Ecological aspects of the dominant amphipod *Monoporeia affinis* (Amphipoda: Pontoporeiidae) in the infralittoral zone on the northeastern coast of the Sakhalin Island (Sea of Okhotsk)

Aspectos ecológicos del anfípodo dominante *Monoporeia affinis* (Amphipoda: Pontoporeiidae) en la zona infralitoral de la costa noreste de la isla Sakhalin (Mar de Okhotsk)

N. L. Demchenko

Laboratory of ecology of shelf communities, A. V. Zhirmunsky Institute of Marine Biology FEB RAS, 17 Palchevskogo Street, Vladivostok, 690041, Russia, E-mail: demnal82@gmail.com

Recibido el 13 de septiembre de 2010. Aceptado el 15 de diciembre de 2010.

ISSN: 1130-4251 (2010), vol. 21, 143-149.

Special Issue: Amphipods: Trends in systematics and ecology (Guest editor: J. M. Guerra García).

Key words: amphipod, the Chayvo Bay, the Sakhalin Island, the Sea of Okhotsk.
Palabras clave: anfípodo, Bahía Chayvo, Isla Sakhalin, Mar de Okhotsk.

ABSTRACT

Monoporeia affinis (Lindstrom, 1855) is the most dominant amphipod species in the infralittoral zone near the Piltun and Chayvo Bays on the north-eastern coast of the Sakhalin Island. This species contributes 60-80% of total amphipod biomass. *M. affinis* forms swarms on the shallows near the lagoons. The summer feeding grounds of gray whales (*Eschrichtius robustus*) are located there. The size structure of the population of *M. affinis* was studied in July, 2007 and 2008 near the Chayvo Bay. The mean density of *M. affinis* in 2007 (788±267 ind./m^2) differs from the density in 2008 (356±162 ind./m^2). The population of *M. affinis* consisted of two cohorts or size groups in the end of July, 2007 and three cohorts in the middle of July, 2008. The reasons why size groups in this region differ between years are discussed.

RESUMEN

Monoporeia affinis (Lindstrom, 1855) es la especie de anfípodo dominante en la zona infralitoral cerca de las bahías de Piltum y Chayvo en la costa noreste

de la Isla de Sakhalin. Esta especies contribuye con el 60-80% de la biomasa total. *M. affinis* forma densos grupos en las aguas superficiales cerca de las *lagoons*. Allí se localizan los territorios de alimentación de las ballenas grises (*Eschrichtius robustus*). La estructura de tamaños de la población de *M. affinis* se estudió en julio de 2007 y 2008 cerca de la bahía de Chayvo. La densidad media de *M. affinis* en 2007 (788 ± 267 ind./m^2) difiere de la densidad en 2008 (356 ± 162 ind./m^2). La población de *M. affinis* estuvo constituida por dos cohortes o grupos de tamaño a finales de julio de 2007, y tres cohortes a mitad de julio de 2008. Se discuten las razones que explican las diferencias en el tamaño de los grupos entre los dos años estudiados.

INTRODUCTION

During the last decade oil and gas were being extracted on the shelf of the northeastern part of the Sakhalin Island in the Sea of Okhotsk. Thus, monitoring of biota in this region is very important now (Nadtochy *et al*., 2004; Moshchenko *et al*., 2005; Labay *et al*., 2008; Fadeeva & Maslennikov, 2009). The main feeding sites of gray whales *Eschrichtius robustus* are also located on the shallow zone there, namely, near the Piltun and Chayvo Bays. It's well known, that gray whales depend on amphipods as the main source in the primary feeding grounds (Kim & Oliver, 1989).

Monoporeia affinis (Lindstrom, 1855) is the most abundant amphipod species in the feeding sites of gray whales in the northeast of Sakhalin at a depth of down to 20 m (Fadeev, 2007, 2009).

The aim of the present work is to reveal ecological aspects of the dominant amphipod species *M. affinis* in the infralittoral zone on the northeastern coast of the Sakhalin Island. The tasks are following: to assess the role of the amphipod *M. affinis* at the gray whale's feeding sites there and to observe the size-age population structure of *M. affinis* during the summer-autumn period of the gray whale's foraging.

MATERIALS AND METHODS

The quantitative samples for morphometry were collected near the Chayvo Bay at 14 stations (7 in 2007 and 7 in 2008) in a depth-range of 10-15 m on well sorted fine sand sediments (Fig. 1).

