A revision of Conioselinum Hoffm. (Umbelliferae) in the Old World

Authors: Pimenov, Michael G., Kljuykov, Eugene V., and Ostroumova, Tatiana A.

Source: Willdenowia, 33(2) : 353-377

Published By: Botanic Garden and Botanical Museum Berlin (BGBM)

URL: https://doi.org/10.3372/wi.33.33213

MICHAEL G. PIMENOV, EUGENE V. KLJUYKOV & TATIANA A. OSTROUMOVA

A revision of *Conioselinum* Hoffm. *(Umbelliferae)* in the Old World

Abstract

Pimenov, M. G., Kljuykov, E. V. & Ostroumova, T. A.: A revision of *Conioselinum* Hoffm. *(Umbelliferae)* in the Old World. – Willdenowia 33: 353-377. – ISSN 0511-9618; © 2003 BGBM Berlin-Dahlem.

Conioselinum (Umbelliferae-Apioideae) and related taxa of the Old World are critically revised. In total, 18 species are accepted in *Conioselinum,* three of which are distributed in North America, one in Europe and sixteen in Asia. Carpoanatomical examination showed that some species of *Ligusticum* described from China are closer to *C. tataricum* (the type of the name *Conioselinum*) and other known species of that genus than to *L. scoticum* (the type of the name *Ligusticum*); consequently seven new names in *Consioselinum* are validated: *C. nematophyllum, C. pseudoangelica, C. sinchianum, C. sinomedicum, C. smithii, C. tenuisectum* and *C. tenuissimum.* Three new species are described: *C. nepalense* from Nepal, *C. reflexum* from SW China and *C. shanii* from central China.

Introduction

The elucidation of relationships in the group of genera presumably close to *Ligusticum* (the "Verwandtschaftkreis der Gattung *Ligusticum*" of G.-H. Leute 1969, 1970) is one of the most complicated issues in the *Umbelliferae-Apioideae* taxonomy of the temperate zone (Pimenov & Leonov 1993). It seems to be an unusually wide distribution of morphological homoplasies in a broad range of taxa what leads to an overall similarity, sometimes also to a similarity in taxonomically valuable characters of distant taxa.

A formal difficulty adds to the problem. In *Ligusticum* L., the core genus of the group, the type of its name, *L. scoticum* L., differs considerably in various characters, particularly in fruit structure, from the majority of other species. Being rigorous, one should limit the genus to 1-2 species, with the remaining 40-50 to be separated. But to what genus (genera)? To the present, only half-hearted solutions were proposed by the different taxonomists, including us, mainly by means of separating the most divergent species into independent genera. There is, of course, the possibility to change the type of the name *Ligusticum,* as suggested already by Holub (1984) so that then *L. scoticum* and *L. hultenii* could be separated into the genus *Haloscias* Fries. No species, however, was proposed for lectotypifying *Ligusticum* (excl. *Haloscias*) instead and the ac-

cumulated data show that the remaining species of *Ligusticum* are still far away from constituting a homogeneous genus; the problem thus remains, minus 1-2 species only.

Another way to bring *Ligusticum* and related genera in greater concordance with natural groups is to separate new taxa of generic rank. This approach has been followed recently. The genera *Ligusticopsis* Leute, *Paraligusticum* V. N. Tikhom., *Arafoe* Pimenov & Lavrova, *Macrosciadium* V. N. Tikhom. & Lavrova were separated from the formerly heteromorphous and heterogenous *Ligusticum,* and the neglected genera *Coristospermum* Bertol., *Halosciastrum* Koidz. and *Hansenia* Turcz. were restored. *Cnidiocarpa* Pimenov, *Kadenia* V. N. Tikhom. & Lavrova, *Magadania* Pimenov & Lavrova and *Rupiphila* Pimenov & Lavrova were separated from *Cnidium,* and *Lithosciadium* Turcz. and *Tilingia* Regel were restored. The genera *Sphaenolobium* Pimenov and *Karatavia* Pimenov & Lavrova were separated from *Selinum,* and *Oreocome* Edgew. was restored. *Dimorphosciadium* Pimenov and *Lomatocarpa* Pimenov were separated from *Pachypleurum* Ledeb., and so on.

A revision of *Ligusticum,* especially in East Asia, has, inevitablely, to address *Conioselinum. Conioselinum* is not one of the recently separated genera, in contrast, it has a long history, being described by a patriarch of the *Umbelliferae* systematics, Georg Franz Hoffmann (1814). The type of its name is *C. tataricum* Hoffm. (= *C. vaginatum* (Spreng.) Thell.), a widely distributed boreal species. Later, the genus has been consistently accepted in regional Floras of northern and central Europe, northern Asia and North America, but ignored in the Floras of the southernmore countries. Hence, *Conioselinum* is included in all regional Floras of the Middle Asia (in the "Russian tradition"), but is absent in all Himalayan Floras, following "British tradition". An intermediate situation exists in the Chinese Floras, where *Conioselinum* is adopted for the northern part of the country, but closely related species of central and SW China, as it will be shown below, are included in *Ligusticum* s.l. This was one of the incentives to undertake this study, another was the absence of any modern review of *Conioselinum.* Up to now, the Chinese flora contains the greatest number of *Ligusticum* species that are problematic for their distance from the type *L. scoticum.*

An artificial separation of *Conioselinum* from closely related taxa in the classical *Umbelliferae* treatment by Drude (1898) was a factor complicating its taxonomy. *Conioselinum* was treated as a member of the *Peucedaneae-Angelicinae,* whereas *Ligusticum* and some related genera as members of the *Ammineae-Seselinae*. The authors of the Soviet (Šiškin 1951) and Chinese (Shan & Sheh 1985-1992) national Floras adhered the viewpoint. It seems that for the same reason *Conioselinum* was excluded from Leute's (1969, 1970) critical revision of the *Ligusticum* group. This artificial separation is not simply Drude's mistake, but reflects one of the general complexities in the *Umbelliferae* systematics, in which a part of genera forms clearly limited groups, treated usually at tribal rank, whereas in other parts of the system it is impossible to circumscribe such groups due to gradual character variation. If a separation of *Ligusticum* and *Conioselinum* on tribal level is clearly incorrect, it is impossible to simultaneously draw a distinct border in carpoanatomical structure between *Conioselinum* and *Angelica* on the one hand, and between the *Ligusticum* group (subtribe *Foeniculinae* or tribe *Selineae*) and *Seseli* as well as *Carum-Apium* on the other hand.

Molecular systematics reaches similar conclusions. Beginning with Kondo & al. (1996) all molecular systematics of *Ligusticum* and related genera showed the polyphyly of these genera and of the *Foeniculinae* ("Verwandtschaftkreis der Gattung *Ligusticum*") in general (Valiejo-Roman & al. 1998, Katz-Downie & al. 1999, Downie & al. 2000a, b, Choi & al. 2000).

According to Index Kewensis (1997, in The Plant Names Project 1999) there are 36 species names in *Conioselinum;* five more could be added (Pimenov 1983, Lavrova 2002); so 41 names are to be evaluated. Ten of them belong to the flora the New World:

– *Conioselinum bipinnatum* (Walter) Britton in Bull. Torrey Bot. Club 14: 233. 1887 ≡ *Apium bipinnatum* Walter. – Loc. class.: Carolina?

– *C. canadense* (Michx.) Torr. & A. Gray in Fl. N. Amer. 1: 619. 1840 ≡ *Selinum canadense* Michx. – Loc. class.: Ad ostium fluminis S. Laurentii.
– ***C. chinense*** (L.) Britton, Stern & Poggenb., Prelim. Catal. New York: 22. 1888 ≡ *Athamanta chinensis* L.; see below.
– *C. coloradense* Osterhout in Muhlenbergia 5: 36. 1909. – Loc. class.: Colorado, Chamber's Lake, Larimer County (13.9.1907, *Osterhout 3659*).
– *C. dawsonii* J. M. Coult. & Rose in Contrib. U.S. Natl. Herb. 7: 152. 1900. – Loc. class.: Yukon, Pelly River, at Pelly Banks, lat. 61° (11.8.1887, *Dawson 23*).
– *C. gmelinii* (Cham. & Schltdl.) J. M. Coult. & Rose in Contrib. U.S. Natl. Herb. 7: 150. 1900, non Steud. (1840) ≡ *Ligusticum gmelinii* Cham. & Schltdl. – Loc. class.: In insula Unalaschka, ad sinum St Laurentii, ad sinum Eschscholzii in qua insula Chamissonis.
– ***C. mexicanum*** J. M. Coult. & Rose in Proc. Washington Acad. Sci. 1: 147. 1900 – Loc. class.: [Mexico], Chihuahua, Sierra Madre, 65 miles east of batopilas *(Goldman 191).*
– *C. pacificum* J. M. Coult. & Rose in Contrib. U.S. Natl. Herb. 7: 152. 1900. – Loc. class.: On the Saucelito hills, near San Francisco *(Kellogg & Harfold 315).*
– *C. pumilum* Rose in Torreya 12: 9. 1912. – Loc. class.: Labrador, ravine on Caribou Island, Battle Harbor (15.8.1909, *Goodsell 81*).
– ***C. scopulorum*** (A. Gray) J. M. Coult. & Rose in Contrib. U.S. Natl. Herb. 7: 151. 1900 ≡ *Ligusticum scopulorum* A. Gray – Loc. class.: New Mexico, Santa Antonita *(Bigelow).*

According to Mathias & Constance (1944-45), *C. canadense, C. bipinnatum, C. gmelinii, C. pacificum* and *C. pumilum* are synonyms of *C. chinense,* whereas *C. coloradense* is a synonym of *C. scopulorum.* These authors also regarded *C. dawsonii* as a synonym of *C. cnidiifolium,* and the latter was shown by Pimenov & al. (1986) to be a member of *Cnidium,* confirming the view of Šiškin (1950). Therefore, in the New World only three species of *Conioselinum* are known at present, namely *C. chinense, C. mexicanum* and *C. scopulorum.*

A greater diversity in *Conioselinum* is observed in the Old World, although many of the described species were reduced to synonyms of other species of *Conioselinum* or transferred to other genera:
– *C. altaicus, C. benthamii, C. boreale, C. fischeri, C. gmelinii, C. ingricum, C. latifolium, C. neglectum, C. schugnanicum, C. papyraceum, C. univittatum, C. vaginatum* and *C. tataricum* are all synonyms of the most widely distributed Eurasian species *C. tataricum* (about its correct name see below);
– *C. cenolophioides* is a synonym of *C. longifolium;*
– *C. filicinum* and *C. nipponicum* are synonyms of *C. chinense.*

The following species are placed today in other genera:
– *C. angelicifolium, C. czernaevia* and *C. wolffianum* in *Angelica* (*Ligusticum mongolicum* H. Wolff, recently transferred to *Conioselinum,* is evidently also an *Angelica*);
– *C. cnidiifolium,* as noted above, in *Cnidium,*
– *C. gayoides* in *Pachypleurum* (a synonym of *P. alpinum*);
– *C. pinnatifolium* as a separate satellite genus *Vvedenskya;*
– *C. humile* in *Ostericum,* being a synonym of *O. tenuifolium* (Pall. ex Spreng.) Y. C. Chu;
– *C. victoris* in *Magadania;*
– *C. kamtschaticum* is a problematic species, which has been regarded by Gorovoy (1978) as a synonym of *Tilingia ajanensis* (this view is adopted here), whereas by modern Japanese authors (Ohba 1999, Yamazaki 2001) as a synonym of *C. chinense*.

Therefore, beginning this revision, we left in *Conioselinum* the following eight Old World species: *C. acuminatum, C. chinense, C. jeholense, C. longifolium, C. morrisonense, C. papyraceum, C. pteridophyllum* and *C. tataricum* (= *C. vaginatum*).

There is every reason to believe that this is not the complete set of species belonging to *Conioselinum,* because its boundaries with adjacent genera, in particular, with *Ligusticum* s.l. (see above) are contradictory.

