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The diving beetles of Kamchatka, with additional records from Sakhalin and the Kuril Islands

(Coleoptera: Dytiscidae)

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Summary

The dytiscid fauna of the north-east Asian peninsula Kamchatka is reviewed based on literature records and more recent collections. The following ten species are here reported from Kamchatka for the first time: *Hygrotus marklini* (GYLLENHAL), *Hydroporus notabilis* LECONTE, *H. submuticus* THOMSON, *H. tristis* (PAYKULL), *H. uenoi* NAKANE, *Oreodytes okulovi* LAFER, *Agabus balkei* FERY & NILSSON, *A. discolor* HARRIS, *Ilybius chishimanus* KÔNO, *Rhantus suturellus* (HARRIS), and *Graphoderus perplexus* SHARP. Altogether 38 species of Dytiscidae are now known from Kamchatka, and of these 22 have Holarctic distributions. *Graphoderus perplexus* is here reported for the Palearctic Region for the first time. Additional records are given for Sakhalin and the Kuril Islands. The following four species are here reported from Sakhalin for the first time: *Hydroporus nigellus* MANNERHEIM, *Agabus kholini* NILSSON, *Ilybius angustior* (GYLLENHAL), and *Acilius canaliculatus* (NICOLAI). The following ten species are here reported from the Kuril Islands for the first time: *Hydroporus nigellus*, *H. notabilis*, *H. submuticus*, *H. tristis*, *Agabus clypealis* (THOMSON), *A. confinis* (GYLLENHAL), *A. costulatus* (MOTSCHULSKY), *A. discolor*, *Ilybius discedens* SHARP, and *Colymbetes dahuricus* AUBÉ. Nine of the species were found in the North Kurils, whereas *H. tristis* was found in the South Kurils. With these additions, 39 species are now known from Sakhalin, and 36 from the Kuril Islands.

Zusammenfassung

Die Dytiscidenfauna der nordostasiatischen Halbinsel Kamtschatka wird auf der Grundlage von Literaturnachweisen und neueren Aufsammlungen zusammengestellt. Die folgenden zehn Arten werden erstmals für Kamtschatka nachgewiesen: *Hygrotus marklini* (GYLLENHAL), *Hydroporus notabilis* LECONTE, *H. submuticus* THOMSON, *H. tristis* (PAYKULL), *H. uenoi* NAKANE, *Oreodytes okulovi* LAFER, *Agabus balkei* FERY & NILSSON, *A. discolor* HARRIS, *Ilybius chishimanus* KÔNO, *Rhantus suturellus* (HARRIS), und *Graphoderus perplexus* SHARP. Insgesamt 38 Dytiscidenarten, davon 22 mit holarktischer Verbreitung, sind nun von Kamtschatka bekannt. *Graphoderus perplexus* wird erstmals aus der Paläarktis nachgewiesen. Weitere Nachweise werden für Sachalin und die Kurilen genannt. Die folgenden Arten sind Erstnachweise für Sachalin: *Hydroporus nigellus* MANNERHEIM, *Agabus kholini* NILSSON, *Ilybius angustior* (GYLLENHAL), und *Acilius canaliculatus* (NICOLAI). Zehn Arten werden erstmals für die Kurilen nachgewiesen: *Hydroporus nigellus*, *H. notabilis*, *H. submuticus*, *H. tristis*, *Agabus clypealis* (THOMSON), *A. confinis* (GYLLENHAL), *A. costulatus* (MOTSCHULSKY), *A. discolor*, *Ilybius discedens* SHARP, und *Colymbetes dahuricus* AUBÉ. Neun dieser Arten wurden auf den nördlichen, *H. tristis* dagegen auf den südlichen Kurilen gefunden. Damit sind jetzt von Sachalin 39 und von den Kurilen 36 Arten bekannt.

Acknowledgements

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Introduction

Kamchatka is the largest peninsula of north-east Asia. It covers a total area of about 370,000 km². In the north part, Kamchatka is connected with the continent by a narrow isthmus (~60°N, the so called Parapolsky Dol, about 100 km wide), and extended for about 1,200 km from NNE to SSW (~51°N, 156°40' E, Cape Lopatka). The south part of the peninsula is separated from the Shumshu Island (the northernmost island of the Kuriles) by the 12 km wide First Kurile Channel.

Kamchatka is characterized by its mountainous topography [about 3/4 of the peninsula is covered by mountain ridges that reaches elevations of 3000 to 3500 m a.s.l. (maximum 4750 m)] and the volcanic activity from the Palaeozoic up to the present time (much more intensively in past). Along the west coast is the Zapadnaya (West) Plain situated with its extensive marshlands. Small areas of lowlands with peatbogs are found on the east coast at the outlets of the rivers. In the central part of the peninsula occurs the intermontane Central-Kamchatka depression (extending from 53°10' N nearly to the coast of the Bering Sea) with the largest river of the peninsula (Kamchatka River).

The pronounced latitudinal extension, atmospheric phenomenons, varied topography, and the different temperature regimes of the surrounding seas create a variety of climatic conditions in Kamchatka. Generally, the west coast has a colder (and relative dry) climate than the east coast. Both coasts are under the influence of the monsoon circulation in the atmosphere. The central part of the peninsula has a sharply different climate relative to the coasts. It may be defined as continental (much warmer summer and colder winter).

Kamchatka has a very rich system of permanent rivers, small streams with very clear water from melting ice and snow on the mountains, lakes and hot springs. Large areas on the plains are covered by *Carex-Sphagnum* and *Carex-Lichen* bogs. The lakes in Kamchatka differ in their origin, i.e. affected by volcanic, tectonic, maritime, glaciation or other activities.

The flora and fauna of Kamchatka show many insular characteristics. The composition and distribution of the forest vegetation is affected by climatic patterns, volcanic activity and diversified landscape. Generally, this area comprises boreal vegetation. *Betula ermanii* CHAM. forms a park-like forest below 500 m a.s.l. with tall and subalpine herbs, or with subalpine krummholz (*Pinus pumila* (PALL.) RGL. and *Alnus kamchatica* (CALL.) KOM.). The forests are dominated on central Kamchatka by larch (*Larix dahurica* TURCZ.), spruce (*Picea ajanensis* FISCH.) and birch (*Betula platyphylla* SUKACS. and *B. ermanii*) and are distributed up to 1000 m a.s.l. The forest zone is spread toward the north at 58°N. The northernmost part of Kamchatka and a narrow belt along the west seashore is treeless moss and lichen tundra.

The following list is based on a combination of literature records and the examination of the specimens collected by S. K. KHOLIN in Kamchatka in 1997. The given additions to our earlier works on Sakhalin and the Kuril Islands (NILSSON & KHOLIN 1994, NILSSON et al. 1997) are based on the results of the 1996 and 1997 American-Japanese-Russian Kuril Expeditions plus S.K. KHOLIN's and YU. MARUSIK's 1995 and 1997 separate visits to these islands. This material is

deposited chiefly in the Fish Collection, University of Washington, Seattle, and the locality data are given below. Additional specimens were studied in the collections of a few museums. The list includes all species of Dytiscidae so far recorded from Kamchatka. For each species are listed the synonyms of special interest with references to all literature records from Kamchatka. Geographical distributions are outlined giving preference to the adjacent regions of NE Asia of which the dytiscid fauna has been revised, i.e. Primorye, Sakhalin, Hokkaido, and the Kurils.

Coding of localities

The Kamchatka localities visited by S. K. KHOLIN in 1997 are coded as:

- (1) Ganalskaya Tundra, artificial lakes with sparse marginal vegetation and sand-stone bottom, 30.vii;
- (2) dito, small residual pool with sand-stone bottom without any vegetation, 30.vii;
- (3) dito, temporary ponds with moss, 30.vii;
- (4) Nagorny, 6km NW of Petropavlovsk-Kamchatskiy, peat bog pool, 10.vii;
- (5) 18km S Elizovo, Bystraya River, residual pool in broadleaved forest 10.vii;
- (6) 12km S Elizovo, Tikhaya River, ponds with moss in bog, 9.vii;
- (7) 17 km NE of Malki, middle reaches of Poperechnaya River, spring pool with moss, 28.vii;
- (8) Foothills of volcanoes Vochkazhty, ponds, 2.viii;
- (9) dito, lake and pools with spring water and moss, 1.viii.