Three replicates were taken on each station. The amphipod body length was measured from the tip of the rostrum to the end of the telson with an accuracy of 0.1 mm. The sex was determined according to presence of the oostegites in females and the penis-papillae in males. Individuals without

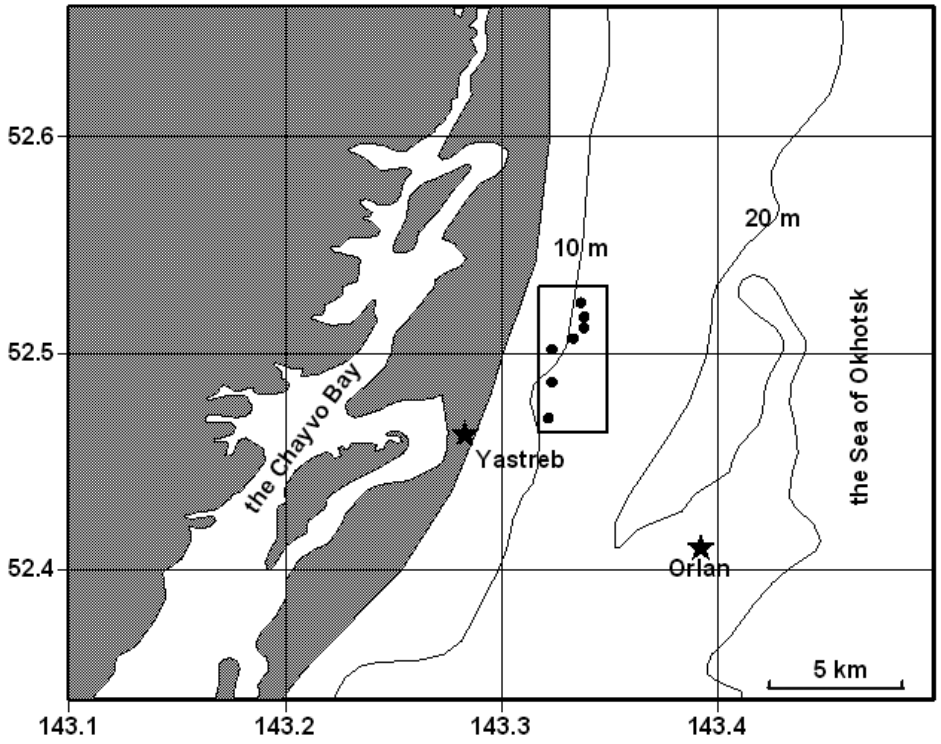

Fig.1.—The location of the sites where samples were taken for morphometry in July, 2007 and 2008.
Fig.1.—Localización de las estaciones de muestreo donde se recolectaron las muestras para morfometría en Julio 2007 y 2008.

visible sexual characters were considered juveniles. The map of amphipod distribution was made by aid of the program ArcGIS 9.2 by E.G. Egedarev (Pacific Institute of Geography FEB RAS).

RESULTS AND DISCUSSION

The amphipod *M. affinis* occurs in the coastal zone of the Piltun and Chayvo Bays (the northeastern coast of the Sakhalin Island, the Sea of Okhotsk). *M. affinis* forms swarms in the shallows (up to 20 m) adjacent to lagoons (Fig. 2).

Summer feeding sites of the gray whales (*Eschrichtius robustus*) are located there. *M. affinis* is the dominant amphipod species in the studied