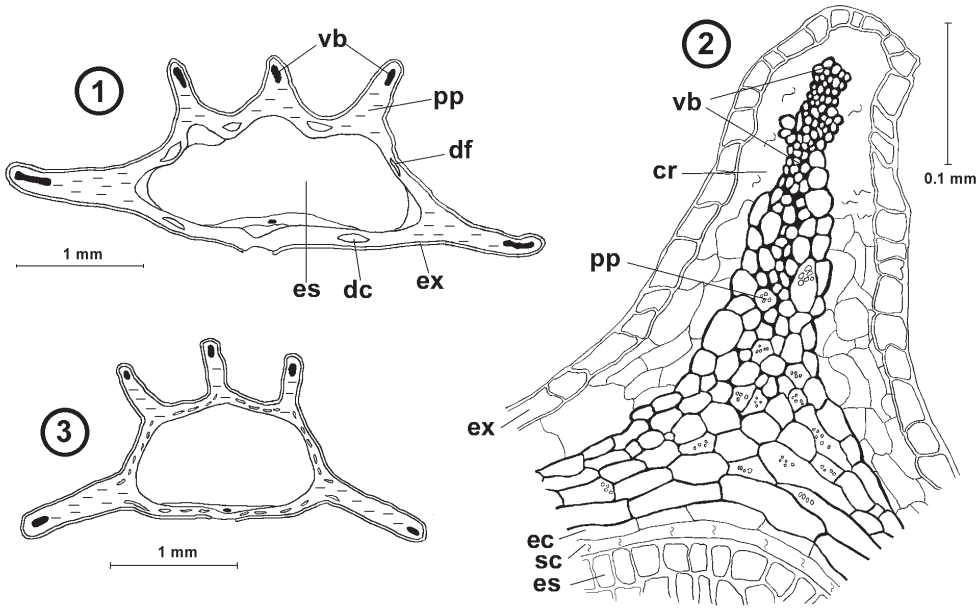

Fig. 1-3. Transects of mericarps of *Conioselinum tataricum* – 1-2: MSU Botanical Garden, plants from Kasakhstan, Mt Talgar, schematic transect (1), dorsal rib (2); 3: *Pimenov & al. 508* (MW), schematic transect. – cr: crushed cells; dc: commissural secretory ducts; df: secretory ducts in furrows; dr: small secretory duct in distal part of rib; ec: endocarp; es: endosperm; ex: exocarp; p: parenchyma cells without pits; pp: parenchyma cells with lignified pitted walls; sc: seed coat; vb: vascular bundles.

The detailed carpoanatomical descriptions of the types of *Ligusticum* and *Conioselinum* are keystones for the classification of species, in particular Chinese ones. Fruit anatomy of *Ligusticum scoticum* (incl. *L. hultenii*) has been described by Gorovoy (1966), Tikhomirov (1973), Suk & al. (1974) and Lavrova & al. (1983), and of *Conioselinum tataricum* (including *C. papyraceum*) by Klan (1947), Lavrova & al. (1983) and Pimenov & Kljuykov (1999a).

Mericarps of *Conioselinum tataricum* (Fig. 1-3) are elliptic, slightly compressed dorsally, 4-6 × 2.5-4 mm, the mericarp cavity is 1.4-2 mm broad; the stylopodium is conical, the styles are long (1.2-1.8 (-2) mm) and reflexed on the dorsal side of the mericarp; calyx teeth are absent; the dorsal ribs are winged and 0.4-0.6 mm wide, the marginal ribs are broadly winged and 1-1.2 mm wide; 1-4 secretory ducts are in the middle valleculas, 1-6 in the lateral valleculas and 2-10 on the commissural face; the exocarp is c. 15 μm thick, unilayered and covers the ventral face of the mericarp up to the carpophore (commissure very narrow); the ribs are composed of lignified parenchyma cells with pitted walls, the xylem elements are situated in the distal part of the ribs and scattered in the lignified parenchyma; the endocarp is c. 10 μm thick; the commissural face of the endosperm is flat or slightly concave.

Other known *Conioselinum* species have a rather similar fruit structure. The most characteristic features of the *Conioselinum* carpology are the narrow (sometimes very narrow) commissure, winged ribs, the localization of vascular bundles in the distal parts of the ribs, whereas the proximal parts are composed of lignified parenchyma with pitted walls.

Characters such as the numbers of vallecular and commissural vittae, which were used in the past to distinguish species, appear to vary within at least some species; the fruits of *C. nepalense* and *C. tenuisectum* have no vittae. *C. smithii* and *C. sinomedicum,* which are very similar to other species in vegetative characters and the structure of umbels, etc., differ by narrow mericarp ribs, especially dorsal ones. The vittae of *C. smithii* are solitary, in *C. sinomedicum* numerous.

We have studied a large set of potential candidates for inclusion into *Conioselinum* (mainly from *Ligusticum* s. ampl.) according to the aforementioned carpoanatomical criteria. Some of these species were analysed earlier and proposed to be transferred to *Ligusticopsis* (Leute 1967-70, Pimenov & Kljuykov 1999b, Pimenov & al. 2001, Lavrova 2002), to *Oreocome* (Pimenov & al. 2001) or to *Rupiphila* (Pimenov & Kljuykov 2002b). Some others are, unfortunately, not available for critical elucidation due to the lack of their type or any other authentic material (in particular the species described by H. Wolff (1929-30): *L. kiangsiense, L. kulingense* (both could be most probably reduced to synonyms of *Tongoloa fortunatii*), *L. levisticifolium, L. littledalei, L. pseudomodestum* and *L. wawrae*.

The other species have been studied in herbarium material of A, CDBI, E, G, GB, GH, HAST, K, KUN, LE, MW, NAS, P, PE, UPS. Many were collected in nature during our trips to Sichuan, Yunnan, Nepal and India.

Taxonomy

Conioselinum Hoffm., Gen. Pl. Umbell., ed.1: 180. 1814; ed. 2: 185. 1816. – Lectotype (Coulter & Rose 1900 and confirmed by Britton & Brown 1913, Pimenov & Tichomirov 1979, Pimenov & Leonov 1993): *C. tataricum* Hoffm.

Eighteen species, distributed in Eurasia and North America; the majority in Asia (16), three species in America and one in Europe.

Key to the Eurasian species of *Conioselinum*

1. Bractlets considerably longer than umbelets; terminal lobes of stem leaves narrow linear, entire 2
– Bractlets equal or shorter than umbelets; if slightly longer *(C. chinense),* terminal lobes of stem leaves ovate, rhombic to lanceolate, toothed 3
2. Leaves heteromorphic, radical ones with broadly toothed lobes, stem leaves with narrowly linear, entire lobes; vallecular vittae solitary . . . . . 11. *C. sinchianum*
– All leaves with narrow, entire terminal lobes; vallecular vittae 1-3, commissural vittae 5-6 . . . . . 5. *C. nematophyllum*
3. Leaf blades lanceolate in outline; basal pair of primary segments almost sessile, reflexed backward under acute angle; roots digitate . . . . . 9. *C. reflexum*
– Leaf blades triangular, ovate to rhombic in outline; basal pair of primary segments not reflexed backward, usually with well developed petiolules, more than 10 mm long; roots usually rope-like 4
4. Mericarp vittae absent 5
– Mericarp vittae well developed, usually seen on the fruit surface 6
5. Plants up to 150-180 cm high with branched caudex; all mesocarp cells aerenchymatous, with pitted walls; stem leaf sheaths inflate . . . . . 6. *C. nepalense*
– Plants no more than 100 cm high with non-branching caudex; mesocarp cells in ribs aerenchmatous, with pitted walls, in valleculas parenchymatous; stem leaf sheaths lanceolate . . . . . 15. *C. tenuisectum*
6. Rhizom creeping, horizontal, branching, inflated at the nodes 7
– Rhizom short, not creeping, frequently vertical, branching 8
7. Involucre usually present, of 3-8 lanceolate or narrowly linear bracts; styles up to 1.5 mm long; terminal leaf lobes ovate to rhombic, obtuse, shallowly lobed, with unequal teeth . . . . . 8. *C. pteridophyllum*
– Involucre usually absent; styles 0.4-0.7 mm long; terminal leaf lobes broadly ovate, with regular small teeth at margin . . . . . 7. *C. pseudoangelica*
8. All mericarp ribs keeled, or dorsal keeled and marginal narrowly winged 9
– All mericarp ribs broadly winged, marginal ones usually larger than dorsal 11

9. Marginal mericarp ribs larger than dorsal, narrowly winged; vallecular vittae solitary (rarely 2), commissural vittae 2 (rarely 4) . . . . . 13. *C. smithii*
– All mericarp ribs almost equal, keeled; vallecular vittae 1-4, commissural vittae 4-7 . 10
10. Umbel rays about 10; involucre usually of 4-5 bracts; rootstock short, not inflated at the nodes; terminal leaf lobes 0.5 cm wide; styles shorter than 2 mm . . 4. *C. morrisonense*
– Umbel rays 15 or more; involucre usually absent or of 1-3 bracts, rootstock with inflated nodes bearing adventive roots; terminal leaf lobes 1-2 cm wide; styles 2 mm long or more . . . . . 12. *C. sinomedicum*
11. Roots digitate . . . . . 1. *C. acuminatum*
– Roots rope-like 12
12. Bracteoles longer than umbelets; stems solid or with narrow hollow . . . 2. *C. chinense*
– Bracteoles shorter than umbelets or equalling them; stems clearly fistulose 13
13. Terminal lobes of stem leaves narrowly linear, entire 14
– Terminal lobes of stem leaves ovate, rhombic or lanceolate, dentate 15
14. Styles up to 1.4 mm long; pedicels short, no more than 1.4 mm long; all mericarp ribs broadly winged, the marginal slightly larger . . . . . 3. *C. longifolium*
– Styles 1.5-2 mm long; pedicels 5-12 mm long; dorsal mericarp ribs keeled, marginal considerably broader . . . . . 16. *C. tenuissimum*
15. Stylopods short-conical; styles c. 2 mm long; mericarp ribs narrow; all mesocarp cells with lignified pitted walls . . . . . 10. *C. shanii*
– Stylopods conical; styles 1-2 mm long; mericarp ribs slightly thickened at the base; mesocarp cells in ribs with lignified pitted walls, in valleculas parenchymatous, non-lignified . . . . . 14. *C. tataricum*

Alphabetical conspectus of *Conioselinum* species and synonyms in Eurasia

1. *Conioselinum acuminatum* (Franch.) Lavrova in Abstr. Int. Sci. Conf. Syst. Higher Pl. (Moscow): 66. 2002 ≡ *Ligusticum acuminatum* Franch. in Bull. Soc. Philom. Paris, ser. 8, 6: 131. 1894 ≡ *Ligusticopsis acuminata* (Franch.) Leute in Ann. Naturhist. Mus. Wien 73: 69, t. 3, fig. 1. 1969. – Holotype: China, "Les bois de san tcha ho, au dessus de Mo-so-pin á 3000 m d'alt", 5.9.1887, *Delavay 2945* (P!)

Distribution. – China (NW: Gansu; N: Shaanxi; C: Henan, Hubei, Hunan; SW: Sichuan, Yunnan), Bhutan.

Fruit structure. – See Fig. 4.

Note. – The above distribution of *C. acuminatum* in China is compiled mainly from the literature since herbarium specimens are scanty.

Ref. – Under *Ligusticum acuminatum:* Shan (1941: 177), Wu (1984: 914), Chang (1985, 2: 252, t. 98, fig. 1-6), Pu (1991: 533), Pu (1993: 1338), Ding & Wang (1997: 165, fig. 1710), Sheh 1997: 589), Watson (1999: 493), Li & al. (2000: 804), Fu & al. (2001: 660, fig. 1059).

Conioselinum altaicum Rupr. = ***C. tataricum*** Hoffm.

Conioselinum angelicifolium (Franch.) Lavrova ≡ ***Angelica angelicifolia*** (Franch.) Kljuykov

Conioselinum benthamii (S. Watson) Fernald = ***C. chinense*** (L.) Britton, Sterns & Poggenb.

Conioselinum cenolophioides Turcz. = ***C. longifolium*** Turcz.