Localities from the 1996 and 1997 American-Japanese-Russian Kuril Expeditions are coded as the two-letter island code plus the original sample number. Note that more detailed information on these samples can be received from the authors; in this case the original sample codes should be referred to, i.e. two-character island code, two-digits year code, 2-3 character collector code, plus the sample number, e.g. IT-96-NM-10. These codes can be extracted from the information given below:

Iturup (IT): (6C) 4km E of Kitovyi, roadside puddle, 29.vii.97; (7) 4km E of Kitovyi, roadside puddle, 29.vii.97; (8) dito; (10) dito; (29) Dobroye Lake, shore & bogs, 23.viii.96; (72) Dobroye Nachalo Bay, shallow pond, 22.viii.96.

Kharimkotan (KH): (33) 2km inland Severgina Bay, pond, 8.viii.96; (35) 3km inland Severgina Bay, pond, 8.viii.96; (42) 0.2km inland Severgina Bay, small pond, 8.viii.96.

Kunashir (KU): (40) 17km W Yuzhno-Kurilsk, geothermal pool, 25.viii.96; (77) Aliger Lake, surrounding ponds, 26.viii.96.

Matua (MA): (56) 0.5km inland Aynu Bay, lake, 14.viii.96.

Makanrushi (MK): (70) inland of Zakat Bay, Spagnum in meadow depression, 18.viii.97; (76) 0.5km inland of Zakat Bay, pond, 18.viii.97; (79) 2km inland of Zakat Bay, pond, 18.viii.97; (81) 0.1km inland of Zakat Bay, pond, 18.viii.97.

Onkotan (ON): (14) 2km inland Nyemo Bay, small pond, 4.viii.96; (15) 2.5 km inland Nyemo Bay, 2 small ponds, 4.viii.1996; (16) 2.5 km inland Nyemo Bay, 2 small ponds, 4.viii.96; (17) 4km inland Nyemo Bay, large pond, 4.viii.96; (18) 4.2km inland Nyemo Bay, ponds, 4.viii.96; (26) 4km inland Mussel Bay, N of Resvyi River, stream, 7.viii.96; (28) 4km inland Mussel Bay, N of Resvyi River, pond, 7.viii.96; (29) 4km inland Mussel Bay, N of Resvyi River, ponds, 7.viii.96.

Paramushir (PA): (2) 0.2km N of Utyosnaya River, small pond, 1.viii.96; (4) 0.2km N of Utyosnaya River, small pond, 1.viii.96; (6) 0.1km N Utyosnaya River, large pond, 1.viii.96; (8) Utyosnaya River, 1.viii.96; (9NM) Vasiljeva Peninsula, small pond, 3.viii.96; (9PO) Vasiljeva Peninsula, large pond, 3.viii.96; (10) dito; (11) Vasiljeva Peninsula, 2 small ponds, 3.viii.96; (23) NE corner of island, Putyatino, pond, 4.viii.97; (24) inland Severo-Kurilsk nr Kuzminka River, bog, 5.viii.97; (35) Severyanka River valley, small ponds, 11.viii.97; (36) 0.2km inland Cape Ozernyi, bog pools, 11.viii.97; (42) Vasilyeva Peninsula, small fish pond, 16.viii.97; (45) Vasilyeva Peninsula, small pools, 16.viii.97; (48) inland W base of Vasilyeva Peninsula, small pond, 16.viii.97; (52) inland Cape Krepkii nr Utyosnaya River, ponds, 11.viii.97; (60) inland Krashennnikova Bay nr K. River, meadow puddle, 14.viii.97; (64) inland Krashennnikova Bay nr K. River, pond, 14.viii.97; (65) dito; (67) 0.2km inland of Cape Kapustnyi, pond, 15.viii.97; (69) 0.3km inland W base

of Vasilyeva Peninsula, 3 ponds, 16.viii.97; (70) 0.3km inland W base of Vasilyeva Peninsula, pond, 16.viii.97; (71) 0.2km inland W base of Vasilyeva Peninsula, pond, 16.viii.97.

Shiashkotan (SA): (12) 1.5km inland Zakatnaya Bay, pond, 12.viii.96; (13) N slope of Mt. Kuntomintar, stream, 12.viii.96; (15) 0.5km inland Zakatnaya Bay, pond, 11.viii.96; (47) Zakatnaya Bay, stream with waterfall, 11.viii.1996; (49) Zakatnaya Bay, small pond, 11.viii.96; (51) 1km inland Zakatnaya Bay, 3 large ponds, 11.viii.96.

Shumshu (SU): (29) 2km S of Pochtareva Cape, bog pond, 8.viii.97; (30) NE of Cape Chibuynyi nr Ozernaya River, bog pool, 9.viii.97; (31NM) 2km S of Pochtareva Cape, small pond, 8.viii.97; (31TIR) NE of Cape Chibuynyi nr Ozernaya River, mud pools, 9.viii.97; (34) inland Babushkina Bay nr Juzhanka River, bog pools, 10.viii.97; (41) NE of Cape Chibuynyi nr Ozernaya River, pond, 9.viii.97; (45) inland Babushkina Bay, puddle nr stream, 10.viii.97; (47) 1km inland Babushkina Bay, lake, 10.viii.97; (48) 1.6km inland Babushkina Bay, puddle, 10.viii.97.

Urup (UR): (67) 3km inland Tetyaeva Bay, marsh ponds, 21.viii.96

Collectors:

CRAWFORD, R.L.: MK-70. - CRAWFORD, R.L. & SCHWEIKERT, J.S.: IT-6C. - MINAKAWA, N.: IT-7, 8, 10, MK-76, 79, 81, ON-26, PA-9NM, 23, 24, 52, 60, 64, 65, 67, 69, 70, SA-12, 13, 15NM, SU-29, 31NM, 41, 45, 47, 48. - MINAKAWA, N. & OBERG, P.: IT-29, 72, KH-33, 35, KU-40, 77, ON-14, 15, 16, 17, 18, 28, 29, PA-2, 4, 6, 8, SA-47, 49. - OBERG, P.: MA-56, PA-9PO, 10, 11, SA-15PO, 51. - OBERG, P. & LOPEZ, A.: KH-42. - PIETSCH, T.W., AMAOKA, K. & STEVENSON, D.E.: PA-42. - RITCHIE, T.I.: IT-7, 8, PA-36, 48, SU-30, 31TIR, 34. - SAYENKO, E.M.: PA-35. - STEVENSON, D.E.: PA-45.

The Kuril localities visited by S.K. KHOLIN in 1997 are coded as below, and in the list they are separated from the others by the addition of *:

Paramushir (PA): (1) Severo-Kurilsk, Ozernyi Cape, lakes, 13.vii; (2) *ibid*, middle reaches of Matroskaya River, pools with slowly running cold water, 12.vii; (3) *ibid*, various ponds with clear and cold water, 11.vii; (4) *ibid*, Utesnaya Bay, bog ponds with moss, 13.vii; (5) *ibid*, outlet of Matroskaya River, ponds with cold water, 12.vii; (6) S of Severo-Kurilsk, lake on the plateau, small bog pools, 24.vii; (7) 3km N of Severo-Kurilsk, lake on plateau, 24.vii; (8) Shelekhova Bay, sedge fen with spring-water, 19.vii; (9) *ibid*, sedge fen, 16-18.vii; (10) Valley of Shimoyur River, lake with volcanic dross bottom, 17.vii; (11) Outlet of Shimoyur River, pond with volcanic dross and stones and moss, 17.vii. - **Shumshu (SU):** (1) Bolshoye Lake, small lakes, in moss, 22.vii; (2) *ibid*, small meadow pond with moss, 21.vii.

The Sakhalin (SK) localities visited by S.K. KHOLIN in 1995 are coded as follows:

South Sakhalin: (1) Pugachevo, 22.ix, man-made ponds in coniferous forest. - **North Sakhalin (Okha district):** (2) Moskalvo 16-17.ix, small lake; (3) Beregovye Langry, 18.ix, small pond; (4) Beregovye Langry, 19.ix, lake; (5) Beregovye Langry, 19.ix, bog; (6) Beregovye Langry, 19.ix, coastal pond; (7) Beregovye Langry, 20.ix, pond; (8) Beregovye Langry, 20.ix, river mouth; (9) Novye Langry, 20.ix, man-made pond in coniferous forest; (10) Novye Langry, 20.ix, temporary pond.

