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New records of freshwater ostracods (Crustacea) from the Far East of Russia, with a checklist of recent freshwater ostracods of the region

Новые находки пресноводных остракод (Crustacea) на Дальнем Востоке России, со списком видов современных пресноводных остракод региона

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KEY WORDS: Ostracoda, *Cypridopsis*, *Ilyocypris*, *Metacypris*, freshwater fauna, Far East.

КЛЮЧЕВЫЕ СЛОВА: Ostracoda, *Cypridopsis*, *Ilyocypris*, *Metacypris*, пресноводная фауна, Дальний Восток.

ABSTRACT. During surveys of the freshwater habitats in Primory and Khabarovsk provinces of the Far East of Russia, a total of 4 ostracod species were recovered and identified. *Cypridopsis vidua* (O.F. Müller, 1776) in the small pond in Botanical Garden-Institute FEB RAS, Primorie Province; *Ilyocypris salebrosa* Stepanaitys, 1960 in the Ussuri River near Kirovsky, Primorie Province; *Ilyocypris dentifera* Sars, 1903 in the flooded sandpit in the Bikin River basin, Khabarovsk Province and *Metacypris digitiformis* Smith et Hiruta, 2004 in the meander of the Nura River, Khabarovsk Province. *I. dentifera* and *M. digitiformis* are reported for the first time from the Far East of Russia. A species-list of recent freshwater ostracods of the Far East of Russia is provided.

РЕЗЮМЕ. Во время обследования пресноводных местообитаний в Приморском и Хабаровском краях Дальнего Востока России были обнаружены и идентифицированы 4 вида остракод. *Cypridopsis vidua* (O.F. Müller, 1776) в небольшом пруду в Ботаническом саду-институте ДВО РАН, Приморский край; *Ilyocypris salebrosa* Stepanaitys, 1960 в реке Уссури близ Кировского, Приморский край; *Ilyocypris dentifera* Sars, 1903 в затопленном карьере в бассейне реки Бикин, Хабаровский край и *Metacypris digitiformis* Smith et Hiruta, 2004 в излучине реки Нура, Хабаровский край. *I. dentifera* и *M. digitiformis* указываются впервые для фауны региона. Представлен список видов современных пресноводных остракод Дальнего Востока России.

