

Centric diatoms (Coscinodiscophyceae) of fresh and brackish water bodies of the southern part of the Russian Far East

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Abstract

Annotated list of centric diatoms (Coscinodiscophyceae) of fresh and brackish water bodies of the southern Russian Far East, based on the authors' data, supplemented by the published literature, is given. It includes 143 algae species (including varieties and forms – 159 taxa) representing 38 genera, 22 families and 14 orders.

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ABBREVIATIONS

AR – Amur region; JAR – Jewish Autonomous region; KHR – Khabarovsk region; PR – Primorsky region; SR – Sakhalin region; NR- nature reserve; BR- biosphere reserve; NBR- nature biosphere reserve.

INTRODUCTION

Today there is a significant amount of data on modern diatoms of continental water bodies of the Russian Far East. The results of floristic investigations on diatoms in North-East Asia and the American sector of Beringia were summarized by Kharitonov (Kharitonov (Charitonov) 2001, 2005a-c). Algae of the southern part of the Russian Far East have been studied since the beginning of the 20th century. Important contributions to the fresh water diatom studies have been made by Skvortzow B.W., Kisselew I.A., Khakhina A.G., Zhurkina V.V., Kukharenko L.A. (Melnikova), Barinova S.S., Medvedeva L.A. and Nikulina T.V.

We made an attempt to generalize the results of those researchers' work. We also included the algae found in river mouths, brackish lakes and the Amur estuary, into the list, in addition to the freshwater algae. Thus, the comparison of our data with V.G. Kharitonov's observations will let provide an objective overall characterization of the diatom flora of the eastern part of Eurasia.

In the paper we provide an annotated list of centric diatoms (Coscinodiscophyceae) of fresh and brackish water bodies of the southern Russian Far East, based on the authors' data supplemented by the published literature. We plan to publish analogous papers on other diatom taxonomic groups in the future.

The southern part of the Russian Far East includes: Khabarovsk, Primorsky, Amur and Sakhalin (including the Kurile Islands) Regions, and the Jewish Autonomous Region (Fig. 1).

We compiled the taxonomic algae list using the system proposed by F.E. Round and his co-authors, with some modifications (Round et al. 1990). The genus *Alveolophora*, absent in this system, is listed separately. The species names are provided in alphabetical order. We used both domestic and foreign taxonomic keys, as well as published papers to describe the species (Kisselew 1931; Diatom Analysis 1949; Simonsen 1979; Germain 1981; The Diatoms of the USSR... 1988, 1992; The Diatoms of Russia... 2002; Konovalova et al. 1989; Genkal, Kukharenko 1990; Krammer, Lange-Bertalot 1991; Hartley et al. 1996; Genkal et al. 1998; Bukhtiyarova 1999; Genkal, Shchur 2000; Genkal, Korneva 2001; Håkansson 2002; Aboal et al. 2003; Houk, Klee 2004; Ryabushko 2006). Some species have been described according to the on-line

data bases on algae: AlgaeBase, Index Nominum Algarum, MarBEF Data System.

The synonyms used for a species in the reference materials are provided in square brackets, (erroneous names are provided as well). The distribution of each species is derived from the original papers principally (Skvortzow 1929; Kisselew 1931, 1937; Khakhina 1937, 1948; Koptjaeva 1964; Barinova 1986, 1989; Barinova, Medvedeva 1989; Kukhareno et al. 1986; Kukhareno 1989, 1998; Dogadina, Kukhareno 1990; Medvedeva 1999a,b; 2001; 2002; Medvedeva, Sirotsky 2002; Medvedeva, Semenchenko 2003; Medvedeva, Barinova 2004; Medvedeva, Savateev 2007; Nikulina 2002, 2003, 2005, 2006a,b; Motylkova, Konovalova 2003).



Fig. 1. Territory of Russian Far East (black) and districts of it's southern part: 1 – Khabarovskiy Region (KHR.), 2 – Primorsky Region (PR.), 3 – Amur Region (AR.), 4 – Sakhalin Region (including Kurile Islands) (SR.), 5 – Jewish Autonomous Region (JAR.).

Since the full bibliography is very extensive, the specific references are only provided for rare species. Some of the species in our list are drawn from papers focused on fossil diatoms, which also referenced contemporary species. Any algae not identified to the species level by the original authors are not included in the list. We used a number of publications to describe the ecological characteristics of the species (Diatom Analysis 1949; The Diatoms of the USSR... 1988, 1992; The Diatoms of Russia... 2002; Konovalova et al. 1989; Bukhtiyarova 1999; Barinova et al. 2006). Therefore the descriptions are rather diverse. Saprobity and the value of species saprobity indices are based on Barinova et al. (2006). Number of species categorized by region and geographical distribution are shown in Table 1. Ecological characteristics of algae according to their habitats as well as to water salinity and pH value are presented in Table 2.

The following annotated list of centric diatoms of fresh and brackish water bodies of the southern Russian Far East includes 143 algae species (including varieties and forms – 159 taxa) representing 38 genera, 22 families and 14 orders.

ANNOTATED LIST OF ALGAE

Class COSCINODISCOPHYCEAE

Subclass THALASSIOSIROPHYCIDAE

Order THALASSIOSIRALES Glezer & Makarova 1986

Family Thalassiosiraceae Lebour 1930

Genus *Thalassiosira* Cleve 1873

1. *Thalassiosira angulata* (Gregory) Hasle 1978 (The Diatoms of the USSR 1988) [= *Thalassiosira decipiens* (Grunow) Jørgensen].
Ecology. Marine, neritic, oceanic, planktonic, wide-boreal. **Locality.** KHR. Amur estuary.
2. *Thalassiosira anguste-lineata* (A.S.) Fryxell et Hasle 1977 (The Diatoms of the USSR 1988) [= *Coscinodiscus sublineatus* Grunow, *Coscosira polychorda* Gran].
Ecology. Marine and brackish, neritic, oceanic, cold and warm water, wide-boreal. **Locality.** KHR. Amur estuary.
3. *Thalassiosira baltica* (Grunow) Ostfeld 1901 (The Diatoms of the USSR 1988) [= *Thalassiosira baltica* var. *fluviatilis* Lemmermann].
Ecology. Brackish, planktonic, neritic, wide-boreal. **Locality.** KHR. Amur River, Amur estuary.
4. *Thalassiosira bioculata* (Grunow) Ostfeld 1903 (The Diatoms of the USSR 1988).
Ecology. Marine, neritic, arctic-boreal. **Locality.** KHR. Amur estuary.

5. *Thalassiosira bramaputrae* (Ehrenberg) Håkansson et Locker 1981 (The Diatoms of the USSR 1988) [=*Coscinodiscus lacustris* Grunow, *Thalassiosira lacustris* (Grunow) Hasle].

Ecology. Fresh water and brackish, β -mezosaprobic (S=2,0), arctic-boreal. **Locality.** KHR. Amur estuary, lakes of Amur plain, Komsomolsky NR. **SR.** Sakhalin and Kunashir Islands. **PR.** Reservoirs, rivers, Sikhote-Alin NBR, Far Eastern Marine BR*.

6. *Thalassiosira eccentrica* (Ehrenberg) Cleve 1903–1904 (The Diatoms of the USSR 1988) [=*Coscinodiscus excentricus* Ehrenberg, *C. excentricus* var. *fasciculatus* Hustedt].

Ecology. Marine, neritic, planktonic, mezohalobic, indifferent (pH), wide-boreal. **Locality.** KHR. Amur estuary. **PR.** Sikhote-Alin NBR.

7. *Thalassiosira faurii* (Gasse) Hasle 1975 (Genkal, Korneva 2001) [=*Thalassiosira* cf. *hasleae* Cassie et Dempsey].

Ecology. No information. **Locality.** **PR.** Water-cooling reservoir.

8. *Thalassiosira gravida* Cleve 1896 (The Diatoms of the USSR 1988).

Ecology. Marine, oceanic, neritic, planktonic, mezohalobic, indifferent (pH), boreal. **Locality.** KHR. Amur estuary.

9. *Thalassiosira hyperborea* (Grunow) Hasle 1989 (MarBEF Data System) [=*Coscinodiscus lacustris* var. *hyperborea* Grunow, *C. plicatus* Grunow].

Ecology. Fresh water, planktonic, halophilic, arctic-alpine. **Locality.** KHR. Amur estuary.

10. *Thalassiosira kryophila* (Grunow) Jørgensen, 1905 (The Diatoms of the USSR 1988) [=*Thalassiosira cryophila* (Gran) Jørgensen].

Ecology. Marine, neritic, arctic-boreal. **Locality.** KHR. Amur estuary.

Comment. Apparently, there was a misprint in the record of this species (Kiselew 1931).

11. *Thalassiosira leptopus* (Grunow) Hasle et Fryxell 1977 (The Diatoms of the USSR 1988) [=*Coscinodiscus lineatus* Ehrenberg].

Ecology. Marine, oceanic, neritic, mezohalobic, wide common. **Locality.** **PR.** Rivers, Far Eastern Marine BR.

12. *Thalassiosira nordenskiöldii* Cleve 1873 (The Diatoms of the USSR 1988).

Ecology. Marine, neritic, planktonic, arctic-boreal. **Locality.** KHR. Amur estuary.

13. *Thalassiosira pacifica* Gran et Angst 1931 (The Diatoms of the USSR 1988).

Ecology. Marine, neritic, mezohalobic, wide common. **Locality.** **SR.** Sakhalin Island.

14. *Thalassiosira proshkinae* var. *spinulata* (Takano) Makarova 1988 (The Diatoms of the USSR 1988).

Ecology. Brackish, planktonic, halophilic, boreal. **Locality.** **SR.** Sakhalin Island.

