 5

p. 9 (1970) ?

Swertia L. x = 7
Frasera Walt. x = 13
Ophelia D. Don x = 8 ?
Anagallidium Griseb. x =
Latouchea Franch.
Veratrilla Franch.
Megacodon (Hemsl.) H. Sm.
Halenia Borkh. (all)

Prografinae [?]

Gentiana (5)
Gentianodes (6)
Favargera (7) — Calathiana (7)
Ciminalis (9) — Dasystephana (11)
Metagentiana (13?)
~~Crawfurdia~~ ?
Ericala (13)
Tretorhiza (13)
Ixanthus (?)
Tripterospermum (23?)

Lomatogonium (5)
Comastoma (5) ~~Stylophora~~ [?]
Jaeschkea (5) Megacodon arom[?] syn. Meg. [?] Stylophora?
Calathiana (7)
Gentianella (9)
Gentianopsis (11) ~~Megacodon~~ s. M. [?] s. Stylophora.
Pterygocalyx (?)
Crawfurdia (?)

möglicherweise [?] 2 Sektionen [?] 2 [?] sg.

Anagallidium (?)
Ophelia (8)
Swertia (7)
Frasera (13)
Veratrilla (?)
Latouchea (?)

Halenia

Chondrophyllum: (= Ericoila Ren., p.p., Hippion Schm. p.p.).

G. altaica; gentilis[?] 2n=26. | possible Hippion, by restriction
G. pyrenaica | flavida; 2n=26.
attenuata
G. prostrata 2n=36
G. aperta
G. humilis.

= Ericala S.F. Gray.

Thylacites: (= Megalanthe Gaud.) - Ciminalis Adans.; rest. Holub

G. acaulis: Alexandri + Kochiana: 2n=36.

Cyclostigma: (= Thylacophora Neck.).

G. utriculosa
G. nivalis 2n=14
G. verna 2n=28.
? G. bavarica 2n=30? Favarger 1965,
G. imbricata.
G. pumila 2n=20: Favarger 1965
G. brachyphylla 2n=28. Favarger 1965, 30: Müller in L. 1974b
G. utriculosa 2n=22
G. terglouensis 2n=42 (c.40)

(Hippion Schmidt)
=
Calathiana Delarbre (1800)
(cf. Holub 1972)

Gentiana argentea Royle n = 10 : Mehra & Vasudeva 1972 (XXXVI) - ettingsh. Chondrophylla = ~~[illegible]~~ Cruciata? x = 9 (10?) = 18? or 20?

G. capitata Ham. n = 10 ettingsh. Chondrophylla = ~~[illegible]~~ Cruciata

G. moorcroftiana Wall. n = 9 : Amarella.

G. pedicellata Wall. n = 9. : Chondrophylla

Jaeschkea latisepala C.B. Clarke n = 10

Swertia lurida Royle n = 13. Ophelia sect Euophelia

Gentiana carinata Griseb. n = 20 : Mehra & Gill 1968 (XVI). = Eurythalia Griseb. (Chondrophylla sp.) sect.

violacea, etc. incl. [illegible] etc.

Swertia alata Royle n = 12 = Ophelia sect Agathotes

S. angustifolia Buch.-Ham. n = 12 Ophelia sect Agathotes

S. cordata Wall. ~~n~~ n = 13. : Ophelia sect. Euophelia.

S. purpurascens Wall. n = 12, : Ophelia sect. Euophelia.

S. speciosa Wall. n = 13 ~ Swertia.

Amarella dichotoma Griseb. (with [illegible]).

There are morphological indications that some species of, e.g. the sections Cyclostigma and Chondrophylla (and) may be misplaced, and that perhaps the section Eurythalia Griseb., which Kusnezov (l.c.) included in the latter actually may be better ~~or Cyclostigma~~ placed as a genus in its own right, with a few species misplaced in Chondrophylla having x = 5

We are aware of that this splitting may not go far enough in a few cases - - -

It is possible and indeed likely that several species have been misplaced ~~[illegible]~~ when arranged in sections by earlier authors, as shown in several such corrections proposed by Smith . . . and Toyokuni ? . . ., and some chromosome information may give hints as to the need, for such transfers. ~~[illegible]~~ It is also possible that some of the species, especially of ~~section~~ the ~~[illegible]~~ unsatisfactory section Chondrophylla, may require the recognition of still other genera than here proposed, when their cytological characteristics become available in support of ~~[illegible]~~ morphological distinctions.

Favarger - Huynh 1964 (II):

Gentiana angustifolia Villars 2n=36
G. aniso-donta Barbey 2n=18
G. asperea Hegetschw. 2n=36
G. brachyphylla Vill. 2n=14   14: Müller.
G. engadinensis (Wettst.) Br.-Bl. & Sam. n=18
G. Favratii Rittner 2n=28-30   32: Müller in L. 1974S.
G. Froelichii Jan 2n=42
G. hypericifolia Murb. 2n=36
G. ligustica Vilm. & Chop. n=18
G. pannonica Scop. 2n=c.40
G. Terglouensis Hacq. 2n=c.42

F. & H. 1965 (IV):

G. (Gentianella) brunneotricha Gilg 2n=36 (S. Am.)
G. umbellata R. & P. 2n=36.
Halenia umbellata (R. & P.) Gilg 2n=22

Frasera speciosa Dougl. 2n=78: Love & Kapoor 1967 (XIV).
Halenia deflexa (Sm.) Griseb. n=11: Mulligan 1967 (XIV).

Gentiana algida Pall. 2n=24: Morgan 1968 (XV).

L. 1974S: Müller:
G. bavarica 2n=30
G. brachyphylla 2n=28
G. favratii 2n=32
G. nivalis 2n=14
G. rostanii 2n=30
G. schleicheri 2n=30
G. verna 2n=28
G. terglouensis 2n=36.
Müller.

~~x Holub.~~ see Toyokuni.

Gentianella trichotoma H. Sm. (Dist. Bot. 1967-70?).

Comastoma (Wettst.) Toyokuni

tenellum (Wettst.) Toyokuni

fr. Nilsson 1967:

arrectum (Franch.) Holub
seetianum (W.W. Sm.) Holub
dichotomum (Pallas) Holub
falcatum (Turcz.) Toyokuni
limprichtii (Grü~~ning~~.) Toyokuni
pedunculatum (G. Don ~~Royle~~) Holub
stellariifolium (Franch.) Holub.

nanum (Wulf.? ~~Wettst.~~) Toyokuni
pulmonarium (Turcz.) Toyokuni
~~falcatum (?)~~

maclarenii (H. Sm.) Holub.
cyananthiflorum (Franch.) Holub
dechyanum (Somm. et Lev.) Holub
henryi (Hemsley) Holub
sectum (Satake) Holub = C. pulmonarium ssp. sectum (Satake) Toyokuni.
traillianum (Forrest) Holub.

se Holub!

Gentianopsis Ma (= G. sect. Crossopetalum) (10 arter??)

G. ciliata (L.) Ma
G. detonsa (~~Fr~~) (Rottb.) Ma — incl. ssp. yukonensis Gillett? var.?
G. crinita (Froel.) Ma
G. lanceolata (~~Gr~~) (Benth.) Iltis
(G. macrocalyx (Llave & Lex.) → incl. in lanceolata? Iltis)
G. ventricosa (Griseb.)
G. serrata (Gunner) } sp: Iltis eller Ma! Varför?
G. simplex (A. Gray)
G. barbellata (Engelm.) Iltis
se Iltis p. ... G. barbata (Froel.) Ma
G. grandis (H. Sm.) Ma
G. scabromarginata (H. Sm.) Ma
G. paludosa (Munro) Ma var. eller ssp. av detonsa?
G. nana (Ling) Ma
G. longistyla Ma
G. lutea (Burkill) Ma
G. contorta (Royle) Ma (jfr. lanceolata).
G. Yabei (Takeda & Hara) Ma
G. mesophila (Holm) Iltis
G. ... (Burkill) Iltis
G. thermalis (O. Ktze.) Iltis (= elegans A. Nelson).
G. macrantha (D. Don) Iltis
G. holopetala (A. Gray) Iltis
G. procera (Th. Holm) Ma
G. Victorinii (Fern.) Iltis — = ... pop. of procera jfr. ...) ssp. eller var.? se Gillett — ... Iltis p. 137-138!
G. Macounii (Th. Holm) Iltis — NV procera-ssp.? (procera-crinita-...).
G. simplex (A. Gray) Iltis
G. virgata (Raf.) Holub

Sj. Pterygocalyx (Maxim.) (Amur & N. China) (1 species) Z. = ?

Gentianopsis volubilis (Maxim.)
= Pterygocalyx volubilis Maxim.; Gentiana volubilis (Maxim.) H. Sm. (in Nilsson 1967)

se ~~Hara p.~~ Gilg, p. 88 — . Nilss— p. 89–90.

Swertia L. (Eurasia, N. Am., Africa) (100 species) X =

S. decumbens → S. erectoramosula, Nilss p. 91, [illegible].

Anagallidium Griseb.

Ophelia D. Don.

Frasera Walt.

F. [illegible] (H. Sm.) } J. Nilss 1967, p. 91, [illegible]!
F. tetrapetala (Pall.)

Fernald 1919!

Lomatogonium A. Br.

L. rotatum (L.) Fr. ?

L. carinthiacum (Wulf.) A. Br.

L. Thomsonii (C. B. Clarke) Fernald

L. brachyantherum (C. B. Clarke) Fernald — see Fernald 1919: Rhodora 21: 193-198.

(in Fernald!) L. spathulatum (A. Kern.)

L. diffusum (Maxim.)

L. bellum (Hemsley) H. Sm. (in Nilsson 1967a). (for Swertia)

L. bonatianum (Burkill) H. Sm.

L. chumbicum (Burkill) H. Sm.

L. gamosepalum (Burkill) H. Sm.

L. sikkimense (Burkill) H. Sm.

L. Stapfii (Burkill) H. Sm.

Nilsson 1967:

L. cuneifolium H. Sm.

L. forrestii (Balf. f.) Fernald

L. longifolium H. Sm.

L. macranthum (Diels & Gilg) Fernald

L. oreocharis (Diels) Marq.

L. saccatum H. Sm.

(= Crawfurdia p.p.).

Tripterospermum Blume (Himalayas, SE. Asia) (? species) 2n = ? 23.

Sg. Tripterospermum

T. fasciculatum (Wall.)
T. affinis (Wall.) H. Sm.
T. japonicum (Sieb. & Zucc.) Makino.
T. trinervis (Blume)

sc. Nilsson:
chinense (Migo) H. Sm.
coeruleum (Hand.-Mazz.) H. Sm.
microphyllum H. Sm.
pterocalyx (Franch.) ... sc. Nilsson 1967, p. 30 ... sg. Stenogyne!

