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Syrphid flies (*Diptera*, *Syrphidae*) from North Korea collected by Polish expeditions. Part II (*Syrphinae*)

Abstract: The present paper is a continuation of an earlier paper concerned with the *Syrphidae* collected by Polish expeditions to North Korea and is specifically concerned with the second part of the collections – the subfamily *Syrphinae*. 28 species representing 16 genera were identified in the material. The results of a zoogeographical analysis of the *Syrphidae* material are also presented alongside species composition similarity comparisons between the fauna of Korea with the adjacent regions of Sakhalin and the Kuril Islands and the Primorye region.

Key words: *Syrphidae*, *Diptera*, North Korea

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INTRODUCTION

The first part of this paper (BAŃKOWSKA 1998) was concerned with those collected *Syrphidae* belonging to two subfamilies: *Milesiinae* and *Microdontiinae*. 37 species were identified and most of them had been previously unknown from the territory of Korea. A few of these species are very rarely recorded and some, such as *Spilomyia panfilovi* ZIMINA, had only been known from the original descriptions. The first part also contains a discussion the present state of knowledge of the *Syrphidae* fauna of the Far East and an exhaustive list of relevant papers concerned with this region.

The present paper is devoted to *Syrphidae* species belonging to the subfamily *Syrphinae*, thus completing the analysis of material collected by Polish expeditions in North Korea. 28 species belonging to 16 genera were classified as belonging to the subfamily *Syrphinae*. Species rarely recorded at these latitudes include *Sphaerophoria viridaenea* BRUN. and *Paragus politus* (WIED.) and *Chrysotoxum asiaticum* BECK.

In order to more fully describe the *Syrphidae* fauna inhabiting the northern part of the Korean peninsula, a zoogeographical analysis was performed, taking into account also earlier papers concerned with regions adjacent to Korea (Table I). Those selected papers included a rather comprehensive work by VILOVITSH (1960) on *Syrphidae* of Sakhalin and the Kuril Islands and another paper, on an area sharing a border with North Korea – the Kiedrovaya Pad reserve in the southern part of the Primorye Region in Russia (ZIMINA 1972).

These papers served also as a basis for a study of the similarity of the species composition of *Syrphidae* in the regions under discussion (Table II). That analysis used a similarity coefficient known as the Soerensen index (So).

SPECIES COMPOSITION

Subfamily: SYRPHINAE

Tribe: *Syrphini*

Allograpta OSTEN SACKEN, 1875

1. *Allograpta javana* (WIEDEMANN, 1824)

Material examined: Korea: N Hamgyong prov., Kyongsong, Onpo-ri, 10.09.1966, 1 male; S Hangyong prov., Hamhung, 13–15.09.1966, 4 male, 1 female.

Distribution: South East Asia, Oriental Region, New Guinea, Australia, Solomon Is, Hawaii, Fijii. Known also from Primorye reg.

Asarkina MACQUART, 1842

2. *Asarkina porcina* (COQUILLET, 1898)

Material examined: Korea: N Hwanghae prov., Kaesong-City, Canyon of Puyon-Falls, 30.06.1990, 1 male.

Distribution: Transbaikal and Amur reg. Primorye, China, Taiwan and Oriental Region.

Betasyrphus MATSUMURA, 1917

3. *Betasyrphus serarius* (WIEDEMANN, 1830)

Material examined: Korea: S Pyongan prov., Pyongyang, 23.05.1965, 1 female, Daebong near Pyongyang, 7.06.1990, 1 female.

Distribution: Far East of Russia (Khabarovsk, Primorye, Sakhalin, Kuril Is), China, Japan, Taiwan, Oriental Region, New Guinea, Australia. Also known from Korea (SHIRAKI 1953).

Dasysyrphus ENDERLEIN, 1938

4. *Dasysyrphus bilineatus* (MATSUMURA, 1917)

Material examined: Korea: Kangwon prov., Kungang Mts, Onjong-ri, 22.06.1990, 1 male.