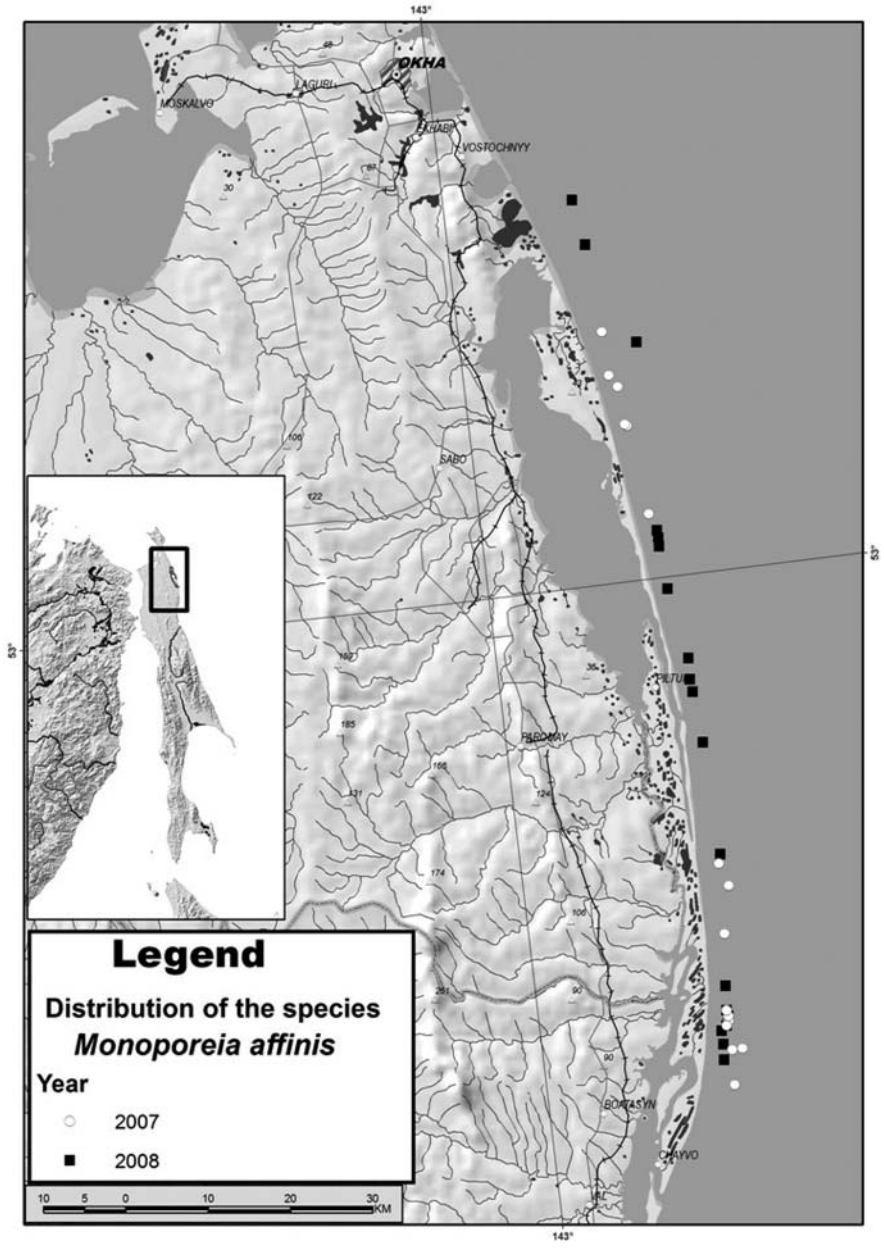

Fig. 2.—The distribution of the amphipod *Monoporeia affinis* on the northeast of the Sakhalin Island.
Fig. 2.—Distribución del anfípodos *Monoporeia affinis* en el noreste de la Isla Sakhalin.

region. The contribution of this species to total amphipod biomass was the same in both observed years. Correlation analysis between abundance and some parameters (depth, salinity, temperature) revealed that the depth has an influence on distribution of *M. affinis* in the studied region; a negative correlation was measured between depth and abundance of this species ($r=-0.52$, $p<0.05$).

The size structure of *Monoporeia* population near the Chayvo Bay was quite different between July, 2007 and July, 2008 (Fig. 3). It consisted of 3 cohorts or size groups in the middle of July, 2008. The cohort 0+ (see Fig. 3) was characterised by a length of 3.6±0.2 mm (Mean ± SD) in 2007 and 3.7±0.3 mm in 2008, the second cohort 1+ (see Fig. 3) was

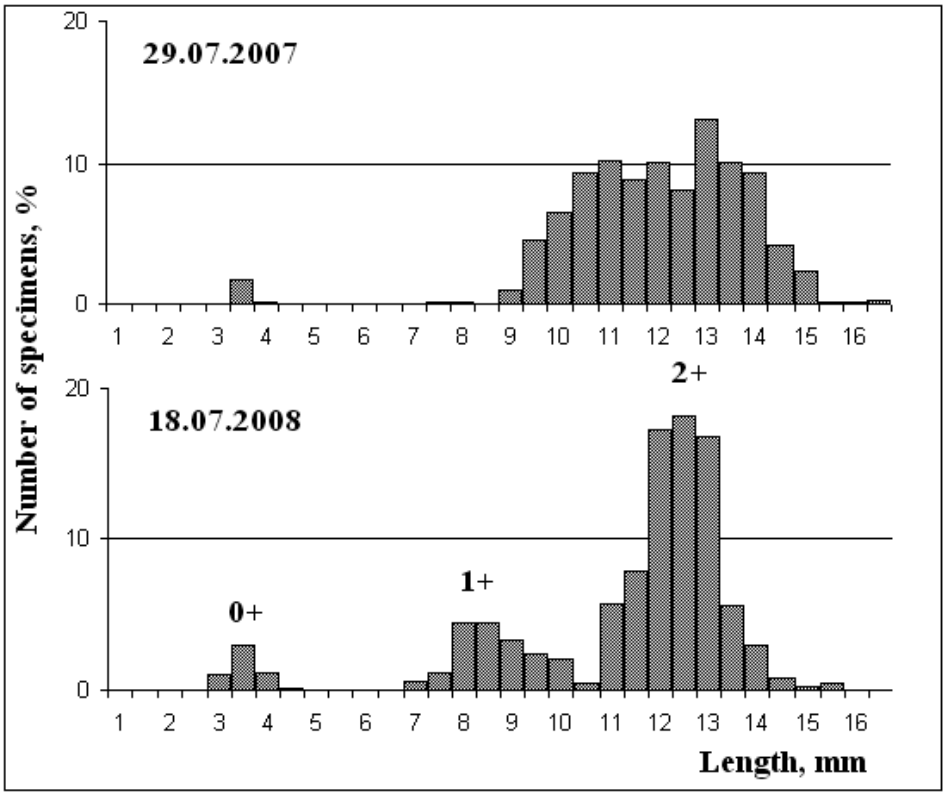

Fig. 3.—The size-age population structure of the *Monoporeia affinis* near the Chayvo Bay in July, 2007 and July 2008.
Fig. 3.—Estructura de edades de la población de *Monoporeia affinis* cerca de la bahía Chayvo en julio de 2007 y 2008.

