Status of the harbour seal (*Phoca vitulina*) along the Murman coast of Russia

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ABSTRACT

Harbour seals are observed along the Murmansk coast of Russia, but they are not very abundant there. The estimated abundance for this area was about 500 individuals in 1998. The number of seals observed during winter months is less than during summer. During summer, the main habitats are the Pechenga inlet, the Motovsky and Kola Bays of the Western Murman coast and the Ivanovskaya Bay in the Eastern Murman coast. The Ivanovskaya Bay was thought to be the easternmost breeding colony of the subspecies *Phoca vitulina vitulina*. However, recent sightings may indicate the establishment of a breeding site further to the east, which then becomes the easternmost known habitat for this subspecies. A substantial, recent decrease in abundance has been observed in the Ivanovskaya Bay. The population numbered about 120 seals in the early 1990s, but only about 20 seals were seen in 2007 and 2008. It is presumed that the reasons for this reduction include hunting, fishery by-catch, disturbance and depletion of the food supply in this semi-enclosed inlet. A gender-specific daily activity pattern was observed in the Ivanovskaya Bay. The highest number of single animals (primarily adult males) hauled out during mid day, while hauled out females with pups showed two peaks per day associated with low tides.

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INTRODUCTION

At present, harbour seals, (*Phoca vitulina vitulina L.*), are considered rare along the Barents Sea coast of the Kola Peninsula (the Murman coast) in Russia. However, earlier presence of the species is documented by historical records (Russian pomors, Finnish and Norwegian colonists) where harbour seals were reported as *"nerpa-kamenka"* (stone seal, spotted seal). In 1900 and 1901, the Murmansk Research and Fishing Expedition only found three live specimens in the East Murman, and one cranium was found on the Novaya Zemlya coast (Smirnov 1903).

In a later report (Surkov 1966), the following was mentioned: "In the Murmansk Region, harbour seals are not present in large quantities, but they can be seen everywhere and come regularly to the shore. They swim up rivers and are found at long distances from the sea, in general the species is coastal. Harbour seals occur as single animals or in small groups forming no large breeding rookeries or moulting lairs and do not make long migrations".

During the 1980s, harbour seals have been observed as single seals or in small groups along the Murman coast including the Ainov Islands, the Zapadnaya Zelenetskaya and Dalneze-

lenetskaya Inlets, the Rynda River mouth and the Nokuev Island (Tatarinkova and Chemyakin 1990, Kondakov 1992). In March 1990 scientists from the Murmansk Marine Biological Institute (MMBI), found a breeding colony of harbour seals in the Ivanovskaya Bay at the Eastern Murman coast. At that time, this was the easternmost breeding colony of this subspecies representing the eastern boundary of its distribution (Kondakov 1992).

MATERIALS AND METHODS

Studies on the harbour seal were commenced by MMBI in 1990-1992 and continued through 2000. The main study areas were the Ivanovskaya Bay and the coastal area at the Dalnie Zelentsy Settlement. In 2002-2004, the Polar Research Institute of Marine Fisheries and Oceanography (PINRO) started investigations using inflatable boats on coastal marine mammal species along the Eastern Murman coast from the Teriberka Bay to the Ivanovskaya Bay. Seals along the open Barents Sea coast and the bays of Voronja, Dalnie Zelentsy, Drozdovka and particular in the inlet of the Ivanovskaya Bay were surveyed (Fig. 1). The most complete harbour seal studies were made at the haulout sites of the Ivanovskaya Bay by MMBI and PINRO in 1992-2008.

The surveys at the western Murman coast were less comprehensive, but in the summer 1998, A. Kondakov (MMBI), covered the whole Murman coast using an inflatable boat. Additional information was obtained from the research vessels of PINRO working near the coast.

Studies of the daily activity patterns of harbour seals in the Ivanovskaya Bay were conducted on 26-27 June 1993. The abundance of hauled out seals were recorded at 20 minute intervals during a 36 hour period. Seals were classified as single animals (mainly adult males) and females with pups. Simultaneously, data on tidal cycle were recorded. The seal behaviour was categorised as "playing", "giving birth", "nursing" and "copulating".