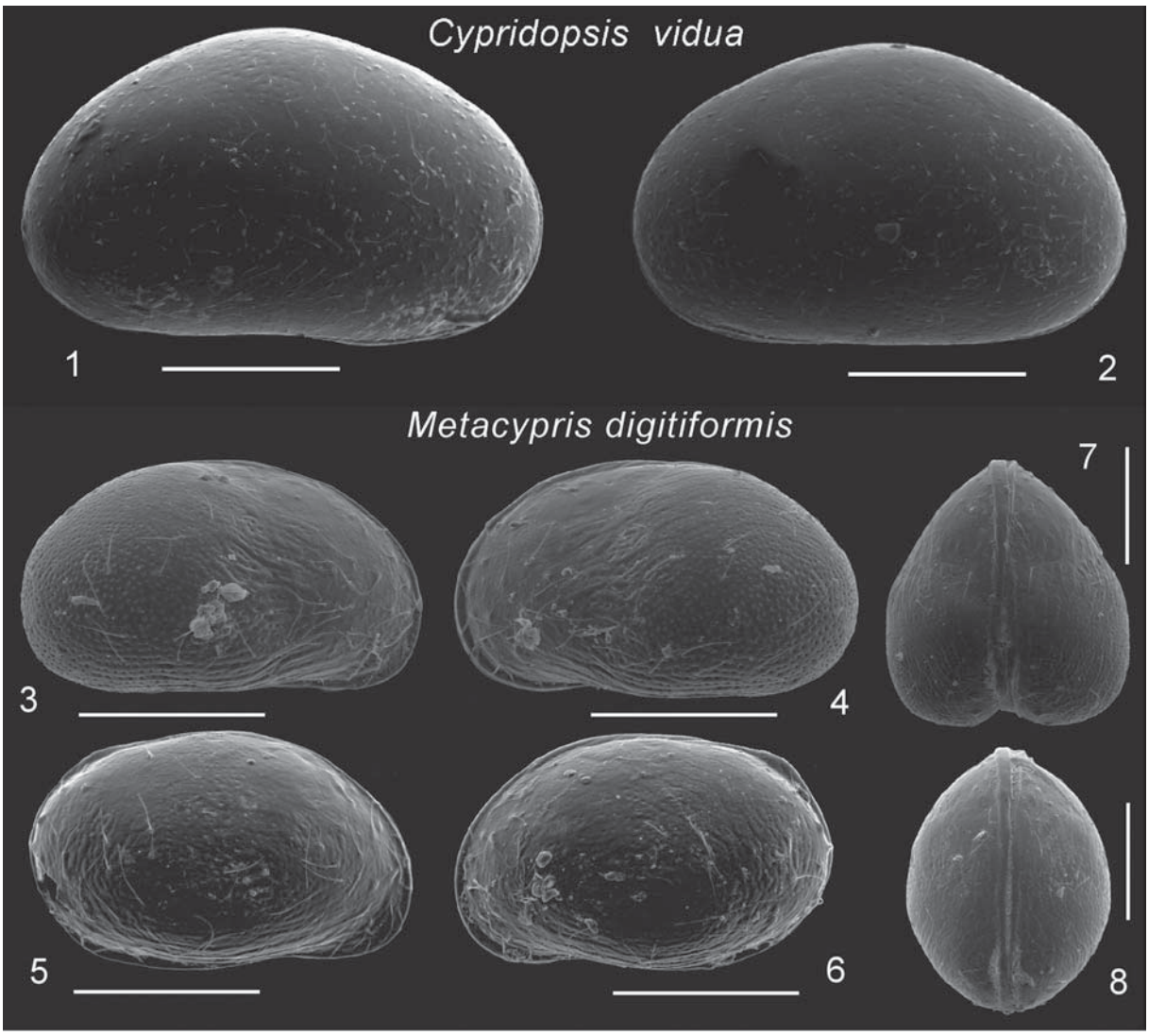
Introduction

The freshwater ostracod fauna of the Russian Far East is extremely poorly investigated with only 21 named species previously recorded from this region in the literature (Table 1). The first records were by Bronstein [1947], who reported three species in his monograph on the freshwater ostracod fauna of Russia: *Eucypris crassa* (O.F. Müller, 1785) and *Cypridopsis vidua* (O.F. Müller, 1776) from various water bodies around Ussuryisk, and *Candona krochini* Bronstein, 1947 from Dalnee Lake in Kamchatka. Later, Schornikov [1986] described of a new species from Khanka Lake, *Athalocythere chankensis* Schornikov, 1986, and Aladin & Schornikov [1986] reported three species from brackish and freshwaters in Primorie. Then, much later, several works devoted to different areas were published. Schornikov and Trebukhova [2001] reported new findings of eleven species from the Tumen (Tumangan) River mouth in the southwestern part of Peter the Great Bay, and Schornikov [2004] dealt with the biota of the Far-Eastern Marine Biospherical Reserve, reporting 18 species, three of them new to the region. The most recent paper, by Zenina & Schornikov [2008], reported of the presence of *Notodromas sinensis* Neale et Zhao, 1991 in lower reaches of the Razdolnaya River (flowing into the Sea of Japan).

The objectives of the study were determine new records of freshwater ostracods from the Far East of Russia with compiling data on regional species list.

Material and Methods

During an expedition organized under the Amur-2 Project in 2005, several species of freshwater ostracods were collected from various freshwater habitats in the Vladivostok Botanical Garden, the Ussuri River near Kirovsky, the Bikin River basin not far from Bikin and in the Nura River basin near Gili. Sediment samples from aquatic habitats were obtained using a small hand-



Figs 1–8. 1, 2 — *Cypridopsis vidua* (O.F. Müller, 1776) (X34868/Cr-1401-FESU), female, Primory Province. 1 — right valve, external view; 2 — left valve, external view. 3–8 — *Metacypris digitiformis* Smith et Hiruta, 2004 (X34871/Cr-1404-FESU), female (3, 4, 7), male (5, 6, 8), Khabarovsk Province. 3 — right valve, external view; 4 — left valve, external view; 5 — right valve, external view; 6 — left valve, external view; 7, 8 — dorsal view of carapace. Scale bars = 200 μm.