15. *Thalassiosira punctigera* (Castracane) Hasle 1983 (The Diatoms of the USSR 1988) [=*Thalassiosira japonica* Kisselew].

Ecology. Marine, neritic, planktonic, mezohalobic, wide-boreal. **Locality.** KHR. Amur estuary. **SR.** Sakhalin Island.

* In our opinion these data are unreliable and occurrence of this species on the territory of the reserve requires verification.

16. *Thalassiosira weissflogii* (Grunow) Fryxell et Hasle 1979 (The Diatoms of the USSR 1988).

Ecology. Fresh water and brackish, planktonic and benthic, halophilic, alkaliphilic, o-saprobic (S=1,0), wide common. **Locality. PR.** Reservoir.

Genus *Porosira* Jørgensen 1905

17. *Porosira glacialis* (Grunow) Jørgensen 1905 (Diatom Analysis 1949).

Ecology. Marine, benthic, mezohalobic, arctic-alpine. **Locality. KHR.** Amur estuary.

Genus *Bacteriosira* Gran 1900

18. *Bacteriosira fragilis* Gran 1900 (The Diatoms of the USSR 1988) [= *Bacteriosira fragilis* Gran, *Coscinodiscus bathyomphalus* Cleve].

Ecology. Marine, neritic, planktonic, mezohalobic, arctic-alpine. **Locality. KHR.** Amur estuary.

Family Skeletonemataceae Lebour 1930 sensu emend.

Genus *Skeletonema* Greville 1865

19. *Skeletonema costatum* (Greville) Cleve 1878 (Bukhtiyarova 1999).

Ecology. Marine, neritic, wide common. **Locality. KHR.** Amur estuary. **SR.** Sakhalin Island.

20. *Skeletonema potamos* (Weber) Hasle 1976 (Bukhtiyarova 1999).

Ecology. Fresh and brackish water, planktonic, indifferent (pH), boreal. **Locality. KHR.** Amur River.

Genus *Detonula* Shütt ex De Toni 1894

21. *Detonula confervacea* (Cleve) Gran 1900 (Konovalova et al. 1989).

Ecology. Brackish, neritic, wide common. **Locality. KHR.** Amur estuary.

Family Stephanodiscaceae Glezer & Makarova 1986

Genus *Cyclotella* (Kützing) Brébisson 1838

22. *Cyclotella antiqua* W. Smith 1853 (Krammer and Lange-Bertalot 1991).

Ecology. Fresh water, planktonic, halophobic, acidophilic, arctic-alpine. **Locality. KHR.** Amur River, Komsomolsky NR.

23. *Cyclotella asterocostata* Lin, Xie et Cai 1985 (Genkal et al. 1998).

Ecology. No information. **Locality. PR.** Water-cooling reservoir.

24. *Cyclotella atomus* Hustedt 1937 (Krammer and Lange-Bertalot 1991).

Ecology. Fresh water, planktonic and benthic, halophilic, o-saprobic (S=1,0), wide common. **Locality. KHR.** Amur River. **PR.** Khanka Lake.

25. *Cyclotella caspia* Grunow 1878 (The Diatoms of the USSR 1992).

Ecology. Marine and brackish, planktonic. **Locality. SR.** Sakhalin Island.

26. *Cyclotella* cf. *comensis* Grunow 1882 (The Diatoms of the USSR 1992).

Ecology. Fresh water, planktonic, indifferent (halobity), indifferent (pH), o-β-mezosaprobic (S=1,5), alpine. **Locality. PR.** Khanka Lake.

27. *Cyclotella distinguenda* var. *distinguenda* Hustedt 1927 (Krammer and Lange-Bertalot 1991) [=*Cyclotella operculata* (Agardh) Gomont].

Ecology. Fresh water, planktonic, halophilic, alkaliphilic, o-saprobic (S=1,2), boreal. **Locality.** AR. Khingansky NR. **KHR.** Amur River, Komsomolsky NR. **SR.** Kunashir and Paramushir Islands. **PR.** Reservoirs, rivers, Ussuriisky NR, Sikhote-Alin NBR, Far Eastern Marine BR*.

var. *mesoleia* (Grunow) Håkansson 1989 (Krammer and Lange-Bertalot 1991).

Ecology. Fresh water, planktonic, halophilic, alkaliphilic, boreal. **Locality.** **PR.** Reservoir, lakes, river.

var. *unipunctata* (Hustedt) Håkansson et Carter 1990 (Krammer and Lange-Bertalot 1991).

Ecology. Fresh water, planktonic, halophilic, alkaliphilic, boreal. **Locality.** **KHR.** Komsomolsky NR. **PR.** Reservoir, river.

28. *Cyclotella meduanae* Germain 1981 (Germain 1981).

Ecology. No information. **Locality.** **PR.** Khanka Lake.

29. *Cyclotella meneghiniana* Kützing 1844 (Krammer and Lange-Bertalot 1991) [=*Cyclotella meneghiniana* Kützing var. *hankensis* Skvortzow, *C. kuetzingiana* Thwaites var. *kuetzingiana*, *C. kuetzingiana* var. *hankensis* Skvortzow].

Ecology. Fresh water, planktonic and benthic, halophilic, alkaliphilic, o- α -mezosaprobic (S=1,8), wide common. **Locality.** **KHR.** Amur River, Amur estuary, lakes of Amur plain, rivers, Bureinsky NR. **SR.** Sakhalin, Onkotan, Moneron Islands. **PR.** Reservoirs, Khanka Lake and other lakes, rivers, Ussuriisky NR, Sikhote-Alin NBR, NBR "Kedrovaya Pad", Far Eastern Marine BR.

Comment. The taxonomic position *Cyclotella meneghiniana* var. *tenera* Kolbe reported from the water reservoir is unclear (Barinova and Kukharensko 1981).

30. *Cyclotella ocellata* Pantocsek 1901 (Krammer and Lange-Bertalot 1991).

Ecology. Fresh water, planktonic and benthic, indifferent (halobity), indifferent (pH), o-saprobic (S=1,0), wide common. **Locality.** **PR.** Khanka Lake, river.

31. *Cyclotella rossii* Håkansson, 1990 (Krammer and Lange-Bertalot 1991) [=*Cyclotella comta* var. *oligactis* (Ehrenberg) Grunow, *C. kuetzingiana* var. *radiosa* Fricke].

Ecology. Fresh water, planktonic, o- β -mezosaprobic (S=1,5). **Locality.** **PR.** Reservoir, Sikhote-Alin NBR.

32. *Cyclotella striata* (Kützing) Grunow 1880 (Krammer and Lange-Bertalot 1991) [=*Cyclotella striata* var. *bipunctata* Fricke].

Ecology. Marine and brackish, boreal. **Locality.** **KHR.** Amur estuary.

Genus *Cyclostephanos* Round ex Round in Theriot, Hakansson, Kociolek, Round and Stoermer 1988 (1987)

33. *Cyclostephanos dubius* (Fricke) Round 1982 (Krammer and Lange-Bertalot 1991) [=*Stephanodiscus dubius* (Fricke) Hustedt].

Ecology. Fresh water, planktonic, o- β -mezosaprobic (S=1,4). **Locality.** KHR. Amur River, Amur estuary, lakes of Amur plain, river, Komsomolsky NR. **SR.** Kunashir Island. **PR.** Khanka Lake.

Genus *Cyclotubicoalitus* Stoermer, Kociolek et Cody 1990

34. *Cyclotubicoalitus undatus* Stoermer, Kociolek et Cody 1990 (Genkal et al. 1998).

Ecology. No information. **Locality.** **PR.** Water-cooling reservoir.

Genus *Discostella* Houk et Klee 2004

35. *Discostella pseudostelligera* (Hustedt) Houk et Klee 2004 (Houk and Klee 2004) [= *Cyclotella pseudostelligera* Hustedt].

Ecology. Fresh water, planktonic, indifferent (halobity), indifferent (pH), o- β -mezosaprobic (S=1,4). **Locality.** **PR.** Khanka Lake.

36. *Discostella stelligera* (Cleve et Grunow) Houk et Klee 2004 (Houk and Klee 2004) [= *Cyclotella stelligera* Cleve et Grunow].

Ecology. Fresh water, planktonic and benthic, indifferent (halobity), indifferent (pH), χ -saprobic (S=0,1), wide common. **Locality.** **AR.** Khingansky NR. **KHR.** Amur River, Amur estuary, lakes of Amur plain, Komsomolsky NR, Bolshekhkhechtsirsky NR. **SR.** Sakhalin, Kunashir, Moneron Islands. **PR.** Reservoirs, Khanka Lake and other lakes, rivers, Ussuriysky NR, Sikhote-Alin NBR, Far Eastern Marine BR*.

Genus *Puncticulata* Håkansson 2002

37. *Puncticulata radiosa* (Lemmermann) Håkansson 2002 (Håkansson 2002) [= *Cyclotella comta* var. *radiosa* Grunow, *C. radiosa* (Grunow) Lemmermann].

Ecology. Fresh water, planktonic, indifferent (halobity), alkalibiontic, o- β -mezosaprobic (S=1,5), wide common. **Locality.** **KHR.** Amur River, Amur estuary, river, Komsomolsky NR, Bolshekhkhechtsirsky NR. **SR.** Sakhalin Island. **PR.** Reservoir, Khanka Lake, Sikhote-Alin NBR.

Genus *Stephanodiscus* Ehrenberg 1846

38. *Stephanodiscus alpinus* Hustedt 1942 (Krammer and Lange-Bertalot 1991).

Ecology. Fresh water, planktonic, cold water, wide common. **Locality.** **SR.** Onkotan and Moneron Islands.