Distribution: Khabarovsk, Primorye, Sakhalin, Kuril Is, Korea, Japan (Hokkaido), and Oriental Region.

5. *Dasysyrphus tricinctus* (FALLÉN, 1817)

Material examined: Korea: Kangwon prov., Kumgang Mts, Onjong-ri, 23.06.1990, 1 male.

Distribution: Palaearctic Region. Known from Japan, Kamchatka, Sakhalin and Kunashir.

6. *Dasysyrphus venustus* (MEIGEN, 1822)

Material examined: Korea: S Pyongan prov., Myohyang Mts, near Kungan-Kave, 12.06.1990, 1 male.

Distribution: Palaearctic and Nearctic Regions. Known from Primorye, Kamchatka and Sakhalin.

Didea MACQUART, 18347. *Didea fasciata* MACQUART, 1834

Material examined: Korea: S Pyongan prov., Daebong near Pyongyang, 7.06.1990, 1 male; Kangwon prov., Kumgang Mts, Onjong-ri, 23.06.1990, 1 male.

Distribution: Palaearctic and Oriental Regions. Mentioned from Primorye, Kamchatka, Kunashir and Japan (Hokkaido and Honshu).

Epistrophe WALKER, 18528. *Epistrophe ochrostoma* (ZETTERSTEDT, 1849)

Material examined: Korea: S Pyongan prov., Myohyang Mts, near Kungan Cave, 10.06.1990, 1 female.

Distribution: Holarctic Region. Known from Siberia and Bajkal reg.

Episyrphus MATSUMURA et ADACHI, 19179. *Episyrphus balteatus* (DE GEER, 1776)

Material examined: Korea: N Hamgyong prov., Chongjijin, 4.09.1970, 2 males, 15.06.1990, 1 female, Deaso-ri, 15–16.06.1990, 2 males, 2 females, Kyongsong County, Sangonpo-ri, 17.06.1990, 1 female, Onpo-ri, 3.06.1965, 1 female; S Hamgyong prov., Oro near Hamhung, 15.09.1960, 1 female; S Pyongan prov., Myohyang Mts., near Kungan Cave, 9–10.06.1990, 5 males, 6 females, Myohyangsan, 11.06.1990, 5 males, 4 females, Pyongyang, Taesongsan Park, 19.09.1966, 4 males, 2 females, 6.06.1990, 6 males, Michon Lake near Pyongyang, 31.08.1987, 3 males, 1 female. Ryongack Mts., Daebong, 24.05.1965, 1 female, 7.06.1990, 2 males, Tomb of King Tongman, 27.06.1990, 1 female; Kangwon prov., Kumgang Mts., Onjong-ri, 22–25.06.1990, 39 males, 26 females; N Hwanghae prov., near Kaesong, 27.08.1966, 1 male, Canyon of Puyon-Falls, 13.08.1987, 1 female; S Hwanghae prov., Haegu, 8.09.1987, 1 male.

Distribution: Cosmopolitan species, widely distributed. Mentioned from Korea (VIOLOVITSH 1960).

Ischyrosyrphus BIGOT, 188210. *Ischyrosyrphus glaucius* (LINNAEUS, 1758)

Material examined: Korea: N Hamgyong prov., Kyongsong, Onpo-ri, 10.09.1966, 1 female.

Distribution: Palaearctic Region. Known from Sakhalin, Kamchatka, Kunashir (VIOLOVITSH 1960) and Japan.

Eupeodes OSTEN-SACKEN, 1977

11. *Eupeodes corollae* (FABRICIUS, 1794)

Material examined: Korea: N Hamgyong prov., Musang-ri 60 km N at Chongjin, 2.06.1965, 1 female; S Hamgyong prov., Hamhung, 11.06.1965, 1 female; S Pyongan prov., Pyongyang, 23.05–7.06.1965, 2 females; Kangwon prov., Kumgang Mts, Onjong-ri, 22–23.06.1990, 5 males, 3 females.

Distribution: Palaearctic and Oriental Regions. Widely distributed species in Far East: Sakhalin, Kamchatka, Kuril Is and Korea (VIOLOVITSH 1960).