2. *Conioselinum chinense* (L.) Britton, Sterns & Poggenb. in Prelim. Cat.: 22. 1888 ≡ *Athamanta chinensis* L., Sp. Pl.: 245. 1753 ≡ *Cnidium chinense* (L.) Spreng. in Neue Schr. Naturf. Ges. Halle 2, 1 [Pl. Umbell. Prodr.]: 40. 1813 ≡ *Kreidion chinense* (L.) Raf., Good Book: 57. 1840. – Type: "Chinensem dixit Barthram, qui semina misit ex Virginia" (LINN 345.11).

= *Selinum canadense* Michx. in Fl. Bor.-Amer. 1: 165. 1803 ≡ *Cnidium canadense* (Michx.) Spreng. in Roemer & Schultes, Syst. Veg. 6: 415. 1820 ≡ *Conioselinum canadense* (Michx.) Torr. & A. Gray in Fl. N. Amer. 1: 619. 1840. – Type: North America, "Ad ostium fluminis S. Laurentii".
= *Ligusticum gmelinii* Cham. & Schltdl. in Linnaea 1: 391. 1826 ≡ *Selinum gmelinii* (Cham. & Schltdl.) Kurtz in Bot. Jahrb. Syst. 19: 382. 1895, non Bray (1818), nom. illeg. ≡ *Conioselinum gmelinii* (Cham. & Schltdl.) J. M. Coult. & Rose in Contr. U.S. Natl. Herb. 7: 150. 1900, non Steud. (1840), nom. illeg. – Syntypes: North America, "[Aleut Isl.], in insula Unalaschka, ad sinum St. Laurentii; ad sunum Eschscholzii inque insula Chamissonis", 1818, *Chamisso* (LE!; isosyntypes: S).
= [*Selinum benthamii* S. Watson in Bibl. Index N. Amer. Bot. 1: 432. 1878, nom. nud.] = *Conioselinum benthamii* [S. Watson ex] Fernald in Rhodora 28: 221. 1926. – Type: Russia [or Japan], "E vicino maris Ochotzk. Wilkes Expedition ".
= *Peucedanum filicinum* H. Wolff in Repert. Spec. Nov. Regni Veg. 21: 246. 1925 ≡ *Conioselinum filicinum* (H. Wolff) Hara in J. Jap. Bot. 18: 28. 1942. – Syntypes: Japan, "insula Yezo, secus torrentes, Ochiai, *Faurie 6293*"; Japan, "[Honshu] Guwassan", 9.1924, *Faurie 392*.
= *Peucedanum wolffianum* Fedde ex H. Wolff in Repert. Spec. Nov. Regni Veg. 33: 250. 1934. – Isotype: Russia, "Plantae Japonicae. Insula Saghalinensis: Korsakof", 9.1908, *Faurie 383* (G!).
= *Conioselinum nipponicum* Hara in J. Jap. Bot. 17: 631, fig. 52. 1941. – Holotype: Japan, "[Honshu] Prov. Rikutyu: Kuzakai", 20.6.1931, *Toba 639* (TI).
[– *Conioselinum kamtschaticum* auct., non Rupr. (1859): Šiškin, Fl. SSSR 17: 4. 1951 ≡ *C. gmelinii* var. *kamtschaticum* (Rupr.) Hulten in Fl. Aleut. Isl.: 248. 1937].

Distribution. – Asia: Russia (Far East: Khabarovsk Terr., Sakhalin d., Kamchatka d. Komandor Islands only), Japan (Hokkaido; Honshu). — North America: Canada (Labrador, New Brunswick, Quebec, Ontario, British Colombia, Jukon, NW Territory), USA (Alaska, Washington, Oregon, N California, Maine, Rhode Island, New Hempshire, Connectitut, Vermont, Massachusetts, New York, Pennsylvania, New Jersey, Virginia, North Caroline, Ohio, Illinois, Indiana, Wiskonsin, Iowa, Nebraska, Michigan, Minnesota, Missouri, Louisiana, Alabama).

Fruit structure. – See Fig. 5.

Notes. – Gorovoy (1978) regarded *C. kamtschaticum* Rupr. as a synonym of *Tilingia ajanensis* Regel & Til.

C. chinense was recorded also for central China (Qiang 1988, Chang 1992); the material providing the base for this record is recognized by us as a different, new species, here described as *C. shanii,* see below.

Ref. – Under *C. chinense:* Hiroe & Constance (1958: 89, fig. 46), Hiroe (1958: 151, p.p.), Hiroe (1979: 1332, p.p.), Pimenov (1987: 247, map 80). – Under *C. kamtschaticum:* Šiškin (1951: 4), Ohwi (1953: 855), Hara (1954: 308), Kitagawa (1960: 17), Gorovoy (1966: 130, fig. 81, 82), Lee (1998: 564), Ohba (1999: 288), Yamazaki (2001: 286). – Under *C. filicinum:* Kitagawa (1960: 17), Ohba (1999: 289), Yamazaki (2001: 286).

Conioselinum cnidiifolium (Turcz.) Porsild ≡ ***Cnidium cnidiifolium*** (Turcz.) Schischk.

Conioselinum czernaevia Fisch. & C. A. Mey. ≡ ***Angelica czernaevia*** (Fisch. & C. A. Mey.) Kitag.

Conioselinum filicinum (H. Wolff) Hara = ***C. chinense*** (L.) Britton, Sterns & Poggenb.

Conioselinum fischeri Wimm. & Grab. = ***C. tataricum*** Hoffm.

Conioselinum gayoides Less. = ***Pachypleurum alpinum*** Ledeb.

Conioselinum gmelinii (Bray) Steud. = ***C. tataricum*** Hoffm.

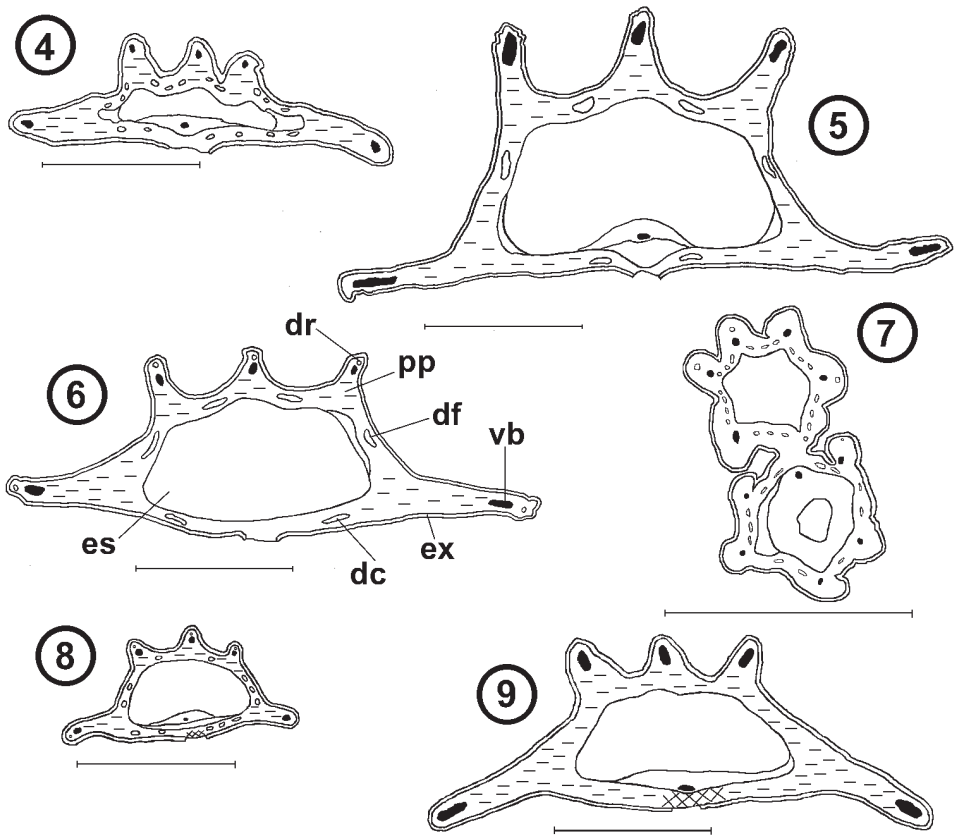

Fig. 4-9. Schematic transects of mericarps – 4: *Conioselinum acuminatum*, *Pimenov & al. 98-445* (MW); 5: *C. chinense,* Sakhalin Isl., *Pimenov* (MW); 6: *C. longifolium, Pimenov & Kljuykov 38* (MW); 7: *C. morrisonense, Ching-I Peng 14483* (HAST); 8: *C. nematophyllum, Pu Fa-ting 164* (CDBI); 9: *C. nepalense, Pimenov & Kljuykov 99-18* (MW). – Scale bar = 1 mm; for the abbreviations see caption of Fig. 1-3.

Conioselinum gmelinii (Cham. & Schltdl.) J. M. Coult. & Rose, nom. illeg. = ***C. chinense*** (L.) Britton, Sterns & Poggenb.

Conioselinum gmelinii var. *kamtschaticum* (Rupr.) Hulten = ***C. chinense*** (L.) Britton, Sterns & Poggenb.

Conioselinum jeholense (Nakai & Kitag.) Pimenov = ***C. smithii*** (H. Wolff) Pimenov & Kljuykov

Conioselinum kamtschaticum Rupr. = ***C. chinense*** (L.) Britton, Sterns & Poggenb.

Conioselinum latifolium Rupr. = ***C. tataricum*** Hoffm.

3. *Conioselinum longifolium* Turcz. in Bull. Soc. Imp. Naturalistes Moscou 17: 736. 1844. – Holotypus: Russia, "ad fluvium Maloi Ircut, in saxosis et subalpinis", 1836, *Kirilov* (LE!).
= *Conioselinum cenolophioides* Turcz. in Bull. Soc. Imp. Naturalistes Moscou 17: 736. 1844. – Syntypes: Russia, "in lapidosis prope Schebutui", 1834, *Kuznetzov* (LE!); "in subalpinis ad Utulik/Schebutui", 1829, *Turczaninov* (LE!).

Distribution. – Russia (C Siberia: Krasnoyarsk Terr., Tuva; E Siberia: Irkutsk d., Buryatia, Chita d., Yakutia), Mongolia.

Fruit structure. – See Fig. 6.

Ref. – Under *C. longifolium*: Ledeb. (1844: 292), Šiškin (1951: 5, t. 1, fig. 2), Grubov (1955: 213), Malyshev (1965: 189), Vodopjanova (1979: 685, fig. 23.7, map 972), Grubov (1982: 192), Vinogradova (1994: 43), Pimenov (1996: 172, map 133), Gubanov (1996: 79).

Conioselinum mongolicum (H. Wolff) Lavrova = ***Angelica czernaevia*** (Fisch. & C. A. Mey.) Kitag.

4. *Conioselinum morrisonense* Hayata in Icon. Pl. Formos. 10: 20, fig. 12. 1921. – Holotype: China "[Taiwan], Monte Morrison, ad 10000 ped. alt.", *Mori.*

Distribution. – China (S: Taiwan).

Fruit structure. – See Fig. 7.

Note. – The species is closely related to *C. sinomedicum,* differing mainly in the presence of bracts, which are absent in *C. sinomedicum* (≡ *Ligusticum sinense*). Formerly the two species were treated in different genera.

Ref. – Liu & al. (1961: 25, t. 4(10),13, fig. 7), Liu & Kao (1977: 949, t. 881), Chang (1992: 4), Kao (1993: 1019, t. 509).

5. *Conioselinum nematophyllum* Pimenov & Kljuykov, **nom. nov.** ≡ *Ligusticum filifolium* R. H. Shan & F. T. Pu ex F. T. Pu in Acta Phytotax. Sin. 29: 538, fig. 7. 1991, non Hook. f. (1852), nom. illeg. – Holotype: China, "Sichuan, Nanping, Gong-Ga-ling, at the edge of alpine conisilvae, alt. 3200 m", 25.8.1984, *He Jin 110* (CDBI!).

Distribution. – China (SW: Sichuan).

Fruit structure. – See Fig. 8.

Note. – As *Ligusticum filifolium* is illegitimate, being a later homonym (a species under the same name had been described from New Zealand), we validate here a new name, saving the meaning of the original epithet.