39. *Stephanodiscus delicatus* Genkal 1985 (The Diatoms of the USSR 1992).

Ecology. Fresh water, planktonic. **Locality.** **KHR.** Amur River.

40. *Stephanodiscus hankensis* Genkal et Schur 2000 (Genkal and Schur 2000).

Ecology. No information. **Locality.** **PR.** Khanka Lake.

41. *Stephanodiscus hantzschii* Grunow 1880 (Krammer and Lange-Bertalot 1991).

Ecology. Fresh water, planktonic, indifferent (halobity), alkaliphilic, α - β -mezosaprobic, wide common. **Locality.** **AR.** Khingansky NR. **KHR.** Amur River, Amur estuary, lakes of Amur plain,

river, Komsomolsky NR. **SR.** Kunashir Island. **PR.** Reservoirs, Khanka Lake, Sikhote-Alin NBR, Far Eastern Marine BR*.

42. *Stephanodiscus invisitatus* var. *invisitatus* Hohn et Hellermann 1963 (The Diatoms of the USSR 1992).

Ecology. Fresh water, planktonic, o-β-mezosaprobic (S=1,5). **Locality. PR.** Khanka Lake.

var. *hakanssoniae* Genkal et Kiss 1991 (Genkal and Schur 2000).

Ecology. Fresh water. **Locality. PR.** Khanka Lake.

43. *Stephanodiscus makarovae* Genkal 1978 (The Diatoms of the USSR 1992).

Ecology. Fresh water, planktonic. **Locality. KHR.** Amur River.

44. *Stephanodiscus minutulus* (Kützing) Cleve et Möller 1878 (Krammer and Lange-Bertalot 1991) [=*Stephanodiscus astraea* var. *minutulus* (Kützing) Grunow, *S. astraea* var. *minutula* (Kützing) Grunow, *S. astraea* var. *minitula* (Kützing) Grunow, *S. astreae* var. *minutula* Grunow, *S. minuta* (Kützing) Round].

Ecology. Fresh water, planktonic, indifferent (halobity), alkaliphilic, o-β-mezosaprobic (S=1,4), wide common. **Locality. KHR.** Amur River, Amur estuary, Komsomolsky NR. **SR.** Kunashir Island. **PR.** Khanka Lake.

45. *Stephanodiscus triporus* Genkal et Kuzmin 1978 (The Diatoms of the USSR 1992).

Ecology. Fresh water, planktonic. **Locality. KHR.** Amur River. **PR.** Khanka Lake.

Subclass COSCINODISCOPHYCIDAE

Order MELOSIRALES Crawford 1990

Family Melosiraceae Kutzing 1844 sensu emend.

Genus *Melosira* Agardh 1827

46. *Melosira arctica* (Ehrenberg) Dickie in Pritchard 1861 (The Diatoms of the USSR 1992).

Ecology. Marine, neritic, arctic-boreal. **Locality. SR.** Sakhalin Island.

47. *Melosira dickiei* (Thwaites) Kützing 1849 (Krammer and Lange-Bertalot 1991).

Ecology. Fresh water, planktonic and benthic, indifferent (halobity), indifferent (pH). **Locality. KHR.** Amur estuary.

48. *Melosira lineata* var. *lineata* (Dillwyn) Agardh 1824 (Krammer and Lange-Bertalot 1991) [=*Melosira juergensii* Agardh, *M. jurgensii* Agardh].

Ecology. Marine and brackish, benthic. **Locality. KHR.** Amur River, Amur estuary, lake of Amur plain, Komsomolsky NR. **PR.** Reservoir, river, Ussuriysky NR, Sikhote-Alin NBR, NBR “Kedrovaya Pad”, Far Eastern Marine BR*, Lazovsky NR.

var. *subangularis* (Grunow in van Heurck) M. Aboal 2003 (Aboal et al. 2003) [=*Melosira juergensii* var. *subangularis* Grunow].

Ecology. Marine and brackish, benthic. **Locality. PR.** Sikhote-Alin NBR.

49. *Melosira moniliformis* var. *moniliformis* (O. Müller) Agardh 1824 (The Diatoms of the USSR 1992).

Ecology. Marine and brackish, planktonic and benthic, wide common. **Locality.** **KHR.** Botchinsky NR. **SR.** Sakhalin Island. **PR.** Lake, Sikhote-Alin NBR, Far Eastern Marine BR*.

var. octogona Grunow 1878 (The Diatoms of the USSR 1992).

Ecology. Marine and brackish, planktonic and benthic, halophilic. **Locality.** **PR.** Sikhote-Alin NBR.

var. subglobosa Grunow 1878 (The Diatoms of the USSR 1992).

Ecology. Marine and brackish, planktonic and benthic, halophilic, wide common. **Locality.** **PR.** Sikhote-Alin NBR.

50. Melosira nummuloides (Dillwyn) Agardh 1824 (The Diatoms of the USSR 1992).

Ecology. Marine, benthic. **Locality.** **KHR.** Amur estuary. **SR.** Sakhalin Island.

51. Melosira undulata (Ehrenberg) Kützing 1844 (The Diatoms of the USSR 1992).

Ecology. Fresh water, benthic, indifferent (halobity), indifferent (pH), wide common. **Locality.** **KHR.** Amur estuary.

52. Melosira varians Agardh 1817 (The Diatoms of the USSR 1992).

Ecology. Fresh water, planktonic and benthic, halophilic, alkaliphilic, α - β -mezosaprobic (S=2,7), wide common. **Locality.** **AR.** River, Khingansky NR. **KHR.** Amur River, Amur estuary, lakes of Amur plain, rivers, Komsomolsky NR, Bolshekhokhtsirsky NR, Bureinsky NR.

JAR. NR "Bastak". **SR.** Sakhalin, Moneron, Paramushir, Shumshu and Shiashkotan Islands. **PR.** Reservoirs, Khanka Lake and other lakes, rivers, Ussuriysky NR, NBR "Kedrovaya Pad", Sikhote-Alin NBR, Lazovsky NR, Far Eastern Marine BR.

Family Stephanopyxidaceae Nikolaev 1990

Genus *Stephanopyxis* (Ehrenberg) Ehrenberg 1845

53. Stephanopyxis ferox (Greville) Ralfs 1861 (Diatom Analysis 1949).

Ecology. No information. **Locality.** **SR.** Sakhalin Island.

Comment. The author indicates the species as a resuspended form (Koptjaeva 1964). It is characterized as an extinct species (Diatom Analysis 1949).

Family Hyalodiscaceae Crawford 1990

Genus *Hyalodiscus* Ehrenberg 1845

54. Hyalodiscus ambiguus (Grunow) Tempère et Peragallo 1890 (Ryabushko 2006).

Ecology. Marine, planktonic and benthic. **Locality.** **KHR.** Amur estuary.

55. Hyalodiscus scoticus (Kützing) Grunow 1879 (The Diatoms of Russia 2002).

Ecology. Marine and brackish, planktonic and benthic, wide common. **Locality.** **KHR.** Amur estuary.

56. Hyalodiscus subtilis Bailey 1854 (The Diatoms of Russia 2002).

Ecology. Marine, wide common. **Locality.** **KHR.** Amur estuary.

Genus *Podosira* Ehrenberg 1840

57. *Podosira corolla* A. Schmidt 1889 (Diatom Analysis 1949) [= *Coscinodiscus corolla* A. Schmidt].

Ecology. No information. **Locality.** KHR. Amur estuary.

Comment. I.A. Kisselew lists the species with a question mark. It is characterized as an extinct species (Diatom Analysis 1949).

Order PARALIALES Crawford 1990

Family Paraliaceae Crawford 1988

Genus *Paralia* Heiberg 1863

58. *Paralia sulcata* (Ehrenberg) Cleve 1873 (The Diatoms of the USSR 1992) [= *Melosira sulcata* (Ehrenberg) Kützing, *M. sulcata* f. *coronata* Grunow, *M. sulcata* f. *radiata* Grunow].

Ecology. Brackish, planktonic, mezohalobic, boreal. **Locality.** KHR. Amur estuary. SR. Sakhalin Island.

Genus *Ellerbeckia* Crawford 1988

59. *Ellerbeckia arenaria* (Moore ex Ralfs) Crawford 1988 (The Diatoms of the USSR 1992) [= *Melosira arenaria* Moore, *Paralia arenaria* (Moore) Moisseeva].

Ecology. Fresh water, planktonic and benthic, indifferent (halobity), alkaliphilic, o- α -mezosaprobic (S=1,9), wide common. **Locality.** PR. Reservoir.

Order AULACOSEIRALES Crawford 1990

Family Aulacoseiraceae Crawford 1990

Genus *Aulacoseira* Thwaites 1848

60. *Aulacoseira alpigena* (Grunow) Krammer 1990 (Krammer and Lange-Bertalot 1991) [= *Melosira distans* (Ehrenberg) Kützing subsp. *alpigena* (Grunow) Skabitschewsky, *M. distans* var. *alpigena* Grunow, *Aulacoseira distans* var. *alpigena* (Grunow) Simonsen].

Ecology. Fresh water, planktonic, indifferent (halobity), indifferent (pH), o-saprobic, wide common. **Locality.** KHR. Amur River, Amur estuary, river. JAR. NR "Bastak". SR. Sakhalin Island. PR. Reservoir, lake, rivers, Ussuriisky NR, Sikhote-Alin NBR, NBR "Kedrovaya Pad".