12. *Eupeodes nitens* (ZETTERSTEDT, 1843)

Material examined: Korea: S Hamgyong prov., Oro near Hamhung, 15.09.1966, 1 female; S Pyongan prov., Myohyang Mts, near Kungan-Cave, 10.06.1990, 1 male, Pyongyang, 23–24.05.1965, 3 females, Vsan-ri near Nampho, 28.05.1965, 1 male, Daebong at Pyongyang, 7.06.1990, 1 female; Kangwon prov., Kumgang Mts, Onjong-ri, 22.06.1990, 3 males.

Distribution: Holarctic Region. Known in Japan and Primorye. Also mentioned from Korea (SHIRAKI 1953).

Syrphus FABRICIUS, 1775

13. *Syrphus ribesii* (LINNAEUS, 1758)

Material examined: Korea: Kangwon prov., Kumgang Mts, Onjong-ri, 22–23.06.1990, 5 males, 4 females.

Distribution: Holarctic Region. Widely distributed in Far East (Kamchatka, Kuril Is, Japan, Primorye).

14. *Syrphus torvus* OSTEN-SACKEN, 1875

Material examined: Korea: N Hamgyong prov., Chongjin, 15–16.06.1990, 2 males; S Pyongan prov., Myohyang Mts, near Kungan-Cave, 10.06.1990, 1 female; Kangwon prov., Kumgang Mts, Onjong-ri, 23.06.1990, 2 males.

Distribution: Holarctic and Oriental Regions. Known in China, Primorye and Japan.

15. *Syrphus vitripennis* MEIGEN, 1852

Material examined: Korea: Kangwon prov., Kumgang Mts, Okryn Valley, 23.06.1990, 3 females.

Distribution: Holarctic and Oriental Regions. Known in Primorye, Kamchatka, Sakhalin, Korea (VIOLOVITSH 1960), China and Japan.

Sphaerophoria LE PELETIER et SERVILLE, 1828

16. *Sphaerophoria indiana* BIGOT, 1884

Material examined: Korea: N Hamgyong prov., Chongjin, 15.06.1990, 3 males, 2 females, Musan-ri, 60 km N at Chongjin, 2.06.1965, 3 males, 1 female, Kyongsong, Sangonpo-ri, 17.06.1990, 3 males, 1 female; S Hamgyong prov., 15 km SW at Hamhyng, 25.09.1970, 1 female; S Pyongan prov., Myohyang

Mts, Myohyangsan, 11–15.06.1990, 4 males, 1 female; N Kwanghae prov., Kaesong, 26.06.1990, 2 males, Canyon of Puyon-Falls near Kaesong, 30.06.1990, 2 males, 3 females; Kangwon prov., Kungang Mts, Onjong-ri, 22.06.1990, 2 males.

Distribution: Oriental Region. Known from India, Ceylon, Afghanistan, Mongolia, Far East of Russia, China, Japan. Mentioned from Korea (BAŃKOWSKA 1964).

17. *Sphaerophoria macrogaster* (THOMSON, 1869)

Material examined: Korea: N Hamgyong prov., Chongjin, 10.09.1970, 8 males, 14 females, 15.06.1990, 4 males, 2 females, Kyongsong, Sangonpo-ri, 17.06.1990, 2 males, 1 female, Onpo-ri, 6.09.1970, 3 females, Musan-rjong 60 km N at Chongjin, 2.06.1965, 1 female; S Hamgyong prov., Macon at Hamhung, 26.09.1970, 1 male, 3 females, Dongsan-ri near Hamhung, 13–14.09.1966, 2 females; S Pyongan prov., Myohyang Mts, Myohyangsan, 9–12.06.1990, 7 males, 1 female, Hyangsan Valley, 22.08.1987, 2 males, 2 females, Pyongyang, 19.09.1966, 1 male, 1 female, Taesong Mts. near Michon Lake, 31.08.1987, 2 males, 2 females, Mangyongdae, 31.08.1970, 2 males, 3 females, Tomb of King Tongman near Pyongyang, 20.06.1990, 2 females; Kangwon prov., Wonsan, 31.08.1966, 1 female, 20.09.1970, 2 males, 1 female, Munchon near Wonsan, 19.07.1970, 1 female, Chonsong-ri near Wonsan, 3.09.1966, 3 males, 2 females, Kungang Mts, Okryn Valley, 22.06.1990, 1 male, Kungansan, 27.06.1990, 2 males; N Kwanghae prov., Kaesong, 12.08.1987, 1 female, 28.06.1990, 6 males, 3 females, Koryo Museum near Kaesong, 29–30.06.1990, 3 males, 4 females; S Kwanghae prov., Haeju, 8.08.1987, 1 male, 2 females, 15 km W of Haeju, 9.08.1987, 1 male, 3 females.