Museum abbreviations:

(IBV) Institute of Biology and Soil Sciences, Vladivostok, (MZH) Zoological Museum, Helsinki, (NRM) Naturhistoriska riksmuseet, Stockholm, (USNM) National Museum of Natural History, Smithsonian Institution, Washington DC, (ZSM) Zoologische Staatssammlung, München.

The species known from Kamchatka

For each collecting record is given the code of the sample followed by no. of adults/no. of larvae.

Subfamily Hydroporinae

Hygrotus impressopunctatus (SCHALLER)

Dytiscus impressopunctatus SCHALLER, 1783:312 (orig. descr.).

Coelambus impressopunctatus (SCHALLER, 1783): LAFER 1989:236 (key).

Hygrotus impressopunctatus (SCHALLER, 1783): NILSSON & HOLMEN 1995:36 (descr.).

New records: 2(1), 4(7), 6(2), 8(7).

A widespread Holarctic species known also from Primorye, Sakhalin, the South Kurils and Hokkaido.

***Hygrotus inaequalis* (FABRICIUS)**

Dytiscus inaequalis FABRICIUS, 1777:239 (orig. descr.).

Hygrotus inaequalis (FABRICIUS, 1777): ZASYPKINA et al. 1996:20 (Kamchatka River).

A widespread Palearctic species that occurs also in Primorye, Sakhalin and Hokkaido. We have not been able to verify the ZASYPKINA et al. (1996) record from Kamchatka. It is most likely correct.

***Hygrotus marklini* (GYLLENHAL, 1813)**

Hyphydrus marklini GYLLENHAL, 1813:689 (orig. descr.).

Coelambus canadensis FALL., 1919:11 (orig. descr.)

Hygrotus marklini (GYLLENHAL, 1813): NILSSON & HOLMEN 1995:36 (descr., syn.).

New record: 2(8).

This Holarctic species is transcontinental in North America where it occurs from Alaska to Newfoundland and south along the Rocky Mountains to New Mexico. The Palearctic range extends from Fennoscandia to Mongolia, northern China and the Magadan region. Our record is the first one from Kamchatka.

***Hydroporus bergmani* NILSSON**

Hydroporus bergmani NILSSON, 1995:23 (orig. descr., Bolscherjetsk).

Hydroporus brevis F. SAHLBERG, 1834: ZIMMERMANN 1931:142 (in part, misident.); ZAITZEV 1953:168 (in part, misident., Kamchatka); LAFER 1989:240 (in part, misident.); ZASYPKINA et al. 1996:20 (misident., Kamchatka River).

This species is so far known only from the type series, collected at Bolscherjetsk by WUORENTAUS in 1917. Literature records of *H. brevis* from Kamchatka and Magadan (ZAITZEV 1953, LAFER 1989, ZASYPKINA et al. 1996) may represent *H. bergmani*.

***Hydroporus fuscipennis* SCHAUM**

Hydroporus puberulus MANNERHEIM, 1853:163 (orig. descr.); preocc. by LECONTE, 1850.

Hydroporus fuscipennis SCHAUM in SCHAUM & KIESENWETTER, 1868:64 (replacement name for *Hydroporus puberulus* MANNERHEIM, 1853, nec LECONTE, 1850); ZIMMERMANN 1925:2, 1931:137 (Kamchatka); NILSSON & LARSON 1984:123 (syn.).

Hydroporus criniticoxis LARSON, 1975:301 (orig. descr.).

New records: 2(14), 3(9), 5(6), 8(6).

A Holarctic species that is transcontinental in North America. The Palearctic range extends from Germany, Austria and Fennoscandia via northern Russia to Kamchatka, Primorye, Sakhalin and Hokkaido.

***Hydroporus laticollis* ZIMMERMANN**

Hydroporus laticollis ZIMMERMANN, 1922:20 (orig. descr.); 1931:123 (Kamchatka); ZAITZEV 1953:173 (Kamchatka); LAFER 1989:240 (key, Kamchatka).

This species was described from Bolscherjetsk in Kamchatka, where it was collected in 1917 by Y. WUORENTAUS. It has later been found also in Sakhalin and Primorye.

[*Hydroporus memnonius* NICOLAI]

Hydroporus memnonius NICOLAI, 1822: JAKOBSON 1908:426, ZAITZEV 1953:172 (misident., Kamchatka).

We have not been able to verify JAKOBSON'S (1908) record of this species from Kamchatka. As this is a West Palearctic species, it is probably based on a misidentification.

***Hydroporus morio* AUBÉ**

Hydroporus morio AUBÉ, 1838a:307 + pl. 36:1 (orig. descr.); NILSSON & NAKANE 1993:421 (syn.); NILSSON 1994a:95 (syn.).

Hydroporus lugubris MOTSCHULSKY, 1845:353 (orig. descr., Kamchatka); preoccupied by AUBÉ, 1838.

Hydroporus caminarius MOTSCHULSKY, 1860:100 (orig. descr., Kamchatka).

Hydroporus melancholicus MOTSCHULSKY, 1860:100 (replacement name for *Hydroporus lugubris* MOTSCHULSKY, 1845, nec AUBÉ, 1838); JAKOBSON 1908:425 (Kamchatka).

Hydroporus watanabei TAKIZAWA, 1933:174 (orig. descr.).

Hydroporus melanocephalus (MARSHAM, 1802): ZIMMERMANN 1931:119 (misident., Kamchatka); ZASYPKINA et al. 1996:20 (misident., Kamchatka).

New record: 9(5).

The world distribution is northern circumboreal and it is known also from Primorye, Magadan, Sakhalin, Hokkaido and the Kurils.

***Hydroporus nigellus* MANNERHEIM**

Hydroporus nigellus MANNERHEIM, 1853:163 (orig. descr.); NILSSON 1994a:93 (Kamchatka).

Hydrocoptus obscuripes MOTSCHULSKY, 1860:100 (orig. descr.)

Hydroporus pyrenaicus WEHNCKE, 1871:163 (orig. descr.)

Hydroporus sieversi J. SAHLBERG, 1910:173 (orig. descr.)

Hydroporus tartaricus LECONTE, 1850: ZIMMERMANN 1925:3, 1931:120 (misident., Kamchatka); ZASYPKINA et al. 1996:21 (misident., Kamchatka River).

New records: 2(36), 3(18), 4(9), 5(1), 7(1), 8(39), 9(20).

A Holarctic species that is known also from Sakhalin and the North Kurils (see below). It is seemingly very common in Kamchatka.

***Hydroporus notabilis* LECONTE**

Hydroporus notabilis LECONTE, 1850:216 (orig. descr.); ANGUS 1985:274 (syn.).

Hydroporus arcticus THOMSON, 1856:197 (orig. descr.)

Hydroporus tomentosus POPPIUS, 1905:12 (orig. descr.)

New record: 6(7).

A Holarctic species that is transcontinental in North America. The Palearctic range extends from Fennoscandia to Kamchatka and the North Kurils in arctic and boreal zones. ANGUS (1985) synonymized both *H. arcticus* THOMSON and *H. tomentosus* Poppius with the Nearctic *H. notabilis* LECONTE, and recognized all three forms as subspecies. Our record is apparently the first one from Kamchatka.

***Hydroporus submuticus* THOMSON**

Hydroporus submuticus THOMSON, 1874:537 (orig. descr.); NILSSON & NAKANE 1993:421 (syn.).

Hydroporus penitus GUIGNOT, 1945:20 (orig. descr.); syn. nov.

Hydroporus konoii NAKANE, 1963:25 (orig. descr.).

New record: 6(2).

This northern Palearctic species is known also from Primorye, Sakhalin, Hokkaido, and the North Kurils. The examination of the holotype of *Hydroporus penitus* GUIGNOT, described from the Khanka Lake area, has shown that it is in fact a junior synonym of *H. submuticus*. Our record is appearingly the first one from Kamchatka.

***Hydroporus tristis* (PAYKULL)**

Dytiscus tristis PAYKULL, 1798:232 (orig. descr.).