61. *Aulacoseira ambigua* (Grunow) Simonsen 1979 (Krammer and Lange-Bertalot 1991) [= *Melosira ambigua* (Grunow) O. Müller, *Aulacosira ambigua* (Grunow) Simonsen]

Ecology. Fresh water, planktonic, indifferent (halobity), alkaliphilic, α - β -mezosaprobic (S=2,6), wide common. **Locality.** AR. Khingansky NR. KHR. Amur River, lakes of Amur plain, rivers, Bolshekhkhtsirsky NR, Komsomolsky NR. SR. Sakhalin and Moneron Island. PR. Reservoirs, Khanka Lake, rivers, Sikhote-Alin NBR, Far Eastern Marine BR*.

Comment. The taxonomic position of *Melosira ambigua* f. *curvata* Skabitschewsky and *M. ambigua* f. *spiroides* Chalfina reported from the Amur River (Chalfina 1966, Kukharensko and Naumenko 1990) is unclear.

62. *Aulacoseira argus* (O. Müller) Simonsen 1979 (Simonsen 1979) [= *Melosira irregularis* O. Müller].

Ecology. Fresh water, acidophilic. **Locality. PR.** Khanka Lake and other lakes.

Comment. In B.V. Skvortzow's paper, only *Melosira irregularis* O. Müller var. *hankensis* Skvortzow with unclear taxonomic position is reported from Khanka Lake (Skvortzow 1929). This variety was reported from Khasan Lake along with the typical form (Zhurkina and Kukhareno 1974). The indication of the typical form for Khanka Lake in the paper by L.A. Kukhareno (Kukhareno 1989) is most likely an inaccurate citation of B.V. Skvortzow's data.

63. *Aulacoseira cataractarum* (Hustedt) Simonsen 1979 (The Diatoms of the USSR 1992) [= *Melosira cataractarum* Hustedt].

Ecology. Fresh water, indifferent (halobity), arctic-alpine. **Locality. PR.** Lake, river (Zhurkina and Kukhareno 1974, Kukhareno 1989).

Comment. Occurrence of this species requires verification.

64. *Aulacoseira distans* (Ehrenberg) Simonsen 1979 (Krammer and Lange-Bertalot 1991) [= *Melosira distans* (Ehrenberg) Kützing].

Ecology. Fresh water, planktonic and benthic, cold water, indifferent (halobity), acidophilic, χ -osaprobic, boreal. **Locality. AR.** Khingansky NR. **KHR.** Amur River, Amur estuary, lakes of Amur plain, rivers, Komsomolsky NR, Bureinsky NR. **JAR.** NR "Bastak". **SR.** Sakhalin, Kunashir and Moneron Islands. **PR.** Reservoirs, Khanka Lake and other lakes, rivers, Sikhote-Alin NBR, NBR "Kedrovaya Pad", Ussuriisky NR, Far Eastern Marine BR*.

Comment. One of the authors (Genkal S. I.) specially studied multiple populations of low frustule species of the genus *Aulacoseira* from the water bodies of different types and geographical locations. *A. distans* was not found in Russia yet and it is most probably that forms under this name from the Far Eastern water bodies belong to another similar species – low frustule *A. subarctica* (Genkal 1999, Genkal and Trifonova 2002).

65. *Aulacoseira granulata* var. *granulata* f. *granulata* (Ehrenberg) Simonsen 1979 (The Diatoms of the USSR 1992) [= *Melosira granulata* (Ehrenberg) Ralfs, *M. granulata* subsp. *granulata* (Ehrenberg) Ralfs, *M. granulata* subsp. *mutabilis* O. Müller, *M. granulata* var. *mutabilis* O. Müller, *M. granulata* subsp. *angustissima* (O. Müller) Skabitschewsky, *M. granulata* var. *angustissima* (O. Müller) Hustedt].

Ecology. Fresh water, planktonic and benthic, indifferent (halobity), indifferent (pH), β - α -mezosaprobic (S=2,4), wide common. **Locality. AR.** Khingansky NR. **KHR.** Amur River, Amur estuary, lakes of Amur plain, rivers, Bureinsky NR, Komsomolsky NR, Bolshehekhtsirsky NR. **SR.** Sakhalin, Moneron, Iturup and Kunashir Islands. **PR.** Reservoirs, Khanka Lake and other lakes, rivers, Ussuriisky NR, Sikhote-Alin NBR, Lazovsky NR, NBR "Kedrovaya Pad", Far Eastern Marine BR*.

var. *granulata* f. *curvata* (Hustedt) Davidova et Moisseeva 1992 (The Diatoms of the USSR 1992) [= *Melosira granulata* var. *curvata* Grunow, *M. granulata* f. *curvata* (Grunow) Hustedt, *M. granulata* var. *angustissima* f. *curvata* (Grunow) Hustedt, *M. granulata* var. *angustissima* f. *spiralis* O. Müller, *Aulacosira granulata* f. *curvata* (Grunow) Hustedt, *A. granulata* f. *curvata* (Grunow) Simonsen, *Aulacoseira granulata* Morphotyp *curvata* (Hustedt) Davidova].

Ecology. Similar to the characteristic of the type form. **Locality.** **KHR.** Amur River, Amur estuary, lakes of Amur plain, Komsomolsky NR. **PR.** Reservoirs, Khanka Lake, NBR “Kedrovaya Pad”.

66. *Aulacoseira islandica* f. *islandica* (O. Müller) Simonsen 1979 (The Diatoms of the USSR 1992) [=*Melosira islandica* O. Müller, *M. islandica* subsp. *helvetica* O. Müller, *M. islandica* var. *helvetica* (O. Müller) Topatschewski, *Aulacosira islandica* (O. Müller) Simonsen, *A. islandica* Morphotyp *helvetica* O. Müller, *A. islandica* subsp. *helvetica* O. Müller].

Ecology. Fresh water, planktonic, cold water, indifferent (halobity), alkaliphilic, o- χ -saprobic (S=0,6), boreal. **Locality.** **KHR.** Amur River, Amur estuary, lake of Amur plain. **SR.** Sakhalin, Moneron and Kunashir Islands. **PR.** Reservoirs, Khanka Lake and other lakes, rivers, Sikhote-Alin NBR, Ussuriisky NR, Lazovsky NR, Far Eastern Marine BR*.

Comment. The taxonomic position of *Melosira islandica* f. *recta* O. Müller indicated for Chlya Lake by Skvortzow (1917) is unclear; *Melosira islandica* f. *recta*, status β O. Müller was reported from Khanka Lake (Skvortzow 1929) and *M. islandica* ssp. *helvetica* f. *tenuis* O. Müller was reported from the Amur River (Skvortzow 1931).

f. *curvata* (O. Müller) Simonsen 1979 (The Diatoms of the USSR 1992) [*Melosira islandica* f. *curvata* O. Müller].

Ecology. Similar to the characteristic of the type form. **Locality.** **KHR.** Amur River.

67. *Aulacoseira italica* var. *italica* f. *italica* (Ehrenberg) Simonsen 1979 (The Diatoms of the USSR 1992) [=*Melosira italica* (Ehrenberg) Kützing, *M. italica* var. *tenuissima* (Grunow) O. Müller, *Aulacosira italica* (Ehrenberg) Simonsen].

Ecology. Fresh water, planktonic and benthic, indifferent (halobity), indifferent (pH), β -o-saprobic (S=1,9), wide common. **Locality.** **AR.** Khingansky NR. **KHR.** Amur River, Amur estuary, lakes of Amur plain, rivers, Komsomolsky NR, Bolshekhkhechtsirsky NR. **JAR.** NR “Bastak. **SR.** Sakhalin, Moneron and Kunashir Islands. **PR.** Reservoirs, Khanka Lake and other lakes, rivers, Sikhote-Alin NBR, Ussuriisky NR, Lazovsky NR, NBR “Kedrovaya Pad”, Far Eastern Marine BR*.

Comment. The taxonomic position of *Melosira italica* var. *hankensis* Skvortzow reported from Khanka Lake (Skvortzow 1929) is unclear, as well as the one of *Melosira italica* subsp. *sulcata* Grunow and *Melosira italica* f. *spiralis* registered in the Amur estuary (Kisselew 1937).

var. *italica* f. *curvata* (Pantocsek) Davidova 1992 (The Diatoms of the USSR 1992) [=*Melosira italica* f. *curvata* Pantocsek, *Aulacosira italica* f. *curvata* (Ehrenberg) Simonsen, *A. italica* var. *italica* f. *curta* Pantocsek].

Ecology. Fresh water, planktonic, indifferent (halobity), acidophilic, boreal. **Locality.** **KHR.** Amur River, Amur estuary, lakes of Amur plain. **PR.** River, Ussuriisky NR.

68. *Aulacoseira lacustris* (Grunow) Krammer 1990 (Krammer and Lange-Bertalot 1991) [=*Aulacoseira distans* var. *lirata* f. *lacustris* (Grunow) Simonsen].

Ecology. Fresh water, β -mezosaprobic, (S=2,3). **Locality.** **KHR.** Komsomolsky NR.

69. *Aulacoseira lirata* (Ehrenberg) Ross 1986 (Krammer and Lange-Bertalot 1991) [=*Melosira distans* var. *lirata* (Ehrenberg) Bethge, *Aulacoseira distans* var. *lirata* (Ehrenberg) Simonsen f. *lirata*].

Ecology. Fresh water, planktonic, acidophilic, β - α -mezosaprobic, (S=2,5), boreal. **Locality.** **KHR.** Amur estuary, Komsomolsky NR.

70. *Aulacoseira subarctica* (O. Müller) Haworth 1988 (Krammer and Lange-Bertalot 1991) [= *Melosira italica* subsp. *subarctica* Müller, *M. italica* subsp. *subarctica* f. *curvata* Hust., *M. italica* subsp. *subarctica* f. *spiralis* Hust., *M. italica* subsp. *subarctica* f. *spiroides* Hust., *Aulacoseira italica* subsp. *subarctica* (O. Müller) Simonsen].