Ref. – Under *Ligusticum filifolium:* Pu (1993: 1339).

6. *Conioselinum nepalense* Pimenov & Kljuykov, **sp. nova**
Holotype: Nepal, E Himalaya, south slopes of Annapurna mountain massif, valley of Modi Khola, right bank, between Himalaya Hotel and Deorali (Deurali), 28°28'N, 83°52'E, 3100-3400 m, 22.10.1999, *Pimenov & Kljuykov 18* (MW!) – Fig. 10 &11.

Ab affini *Conioselino tenuisecto* lobis terminalibus foliorum rhomboideis vel ovatis (non lanceolatis vel linearibus), vaginis foliorum superiorum inflatis, statura altiore, caulorhizis ramosis, bracteis pedicellis subaequilongis (non superantibus), mericarpiis cum mesocarpiis multistratosis cellulis membranis lignescentibus fissuratim porosis compositis, jugis dorsalibus carinatis (non alatis) differt. A *C. tatarico,* quod in statura plantarum similis est, fructibus latioribus, vittis vallecularibus commissuralibusque obsoletis, cellulis mesocarpii membranis lignescentibus bene differt.

Plantae perennes polycarpicae, ad 150-180 cm alti, caulorhizis ramosis, rhizomatis horizontalibus bruneis, abbreviatis, incrassatis, ramosis, radicibus funiformibus. *Cauli* 2-5, basi ad 13 mm in diametro, fistulosi, inferne rotundi, glabri, sub umbellis striatelli et scabridi, in nodis leviter arcuatim curvati, in parte superiore corymbosim ramosi. *Folia* radicalia ignota, caulina inferiora et media glabra, angustevaginata, longepetiolata, laminis 10-15 cm longis, 6-7 cm latis,

ambitu triangulatis, tripinnatis; segmentis primariis petiolulis ad 3 mm longis, lobis terminalibus rhomboideis vel ovatis, ad 10 mm longis, c. 4-5 mm latis, dentatis. *Folia* caulina superiora cum vaginis longis, saepe inflatis, laminis minutis, bipinnatis. *Umbellae* terminales, fructificatione 6-7 cm in diametro, bracteis nullis, radiis 15-20, subaequilongis, leviter arcuatim curvatis, 2-3 cm longis, striatellis, scabridulis. *Umbellulae* bracteolis 8-9, lineari-filiformibus, margine vix scabridis, herbaceis, pedicellis subaequilongis, radiolis 25-30, ad 6 mm longis, inaequilongis, teretibus, vix puberulis. *Dentes* calycini obsoleti. Petala ignota. *Stylopodia* breviter conica; styli 0.7-1 mm longis, dorso recurvi. *Fructus* ovati, glabri, carpophorum ad basin bifidum. *Mericarpia* ambitu obovata vel ovalia, 4-4.2 mm longa, 2.5-3.5 mm lata, dorso leviter compressa, jugis alatis, marginalibus duplo latioribus. *Exocarpium* e cellulis minutis, leptodermaticis, interruptum prope carpophorum (commissura angusta). *Mesocarpium* fere totum e cellulis lignescentibus membranis fissuratim porosis. *Vittae* valleculares commissuralesque obsoletae. *Endocarpium* e cellulis minutis, spermoderma unistratosa, e cellulis magnis. *Endospermium* a facie commissurali fere planum.

Fruit structure. – See Fig. 9.

Conioselinum nipponicum Hara = ***C. chinense*** (L.) Britton, Sterns & Poggenb.

Conioselinum papyraceum (C. B. Clarke) Pimenov & Kljuykov = ***C. tataricum*** Hoffm.

Conioselinum pinnatifolium (Korovin) Schischk. ≡ ***Vvedenskya pinnatifolia*** Korovin.

7. *Conioselinum pseudoangelica* (H. Boissieu) Pimenov & Kljuykov, **comb. nova** ≡ *Ligusticum pseudoangelica* H. Boissieu in Bull. Herb. Boissier, ser. 2, 10: 845. 1903 ≡ *Pleurospermum pseudoangelica* (H. Boissieu) H. Boissieu in Bull. Soc. Bot. France 53: 434. 1906. – Lectotype (Leute 1970: 494): China, "[Yunnan], les marais de Kan-Hay, sur le Hee chan men (Lan Kong), á 2800 m", 21.9.1885, *Delavay 2021* (P!).
= *Ligusticum glaucifolium* H. Wolff in Repert. Spec. Nov. Regni Veg. 27: 312. 1929. – Holotype: China, "Yunnan, 27°20', 10000', shady situations by streams on the Tong-Shan in the Yangtze bend", 9.1913, *Forrest 11280* (E!; isotypes: PE! K!).

Distribution. – China (SW: Yunnan).

Fruit structure. – See Fig. 14.

Note. – *Conioselinum pseudoangelica* was described on the basis of heterospecific material. The excluded specimen (*Soulie 119,* P!) represents *Notopterygium oviforme* F. H. Shan.

Ref. – Under *Ligusticum pseudoangelica:* Leute (1970: 494, t. 15, fig. 4). – Under *Pleurospermum pseudoangelica:* Wu (1984: 923). – Under *Ligusticum glaucifolium:* Wu (1984: 915), Pu (1991: 533), Pu (1993: 1339), Sheh (1997: 593).

8. *Conioselinum pteridophyllum* (Franch.) Lavrova in Abstr. Int. Sci. Conf. Syst. Higher Pl. (Moscow): 67. 2002 ≡ *Ligusticum pteridophyllum* Franch. in Bull. Soc. Philom. Paris, ser. 8, 6: 132. 1894 ≡ *Ligusticopsis pteridophylla* (Franch.) Leute in Ann. Naturhist. Mus. Wien 73: 78, t. 5, fig. 4. 1969. – Lectotype (designated here): China, "ad pedem montis Tsang-chan, supra Tali", 25.9.1888, *Delavay 3618* (P!); paralectotypes: China, "Yunnan, in silvis ad collum Pi-iou-se supra Tapin-tze, alt. 2000 m", 15.10.1886, *Delavay 2517* (P!); "ad basin montis Ma-eul-chan", 30.10.1889, *Delavay* (P).
= *Peucedanum reptans* Diels in Bot. Jahrb. Syst. 29 [Fl. Centr. China]: 502. 1901 ≡ *Ligusticum reptans* (Diels) H. Wolff in Acta Horti Gothob. 2: 316. 1926. – Type: [Central China], "S Nan ch'uan: Hei wan ai", *"Rosthorn 1012*".

Distribution. – China (NW: Gansu; Tibet: Xizang A.R.; SW: Sichuan, Guizhou, Yunnan).

Fruit structure. – See Fig. 15.

Fig. 10. *Conioselinum nepalense* – basal part of the holotype.

Fig. 11. *Conioselinum nepalense* – upper part of the holotype.

Note. – This species usually has involucres of several bracts, but in Sichuan we collected a plant without bracts: 18.9.1998, *Pimenov & Kljuykov 230* (MW).

Ref. – Under *Ligusticum pteridophyllum:* Wu (1984: 916), Chang (1985: 257, t. 97, fig. 1-6), Pu (1991: 533), Pu (1993: 1339), Sheh (1997: 591, t. 189, fig. 1-4), Li & al. (2000: 805), Fu & al. (2001: 659, fig. 1058). – Under *Ligusticum reptans:* Shan (1941: 178), Chang (1985: 254), Yang (1989: 407, t. 143, fig. 1-2), Pu (1991: 531).

9. *Conioselinum reflexum* Pimenov & Kljuykov, **sp. nova**
Holotype: China, Yunnan, NW part, Zhongdian Co., 27 km N of Zhongdian, 28°01'N, 99°43'E, 3800 m, 26.9.1998, *Pimenov, Kljuykov, Hu Zhi Hao & Liu Qi Xing 436* (MW!) – Fig. 12.

A speciebus omnibus generis *Conioselini* foliis segmentis primariis paris primi reflexis sub angulo acuto bene differt. A speciebus plurimis *C. acuminato* excepto rhizomatis ramosis, plus minusve incrassatis distinguitur. A speciebus plurimis *C. sinchiano* et *C. nematophyllo* exceptis segmentis primariis basalibus foliorum subsessilibus dignoscitur.

Plantae perennes polycarpicae, 50-70 cm alti, caulorhizis eramosis, rhizomatis abbreviatis, radicibus plus minusve incrassatis. *Caules* solitarii, raro bini, tenui, basi 2-3 cm in diametro, fistulosi, inferne teretes, glabri, sub umbellis striatelli, scabridi, in nodis leviter arcuatim curvati, in parte superiore pauciramosi. *Folia* plerumque caulina, inferiora et media glabra, longepetiolata, petiolis ad 14 cm longis, laminis 8-12 cm longis, 4-6 cm latis, ambitu ovatis vel ovato-lanceolatis, tripinnatis; segmentis primariis ad 7, petiolulis brevissimis, segmentis paris primi reflexis sub angulo acuto; lobis terminalibus lanceolato-linearibus, 5-7 mm longis, c. 1.5 mm latis, acutis. *Folia* caulina superiora cum vaginis longis, saepe inflatis, laminis minutis, pinnatis. *Umbellae* terminales, ad 5 cm in diametro, bracteis nullis, radiis 8-10, aequilongis, ad 3 cm longis, acuticostatis, scabridulis. *Umbellulae* bracteolis 7-9, lineari-filiformibus, margine scabridis, herbaceis, umbellulis aequilongis, radiolis 25-30, ad 4 mm longis, subglabris. *Dentes* calycini obsoleti. *Petala* 1-1.4 mm longis, obovata, basi subcuneata, apice vix emarginata, incurva, cacuminis attenuatis, albida, viridiuscula vel fuscidula, canalibus secretoriis indistinctis. *Stylopodia* breviter conica; styli ad 1 mm longi, dorso recurvi. *Fructus* juveniles ad 3 mm longi, glabri, mericarpiis elongatis vel lanceolatis, jugis anguste alatis, fasciculis conductoriis partibus distalibus sitis. *Exocarpium* e cellulis minutis, commissura angusta. *Mesocarpium* e cellulis minutis. *Vittae* valleculares 3-5 per vallecula, commissurales 5-6. *Endospermium* a facie commissurali probabiliter planum.

Fruit structure. – See Fig. 16.

Distribution. – China (SW: Yunnan, Sichuan).

Additional specimens studied. – Sikang, Taofu (Dawo) distr., mont. orient Lhamo Mondeh La, in prato herboso-fruticoso, c. 3700 m, 21.9.1934, *Smith* (PE); Yunnan, Zhongdian, 21.9.1984, *coll. unknown 84-288* (KUN); Yunnan, Zhongdian, Wucun, 3700 m, 6.9.1959, *coll. unknown 23486* (PE).

Conioselinum schugnanicum B. Fedtsch. = ***C. tataricum*** Hoffm.

10. *Conioselinum shanii* Pimenov & Kljuykov, **sp. nova**
Holotype: China, Anhui, 11.1990, *coll. unknown 90133* (NAS!) – Fig. 13.

A specie affini *C. chinensi* bracteolis brevioribus, stylis longioribus, jugis dorsalibus tenuibus (non carinatis), vittis vallecularibus 2-4 (non solitariis) et commissuralibus ad 8 (non 2-4) differt.