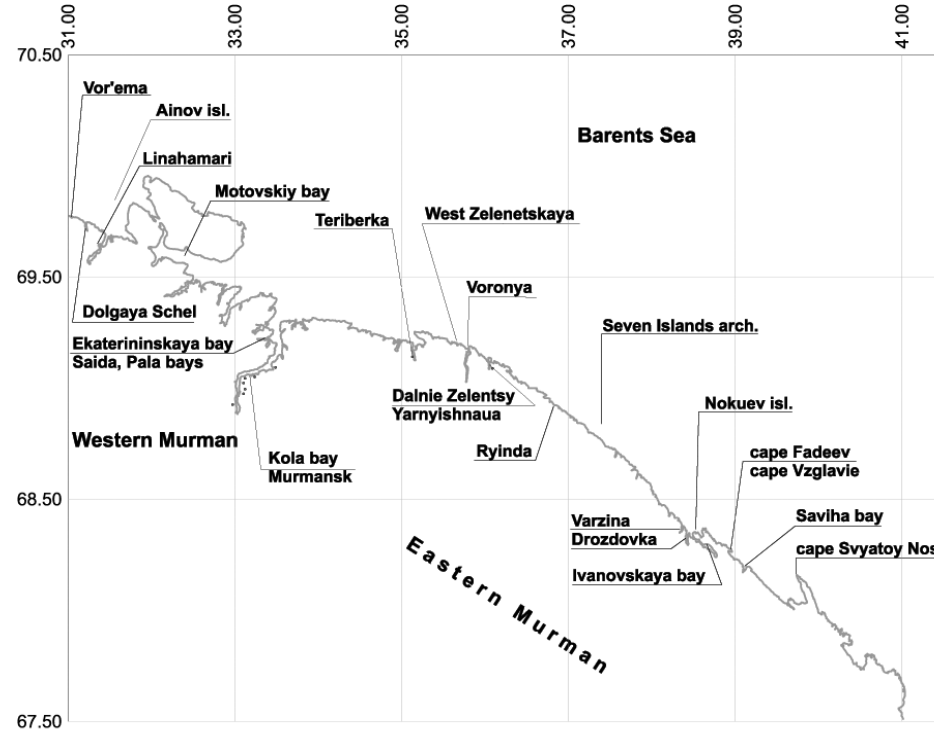

Fig. 1. *Map of Murman coast of the Barents Sea, with geographical names mentioned in this paper.*

RESULTS AND DISCUSSION

Overall distribution, haulout habitats and abundance

Harbour seals are distributed along the Murman coast of the Barents Sea from the Varangerfjord (Vor'ema River) to the Ivanovskaya Bay (Fig. 1). The main breeding sites include the Kola Bay, Voronya River and the Ivanovskaya Bay, which will be described in further detail below.

At present, harbour seals are rare in the White Sea. Based on interview data, single animals have been observed at the west coast entrance of the White Sea. However, suitable habitats, may suggest that harbour seals could establish in the White Sea. (Bychkov 1997).

Harbour seals were most frequently observed hauledout in the intertidal zone of small rocky islets or shore banks (*ludas*) and on stones exposed only during ebb tides (*korga*). At the Murman coast harbour seals rarely haul out on the mainland shores, it was observed only twice.This could be an adaption to the presence of terrestrial carnivores in the region. Mixed haulout groups of harbour and grey seals were also observed.

No rookeries were observed on sand banks associated with river mouths in the Kola Peninsula, which is a common haulout habitat in the United Kingdom, and also in the Tanafjord in Norway (Henriksen 1995). However, harbour seals were frequently observed at mouths of rivers, such as Voronja, Varzina, Drozdovka at the Eastern Murman coast.

Harbour seals are generally resident, in particular during the summer months when breeding and moulting occur. However, they show less site fidelity during winter when some longer movements have been observed (Wiig and Øien 1988). The numbers of seals observed at the Murman coast were generally lower during winter than summer. Some of the summer haulout sites are surrounded by winter ice and therefore not accessible during winter. There is likely a westward movement of harbour seals into Norwegian coastal waters during autumn and winter. Small groups, however, spend the winter in the Pechenga Bay in Varangerfjord area. It is also thought that wintering areas may incude the Drozdovka and Shuritskaya Inlets and the Motovsky and Kola Bays.