Ecology. Fresh water, planktonic, indifferent (halobity), alkalibiontic, o- β -mezosaprobic, (S=1,3), alpine. **Locality.** KHR. Amur River, Amur estuary, lakes of Amur plain. **PR.** Khanka Lake.

71. *Aulacoseira valida* (Grunow) Krammer 1990 (Krammer and Lange-Bertalot 1991) [= *Melosira italica* (Ehrenberg) Kützing var. *valida* (Grunow) Hustedt, *Aulacoseira italica* var. *valida* (Grunow) Simonsen, *A. italica* var. *valida* (Grunow) Simonsen].

Ecology. Fresh water, planktonic, indifferent (halobity), alkalibiontic, arctic-alpine. **Locality.** KHR. Amur estuary, lakes of Amur plain, Komsomolsky NR. **SR.** Sakhalin, Iturup and Paramushir Islands. **PR.** Reservoirs, river, NBR “Kedrovaya Pad”.

Order ORTHOSEIRALES Crawford 1990

Family Orthoseiraceae Crawford 1990

Genus *Orthoseira* Twaites 1848

72. *Orthoseira roeseana* (Rabenhorst) O'Meara 1876 (Krammer and Lange-Bertalot 1991) [= *Melosira roeseana* Rabenhorst, *M. roeseana* var. *epidendron* Grunow, *Aulacosira epidendron* (Ehrenberg) Crawford].

Ecology. Fresh water, benthic, indifferent (halobity), alkaliphilic, o-saprobic (S=1,3), boreal.

Locality. KHR. Komsomolsky NR. **JAR.** NR “Bastak”. **PR.** River, swamp.

Comment. B.V. Skvortzow also reported var. *asiatica* Skvortzow and var. *epidendron* Grunow (Skvortzow 1938) along with the type variety. The taxonomic position of *Melosira roeseana* var. *asiatica* Skvortzow is unclear.

Order COSCINODISCALES Round & Crawford 1990

Family Coscinodiscaceae Kützing 1844

Genus *Coscinodiscus* Ehrenberg 1844

73. *Coscinodiscus apiculatus* var. *ambiguus* Grunow 1884 (The Diatoms of Russia 2002) [= *Coscinodiscus apiculatus* Ehrenberg var. *ambigua* Grunow].

Ecology. Marine, neritic. **Locality.** KHR. Amur estuary.

74. *Coscinodiscus centralis* Ehrenberg 1839 (The Diatoms of Russia 2002).

Ecology. Marine, planktonic, wide common. **Locality.** KHR. Amur estuary.

75. *Coscinodiscus concinnus* W. Smith 1856 (The Diatoms of Russia 2002).

Ecology. Marine, neritic, wide common. **Locality.** KHR. Amur estuary. **SR.** Sakhalin Island.

76. *Coscinodiscus curvatulus* var. *curvatulus* Grunow 1878 (Diatom Analysis 1949).

Ecology. Marine, benthic. **Locality.** KHR. Amur estuary.

var. *minor* (Ehrenberg) Grunow 1884 (Diatom Analysis 1949).

Ecology. No information. **Locality.** KHR. Amur estuary.

Comment. It is characterized as fossil form (Diatom Analysis 1949).

- 77. *Coscinodiscus decrescens* Grunow 1884** (The Diatoms of Russia 2002).
Ecology. Marine, neritic. **Locality.** PR. Ussuriisky NR.
Comment. Apparently, the valve got into the sample by accident. Perhaps, the species is erroneously identified.
- 78. *Coscinodiscus denarius* A. Schmidt 1878** (The Diatoms of Russia 2002).
Ecology. Marine. **Locality.** KHR. Amur estuary.
- 79. *Coscinodiscus divisus* Grunow 1878** (Diatom Analysis 1949).
Ecology. Marine, planktonic, halophilic, boreal. **Locality.** KHR. Amur estuary.
- 80. *Coscinodiscus janischii* A. Schmidt 1874** (The Diatoms of Russia 2002).
Ecology. Marine. **Locality.** KHR. Amur estuary.
- 81. *Coscinodiscus jonesianus* (Greville) Ostenfeld 1915** (The Diatoms of Russia 2002) [= *Coscinodiscus jonesianus* var. *commutata* (Grunow) Hustedt].
Ecology. Marine and brackish, neritic, warm water. **Locality.** KHR. Amur estuary. SR. Sakhalin Island.
- 82. *Coscinodiscus marginatus* Ehrenberg 1841** (The Diatoms of Russia 2002).
Ecology. Marine, oceanic, neritic, cold water, wide common. **Locality.** KHR. Amur estuary.
- 83. *Coscinodiscus obscurus* A. Schmidt 1878** (The Diatoms of Russia 2002).
Ecology. Marine, oceanic, boreal. **Locality.** KHR. Amur estuary.
- 84. *Coscinodiscus oculus iridis* var. *oculus iridis* Ehrenberg 1839** (The Diatoms of Russia 2002).
Ecology. Marine, oceanic, wide common. **Locality.** KHR. Amur estuary.
- var. *borealis* (Bailey) Cleve 1883** (The Diatoms of Russia 2002).
Ecology. Marine. **Locality.** KHR. Amur estuary. SR. Sakhalin Island.
- 85. *Coscinodiscus radiatus* Ehrenberg 1841** (The Diatoms of Russia 2002).
Ecology. Marine, oceanic, neritic, wide common. **Locality.** KHR. Amur estuary.

Family Hemidiscaceae Hendey 1937 emend Simonsen 1975

Genus *Actinocyclus* Ehrenberg 1837

- 86. *Actinocyclus curvatulus* Janisch 1878** (Diatom Analysis 1949).
Ecology. Marine. **Locality.** KHR. Amur estuary.
- 87. *Actinocyclus divisus* I. Kisselew 1931** (Diatom Analysis 1949).
Ecology. Marine, planktonic, mezohalobic. **Locality.** KHR. Amur estuary.
- 88. *Actinocyclus kützingii* (A. Schmidt) Simonsen 1975** (MarBEF Data System) [= *Coscinodiscus kützingii* A. Schmidt].
Ecology. Marine, neritic. **Locality.** KHR. Amur estuary.
- 89. *Actinocyclus normanii* f. *subsala* (Juhlin-Dannfelt) Hustedt 1957** (MarBEF Data System) [= *Coscinodiscus rothii* var. *subsalsa* (Juhlin-Dannfelt) Hustedt].
Ecology. Marine and brackish, planktonic. **Locality.** KHR. Amur estuary.
- 90. *Actinocyclus octonarius* var. *octonarius* Ehrenberg 1838** (Ryabushko 2006) [= *Actinocyclus ehrenbergii* Ralfs].
Ecology. Mezohalobic, alkaliphilic, wide common. **Locality.** KHR. Amur estuary. SR. Sakhalin Island. PR. Sikhote-Alin NBR.

var. *ralfsii* (W. Smith) Hendey 1954 (Ryabushko 2006) [= *Actinocyclus ehrenbergii* var. *ralfsii* (W. Smith) Hustedt].

Ecology. Mezohalobic, wide common. **Locality.** SR. Sakhalin Island.

Comment. The species name of this alga is indicated with a question mark (Koptjaeva 1964).

Family Heliopeltaceae H. L. Smith 1872

Genus *Actinoptvchus* Ehrenberg 1843

91. *Actinoptvchus orientalis* I. Kisselew 1931 (Diatom Analysis 1949).

Ecology. Marine. **Locality.** KHR. Amur estuary.

92. *Actinoptvchus senarius* (Ehrenberg) Ehrenberg 1843 (Hartley et al. 1996) [= *Actinoptvchus undulatus* (Bailey) Ralfs].

Ecology. Marine, neritic. **Locality.** KHR. Amur estuary. SR. Sakhalin Island.

Comment. The taxonomic position of *Actinoptvchus undulatus* var. *tamanica* Jousé reported from Sakhalin Island (Nikulina 2005) is unclear.

93. *Actinoptvchus splendens* (Schadbolt) Ralfs 1861 (Diatom Analysis 1949).

Ecology. Marine, benthic. **Locality.** KHR. Amur estuary.

Order ARACHNOIDISCALES Round 1990

Family Arachnoidiscaceae Round 1990

Genus *Arachnoidiscus* Deane ex Pritchard 1852

94. *Arachnoidiscus ehrenbergii* Bailey 1849 (Konovalova et al. 1989).

Ecology. Marine, benthic. **Locality.** KHR. Amur estuary. PR. Sikhote-Alin NBR.

Subclass BIDDULPHIOPHYCIDAE

Order TRICERATIALES Round & Crawford 1990

Family Triceratiaceae (Schutt) Lemmermann 1899

Genus *Triceratium* Ehrenberg 1839

95. *Triceratium coelatum* Janisch 1875 (Diatom Analysis 1949).

Ecology. Marine. **Locality.** KHR. Amur estuary.

96. *Triceratium repletum* var. *balearica* Grunow 1883 (Diatom Analysis 1949).

Ecology. Marine. **Locality.** KHR. Amur estuary.

Comment. I.A. Kisselew treats this alga as a species with unclear taxonomic position (Diatom Analysis 1949).

Genus *Odontella* Agardth 1832

97. *Odontella aurita* (Lyngbye) Agardth 1832 (Hartley et al. 1996) [= *Biddulphia aurita* (Lyngbye) Brébisson et Godey].

Ecology. Marine and brackish, benthic. **Locality.** KHR. Amur estuary. SR. Sakhalin Island.

Comment. The taxonomic position of the alga indicated under the names *Biddulphia aurita* var. *polyspina* I. Kisselew (Kisselew 1931) and *Odontella aurita* (Lyngbye) Agardth var. *polyspina* I. Kisselew (Nikulina 2006a) is unclear.