Plantae perennes, videtur polycarpicae, 70-80 cm alti. *Caules* solitarii, tenui, basi 3-4 mm in diametro, fistulosi, teretes, in nodis leviter curvati, in parte superiore eramosi. *Folia* caulina tripinnata, glabra, anguste vaginata, longepetiolata, laminis ad 12 cm longis, 10 cm latis, ambitu

Fig. 12. *Conioselinum reflexum* – holotype.

late triangulatis; segmentis primariis petiolulis 7-10 mm longis, lobis terminalibus rhomboideis vel lanceolatis, 5-7 mm longis, 2-3 mm latis, profunde incisis vel integris. *Folia* caulina superiora vaginis oblanceolatis. *Umbellae* terminales, c. 5 cm in diametro, bracteis nullis, radiis 7-8, aequilongis, ad 2.5 cm longis. *Umbellulae* bracteolis nonnulis, lineari-filiformibus, herbaceis, umbellulis vix brevioribus, radiolis ad 10-12, 6-7 mm longis, teretibus, subglabris. *Dentes* calycini obsoleti. *Petala* c. 1.2 mm longa, obovata, basi cuneata, apice emarginata, incurva, cacuminis attenuatis, sordida, canalibus secretoriis indistinctis. *Stylopodia* minora, breviter conica; styli ad 2 mm longi, dorso recurvi. *Fructus* glabri, laeves, mericarpiis late ovalibus, 5 mm longi, 4 mm lati, jugis tenuibus, marginalibus late alatis, dorsalibus vix brevioribus, alatis, sectione transversali semiorbiculatis fasciculis conductoriis partibus distalibus sitis. *Exocarpium* e cellulis minutis, commissura angusta. *Mesocarpium* fere totum e cellulis lignescentibus membranis fissuratim porosis. *Vittae* valleculares minores, 2-4 per vallecula, commissurales ad 8. *Endospermium* a facie commissurali fere planum.

Fruit structure. – See Fig. 17.

Distribution. – China (C: Anhui, Jiangxi, ? Zhejiang).

Note. – We had very limited material at our dioposal when describing this species, and some characters remain unknown. The specimen was determined formerly as *Conioselinum chinense,* which is distributed considerably further north and, in spite of its scientific name, not present at all in China.

Ref. – Under *C. chinense*: Qiang (1988: 631, fig. 1677), Chang (1992: 2, t. 1, fig. 1-4) (the figure rather corresponds to characters of *C. chinense,* not *C. shanii*).

11. *Conioselinum sinchianum* (K. T. Fu) Pimenov & Kljuykov, **comb. nova** ≡ *Cnidium sinchianum* K. T. Fu in Fl. Tsinling. 1, 3: 459, 415, fig. 355. 1981 ≡ *Selinum sinchianum* (K. T. Fu) C. C. Yuan & L. B. Li in Acta Bot. Boreali-Occid. Sin. 13: 66. 1993. – Holotype: China, "Shensi, Feng Hsien, Sin-cha-shan, Paimu-tze-tan, alt. 2430-2450 m", 21.9.1951, *Liou KiMou 10682* (WUK; isotype: KUN!).
= *Ligusticum moniliforme* Z. X. Peng & B. Y. Zhang in Acta Phytotax. Sin. 33: 302. 1995. – Holotype: China, "Gansu, Tianjiahe, near the village Lannigou, alt. 2300 m, on borders of field", 18.9.1993, *Zhang BingYan 93060* (LZU).

Fruit structure. – See Fig. 18.

Distribution. – China (NW: Gansu; N: Shaanxi).

Ref. – Under *Ligusticum moniliforme:* Pan (1999: 401).

12. *Conioselinum sinomedicum* Pimenov & Kljuykov, **nom. nov.** ≡ *Ligusticum sinense* Oliv. in Hook. Icon. Pl., ser. 3, 20: t. 1958. 1891 [non *Conioselinum chinense* (L.) Britton, Sterns & Poggenb.]. – Lectotype (designated here): "Central China, prov. Hupeh, district Hsingshan", 1885-88, *Henry 6759A* (K; isotypes: E!, G!, PE!, US).
= *Carum anthriscoides* H. Boissieu in Bull. Soc. Bot. France 53: 426. 1906 ≡ *Aegopodium anthriscoides* (H. Boissieu) H. Boissieu in Bull. Soc. Bot. France 56: 350. 1909. – Holotype: China, "Su-tschuan oriental, district de Tcheu-keou-tin", *Farges 119-bis* (P!).
= *Ligusticum markgrafianum* Fedde ex H. Wolff in Repert. Spec. Nov. Regni Veg. 27: 313. 1929. – Isotype: China, "Prov. Hubei", *Henry 4954* (E!).
= *Ligusticum pilgerianum* Fedde ex H. Wolff in Repert. Spec. Nov. Regni Veg. 27: 322. 1930, non H. Wolff (1930: 307), nom. illeg. ≡ *L. harry-smithii* M. Hiroe, Umbell. Asia 1: 109. 1958. – Lectotype (designated here): China, "Shansi, Chiao-chung Distr., Pa-shui-ko-shan, in prato fruticoso herboso ad silvulam, 2000 m", 24.8.1924, *Smith 7112* (UPS!; isotype PE!); Paralectotype: China, "SW Kansu, Upper Telbu country, in moist meadows and along stream in Drakana, 10000' ", *Rock 14590.*

Fig. 13. *Conioselinum shanii* – holotype.

= *Ligusticum sinense* var. *alpinum* R. H. Shan ex K. T. Fu in Fl. Tsinling. 1, 3: 461, 419. 1981. – Holotype: China, "Shensi: Hwa-in Hsien, Hwa-yang Commune, Ta-pai-yang-cha, alt. 1400-1500 m", 23.9.1974, *Fu KunTsun 17254* (WUK).

Distribution. – China (NW: Gansu; N: Shaanxi, Shansi; C: Henan, Anhui, Hubei, Jiangxi, Zhejiang, Fujiang; SW: Sichuan, Guizhou, Yunnan).

Fruit structure. – See fig. 19.

Notes. – The epithet "*sinense*" is under *Conioselinum* not available for this species (see ICBN, Art. 53.3, Ex.9), thus a nomen novum had to be validated.

The highly variable species is widely used in traditional Chinese medicine (Chiangxiong) and therefore cultivated in some provinces of central and SW China. Chinese authors have separated some varieties and convarieties of rather dubious taxonomic status. Leute (1970: 490) and Pu (1991: 529) regarded *Ligusticum silvaticum* H. Wolff as conspecific with *C. sinomedicum* (sub *L. sinense*). The investigation of the holotype of the former name from UPS showed, however, that they are not identical.

Ref. – Under *Ligusticum sinense:* Shan (1941: 176), Leute (1970: 490, t. 14, fig. 3), Hiroe (1979: 1064, p.p.), Wu (1984: 916), Chang (1985: 252, t. 105, fig. 1-6), Qiang (1988: 630), Ma & Liu (1988: 56, fig. 45), Yang (1989: 410), Zeng (1989: 195, fig. 152), Pu (1991: 529), Pu (1993: 1337), Chang (1993: 371, fig. 465), Ding & Wang (1997:165, fig. 1711), Sheh (1997: 591, t. 189, fig. 5-8), Li & al. (2000: 805), Fu & al. (2001: 660, fig. 1060). – Under *Aegopodium anthriscoides:* Wolff (1927: 331). – Under *Ligusticum harry-smithii:* Hiroe (1979: 1076).

13. *Conioselinum smithii* (H. Wolff) Pimenov & Kljuykov, **comb. nova** ≡ *Ligusticum smithii* H. Wolff in Acta Horti Gothob. 2: 314. 1926. – Holotype: China, "Chili, Hsiao-wu-tai-shan, Yang-kia-p'ing, Hsi-lin, 1600-2600 m", 1.9.1921, *Smith 1097* (UPS!).
= *Ligusticum longilobum* H. Wolff in Acta Horti Gothob. 2: 313. 1926 ≡ *Ligusticopsis longiloba* (H. Wolff) Leute in Ann. Naturhist. Mus. Wien 73: 78. 1969. – Holotype: China, "Chili, Hsiao-wu-tai-shan, Tien-lin-ssu, c. 2300 m, in prato alpino", 18.9.1921, *Smith 101* (UPS!).
= *Cnidium jeholense* Nakai & Kitag. in Rep. First Sci. Exped. Manchoukuo, sect. 4, 1: 38, t. 12. 1934 ≡ *Ligusticum jeholense* (Nakai & Kitag.) Nakai & Kitag. in Rep. First Sci. Exped. Manchoukuo, sect. 4, 4: 36, 90. 1936 ≡ *Tilingia jeholensis* (Nakai & Kitag.) Leute in Ann. Naturhist. Mus. Wien 74: 511. 1970 ≡ *Conioselinum jeholense* (Nakai & Kitag.) Pimenov in Vestn. Moskovsk. Gosud. Univ., Ser. 16, Biol. 3: 71. 1985. – Holotypus: China, "in sylvis montis Wu-lin-shan", 2.9.1933, *Nakai*, *Honda & Kitagawa*" (TI?).

Distribution. – Russia (Far East: Maritime Terr.), China (N: Shanxi, Hebei, Shandong; NE: Jilin, Liaoning).

Fruit structure. – See Fig. 20-22.

Ref. – Under *Ligusticum jeholense:* Kitagawa (1960: 23), Liou & Huang (1977: 239, t. 96, fig. 1-7), Kitagawa (1979: 483), He & al. (1984: 655, fig. 812), Chang (1985: 256, t. 105, fig. 7-8), He & Fan (1988: 269, fig. 1173), Cheng (1988: 1322, t. 575, fig. 1-5), Pu (1991: 531), Chen & Jin (1992: 203, fig. 114), Li (1997: 822, fig. 703), Ding & Wang (1997: 166, fig. 1711), Chen & Jin (2000: 350, t. 194), Fu & al. (2001: 659, fig. 1057). – Under *Conioselinum jeholense:* Pimenov (1987: 248, map 80).

14. *Conioselinum tataricum* Hoffm., Gen. Umbell., ed. 2: 185, t. titul., fig. 5. 1816, in nota. – Type: plants cultivated in Botanical Garden Gorenki ("hort. Gorenk.").
= *Conioselinum vaginatum* (Spreng.) Thell. in Hegi, Ill. Fl. Mittel-Eur. 5(2): 1329. 1926 ≡ *Ligusticum vaginatum* Spreng., Pl. Min. Cogn. Pug. 2: 57. 1815, nom. illeg., p.p. [excl. syn. *Athamanta condensata* L.] – Type: Russia, "In Sibiria".

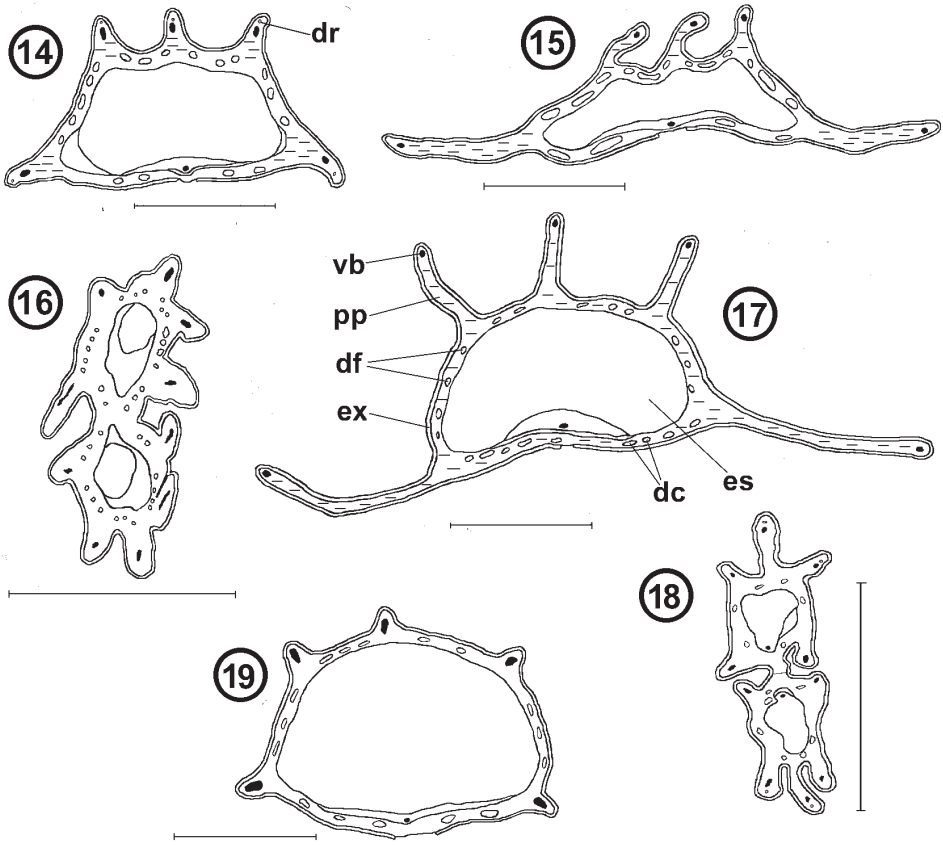

Fig. 14-19. Schematic transects of mericarps – 14: *Conioselinum pseudoangelica, Pu Fa-ting 161* (CDBI); 15: *C. pteridophyllum, Delavay 3618* (P); 16: *C. reflexum,* immature fruit, *Pimenov & al. 98-436* (MW); 17: *C. shanii,* holotype (NAS); 18: *C. sinchianum,* immature fruit, 12.9.1982, *10989* (PE); 19: *C. sinomedicum, Farges* (P). – Scale bar = 1 mm; for the abbreviations see caption of Fig. 1-3.