Hydroporus tristis (PAYKULL, 1798): NILSSON & KHOLIN 1994:147 (Sakhalin).

New record: 2(3).

The distribution of *H. tristis* is Holarctic, and it is known from the Magadan Terr., Sakhalin, Hokkaido, and the South Kurils. Our record is apparently the first one from Kamchatka.

***Hydroporus uenoi* NAKANE**

Hydroporus uenoi NAKANE, 1963:25 (orig. descr.); NILSSON & NAKANE 1993:424 (descr.); NILSSON & SATO 1993:92 (Sakhalin).

Hydroporus striola (GYLLENHAL, 1826): BALFOUR-BROWNE 1947:439 (misident.).

Hydroporus eugeniae ZAITZEV, 1909: ZIMMERMANN 1931:120 (misident., Kamchatka); ZAITZEV 1953:163 (in part, misident., Kamchatka); LAFER 1989:240 (misident., Kamchatka); ZASYPKINA et al. 1996:20 (misident., Kamchatka River).

New records: 4(5), 8(1).

Together with *H. ijimai* NILSSON & NAKANE, this species form a complex that is known from NE China, Primorye, Sakhalin, South Kurils, Hokkaido and Honshu. We suggest that the literature records of *H. eugeniae* from Kamchatka are based on misidentifications of *H. uenoi*.

***Hydroporus umbrosus* (GYLLENHAL)**

Hyphydrus umbrosus GYLLENHAL, 1808:538 (orig. descr.).

Hydroporus umbrosus (GYLLENHAL, 1808): ZIMMERMANN 1931:104 (Kamchatka)

New records: 6(16), 8(22).

The distribution covers most of North and Central Europe and Siberia to Primorye, Kamchatka, and the northern Kurils.

***Oreodytes alpinus* (PAYKULL)**

Dytiscus alpinus PAYKULL, 1798:226 (orig. descr.).

Oreodytes alpinus (PAYKULL, 1798): LAFER 1989:214 (Kamchatka); ZASYPKINA et al. 1996:21 (Kamchatka River).

New record: Bystraya River, lower part, 30.viii.1972, 2 females, leg. NIKOLAEVA (IBV).

LAFER (1989) synonymized *O. dauricus* (MOTSCHULSKY) with *O. alpinus*, leaving it open which of the two species that occur in Kamchatka. ALARIE (1993) associated *O. dauricus* with the *alaskanus*-clade of the genus, whereas *O. alpinus* belongs to another clade. One characteristic feature of the *alaskanus*-clade is the emarginate female last abdominal sternite; not found in *O. alpinus*. As the two females seen from Kamchatka belong to *O. alpinus*, our conclusion is that *O. dauricus* does not occur in this Peninsula.

***Oreodytes okulovi* LAFER**

Oreodytes okulovi LAFER, 1988:52 (orig. descr.).

New record: Penzhina River at Kamenskoye, 16.viii.1972, 1 ind., leg. NIKOLAEVA (IBV).

This species was previously known only from the type locality in the south Sikhote-Alin in Primorye. The new record expands the distributional range to include also Kamchatka.

***Oreodytes sanmarkii* (C. R. SAHLBERG)**

Hyphydrus sanmarkii C. R. SAHLBERG, 1826:172 (orig. descr.).

Hyphydrus rivalis GYLLENHAL, 1827:384 (orig. descr.).

Oreodytes rivalis (GYLLENHAL, 1827): ZAITZEV 1953:186 (Kamchatka); LAFER 1989:242 (Kamchatka); ZASYPKINA et al. 1996:21 (Kamchatka).

New record: Bystraya River, lower part, 30.viii.1972, 3 inds, leg. NIKOLAEVA (IBV).

This Holarctic species is known from Primorye, Sakhalin, Hokkaido, the South Kurils and Kamchatka.

***Stictotarsus multilineatus* (FALKENSTRÖM)**

Potamodytes griseostriatus Var. *multilineatus* FALKENSTRÖM, 1922:16 (orig. descr.).

Stictotarsus multilineatus (FALKENSTRÖM, 1922): NILSSON & ANGUS 1992: 287 (class.).

Deronectes griseostriatus (DE GEER, 1774): ZIMMERMANN 1933:156 (misident., Kamchatka).

Potamonectes griseostriatus (DE GEER, 1774): ZIMMERMANN 1925:3 (misident., Kamchatka); ZAITZEV 1953:196 (misident., Kamchatka); LAFER 1989:242 (misident., Kamchatka); ZASYPKINA et al. 1996:21 (misident., Kamchatka River).

New record: 2(1).

This species belongs to a complex of cryptic species recognized primarily on karyotypic characters. No chromosome studies have so far been performed on Asian populations, and it can only be assumed that the Kamchatka and north Kuril records refer to *S. multilineatus* as this species seems to be distributed along the northernmost Palearctic from Scandinavia to Kamchatka. No karyotypic studies have been made on North American material.

Subfamily Colymbetinae

***Agabus affinis* (PAYKULL)**

Dytiscus affinis PAYKULL, 1798:211 (orig. descr.).

Agabus affinis (PAYKULL, 1798): ZAITZEV 1953:239 (Kamchatka); LAFER 1989:245 (Kamchatka); ZASYPKINA et al. 1996:21 (Kamchatka).

We have not been able to verify the literature records of this species from Kamchatka. A reexamination would be motivated from the fact that several new species of this group have been

described from the Far East of Russia more recently (NILSSON 1994b). However, as specimens of *A. affinis* were seen from Primorye, the occurrence in Kamchatka is not unexpected.

***Agabus arcticus* (PAYKULL)**

Dytiscus arcticus PAYKULL, 1798:201 (orig. descr.).

Gaurodytes punctipennis J. SAHLBERG, 1880:56 (orig. descr.).

Agabus arcticus (PAYKULL, 1798): LARSON 1989:899 (distr.).

Gaurodytes arcticus (PAYKULL, 1798): ZIMMERMANN 1934:195 (Kamchatka); ZAITZEV 1953:245 (Kamchatka); LAFER 1989:245 (Kamchatka); ZASYPKINA et al. 1996:21 (Kamchatka).

A circumboreal to -polar species that in North America is known from western Alaska to Labrador and northern Newfoundland. The Palearctic range extends from NW Europe and eastwards to Mongolia and Kamchatka and the northern Kurils. We have not seen any specimens from Kamchatka, although our material from the North Kurils cited below provide support for the literature records given above.

***Agabus balkei* FERY & NILSSON**

Agabus balkei FERY & NILSSON, 1993:103 (orig. descr.).

Agabus erichsoni GEMMINGER & HAROLD, 1868: FERY & NILSSON, 1993:103 (in part, misident.).

Gaurodytes nigroaeneus (ERICHSON, 1837): ZIMMERMANN 1925:3, 1934:189 (misident., Kamchatka).

Gaurodytes subtilis (ERICHSON, 1837): ZASYPKINA et al. 1996:21 (misident., Kamchatka River).

Colymbetes oceanicus MOTSCHULSKY, 1853:8 (nomen nudum, Kamchatka).

New records: 3(1), 8(13).

This species was earlier not separated from the very similar *A. erichsoni*. ZIMMERMANN (1925) recorded *A. erichsoni* from Kamchatka, and based on 3 females in NRM FERY & NILSSON (1993) reproduced this record. However, as females of *balkei* and *erichsoni* cannot be separated, and males of only *balkei* so far have been found in Kamchatka, it is more parsimonious to interpret ZIMMERMANN'S record as referring to *balkei*. The occurrence of also *A. erichsoni* in Kamchatka is, however, not unexpected.

***Agabus biguttulus* (THOMSON)**

Gaurodytes biguttulus THOMSON, 1867:110 (orig. descr.); ZIMMERMANN 1925:3 (Petropavlovsk); 1934:193 (Kamchatka).

Agabus biguttulus (THOMSON, 1867): NILSSON & HOLMEN 1995:101 (descr.).

The specimen that ZIMMERMANN'S Kamchatka record was based on was examined by the senior author in NRM several years ago. However, it could now not be found for reexamination, and we find it highly possible that it is misidentified as several species have been described in this group more recently.