98. *Odontella granulata* (Roper) R. Ross 1986 (Hartley et al. 1996)
[=*Biddulphia granulata* Roper].

Ecology. Marine and brackish, benthic. **Locality.** KHR. Amur estuary.

99. *Odontella reticulata* (Roper) De Toni 1894 (Index Nominum Algarum)
[=*Biddulphia reticulata* Roper].

Ecology. Marine. **Locality.** KHR. Amur estuary.

Genus *Cerataulus* Ehrenberg 1843

100. *Cerataulus turgidus* (Ehrenberg) Ehrenberg 1843 (Hartley et al. 1996).

Ecology. Marine, benthic. **Locality.** KHR. Amur estuary.

Order BIDDULPHIALES Krieger 1954

Family Biddulphiaceae Kutzing 1844

Genus *Isthmia* Agardh 1832

101. *Isthmia nervosa* Kützing 1844 (Diatom Analysis 1949).

Ecology. Marine, benthic. **Locality.** KHR. Amur estuary.

Genus *Trigonium* Cleve 1868

102. *Trigonium arcticum* (Brightwell) Cleve 1868 (The Diatoms of Russia 2002) [= *Triceratium arcticum* Brightwell].

Ecology. Marine, benthic, cold water. **Locality.** KHR. Amur estuary. **PR.** River estuary.

103. *Trigonium formosum* (Brightwell) Mann 1925 (The Diatoms of Russia 2002) [= *Triceratium formosum* Brightwell].

Ecology. Marine, benthic. **Locality.** KHR. Amur estuary.

Genus *Terpsinoe* Ehrenberg 1843

104. *Terpsinoe americana* (Bailey) Ralfs 1868 (Diatom Analysis 1949).

Ecology. Brackish. **Locality.** KHR. Amur estuary.

Order HEMIAULALES Round & Crawford 1990

Family Hemiaulaceae Heiberg 1863

Genus *Eucampia* Ehrenberg 1839

105. *Eucampia zoodiacus* Ehrenberg 1839 (Diatom Analysis 1949)
[=*Eucampia groenlandica* Cleve].

Ecology. Marine, neritic, wide common. **Locality.** KHR. Amur estuary.

Family Bellerocheaceae Crawford 1990

Genus *Bellerochea* Van Heurck 1885

106. *Bellerochea malleus* (Brightwell) Van Heurck 1885 (Konovalova et al. 1989).

Ecology. Marine, neritic, wide common. **Locality.** KHR. Amur estuary.

Subclass LITHODESMIOPHYCIDAE

Order LITHODESMIALES Round & Crawford 1990

Family Lithodesmiaceae Round 1990

Genus *Ditylum* J.W. Bailey 1861

107. *Ditylum brightwellii* (T. West) Grunow 1883 (Diatom Analysis 1949).

Ecology. Marine, neritic, wide common. **Locality.** KHR. Amur estuary.

Subclass RHIZOSOLENIOPHYCIDAE

Order RHIZOSOLENIALES Silva 1962

Family Rhizosoleniaceae De Toni 1890

Genus *Rhizosolenia* Round et Crawford 1990

108. *Rhizosolenia delicatula* Cleve 1900 (Konovalova et al. 1989).

Ecology. Marine, neritic, wide common. **Locality.** KHR. Amur estuary.

109. *Rhizosolenia fragilissima* Bergon 1903 (Konovalova et al. 1989).

Ecology. Marine, neritic, wide common. **Locality.** SR. Sakhalin Island.

110. *Rhizosolenia hebetata* f. *semispina* (Hensen) Gran 1904 (Konovalova et al. 1989).

Ecology. Marine, neritic, warm water. **Locality.** KHR. Amur estuary.

111. *Rhizosolenia setigera* var. *setigera* Brightwell 1858 (Konovalova et al. 1989).

Ecology. Marine, neritic, wide common. **Locality.** KHR. Amur estuary. **SR.** Sakhalin Island. **PR.** River.

var. *arctica* I. Kisselew 1933 (Diatom Analysis 1949).

Ecology. Marine, neritic, arctic. **Locality.** KHR. Amur estuary. **PR.** River.

Genus *Urosolenia* Round et Crawford 1990

112. *Urosolenia eriensis* var. *eriensis* (H.L. Smith) Round et Crawford 1990 (Bukhtiyarova 1999) [= *Rhizosolenia eriensis* H.L. Smith].

Ecology. Fresh and brackish water, planktonic, halophilic, acidophilic, wide common. **Locality.** KHR. Amur River, lake of Amur plain. **PR.** Reservoirs, lakes, Lazovsky NR, Far Eastern Marine BR*.

var. *morsa* (W. et G.S. West) Bukhtiyarova 1995 (Bukhtiyarova 1999) [= *Rhizosolenia eriensis* var. *morsa* W. et G.S. West].

Ecology. Fresh and brackish water, planktonic, halophilic, wide common. **Locality.** **PR.** Reservoirs, lakes.

Comment. There are no original finding reports on this variety. It is treated according to the paper by L.A. Kukhareno (1989), in which, perhaps, the report on type variety is repeated.

113. *Urosolenia longiseta* (Zacharias) Bukhtiyarova 1995 (Bukhtiyarova 1999) [= *Rhizosolenia longiseta* Zacharias].

Ecology. Fresh and brackish water, planktonic, indifferent (halobity), acidophilic, χ -o-saprobic (S=0,4), wide common. **Locality.** KHR. Amur River. **PR.** Reservoirs, lake, Far Eastern Marine BR*.

Subclass CHAETOCEROTOPHYCIDAE

Order CHAETOCEROTALES Round & Crawford 1990

Family Chaetocerotaceae Ralfs in Pritchard 1861

Genus *Chaetoceros* Ehrenberg 1844

114. *Chaetoceros affinis* Lauder 1864 (Konovalova et al. 1989).

Ecology. Marine, neritic, warm water, wide common. **Locality.** KHR. Amur estuary.

115. *Chaetoceros atlanticus* Cleve 1873 (Konovalova et al. 1989).

Ecology. Marine, oceanic, wide common. **Locality.** KHR. Amur estuary.

116. *Chaetoceros borealis* J.W. Bailey 1854 (Diatom Analysis 1949).

Ecology. Marine and brackish, oceanic, planktonic, boreal. **Locality.** KHR. Amur estuary.

117. *Chaetoceros brevis* Schütt 1895 (Diatom Analysis 1949).

Ecology. Marine, neritic, wide common. **Locality.** KHR. Amur estuary.

118. *Chaetoceros compressus* Lauder 1864 (Konovalova et al. 1989).

Ecology. Marine, neritic, wide common. **Locality.** KHR. Amur estuary.

119. *Chaetoceros concavicornis* f. *concavicornis* Mangin 1917 (Diatom Analysis 1949).

Ecology. Marine, oceanic, boreal, wide common. **Locality.** KHR. Amur estuary.

f. *volans* (Schütt) Hustedt 1930 (Diatom Analysis 1949).

Ecology. Marine, oceanic, boreal, wide common. **Locality.** KHR. Amur estuary.

120. *Chaetoceros constrictus* Gran 1897 (Konovalova et al. 1989).

Ecology. Marine, neritic, wide common. **Locality.** KHR. Amur estuary. **PR.** River.

121. *Chaetoceros convolutus* Castracane 1886 (Konovalova et al. 1989).

Ecology. Marine, oceanic, boreal. **Locality.** KHR. Amur estuary.

122. *Chaetoceros danicus* Cleve 1889 (Konovalova et al. 1989).

Ecology. Marine, neritic, wide common. **Locality.** KHR. Amur estuary.

123. *Chaetoceros debilis* Cleve 1894 (Konovalova et al. 1989).

Ecology. Marine, neritic, wide common. **Locality.** KHR. Amur estuary.

124. *Chaetoceros decipiens* Cleve 1873 (Konovalova et al. 1989) [= *Chaetoceros decipiens* f. *singularis* Grunow].

Ecology. Marine, oceanic, wide common. **Locality.** KHR. Amur estuary. **PR.** River.

125. *Chaetoceros diadema* (Ehrenberg) Gran 1897 (Konovalova et al. 1989) [= *Chaetoceros subsecundus* (Grunow) Hustedt].

Ecology. Marine, neritic, wide common. **Locality.** KHR. Amur estuary. **SR.** Sakhalin Island. **PR.** River.

126. *Chaetoceros didymus* var. *didymus* Ehrenberg 1845 (Konovalova et al. 1989).

Ecology. Marine, neritic, waarmwater. **Locality.** KHR. Amur estuary.

var. *anglica* (Grunow) Gran 1905 (Konovalova et al. 1989).

Ecology. Marine, neritic, warm water. **Locality.** KHR. Amur estuary.

127. *Chaetoceros furcellatus* Bailey 1856 (Diatom Analysis 1949).

Ecology. Marine, neritic, arctic. **Locality.** KHR. Amur estuary.

128. *Chaetoceros lacinosus* Schütt 1895 (Diatom Analysis 1949).

Ecology. Marine, neritic, boreal. **Locality.** KHR. Amur estuary.

129. *Chaetoceros mitra* (Bailey) Cleve 1896 (Konovalova et al. 1989).

Ecology. Marine, planktonic, indifferent (halobity), boreal-arctic. **Locality.** KHR. Amur estuary.

130. *Chaetoceros muelleri* Lemmermann 1898 (Konovalova et al. 1989).

Ecology. Brackish, planktonic and benthic, halophilic, wide common. **Locality.** KHR. Amur estuary. **SR.** Sakhalin Island. **PR.** Lakes, Far Eastern Marine BR*.