= *Selinum gmelinii* Bray in Denkschr. Bayer. Bot. Ges. Regensb. 2: 36. 1818 ≡ *Conioselinum gmelinii* (Bray) Steud., Nom. Bot., ed. 2, 1: 403. 1840. – Type: "Livonia, in fruticetis inter *Corylos* et alios frutices".
= *Conioselinum fischeri* Wimm. & Grab. in Fl. Siles. 1: 266. 1827.
= *Conioselinum univittatum* Turcz. ex Kar. & Kir. in Bull. Soc. Imp. Naturalistes Moscou 15: 363. 1842 ≡ *Selinum univittatum* Turcz. in Bull. Soc. Imp. Naturalistes Moscou 17: 735. 1844. – Type: Russia, "[Baikal & Transbaikalia], in pratis sylvaticis".
= *Conioselinum altaicum* Rupr. in Beitr. Pfl. Russ. Reich. 11: 22. 1859.
= *Conioselinum latifolium* Rupr. in Mém. Acad. Imp. Sci. Saint-Petersbourg (Sci. Phys.-Math.), ser. 7, 14(4) [Sert. Tianschan.]: 48. 1869. – Lectotypus: "Molda-assu-Schlucht", 12.8.1867, *Osten-Saken* (LE).
= *Selinum papyraceum* C. B. Clarke in Hook.f., Fl. Brit. Ind. 2: 701. 1879 ≡ *Cortia papyracea* (C. B. Clarke) Leute in Ann. Naturhist. Mus. Wien 73: 84. 1969 ≡ *Conioselinum papyraceum* (C. B. Clarke) Pimenov & Kljuykov in Bot. Žurn. 84(3): 91, fig. 1, map 2. 1999. – Syntype: India, "from Baltistan and Kashmir to Sikkim, alt. 8000-12000 ft.", *Clarke 31047* (K).

= *Conioselinum schugnanicum* B. Fedtsch. in Trudy Bot. Mus. Imp. Acad. Nauk 1: 135. 1902. – Lectotypus: Tadzhikistan, "in valle fl. Gunt prope Rivak, in frutices", 29.7.1901, *Fedtschenko* (LE!).

Distribution. – EUROPE: Norway, Finland, Poland, Czechia, Slovakia, Austria, Romania, Estonia, Latvia, Lithuania, Bielorussia, Ucraine, Eur. Russia (Murmansk d., Karelia, Archangelsk d., Komi, Vologda d., Kirov d., Leningrad d., Pskov d., Novgorod d., Kaliningrad d., Brjansk d., Smolensk d., Tver' d., Moskow d., Kaluga d., Vladimir d., Yaroslavl' d., Kostroma d., Ivanovo d., Nizhegorod. d., Tula d., Orel d., Rjazan d., Mordovia, Chuvaschia, Mariy-El, Tatarstan, Ulianovsk d., Pensa d., Tambov d., Kursk d., Lipezk d., Voronezh d., Belgorod d., Perm' d., Sverdlovsk d., Cheliabinsk d., Baschkiria, Orenburg d., Samara d., Saratov d., Volgograd d., Rostov-na-Donu d. — ASIA: As. Russia (W Siberia: Tyumen d., Kurgan d., Novosibirsk d., Tomsk d., Kemerovo d., Altai Terr., Mount. Altai; C Siberia: Krasnoyarsk Terr., Tuva; E Siberia: Irkutsk d., Buryatia, Chita d., Yakutia), China (NW: Xinjiang Weiwuer A.R.), Mongolia, Kazakhstan (N: Pavlodar d.; NE: Semei d., E Kazakhstan d.; S: S Kazakhstan d., Zhambyl d.; SE: Taldy-Kurgan d., Almaty d.), Kirghizia, Tadzhikistan, Uzbekistan, Afghanistan, Pakistan, India (W Himalaya: Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh; E Himalaya: Sikkim).

Note. – Two epithets concur in the nomenclature of this species, *tataricum* and *vaginatum*, the latter preceding the first for one year. The question is, however the legitimacy of *Ligusticum vaginatum* Spreng. *L. vaginatum* was described by Sprengel (1815) and two references on previously published names were made in the protologue. The first is *Athamanta condensata* L., the basionym of the presently accepted binomen *Seseli condensatum* (L.) Rchb. The second is to *Angelica foliolis pennatifidis* Gmel. (Fl. Sib. 1: 195, f. 44. 1747). Later, Sprengel (1818) stated that *Athamanta condensata* and *Angelica foliolis pennatifidis* are two different Siberian species. In the same year 1818 Sternberg in a comment (Adnotatio) to Bray's publication (1818) made detailed comparison of *A. condensata* L. and *L. vaginatum* Spreng., showing their difference in many characters. *Selinum gmelinii* Bray (= *Angelica foliis pennatifidis* Gmel.) was described as a new species from Lithuania in the same article. On the basis of the 1815 publication by Sprengel *L. vaginatum* must be, however, put in synonymy of *Seseli condensatum*, at least partly. The correction of 1818 was not of nomenclatural value, as at that time the indisputable name *Conioselinum tataricum* Hoffm. (1816) had been published as descriptio generico-specifica.

Having a wide range of distribution in boreal Eurasia, *C. tataricum* varies in some characters, which led to the description of several species that, on closer examination, are not supported by true discontinuities. For instance, Turczaninov (1842) separated *C. univittatum* on the basis of solitary vittae in mericarp valleculas, and later Ruprecht (1859, 1869) distinguished some geographical variants from W European, E European, Siberian, Middle-Asian regions, etc., as separate species. Diagnostic characters of these variants are, however, variable; for instance, the number of vallecular vittae of mericarps can be 1 to 6, without geographical peculiarity.

Recently we showed (Pimenov & Kljuykov 1999a) that *Conioselinum* is distributed in the Himalayas, as *Selinum papyraceum* was found to be conspecific with *C. schugnanicum,* the latter generic attribution being correct. Our further field investigations in the Indian Himalaya convinced us that it would be impossible to distinguish Himalayan-Pamirian populations (which seemed smaller in all plant parts) from widely distributed ones in Middle Asia and northernmore *C. tataricum* (earlier treated there as *C. latifolium*). In good conditions (e.g. in the so-called Valley of Flowers in Uttar Pradesh) local plants can be two meters high.

Ref. – Under *C. tataricum:* Calestani (1905: 216), Todor (1958: 552), Tutin (1968: 357), Vodopjanova (1979: 685, map 973), Grubov (1982: 191), Pimenov (1983: 269), Korovin & al. (1984: 144, t. 25, fig. 1-3), Yang (1985: 386), Vinogradova (1994: 43), Pimenov (1996: 173, map 132), Gubanov (1996: 79), Slavik (1997: 370), Pimenov & Kljuykov (2002a: 164, t. XXIII, g, map XVI, v). – Under *C. vaginatum:* Krylov (1935: 2061), Dostal (1950: 1054), Šiškin (1951: 2, t. 8, fig. 2), Grubov (1955: 213), Koczwara (1960: 99), Korovin (1963: 312, t. 38, fig. 1), Malyshev (1965: 188), Wu (1984: 910), Chang (1992: 4). – Under *C. gmelinii:* Ledebour (1829:

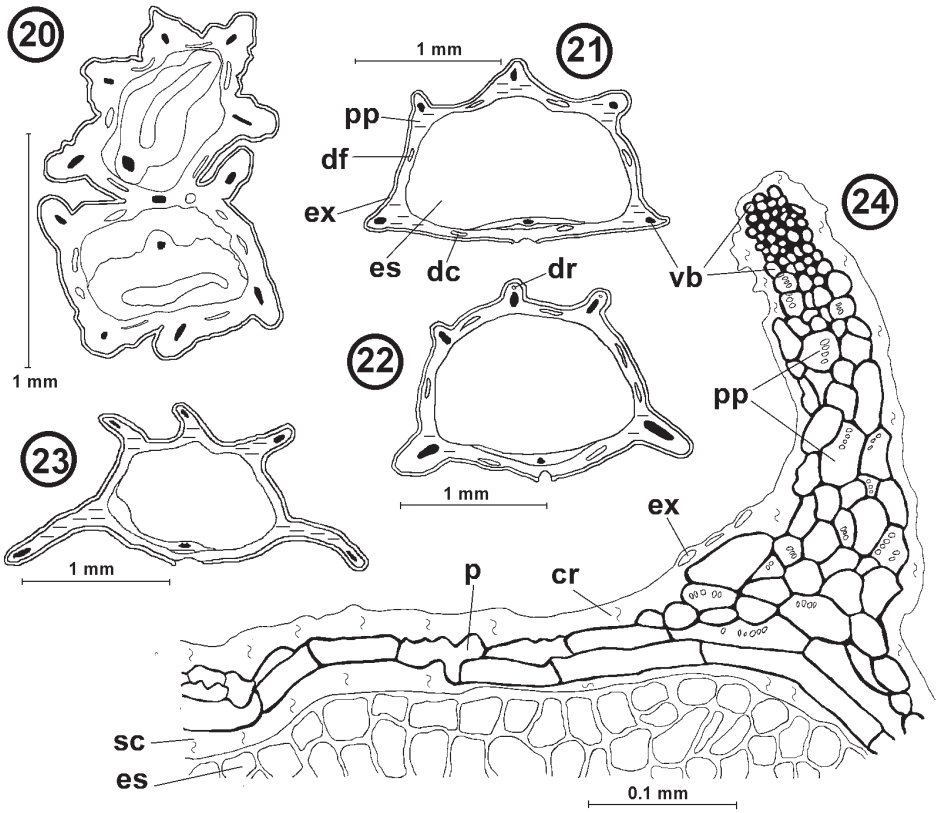

Fig. 20-24. Transects of mericarps – 20-22: *Conioselinum smithii;* 20: holotype (UPS); 21: 2.10.1955, *1824* (PE); 22: *Smith 101* (UPS); 23-24: *C. tenuisectum, Farges* (P), schematic transect (23), dorsal rib (24); for the abbreviations see caption of fig. 1-3.

318). – Under *C. fischeri:* Ledebour (1844: 290), Fedtschenko & Fedtschenko (1909: 98), (1911: 43). – Under *C. latifolium:* Šiškin (1951: 3, t. 8, fig. 3), Korovin (1959: 393, t. 45, fig. 2), Kaschtschenko (1959: 78). – Under *Selinum papyraceum:* Fedtschenko & Fedtschenko (1911: 43), Bamber (1916: 396), Hiroe (1958: 156), Kitamura (1960: 290), Nasir (1972: 117, fig. 35, D-G), Podlech (1977: 460), Hiroe (1979: 1310), Chowdhery & Wadhwa (1984: 328), Mukherjee & Constance (1993: 179), Aswal & Mehrotra (1994: 296), Watson (1999: 491), Dickore & Nüsser (2000: 190). – Under *Cortia papyracea:* Hedge & Rechinger (1987: 363, t. 294). – Under *Conioselinum papyraceum:* Pimenov & Kljuykov (2001: 198). – Under *Conioselinum schugnanicum:* Fedtschenko & Fedtschenko (1909: 98), (1911: 43), Šiškin (1951: 4), Pimenov (1983: 269), Korovin & al. (1984: 146, t. 25, fig. 4, 5).