In the spring, when the Ivanovskaya Bay is covered with ice, harbour seals start to congregate in this area. About 50 and 100 harbour seals were counted in March 1990 and 19-21 March 1992, respectively (Kondakov 1992). In the period 12-14 March 1994, when the Ivanovskaya Bay was almost completely covered with ice, only

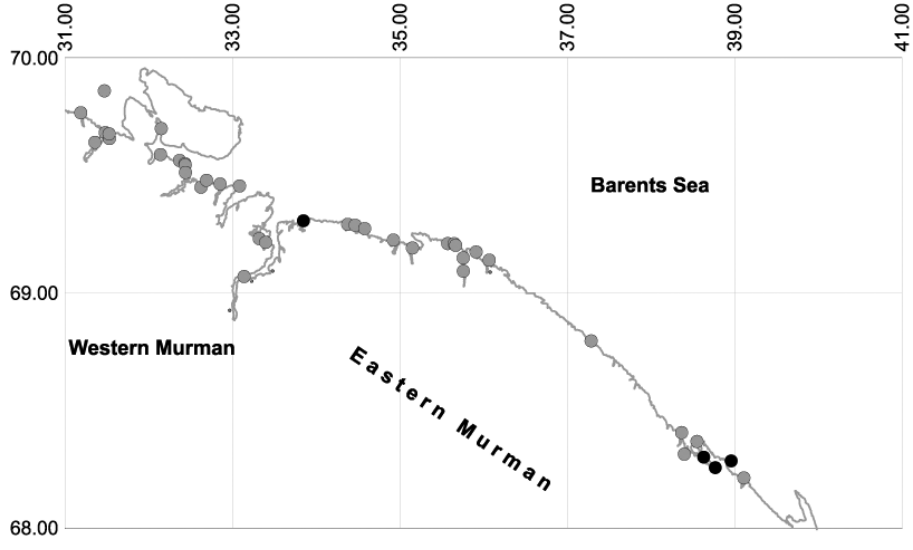

Fig. 2. *Observations of harbour seals on the Murman coast of the Barents Sea. Black dots: above 50 seals.*

4 animals were recorded at the entrance of the bay. In the neighbouring Drozdovka inlet, 11 harbour seals were observed hauling out on a small island (Zyryanov and Moskvin 1997). On 19 March 1995, 8 harbour seals were observed from a helicopter in the area of Ivanovskaya Bay to the Nokuev Island (Nygard *et al.* 1995). In the area of the Dalnie Zelentsy Settlement (the Yarnyshnaya inlet), 2 harbour seals were seen on 10 March 1996.

The harbour seal abundance of the entire distribution area along the Murman coast was estimated from 27 July to 27 August 1998. The survey was conducted from the mouth of the Vorjema River to the Seven Islands archipelago and in the Ivanovskaya Bay. A total of 265 harbour seals, including 32 pups, were observed (see Fig. 2 and Table 1). The total abundance of harbour seals on the Murman coast was estimated to be 400-500 seals (Kondakov *et al.* 1999), which has been corroborated by Mishin *et al.* (2001).

The Kola Bay habitat

In the Kola Bay, harbour seals occur only in the northern part, primarily in the Ekaterininskaya Harbour and the adjacent small inlets (Olenya, Saida, Pala). A small rookery has been found on the small island (*luda*) of the Pala inlet. The total abundance of harbour seals in Kola Bay is probably about 20 animals.

In February 1999, 2 seals were observed in the water north of the Zeleny Cape, (in the port area of the city of Murmansk city). The seals were observed in Kola Bay mainly in March-April, which suggests that it may be a wintering area. However, high background noise and busy ship activity probably restrict seal distribution in the bay.

The Voronya River habitat

The lower part of the Voronya river is up to one km wide and shallow (average depths range from 0.5-4 m), with wide shoals, islands and many stones. The landscape changes according to tidal state and at ebb tide large areas are exposed. Groups of bearded seals, *(Erignathus barbatus)*, inhabit the mouth of the river. Harbour seals primarily occur 16-20 km further upstream, in the shallow stony part of the bed (but not in the channel of the power station), as well as in the estuarine waters of the Voronya Inlet.

Table 1. Observations of harbour seals along the western Murman coast during summer 1998 (from: Kondakov *et al.* 1998).