131. *Chaetoceros protuberans* Lauder 1864 (AlgaeBase) [= *Chaetoceros didymus* var. *protuberans* (Lauder) Gran et Yendo].

Ecology. Marine, neritic, warm water. **Locality.** KHR. Amur estuary.

132. *Chaetoceros radicans* Schütt 1895 (Konovalova et al. 1989).

Ecology. Marine, neritic, boreal. **Locality.** KHR. Amur estuary.

133. *Chaetoceros similis* Cleve 1896 (Diatom Analysis 1949).

Ecology. Marine, neritic, boreal. **Locality.** KHR. Amur estuary.

134. *Chaetoceros subtilis* Cleve 1896 (Diatom Analysis 1949).

Ecology. Brackish. **Locality.** KHR. Amur estuary. **SR.** Sakhalin Island.

135. *Chaetoceros teres* Cleve 1896 (Diatom Analysis 1949).

Ecology. Marine, neritic, boreal. **Locality.** KHR. Amur estuary.

Genus *Bacteriastrum* Schadbolt 1854

136. *Bacteriastrum delicatulum* Cleve 1897 (Konovalova et al. 1989).

Ecology. Oceanic, warm water. **Locality.** PR. Sikhote-Alin NBR.

Family Acanthocerataceae Round, Crawford & Mann 1990

Genus *Acanthoceras* Honigmann 1910

137. *Acanthoceras zachariasii* (Brun) Simonsen 1979 (Krammer and Lange-Bertalot 1991) [= *Attheya zachariasii* Brun, 1894].

Ecology. Fresh water, planktonic, wide common. **Locality.** KHR. Amur River, lakes. **PR.** Reservoirs, Khanka Lake and other lakes, Far Eastern Marine BR*.

Order LEPTOCYLINDRALES Round & Crawford 1990

Family Leptocylindraceae Lebour 1930

Genus *Leptocylindrus* Cleve 1889

138. *Leptocylindrus danicus* Cleve 1889 (Diatom Analysis 1949).

Ecology. Marine, neritic, boreal. **Locality.** KHR. Amur estuary.

Taxon absent in the system of F.E. Round with co-authors (Round et al., 1990)

Family Aulacoseiraceae Crawford 1990

Genus *Alveolophora* Moisseeva et Nevretdinova 1990

139. *Alveolophora areolata* (Moisseeva) Moisseeva 1990 (The Diatoms of the USSR 1992).

Ecology. Fresh water, planktonic. **Locality. KHR.** River.

Comment. The species is considered to be extinct. Perhaps, the valve got into the sample by accident.

Species with doubtful locality

140. *Stephanodiscus flabellatus* Chursevich et Loginova 1986 (The Diatoms of the USSR 1992).

Ecology. Fresh water, planktonic. **Locality. SR.** Kunashir Island.

Comment. It is characterized as a rare species; it most likely is an extinct species (The Diatoms of the USSR 1992).

141. *Stephanodiscus niagarae* Ehrenberg 1845 (The Diatoms of the USSR 1992).

Ecology. Fresh water, planktonic, indifferent (halobity), boreal. **Locality. KHR.** Amur River.

142. *Stephanodiscus rotula* (Kützing) Hendey 1964 (Krammer and Lange-Bertalot 1991) [= *Stephanodiscus astraea* (Ehrenberg) Grunow].

Ecology. Fresh water, planktonic, indifferent (halobity), alkalibiontic, β - α -mezosaprobic (S=2,7), wide common. **Locality. KHR.** Amur River, Amur estuary, lakes of Amur plain, Komsomolsky NR. **PR.** Khanka Lake, river, Sikhote-Alin NBR, Lazovsky NR.

Comment. According to electron microscopical studies of one of the authors (Genkal S. I., published and unpublished data), another species – *S. neoastraea*, which is similar in morphology to the species *S. rotula* and *S. niagarae* is widely distributed in inland water bodies of Russia and most probably it is vegetated in the Far Eastern water bodies.

143. *Aulacoseira baicalensis* (K. Meyer) Simonsen 1979 (The Diatoms of the USSR 1992) [= *Melosira baicalensis* (K. Meyer) Wislouch f. *oblongo-punctata* Skvortzow et Meyer].

Ecology. Fresh water, planktonic, cold water, indifferent (halobity), alkaliphilic. **Locality. KHR.** Amur River.

Comment. With the exception of Lake Baikal it was found only in Transbaikalian lakes (Genkal and Bondarenko 2006), therefore its finding in the Amur River requires verification.

Table 1

Categorization of algae on studied regions and geographical distribution.

Group	Number of species
REGION	
Amur region (AR.)	8
Jewish Autonomous region (JAR.)	5
Khabarovsk region (KHR.)	127
Primorsky region (PR.)	62
Sakhalin region (SR.)	40
DISTRIBUTION	
Alpine	2
Arctic	2
Arctic-alpine	6
Arctic-boreal	5
Boreal-arctic	1
Boreal	27
Wide-boreal	5
Wide common	55

Table 2

Categorization of algae on ecological groups.

Group	Number of species
HABITAT	
Planktonic	51
Planktonic and benthic	18
Benthic	15
SALINITY	
Marine	87
Brackish *	27
Fresh *	55
Mesohalobic	11
Halophilic	15
Indifferent	28
Halophobic	1
pH RELATION	
Alkalibiontic	4
Alkaliphilic	15
Indifferent	13
Acidophilic	7
TEMPERATURE	
Cold water	8
Warm water	8

* Some species have dual characteristics.

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REFERENCES

- Aboal M., Alvarez Cobelas M., Cambra J., Ector L., 2003, *Floristic list of non-marine diatoms (Bacillariophyceae) of Iberian Peninsula, Balearic Islands and Canary Islands. Updated taxonomy and bibliography. Diat. Monogr.* 4:1-639
- AlgaeBase, <http://www.algaebase.org>
- Barinova S.S., 1986, *On the alga flora of Artemovsk Reservoir (Primorskiy Region)* [in:] *Flora and systematics of spore plants of Far East*, Eds. Vasil'eva Lar.N., Azbukina Z.M., Egorova L.N., Vladivostok, FEB AS USSR, pp. 3-21, (in Russian)
- Barinova S.S., 1989, *Freshwater diatom algae of Kurile Islands* [in:] *Systematics and ecology of river organisms*, Eds. Levanidova I.M., Makarchenko E.A., Vladivostok, FEB RAS, pp. 138-41, (in Russian)
- Barinova S.S., Kukharensko L.A., 1981, *Algae of Artjemovskoe reservoir and the forecast of phytoplankton expansion* [in:] *Systematics, ecology and geography of cryptogamic plants of the Far East*, Eds. Egorova L.N., Cherdantseva V.Ja., Bulakh E.M., Vladivostok, FEB AS USSR, pp. 21-9 (in Russian)
- Barinova S.S., Medvedeva L.A., 1989, *Algae* [in:] *Fungi, lichens, algae and moss of the Komsomolsky reserve (Khabarovsk territory)*, Eds. Azbukina Z.M., Cherdantseva V.Ya., Vladivostok, FEB RAS, pp. 66-109 (in Russian)
- Barinova S.S., Medvedeva L.A., Anissimova O.V., 2006, *Diversity of algal indicators in environmental assessment*, Israel, Pilies Studio, pp. 498 (in Russian)
- Bukhtiyarova L., 1999, *Diatoms of Ukraine Inland waters*, Kyiv, pp. 133
- Chalfina N.A., 1966, *De speciebus generis Melosira Ag. e flumine Amur notula*, *Novitates systematicae plantarum non vascularium*, 43-6 (in Russian)
- Diatom Analysis*, 1949, Ed. Proshkina-Lavrenko A.I., Gosgeolizdat, Leningrad, 2, pp. 443 (in Russian)
- Dogadina T.V., Kukharensko L.A., 1990, *Algae* [in:] *Flora, myco- and lichenobiota of the Lazovsky reserve (Primorski Krai)*, Ed. Azbukina Z.M., Vladivostok, FEB RAS, pp. 10-34 (in Russian)
- Genkal S.I., 1999, *Problems in identifying diatoms for monitoring the water quality of large rivers*, Use of algae for monitoring rivers. III, pp. 182–7
- Genkal S.I., Bondarenko N.A., 2006, *Are the Lake Baikal diatoms endemic?*, *Hydrobiologia*, 568(1):143-53
- Genkal S.I., Korneva L.G., 2001, *New records of diatoms (Centrophyceae) from Volga reservoirs (Russia)*, *Algologia*, 11(4):457-61 (in Russian)