***Agabus clypealis* (THOMSON)**

Gaurodytes clypealis THOMSON, 1867:107 (orig. descr.).

Agabus clypealis (THOMSON, 1867): LARSON 1991:1259 (distr.).

New record: Bolscherjetsk 27.vi.1917 leg. Y. WUORENTAUS, 3 inds MZH, 1 male ZSM.

The delimitation of this species is problematic. LARSON (1991) assigned Nearctic specimens from northwestern Canada to *A. clypealis*. At least some of the literature records from Siberia seemingly refer to other species (NILSSON 1994c). In Europe, *A. clypealis* is a rare species known from

northern Germany, Poland, Denmark, Fennoscandia and Russia (BALKE & HENDRICH 1987). We have preliminary assigned specimens from Kamchatka and North Kurils to this species sensu LARSON (1991).

***Agabus costulatus* (MOTSCHULSKY)**

Colymbetes costulatus MOTSCHULSKY, 1859:541 (orig. descr.).

Gaurodytes tunkinensis ZIMMERMANN, 1928:178 (orig. descr.).

Agabus costulatus (MOTSCHULSKY, 1859): JAKOBSON 1908:430 (Kamchatka); ZAITZEV 1915:267 (Kamchatka); NILSSON 1990:153 (descr.).

Gaurodytes costulatus (MOTSCHULSKY, 1859): ZAITZEV 1953:248 (Kamchatka); LAFER 1989:247 (Kamchatka); ZASYPKINA et al. 1996:22 (Kamchatka).

New records: 5(1), 7(1/3).

This large eastern Palearctic *confinis*-group species is hard to separate from *A. thomsoni*. Generally, specimens of *costulatus* are slightly larger and broader than those of *thomsoni* (NILSSON 1990). We have assigned the two specimens we have seen to *costulatus* after a comparison with the longer series seen from the North Kurils (see below).

***Agabus coxalis* SHARP**

Agabus coxalis SHARP, 1882:535 (orig. descr.).

Gaurodytes coxalis (SHARP, 1882): LAFER 1989:246 (key, Kamchatka); ZASYPKINA et al. 1996:21 (Kamchatka).

Gaurodytes coxalis ermaki ZAITZEV, 1953:259 (orig. descr., Kamchatka).

This Holarctic species is in North America confined to the northwest. The Palearctic range extends from the Ural and Caucasus and eastwards to Kamchatka. According to ZAITZEV (1953) the Kamchatka populations belong to the subspecies *A. c. ermaki*. We have not been able to verify the presence of this species in Kamchatka. However, as it is highly characteristic, it is not likely to be misidentified.

***Agabus discolor* (HARRIS)**

Colymbetes discolor HARRIS, 1828:164 (orig. descr.)

Agabus levanderi HELLÉN, 1929:40 (orig. descr.); syn. nov.

Agabus discolor (HARRIS, 1828): LARSON 1991:1272 (descr.).

Gaurodytes chypealis THOMSON, 1867: ZIMMERMANN 1934:208 (misident., ?Kamchatka, Ozernaja).

New records: 3(1), 8(4), 9(7).

Ozernaja 1♂ ZSM.

A northern circumboreal species that is known from northern Fennoscandia to Kamchatka in the Palearctic and is transcontinental in North America. It belongs to a complex of chiefly Nearctic species. According to LARSON (1991), eastern Palearctic specimens of *A. levanderi* cannot be separated from *A. discolor* (HARRIS) specimens from western Alaska. NILSSON (1994c) showed that some of the Palearctic specimens assigned to *discolor* and *levanderi* by various authors in fact belong to a separate species, *A. angusi*. As a result, the relative width of the metasternal wing of Palearctic *discolor* populations is now within the range of the Nearctic ones. As we have seen one male of this species labelled "Ozernaja" in coll. ZIMMERMANN, his Kamchatka record of *A. chypealis* most probably refers to *A. discolor*.

***Agabus opacus* AUBÉ**

Agabus opacus AUBÉ, 1837:173 (orig. descr.).

Gaurodytes opacus (AUBÉ, 1837): LAFER 1989:244 (key).

Gaurodytes mimmi J. SAHLBERG, 1875:182 (orig. descr.); ZAITZEV 1915:267 (Kamchatka).

Agabus sibericus SHARP, 1882:519 (orig. descr.); preoccupied by J. SAHLBERG 1880.

Agabus sharpi JAKOBSON, 1908:430 (replacement name for *Agabus sibericus* SHARP, 1882, not J. SAHLBERG, 1880); LARSON & NILSSON 1985:124 (syn.).

Agabus sachalinensis KAMIYA, 1938:37 (orig. descr.).

New records: 5(2), 7(1).

In North Europe, this species prefers temporary forest pools. The world distribution is northern Holarctic. It is known in the Far East from Primorye, Sakhalin and Kamchatka.

***Agabus tristis* AUBÉ**

Agabus tristis AUBÉ, 1838b:356 (orig. descr.); NILSSON 1990:159 (syn.).

Agabus kurilensis KAMIYA, 1938:35 (orig. descr., Shumshu).

Gaurodytes tristis (AUBÉ, 1838): ZIMMERMANN 1934:181 (Kamchatka).

New records: 2(3), 9(1).

Ozernaja 30.vii.1917, leg. WUORENTAUS, 1 ind ZMH.

This Holarctic species is widespread in Siberia and known also from Magadan, Chukotka and the North Kurils (LAFER 1989).

***Ilybius angustior* (GYLLENHAL)**

Dytiscus angustior GYLLENHAL, 1808:500 (orig. descr.).

Ilybius angustior (GYLLENHAL, 1808): JAKOBSON 1908:428 (Kamchatka); ZAITZEV 1953:280 (Kamchatka); ZASYPKINA et al. 1996:23 (Kamchatka).

Ilybius aenescens THOMSON, 1870: ZIMMERMANN 1925:3 (misident.; Tarja, Avatcha Bay).

New record: 4(1).

A Holarctic species with a chiefly boreal range. In North America it is transcontinental, known from Alaska to Newfoundland and south along the Rocky Mountains to New Mexico. In the Palearctic known from Fennoscandia and eastwards to North Sakhalin, Kamchatka and North Kurils. A specimen from Kamchatka was present in coll. MOTSCHULSKY according to ZAITZEV (1915). A single male in NRM from Kamchatka was misidentified by ZIMMERMANN (1925) as *I. aenescens*.

***Ilybius chishimanus* KÔNO**

Ilybius chishimanus KÔNO, 1944:80 (orig. descr.); NILSSON 1994d:57 (syn.).

Ilybius weymarni J.BALFOUR-BROWNE, 1947:446 (orig. descr.).

? *Ilybius gibbus* MOTSCHULSKY, 1852:7 (nomen nudum, Kamchatka).

? *Ilybius bergeri* ZAITZEV, 1915:260 (nomen nudum).

New records: 4(3), 6(1).

This species was first described from Paramushir. It occurs from Irkutsk and eastwards to North China, Primorye, Kamchatka and North Kurils (NILSSON 1994d). ZAITZEV (1915) identified MOTSCHULSKY's Kamchatka specimens as belonging to his *I. bergeri* that he intended to describe from material from the South Ussuri Region. We here suggest that these specimens belonged to *I. chishimanus*.

***Ilybius discedens* SHARP**

Ilybius discedens SHARP, 1882:557 (orig. descr.); ZIMMERMANN 1925:3 (Petropavlovsk); LARSON 1987:350 (descr.).

New record: 6(1).

ZIMMERMANN's (1925) record of this species was overlooked by subsequent authors. Consequently, *I. discedens* has been known as strictly Nearctic (LARSON 1987). As we have confirmed the presence of this species in Kamchatka and the Island of Paramushir there is no longer any doubt of its Holarctic distribution.

***Colymbetes dahuricus* AUBÉ**

Colymbetes dahuricus AUBÉ, 1837:99 (orig. descr.); JAKOBSON 1908:433 (Kamchatka); ZAITZEV 1915:276 (Kamchatka); GSCHWENDTNER 1936:94 (Kamchatka); ZAITZEV 1953:297 (Kamchatka); LAFER 1989:250 (Kamchatka); ZASYPKINA et al. 1996:23 (Kamchatka).