Рис. 1–8. 1, 2 — *Cypridopsis vidua* (O.F. Müller, 1776) (X34868/Cr-1401-FESU), самка, Приморье. 1 — правая створка, вид снаружи; 2 — левая створка, вид снаружи. 3–8 — *Metacypris digitiformis* Smith et Hiruta, 2004 (X34871/Cr-1404-FESU), самка (3, 4, 7), самец (5, 6, 8), Хабаровский край. 3 — правая створка, вид снаружи; 4 — левая створка, вид снаружи; 5 — правая створка, вид снаружи; 6 — левая створка, вид снаружи; 7, 8 — карапакс, вид со спины. Линейки = 200 μm.

held dredge modified according to Schornikov [2007]. The samples were washed through a series of sieves with mesh sizes 2500 μm and 250 μm in the field and the resulting residues preserved in 80% alcohol solution. The samples were sorted in the lab using a dissecting microscope, Lomo MBS-9.

The ostracod specimens were placed in pure water for two-days and subsequent clearing was attained in Javelle Water (10% sodium hypochlorite solution) by heating in a water bath. The soft parts of all recorded species were dissected and mounted on glass slides in polyvinyl lactophenol (PVL) and methylene blue staining solution. Carapaces were coated with palladium-gold before being photographed with a Carl Zeiss Evo 40 scanning electron microscope. Carapaces were stored dry in micropalaeontological cavity slides.

In the checklist information about described species according to article 11.1 of the International Code of Zoological Nomenclature [ICZN, 2004] is given only; species in “open nomenclature” are not listed. Synonymies follows by Martens & Savatenalinton [2011]. The material examined is deposited in the Zoological Museum of the Far East State University, Vladivostok (FESU).

Figs 9–12. *Ilyocypris salebrosa* Stepanaitys, 1960 (X34869/Cr-1402-FESU), female, Primorie Province. 9 — right valve, external view; 10 — left valve, external view; 11 — right valve, internal view; 12 — dorsal view of carapace. Scale bars = 200 μm.

Рис. 9–12. *Ilyocypris salebrosa* Stepanaitys, 1960 (X34869/Cr-1402-FESU), самка, Приморье. 9 — правая створка, вид снаружи; 10 — левая створка, вид снаружи; 11 — правая створка, вид изнутри; 12 — карапакс, вид со спины. Линейки = 200 μm.

Taxonomy

Family Cyprididae Baird, 1845

Genus *Cypridopsis* Brady, 1868

Cypridopsis vidua (O.F. Müller, 1776)
Figs 1, 2.

For previous synonymies see Meisch [2000].

Cypridopsis parva G.W. Müller, 1900: Schornikov, 2004: 462.

Cypridopsis vidua: Smith et al., 2011:. 9, figs 2H, 2I.

MATERIAL EXAMINED. 18 ♀♀, 4 empty valves, (X34868/Cr-1401-FESU); Russia, Primorie Province, environs of Vladivostok, Sedanka, Botanical Garden-Institute FEB RAS, small pond, 19.10.2005 (Dudko leg.).

HABITAT. This species was collected from a small pond containing *Salvinia* sp.

DISTRIBUTION. *C. vidua* is known from Primory (Falshivy and Popova Islands, Gamova Peninsula, and Khanka Lake) and Khabarovsk regions [Schornikov, 2004]. It is a widely distributed species [Martens & Savatenalinton, 2011].

Family Ilyocyprididae Kaufmann, 1900

Genus *Ilyocypris* Brady et Norman, 1889

Ilyocypris salebrosa Stepanaitys, 1960
Figs 9–12.

Ilyocypris salebrosa Stepanaitys, 1960: Schornikov, 2004: 458, fig. 1(1). — Smith et al., 2011: 17, figs 9–11.

MATERIAL EXAMINED. 3 ♀♀ (X34869/Cr-1402-FESU); Russia, Primorie Province, Kirovsky Area, near Kirovsky, Ussuri River, 45°15.741' N; 133°29.598' E, 03.07.2005 (Sidorov, Semenchenko leg.).

