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ГЛОБАЛЬНЫЕ КЛИМАТИЧЕСКИЕ ПРОЦЕССЫ И ИХ ВЛИЯНИЕ НА ЭКОСИСТЕМЫ АРКТИЧЕСКИХ И СУБАРКТИЧЕСКИХ РЕГИОНОВ

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В сборнике представлены тезисы докладов Международной конференции "Глобальные климатические процессы и их влияние на экосистемы арктических и субарктических регионов", организованной Мурманским морским биологическим институтом КНЦ РАН. Рассматриваются теоретические и практические проблемы, связанные с глобальными изменениями климата и современным состоянием экосистем арктических и субарктических регионов. Обсуждаются современные тенденции и прогнозы состояния гидрологического режима Северного Ледовитого океана, перигляциальные явления и процессы, методология и результаты геолого-геофизических и палеогеографических исследований. Большое внимание уделено особенностям эволюции флоры и фауны арктических и субарктических регионов в условиях глобальных климатических изменений и антропогенного пресса.

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GLOBAL CLIMATIC PROCESSES AND THEIR EFFECTS ON ECOSYSTEMS OF ARCTIC AND SUBARCTIC REGIONS

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(Murmansk, 9–11 November 2011)

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This publication contains proceedings of the International Scientific Conference "Global climatic processes and their effects on ecosystems of Arctic and Subarctic regions" held by the Murmansk Marine Biological Institute KSC RAS on November 9–11, 2011. The book addresses fundamental and applied issues of global climate change and the status of arctic and subarctic ecosystems. Discussed are modern trends and forecasts of the hydrologic regime of the Arctic Ocean, periglacial events and processes, and methodology and results of geological, geophysical and paleogeographical studies. The book pays much attention to the evolution processes of the arctic flora and fauna under the conditions of global climate change and man-caused pressure.

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В 1990-е годы в результате климатических изменений произошло потепление Арктики, которое оказало влияние на физиологические процессы, биологию и жизненный цикл многих видов, обитающих в морях высоких широт (De Prisco, Verde, 2006). Популяция сайки, биомасса которой на современном этапе достигла высокого уровня, в условиях повышенного теплосодержания вод Баренцева моря характеризуется новыми структурными и функциональными свойствами. Отмечается более раннее половое созревание, снижение массы тела при сохранении линейных размеров одновозрастных рыб, преобладание в нерестовой части популяции молодых, впервые нерестующих рыб, снижение популяционной плодовитости, сокращение продолжительности жизни (в уловах отсутствуют особи старше 6+ лет, высокая естественная смертность) (Шепель, 1972; Боркин, 1990; Survey ..., 2004; Оганин, Терещенко, 2009).

Быстрое созревание способствует замедлению соматического роста за счет перераспределения энергии на процессы генеративного синтеза, поэтому масса тела уменьшается при сохранении линейных размеров особи. С увеличением скорости смены поколений увеличивается интенсивность продукционных процессов в популяции. Рассчитанный для 1986–1988 и 2004 гг. P/B-коэффициент популяции в возрастных группах от 1 до 4 лет колебался – 0.72–1.28 (среднее 0.91). Согласно выполненным расчетам продукция в 1986–2004 гг. колебалась от 103 тыс. т (1988 г.) до 2049 тыс. т (2001) и в среднем составила 746 тыс. т. Основная доля продукции создавалась особями в возрасте 1+...2+ лет. В то же время генеративная продукция сократилась за счет омоложения возрастной структуры нерестового стада, в котором преобладают особи с низкой абсолютной индивидуальной плодовитостью. Величина генеративной продукции в 1986–1988 гг. оценена 18.9–103.1 тыс. т, в 2004 г. – 235.3 тыс. т, что составило соответственно 12–23 и 16 % от величины общей продукции.

Таким образом, современная популяция сайки качественно отличается от популяции допромыслового периода, и характеризуется специфической структурой, динамикой численности и скоростью продукционных процессов, что является реакцией вида на меняющиеся условия его существования.

НОВЫЕ ВИДЫ МОЛЛЮСКОВ И ПОЛИХЕТ ДЛЯ БАРЕНЦЕВА МОРЯ: РАСШИРЕНИЕ АРЕАЛОВ ИЛИ СЛАБАЯ ИЗУЧЕННОСТЬ ФАУНЫ?

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NEW RECORDS OF ARCTIC MOLLUSKS AND POLYCHAETES: RANGE EXPANSION OR POORLY STUDIED FAUNA?