Date	Place of observation	Lat N (DD)	Long E (DD)	Numbers
28.07.1998	island	69.6825	31.4812	1
30.07.1998	bay	69.6413	31.358	1
04.08.1998	island	69.6825	31.4812	1
04.08.1998	bay	69.6575	31.5313	1
04.08.1998	bay	69.6775	31.5265	15
05.08.1998	luda	69.5892	32.1405	40
06.08.1998	on the water	69.5642	32.3685	1
06.08.1998	on the water	69.55	32.4333	2
06.08.1998	on the water	69.545	32.4367	1
06.08.1998	luda	69.5132	32.4395	30
06.08.1998	bay	69.4502	32.6245	1
06.08.1998	island	69.4797	32.6908	1
06.08.1998	on the water	69.4642	32.8533	1
06.08.1998	on the water	69.4555	33.0857	1
07.08.1998	cape	69.3075	33.849	50

The Voronya River has populations of salmon *(Salmo salar)*, trout *(Salmo trutta)*, and Arctic char *(Salvelinus alpinus)*. It is thought that these species, and possibly some flatfish species, contribute to the diet of harbour seals in the area. According to interviews, harbour seals were abundant in the area in the period 1940-1960. They were perceived as a nuisance for local gill-net fisheries and subject to hunting by fishermen. In recent years, 13 animals were recorded in the river in 1996. In summer of 2007 a group of 6 harbour seals including 2 females with pups was seen. This was the first documented reproduction of harbour seals in the Voronya River. Harbour seals have seldom been observed in the adjacent large Teriberka River.

The Ivanovskaya Bay habitat

The Ivanovskaya Bay is a partly isolated inlet stretching from the Nokuev Island and about 20 km towards the southeast. The bay is relatively narrow (1.5-2 km). Maximum depth is 55 m, but shallow ridges divide the inlet into three basins separated by strong currents. The bay is separated from the Barents Sea by a high mountain ridge in the north. The surface layer has low salinity caused by the waters from two rivers and 10 smaller brooks, which forms stable winter ice covering most of the inlet. During summer, the surface layer temperature may exceed 12°C, but at depths greater than 15 m, the water remains cold (about -0.7°C) and has normal salinity. The narrow entrance and shallow rapids reduce the tidal amplitude by 30-50% in the inner basin, decreasing the rate of marine water exchange (Semyonov 1989).

Seals occur all over the Ivanovskaya Bay. Despite reduced tidal amplitude, there are a number of intertidal stones and rocks that are suitable for harbour seal haulout. These are used for parturition, nursing, moulting and resting. In the breeding period, females and pups haul out on the stones and small islands in the second and third basins. The seals can easily run through narrows and shallow rapids in the inlet and some seals enter a branch of the Ivanovka River, between the third basin and the reach of the main river where the anadromous fish (trout and salmon) are harvested. The potential prey species for harbour seals in the Ivanovskaya Bay are salmon, trout and arctic char, conditioned by the two spawning rivers Ivanovka and Chernaya, but

Table 2. Maximum numbers of harbour seals counted in the Ivanovskaya Bay during the breeding seasons in 1990-2008.

Study period	Number of observation days	Number of adults	Number of pups
June 1990	2	45	17
June 1992	12	78	31
June 1993	23	94	47
August 1994	4	36	4
August 1995	16	51	10
July 1996	23	52	25
August 1996	6	35	1
July 1997	10	22	8
August 1998	3	67	3
July 1999	13	40	12
June 2000	1	8	7
June 2005	15	21	6
June 2007	4	12	5
July 2008	6	21	8

also flatfishes and cod *(Gadus morhua)* occur in the inlet. Seals feed practically everywhere in the bay area, but noticeably prefer rapids and mouths of spawning rivers (Zyryanov and Moskvin 1997).

During the breeding period, mature harbour seals tend to stay close to the rookery (Thompson and Miller 1990). However, immature animals may feed actively in a wider area before they congregate for moult (Thompson *et al.* 1989). The presence of sites suitable for reproduction and moulting, and the possibility to feed regularly close to the rookery, make the Ivanovskaya Bay a preferred summer habitat for harbour seals. The area hosts the largest breeding colony of harbour seals along the Murman coast.