HABITAT. This species was obtained from the bottom of the main river bed about 1.5 m of depth on the reach of the river. Substrate: boulders, stones, pebbles, coarse-grained sand.

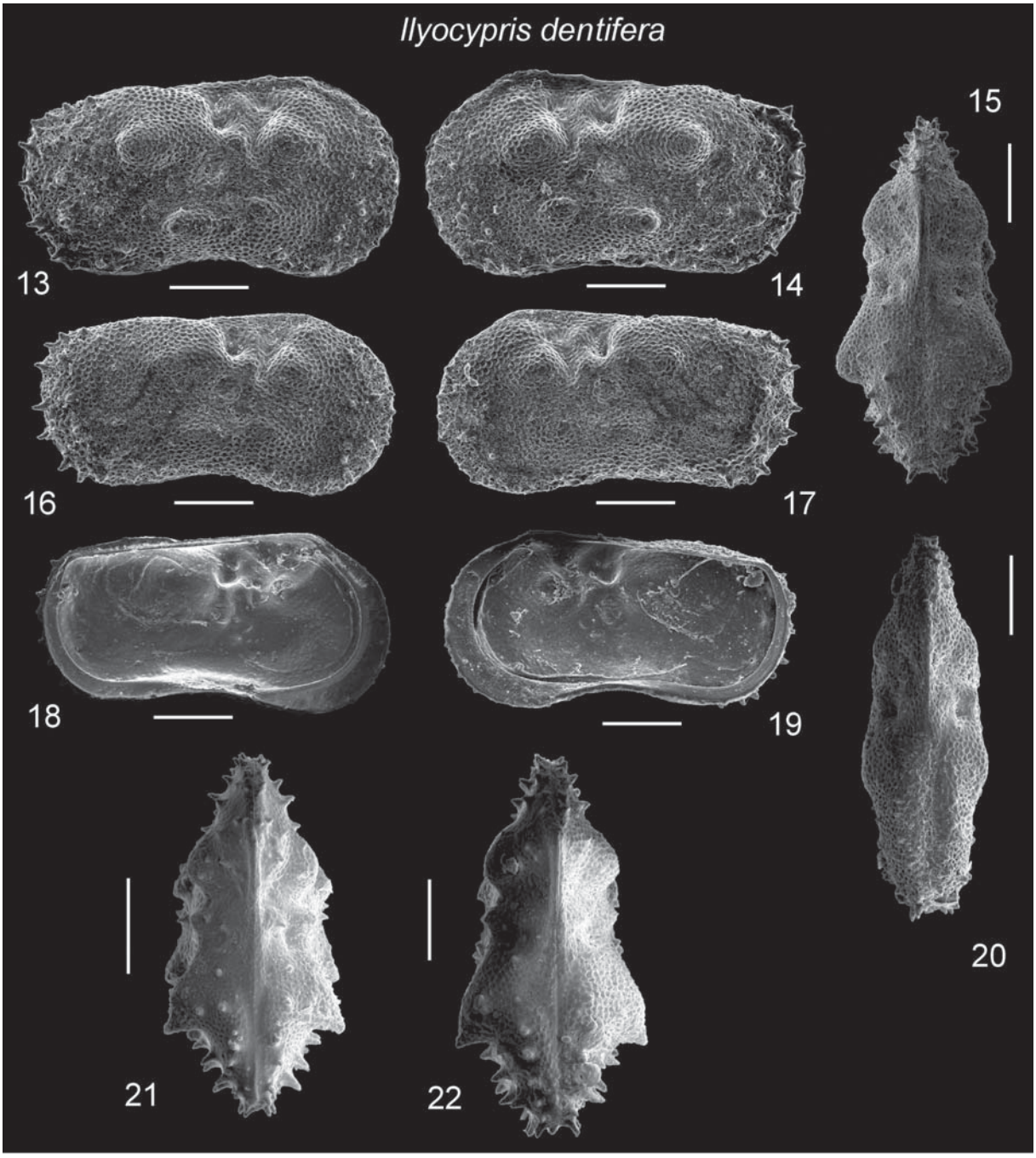
DISTRIBUTION. *I. salebrosa* is known from Primory (Popova Island and Khanka Lake) [Schornikov, 2004]. This species has a Holarctic distribution [Martens & Savatenalinton, 2011].