15. *Conioselinum tenuisectum* (H. Boissieu) Pimenov & Kljuykov, **comb. nova** ≡ *Ligusticum tenuisectum* H. Boissieu in Bull. Herb. Boissier, ser. 2, 10: 843. 1903 ≡ *Ligusticopsis tenuisecta* (H. Boissieu) Leute in Ann. Naturhist. Mus. Wien 73: 79. 1969. – Holotype: China, "Su-Tchuen oriental, district de Tchou-Keou-Tin", *Farges 119* (P!; isotypes: E!, K!).

= *Cnidium nullivittatum* K. T. Fu in Fl. Tsinling. 1(3): 460, 415, fig. 356. 1981 ≡ *Selinum nullivittatum* (K. T. Fu) C. C. Yuan & L. B. Li in Acta Bot. Boreali-Occid. Sin. 13: 66. 1993. –

Holotype: China, "Shensi, Hwa-in Hsien, Ta-pai-yang-cha, alt. 1600-1900 m", 27.9.1974, *Fu Kun Tsun 17241* (WUK).

Distribution. – China (N: Shaanxi, Hebei; C: Henan, Hubei; SW: Sichuan, Yunnan).

Fruit structure. – See Fig. 23-24.

Note. – The description of the mericarp vittae in the protologue (Boissieu 1903: "... mediocriter conspicuae, in valleculis dorsalibus plerumque 3, in lateralibus 4-5, commissurales 6-10 ...") could be a sourse of confusion. This description is related to the genus ("pro genere") and not to the species. Our investigation of the fruit structure in *Farges 119* (P!) showed mericarps without vallecular and commissural vittae.

Ref. – Under *Ligusticum tenuisectum:* Diels (1905: 83), Pu (1991: 540), Pu & al. (1992: 255), Pu (1993: 1339).

16. *Conioselinum tenuissimum* (Nakai) Pimenov & Kljuykov, **comb. nova** ≡ *Angelica tenuissima* Nakai in Bot. Mag. Tokyo 33: 10. 1918 ≡ *Ligusticum tenuissimum* (Nakai) Kitag. in J. Jap. Bot. 17: 562. 1941. – Syntype: Korea, "in silvis montium Kumgangsan v. Diamond mountains", *Uchiyama & Nakai 5728*, *5729* (TI?).
= *Ligusticum multifidum* Nakai in Fl. Koreana 1: 265. 1909, non Sm. (1808), nom. illeg. – Type: Korea, "Kang-uon, monte Kun-goang-san", 18.8.1902, *Uichiyama.*

Distribution. – China (N: Hebei; NE: Liaoning), Korea.

Ref. – Under *Angelica tenuissima*: Lee (1985: 589, fig. 2356). – Under *Ligusticum tenuissimum*: Kitagawa (1960: 23, t. 2, fig. 2), Liou & Huang (1977: 241, t. 97), Kitagawa (1979: 483), He & al. (1984: 655), Chang (1985: 244, t. 101, fig. 1-4), He & Fan (1988: 271), Cheng (1988: 1323, t. 576), Pu (1991: 540), Lee (1998: 562, fig. 1764).

C. univittatum Turcz. ex Kar. & Kir. = ***C. tataricum*** Hoffm.

C. victoris Schischk. ≡ ***Magadania victoris*** (Schischk.) Pimenov & Lavrova

C. wolffianum (Fedde) Nakai = ***Angelica polymorpha*** Maxim.

Acknowledgements

This investigation was supported by grants from the Russian Foundation for Fundamental Investigations (RFFI) and of the National Geographic Society (USA). The curators of following herbaria are gratefully acknowledged for the loan of specimens and study facilities to examine collections: A, B, CDBI, E, G, GB, GH, HAST, K, KUN, LE, MW, NAS, P, PE, UPS, W, WU. We thank the reviewers Prof. Pu Fating, Prof. Sheh Menglan (both Nanjing) and Dr Pierre Reduron (Mulhouse) for their valuable comments on an earlier version of this paper.

References

Aswal, B. S. & Mehrotra, B. N. 1994: Flora of Lahaul-Spiti: a cold desert of North West Himalaya. – Dehra Dun.

Bamber, C. J. 1916: Flora of the Punjab. – Lahore.

Boissieu, H. de 1903: Les ombellifères de Chine d'après les collections du Muséum d'Histoire Naturelle de Paris. – Bull. Herb. Boissier, ser. 2, **10:** 837-856.

Bray, F. G. von 1818: Plantae novae et rariores in Livonia observatae. – Denkschr. Königl. Bayer. Bot. Ges. Regensburg [1] Abt. **2:** 31-48.

Calestani, V. 1905: Contributo alla sistematica delle Ombellifere d'Europa. – Webbia **1:** 89-280.

Chang, H. T. 1985: *Ligusticum* L. – Pp. 234-257 in: Shan, R. H. & Sheh, M. L. (ed.), Flora Reipublicae Popularis Sinicae **55(2).** – Beijing.
— 1992: *Conioselinum*. – Pp. 2-4 in: Shan, R. H. & Sheh, M. L. (ed.), Flora Reipublicae Popularis Sinicae **55(3).** – Beijing.
Chang, Y. H. 1993: *Umbelliferae*. – Pp. 341-385 in: Qui, B. L. (ed.), Flora of Zhejiang **4.** – Zhejiang.
Chen, Y. L. & Jin, S. Y. 1992: *Umbelliferae.* – Pp. 192-215 in: Liu, T. W. & Zhang, Y. F. (ed.), Flora taiyuamica **2.** – Taiyuan.
— & — 2000: *Umbelliferae*. – Pp. 320-385 in: Liu, T. W. (ed.), Flora shanxiensis **3.** – Beijing.
Cheng, G. Y. 1988: *Umbelliferae*. – Pp. 1273-1359 in: Li, S. X. (ed.), Flora liaoningica **1.** – Liaoning.
Choi, H.-K., Kim, C. & Shin, H. 2000: Molecular reexamination of Korean *Umbelliferae* based on internal transcribed spacer sequences of rDNA: *Ligusticum tenuissimum* (Nakai) Kitagawa and *Libanotis coreana* (Wolff) Kitagawa. – J. Pl. Biol. **43:** 128-135.
Chowdhery, H. J. & Wadhwa, B. M. 1984: Flora of Himachal-Pradesh **1.** – New Delhi.
Dickoré, W. B. & Nüsser, M. 2000: Flora of Nanga Parbat (NW Himalaya, Pakistan). An annotated inventory of vascular plants with remarks on vegetation dynamics. – Englera **19.**
Diels, L. 1905: Beiträge zur Flora des Tsin-Ling Shan. – Bot. Jahrb. Syst. **36(5)**, Beibl. 82.
Ding, B. Z. & Wang, S. Y. (ed.) 1997: Henan zhiwuzhi [Flora of Henan] **3.** – Zhanlanguanlu.
Dostal, J. 1950: Květena ČSR. – Praha.
Downie, S. R., Watson, M. F., Spalik, K. & Katz-Downie, D. S. 1999: Molecular systematics of Old World *Apioideae (Apiaceae):* relationships among some members of tribe *Peucedaneae* sensu lato, placement of several island-endemic species, and resolution within the apioid superclade. – Canad. J. Bot. **78:** 506-528.
— Katz-Downie, D. S. & Watson, M. F. 2000: A phylogeny of the flowering plant family *Apiaceae* based on chloroplast DNA *rpl16* and *rpoC1* intron sequences: towards a suprageneric classification of subfamily *Apioideae*. – Amer. J. Bot. **87:** 273-292.
Drude, O. 1897-98: *Umbelliferae*. – Pp. 63-272 in: Engler, A. & Prantl, K. (ed.), Die natürlichen Pflanzenfamilien **3(8).** – Leipzig.
Fedtschenko, O. A. & Fedtschenko, B. A. 1909: Conspectus florae turkestanicae **3.** – Yuriev.
— & — 1911: Conspectus florae turkestanicae. – Beih. Bot. Centralbl. **28(2).**
Fu, L. K., Chen, T. Q., Lang, K. Y., Hong, T. & Lin, Q. (ed.) 2001: Zhangguo-gaodeng-zhiwn [Higher plants of China] **8.** – Beijing.
Gmelin, J. G. 1747: Flora sibirica sive historia plantarum Sibiriae **1.** – St Petersburg.
Gorovoy, P. G. 1966: Zontihnye (fam. *Umbelliferae* Moris.) Primor'ja i Priamur'ja. [*Umbelliferae* Moris. of Primorje and Priamurie]. – Moscow & Leningrad.
— 1978: The genus *Tilingia* Regel. – Pp. 653-661 in: Ombellifères. Actes 2e Symp. Int. Perpignan, 1977. – Perpignan.
Grubov, V. I. 1955: Konspect flory Mongolskoi Narodnoi Respubliki [Conspectus florae Reipublicae Popularis Mongolicae]. – Moscow & Leningrad.
— 1982: Opredelitel' sosudistyh rastenij Mongolii (s atlasom) [Key to the vascular plants of Mongolia (with an atlas)]. – Leningrad.
Gubanov, I. A. 1996: Konspect flory Vneshnei Mongolii (sosudistye rasteniya) [Conspectus of flora of Outer Mongolia (vascular plants)]. – Moscow.
Hara, H. 1954: *Umbelliferae*. – Pp. 291-328 in: Enumeratio spermatophytarum japonicarum **3.** – Tokyo.
He, S. Y. & al. 1984: Flora of Beijing **2.** – Beijing.
— & Fan, W. T. 1988: *Umbelliferae*. – In: He, H. (ed.), Flora hebeiensis **2.** – Beijing.
Hedge, I. C. & Rechinger, K. H. 1987: *Cortia.* – Pp. 362-364 in: Rechinger, K. H. (ed.), Flora iranica **162.** – Graz.
Hiroe, M. 1958: *Umbelliferae* of Asia (excluding Japan) **1.** – Kyoto.
— 1979: *Umbelliferae* of the world. – Tokyo.