Sg. Otophora

T. otophora (Franch.).
T. caryophyllum (H. Sm.).
T. decorata (Diels)
T. tsarongensis (Balf. f. ex Forrest)

Latouchea Franch. (E. China) (1 species) 2n = ?

Veratrilla Franch. (China) (2 species) 2n = ?

V. baillonii Franch. + 1 till Megacodon?
V. burkilliana (W. W. Sm.) H. Sm. (in Nilsson 1967).

Megacodon (Hemsley) H. Sm. (Himalayas) (2 species) 2n = ?
(incl. Stylophorum C. B. Clarke).

M. venosus (Hemsley) H. Sm. ? (in Nilsson 1967).
M. stylophorus (C. B. Clarke) H. Sm. ? 1936.

Ixanthus Griseb. (Canary Islands) (1 species) 2n = ?

Jaeschkea Kurz (Himalayas) (3 species) 2n = 30.

J. oligosperma (Griseb.) Knobloch + gentianoides 2n = 28: Kaul & Gohil (1973)
J. canaliculata (Don) Knobloch + latisepala C.B. Clarke n=10: Mehra & Vasudeva 1972 (XXXVI)
J. microsperma C.B. Clarke

Crawfurdia Wall. (Himalayas) (9? species) 2n = [illegible] ?
(= sy. Dipterosperma C.B. Clarke)

C. speciosa Wall.
C. campanulacea Wall. & Griff.
C. angustata C.B. Clarke
C. puberula C.B. Clarke.

Gentiana L. s. str.

sg. Gentiana

G. lutea L.

sg. Coilantha (Borkh.) Holub.

G. Burseri Lapeyr.
G. punctata L.
G. purpurea L.
G. pannonica Scop.

incl. [illegible] p.p. (Nilsson p. 84), also: Frigida [illegible]

Tretorhiza Adans. (= Pneumonanthe p.p. Aptera).

sg. Tretorhiza (= Aptera). (12 species)

T. cruciata (L.) L. & L.

T. decumbens (L.) L. & L.
T. Regelii (Kusnezow) L. & L.
T. Olgae (Regel & Schmalh.) L. & L.
T. Grombczewskii (Kusn.) L. & L.
T. Renardii (Regel).
T. Walujewii (Regel)
T. siphonantha (Maxim.)
T. Kaufmanniana (Regel & Schmalh.)
T. dahurica (Fisch.)
T. biflora (Regel).
T. Kurroo (Royle)

(flores lutei/flavi)

T. tibetica (King)
T. straminea (Maxim.)
T. Fetisowii (Regel & Winkler)
T. macrophylla (Pall.)
T. Olivieri (Griseb.).
T. cachemirica (Decne.) — p. [illegible]

sg. Pneumonanthe

sect. Asclepiadeae → (sg. Kusnezow, p. 82)
← sect. Pneumonanthe

T. pneumonanthe (L.) L. & L.
T. scabra (Bunge) L. & L.

Gentianodes

sg. Gentianodes

J. [illegible] L. & L. 1972

sect. ~~Monopodiae~~, Sympodiae

~~G. [illegible]~~

~~G. [illegible]~~

~~G. delavayi~~

sg. Stenogyne (Franch.).

G. stricta (Maxim.)

G. rhodantha (Franch.)

G. serra (Franch.)

G. pterocalyx (Franch.) — source: Tripterospermum, see Nilsson 1967, p. 90 [illegible].

G. filicaulis (Hemsley)

G. primuliflora (Franch.).

G. tongolensis (see Nilsson p. 86).

Dasystephana Adans. (= G. sect. Pneumonanthe ~~[illegible]~~) series Asclepiadeae Grossh.).

D. asclepiadea (L.) Borckh.

D. schistocalyx (C. Koch) L. & L.

Favargera L. & L. (= G. sect. Frigida subsect. Froelichii).

F. froelichii (Jan) L. & L.

Mehraea L. & L. (= G. sect. Frigida subsect. Phyllocalyx).

M. phyllocalyx (C.B. Clarke) L. & L.

X = 9.

s. str. (type acaulis, excl. genuine Chondrosphylla).

Ciminalis Adans. (= annual Chondrophylla + Thylacites, of Ericala in L. & L. p.p.).

C. acaulis (L.) Brockh. (= Thylacites)

C. durii (Parr. & Sagr.) Hlms. also Eric. sp. Hlms. of annual Chondrophylla, cf. Hum., p. 84.

Remember: Ericala (S. F. Gray. (genuine Chondrophylla). hybrids of genuine (Wilson 1967) p. 76/.

E. pyrenaica (L.) G. Don.

E. (altaica Pall.) = E. gracilipes ...?

E. nipponica (Maxim.)

E. infelix (C. B. Clarke)

E. Burgi (Briss.)

E. setifolia (Kunth)

Calathiana Delarbre (1800) (= sect. Cyclostigma; Hippion in L. & L.)

C. nivalis (L.) Delarbre 6 Illyrian + 6 others: Hlms.

C. utriculosa (L.)

C. verna (L.)

C. bavarica (L.). 2n=30: Müller in L. 1974.

C. imbricata (Froel.)

C. pumila (Jacq.)

(G. brachyphylla!)

(G. terglouensis!)

Gentianella Moench.

Sg. Gentianella (= sect. Amarella Griseb.) see Kusn. p. 85-86.

sect. ?

Sg. Arctophila (Griseb.) L. & L.

sect. Arctophila

G. quinqueflora (Lam.)
G. Wislizenii (Engelm.). – trivial: Nilsson 1967 p. 87.
G. tenuis (Griseb.)
G. propinqua (Richards.)
G. aurea (L.)
G. umbellata (MB.)
G. aleutica (Cham. & Schlecht.)

G. arctophila (Griseb.). (Kusnezow?)
G. pygmaea (Rgl. & Schmalh.)
G. [illegible] (Maxim.)
G. azurea (Bge) H. Sm. (in Nilsson 1967).
G. durthiei (Burkill) H. Sm.
G. pygmaea (Regel & Schmalh.) H. Sm.

sect. Antarctophila Griseb.

G. ~~montana~~ (Forst.)
G. pleurogynoides (Griseb.)
G. magellanica (Gaudich.)
G. patagonica (Griseb.).
G. johiana see Nilsson, p. 88.

sect. Andicola Griseb.

G. saxosa (see Nilsson, p. 88).

Halenia Borkh. (c. 25 sp.)

H. elliptica Don
H. Perrottetii Griseb.
H. sibirica Borkh.
H. Fischeri Grah.
H. deflexa (Sm.) Griseb.
H. latirantha Griseb.
H. Brentoniana Griseb. (w.t. N. Am.).
H. Rothrockii A. Gray (Arizona)
H. plantaginea (HBK.) Griseb.
H. Schiedeana Griseb.
H. multiflora Benth.
H. parviflora (HBK.) Don
H. asclepiadea (HBK) Griseb.
H. pinifolia (R. & P.) Don
H. brevicornis (HBK) Don.

Table 1.

Type species:

(Löve & Löve)

Gentiana L. (x = 5) (= G. sect. Coelanthe Dostál) + sg. Coelanthe (Dostál) Holub — G. lutea L.
G. purpurea L.

Gentianodes L. & L. (x = 6) (= G. sect. Frigida Kusn. subsect. Typicae Kusn.) + sg. Stephora (Kusn.) L. & L.
G. frigida (L.) L. & L. — G. stephora (Franch.) L. & L.

Favargera L. & L. (x = 7) (= G. sect. Frigida Kusn. subsect. Froelichii Kusn.)
F. froelichii (Jan) L. & L.

Calathiana Delarbre (x = 7) (= G. sect. Cyclostigma Griseb.) — C. verna (L.) Delarbre

Ciminalis Adans. (x = 9) (= G. sect. Chondrophylla Dyz., excl. species, and sect. Thylacites Ren.) — { sect. ~~Chondrophylla~~ Ciminalis; sect. Thylacites Dyz.
C. acaulis (L.) Dostál ? C. clusii (Perr. & Song.) Holub ?

Dasystephana Adans. (x = 11) (= G. sect. Pneumonanthe Link ~~subsect.~~ series Asclepiadeae Grossh. p.p.)
D. asclepiadea (L.) ~~[illegible]~~ Dostál.

Ericala Ren. ex S. F. Gray (x = 13) (= G. sect. Chondrophylla Dyz., pro min. parte) — E. pyrenaica (L.) G. Don.

Mehraea L. & L. (x = 13) (= G. sect. Frigida Kusn. subsect. Phyllocalyx Kusn.) — M. phyllocalyx (C. B. Clarke) L. & L.

Tretorhiza Adans. (x = 13) (= G. sect. Aptera Kusn. and sect. Pneumonanthe Link, p.p.) + sg. Pneumonanthe (Link) L. & L.
T. cruciata (L.) L. & L. — T. pneumonanthe (L.) L. & L.

Ixanthus Griseb. (x = ?) — I. viscosus Griseb.

Tripterospermum Blume (x = 23 ?) — + sg. Stenogyne (Franch.) L. & L.
. . . . . . — T. . . . .

Lomatogonium A. Br. (x = 5) — L. carinthiacum (Wulf.) Rchb. f. ?

~~Megacodon H. Sm. (x = ?)~~

Comastoma Toyokuni (x = 5) (= sect. ~~[illegible]~~ Wettst.) — C. . . . (Wulf.) Toyokuni ? C. tenellum (Rottb.) Toyok. ?

Jaeschkea Kurz (x = 5) — J. . . .

Megacodon H. Sm. (x = ?) . . . .

~~Calathiana (x = 7)~~

Gentianella Moench (x = 9) (= G. sg. Gentianella Kusn. ~~[illegible]~~ p.p.) — incl. sg. Gentianella: sect. Gentianella (= sect. Amarella Kusn.) — G. amarella (L.) Börner; sect. Arctophila Griseb. — G. . . . (L.) H. Sm.
G. amarella (L.) Börner

Gentianopsis Ma (x = 11) (= G. sect. Crossopetalum Froel.) — type G. . . . . Ma — sg. Austromarella L. & L. — G. . . . (Forst. f.) L. & L.; sect. Austromarella (= sect. Antarctophila); sect. Andicola Griseb. . . . .
incl. sg. Pterygocalyx (. . . Maxim.) L. & L.
= G. . . . ( ) L. & L.

~~Pterygocalyx (x = ?)~~

Crawfurdia Wall. (x = ?) . . . .

Anagallidium Griseb. (x = ?) = A. . . .

Ophelia D. Don (x = 6) (= Swertia sect. Ophelia Benth. & Hooker, p.p.) . . . . . .

Swertia L. (x = 7) Swertia . . . L.

Halenia Borkh. (x = 11). . . . .

Frasera Walt. (x = 13) (= Swertia sect. Frasera ?) Frasera . . . . .

Veratrilla Franch. (x = ?) . . . .

Latouchea Franch. (x = ?). . . . .