Ilyocypris dentifera Sars, 1903
Figs 13–22.

Ilyocypris dentifera Sars, 1903: Victor, Fernando, 1981: 1106, figs 1–38.

Ilyocypris angulata Sars, 1903: Chen, 1990: 253, fig. 1.

MATERIAL EXAMINED. 28 ♀♀, 15 ♂♂, 8 juv., 10 empty valves (X34870/Cr-1403-FESU); Russia, Khabarovsk Province, Bikinsky District, flooded sandpit about 1.5 km from the Bikin River, 46º47.347' N; 134º16.627' E, 16.06.2005 (Sidorov, Semenchenko leg.).



Figs 13–22. *Ilyocypris dentifera* Sars, 1903 (X34870/Cr-1403-FESU), female (13–15), male (16–20), juveniles (21, 22), Khabarovsk Province. 13 — right valve, external view; 14 — left valve, external view; 15 — dorsal view of carapace; 16 — right valve, external view; 17 — left valve, external view; 18 — left valve, internal view; 19 — right valve, internal view; 20–22 — dorsal view of carapace. Scale bars = 200 μm.

Рис. 13–22. *Ilyocypris dentifera* Sars, 1903 (X34870/Cr-1403-FESU), самка (13–15), самец (16–20), личинки (21, 22), Хабаровский край. 13 — правая створка, вид снаружи; 14 — левая створка, вид снаружи; 15 — карапакс, вид со спины; 16 — правая створка, вид снаружи; 17 — левая створка, вид снаружи; 18 — левая створка, вид изнутри; 19 — правая створка, вид изнутри; 20–22 — карапакс, вид со спины. Линейки = 200 μm.

HABITAT. This species was collected from the bottom of a flooded sandpit about 1.3–1.5 m in depth. Substrate: clayey coarse-grained sand, residues of aquatic vegetation.

DISTRIBUTION. This is the first record of *I. dentifera* for the Far East of Russia. It is also known from Canada, Indonesia, Philippines, China and Japan [Victor & Fernando, 1981, Yu et al., 2009].