- Genkal S.I., Kukhareno L.A., 1990, *New data on the diatom flora of Amur River*, [in:] *Cryptogamic investigations in the Far East*, Eds. Vasil'eva Lar.N., Azbukina Z.M., Egorova L.N., Vladivostok, FEB AS USSR, pp. 45-7 (in Russian)
- Genkal S.I., Makarova I.V., Goncharov A.A., 1998, *Centric diatom species (Centrophyceae, Bacillariophyta) new for the waterbodies of Russia*, *Botanicheskii Zhurnal*, 83(10):121-3 (in Russian)
- Genkal S.I., Schur L.A., 2000, *New data on the flora of Bacillariophyta of Lake Khanka (Primorsky region, Russia)*, *Algologia*, 10(3):278-81 (in Russian)
- Genkal S.I., Trifonova I.S., 2002, *Note worthy and new for Russia representatives of genus Aulacosira (Bacillariophyta)*, *Botanicheskii Zhurnal*, 87(6):117-22 (in Russian)
- Germain H., 1981, *Flore des diatomées Diatomophycées*, Paris, pp. 444
- Håkansson H., 2002, *A compilation and evaluation of species in the general Stephanodiscus, Cyclostephanos and Cyclotella with a new genus in the family Stephanodiscaceae*, *Diatom Res.*, 17(1):1-139
- Hartley B., Barber H.G., Carter J.R., 1996, *An Atlas of British Diatoms*, Bristol, Biopress Ltd., pp. 601
- Houk V., Klee R., 2004, *The stelligeroid taxa of the genus Cyclotella (Kütz.) Bréb. (Bacillariophyceae) and their transfer into the new genus Discostella gen. nov.*, *Diatom Res.*, 19(2):203-28
- Index Nominum Algarum, <http://ucjeps.berkeley.edu>
- Khakhina A.G., 1937, *Phytoplankton of the lakes from down stream of Amur River*, *Acta of Far Eastern Branch Academy Science of USSR*, II:333-73 (in Russian)
- Khakhina A.G., 1948, *Microflora of the Bolon' Lake in connection with problems of the Silver carp feeding*, *Izvestya of the Pacific Scientific Research Fisheries Centre*, 27:187-219 (in Russian)
- Kharitonov V.G., 2001, *Representatives of the Achnanthaceae (Bacillariophyta) in the freshwater reservoirs of Beringia*, *Botanicheskii Zhurnal*, 86(4):53-61 (in Russian)
- Kharitonov V.G., 2005a, *Members of the Centrales (Bacillariophyta) in waterbodies of Beringia*, *Botanicheskii Zhurnal*, 90(3):336-50 (in Russian)
- Kharitonov V.G., (Charitonov) 2005b, *Representatives of Eunotiaceae (Bacillariophyta) in fresh waterbodies of Beringia*, *Botanicheskii Zhurnal*, 90(2):165-82 (in Russian)
- Kharitonov V.G., 2005c, *Representatives of the family Fragilariaceae (Bacillariophyceae) in waterbodies of Beringia*, *Botanicheskii Zhurnal*, 90(11):1693-711 (in Russian)
- Kisselew I.A., 1931, *Bestand und Verteilung des Phytoplanktons im Amur-Liman*, *Explorations der mers d'USSR*, 14:31-116 (in Russian)
- Kisselew I.A., 1937, *Neue Angaben über den Bestand und die Verteilung des Phytoplanktons im Amurästuargebiet und in den ihm Nächstliegenden Teilen des Japanischen und Ochotskischen meeres*, *Annals of Leningrad State University*, III(15, 5):41-52 (in Russian)
- Konovalova G.V., Orlova T.Yu., Pautova L.A., 1989, *Atlas of phytoplankton of the Sea of Japan*, Leningrad, Nauka, pp. 160 (in Russian)
- Koptjaeva T.F., 1964, *Phytoplankton of Vavajskie lakes on southern Sakhalin* [in:] *Lakes of southern Sakhalin and their ichthyofauna*, Ed. Kljuchareva O.A., Moscow, Moscow University Press, pp. 141-53 (in Russian)
- Krammer K., Lange-Bertalot H., 1991, *Bacillariophyceae. Süßwasserflora von Mitteleuropa*, 2,3, Jena, Stuttgart, New York, Gustav Fischer Verlag, pp. 576
- Kukhareno L.A., 1989, *Algae of freshwater reservoirs of Primorye Region*. Vladivostok, FEB RAS, pp. 152 (in Russian)
- Kukhareno L.A., 1998, *Algae* [in:] *Flora and vegetation of the Khingansky reserve (Amur Area)*, Eds. Vasil'eva Lar.N., Vladivostok, Dalnauka, pp. 11-32 (in Russian)

- Kukhareno L.A., Medvedeva L.A., Barinova S.S., Batenok I.N., 1986, *Algae* [in:] *Flora and vegetation of the Bolshehehtsirsky reserve (Khabarovsk Region)*, Eds. Azbukina Z.M., Kharkevich S.S. FEB AS USSR, Vladivostok, pp. 13-29 (in Russian)
- Kukhareno L.A., Naumenko Yu.V., 1990, *Estimation of Amur River water quality by algae saprobity* [in:] *Cryptogamic investigations in the Far East*, Eds. Vasil'eva Lar.N., Azbukina Z.M., Egorova L.N., Vladivostok, FEB AS USSR, pp. 48-59 (in Russian)
- MarBEF Data System, <http://www.marbef.org>
- Medvedeva L.A., 1999a, *First data to the algoflora of Bureinsky reserve*. Proc. of state nature reserve Bureinsky, 1:87-101 (in Russian)
- Medvedeva L.A., 1999b, *List of algae of the Bikin River basin* [in:] *Geochemical and biogeochemical processes in ecosystems of Far East*, 9, Ed. Ivashov P.V. Vladivostok, Dalnauka, pp. 161-77 (in Russian)
- Medvedeva L.A., 2001, *Biodiversity of aquatic algal communities in the Sikhote-Alin biosphere reserve (Russia)*, Cryptogamie, Algol. 22(1):65-100.
- Medvedeva L.A., 2002, *Freshwater algae* [in:] *Cadastre of plants and fungi of the reserve "Kedrovaya Pad"*. Check-lists of species, Ed. Korkischko R.I. Vladivostok, Dalnauka, pp. 6-20 (in Russian)
- Medvedeva L.A., Sirotsky S.Ye., 2002, *Annotated list of algae of the Amur River and reservoirs of its subordinate system* [in:] *Biogeochemical and geocological investigations of terrestrial and freshwater ecosystems*, 12, Ed. Ivashov P.V. Vladivostok, Dalnauka, pp. 130-218 (in Russian)
- Medvedeva L.A., Semenchenko K.A., 2003, *The results of algological research of Samarga River (Primorye Territory)*, V.Ya. Levanidov's Biennial Memorial Meetings, 2:242-53 (in Russian)
- Medvedeva L.A., Barinova S.S., 2004, *Freshwater algae of some waterbodies of Khabarovsk Territory*, Botanicheskii Zhurnal, 89(11):1768-82 (in Russian)
- Medvedeva L.A., Savateev I.N., 2007, *Algae* [in:] *Flora, mycobiota and vegetation of the nature reserve «Bastak»*, Ed. Rubtsova T.A. Vladivostok, Dalnauka, pp. 37-82 (in Russian)
- Motyilkova I.V., Konovalova N.V., 2003, *The spring phytoplankton Tunaicha Lake (South Sakhalin)*, V.Ya. Levanidov's Biennial Memorial Meetings, 2:287-94 (in Russian)
- Nikulina T.V., 2002, *The freshwater algal flora* [in:] *Flora and fauna of Kuril Islands*, Eds. Storozhenko S.Yu., Bogatov V.V., Lelei A.S. Vladivostok, Dalnauka, 23-34 (in Russian)
- Nikulina T.V., 2003, *Algae of Khankaisky state reserve (Primorye Territory)*, V.Ya. Levanidov's Biennial Memorial Meetings, 2:263-71 (in Russian)
- Nikulina T.V., 2005, *Diatom algae (Bacillariophyta) from the south part of Sakhalin Island* [in:] *Flora and fauna of Sakhalin Island (Materials of International Sakhalin Island Project)*, 2, Ed. Storozhenko S.Yu. Vladivostok, Dalnauka, pp. 8-20 (in Russian)
- Nikulina T.V., 2006a, *Algae* [in:] *Flora, vegetation and mycobiota of the reserve «Ussuriysky»*, Eds. Vasilyeva Lar.N., Bezdeleva T.A. Vladivostok, Dalnauka, pp. 29-50 (in Russian)
- Nikulina T.V., 2006b, *Algal flora of Moneron Island* [in:] *Flora and fauna of Moneron Island (Materials of International Sakhalin Island Project)* Ed. Storozhenko S.Yu. Vladivostok, Dalnauka, pp. 21-43 (in Russian)
- Round F.E., Crawford R.M., Mann D.G., 1990, *The Diatoms. Biology & morphology of the genera*, Cambridge University Press. pp. 747
- Ryabushko L.I., 2006, *Microalgae of the Black Sea benthos (Check-list, Synonyms, Comment)*, Sevastopol, EKOCI-Gidrofizika, pp. 143
- Simonsen R., 1979, *The Diatom system: ideas on phylogeny*, Bacillaria, 2:9-71.
- Skvortzow B.W., 1917, *About phytoplankton of Chlya Lake from Amur district. Materials about algae flora of Asian Russia*, 3. J. of Russian Bot. society, 2:15-20 (in Russian)
- Skvortzow B.W., 1929, *Diatoms of Khanka Lake*, Memoirs of the Southern Ussuri Branch of the State Russian Geographical society, 3: pp. 66 (in Russian)

- Skvortzow B.W., 1931, *Phytoplankton from Siberia. III. From the Amur rive*, J. of Bot., 69:818-9 (in Russian)
- Skvortzow B.W., 1938, *Freshwater diatoms from the environs of Vladivostok*, Philip. J. Sci., 65(2):251-61
- The diatoms of Russia and adjacent countries: fossil and recent*, II(3), 2002, Ed. Makarova I.V. St.-Petersburg, University Press, pp. 112 (in Russian)
- The diatoms of the USSR (fossil and recent)*, 1988, II(1), Eds. Gleser S.I., Makarova I.V., Moisseeva A.I., Nokolaev V.A. Leningrad, Nauka, pp. 116; 1992, II(2), St.-Petersburg, Nauka, pp. 125 (in Russian)
- Zhurkina V.V., Kukharensko L.A., 1974, *Freshwater diatoms of Khasan district in Primorye* [in:] *Cryptogamic plants of the Soviet Far East* Ed. Vasil'eva L.N. Vladivostok, FEB AS USSR, pp. 17-28 (in Russian)