Ixanthus Griseb. 2n = . . . one: Canaries. →

Jaeschkea 2n = 20 three: Himalayas

Crawfurdia = Gentiana.
2 sect. japonica 2n = 46: Wada 1956

Tripterospermum japonicum 2n = 46 Wada 1966 (in how do we?). = Crawfurdia

Gentiana 400 some spp.

Coelanthe x = 5 (2n = 40 ...) G. lutea, punctata, purpurea. Resides in pollen. (p. 63!).

69: ... Pneumonanthe x = 13, 2n = 26 → Andrewsii, linearis, pneumonanthe, puberula, saponaria, scabra, septemfida, asclepiadea 2n = 44.
(decumbens? ... 2n = 26)

Otophora

Stenogyne

Frigida x = 6 (2n = 24)

Aptera x = 13 (2n = 52 phlogifolia, straminea, fetisowii, 26: dahurica, gracilipes, (32-36: Feti...?) 2n = 42: macrophylla (Rork).

– Chondrophylla (~~x = 13 (2n = 26)?~~) x = 13 (pyrenaica 2n = 26), slightly diff. pollen (p. 67).
– Thylacites (Clusii) x = 9 (2n = 36). x = 6 (2n = 36: prostrata). pedicellata 2n = 18: Nak... Vanden...
– Cyclostigma → 2n = 30: G. bavarica (Favarger 1959) 2n = 28: G. brachyphylla: Favarger Bose, G. verna (Favarger, Skalinska

Gentianella 2n = 14: G. nivalis. 2n = 22: G. utriculosa, Favarger.
– Crossopetalum x = 11 (44: ciliata; detonsa, 2n = 78: crinita, procera (Rork)) pollen diff. ...: p. 71.
Arctophila x = 9 (... 2n = 36, ... 35). (~~Pleurogynella?~~)
Amarella x = 9 (2n = 36). —— monocliptera 2n = 18.
– Comastoma x = 5 2n = 38: Favarger (...). 2n = 10: Tuch...).
Antarctophila x = 6: (2n = 36: G. cerastioides).
Andicola 2n = 36: dolichopoda.

Lomatogonium x = 5

Swertia x = 13 (~~9, 7, 7, 8?~~ 6, 7, 8, 9, 10)? 2n = 24: Nakao & Gill 1968.
Ophelia (~~= Frasera? 2n = 102: Gupta & Mathur~~) → 2n = 20 Africa: Hedberg? 70-445
Enswertia 2n = 28: perennis 26: speciosa.
~~Frasera~~
Frasera?: (2n = 78)

Latouchea

Veratrilla

Megacodon

Halenia x = 11

11. 24. 26

G. cerinata Griseb. 2n=40 : Mehra & Gill 1968 (L. XVI).

G. argentea Royle 2n=20 : Mehra & Vasudeva 1972 (L. XXXVI).

G. capitata Ham. 2n=20 :

G. moorcroftiana Wall. 2n=18 :

G. pedicellata Wall. 2n=18 :

Jaeschkea latisepala Clarke 2n=20 : Mehra & Vasudeva 1972.

Swertia alata Royle 2n=24 : Mehra & Gill 1968 (XVI).

S. angustifolia Buch.-Ham. 2n=24 :

S. cordata Wall. 2n=26 :

S. purpurascens Wall. 2n=24 :

S. speciosa Wall. 2n=26 :

S. lurida Royle 2n=26 : Mehra & Vasudeva 1972.

a l.

Some of the more widespread sp. of the larger genus

(5) Gentiana L., Sp. pl. . . .

Subgenus Gentiana — type

Gentiana lutea L.
~~G. lutea~~ ssp. lutea
ssp. symphyandra (Murb.) Hayek

Subgenus Coelanthe (Borkh.) [illegible], Folia Geobot. Phytotax. . . .

4 Gentiana punctata L.
G. pannonica Scop.
G. purpurea L. — ~~ssp. purpurea~~ ~~ssp. camtschatica (DC.)~~
G. Burseri Lapeyr.
ssp. Burseri
ssp. Villarsii (Griseb.) Rouy

(40) Gentianodes Löve & Löve, Bot. Notiser (= G. sect. Frigida subsect. Frigida) + sect. Isomeria (p.p.) — type.

sect. ~~Frigida~~ Gentianodes = Monopodiae (H. Sm.)
sect. Sympodiae (H. Sm.)

frigida (Haenke) L. & L.
algida (Pallas) L. & L. — amoena (C.B. Clarke) fr. Isomeria
amplicrater (Burkill) L. & L. — cachemirica (Decaisne) (fr. Isomeria)
cephalantha (Franch.) L. & L. — Cunninghamii (H. Sm. in ed.)
delavayi (Franch.) L. & L.
depressa (D. Don) L. & L.
duclouxii (Franch.) L. & L.
elwesii (C.B. Clarke) L. & L.
ernestii (Marq.) L. & L.
farreri (Balf. f.) L. & L.
filistyla (Balf. f.) L. & L.
glauca (Pallas) L. & L.
hexaphylla (Maxim.) L. & L. — Loderi (Hook. f.) fr. Isomeria
lineolata (Franch.) L. & L. — oreades (H. Sm. in ed.)
picta (Franch.) L. & L.
praeclara (Marq.) L. & L. — Nakaberngii
rigescens (Franch.) L. & L.
sikkimensis (C.B. Clarke) L. & L.
sino-ornata (Balf. f.) L. & L.
stipitata (Edgeworth) L. & L.
stragulata (Balf. f. & Forrest) L. & L.
suboccultata (Marq.) L. & L.
szechenyii (Kanitz) L. & L.
tizuensis (Franch.) L. & L.
tongolensis (Franch.) L. & L.
trichotoma (Kusnez.) L. & L. — triphylla (H. Sm.)
tubiflora (Wallich) L. & L.
urnula (H. Smith) L. & L.
vaniotii (Léveillé) L. & L.
veitchiorum (Hemsley) L. & L.
venusta (Wallich) L. & L.
yunnanensis (Franch.) L. & L. — yakushimensis (Makino, Bot. Mag. Tokyo 23 (1909) p. 252)

Arctic — Gentianaceae key: 18 — .

~~Flowers solitary;~~

1a. {Corolla rotate, pale blue or white; tube short; lobes five, rarely four, each with two fimbriate nectaries from the base on their inner surface; calyx deeply divided into five, rarely four, lobes; ~~stamens on base of corolla; stigma sessile~~; ~~[illegible]~~ annular bi...

— — Lomatogonium

1b. Flowers solitary or few; corolla funnelform, campanulate or or salverform, the sinuses with or without plaits or appendages; calyx with an elongate tube, ~~Stamens~~ 2

2a. Corolla with appendages between the lobes; throat and lobes not ciliate — .. 3

2b. Corolla without appendages between the lobes; throat and lobes usually ciliate . . . 5

3a. Appendage in the sinus between the corolla-lobes more than half as long as the lobes; the corolla thus appearing ten-lobed; corolla obconical, plicate, ~~[illegible]~~ anthers free; seeds not winged ~~unwinged~~ — — — — — Ciminalis

3b. Appendage in the sinus between the corolla-lobes much shorter than the lobes . . . 4

4a. Annual, without non-flowering shoots; corolla-tube almost cylindrical, plicate, with five patent lobes, the appendage in the sinus small; anthers free; seeds not winged . — — — — — — — Calathiana

4b. Perennial, with non-flowering shoots; lower leaves in a rosette, cauline leaves free; anthers free; seeds covered with white, membranous lamellae.. Gentianodes

5a. Flowers four-merous; corolla obconical, corolla-lobes ovate to obovate, obtuse, usually more or less fringed or ciliate at margin, patent; sinuses of the corolla-lobes with a thin inner membrane extending across the base and bearing minute processes; ~~anthers~~ capsule stipitate; ... Gentianopsis
seeds oblong or angular, papillose; ovules borne over the entire inner surface of the ovary;

5b. Flowers 4- or 5-merous; sinuses of the corolla-lobes without an inner ~~margin~~ membrane; ovules borne in two rows along the margin of each suture; seeds globose or slightly flattened, smooth. — — — — — 6

6a. Calyx-lobes four or five, equal; corolla obconical or cylindrical, fimbriate in throat; pedicels shorter than the subtending internode; corolla ~~orifice~~ tube naked, or with scattered, vascular and minutely papillose fimbriae, or the fimbriae united to form a single scale across the base of the corolla-lobe; capsule stipitate or sessile Gentianella

6b. Calyx-lobes four or five, unequal; corolla narrowly obconical, with a few scales forming a fringe at the base of the acute or subacute lobes; pedicels longer than the subtending internode; corolla ~~orifice~~ tube with two fimbriate scales at the base of each lobe, the fimbriae shortly digitate, evascular and smooth; capsule sessile . . — — — Comastoma

1

Gentiana cinereifolia van Royen, in Nova Guinea, Bot., No. 17, 404 (1964): N. Guinea (Papua)
G. dimorphophylla van Royen, in Nova Guinea, Bot., No. 17, 378 (1964)
G. ingitii van Royen, in Nova Guinea, Bot., No. 17, 387 (1964)
G. nertereifolia van Royen, in Nova Guinea, Bot., No. 17, 381 (1964)
G. papuana van Royen, in Nova Guinea, Bot., No. 17, 405 (1964)
G. piundensis van Royen, l.c. 393
G. polytrichoides van Royen, l.c. 392
G. protensa van Royen, l.c. 400
G. pungens van Royen, l.c. 383
G. recurvifolia van Royen, l.c. 390
G. sclerophylla van Royen, l.c. 378

G. cruttwellii H. Smith, in Kew Bull. 1957, 225 (1957) (New Guinea)
G. juniperina H. Smith, l.c. 225

Gentianella fasciculata Fabris, Bol. Soc. Argent. Bot. VII, 90 (1958)
G. sprucean Fabris, Bol. Soc. VIII, 182 (1960)
G. vargasii Fabris, l.c. VII, 86 (1958)
Se [illegible] transfers from Gentiana!

G. amoena (Wedd.)
~~G. [illegible] (Gilg)~~
campanuliformis Reimers, in Engl. Jahrb. LXII, 324 (1929) (Peru.)
cerastioides H.B. & K.
chamuchui Reimers, l.c. 333 (Peru.)
~~[illegible]~~ Gilg
crassulifolia Griseb.
~~[illegible] Gilg~~
dianensis Griseb.
diffusa H.B.K.
dilatata Griseb.
ericoides Griseb.
fastigiata Benth.
flaviflora Griseb.
foliosa H.B.K.
~~[illegible] Gilg~~
gracilis H.B.K.
graminea H.B.K.
~~[illegible] Gilg~~
hirculus Griseb.
Hookeri Griseb.
~~hypericoides Gilg~~
hyssopifolia H.B. & K.
incurva Hook.
jamesonii Hook.
kurtzii Gilg, in Engl. Jahrb. LIV, Beibl. 118, 36 (1916) Argent.
~~lehmannii Gilg~~
limoselloides H.B. & K.
~~[illegible] Gilg~~
multicaulis Gillies ex Griseb.