Colymbetes paykulli ERICHSON, 1837: ZIMMERMANN 1925:3 (misident., Kamchatka).

New record: 6(4).

This northern Holarctic species is widespread in East Siberia and in the Far East of Russia, including Primorye. One female in NRM was misidentified by ZIMMERMANN (1925) as *C. paykulli*.

***Colymbetes dolabratus* (PAYKULL)**

Dytiscus dolabratus PAYKULL, 1798:204 (orig. descr.).

Colymbetes groenlandicus AUBÉ, 1838b:233 (orig. descr.).

Colymbetes thomsoni SHARP, 1882:628 (orig. descr.).

Colymbetes dolabratus (PAYKULL, 1798): JAKOBSON 1908:433 (Kamchatka); ZAITZEV 1915:275 (Kamchatka); ZIMMERMANN 1925:3 (Kamchatka); GSCHWENDTNER 1936:96 (Kamchatka); LAFER 1989:250 (Kamchatka); ZASYPKINA et al. 1996:23 (Kamchatka).

New records: 8(1), 9(1).

A circumpolar species that in North America occurs along the northern edge of the continent from Alaska to Quebec. On Greenland north to about 75°N. In Eurasia it ranges from Iceland and Fennoscandia to Kamchatka, Komandorskiye Islands, and North Kurils, in arctic and northern boreal regions.

***Rhantus notaticollis* (AUBÉ)**

Colymbetes notaticollis AUBÉ, 1837:107 (orig. descr.).

Rhantus nigriventris MOTSCHULSKY, 1860:101 (orig. descr., Kamchatka).

Rhantus notaticollis (AUBÉ, 1837): JAKOBSON 1908:432 (Kamchatka); ZAITZEV 1915:273 (Kamchatka); ZIMMERMANN 1925:3 (Kamchatka); GSCHWENDTNER 1936:65 (Kamchatka); ZAITZEV 1953:289 (Kamchatka); LAFER 1989:250 (Kamchatka); ZASYPKINA et al. 1996:23 (Kamchatka).

This widespread Palearctic species is known also from Primorye, Sakhalin, Hokkaido, and the Kurils. A single female from Kamchatka identified by A. ZIMMERMANN was seen in NRM. It was reported from Kamchatka already by MOTSCHULSKY (1860).

***Rhantus suturellus* (HARRIS)**

Colymbetes suturellus HARRIS, 1828:164 (orig. descr.).

Rhantus suturellus (HARRIS, 1828): KONO 1944:81 (Paramushir).

New records: 2(2/2), 6(1/1), 8(7).

A circumboreal species that is transcontinental in North America where it is known from Alaska to Nova Scotia and south to New Jersey, Wyoming and Washington. In the Palearctic known from France and Austria to Great Britain and Fennoscandia, and eastwards to East Siberia, Magadan, Kamchatka and North Kurils. Our record is appearingly the first one from Kamchatka.

Subfamily Dytiscinae

Graphoderus perplexus SHARP

Graphoderus perplexus SHARP, 1882:695 (orig. descr.); LARSON 1975:407 (distr.).

New record: 6(5/3).

Our record from Kamchatka is the first Palearctic one of this otherwise Nearctic species (LARSON 1975). It is very similar to the Palearctic *G. zonatus*, but differs chiefly in the lower number of adhesive discs on the male pro- and mesotarsi. WALLIS (1939) gave some additional differences. The five Kamchatka males had 27-30 small discs on the protarsus (excl. 3), and 14-17 on the mesotarsus arranged in two regular rows. Corresponding values for three males from Urup are 61-66 and 27-31.

Acilius canaliculatus (NICOLAI, 1822)

Dytiscus canaliculatus NICOLAI, 1822:29 (orig. descr.).

Acilius canaliculatus (NICOLAI, 1822): JAKOBSON 1908:435 (?Kamchatka); ZAITZEV 1953:319 (Kamchatka); LAFER 1989:252 (Kamchatka); ZASYPKINA et al. 1996:23 (Kamchatka).

New record: 8(6).

This northern Palearctic species occurs from France to Great Britain and Scandinavia, and eastwards to the Far East of Russia including Sakhalin and Kamchatka.

Dytiscus circumcinctus AHRENS

Dytiscus circumcinctus AHRENS, 1811:67 (orig. descr.); ZIMMERMANN 1925:3 (Kamchatka); ZAITZEV 1953:331 (Kamchatka); LAFER 1989:253 (Kamchatka); ZASYPKINA et al. 1996:23 (Kamchatka).

Macrodytes circumcinctus (AHRENS, 1811): JAKOBSON 1908:435 (Kamchatka).

Dytiscus ooligbuckii KIRBY, 1837:74 (orig. descr.).

Dytiscus confusus MOTSCHULSKY, 1860:101 (orig. descr., Kamchatka).

A single male from Kamchatka of this Holarctic species identified by A. ZIMMERMANN was seen in NRM. It was reported from Kamchatka already by MOTSCHULSKY (1860).

Dytiscus dauricus GEBLER

Dytiscus dauricus GEBLER, 1832:29 (orig. descr.); ZIMMERMANN 1925:3 (Kamchatka); ROUGHLEY 1990:483 (syn., map); ZASYPKINA et al. 1996:23 (Kamchatka).

Macrodytes dauricus (GEBLER, 1832): JAKOBSON 1908:435 (Kamchatka).

Dytiscus obscurus GSCHWENDTNER, 1922:93 (orig. descr.).

Dytiscus frontalis MOTSCHULSKY, 1860:101 (orig. descr., Kamchatka); GSCHWENDTNER 1938:50 (Kamchatka).

Macrodytes frontalis (MOTSCHULSKY, 1860): JAKOBSON 1908:436 (Kamchatka).

New records: 1(5), 6(1), 8(1/2).

This Holarctic species is widespread in the East Palearctic. It is known both from Sakhalin, Hokkaido, the Kurils and Kamchatka. All females seen from the Kurils and Kamchatka belong to the smooth morph. A sulcate female from Hokkaido differed also in having much narrower marginal yellow bands on the pronotum when compared to Kuril specimens. This difference may represent a more general pattern as it is valid also for the Japanese specimens shown in MORI & KITAYAMA (1993). Japanese populations have been given subspecific status as *D. dauricus zaitzevi* NAKANE, 1990.

Additional records for the Kuril Islands and Sakhalin

Hygrotus impressopunctatus (SCHALLER)

IT: 29(3/3), 72(2).

SK: 3(2), 5(1).

First records for Iturup and North Sakhalin.

Hygrotus inaequalis (FABRICIUS)

SK: 2(7), 4(22).

First records for North Sakhalin.

Hydroporus brevisculus POPPIUS

SK: 1(16), 4(5), 5(4), 6(1), 7(1), 8(3).

First records for North Sakhalin.

Hydroporus fuscipennis SCHAUM

SK: 3(11), 4(6), 5(41), 6(20), 7(3), 8(1), 9(2).

First records for North Sakhalin.

Hydroporus morio AUBÉ

KH: 42(3). - MA: 56(53/6). - MK: 70(1), 76(71), 79(1), 81(67). - ON: 14(31), 16(52), 18(6), 28(87), 29(24). - PA: 24(21), 60(5), 69(2), *2(22/1), *3(7), *5(1), *6(2), *8(1), *11(2). - SA: 12(1), 15(14), 49(24), 51(20). - SU: 29(5), 48(3).

SK: 9(7).

First records for Kharimkotan, Makanrushi, Matua, and Onekotan

Hydroporus nigellus MANNERHEIM

MK: 76(7), 79(2), 81(43). - PA: 2(25), 9(1), 10(8), 23(5), 24(1), 60(28), 67(3), 69(2), 71(5), *1(1), *4(13), *7(2), *8(24), *9(3), *10(24), *11(2). - SU: 29(7), 30(1), 34(14), 41(29), 45(8), 47(2), 48(1), *1(23), *2(7).

SK: 3(2), 4(1), 5(2), 6(2), 9(4), 10(2).

First records for Sakhalin and the Kurils: Makanrushi, Paramushir, and Shumshu.

Hydroporus notabilis LÉCONTE

PA: 2(1), 23(2), 60(3), 67(1), 69(4), *11(3). - SU: 48(6), *1(5), *2(5).

