ABSTRACT

The Russian Far East is of particular interest to monographers of the genus *Euonymus*, because this is where the northern distribution limits of many East Asian species are. At the same time, the main problem is different understanding of the scope and status of a number of taxa by Russian and foreign botanists. The article presents the chronology of the most prominent results of various authors, Russian and foreign (primarily Chinese, Korean and Japanese), who contributed to taxonomic, environmental and chorological studies of the genus *Euonymus*. The contributions of N.S. Turczaninow, K.J. Maksimovich, F.B. Schmidt, V.L. Komarov, T. Nakai, Ya.I. Prokhanov, A.I. Tolmachev, B.A. Shaikhobodsky, T.G. Leonova, N.N. Turelev, S.K. Cherепанов, K.V. Киселева, V.A. Недоизяк и В.А. Вялых are analyzed. Unresolved issues of biology of the Far Eastern species are emphasized, the ways of to solve them are outlined.

Keywords: history of botanical research, Russian Far East, China, Korea, Japan, *Euonymus*.

**Table 1.**

| Taxon Name | Year | Author | Location |
|------------|------|--------|----------|
| *E. albus* | 1827 | Siebold | Japan |
| *E. sieboldianus* | 1827 | Siebold | Japan |
| *E. maackii* | 1857 | Ruprecht | Russia |
| *E. macropterus* | 1857 | Ruprecht | Russia |
| *E. panniferus* | 1859 | Maxim | Russia |
| *E. occidentalis* | 1865 | Miq. | Japan |
| *E. sachalinensis* | 1882 | Schmidt | Russia |
| *E. planipes* | 1906 | Koehne | Japan |
| *E. maximowiczianus* | 1949 | Prokhorov | Russia |

**REZЮМЕ**

Савинов И.А. История и особенности изучения дальневосточных видов Евоньмус в России и соседних странах. Дальневосточный регион представляет особый интерес для монографов рода *Euonymus*, поскольку здесь находятся северные границы распространения многих восточноазиатских видов. В то же время, основной проблемой является разное понимание объема и статуса ряда видов российскими и зарубежными ботаниками. В статье представлена хронология наиболее выдающихся результатов исследований различных авторов, российских и зарубежных (в первую очередь китайских, корейских и японских), которые внесли свой вклад в систематику, экологию и распространение дальневосточных видов рода *Euonymus*. Приведен анализ вклада Н.С. Турчанинова, К.И. Максимовича, Ф.Б. Шмидта, В.А. Комарова, Т. Накаи, Я.И. Проханова, А.И. Толмачева, Б.А. Шукободского, Т.Г. Леоновой, Н.Н. Цвелевой, С.К. Черепанова, В.А. Недоизяк и В.А. Вялых в формирование современной таксономической концепции рода *Euonymus*. Освещены нерешенные вопросы биологии дальневосточных видов, намечены пути их решения.

**Ключевые слова:** история ботанических исследований, российский Дальний Восток, Китай, Корея, Япония, *Euonymus*.
Table 1. The main stages in studying *Euonymus* of the Russian Far East and neighboring countries. For herbaria acronyms author follows Thiers (continuously updated).