Distribution: Oriental Region, Australia, New Guinea, New Caledonia, Asia: China, Korea, Japan, Mongolia, Far East of Russia.

18. *Sphaerophoria rueppelli* (WIEDEMANN, 1830)

Material examined: Korea: N Hamgyong prov., Chongjin, 4–10.09.1970, 1 male, 1 female; S Pyongan prov., Pyongyang, Hortus Moran, 19.05.1965, 1 male, Mangyongdae, 31.08.1970, 2 males, 1 female, Myohyang Mts, near Kungan Cave, 22.08.1987, 1 female, 11.06.1990, 1 male; N Kwanghae prov., Kaesong, Canyon of Puyon-Falls, 28–29.06.1990, 5 males, 3 females.

Distribution: Palaearctic Region. Known from Korea (BAŃKOWSKA 1964).

19. *Sphaerophoria viridaenea* BRUNETTI, 1915

Material examined: Korea: S Pyongan prov., Myohyang Mts, near Kungan Cave, 10.06.1990, 1 male.

Distribution: India, Afghanistan, Mongolia, China, Far East of Russia, Taiwan; Oriental Region. Rare species, mentioned from Korea (BAŃKOWSKA 1964).

Tribe: *Bacchini*

Baccha FABRICIUS, 1775

20. *Baccha maculata* WALKER, 1852

Material examined: Korea: N Hamgyong prov., Chongjin, 16.06.1990, 1 female.

Distribution: Oriental Region and East Asia: Sakhalin, Primorye and Japan. Known from Korea (SHIRAKI 1953).

Tribe: *Chrysotoxini*

Chrysotoxum MEIGEN, 1803

21. *Chrysotoxum asiaticum* BECKER, 1921

Material examined: Korea: Kangwon prov., Kumgang Mts, Onjong-ri, 22.06.1990, 1 female.

Distribution: Siberia, Mongolia, China and Japan.

Tribe: *Melanostomatini*

Melanostoma SCHINER, 1860

22. *Melanostoma mellinum* (LINNAEUS, 1758)

Material examined: Korea: N Hamgyong prov., Chongjin, 9–10.10.1970, 2 males, 1 female, 15.06.1990, 2 males, Onpo-ri, 6.09.1970, 1 female, Suncheon, 27.05.1965, 1 female, Kyongsong, Sangonpo-ri, 17.06.1990, 1 male, 1 female; S Pyongan prov., Pyongyang, 19.05.1965, 3 females, Myohyang Mts, near Kungan Cave, 10.06.1990, 1 male; Kangwon prov., Wonsan, 20.09.1970, 1 female, Munchon 12 km NW at Wonsan, 19.09.1970, 2 females, Chonsan-ri 10 km S at Wonsan, 3.09.1966, 1 male, Kumgang Mts, Onjong-ri, 22.06.1990, 3 males, 6 females; N Hwanghae prov., Tomb of King Kongmin, 27.06.1990, 1 male.

Distribution: common species. Palaearctic and Nearctic Regions. Known from Primorye and Sakhalin.