Trends in harbour seal abundance in the Ivanovskaya Bay habitat

The total abundance of adults in the breeding seasons of 1992-1993 was between 78 and 94 harbour seals (Table 2). Later, reduction in the abundance in Ivanovskaya Bay and possibly migration of some animals to the Drozdovka and Varzina inlets were observed (Table 2). Boat-based assessments were conducted 4-16 August 1995. This period was characterized by heavy rain and large fluctuations in water levels. On the 4 August, 19 adults and 5 pups were observed in the third basin, and on the 9 August, 12 adults were counted. On the 14 August, the water level in the inlet increased to 1.5 m above normal high tide, also water turbidity increased. Seals actively moved between rookeries in this period. On 16 August, 35 seals were counted in the second basin, as compared to 26 seals seen on the 6 August.

In 1996, a good assessment of harbour seals was not possible for a long time because of the active movements of animals. Due to a certain tidal current and the prevailing flush of water through the inlet, the seals spent much time outside the entrance of the inlet towards the Nokuev Island.

In 1999 the ice in the inlet melted late. Based on interviews, there were many seals in the bay in early and mid June (*i.e.* during the peak period of reproduction). Following this period, the abundance declined.

The winter 2004-2005 was characterized by little snow and an early spring in the Ivanovskaya Bay. The ice in the inlet melted early and the water levels in the rivers were low. This usualy offers good conditions for fish in the inlet. However, only a few harbour seals were observed.

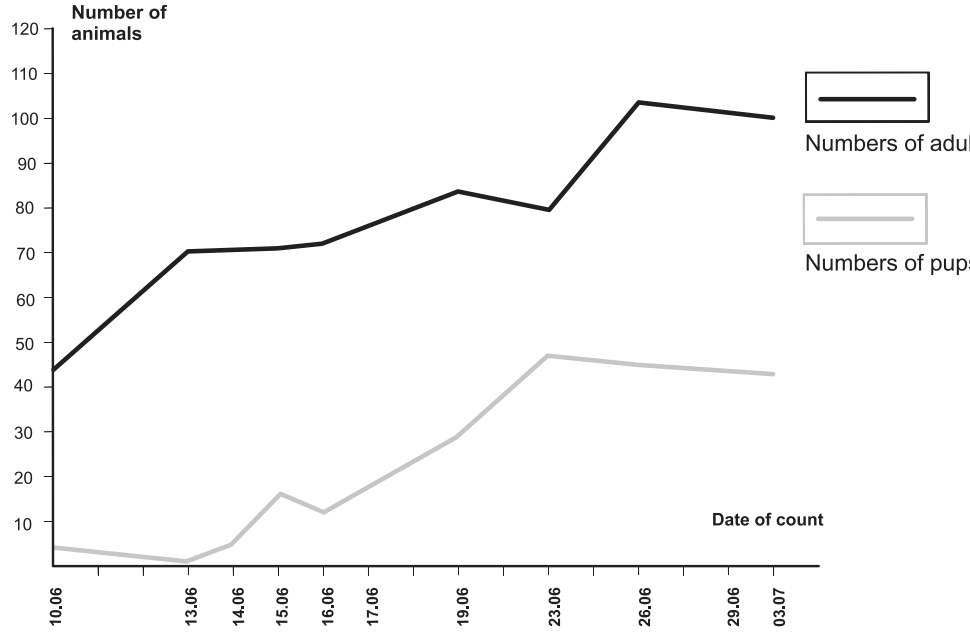

Fig. 3. *Harbour seal counts (adults and pups) in the Ivanovskaya Bay during the breeding season1993.*

In 2007, a further decline in the number of harbour seals in the Ivanovskaya Bay was recorded. The abundance did not exceed 20 animals (17 individuals including 5 females with pups were observed). Pupping was only observed in the third basin of the bay. Also in 2008, about 20 animals were recorded in the Ivanovskaya Bay. According to information from the Coastguard (B. Mustafin, pers. comm.), harbour seals were observed on the open seashore, further to the east, on the islands in the area of the Fadeev and Vzglavje Capes (68.18°N 38.52°E and 68.18°N 38.52°E). In the summer 2008, about 60 adult animals were observed in that area, indicating a possible new breeding colony. However, this was not studied in detail.