10.7±0.8 mm (2007) and 8.8±0.7 mm (2008) and the third cohort 2+ (see Fig. 3) 13.2±1.0 mm (2007) and 12.6±0.8 mm (2008). The growth rate of the *M. affinis* near the Chayvo Bay was higher in July, 2007 than in July, 2008, probably due to differences in temperature; in fact, monthly bottom temperature in July, 2007 was 7.9°C whereas in July, 2008 was 5°C. The females did not differ statistically from males by body length (Student's t-test=0.9; $p>0.05$). Males and females have the same mean and mode length (Table I). The maximal length of females (15.2 mm) exceeded that of males (14.7 mm). According to our observations, *M. affinis* become mature in age of one year when they reach the length of 8 mm. Taking into account the results of the present study, the life time of *M. affinis* should be no less than 2 years, according to size-age structure. This species is the dominant amphipod in the studied region contributing to the total amphipod biomass 60-80%. Consequently, the ecological data provided by this work contributes to the knowledge of this species, which was poorly knwon in this region before the present study.

Table I.—Variations of length and weight of the species *Monoporeia affinis*
Tabla I.—Variaciones de longitud y peso de la especies *Monoporeia affinis.*

	Females		**Males**		**Juveniles**	
	Length, mm	**Weight, g**	**Length, mm**	**Weight, g**	**Length, mm**	**Weight, g**
Mean	12.2	0.043	12.2	0.041	5.7	0.006
SD	0.1	0.002	0.1	0.001	0.5	0.001
Mode	13	0.052	13	0.044	3.6	0.001
Min	8	0.011	9	0.017	3.5	0.001
Max	15.2	0.108	14.7	0.074	8.8	0.016
N	112		127		20	

ACKNOWLEDGEMENTS

The author is very grateful to Dr. Valeriy I. Fadeev for given material and also to Liudmila N. Khorolskaya for help in measuring of amphipods.

REFERENCES

FADEEV, V. I. 2007. *Investigations of benthos and food resources in summer feeding areas of the Korean - Okhotsk population of the gray whale Eschrichtius robustus in 2001-2003. Response of marine biota to environmental and climatic changes: Materials of Complex Regional Project of Far East Branch of the Russian Academy of Sciences under the program of Russian Academy of Sciences Presidium*. Dalnauka. Vladivostok, 232 pp.

FADEEV, V. I., 2009. Benthos studies in feeding grounds of western gray whales off the northeast coast of Sakhalin Island (Russia), 2004-2008. En: *Scientific reports of International Whaling Commission*, 61st annual meeting: 1-9. Funchal, Madeira, Portugal.

FADEEVA, N. P. & MASLENNIKOV, S. I. 2009. The abundance and distribution of free-living marine nematodes of the Piltun-Astokhskoye oil and gas field (North-East Sakhalin). *Russian Journal of Nematology*, 17(1): 31-42.

KIM, S. L. & OLIVER, J. S., 1989. Swarming benthic crustaceans in the Bering and Chukchi seas and their relation to geographic patterns in gray whale feeding. *Canadian Journal of Zoology*, 67: 1531-1542.

LABAY, V. S.; MOTYL'KOVA, I. V.; KONOVALOVA, N. V.; NEMCHINOVA, I. A.; MUKHAMETOVA, O. N.; ZHUKOVSKYI, S.B. & SAMATOV, A.D., 2008. Brief hydrobiological description of the Okhotsk Sea coastal shallows along northeastern Sakhalin Island. *SakhNIRO*, 10: 3-34.

MOSHCHENKO, A. V.; KONOVALOVA, T. V.; BELAN, T. A. & KHRISTOFOROVA, N. K. 2005. Variations of benthos distribution under changed environmental conditions near Moliqpak oil platform (north-east Sakhalin shelf). *Izvestiya TINRO*, 142: 223-245.

NADTOCHY, V. A.; BUDNIKOVA, L. L.; KOBLIKOV, V. N.; & BEZRUKOV, R. G. 2004. Modern data on composition and quantitative distribution of macrobenthos on the Okhotsk Sea shelf of Sakhalin Island. *Izvestiya TINRO*, 139: 317-339.