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Recently, 11 gastropods were recorded for the first time from the Barents Sea, Russian Arctic Seas, or the entire Arctic Ocean (Grantovich, Sokolova, 2001; Martynov et al., 2006; Kantor et al., 2008). Many of them were collected during expeditions of the Severtsov Institute of Ecology and Evolution in 2002–2006. In 2009 we also found in the Jarnyshnaja Inlet (Barents Sea) 3 polychaetes and 2 bivalves that could be new for the regional fauna. Additionally, 2 spirorbin polychaetes were found in the collections of Zoological Institute (St. Petersburg, Russia) and Niva-Akvaplan (Tromso, Norway). Finding a species new for a region always raises the question whether the species is new indeed or it simply has not been discovered earlier. Not only there is a significant confusion with the terms "a new species for a fauna" and "an invading (alien) species", but also it is hard to tell whether a species is an alien or a native missed earlier. For the Barents Sea it should be kept in mind that 1) its fauna is one of the best studied in the

Arctic, so a new record may be really an alien species, and 2) taxonomy of some invertebrates or their regional fauna are so poorly known that it may be just a first record of a native species. Here we analyze the status of newly found species of mollusks and polychaetes.

Because prosobranch gastropods of the Barents Sea are well studied, discovering of a dense population of *Aporrhais pespelicani* in 2007 was unexpected. Due to its very characteristic morphology, this large mollusk could not have been missed or misidentified. This widely distributed in the North Atlantic species is a deposit feeder with planktonic larvae that can easily disperse to a new region. Apparently, it has extended its range eastward as a result of raise in seawater temperature. The situation appears opposite with numerous specimens of *Littorina arcana* found in the Barents Sea in 2000. This species described only in 1978 was separated from a species-complex based on molecular and reproductive biology data. Living in a mixture with a common *L. saxatilis,* it had not recognized before due to insignificant morphological differences among species.

Most new species records were found among nudibranchs. These mollusks have a short life cycle and inhabit shallow waters, may potentially be indicators of short-term environmental changes, but are difficult for identification. A description of *Murmania antiqua* gen. et sp. nov. from the Barents Sea (Martynov, 2006) suggests that the nudibranchs have not been well studied in the region despite the work by Volodchenko (1940) and Roginskaja (1962–2000). Formally, 9 new species were recorded from the Barents Sea or surrounds. Few specimens of *Archidoris pseudoargus,* a large brightly-coloured snail, were first found in 2000 and already in 2005–2006 numerous animals were found breeding successfully. We conclude that this record is a recent invasion. Numerous breeding specimens of *Trinchesia pustulata* and *Tergipes tergipes* were found first in 2000 in tidal pools. Previously these two species were known only from northward off the Great Britain and Ireland, so they are probably also recent invaders to the Barents Sea. Characteristic features of these species assure that they could not have been misidentified earlier, though they could have been missed because of their small size (about 1 cm). Previous northernmost records of *Polycera quadrilineata* were the Lofoten Islands and Greenland. In 2005, two juveniles of *P. quadrilineata* were found in the Barents Sea. Adults of this mollusk with distinct features are about 4 cm long. Situation is unclear because no stable population was observed. *Coryphella verrucosa* formally was first recorded off the Murman coast of the Barents Sea in 2006. However, the species simply was not previously distinguished from *C. gracilis* found in the same localities. The opposite situation appears for three other nudibranchs, *Nudibranchus exiguous*, *Eubranchus tricolor* and *Embletonia pulchra*, all of which were recorded long before the Martynov et al. (2006) study, but all these definitions were erroneous. Undisputable records of the numerous *Nudibranchus exiguous* have been reported only since 2000 from floating constructions off Dal'nezelenetskaja Inlet where they found in the community of *Obelia longissima* on *Saccharina latissima*. The nudibranch may be an alien species, though it could have been overlooked due to its small size (about 1 cm) or due to its specific habitat. The other two species are rare and may be either really new or previously overlooked. Martynov et al. (2006) suggested that *E. pulchra* is also new record for Subarctic, though it is plotted on the WORMS map (http://www.marinespecies.org/) nearby the Shetland Islands and Denmark. Finally, the only specimen of *Doto fragilis,* a small snail about 1 cm long, from the Barents Sea was found in 2006. Although the taxonomy of genus is poorly understood, the only other *Doto* (*D. coronata*) from the Barents Sea is clearly distinct from *D. fragilis.* Therefore, *Doto fragilis* a new record for the Russian Arctic Seas, although with unclear invasive status.