| Stages of research       | Main researchers (* = main collectors), their life dates, places of birth | Collection years and regions, herbaria acronyms | Described species and other taxa                                                                 | Total number of *Euonymus* spp., described / Russian Far East species / new spp. | Publications and notes                                                                 |
|--------------------------|--------------------------------------------------------------------------|------------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Beginning                | C.P. Thunberg (1743–1828), Jönköping, Sweden                              | 1775–1776, Japan, UPS                           | *Euonymus japonicus* Thunb., *E. inobita* Thunb., *Gleasoniana alata* (Thunb.) Siebold         | 3/1/1                                                                            | *Flora of Japan* (Thunberg 1780, 1784)                                               |
|                          | P.F. von Siebold (1796–1866), Würzburg, Germany                          | 1823–1829, Japan, LE                            | *Euonymus* ssp. **floristic and others** Manchuria                                           |                                                                                  | *Flora Japonica* (Siegbold 1835)                                                     |
|                          | R.K. Maack* (1825–1886), A(hrensburg-Kuressaare), Russia                 | 1855, Amur, LE; 1889, Ussuri, LE                | **Maack** 1859, Regel 1862, in Russian. Collections were prepared by Ruprecht (1857), Regel (1864) and Maximowicz |                                                                                  |                                                                                       |
|                          | C.J. Blume (1796–1862), Braunschweig, Germany                            | 1822–1826, L                                    | *E. sieboldianus* Blume, *E. subtriflorus* Blume (= *E. alatus* (Thunb.) Siebold), *E. thunbergianus* Blume (= *E. alatus* (Thunb.) Siebold) | 5/3/3                                                                            | 1827                                                                                 |
|                          | C. Ledebour (1785–1851), Stralsund, Germany                              | 1826, 1829–1831, LE                            |                                                                                               |                                                                                  | *Flora Rossica* (Ledebour 1841–1842); only European and Crimian-Caucasian species (with a note about the collection of *E. verrucosus* – also from "Sibiria Uralensi", coll. Lessing) |
|                          | N.S. Turczaninow (1796–1863), Nikolitovka, Russia                       | KW, LE                                         | *Genus Melanocarya* Turez., (now as the section *Melanocarya* Turez.) Nakai in *Euonymus*)   |                                                                                  | 1858                                                                                 |
|                          | F.J. Ruprecht (1814–1870), Freiburg im Breisgau, Germany               | LE                                             | *E. maackii* Rupr., *E. macropteris* Rupr.                                                    | 2/2/2                                                                            | *Die ersten botanischen Nachrichten über das Amurland*, 1857                        |
|                          | F.B. Schmidt* (1832–1908), Kaisma, Russia                               | 1859–1862, Amur, Sakhalin, LE                  | *E. latifolia var. sachalinensis* F. Schmidt                                                    | 4/4/1                                                                            | *Sakhalinskaya flora* (Schmidt, 1874b, in Russian; Dutch ed. – 1868)                 |
|                          | C.J. Maximowicz* (1827–1891), Tula, Russia                              | 1854–1857, Amur, Ussur, LE; 1860–1864, Japan, LE | *E. paniculata* Maxim., *E. sachalinensis* (F. Schmidt) Maxim.; *E. assurensis* Maxim.         | 17/6/3                                                                           | *Primitiae floriae amurenensis* (Maximowicz 1859, in Latin); *Diagnoses plantarum novarum asiaticarum* (Maximowicz 1881, 1882, in Latin); from territories, adjacent to Russia, such species as *E. bungeana* Maxim., *E. nipponica* Maxim., *E. przewalskii* Maxim., *E. ichinokana* Maxim. |
|                          | Central Asia, coll. N.M. Przewalskii (1839–1888), prepared by Maximowicz, LE |                                               |                                                                                               |                                                                                  | *Flora Tangutica* (Maximowicz 1889, in Latin). Based on materials provided by C.J. Maximowicz, other authors have described a few more species |
| "Flora of Manchuria" and others floristic works | V.L. Komarov* (1869–1945), St. Petersburg, Russia                        | 1895–1897, Amur, South-Ussuri Territory, Manchuria, North Korea, LE, LEICB                  | *E. hamiltoniana* Wall. in Roxb. var. *maackii* (Rupr.) Kom.; *E. hamiltoniana* Wall. in Roxb. var. *sieboldianus* (Blume) Kom. | 6/5/0                                                                            | *Flora of Manchuria* (Komarov 1904, in Russian); *Introduction to the floras of Mongolia and China* (Komarov 1908, in Russian): 50 000 specimens and about 6 000 species from China, Korea, Japan, Mongolia and Tibet (the family Celastraceae ranks 25th with its 9 genera and 84 species) |
|                          | A.N. Krishtofovich (1885–1953), Krishtofovka, Russia                   | 1914, 1917, Amur, Sakhalin, LE                  |                                                                                               | 7/5/0                                                                            | Krishtofovich 1914, in Russian                                                                 |
| "Die Naturlischen Pflanzen­familien" | Ludwig Eduard Theodor Loesener (1865–1941), Germany                 | B                                              |                                                                                               |                                                                                  | 1st ed. – 1896, 2nd ed. – 1942; 36 species out of 60 known at that time; in the second edition – 96 species out of 170; original system of the genus, with 11 sections, which was criticized by many subsequent authors (for a review see: Blakelock 1951) |
History of study of the Far Eastern species of Euonymus

As the new data on the polymorphism and species diversity within Euonymus have been accumulated, from time to time there came a temptation to split some species into several independent ones, rejecting the broad Linnean interpretation. However, the entire history of taxonomic studies of the genus clearly demonstrates the importance of its broad treatment (Savinov & Baikov 2007).

Far Eastern species of Euonymus as treated by Chinese taxonomic school

Out of the earlier works, the paper by Wang Chen-Hwa (1936) must be mentioned. It is of a huge interest because China is one of the main centers of species diversity for Euonymus. Wang cited diagnoses and keys for identification of 35 Euonymus species. The author also provided the
data on distribution, herbarium specimens examined and possible relationships between certain species.