Fabris 1954 →
van Royen, 1964 →

(Ericoila in Australia.)

? Apiculata

Of the widespread and variously [illegible] genera of gentians, only Gentianella reaches the southern hemisphere, with one species in South America (to Chile (Wilson, p. 104)) and several others in Australia and New Guinea. Other austral gentians all belong to the new genus Gentianella.

for which there are almost 300 (validly) published names

Although many of the taxa of this group [illegible] (species [illegible] in the past certainly are too highly standardised) it seems safe to conclude that the following [illegible] are good biological species and [illegible] transfer to the new genus:

Lomanogonia E. Mey.
Anthophylax
Antiphila
Gentianella (Grisebach)?

Oreophylax (Endl.) (S. Am.) Hagrey.
= sect. Andicola

Since we doubt that many of these taxa (of the species) are correctly classified at this level (maintained below the subfamily level) and ought rather to be reduced in rank, we refrain from transferring (to the new genus) other than those that we feel are certainly good biological (separate) species. These are for N.Z. . . .

Many of these validly published names are likely to be relegated to synonymy, though some may represent geographical races that in the future will (may) probably be regarded as subspecies or varieties only.

Fabris: Gentianella XIII / Fabris ... and later 2. (1955, 1958, 1959, 1960)   S. Am. fr. Guatemala to Tierra

Gentiana nitida Griseb.
nummulariifolia Griseb.
ottonis Phil.
pavonii Griseb.
pernettyoides Reimers, in Engl. Jahrb. LXII, 228 (1929) Peru.
peruviana Griseb. — see 7 (Gilg!).
~~pseudotenella Gilg~~
punensis Fabris, in Not. Mus. La Plata, Bot. XV, 122 (1950)
rima D. Don
saxifragoides H.B.K.
selaginifolia Griseb.
~~splendens Gilg~~
Gentianella spruceana Fabris, in Bol. Soc. Argent. Bot. VIII, 187 (1960)
stellarioides Griseb.
~~sulphurea Gilg~~
thyrsoidea Hook.
Gentianella vargasii Fabris, in Bol. Soc. Argent. Bot. VII, 86 (1958)
violacea D. Don
~~weberbaueri Gilg~~

Gentiana fabrisiae Fabris, in Not. Mus. La Plata, Bot. XV, 124 (1950)
G. coerulescens Gill. ex Griseb. in Abh. Ges. Wiss. Göttingen XXIV 237 (1879) (Symb. Fl. Argent.)
G. jujuyensis Fabris, in Not. Mus. La Plata, Bot. XV, 117 (1950)
— G. neomacdonaldii R.C. Foster, in Rhodora LVI, 103 (1954) (= G. macdonaldii Gilg) (S. Am.?)
G. oranensis Fabris, in Not. Mus. La Plata, Bot. XV, 120 (1950)
G. [illegible] R.C. Foster, in Rhodora LVI, 103 (1954) (= G. praticola Gilg. — S. Am.?)
G. verecunda G. Simpson, in Trans. & Proc. Roy. Soc. N.Z. LXXIX, 425 (1952) N. Zeal.
G. alticola R.C. Foster, Rhodora LVI, 103 (1954) (= G. lancifolia Gilg. S. Am.?)

Gentiana
albo-rosea Gilg
(Gentianella) alborubra Fabris, in Bol. Soc. Argent. Bot. VI, 49 (1955) (Peru).
brandtiana Gilg
cernua H.B.K.
Gentianella carrascoi Fabris, l.c. 48 (Peru)
Gentianella euphorbiifolia Fabris, l.c. 50 (Peru)
Gentianella huancavelicaensis Fabris, l.c. 46 (Peru)
Gentianella tovariana Fabris, l.c. 45 (Peru).

Gentiana

cocuyana Cuatrec., in Caldasia III, 437 (1945) (Colombia)
guatemalensis Standley & Steyerm., in Publ. Field Mus. Nat. Hist., Chicago, Bot. Ser. XXIII, 75 (1944) (Guatemala)
lewisiae Standl. & Steyerm., l.c., 76 (1944) (Guatemala)
meyeri Fabris, in Not. Mus. La Plata, Bot. XIV, 71 (1949) (Argentina)
pumilio Standley & Steyerm., l.c., 76 (Guatemala)
reflexifolia Killip & Vargas, in Bol. Mus. Hist. Nat. "Javier Prado", Lima, VIII, 218 (1944) (Peru).
? unciifolia H. J. Lam, in Blumea V, 578 (1945) (Celebes).

? pachyphylla Merrill, in Not. Nat. Acad. Sci. Philad., No. 47, 7 (1940) (Sumatra)
? ulmeri Merrill, l.c. 8 (Sumatra)

Gentianella

Andreae-Mathewsii Briquet, in Candollea IV, 326 (1931) (= G. Mathewsii Gilg) (Peru)
Arbelaezii Cuatrec., in Trab. Mus. Cienc. Nat., Madrid, Ser. Bot., No. 26, 22 (1933) (Colombia)
coquimbensis Briquet, l.c. 328 (1931) (Chile).
Ernesti Briquet, l.c. 326 (1931) (Peru)
Stuckertii Briquet, l.c. 325 (1931) (Argentina)
Tatei Rusby, in Phytologia I, 72 (1934) (Bolivia)
? Townsendii Briquet, l.c. 329 (1931) (Mexico)

Gentiana.

amabilis Petrie, in Trans. & Proc. N. Z. Inst. LVI, 14 (1926) N. Z.
flava Larrañaga, Escritos D. A. Larrañaga, II, 100 (1923) (Urug.)
gilgiana Reim., in Engl. Jahrb. LXII, 326 (1929) (Peru.)
herrerae Reim. l.c. 330 (1929) (Peru)
? lunnifusa S. Moore, in Journ. Bot. 1925, LXIII, Suppl., 70 (Sumatra)
longipes Rusby, in Mem. N.Y. Bot. Gard. VII, 321 (1927) (Bolivia)
luteo-marginata Reim., in Engl. Jahrb. LXII, 332 (1929) Peru
persquarrosa Reimers, l.c. 332 (Peru)
rubra Larrañaga, l.c. II, 100 (1923) (Urug.)
solidaginoides Reimers, l.c. 329 (Colombia)
Spedenii Petrie, in Trans. & Proc. N. Z. Inst. LVI, 14 (1926) N. Z.

? coerulea Moc. & Sessé, in Sessé & Moc. Pl. N. Hisp. ed. 2, 44 (1887-90) (Mexico).
regina Gilg, in Notizbl. Bot. Gart. Berlin VII, 509 (1921) (Peru).

albo-rosea Gilg, in Engl. Jahrb. LIV, Beibl. 118, 55 (1916) (Peru).
androtricha Gilg, l.c. Beibl. 118, 79 (1916) Ecuador,
astonii Petrie, in Trans. N. Z. Inst. 1915, XLVIII, 187 (1916) N. Z.
atroviolacea Gilg, l.c. 53 (Colomb.)
benedictae Gilg, l.c. 80 (Boliv.)
Bockii Gilg, l.c. 74, Boliv.
briquetiana Gilg, l.c. 72, Boliv.
cardiophylla Gilg, l.c. 75, Ecuador
carinicostata Wernham, in Trans. Linn. Soc., Bot. IX, 117 (1916) N. Guinea)

Gentiana.

carneo-rubra Gilg, in Engl. Jahrb. LIV, Beibl. 118, 55 (1916) Peru.
chrysantha Gilg, l.c. 81 (Bolivia)
chrysosphaera Gilg, l.c. 77 (Peru).
chrysotaenia Gilg, l.c. 79 (Peru).
? clementis Merrill, in Philipp. Journ. Sci., Bot. XIII. 120 (1918) (Borneo)
comarapana Gilg, l.c. 82 (Bolivia)
crassicaulis Gilg, l.c. 60 (Peru)
dasythamna Gilg, l.c. 63 (Bolivia)
dolichopoda Gilg, l.c. 36 (Peru)
gibbsii Petrie, in Trans. N.Z. Inst. 1916, XLIX, 52 (1917), N.Z.
graebneriana Gilg, l.c. 24 (Peru)
? hauthalii Gilg, ~~in Hauthal, Reisen in Bolivia u. Peru~~ in Engl. Jahrb. XLIX, 212 Bolivia or ?
hedenstroemioides Gilg, l.c. 59. Peru.
herzogii Gilg, l.c. 57. (Bolivia)
lareccajensis Gilg, l.c. 31 (Bolivia)
lilacino-flavescens Gilg, l.c. 38 (Bolivia)
lithophila Gilg, l.c. 39 (Bolivia)
lobbii Gilg, l.c. 60 (Peru).
lobelioides Gilg, l.c. 30 (Peru)
lythroides Gilg, l.c. 24 (Bolivia)
macrorrhiza Gilg, l.c. 40 (Bolivia)
mandonii Gilg, l.c. 37 (Bolivia)
— mathewsii Gilg, l.c. 64 (Peru.)
mendocina Gilg, l.c. 36 (Argent.)
narcissoides Gilg, l.c. 65 (Bolivia)
pachystemon Gilg, l.c. 46. (Peru)
pulcana Gilg, l.c. 47 (Bolivia)
pallido-lilacina Gilg, l.c. 58 (Bolivia)
pilgeriana Gilg, l.c. 42 (Bolivia)
potamophila Gilg, l.c. 74. (Peru).
praticola Gilg, l.c. 46 (Bolivia)
primuloides Gilg, l.c. 31 (Bolivia, Peru).
purpureifolia Gilg, l.c. 65 (Bolivia)
sagimifolia Wernham, in Trans. Linn. Soc., Bot. IX, 117 (1916), N. Guinea.
scarlatinostriata Gilg, l.c. 67. (Peru)
? singgalangensis, Bacher, in Bull. Jard. Bot. Buitenz. Sér. III, II, 326 (1920) Java
splendens Gilg, l.c. 74 (Ecuador)
striaticalyx Gilg, l.c. 56 (Bolivia)
stricticaulis, Gilg, l.c. 62 (Peru)
? sumatrana Ridley, in Journ. Fed. Mal. States Mus. VIII, IV. 58 (1917) (Sumatra)
tereticaulis Petrie, in Trans. N.Z. Inst. 1916, XLIX. 51 (1917), N.Z.
titorensis Gilg, l.c. 84 (Bolivia)
? vanderwateri Wernham, in Trans. Linn. Soc., Bot. IX, 117 (1916) N. Guinea.
? wollastonii Wernham, l.c. 118 (N. Guinea)

Gentiana:

bellatula Gilg, in Engl. Jahrb. 1, Beibl. 111, 49 (1913) (Boliv.)
brandtiana Gilg, l.c. 48 (Peru)
clarenii Gilg, l.c. 48? (Argent.?)
? copelandii Elmer, Leaflets Philipp. Bot. VII, 2671 (1915) Philippines)
eurysepala Gilg, l.c. 50 (Peru)
flavida Petrie, Trans. N.Z. Inst. 1910, XLIII, 255 (1911) N.Z.
matthewsii Petrie, Trans. N.Z. Inst. 1911, XLIV, 183 (1912) N.Z.
poculifera Gilg, l.c. 48. (Peru).
scarlatiflora Gilg, l.c. 49 (Peru)
serotina Cockayne, in Trans. N.Z. Inst. 1914, XLVII, 113 (1915) N.Z.
tenuifolia Petrie, in Trans. N.Z. Inst. 1912, XLV, 270 (1913) N.Z.