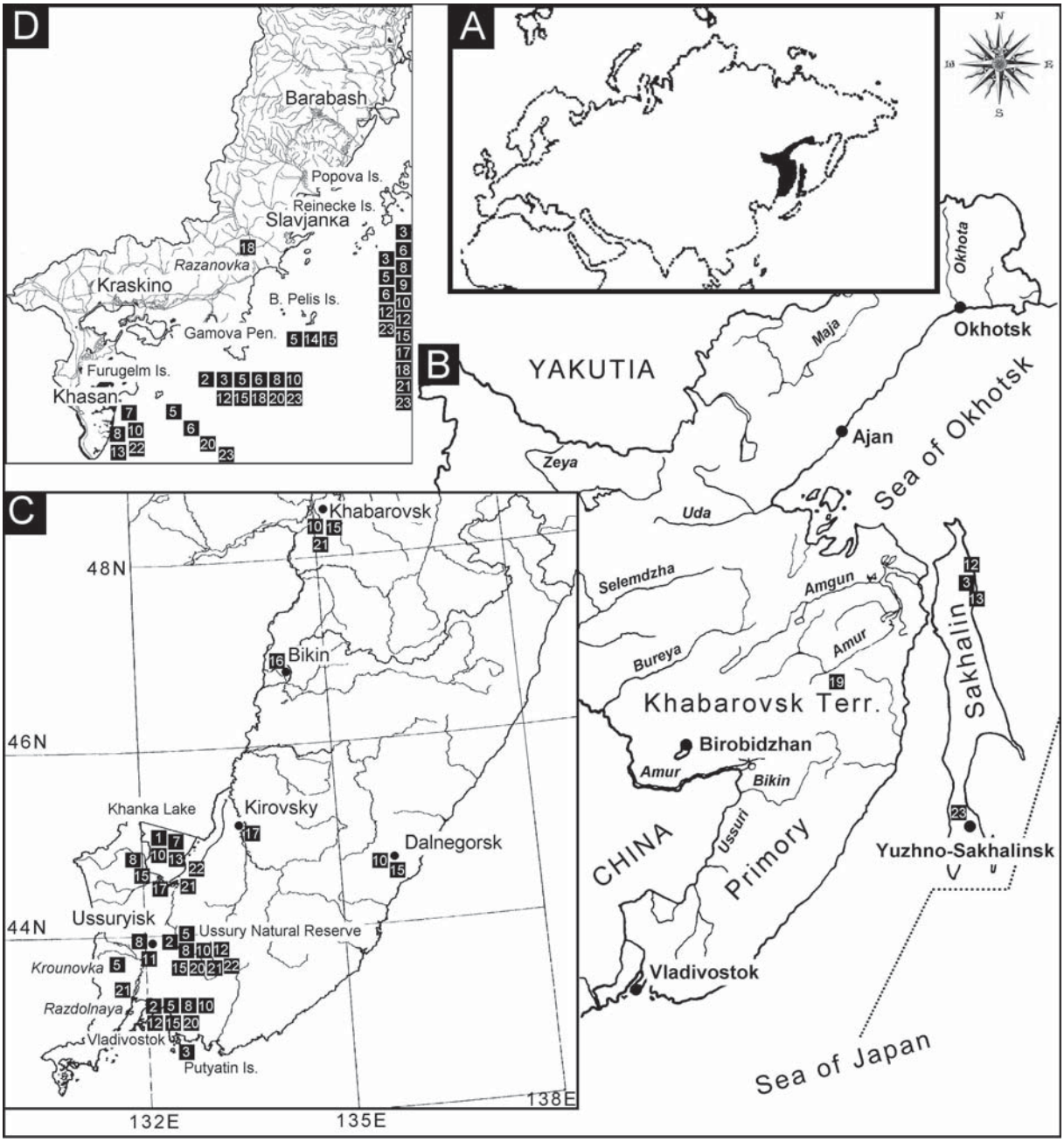


Fig. 23. Map-scheme indicating geographic distribution of Ostracoda in the Far East of Russia: A — overview of Palaearctic (Russian Far East shaded); B — enlarged Russian Far East (continental parts with Sakhalin); C — Primorie with Khabarovsk Province (south part); D — Khasan District of Primorie. Species indication as in Table 1. Source: Blank Mapping Tools, Moscow [2009].

Рис. 23. Карта-схема, отражающая географическое распространение Ostracoda на Дальнем Востоке России: A — Палеарктика, общий вид (Российский Дальний Восток заштрихован); B — Российский Дальний Восток, увеличено (континентальные части с Сахалином); C — Приморье с Хабаровским краем (южная часть); D — Хасанский район, Приморье. Обозначение видов как в Таблице 1. Источник: Коллекция бланковых карт, Москва [2009].

Family Limnocytheridae Klie, 1938

Genus *Metacypris* Brady et Robertson, 1870

Metacypris digitiformis Smith et Hiruta, 2004
Figs 3–8.

Metacypris digitiformis Smith et Hiruta 2004: 38, figs 2–5 (orig. descrip.).

MATERIAL EXAMINED. 13 ♀♀, 9 ♂♂, 5 empty valves (X34871/Cr-1404-FESU); Russia, Khabarovsk Province, Troitzky District, 6 km SW of Gili, meander of the Nura River, 49°48.485’ N; 137°07.715’ E, 2.07.2005 (Sidorov, Semenchenko leg.).

Table 1. Species-list of recent freshwater Ostracoda of the Russian Far East.
Таблица 1. Список видов современных пресноводных остракод Российского Дальнего Востока.