Platycheirus LE PELETIER et SERVILLE, 1828

23. *Platycheirus albimanus* (FABRICIUS, 1721)

Material examined: Korea: Kangwon prov., Kumgang Mts, Onjong-ri, 23.06.1990, 1 male.

Distribution: Holarctic and Oriental Regions. Common in Far East of Russia: Kamchatka, Sakhalin and Kuril Is.

Tribe: *Paragini*

Paragus LATREILLE, 1804

24. *Paragus albifrons* (FALLÉN, 1817)

Material examined: Korea: S Hamgyong prov., Cojang near Hamhung, 25.09.1970, 1 male, Macon near Hamhung, 26.09.1970, 1 male; S Pyongan prov., Myohyang Mts, 8.08.1959, 1 female, Dephun near Kangdong, 5.09.1959, 2 males, 4 females, Pyongyang, 12.09.1959, 2 females, Junha-ri 40 km W at Pyongyang, 13.09.1970, 1 male, Suncheon, 27.05.1965, 1 male.

Distribution: Palaearctic Region. Known from Primorye (PECK 1988).

25. *Paragus bicolor* (FABRICIUS, 1794)

Material examined: Korea: S Pyongan prov., Dephun at Kangdong, 6.09.1959, 1 male.

Distribution: Holarctic Region. Known from Far East of Russia (VIOLOVITSH 1983).

26. *Paragus haemorrhoeus* MEIGEN, 1822

Material examined: Korea: Kangwon prov., Kumgang Mts, Onjong-ri, 28.08.1987, 1 male, 1 female.

Distribution: Holarctic and Afrotropical Regions. Mentioned from Korea (SHIRAKI, 1930).

27. *Paragus politus* WIEDEMANN, 1830

Material examined: Korea: S Pyongan prov., Myohyang Mts, 19.06.1965, 1 male; Kangwon prov., Kumgang Mts, Onjong-ri, 22.06.1990, 1 female; N Hwanghae prov., Kaesong, Puyon-Falls, 1 male.

Distribution: East Asia and Oriental Region. Known from China and Japan.

28. *Paragus tibialis* (FALLÉN, 1817)

Material examined: Korea: S Pyongan prov., Myohyang Mts, 9.08.1959, 2 males, 16.06.1965, 2 females, Pyongyang, Taesong Park, 13.09.1959, 1 male, 6.06.1990, 1 female, Maram near Pyongyang, 21-30.07.1959, 1 male, 2 females, Dephun at Kungdong, 5.09.1959, 2 males, 1 female; Kangwon prov., Chonnae, 10.06.1965, 1 female, Wonsan, 3.09.1966, 1 male, Sijung-ho 45 km S at Wonsan, 18.09.1970, 1 male; N Hwanghae prov., Kaesong, Canyon at Puyon-Falls, 28.06.1990, 1 female.

Distribution: Palaearctic and Oriental Regions. Common species, known from Korea, China and Japan (VIOLOYTSH 1960).

ZOOGEOGRAPHICAL ANALYSIS

The entire *Syrphidae* material collected by Polish expeditions in North Korea contained 65 species belonging to 37 genera of this family of dipterans. This material is far from fully reflecting the fauna of the region under study, yet the list of species is the only more or less complete available catalogue of *Syrphidae* species found in this country. Other information about Korean species of *Syrphidae* is dispersed in papers mostly by Japanese and Russian dipterologists, covering altogether a dozen or so species.

The flora of the Korean Peninsula is very similar to that of Eastern Siberia, the Ussuri region, the Primorye region, the island Sakhalin and the Japanese Islands. There are mountainous areas with mixed forests while subtropical-type deciduous forests with relics of stenothermal vegetation are preserved at lower altitudes.

Therefore the syrphid fauna of the northern part of the Korean Peninsula is characterized by a wide species variety and represents a blend of northern and southern elements. Typical boreal species are found alongside representatives of genera associated with the tropical forest zone, such as *Allograpta javana* (WIED.) or *Asarkina porcina* (COQ.). The genus *Asarkina* MACQ. consists

of 14 species whose geographical ranges are restricted to the central and southern part of the African continent and south-east Asia, Indonesia, and further south to northern Australia (VOCKEROTH 1969).