---

anthosphaera Gilg, in Fedde Repert. II, 46. (1906) (Boliv.)
? apoensis Merrill, in Philipp. Journ. Sci. 1, Suppl. 223 (1906) Philippines. ?
arenarioides Gilg, l.c. 39 (Peru).
boliviana ~~Gilg~~ Pax, in Fedde Repert. VII, 243, (1909) (Boliv.)
bruneo-tincta Gilg, l.c. 37 (Peru)
calcarea Gilg, l.c. 42 (Peru)
chathamica Cheeseman, Man. N. Zeal. Fl. 449 (1906) Ins. Chatham: N.Z.)
corallina Gilg, l.c. 48. (Peru)
? diversifolia Merrill, Philipp. J. Sci. I, Suppl. 224 (1906) (Philippines).
divisa Cheeseman, Man. N. Zeal. Fl. 453 (1906) (N. Zeal.)
ericothamna Gilg, l.c. 50 (Peru).
erythrochrysea Gilg, l.c. 38 (Boliv.)
fiebrigii Gilg, l.c. 45 (Boliv.)
flavido-flammea Gilg, l.c. 37 (Peru).
gracilifolia Cheeseman, Man. N. Zeal. Fl. 1144 (1906) N.Z.
hydrophiloides Gilg, l.c. 40 (Boliv.)
ignea Gilg, l.c. 49 (Peru)
krauseana Gilg, l.c. 45 (Boliv.)
lavradioides Gilg, l.c. 49 (Peru)
lilacina Gilg, l.c. 40 (Peru)
lorentzii Koord. in Lorentz, Nova Guinea, VIII, 175 (1909) (Neu Guinea)
lurido-violacea Gilg, l.c. 37 (1906) (Peru).
macroclada Gilg, l.c. 47 (Boliv.).
mesembrianthemoides Gilg, l.c. 41 (Peru).
muscoides Gilg, l.c. 35 (1906) (Peru).
myrtantha Gilg, l.c. 43 (1906) (Boliv.).
odontosepala Gilg, l.c. 48 (Boliv.).
oreosilene Gilg, l.c. 40 (Peru)

(Cont.)

Gentiana (cont.).

paludicola Gilg, l.c. 42 (Peru)
patula Cheesem., Man. N. Zeal. Fl. 452 (1906) (N. Z.).
petrophila Gilg, l.c. 42 (Peru)
porphyrantha Gilg, l.c. 39 (Peru)
pseudocrassula Gilg, l.c. 44 (Bolivia)
pseudolycopodium Gilg, l.c. 38 (Peru).
roseo-lilacina Gilg, l.c. 35 (Peru)
sanctorum Gilg, l.c. 41 (Peru)
sandiensis Gilg, l.c. 36 (Bolivia)
scarlatina Gilg, l.c. 36 (Peru)
thiosphaera Gilg, l.c. 46 (Bolivia)
townsonii Cheeseman, Man. N. Zeal. Fl. 450 (1906). (N. Z.).
tristicha Gilg, l.c. 39 (Peru).
vernicosa Cheeseman, l.c. 1145 (N. Z.)
weberbaueri Gilg, l.c. 51 (Peru)

III.
dolichantha Gilg, in Torrey V, 109 ... impt or! (Bolivia)
? perpusilla T. S. Brandegee, in Zoe, V, 181 (1904) (Mexico).

II
albido-caerulea Gilg, in Engl. Jahrb. XXII, 331, impt or! (Bolivia)
bangii Gilg, l.c. 324. impt or (Bolivia).
barbeyana Gilg, l.c. 310 (Peru).
brachysepala Gilg, l.c. 328 (Ecuador)
bridgesii Gilg, l.c. 316 (Bolivia)
calanchoides Gilg, l.c. 330 (Peru)
cantamlensis Gilg, l.c. 334 (Peru)
claytonioides Gilg, l.c. 318 (Argent.)
cochabambensis ~~Gilg, l.c.~~ Rusby, in Mem. Torrey Bot. Club VI, 79 (Bolivia).
dacryoides Gilg, l.c. 311 (N. Granat.)
dasyantha Gilg, l.c. 309 (N. Granat.)
dielsiana Gilg, l.c. 316 (Bolivia)
englerii Gilg, l.c. 314 (N. Granat.)
exacoides Gilg, l.c. 329 (Peru)
filipes Cheesem., in Trans. N. Z. Inst. XXVIII, 536 (19..). (N. Z.)
gageoides Gilg, l.c. 320 (Bolivia)
gilioides Gilg, l.c. 314 (Ecuador)
Gillierii Gilg, l.c. 317 (Amer. austr.)
Giulianetti Hemsley, in Kew Bull. 1899, 106 (N. Guinea)
gyrophora Gilg, l.c. 305 (Bolivia).

Jants..

cont..

helianthemoides Gilg, l. c. 321 (Reg. Argent.)
hieronymi Gilg, l. c. 305 (Argent.)
hypericoides Gilg, l. c. 312 (Amer. austr.)
inaequicalyx Gilg, l. c. 324 (Bolivia)
kuntzei Gilg, l. c. 326 (Bolivia)
(nobis: Grsm!) [illegible] kusnezowii Gilg, l. c. 325 (Bolivia)
laxifolia Gilg, l. c. 326 (Bolivia)
? lateriflora Hemsley, in Kew Bull. 1896, 38 (Celebes)
lehmannii Gilg, l. c. 310 (Amer. austr.).
longibarbata Gilg, l. c. 331 (Ecuador)
macgregorii Hemsley, in Kew Bull. 1899, 107 (N. Guinea)
nevadensis Gilg, l. c. 313 (N. Granat.)
orobanchoides Gilg, l. c. 333 (Boliv.)
peruviana Gilg, l. c. 304 (non Griseb.!) (Peru). see Z (Griseb.).
riojae Gilg, l. c. 319 (Argent.)
sabbatioides Gilg, l. c. 328 (Ecuador)
silenoides Gilg, l. c. 319 (Bolivia)
soratensis Gilg, l. c. 332 (Bolivia)
speciosissima Gilg, l. c. 325 (Peru)
stenosepala Gilg, l. c. 331 (Bolivia)

stuebelii Gilg, l. c. 317 (Peru)
sulphurea Gilg, l. c. 308 (Ecuador)
tarapacana Gilg, l. c. 305 (Chile)
tubulosa Gilg, l. c. 315 (Argent.)
Tupa Gilg, l. c. 333 (Peru).

(DH[?] I) 8. G. [?] : [?] : Syd Amer.

Gentiana

antarctica T. Kirk, in Transact. N.Z. Inst. XXVII, 339 (1895) (N.Z.).
antipoda T. Kirk, l.c. ~~XXIII, 440~~ XXVII, 340 (1895) (N. Zeal.).
araucana Phil., in Anal. Univ. Chil. XC, (1895) 205 (Chile).
corymbifera T. Kirk, l.c. 336 (N.Z.).
ettingshausenii F. Muell., in Trans. Roy. Soc. Vict., N.S. I, II (1889), 27 (N. Guinea).
lactea Phil., l.c. 206 (Chile).
lineata T. Kirk, l.c. 334 (N.Z.).
lycopodioides Stapf, in Trans. Linn. Soc. Ser. II, IV, (1894) 208 (Borneo)
multibracteolata Colenso, in Trans. N.Z. Inst. XXIV (1892) 389 (N.Z.)
? ovatiloba Kusnezow, in Act. Horti Petrop. XIII (1893) 60 (Mexico).
? rusbyi Greene, in Kusnezow, ~~Act. Horti Petrop. XIII (1893) 59~~ (1894) 57 (N. Mexico).
spenceri T. Kirk, Trans. N.Z. Inst. XXVII (1895) 335 (N.Z.).
superba Greene, Pittonia 1 (1888) 155. (Mexico).
valdiviana Phil., in Anal. Univ. Chil. XC (1895), 206 (Chile).

in [?] [?] fr. S. Am. + N.Z. (+ Ins. Auckl.) + N. Guinea, Mexico

setigera A. Gray : Calif.
wislizenii Engelm. : Arizona [?]
wrightii A. Gray : Arizona.

Austr.

1 : montana Forst. f. Prodr. 21.

201
81
282 S. Am.

44 + 5 = 49 = N.Z. + Austr. + N.G.

24 : [?]

Warburg : Fl. Br. Isl. 1952, 823
in Gentianella

Toyokunia

sect. Toyokunia: N. Z. Aust.
sect. Andicola (Griseb.) L.&L.: S. Am.

antarctica (Kirk) L.&L.
antipoda (Kirk)
astonii (Petrie)
bellidifolia Hook.f.
cerina (Hook.f.)
ssp. cerina
ssp. suberecta (Kirk)
chathamica (Cheesem.)
concinna (Hook.f.)
corymbifera (Kirk)
divisa (Kirk)
ssp. divisa
ssp. magnifica (Kirk)
filipes (Cheesem.)
gibbsii (Petrie)
grandiflora (Cheesem.)
grisebachii (Hook.f.)
lineata (Kirk)
matthewsii (Petrie)
montana (Forst.f.)
ssp. stolonifera (Cheesem.)
patula (Kirk)
saxosa (Forst.f.)
serotina (Ckn.)
spenceri (Kirk)
tenuifolia (Petrie)
tereticaulis (Petrie)
townsonii (Cheesem.)
vernicosa (Cheesem.)

magellanica Gaudich.
patagonica (Griseb.)
pleurogynoides (Griseb.)