— & Constance, L. 1958: *Umbelliferae* of Japan. – Univ. Calif. Publ. Bot. **30(1).**
Hoffmann, G. F. 1814: Genera plantarum *Umbelliferarum*, ed. 1. – Mosquae.
— 1816: Plantarum *Umbelliferarum* genera, ed. 2. – Mosquae.
Holub, J. 1984: Some new nomenclatural combinations I. – Folia Geobot. Phytotax. **19:** 213-215.
Index kewensis on CD-ROM, 1997, version 2.0. – Oxford.
Kao, M. T. 1993: *Umbelliferae.* – Pp. 1010-1045 in: Huang, T. C. (ed.), Flora of Taiwan, ed. 2, **3.** – Taipei.
Kaschtschenko, V. I. 1959: *Conioselinum* Fisch. – Pp. 78-79 in: Vredenskij, A. I. (ed.), Flora Kirghiz SSR **8.** – Frunze.
Katz-Downie, D. S., Valiejo-Roman, K. M., Terentieva, E. I., Troitsky, A.V., Pimenov, M. G., Lee, B. & Downie, S. R. 1999: Towards a molecular phylogeny of *Apiaceae* subfamily *Apioideae*: additional information from nuclear ribosomic DNA ITS sequences. – Pl. Syst. Evol. **216:** 167-195.
Kitagawa, M. 1960: Synoptical review of *Umbelliferae* from Japan, Korea & Manchuria. – Bull. Nat. Sci. Mus. **5(1):** 1-35.
— 1979: *Umbelliferae*. – Pp. 473-490 in: Neo-Lineamenta florae manshuricae. – Vaduz.
Kitamura, S. 1960: Flora of Afghanistan. – Kyoto.
Klan, Z. 1947: Srovnávací anatomie plodu rostlin okolicnatých oblasti Republiky Ceskoslovenské (anatomický klic). – Praha.
Koczwara, M. 1960: Flora Polska. Rosliny naczyniowe polski i ziem osciennych **9.** – Krakow.
Kondo, K., Terabayashi, S., Okada, M., Yuan, C. & He, S. 1996: Phylogenetic relationships of medicinally important *Cnidium officinale* and Japanese *Apiaceae* based on *rbc*L sequences. – J. Pl. Res. **109:** 21-27.
Korovin, E. P. 1959: *Umbelliferae*. – Pp. 257- 470 in: Vvedensky, A. I. (ed.), Flora uzbekistana **4.** – Tashkent.
— 1963: *Umbelliferae*. – Pp. 258- 428 in: Pavlov, N. V. (ed.), Flora kazahstana **6. –** Alma-Ata.
—, Pimenov, M. G. & Kinzikaeva, G. K. 1984: *Umbelliferae*. – Pp.10-214 in: Ovczinnikov, P. N. (ed.) Flora Tadzhikskoi SSR **7.** – Moscow & Leningrad.
Krylov, P. N. 1935: *Umbelliferae*. – Pp. 1980-2085 in: Krylov, P. N. (ed.), Flora zapadnoi Sibiri **8.** – Tomsk.
Lavrova, T. V. 2002: Problemy revisii roda *Ligusticum* L. *(Umbelliferae)* [Taxonomic problems of the genus *Ligusticum* L. *(Umbelliferae)*]. – Pp. 65-67 in: Anonymous (ed.), Abstracts International Science Conference Systematics Higher Plants. – Moscow.
— , Pimenov, M. G. & Tikhomirov, V. N. 1983: Opisanie i analiz stroenija plodov zontihnyh triby *Ligusticeae* [Description and analysis of the *Umbelliferae* fruit structure in the tribe *Ligusticeae*]. – Bull. Soc. Nat. Mosc., Div. biol. **88(2):** 107-122.
Ledebour, C. F. 1829: Flora altaica **1.** – Berlin.
— 1844: Flora rossica **2.** – Stuttgart.
Lee, T. B. 1985: Illustrated flora of Korea. – Seoul.
— 1998: *Umbelliferae.* – Pp. 547-572 in: Lee, Y. N. (ed.), Flora of Korea, ed. 3. – Seoul.
Leute, G. H. 1969-70: Untersuchungen über den Verwandtschaftskreis der Gattung *Ligusticum* I, II. – Ann. Naturhist. Mus. Wien **73:** 55-98; **74:** 457-519.
Li, F. Z. 1997: *Umbelliferae* – in: Chen, H. B. (ed.), Shandong-zhiwuzhi [Flora of Shandong] **2.** – Shandong.
Li, H., Guo, H. J. & Dao, Z. L. (ed.) 2000: Flora of Gaoligong mountains. – Kunming.
Liou, T. N. & Huang. 1977: *Umbelliferae*. – Pp. 171-290 in: Flora plantarum herbacearum Chinae boreali-orientalis. – Beijing.
Liu, T. S., Chao, C. Y. & Chuang, T. 1961: *Umbelliferae* of Taiwan. – Quart. J. Taiwan Mus. **14(1-2)**: 15-47.
— & Kao, M. T. 1977: *Umbelliferae*. – Pp. 938-974 in: Li, H. L. (ed.), Flora Taiwan **3.** – Taipei.
Ma, D. Z. & Liu, H. L. 1988: *Umbelliferae*. – Pp. 35-60 in: Flora Ningxiaensis **2.** – Yiunchuan.

Malyshev, L. I. 1965: Vysokogornaya flora Vostochnogo Sayana [Alpine flora of East Sayan]. – Moscow – Leningrad. 368 p.
Mathias, M. E. & Constance, L. 1944-45: *Umbelliferae*. – Pp. 43-295 in: North American Flora **28B.** – New York.
Mukherjee, P. K. & Constance, L. 1993: *Umbelliferae (Apiaceae)* of India. – New Delhi, etc.
Nazir, E. 1972: *Umbelliferae*. – In: Nazir, E. & Ali, S. I. (ed.), Flora of West Pakistan **20.** – Rawalpindi.
Ohba, H. 1999: *Umbelliferae*. – Pp. 268-303 in: Iwatsuki, K., Boufford, D. E. & Ohba, H. (ed.), lora of Japan **2C.** – Kodansha.
Ohwi, F. 1953: Flora of Japan. – Tokyo.
Pan, J. T. 1999: *Umbelliferae*. – Pp. 383-431 in: Liu, S. W. (ed.), Flora qinghaica **2.** – Xining.
Pimenov, M. G. 1983: *Umbelliferae*. – Pp. 167-322 in: Vvedensky, A. I. (ed.), Conspectus florae Asiae mediae **7.** – Tashkent.
— & Kljuykov, E. V. 1999a: Juzhnaja granica areala roda *Conioselinum (Umbelliferae)* prohodit v Gimalajah [Southern area border of *Conioselinum (Umbelliferae)* gets through the Himalaya]. – Bot. Žurn. **84(3):** 87-92.
— & — 1999b: New nomenclatural combinations for Chinese *Umbelliferae*. – Feddes Repert. **110:** 481-491.
— & — 2001: Floristic novelties in the *Umbelliferae* of Xinjiang, China. – Acta Phytotax. Sin. **39:** 193-202.
— & — 2002a: *Umbelliferae* of Kirghyzia. – Moscow.
— & — 2002b: O nekotoryh vidah *Umbelliferae* opisannyh H. Wolffom iz Severnogo Kitaja [On some *Umbelliferae* species, described by H. Wolff from northern China]. – Bot. Žurn. **87(1):** 122-127.
— , — & Ostroumova, T. A. 2001: Towards a clarification in the taxonomy of Sino-Himalayan species of *Selinum* L. s.l. *(Umbelliferae).* The genus *Oreocome* Edgew. – Willdenowia **31:** 101-124.
— & Leonov, M. V. 1993: The genera of the *Umbelliferae*. A nomenclator. – Kew.
— , Tikhomirov, V. N., Lavrova, T. V. 1986: Revisija roda *Cnidium* Cuss. ex Jussieu *(Umbelliferae-Apioideae)* [Revision of the genus *Cnidium* Cuss. ex Jussieu *(Umbelliferae-Apioideae)*]. – Bjull. Moskovsk. Obšč. Isp. Prir., Otd. Biol. **91(2):** 90-98.
Plant names project, The 1999: International plant names index (IPNI). – Published on the Internet, http://www.ipni.org
Podlech, D. & Anders, O. 1977: Florula des Wakhan (Nordost-Afghanistan). – Mitt. Bot. Staatssamml. München **13:** 361-405.
Pu, F. T. 1991: A revision of the genus *Ligusticum (Umbelliferae)* in China. – Acta Phytotax. Sin. **29:** 385-393, 525-548 (in Chinese).
— , Sheh, M. L. & Liou, S. L. 1992: Supplementum. – Pp. 225-255 in: Shan, R. H. & Sheh, M. L. (ed.), Flora Reipublicae Popularis Sinicae **55(3).** – Beijing.
— 1993: *Umbelliferae*. – Pp. 1276-1355 in: Wang, W. T. (ed.), Vascular plants of Hengduan Mountains. – Beijing.
Qiang, S. 1988: *Conioselinum chinense.* – P. 631 in: Flora of Anhui **3.** – Beijing.
Ruprecht, F. J. 1859: Revision der Umbelliferen aus Kamtschatka. – Pp. 20-23 in: Beitr. Pflanzenk. Russ. Reich. **11.** – St. Petersburg.
— 1869: *Conioselinum latifolium* Rupr. – P. 48 in: Osten-Sacken, F. von & Ruprecht, F. J. Sertum tianschanicum. – Mem. Acad. St. Petersburg, ser. 7, **14(4).**
Šiškin, B. K. 1950: *Umbelliferae.* – Pp. 36-646 in: Šiškin, B. K. & Bobrov, E. G. (ed.), Flora SSSR **16.** – Leningrad & Moskva.
— 1951: *Umbelliferae.* – Pp. 1-314 in: Šiškin, B. K. & Bobrov, E. G. (ed.), Flora SSSR **17.** – Leningrad & Moskva.
Shan, R. H. 1941: Studies on *Umbelliferae* of China IV. – Sinensia **12 (1-6)**: 163-183.
— & Sheh, M. L. (ed.) 1985-1992: Flora Reipublicae Popularis Sinicae **55(2, 3).** – Beijing.

Sheh, M. L. 1997: *Umbelliferae.* – Pp. 357-640 in: Wu, C. Y. & Chen, S. K. (ed.), Flora yunnanica **7. –** Beijing.
Slavík, B. (ed.) 1997: Květena České Republiky **5.** – Prague.
Sprengel, C. 1815: Plantarum minus cognitarum pugillus secundus. – Halae.
— 1818: Species *Umbelliferarum* minus cognitae, illustratae. – Halae.
Suk, K.-T., Nitta, A. & Konoshima, M. 1974: Studies on origin of Japanese Chuanxiong. IV. *Ligusticum* and *Tilingia*. – J. Pharm. Soc. Jap. (Yakugaku Zasshi) **94:** 1257-1264.
Thellung, A. 1925-26: *Umbelliferae*. – Pp. 926-1537 in: Hegi, G. (ed.), Illustrierte Flora von Mittel-Europa **5(2).** – München.
Tikhomirov V. N. 1973: *Paraligusticum* V. Tichom. gen. nov. – novyy rod iz semeistva *Umbelliferae* [*Paraligusticum* V. Tichom gen. nov. – a new genus of the family *Umbelliferae*]. – Bjull. Moskovsk. Obšč. Isp. Prir., Otd. Biol. **78(1):** 100-108.
Todor, I. 1958: *Umbelliferae.* – Pp. 326-652 in: Săvulescu, T. (ed.), Flora Republicii Populare Romîne **6.** – Bukurestu.
Turczaninov, N. 1842: *Conioselinum univittatum.* – P. 363 in: Karelin, G. & Kirillow, J. (ed.), Enumeratio plantarum in desertis Songoriae orientalis et in jugo alpinum Alatau anno 1841 collectarum. – Bull. Soc. Imp. Natur. Mosc. **15:** 321-453.
Tutin, T. G. 1968: *Umbelliferae*. – Pp. 315-375 in: Tutin, T. G., Heywood, V. H., Burges, N. A., Moore, D. M., Valentine, D. H. , Walters, S. M. & Webb, D. A. (ed.), Flora europaea **2.** – Cambridge, etc.
Valiejo-Roman, K. M., Pimenov, M. G., Terentieva, E. I., Downie, S. R., Katz-Downie, D. S. & Troitsky, A. V. 1998: Molecular systematics of the *Umbelliferae*: using nuclear rDNA internal transcribed spacer sequences to resolve issues of evolutionary relationships. – Bot. Žurn. **83(7):** 1-22.
Vinogradova, V. M. 1994: *Umbelliferae*. – Pp. 9-99 in: Grubov, V. I. (ed.), Rastenija Central'noj Azii [Plantae Asiae Centralis] **10.** – St. Petersburg.
Vodopjanova, N. S. 1979: *Apiaceae* ili *Umbelliferae*. – Pp. 671-691 in: Malyshev, L. I. & Peshkova, G. A. (ed.), Flora Sibiriae centralis **2.** – Novosibirsk.
Watson, M. F. 1999: *Umbelliferae*. – Pp. 434-504 in: Grierson, A. J. & Long, D. G. (ed.), Flora of Bhutan **2(2).** – Edinburgh.
Wolff, H. 1927: *Umbelliferae - Apioideae - Ammineae - Carinae*, *Ammineae* novemjugatae et genuinae. – Pp. 1-398 in: Engler, A. (ed.), Das Pflanzenreich **90.** – Leipzig**.**
— 1929-30: *Umbelliferae* asiaticae novae relictae III. – Repert. Nov. Spec. Regni Veg. **27:** 301-335.
Wu, Z. Y. (ed.) 1984: Index florae yunnanensis **1.** – Kunming.
Yamazaki, T. 2001: *Umbelliferae* in Japan II. – J. Jap. Bot. **76:** 275-287.
Yang, C. Y. 1985: Clavis plantarum xinjiangensium **3.** – Urumqi.
Yang, M. Z. 1989: *Umbelliferae.* – In: Li, Y .K. (ed.), Flora guizhouensis **4.** – Guiyang.
Zeng, W. B. 1989: *Umbelliferae.* – Pp. 171-200 in: Flora fujianica **4.** – Fujian.

Address of the authors:
Prof. Michael G. Pimenov, Dr Eugene V. Kljuykov, Dr Tatiana A. Ostroumova, Botanical Garden, Moscow State University, Moscow 119899, Russia; e-mail: pimenov@2.botgard.bio.msu.ru