No.	Species	Locality	Habitat	Reference
1.	*Athalocythere chankensis* Schornikov, 1986	Primorie, Khanka Lake (NA)	lake	Schornikov [1986]
2.	*Bradleystrandesia reticulata* (Zaddach, 1844)	Primorie, Gamova Pen. (NA), near Vladivostok (NA), Ussury Natural Reserve (NA), Chukchi Pen., Kolyma River and Anadir River basins (NA)	pools	Schornikov & Trebukhova [2001], Schornikov [2004]
3.	*Candona candida* (O.F. Müller, 1776)	Primorie, Gamova Pen. (NA), Popova Is. (NA), Reinecke Is. (NA), Putyatin Is. (NA), NE Sakhalin Is., Val River (NA)	springs, streams	Schornikov & Trebukhova [2001], Schornikov [2004]
4.	*Candona krochini* Bronstein, 1947	Kamtchatka, Dalnee Lake (NA)	lake	Bronstein [1947]
5.	*Cavernocypris subterranea* (Wolf, 1920)	Primorie, Gamova Pen., Spasenya Bay (NA), Astafiev Bay, Gorshkov Bay (NA), Furugelm Is. (NA), B. Pelis Is. (NA), Reinecke Is. (NA), near Vladivostok (NA), Ussury Natural Reserve (NA), Krounovka River basin, Borisov plateau (NA)	subterranean waters, springs	Schornikov & Trebukhova [2001], Schornikov [2004]
6.	*Cyclocypris ovum* (Jurine, 1820)	Primorie, Gamova Pen., Astafiev Bay, Gorshkov Bay (NA), Furugelm Is. (NA), Reinecke Is. (NA), Popova Is. (NA)	ubiquist	Schornikov & Trebukhova [2001], Schornikov [2004]
7.	*Cypretta seurati* Gauthier, 1929	Primorie, Falshivy Cape (NA), near Khanka Lake (NA)	pools, rice fields	Schornikov & Trebukhova [2001], Schornikov [2004]
8.	**Cypridopsis vidua* (O.F. Müller, 1776)	Primorie, Falshivy Cape (NA), Vladivostok (NA), Gamova Pen. (NA), Popova Is. (NA), Ussury Natural Reserve (NA), near Ussuryisk (NA), Khanka Lake (NA)	lakes, ponds, pools, streams, rice fields, wetlands	Bronstein [1947], Aladin & Schornikov [1986], Schornikov & Trebukhova [2001], Schornikov [2004], this paper
9.	**Cyprinotus uenoi* Brehm, 1936	Primorie, Popova Is., Alekseeva Bay (NA)	coastal lagoons	Schornikov [2004]
10.	**Dolerocypris fasciata* (O.F. Müller, 1776)	Primorie, Falshivy Cape (NA), Gamova Pen. (NA), Popova Is. (NA), near Vladivostok (NA), Ussury Natural Reserve (NA), Khanka Lake (NA), Pramaya Pad River basin near Kamenka, Dalnegorsk (NA), near Khabarovsk (NA), Chukchi Pen., Kolyma River and Anadir River basins (NA)	lakes, pools, streams, rice fields	Aladin & Schornikov [1986], Schornikov & Trebukhova [2001], Schornikov [2004]
11.	*Eucypris crassa* (O.F. Müller, 1785)	Primorie, near Ussuryisk (NA)	ponds, pools	Bronstein [1947]
12.	*Eucypris pigra* (Fisher, 1851)	Primorie, Gamova Pen., Gorshkov Bay (NA), Furugelm Is. (NA), Reinecke Is. (NA), Popova Is. (NA), near Vladivostok (NA), Ussury Natural Reserve (NA)	springs, streams, rarely in lakes, rivers and artificial pools	Schornikov & Trebukhova [2001], Schornikov [2004]
13.	*Fabaeformiscandona subacuta* (Yang, 1982)	Primorie, Falshivy Cape (NA), Khanka Lake (NA), NE Sakhalin Is., Bolshoy Garomay River (NA), Chaivo Bay (NA)	wetlands, lakes, pools, coastal lagoons	Schornikov & Trebukhova [2001], Schornikov [2004]
14.	*Heterocypris barbara* (Gauthier et Brehm, 1928)	Primorie, B. Pelis Is. (NA)	lakes, synanthropic pools	Schornikov [2004]
15.	**Heterocypris incongruens* (Ramdohr, 1808)	Primorie, Gamova Pen. (NA), B. Pelis Is. (NA), Popova Is. (NA), Vladivostok (NA), Ussury Natural Reserve (NA), Khanka Lake (NA), Pramaya Pad River basin near Kamenka, Dalnegorsk (NA), near Khabarovsk (NA)	lakes, synanthropic pools	Aladin & Schornikov [1986], Schornikov & Trebukhova [2001], Schornikov [2004]
16.	*Ilyocypris dentifera* Sars, 1903	Khabarovsk, Bikin River basin (46º47.347' N; 134º16.627' E)	artificial pools	this paper
17.	**Ilyocypris salebrosa* Stepanaitys, 1960	Primorie, Popova Is. (NA), Khanka Lake (NA), Ussuri River (45°15.741' N; 133°29.598' E)	coastal lagoons, lakes, streams	Schornikov [2004], this paper
18.	**Limnocythere stationis* Vávra, 1891	Primorie, Gamova Pen. (NA), Popova Is. (NA), Razanovka River basin, Khasan (NA), Kamtchatka (NA)	lakes, pools, rice fields, rarely in streams	Aladin & Schornikov [1986], Schornikov & Trebukhova [2001], Schornikov [2004]