First records for the Kurils: Paramushir and Shumshu.

Hydroporus saghaliensis TAKIZAWA

Kunashir: NW shore, Rudnoye village, by Severyanka River, in water bodies on the road, 26.viii.1997, 1 fe, leg. Y. MARUSIK.

First record for Kunashir.

Hydroporus submuticus THOMSON

PA: *6(1). - SU: 48(2).

SK: 1(3).

First record for the Kurils: Paramushir and Shumshu.

Hydroporus tristis (PAYKULL)

IT: 72(2). - UR: 67(2).

SK: 4(17), 5(1), 9(17).

First records for North Sakhalin and the Kurils: Iturup and Urup.

Hydroporus uenoi NAKANE

IT: 7(1), 8(1). - UR: 67(13).

SK: 1(13), 2(9), 3(1), 4(1), 6(2).

First records for Iturup and North Sakhalin.

Stictotarsus multilineatus (FALKENSTRÖM)

KH: 33(31/19), 35(96/32), 42(12/7). - ON: 14(23/27), 18(1). - PA: 70(4), *2(10), *5(1/2). - SA: 51(2). - SU: 47(5), *1(1).

First records for Kharimkotan, Onekotan and Shiashkotan.

Agabus arcticus (PAYKULL)

PA: 23(3), 42(5), 48(11), 69(74), 70(3/1), *7(5). - SU: 47(11), *1(21/1).

Agabus clypealis (THOMSON)

PA: *6(25). - SU: 48(8).

First record for the Kurils: Paramushir and Shumshu.

Agabus confinis (GYLLENHAL)

PA: 2(5), 52(1), *6(1). - SU: 48(1).

First record for the Kurils: Paramushir and Shumshu.

Agabus congener (THUNBERG)

IT: 72(1).

SK: 4(1), 5(3), 6(6), 9(2).

First record for Iturup and North Sakhalin.

Agabus conspicuus SHARP

IT: 7(57), 8(12), 10(1). - UR: 67(23).

Agabus costulatus (MOTSCHULSKY)

PA: 24(62), 60(24), 67(16), *3(2/2). - SU: 29(1), 31(2), 34(2), 41(2).

First record for the Kurils: Paramushir and Shumshu.

Agabus discolor (HARRIS)

PA: *2(1). - SU: 31(7).

First record for the Kurils: Paramushir and Shumshu.

Agabus erichsoni GEMMINGER & HAROLD

SK: 4(1), 5(2).

First records for North Sakhalin.

Agabus japonicus SHARP

IT: 7(9), 8(6), 29(8). - KH: 33(1). - MK: 76(4), 81(26). - ON: 14(3/1), 15(5), 16(3), 18(24), 26(/1), 28(10), 29(42). - SA: 12(9), 15(/1), 15PO(5), 49(44), 51(13/16). - UR: 67(36).

SK: 1(1).

First records for Iturup, Kharimkotan, Makanrushi, Onekotan, and Shiashkotan.

Agabus kholini NILSSON

SK: 4(12).

First record for Sakhalin.

Agabus opacus AUBÉ

SK: 7(2).

First record for North Sakhalin.

Agabus thomsoni J. SAHLBERG

PA: 2(2).

Agabus tristis AUBÉ

PA: 60(8/1), *2(2/3), *3(1/4), *5(/2), *7(2), *8(21/3).

Ilybius angustior (GYLLENHAL)

ON: 17(5), 18(2). - PA: 2(1), 4(3), 6(1), 23(29), 48(1), 52(26), 69(8), 71(1), *1(1), *2(2), *4(7). - SU: 30(22), 31NM(6), 31TIR(5), 41(5), 47(2), 48(1), *1(24).

SK: 1(1), 6(/7), 7(1).

First records for Sakhalin and Onekotan.

Ilybius apicalis SHARP

IT: 29(7). - KU: 77(1). - UR: 67(92).

Ilybius chishimanus KÔNO

PA: 9(1), 10(3), 11(13), 35(1), 36(7), 42(4), 48(12), 69(28), 71(1), *1(3).

Ilybius discedens SHARP

PA: *6(11).

First record for the Kurils: Paramushir.

Ilybius nakanei NILSSON

IT: 8(1).

SK: 1(1/5), 9(/14).

First records for Iturup and North Sakhalin.

Colymbetes dahuricus AUBÉ

KH: 35(/1), 42(3). - MK: 79(4), 81(11/3). - ON: 17(1), 28(8), 29(34). - SA: 13(2), 15(1), 49(2), 51(3/9).

First record for the Kurils: Kharimkotan, Makanrushi, Onekotan, and Shiashkotan.

Colymbetes dolabratus (PAYKULL)

PA: 2(3), 4(1), 6(1), 23(78), 48(4), 67(4/2), *2(/1), *5(3/1), *6(/1), *7(2), *9(1/11), *10(/2). - SU: 29(28/6), 30(3/2), 31NM(2), 31TIR(3), 41(9), 47(18), *2(/4).

Colymbetes tolli ZAITZEV

SK: 7(2), 8(1).

First records for North Sakhalin.

Rhantus notaticollis (AUBÉ)

IT: 7(1), 8(1/2), 29(1), 72(5).

SK: 5(1).

First records for Iturup and North Sakhalin.

Rhantus suturalis (MACLEAY)

IT: 6C(1), 7(6/1), 8(6), 10(1), 72(1).

First records for Iturup.

Rhantus suturellus (HARRIS)

ON: 17(3). - PA: 8(1), 10(1/3), 60(1), 65(5). - SU: 30(1/5), 31TIR(1/3), *1(1/2).

First records for Onekotan and Shumshu. ZIMMERMAN & SMITH (1975) noted the presence of specimens from Alaska and especially the Kenai Peninsula with the anterior and posterior black pronotal bands expanded and fused medially. The two males from Onekotan displayed this colour pattern, whereas the single female had the normal coloration. The presence of this colour morph on both sides of the Bering Strait provides a strong indication of gene flow across this barrier.

Dytiscus dauricus GEBLER

IT: 7(1), 8(1), 29(1). - PA: 9(1), 10(1), 11(3), 23(9), 42(4), 45(1), 64(4), 69(54), *2(1), *5(8), *7(4), *11(2). - SU: 29(1), 30(1/10), 31TIR(2/5), 41(2), *1(3/2). - UR: 67(2/1).

SK: 6(2).

First record for North Sakhalin.

Dytiscus delictus (ZAITZEV)

One specimen from Paramusir (Okeanskoje Aug. 1923) was seen in USNM by R.E. ROUGHLEY (in litt.). This is the first record from the Kurils.

Acilius canaliculatus (NICOLAI)

SK: 2(1).

First record for Sakhalin.

Discussion

Currently, 62 species of Dytiscidae are known from Sakhalin, the Kuril Islands and the Kamchatka Peninsula (Tab. 1). The faunas of these three regions are of comparable size, i.e. 39 species in Sakhalin, 36 in the Kuril Archipelago, and 38 in Kamchatka. Additional sampling of these faunas will no doubt raise these values. Highly expected to occur also in Kamchatka are the species known from the North Kuril Islands, but not from the peninsula itself, i.e. *Agabus confinis* and *A. thomsoni*. Three species that earlier had this kind of distribution were expected to be found in Kamchatka by NILSSON et al. (1997). All three species, viz. *Agabus tristis*, *Ilybius chishimanus* and *Rhantus suturellus* are here indeed reported from Kamchatka for the first time. No similar gaps are known from the south end of the Kuril island chain, i.e. all species known from the South Kurils have also been found in Sakhalin and/or Hokkaido (Tab. 1). On the other hand, there are seven species known from both the south and north Kuril source areas, Kamchatka and Sakhalin and/or Hokkaido, that are seemingly absent from the Kuril islands. Especially striking is the absence of *Hygrotus inaequalis* and *Hydroporus fuscipennis*.

A comparison with the species composition of the individual Kuril islands with that of the source areas produces relatively tight patterns, i.e. species that occur in one of the source areas and in a series of adjacent islands. Applying KRYVOLUTSKAJA'S (1973) division of the Kuril islands into three groups based on their insect faunas (cf. Tab. 1), results in a species-poor central group with eight species, and richer south and north groups with 16 and 21 species, respectively. Of the six

species that probably have colonized the central islands from the north, *Hydroporus morio* have been most successful, reaching all the way to Ketoi. The same island was seemingly reached from the south by *Agabus conspicuus*, whereas *A. japonicus* seemingly has successfully colonized the central islands north to Makanrushi.