For the current "Flora of China", the authors (Ma 2001, Ma & Funston 2008) accepted 5 sections of the genus *Euonymus* (Unabundantes Rouy et Foucaud, Echinocercus Nakai, Melian- carya (Turcz.) Nakai, Ibioida Nakai, *Euonymus*) and 90 species (50 of which are endemic). Unfortunately, many species from the Russian Far East territory are reduced to synonyms of closely related Chinese species there (among them there are *E. planipes, E. maximowiczianus, E. × miniatus, E. sauroanthus, E. sieboldiana, E. pumilio*). This by no means can be considered a good solution, because, apart from clearly separated ranges, these species have solid morphological distinctions.

**Far Eastern species of *Euonymus* as treated by Korean taxonomic school**

In a series of works by Kim & Kim (1994a-c), Kim et al. (1997) a complex approach to investigating the species diversity of *Euonymus* from the Korean Peninsula was introduced. It involves the analysis of morphological and anatomical features of vegetative and reproductive organs (the shape of stem and buds, leaf morphology: the shape of leaf blade, edge and top, petiole and leaf blade anatomy, structure of flowers, inflorescences and capsules), numerical analysis of 60 characters, for 16 taxa (9 species, 4 varieties and 3 forms). Our knowledge on *Euonymus* for Korean Peninsula was enriched with the new treatment by Ka (2006) for the "New flora of Korea" that includes 19 (!) species, subspecies, varieties and forms of *Euonymus* found on the peninsula, some of them being the same as in Russia.

**Far Eastern species of *Euonymus* as treated by Japanese taxonomic school**

Takenoshin Nakai (1882–1952) is one of the most prominent Japanese botanists, who studied not only floras of Korea and Japan, but also authored some critical monographic treatments of the genus *Euonymus* (Nakai 1934, 1943). In his first paper, 36 *Euonymus* species from Eastern Asia are investigated and subdivided into a number of sections; in the other work (Nakai 1943) he subdivided the genus *Euonymus* into 6 subgenera, also describing 3 sections; in the other work (Nakai 1943) he subdivided the genus *Euonymus* into 6 subgenera, also describing 3 sections; in the other work (Nakai 1943) he subdivided the genus *Euonymus* into 6 subgenera, also describing 3 sections; in the other work (Nakai 1943) he subdivided the genus *Euonymus* into 6 subgenera, also describing 3 sections; in the other work (Nakai 1943) he subdivided the genus *Euonymus* into 6 subgenera, also describing 3 sections; in the other work (Nakai 1943) he subdivided the genus *Euonymus* into 6 subgenera, also describing 3 sections; in the other work (Nakai 1943) he subdivided the genus *Euonymus* into 6 subgenera, also describing 3 sections; in the other work (Nakai 1943) he subdivided the genus *Euonymus* into 6 subgenera, also describing 3 sections; in the other work (Nakai 1943) he subdivided the genus *Euonymus* into 6 subgenera, also describing 3 sections.

Japanese botanists (Sugawara 1940, Tatewaki 1957) contributed to the study of *Euonymus* diversity in Sakhalin and the southern Kuril islands.

In "Flora of Japan", Ohwi (1984, English edition, Japan – 1965) listed 15 species of *Euonymus* (some of them including varieties and forms), 6 of the presented species were common in Japan and Russia, – *E. alatus, E. sieboldiana, E. macropterus, E. aciphyllus, E. planipes, E. tricarpus = E. sachalinensis. Recent taxonomical treatments suggest that *E. maximowiczianus* Prokh. occurs not only in south of Primorye Territory (Russian Far East), but also in the neighboring parts of northeast China and North Korea (in the latter case it mistakenly considered as *E. sachalinensis* (F. Schmidt) Maxim., incl. *E. planipes* (Koehne) Koehne). *E. sachalinensis* (F. Schmidt) Maxim. and *E. × miniatus* Tolm. occurs in northern Japan (both species are considered to be *E. tricarpus* by Japanese authors).

The following issues of biology of the Far Eastern *Euonymus* species of the can be considered unresolved or under-investigated: 1) phenology and rhythms of seasonal development in all species; 2) details of ecology and distribution of separate species, in particular, vicarious (e.g., *Euonymus alatus* and *E. sauroanthus*); 3) life form morphogenesis taking into account its polyvariety for all Far Eastern species according to the approach by Bezdelev & Bezdeleva (2006); 4) taxonomic status of some species in the neighboring countries (Russia, DPRK and Republic of Korea, China and Japan).

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