Table 1 (contituing)
Таблица 1 (продолжение)

19.	*Metacypris digitiformis* Smith et Hiruta, 2004	Khabarovsk, Nura River basin (49°48.485' N; 137°07.715' E)	wetlands	this paper
20.	*Nannocandona faba* Ekman, 1914	Primorie, Gamova Pen., Astafiev Bay (NA), Furugelm Is. (NA), Vladivostok (NA), Ussury Natural Reserve (NA), South Kuril Isl. (NA), Kamtchatka (NA)	springs, seeps	Schornikov & Trebukhova [2001], Schornikov [2004]
21.	*Notodromas sinensis* Neale et Zhao, 1991	Primorie, Popova Is. (NA), Ussury Natural Reserve (NA), Razdolnaya River (NA), Khanka Lake (NA), near Khabarovsk (NA)	lakes, pools	Schornikov & Trebukhova [2001], Schornikov [2004], Zenina & Schornikov [2008]
22.	*Physocypria kraepelini* G.W. Müller, 1903	Primorie, Falshivy Cape (NA), Ussury Natural Reserve (NA), Khanka Lake (NA)	lakes, streams, wetlands	Schornikov & Trebukhova [2001], Schornikov [2004]
23.	*Scottia birigida* Smith et al., 2002	Primorie, Gamova Pen., Gorshkov Bay (NA), Furugelm Is. (NA), Reinecke Is. (NA), Popova Is. (NA), Sakhalin, near Yuzhno-Sakhalinsk (NA)	springs, seeps	Schornikov & Trebukhova [2001], Schornikov [2004]

Notes: * — sometimes dwells in brackish waters, NA — coordinates not available.

HABITAT. This species was obtained from the bottom of a swampy oxbow lake at a depth of about 1.2 m. Substrate: black silt, decaying plant remains, detritus, aquatic vegetation, submerged logs, tussocks.

DISTRIBUTION. Japan [Smith & Hiruta, 2004].

REMARKS. Previously by Schornikov & Trebukhova [2001], and Schornikov [2004] reported several findings in Primory of the similar species *Metacypris hebeiensis* Huang, 1985, which was described from the Pleistocene deposits of Hebei, China [Huang, 1985].

Results

Including the two new records presented herein, a total of 23 species of freshwater ostracods have been identified from the region (Fig. 23). A number of previous publications have listed species in "open nomenclature", without proper descriptions and only with information on distribution and ecology. Undescribed taxa are not included in the present species-list (see Table 1), but it should be noted that several other genera, *Vestalenula* Rossetti et Martens, *Cryptocandona* Kaufmann, *Pseudocandona* Kaufmann and *Cypria* Zenker, have been reported from the Primory by Schornikov & Trebukhova [2001], and Schornikov [2004]. However, no named species of these genera have been so far reported from the region [Schornikov, 1995].

Ilyocypris japonica Okubo, 1990, seems to be closely related to the undescribed species *Ilyocypris* sp. 1. sensu Schornikov & Trebukhova [2001] [Schornikov, 2004, p. 458, 464, fig. 1, 2]; they share similarities in size ranges and the sculpture of the shell. The ostracod fauna of the Russian Far East includes Palearctic, Holarctic, and one endemic species (*Athalocythere chankensis*). No doubt more thorough investigations will result in more discoveries of this poorly known fauna in the region.

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