Among bivalves, we found *Abra prismatica* (8 specimens, both adults and juveniles) and *Gari fervensis* (3 juveniles). It is very doubtful whether the former species was present in the Arctic before. The sites plotted on the WORMS map for both species in the Greenland Sea are questionable and the only literature record of *A. prismatica* from the Barents Sea is of unclear origin and location (Brjazgin et al., 1981). Kantor and Sysoev (2005) suggests that the latter record came from an old unpublished manuscript of Filatova and belongs to the western part of Barents Sea (beyond the Russian coasts), so it could be not *Abra* at all. However, in the North

Sea this species lives in the community with polychaetes *Aonides paucibranchiata* and *Pisione remota*, that are also newly recorded in the Barents Sea. Therefore, it may either be a complex of recent invaders, or the species missed earlier in the Barents Sea because they inhabit only unstudied shallow coastal parts of inlets. Finding of *Gari fervesnis* could be a result of occasional or even regular settlement of planktonic larvae not followed by juvenile survival. Juveniles *G. fervensis* resemble those of common *Hiatella arctica*, so they could be misidentified earlier, while adults are easy recognisable.

We found 5 interesting polychaetes, including morphologically similar spionids – a common *A. paucibranchiata* and a rare *A. oxycephala*. Simultaneously, numerous specimens of the former species were found in Teriberka Inlet by Anisimova et al. (2009). Adults of both species were previously known in the Arctic only from the southern part of Norwegian Sea (Sikorski, 2001). Sikorski (pers. comm.) also suggested that in the recent years these species had extended their range north-east along the Norwegian coast. However, Lebskij (1970) described larval development of *A. paucibranchiata* from the White Sea and probably it is his planktonic records that were plotted on the WORMS map. Neither larvae nor adults were recorded from the White Sea before or after Lebskij, but it is common for many spionids with long-living larvae to be found in the plankton, but not in the benthos as adults. *A. paucibranchiata* may be is a new invader that has established in the Barents Sea only recently. In the North Sea, this species lives in the same community as *A. prismatica* and *P. remota*, also proposed to be alien species for the Russian Arctic Seas. As stated above, the habitat where they live could have been missed during previous studies. *A. oxycephala* was recorded only once from the Barents Sea (Brjazgin et al., 1981); the situation with this record seems identical to that with *A. prismatica*. *Aonides* sp. was recorded from the Laptev Sea (Gagaev, 2004), but the material was not kept and identification was probably incorrect. We also found 10 specimens of Pisionidae, probably *P. remota*, which could be the first record of this family from the Arctic. There are two sites plotted on the WORMS map for this species in Arctic, but Tzetlin and Zhirkov (pers. comm.) claim that there are no literature data on any pisionids there. Thus, pisionids were proven new records for the Russian Arctic Seas and their appearance may be a result of the range expansion due to water warming. However, they could have been missed earlier because of their tiny size or misidentified as syllin Exogoninae sp. In spirorbins, we found *Spirorbis cinereus* from the White Sea, which is new species for the Russian Arctic Seas. Because the spirorbins of the White Sea were studied by Aleksandrov (1981), Tzetlin (1985) and Jakovis (1997), this species is appears to be alien. The surprising fact is that the material examined in this study was collected back in 1923. Another spirorbin, *Bushiella acuticostalis* was collected in the Barents Sea in 1978 and 1992, while the species was described only in 1991 and more likely was misidentified before it. Obviously, both *S. cinereus* and *B. acuticostalis* species are native for the studied areas.

In conclusion, out of 20 species suggested as new records for some Arctic regions, unquestionably 2 and most likely 5 are recent invaders, 4 species are natives, and remaining 9 are of unclear status. The studies were supported by programs "Biological diversity", "Fundamental basis of resources management" of RAS, and RFBR № 10-04-011764-а.

АНАЛИЗ ПЕРЕМЕЩЕНИЙ РАДИОМЕЧЕНЫХ САМОК БЕЛЫХ МЕДВЕДЕЙ В БАРЕНЦЕВОМ МОРЕ ЗИМОЙ 2010/2011 ГГ.

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В российской науке недостаточно данных о спутниковом слежении за перемещением белых медведей с использованием радиоошейников. Совместные российско-американские