Andicola: H.B.K.?

rupicola (Kunth)
limoselloides (Kunth)
vaginalis (Griseb.)
saxicola (Griseb.)
nitida (Griseb.)
cernua (Kunth)
meyeniana (Griseb.)
saxifragoides (Kunth)
hirculus (Griseb.)
hookeri (Gilg)
gracilis (Kunth)
NZ. saxosa (Forst.)
incurva (Hook. f.)
primulifolia (Griseb.)
dilatata (Griseb.)
cerastioides (Kunth)
corymbosa (Kunth)
cuspidata (Griseb.)
Van Diemen's diemensis (Griseb.)
stellarioides (Griseb.)
graminea (Kunth)
multicaulis (Kunth)

foliosa (Kunth)
crassulifolia (Griseb.)
nummulariifolia (Griseb.)
hyssopifolia (Kunth)
dianthoides (Kunth)
relicta (Griseb.)
ericoides (Griseb.)
distichifolia (Griseb.)
inflata (Griseb.)
pavonii (Hook.)
pedunculata (Griseb.)
swertioides (Griseb.)
diffusa (Kunth)
liniflora (Kunth)

brevifolia (Griseb.)
cosmantha (Griseb.)
dacrydioides (Gilg)
dolichopoda (Gilg)
gageoides (Gilg)
hieronymi (Gilg)
magellanica (Gaudich.)
multicaulis (Gill. ex Griseb.)
multiflora (Griseb.)
rima (G. Don)
scarlatina (Gilg)
striaticalyx (Gilg)

Gregophylae (Endl.) Kusnezov §

The New Zealand gentians.
austral

Tryoldonia, a (~~recd~~) ~~rule~~ genus of for the austral gentians.
(genus new for the)

In connection with extensive studies of the natural classification of the gentians of the world into smaller and biologically clearly defined units, we have encountered the problem of the austral representatives of the collective genus Gentiana, which belong to the two sections Andicola Griseb. and Antarctophila Griseb. that often have been distinguished as sections of the more restricted but still collective genus Gentianella Moench. According to palynological studies by Nilsson (1967 a), the pollen ~~more than fifty~~ species of Australia, New Zealand (&) ~~South America~~ South America ~~that belong to the section Antarctophila are apparently closely related to the pollen close to unrelated species of section Andicola from the mountains of South America~~ from Colombia to Tierra del Fuego and the Falkland Islands are ~~all~~ closely related. But the distinction between the sections seems to be so subtle or confused All the species, that a designation appearing to either ... [illegible] ... the base chromosome number $x = 9$ ~~...~~ on which a polyploid series is based (Hair ... [illegible]), In these features these sections are similar to the genus Gentianella of boreal ~~...~~ mountains and tundras of ... [illegible] (... Nilsson 1967). However, Allen (1961) doubted the correctness of placing the New Zealand species in this boreal genus for various reasons, but probably mainly because in several morphological characters these taxa seem to be ~~...~~ closer to the distinct genus Lomatogonium, from which they nevertheless ~~...~~ differ in pollen morphology and, especially, in basic chromosome number.

Our studies, ~~that which will remain~~ the details of which will remain unpublished ~~...~~ until completed for the entire group, support the doubts expressed by Allen (1961) as to the distinctness of the austral groups from the boreal ones, both morphologically and especially as to the very important structure of the seed coats, which is a character of utmost taxonomical importance for the ~~...~~ recognizing of the biological genera of the Gentianaceae; it is being closer investigated by aid of the scanning electron microscope by Professor H. Toyokuni of Japan.

All the species ... [illegible]

× Fabri... (1952/1955)

Limits of ... [illegible]

It has clearly emerged that although the genes — or DNA if the reader so wishes —, ~~and~~ their mutation and recombination and the following natural selection of the combination are all-important for creation of variability in all the characteristics of any taxon, this is a process requiring interfertility at least until selection sets in, whereas selection will continue its polishing of the results until the evolutionary line becomes extinct. But it has also been shown that the chromosomes, in which the genes are situated, are all-important as the agents of reproductive isolation that conserves the favorable combinations of genes, and that this isolation is produced by aid of ~~[illegible]~~ mainly euploid [illegible] and linear changes in the chromosomes that greatly affect their pairing at meiosis and, thus, the formation of the gametes. ~~[illegible]~~ At the same time the great significance of dysploid chromosome changes for the creation of new evolutionary lines at a level above that of reproductive isolation has been established, whereas the significance of morphological changes in the chromosomes for still higher level evolution continues to remain obscure.

~~As is the case of a loved child, plant taxonomy is a field which is looked upon from~~

Taxonomy has been defined in various ways, ~~it~~ according to the point of view of those concerned. ~~but it is included~~ It is actually a dual science, which bases its approach on the theory of evolution ~~as~~ as reflected in the flow of organisms from a lower level to a higher. It is our ~~the~~ opinion ~~of~~ ~~the writer~~ that it is wisely divided into what could be called true plant systematics and taxonomy in the restricted sense. ~~[illegible]~~ The aim of the former ~~[illegible]~~ is to ~~[illegible]~~ produce a system in which all the categories of organisms are classified in such a way that reflects their evolutionary history as closely as possible. ~~Since systematics so defined inevitably the~~ ~~Taxonomy in its restricted sense, however, is mainly concerned with the classification of the lower cat~~

Systematics so defined is mainly a historical science which is forced to work with

---

Introduction (1964) — leder till [illegible] om syst. + taxon.

och att för förståendet av de högre kategorierna måste man ha cytogenetiken för att skilja arter och [illegible], [illegible] för att förstå utvecklingen av de senare genom selektionsprocessen, morfologin för identifiering, och nomenklaturen för namngivandet.

Karyotaxonomi — genetiken, egentligen ~~[illegible]~~ att stödja morfologi & genetisk kombinerande, av största vikt för högre kategorier, liksom kromosommorfologi och grundtal.

De [illegible] [illegible] av [illegible] karaktärer är viktigaste för den högre systematiken, men man bör komma ihåg, att de inte alltid [illegible] sig på cytogenetikens betydelse eller på karyogenetiken.

Skilja tydligt emellan heredity och genetics, och [illegible] fenotyp och genotyp — — .

Evolutionary ~~classification of~~ plants classification. (se Simpson).

Although Warburg (   ), on the authority of Smith (   ), had regarded all the New Zealand gentians as representative of <u>Gentianella</u>, as actually had been indicated already by Kusnezow (. .) when placing the austral gentians in the section - - - - - of that ~~subgenus~~ group, which he regarded as a subgenus only, Allan (19 . .) voiced doubts as to the correctness of this.
~~[illegible]~~

There is a reason to suggest, on basis of the morphological ~~and~~ diversity ~~of the material~~ of even the limited material seen, ~~for~~ that the genus could be subdivided into sections, although the variation is considerably more limited than that of the large boreal ~~genus Gentianella s. str.~~ genera that have been so classified. However, the preliminary sectional division into Antarctophila and . by Grisebach ( ) is likely to have to be abandoned, since it ~~clearly~~ is based on characters that are not even geographically limited to one of the very disjunct areas of the genus and so is artificial rather than evolutionary.

Below we transfer to the new genus only species which we are convinced are correctly classified at this level, as shown by recent observations by botanists ~~for the area of distr.~~ who have studied the taxa ~~in their area~~ from good ~~collections~~ and recent collections.

Of the boreal genera split out of Gentiana s. lat., the species Ciminalis prostrata (Haenke) Love & Love reaches South America, and several other annual-biennial species of that genus ~~are known to occur~~ are known from New Guinea and Australia. But other ~~*~~ gentians of the austral regions belong to the new genus Gajoheimia.

Prostratae 36 (Chondrophyllae) = Ciminalis, others, prostrata reaches S. Am. + N. Guinea.

The gentians of New Zealand and ~~the neighboring~~ areas in ~~Australia and New Guinea~~ and the Australian area, and also those of South America caused a problem of classification that [illegible] (18) ~~[illegible]~~ bypassed through grouping them all as ~~sections~~ of two sections of the subgenus Gentianella.

Later, when this subgenus ~~of the~~ was elevated to generic status by several taxonomists, several austral botanists followed suit and transferred numerous species to this genus without closer investigation. Allan ( ) however, ~~[illegible]~~ was uncertain as to the ~~identity of the austral~~ close relationship of the austral and boreal sections, and so hesitated to accept this procedure for the New Zealand species, despite certain similarities and the fact that Gentianella s.str. from the boreal zone and all gentians so far studied by cytologists from New Zealand and South America are characterized by the same basic chromosome number and a preponderance of tetraploidy.

Since the distinguishing of these austral species in a genus of its own will solve the problem of their identity and may help phytogeographical studies of their history, we feel urged to propose for this group a generic name and to transfer to it at least the most important species, despite the fact that the details of our investigation may not become available for publication for some time. ~~As~~ ~~[illegible] We propose to name the~~ The name selected for this new genus is in honour of Professor H. Toyokuni of the Asahikawa University in Hokkaido in Japan, both of whom have contributed considerably to the solution of the riddle of the Gentianaceae in general and to the understanding of the austral group in particular:

Toyokunia Löve & Löve, gen. nov. Gentianaceae-Gentianeae.

~~[illegible]~~ Plantae [illegible] (Gentianella similes) annuae.

[illegible] destituta. Antherae versatiles, liberae. Stylus nullus vel subnullus, stigmatibus duobus distinctis. Capsula sessilis. Testa exalata. ~~[illegible]~~ Species [illegible] hemisphaerii australis.

Typus generis: Toyokunia montana (Forst. f.) Löve & Löve.

The genus includes the following sections and species:

Sectio Toyokunia

Sectio Antarctica (Griseb.)

Since the delimitation of the two sections described by Grisebach ( ) still remains critical, perhaps because another approach is required, we refrain from transferring these sectional names to the new genus. We have, however, been able to ascertain that the following species certainly belong to the new genus:

Although the austral gentians bear a greater resemblance to those [illegible] (Kusnezov) placed into the subgenus Gentianella [illegible] the tradition that be retained in the [illegible], they are all morphologically far apart from any [illegible] group of this taxon.

(5) Gentiana
sg. Gentiana
sg. Cilientha

(40) Gentianodes L. & L.

Harryhatlia
(5) Otophora (Kusnezow) = G. sect. Otophora - - - type.
caryophyllea (H. Sm.)
decorata (Diels)

- - - - = G. Otophora Franch.

tsarongensis (Balf. & Forrest)

(1) Favargera Löve & Löve (= G. sect. Frigida subsect. Froelichii - - -).
Froelichii (Jan.) Löve & Löve type.

x=7 (8, 15)

(10) Calathiana Delarbre (= G. sect. Cyclostigma; Higginia) (x=7, 8, 15)
+ se Holub! type.

bavarica (L.) Holub 1973
brachyphylla (Vill.) Holub 1973
nivalis (L.) Delarbre
utriculosa (L.) Holub 1973
verna (L.) Holub 1973
delphinensis (Beauverd) Holub 1974
angulosa (M.B.) Holub 1973
navarrensis (Soltokovic) Holub 1973
orbicularis (Schur) Holub 1973
pontica (Soltokovic) Holub 1973
pumila (Jacq.) Holub 1973
rostanii (Reuter) Holub 1973
schleicheri (Vacc.) Holub 1973
tergestina (G. Beck) Holub 1973
terglouensis (Hacq.) Holub 1973
uniflora (Georgi) Holub 1974

Kryloviii (Grossh.)
oschtenica (Kusn.)
arctica (Grossh.) ? ...
imbricata (Froel.) syn.?
pumila (Jacq.) syn.?

2.

se Nilsson + Kusn. for gruppering av Chondrophyllae!