Based on their distributions, the species found in Kamchatka plus Sakhalin and the Kurils were classified into four groups, viz. Holarctic, Palearctic, East Palearctic and Japano-Kurilian (Tabs 1 & 2). The last group includes species found on one or more of the north-east Pacific islands, but absent from the mainland outside Korea. The Holarctic element is strongly represented in the Kamchatkan fauna, including three out of five species found in the peninsula. In Sakhalin only one out of three species has a Holarctic distribution, and instead the Palearctic and East Palearctic elements are more important. Moreover, the Japano-Kurilian group of species that includes a high proportion of lotic species is totally absent from Kamchatka.

The presence in Kamchatka of otherwise strictly Nearctic species like *Ilybius discedens* and *Graphoderus perplexus* stresses the importance of extending the faunal analysis to the North American parts of Beringia. However, no detailed faunistic account is available for the 92 species of Dytiscidae known from Alaska and the Aleutian Islands (BOUSQUET 1991). Comparing faunas from the two continents surrounding Beringia would also stress the need for more detailed taxonomic studies, including the analysis of geographic variation in morphology among island and mainland populations.

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Tab. 1: List of species of Dytiscidae found in Sakhalin (SK), Kuril Islands (KL) and Kamchatka (KA). The presence in Hokkaido (HK) is also noted and records are given for the following of the Kuril Islands: (ZE) Zelfonyi, (ST) Shikotan, (KU) Kunashir, (IT) Iturup, (UR) Urup, (CH) Chumashir, (SI) Simushir, (KE) Ketoi, (RA) Rasshua, (MA) Matua, (SA) Shiashkotan, (KH) Kharimkotan, (ON) Onekotan, (MK) Makanrushi, (PA) Paramusir, and (SS) Shumshu.

Distribution & species	Habitat	Occurrence																				
		South						Central						North								
		SK	HK	KI	ZE	ST	KU	IT	UR	CH	SI	KE	RA	MA	SA	KH	ON	MK	PA	SS	KA	
<i>Holarctic</i>																						
<i>Hygrotus impressopunctatus</i>	Lentic	1	1	1	1	1	1	1														1
<i>Hygrotus marklini</i>	Lentic																					1
<i>Hydroporus fascipennis</i>	Lentic	1	1																			1
<i>Hydroporus morio</i>	Lentic	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1	1	1
<i>Hydroporus nigellus</i>	Lentic	1		1	1	1	1	1										1	1	1	1	1
<i>Hydroporus notabilis</i>	Lentic			1	1	1	1	1											1	1	1	1
<i>Hydroporus tristis</i>	Lentic	1	1	1	1	1	1	1	1													1
<i>Oreodytes sanmarkii</i>	Lentic	1	1	1	1	1	1	1														1
<i>Agabus arcticus</i>	Lentic			1															1	1	1	1
<i>Agabus clypealis</i>	Lentic			1															1	1	1	1
<i>Agabus confinis</i>	Lentic			1															1	1	1	1
<i>Agabus coxalis</i>	Lentic	1																				1
<i>Agabus discolor</i>	Lentic			1															1	1	1	1
<i>Agabus erichsoni</i>	Lentic	1		1																		1
<i>Agabus opacus</i>	Lentic	1																				1
<i>Agabus thomsoni</i>	Lentic			1															1	1	1	1
<i>Agabus tristis</i>	Lentic			1															1	1	1	1
<i>Ilybius angustior</i>	Lentic	1		1													1		1	1	1	1
<i>Ilybius discedens</i>	Lentic			1															1	1	1	1
<i>Colymbetes dahuricus</i>	Lentic	1		1										1	1	1	1	1				1
<i>Colymbetes dolabratus</i>	Lentic			1															1	1	1	1
<i>Rhantus suturellus</i>	Lentic			1															1	1	1	1
<i>Graphoderus perplexus</i>	Lentic			1																		1
<i>Hydaticus aruspex</i>	Lentic	1		1																		1
<i>Dytiscus circumcinctus</i>	Lentic			1																		1
<i>Dytiscus dauricus</i>	Lentic	1		1	1	1	1	1	1										1	1	1	1

Distribution & species	Habitat	Occurrence																				
		South						Central						North								
		SK	HK	KI	ZE	ST	KU	IT	UR	CH	SI	KE	RA	MA	SA	KH	ON	MK	PA	SS	KA	
Palaearctic																						
<i>Hygrotes inaequalis</i>	Lentic	1	1																			1
<i>Hydroporus ?acutangulus</i>	Lentic	1																				
<i>Hydroporus submuticus</i>	Lentic	1	1	1															1	1	1	1
<i>Hydroporus umbrosus</i>	Lentic	1	1	1															1	1	1	1
<i>Oreodytes alpinus</i>	Lotic	1																				1
<i>Stictotarsus multilineatus</i>	Lentic			1											1	1	1		1	1	1	1
<i>Agabus affinis</i>	Lentic																					1
<i>Agabus biguttulus</i>	Lentic			1																		1
<i>Agabus congener</i>	Lentic	1	1	1				1														
<i>Agabus labiatus</i>	Lentic	1																				
<i>Rhantus notaticollis</i>	Lentic	1	1	1				1											1			1
<i>Rhantus suturalis</i>	Lentic	1	1	1	1			1														
<i>Graphoderus zonabus</i>	Lentic	1	1	1					1													1
<i>Acilius canaliculatus</i>	Lentic	1																				
<i>Acilius sulcatus</i>	Lentic	1																				
East Palearctic																						
<i>Hydroporus bergmani</i>	Lentic																					1
<i>Hydroporus brevisculus</i>	Lentic	1																				
<i>Hydroporus laticollis</i>	Lentic	1																				1
<i>Hydroporus uenoi</i>	Lentic	1	1	1				1														1
<i>Oreodytes okalovi</i>	Lotic	1																				
<i>Agabus aequalis</i>	Lentic	1																				
<i>Agabus balkei</i>	Lentic																					
<i>Agabus costulatus</i>	Lentic			1																		1
<i>Agabus japonicus</i>	Lentic	1	1	1				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Agabus kholini</i>	Lentic	1																				
<i>Ilybius apicalis</i>	Lentic	1	1	1				1	1	1												
<i>Ilybius chishimanus</i>	Lentic	1	1	1				1	1	1												1
<i>Ilybius sp. nr poppiusi</i>	Lentic	1																				

Distribution & species	Habitat	Occurrence												North									
		SK	HK	KI	ZE	ST	KU	IT	UR	CH	SI	KE	RA	MA	SA	KH	ON	MK	PA	SS	KA		
<i>Colymbetes ?tolli</i>	Lentic	1	1																			1	
<i>Dytiscus delictus</i>	Lentic			1																			
Japano-Kurilian																							
<i>Hydroporus saghalienis</i>	?	1	1	1		1	1																
<i>Nebrioporus simplicipes</i>	Lotic	1	1	1		1																	
<i>Agabus matsumotoi</i>	Lotic	1	1																				
<i>Agabus conspicuus</i>	Lentic	1	1	1		1	1	1		1	1												
<i>Platambus pictipennis</i>	Lotic	1	1	1		1																	
<i>Ilybius nakanei</i>	Lotic	1	1	1		1	1																
No. of species		39	25	36	1	3	11	12	7	1	2	3	2	1	3	4	6	4	21	17	38		

Tab. 2: Number and proportion of species of Dytiscidae found in Sakhalin, the Kuril Islands and Kamchatka classified into different faunal elements based on geographic ranges.

Faunal element	Sakhalin		Kuril Islands		Kamchatka		All	
	No. of species	% of species	No. of species	% of species	No. of species	% of species	No. of species	No. of species
Japano-Kurilian	6	15.4	5	13.9	0	0.0	6	6
East Palearctic	9	23.1	6	16.7	7	18.4	15	15
Palearctic	11	28.2	7	19.4	9	23.7	15	15
Holarctic	13	33.3	18	50.0	22	57.9	26	26
Sum	39		36		38		62	62