Such a diversification of the fauna in this region is the result of environmental changes in the Tertiary that occurred on the Asian continent. The ice cap covered a considerable part of the continent, including nearly the whole of Siberia, while south-east Asia (the Ussuri region, north-east China-Manchuria and the Korean Peninsula) was not affected. This may account for the large proportion of tropical species in the syrphid fauna of Korea. Despite the cooling of the climate these species have survived in these areas until the present time, sheltering in river valleys with subtropical vegetation (VIOLOVITSH 1960). Apart from the two species representing tropical fauna mentioned above, species from many other genera belong here, including *Baccha maculata* WALK., *Betasyrphus serarius* (WIED.), *Dasysyrphus bilineatus* (MATS.), *Sphaerophoria indiana* (BIG.), *Sph. macrogaster* (THOMS.), *Sph. viridaenea* BRUN., *Paragus politus* WIED., *Eristalis cerealis* FABR., *Lathyrrophthalmus tarsalis* (MACQ.), *Phytomia zonata* (FABR.), *Xylota coquilletti* H.-B. or *Microdon simplex* SHIR.

Another quite numerous group of species that can be distinguished in the syrphid fauna of Korea is associated with the mixed and deciduous forest zone and has been referred to as the Manchurian species. These species have quite wide geographical ranges, occurring in north-east China, the Ussuri region, the Primorye region and Korea. Some species have reached Japan, Sakhalin and the Kuril Islands and some reach Trans-Baikal and Mongolia. VIOLOVITSH (1960) has reported a decreasing number of species and abundance from north to south, which seems to indicate that Manchuria is a dispersal centre for these species.

In the Korean fauna, the Manchurian species group is represented by such species as *Rhingia laevigata* LW., *Volucella inanoides* H.-B., *Orthonevra kurumaiensis* MATS., *Eumerus japonicus* MATS., *Lathyrrophthalmus viridis* (COG.), *Helophilus sapporensis* MATS., *Mallota bicolor* SACK., *Blera japonica* (SHIR.), *Spilomyia panfilovi* ZIM., *Chalcosyrphus sapporoensis* (SHIR.), *Xylota frontalis* (SHIR. et EDAS.) and *Microdon auricomus* COG.

Russian researchers speak of yet another group, called "island" species, most of which are endemic and known also under the name of the south-Okhotsk complex. These species have diversified from continental species during a long period of isolation and now they form a large and homogeneous group. They occur in Sakhalin, the southern part of the Kuril islands and the northernmost Japanese island of Hokkaido. According to VIOLOVITSH (1960) there are 52 *Syrphidae* species in this group. In the North Korean material only 2 south-Okhotsk species have been found, namely, *Sphegina melancholica* STACK. and *Asiosphegina nitidifrons* STACK.

There is also one more separate group of species in the Asian continent, known as the East Siberian species. They are associated with the biome of coniferous forests of East Siberia and Trans-Baikal. They are widely distributed, from the Kamchatka and Sakhalin to the Altai Mts. in Western Siberia

and Mongolia, and in the south they reach Korea and the island of Honsiu (STACKELBERG 1953). Examples include *Xylota amurensis* STACK. or *X. japonica* SHIR. Among the species from Korea, *Chrysotoxum asiaticum* BECK. and *Volucella pellucens tabanoides* MOTSCH. were included in this group. One more species belonging to this group, *Cynorrhina nitens* STACK., has been reported from the territory of Korea (VIOLOVITSH 1960).

The most numerous group consists of wide-range species which inhabit mixed forests in Eurasia and possess remarkable environmental resilience, enabling them to settle in a variety of habitats. They represent the Palaearctic element. 18 species in the study material were considered to belong to this group.

Species belonging to the Holarctic element, and occurring in North America as well as in Eurasia, constitute a slightly smaller group in the study material. These species are associated with the taiga forests. The emergence of the "Beringian" complex took place at a time when there was a broad connection between the two continents. 10 Holarctic species have been identified in the study material.