~~Calathiana Delarbre (=~~
New Guinea etc.
c Ericoidea
(60) Ciminalis Adans. (= G. sect. Chondrophylla, ... + Megalanthe (pars), + Thylacites)
acaulis (L.) Moench (Megalanthe - ... type.
alpina (Vill.) Holub 1973
occidentalis (Jakowatz) Holub 1973
Janeii (Hemsley) (jfr. ...) jf Toyokuni 1962, p. 223
prostrata (Haenke) L. & L. ?
Fremontii (Engelm.) ...
~~humilis~~
aquatica (L.) (= humilis Stev., jf Toyokuni 1961).
Douglasiana (Bong.) not!! N. Am.
? nivalis (L.)

(Chondrophylla - andre:)
laeviuscula (Toyokuni 1961)
pseudo-humilis (Makino 1904)
Thunbergii (G. Don) ~~...~~ T. 1962, p. 211-212
yakumontana (Masamune) T. 1962.
squarrosa (Ledeb.)
Zollingeri (Fawcett)
nipponica (Maxim.)
angustifolia (Vill.) Holub 1973
clusii (Perr. & Song.) Holub 1973 Thylacites
dinarica (G. Beck) Holub 1973
ligustica (Vilm. & Chop.) Holub 1973
Fl. SSSR. nutans (Bge.)
Karelinii (Griseb.)
[illegible] (Kusn.)
pseudoaquatica (Kusn.)
riparia (Kar. & Kir.)
Thylacites excisa (Presl)
Kusn. s. micans (C. B. Clarke)
aperta (Maxim.)
Maximowiczii (Kusn.)
humilis (Stev.) — Caucasus, Altai — ? Fl. SSSR?
pulla (Franch.)
spathulifolia (Kusn.)
Prattii (Kusn.)
Franchetiana (Kusn.)
Grumii (Kusn.)
aristata (Maxim.)
linoides (Franch.)
purpurata (Maxim.)
rubicunda (Franch.)
Vandellioides (Hemsl.)
recurvata (C. B. Clarke)
~~Bungeana (Bge.)~~ N. Am.
Piasezkii (Maxim.)
pedicellata (Wall.)
quadrifaria (Blume)
Souliei (Hartl.)
Loureirii (Griseb.)
delicata (Hance)
Ozgillera (Franch.)
Sutchuenensis (Franch.)
decumbens (Hamilton)
capitata (Dunn)
argentea (Royle) + flere i Kusn. p. 84) + Nilsson!
(Rejf. Fremontii (Torr.) ~~...~~
Ciminalis

~~(10) Holubia Löve & Löve (= sect. Chondrophylla ...)~~ x = 13.

(2) Dasystephana Adans. (x=11) (= G. sect. Pneumonanthe p.p.).
asclepiadea (L.) Borkh.
schistocalyx (C. Koch) L. & L. (in Maeder-Schw.)

(10) Holubia Löve & Löve (Chondrophylla ... sect. Gentianella (Kusn.) ... (x=13)
(see Kusn. & ...)
pyrenaica (L.) Löve & Löve
Boryi (Boiss.) Löve & Löve
nipponica (Maxim., Bull. Acad. St. Pét. 32 (1888), p. 507)
Jamesii (Hemsley, J. Linn. Soc. 26 (1890), p. 128) = ...
FISSUR grandiflora (Laxm.)
laciniata (Kit.)
djimilensis (C. Koch)
~~sayanensis~~ (Grossh.)
altaica (Pall.)
dipholix (C.B. Clarke)
setifolia (Kunth)

N. & S. Am. ?

(1) Mehraea Löve & Löve (Frigida sect. Phyllocalyx). in Res. Adv. Bot. (New Delhi) 1975, p.
phyllocalyx (C.B. Clarke) Löve & Löve.

(30) Tretorhiza Adans. (= sect. Aptera Kusn.) = sect. Cruciata Gaudin (L. & L. 1975)
crassicaulis (Duthie) — biflora (Royle) ~~...~~
cruciata (L.) Opiz
dahurica (Fisch.)
decumbens (L.f.)
Fetissowii (Regel & Winkl.)
gracilipes (Turrill)
~~Grombczewskii (Kusn.)~~ = Olgae
Kaufmanniana (Regel & Schmalh.) Kurroo (Royle)
lhassica (Burk.)
macrophylla (Pall.) — Olgae (Regel & Schmalh.)
Olivieri (Griseb.)
phlogifolia (Schott & Kotschy)
pseudodecumbens (H. Smith) — ~~...~~
straminea (Maxim.) — Regelii (Kusn.)
Waltonii (Burk.) — Renardii (Regel)
Walujewii (Regel & Schmalh.) siphonantha (Maxim.)
tibetica (King)
wutaiensis (Marq.)
tianschanica (Rupr.)
~~Olgae (Regel & Schmalh.)~~
W ~~...~~

Tretorhiza cont.

Pneumonanthe:
Menziesii (Griseb.)
platypetala (Griseb.)
rigescens (Franch.) — ... ?
Makinoana (Kusn.)
Fremontiana (Burm.)
calycina (Boiss. & Hausskn.)

(15)† Pneumonanthe ~~...~~ Gleditsch.
affinis (Griseb.) Greene
alba (Muehl.)
Andrewsii (Griseb.)
Boissieri (Schott & Kotschy)
cachemirica (Decne.)
~~calycosa (Griseb.) Greene~~ — ... (Makino) Tzvelev 1962, p. 145 ? syn?
elliottii (Chapm.)
gelida (M.B.) — ssp. ... ; ssp. ... (Schrenk)
linearis (Froel.) Greene — ? Makinoi (Kusnez.) (Tzvelev 1962)
Newberryi (A. Gray) Greene
ochroleuca (Willd.) — platypetala (Griseb.) Greene
oregana (Engelm.)
paradoxa (Albov)
Parryi (Engelm.)
vulgaris F.W. Schmidt (≡ Pneumonanthe L.) (+ ssp. ... (Boiss.) ?)
puberula (Michx.) Greene
saponaria (L.)
scabra (Bge.) (+ ssp. Buergeri (Maxim.) ?) Tzvelev 1962 p. ...
sceptrum (Griseb.) Greene
septemfida (Pall.) (+ ssp. lagodechiana Kusn. ?)
sikokiana (Maxim.)
tubiflora ... (Pall.)
yakushimensis (Makino) — flora ... ?
spathacea (H.B.K.)
triflora (Pall.)

FISSUR Makinoi (Kusn.)
axilliflora (Lévl. & Van.)
Fischeri (P. Smirn.)
dauurica (Rgl.)
cordifolia (C. Koch)
Grossheimii (Doluch.)
Kolakovskyi (Doluch.)
lagodechiana (Kusn.)
paradoxa (Albov)
gelida (M.B.)
Oxeviniii (Kusn.)

Kusn.:
Selyana (Griseb.)
... Lévl. & Lex.
Sarmei (Griseb.)
ovatiloba (Kusn.)
adsurgens (Cerv.)
Rusbyi (Greene)
californica (Kusn.)
setigera (A. Gray) Greene
scabrida (Kusn.)
angustifolia (Michx.)
Grayi (Kusn.)

[illegible] Crawfurdia? (Fl. SSSR)

(20) Tripterospermum Blume
Type: T. trinerve Blume

4 affine H. Sm.
caudatum (Marq.) H. Sm.
chinense (Migo) H. Sm.
coeruleum (Hand.-Mazz.) H. Sm.
cordatum (Marq.) H. Sm.
japonicum (Sieb. & Zucc.) Maxim.
microphyllum H. Sm.
pallidum H. Sm.
volubile (D. Don) H. Sm.
Toyokuni? trinerve Blume = japonicum acc. Toyokuni 1962, p. 247-248?

Kurz. fasciculatum (Wall.)

Toyokunia?
(10) Stenogyne (Franch.) Love & Love x=?
+ expansa (H. Sm.)
primuliflora (Franch.)
pterocalyx (Franch.)
pulchra (H. Sm.)
rhodantha (Franch.)
serra (Franch.)
Souliei (Franch.)
striata (Maxim.)
filicaulis Hemsl.

(1) Ixanthus Griseb. x=?
viscosus Griseb. (Canary)

+ see Ham. + Airy Shaw (K. & L. [illegible]!), + Toyokuni & Holub!

(51) Lomatogonium A. Br. x=5.
bellum (Hemsley) H. Sm.
brunonianum (Burk.) H. Sm.
caespitosum H. Sm.
carinthiacum (Wulf.) Rchb. (+ v. [illegible] Burk.?) + v. Stelleriana Griseb.?
chumbicum (Burk.) H. Sm.
coeruleum (Royle) H. Sm.
cuneifolium H. Sm.
Forrestii (Balf. f.) Fern.
gamosepalum (Burk.) H. Sm. incl. (see Nilsson [illegible]! [illegible])
graciliflorum H. Sm. incl.
lineariifolium H. Sm. –
longifolium H. Sm.
macranthum (Diels & Gilg) Fern.
micranthum H. Sm. incl.
oreocharis (Diels) Marq.
rotatum (L.) Fr. + ssp.?
saccatum H. Sm.
sikkimense (Burk.) Fern.
Stapfii (Burk.) H. Sm.
also? Stelleriana (Cham. & Schlecht.)
~~Kurz. [illegible] (Gaudich.)~~
~~[illegible] (Gaudich.)~~
~~spathulatum (Hultén)~~
~~[illegible] (Maxim.)~~

+ fr. Africa!

(4?) Pleurogynella Ikonn. 1967.
brachyanthera (C.B. Clarke) Ikonn.
diffusa (Maxim.) Ikonn.
spathulata (A. Kerner) Ikonn.
Thomsonii (C.B. Clarke) Ikonn.

(1) Phyllostoma H. Sm.
cordinum H. Sm.

(20) Comastoma Toyokuni — se Toyokuni + Nilsson! type: C. tenellum
tenellum (Rottb.) Toyokuni — sg. Tenellum; sg. pedunculata
falcatum (Turcz.) Toyokuni
dingrichtii (Grün.) Toyokuni
nanum (Wulf.) Toyokuni
pulmonarium (Turcz.) Toyokuni — sg. pulmonaria (Smith); sg. sectum (Toyokuni) (= G. secta Satake) Holub
Holub 1967:
cyananthiflorum (Franch.) Holub
Dechyanum (Somm. & Lev.) Holub
disjunctum (Pall.) Holub
Henryi (Hemsley) Holub
Traillianum (Forrest) Holub
Holub 1968: arrectum (Franch.) Holub
Beesianum (W.W. Smith) Holub.
Maclarenii (H. Sm.) Holub
pedunculatum (G. Don) Holub
stellariifolium (Franch.) Holub
Ø.Löve. pygmaeum (Rgl. & Schmalh.)

(3) Jaeschkea Kurz
canaliculata (Royle) Knobl.
oligosperma (Griseb.) Knobl.
gentianoides Kurz.
microsperma C.B. Clarke

+ Mehr - ? Varietäten?

+? (2) Megacodon (Hemsl.) H. Sm. (= sect. Stylophorus + Megacodon.)
stylophorus (C.B. Clarke) H. Sm. } same art, el. Toyokuni 1965
venosus (Hemsl.) H. Sm.

+ Gentianella Moench — se Holub! 1967 Folia (6) 118
(84) sg. Gentianella (= Endotricha Froel.) — sg. amarella; sg. acuta (Michx.) J.M. Gillett; sg. germanica (A. & Kerner); sg. campestris (Bab.); sg. lingulata (Agardh); sg. uliginosa (F.W. Schmidt); + v. islandica!
amarella (L.) Börner
baltica (Murb.) Börner
campestris (L.) Börner
uliginosa (Willd.) Börner
stricta (Klotzsch) Ikonn.
pygmaea (Regel & Schmalh.) Ikonn.
hypericifolia (Murb.) Pritchard
[illegible] auriculata (Pall.) J.M. Gillett
yuparensis (Takeda) Satake — sg. yuparensis 1963; sg. takedae (Kitagawa) Toyokuni 1961.
se Holub 1967 (not the dubious!) [illegible], 1973.
Ø.Löve. Biebersteinii (Bge)
caucasica (M.B.)
Lipskyi (Kusn.)
plebeja (Cham. & Schlecht.)
paludicola (Kusnezow) — (incl. v. Marcowiczii (Kusn.))
~~[illegible]~~ — se Kusn. p. 85

Kuz.! F.Jap. Gentianella (Juss.)

(2?) sg. Arctophila (Griseb.) L. & L. Lectotype: G. aurea L.

angustiflora H. Sm.
aurea (L.) H. Sm.
azurea (Bge.) H. Sm.
Duthiei (Burk.) H. Sm.
gentianoides (Franch.) H. Sm.
Ludlowii H. Sm.
Moorcroftiana (Wall.) Airy-Shaw
obtorta H. Sm. — propinqua (Richards.) J. M. Gillett
Pygmaea (Regel & Schmalh.) H. Sm. ssp. propinqua — J. M. Gillett
? quinquefolia (L.) Small ssp. aleutica (Cham. & Schlecht.)
Wislizenii (Engelm.) J. M. Gillett ssp. quinquefolia
Fl. SSSR turkestanorum (Gand.) ssp. occidentalis (Gray) J. M. Gillett
etrata (Bge.)
umbellata (M. B.)
sibirica (Kusn.)
pamirica (Grossh.)
~~azurea~~
Kusn.: quinqueflora (Lam.) ... N. Am. — [illegible]?
tenuis (Griseb.)
umbellata (M. B.)
arctophila (Griseb.) N. Am. ? syn.?
pygmaea (Regel & Schmalh.)
[illegible] (Maxim.)

Oreophylax (Endl.) Kusnez.) [illegible] Nilss. + Fabris!
(Lectotype: G. [illegible]) [illegible]

(20?) sg. Oreophylax (= G. sect. Andicola Griseb.)
J. Kusn. p. 35 [illegible]

7.

Gentianella (contd.)

(50?) sg. Antarctophila

see Holub 1967, 1968 (sub Gentianella).

montana (Forst.)
pleurogynoides (Griseb.)
magellanica (Gaudich.)
patagonica (Griseb.)

see N.Z. pl. + Nilsson + Ham.

Austrogentiana?
Lectotype: G. montana Forst.

see Nilsson ± Holub!
21 ... 1968

(7a) Gentianopsis Ma — + Gentianella sect. Imaicola (= G. contorta Royle) — (= G. sect. Crossopetalum Froel.) type: G. barbata (Froel.) Ma.; Gillett

detonsa (Rottb.) Ma — ssp. detonsa; ssp. yukonensis (J.M. Gillett); ? ~~ssp. mesophila (T. Holm) J.M. Gillett~~; ssp. Raupii (A.E. Porsild) J.M. Gillett; ssp. holopetala (A. Gray) comb. ...

crinita (Froel.) Ma — ssp. crinita; ? ... (Holub) — ssp. procera (T. Holm) J.M. Gillett; ssp. Victorinii (Fern.) J.M. Gillett; ...? ssp. Macounii (T. Holm) J.M. Gillett, ...

barbata (Froel.) Ma — ssp. barbata; ssp. sinensis (Ma)

(~~grandis (H. Sm.) Ma~~ = Smithii Toyokuni)
scabromarginata (H. Sm.) Ma
paludosa (Hook.f.) Ma
nana (Ling) Ma
longistyla Ma
lutea (Burk.(?)) Ma
contorta (Royle) Ma — + var. Wui Ma
Yabei (Takeda & Hara) Ma
ciliata (L.) Ma — ssp. ciliata; ssp. Doluchanovii (Grossh.) Toyokuni; ssp. blepharophora (E. Bordz.)
? mesophila (T. Holm) Holub
? Raupii (A.E. Porsild) Holub — ssp. raupii (A.E. Porsild) Toyokuni; ssp. vvedenskyi (Grossh.) Toyokuni; ... Toyokuni 1967, p. 141 note.
thermalis (O. Ktz.) Holub
macrantha (D. Don) Holub
lanceolata (Benth.) Holub
holopetala (A. Gray) Holub :: Sida 2(2) (1965), p. 176 — synonym of Toyokuni 1967!
{procera (Th. Holm) Ma} — ssp. macounii (Holm) Holub ...
barbellata (Engelm.) Holub
Holub: ~~Rzybae (A. Gray) Holub~~
Toyokuni 1967:
Smithii Toyokuni
Komarovii (Grossh.) Toyokuni
virgata (Raf.) Holub 1967
Holub 1973:
Stracheyi (C.B. Clarke) Holub 1973
stricta (Klotzsch) Holub 1973

contorta (Royle) — (Gentianella sect. Imaicola)
Vvedenskyi (Grossh.)
Mexico: macrocalyx (Llav. & Lex.) — Mexico)
ventricosa (Griseb.)
? serrata (Gunner) — N. Am. = ?
~~barbellata (Engelm.) N. Am.~~ ?

(1) Pterygocalyx Maxim. — synonymt f. Crawfurdia, inte till mina linner!

volubilis Maxim.

(10) Crawfurdia Wall. (Lygre gyp?) Type: C. speciosa Wall.

angustata C.B. Clarke
campanulacea Wall. & Griff.
crawfurdioides (Marq.) H. Sm.
delavayi Franch.
dimidiata (Marq.) H. Sm.
iochroa (Marq.) H. Sm.
ludlowii H. Sm.
semialata (Marq.) H. Sm.
speciosa Wall.
Sharocalyx H. Sm.
~~volubilis Maxim.~~
Khasia: pubescens C.B. Clarke

(1) Anagallidium Griseb.

dichotomum (L.) Griseb.

(20) Ophelia D. Don — se mannen! se Nilsson + Toyokuni & Hultberg?

Typus: O. paniculata D. Don

sec. als. Frasera: (Fl. SSSR 18: 625 (1952): Pojark., Fl. U.S.S.R. 18: 537 (1953))

Toyokuni 1963: sect. Halleria,

tetragonata (Pallas) ~~Toyok.~~ Kuntze ~~(Grossh.)~~ ssp. tetragonata; ssp. micrantha (Turcz.) Toyokuni

sect. Ophelia — (sect. Blepharocalyx till Frasera!)

diluta (Turcz.) Ledebour
pseudochinensis Toyokuni
japonica ~~Griseb.~~ (Schultes) Grisebach

sect. Swertopsis

umbellata Toyokuni

sect. Rotatae Toyokuni

tashiroi Maxim.

Fl. SSSR: chinensis Bge.
Tschernjakovii (Kom.) Grossh.
Wilfordii Kerner

(50) Swertia L. (= sect. Eusweertia C.B. Clarke) — se Nilsson!

Asia: acaulis H. Sm. ined.
atroviolacea H. Sm.
bifolia Batalin
cuneata D. Don
Davidii Franch.
decumbens M. Vahl
erythrosticta Maxim.
Forrestii H. Sm.
Handeliana H. Sm.
Hookeri C.B. Clarke
Kingii Hook. f.
multicaulis D. Don
petiolata D. Don
pseudo-Hookeri H. Sm. ined.
speciosa D. Don
Staintonii H. Sm. ined.
tibetica Batalin
virescens H. Sm. ined.
Younghusbandii Burk.

Afrika: calycina N.E. Br.
crassiuscula Gilg → Lomatogonium? eller Swertia? se Hultberg.

Fl. SSSR: iberica (Fisch. & Mey.)
obtusa Ledeb.
~~[illegible]~~
connivens Maxim.
marginata Schrenk
graciliflora Gontsch.
Aucheri Boiss.
lactea Bge.
aroseola Gontsch.

N. Am. albicaulis (Dougl.) Kuntze
albomarginata (Wats.) Kuntze
caroliniensis (Walt.) Kuntze
columbiana H. St. John
montana
perennis L. — ssp. perennis; ssp. cuspidata (Maxim.) Hara

se mannen! ~~ej~~ Nilsson! (till Frasera!)

+

(50) Halenia Borckh. type: H. sibirica Borckh. = H. corniculata (L.) Druce.

brevicornis (H.B.K.) G. Don
Conzattii Greenm.
corniculata (L.) ~~Druce~~ Cornaz (ed. Toyokuni) Fl. SSSR. — ssp. deflexa — ssp. Brentoniana (Griseb.) J.M. Gillett
deflexa (Sm.) Griseb.
elliptica D. Don
foliosa Gilg
gracilis (H.B.K.) G. Don
Palmeri A. Gray
pendula flora Gilg
plantaginea (H.B.K.) Griseb.
robusta Gilg
Schiedeana (Schlecht. & Cham.) Griseb.
silenoides Gilg
tolimae Gilg
Weberbaueri Allen
Weddelliana Gilg.

Kusn. p. 85

sect. XI: Dasystephana Griseb.

G. thyrsoidea Hook.: Peru — vad hør den? og hos H. Smith!

(30) Frasera Walt. type sp. F. caroliniensis,

Gillett:

caroliniensis Walt.

Toyokuni: Ophelia sect. Bimaculatae Toyokuni:

bimaculata (Sieb. & Zucc.) Toyokuni 1965

Calif. Fl.: speciosa Dougl.
Parryi Torr.
albomarginata Wats.
tubulosa Cov.
neglecta Hall.
puberulenta A. Davids.
albicaulis (Griseb.) Kuntze — ssp. albicaulis
umpquaensis Peck & Applegate. ssp. nitida (Benth.) Post
FNA albomarginata S. Wats.
fastigiata (Pursh) Heller
montana Mulford
paniculata Torr.

3? se Kusn.!

(2) Veratrilla Franch.

Baillonii Franch.
Burkilliana (W.W. Sm.) H. Sm.

+

(1) Latouchea Franch.

fokienensis Franch.