Identified in the material were also 5 cosmopolities species, found in nearly all continents and climatic zones. These species possess outstanding ecological resilience and are often chemisynanthropic, introduced into new areas accidentally by man, such as *Episyrphus balteatus* (DEG.) or *Eristalis tenax* (L.).

The proportions of the different chorological elements in three areas with similar climate and vegetation profiles have been compared in table I. The present list of Korean species was used alongside earlier papers on these dipterans in the Far East. The two "comparator" areas were the southern part of the Primorye region, bordering on Korea, with data derived from ZIMINA (1972) – a study of *Syrphidae* inhabiting the Kiedrovaya Pad reserve that found 72 species, and Sakhalin and the Kurils, described in VIOLOVITSH (1960) with 185 species of syrphid flies collected during his 8-year work.

Table 1. Percentage contributions of the chorological elements in the syrphid fauna of three regions in the Far East

Zoogeographical element	North Korea	South Primorye	Sakhalin and Kuril Is
Cosmopolitan	7.5	5.5	3
Holarctic	15.5	18	15
Palaearctic	28	30.5	33
East-Siberian	3	3	5
Manchurian	18.5	32	12
South-Okhotskian	3	1	28
Indo-Malayan	24.5	10	4

The zoogeographical analysis of the syrphid fauna of these three regions (Table I) indicates small differences in percentage contributions of wide-range species (Cosmopolitan, Holarctic and Palaearctic). The Manchurian element is most abundant in the Primorye region, and least abundant in the Kuril Islands

and Sakhalin. There are significant differences in the case of the South-Okhotsk species, which hardly migrate to the continent and so form a completely isolated group. The species representing the tropical Indo-Malayan element are also distributed rather unevenly, offering highest percentage distribution to the fauna of Korea (24.5%), a much lower one to the Primorye region (10%) and with only 4% penetrating the islands in the Okhotsk Sea. This is undoubtedly the result of a particular geographical situation of these islands, located north of the Korean Peninsula, strong winds blowing nearly throughout the year, all of these resulting in worse climatic conditions that hamper the settlement of stenothermal forms.

Further analysis of the *Syrphidae* of the Korean Peninsula included a study of the similarity of species composition in the three regions of the Far East mentioned above (Table II).

Table II. Similarity of species composition of the Syrphid fauna in three regions: a – North Korea, b – South Primorye, c – Sakhalin and Kuril Islands (according to Soerensen index).

	a	b	c
a	100	38	23
b	38	100	35
c	23	35	100

The North Korean syrphid fauna bears little similarity (38%) to the fauna of South Primorye, as the contribution of the Manchurian complex of species is much lower in Korea while the contribution of Indo-Malayan species increases by more than a half. The syrphid fauna of Sakhalin and the Kurils is still less similar to the Korean fauna (23%) as in the former region there are hardly any stenothermal, Indo-Malayan species associated with tropical and subtropical forests. A relatively small number of continental (Manchurian) species migrate to the islands, while the presence of endemic fauna (the South-Okhotsk complex) accounts for a special character of the syrphid fauna inhabiting these islands.

Due to our currently poor knowledge of the syrphid fauna or large areas in the Asian continent, and particularly China and central Asia, it is difficult at present to delineate the real ranges for many species. The species of *Syrphidae* classified as the Manchurian complex pose particular difficulties, especially the southern and western limits of their ranges. It is difficult to predict whether new faunistic data on Asia will show that the South-Okhotsk complex, hitherto regarded as hermetic, is actually much more broadly distributed in the Far East.

Present data show that the syrphid fauna of the northern part of Korea is formed by a blend of northern elements, representing the biome of taiga and mixed forests, and southern, Indo-Malayan elements migrating from the forest of the tropical and subtropical zones. The Korean Peninsula is considered by many researchers to have been an important refuge for forest fauna in the glaciation era, with many species migrating therefrom into the north and west of the Eurasian continent as the climate grew warmer.

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