Change in abundance during the breeding season in the Ivanovskaya Bay

The breeding and lactation period of harbour seals last, from 25 May to 5 July in the Ivanovskaya Bay (Zyryanov and Moskvin 1997). This is in accordance with the timing harbour seal breeding in other areas (Thompson 1988). The abundance of seals in the Ivanovskaya Bay was increasing during the breeding season. In 1993, the abundance increased during the greater part of the period with a maximum of 139 individuals, including 45 pups, on 26 June. On 3 July, when some of the animals started to migrate from the bay, a total of 123 seals, including 43 pups, were counted (Fig. 3). The data also indicated two peaks of parturition: middle and end of June, respectively.

The increase in abundance of harbour seals during the breeding season was caused by the arrival of adults participating in breeding and the birth of pups. Natural mortality of pups in the assessment was recorded as minimal (only-one dead pup was observed). After the breeding season, a decline in abundance in the inlet was supposed to be related to increased abundance of feeding seals just outside the inlet and in the adjacent waters and bays (Drozdovka, Varzina inlets). Later in July, groups of yearlings also appeared in those areas.

Diurnal activity pattern during the breeding season in the Ivanovskaya Bay

A total of 55 adults, including 26 females with-pups, were recorded at the haulout site on 26 and 27 June 1993. Most of the mature females had given birth at this stage. Therefore single animals were assumed to be mainly males. Immature specimens were not recorded sepa-

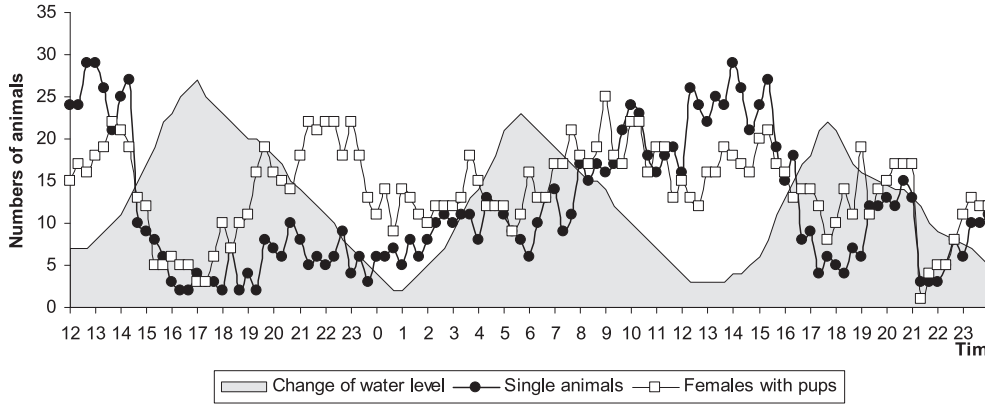

Fig. 4. *Daily harbour seal haul out pattern and water level in the Ivanovskaya Bay in late June 1993 (based on data from Mishin et al. 2001).*

rately, but based on the size of the animals they were few. The field studies in 1993 were carried out in good weather conditions and with little disturbance of the seals (Zyryanov and Moskvin 1997). The activity pattern of females with pups showed a bimodal distribution with more animals hauled-out at low tide than at high tide (Fig. 4). This is in accordance with activity patterns observed elsewhere (*e.g.* Hauksson 1985, Thompson *et al.* 1989). The single animals (mostly males) showed a different activity pattern with very few animals hauled-out during night time and a maximum during day time (Fig. 4). Overall, single animals spent less time at haulout sites than females with pups. We presume that this difference in time on land is associated with gender-specific activities in the breeding season. Females spend time lactating (hauled-out) and foraging (at sea), and males spend time displaying (at sea), foraging (at sea) and resting (hauled-out).

Interaction with man and effects of disturbance

Low abundance of harbour seals on the western Murman coast may be explained by the frequent disturbance by humans at rookeries. In the Varangerfjord, coastal fisheries and presence of people close to potential rookeries have increased recently. In the recent past, breeding was known to have occurred in the Dolgaya Scshel Inlet. At present, no breeding has been observed there. This is possibly because of the construction of fishermen's houses near the former rookery. In the Motovsky Bay also local disturbance occur. (Kondakov *et al.* 1998).

On the eastern Murman coast (east of the Kola Bay to the Svyatoj Nos Cape), seals were found in small numbers at several sites along the coast. These sightings may indicate an eastward movement of seals in spring and early summer. For a number of years, harbour seals were seen in the area of the Dalnie Zelentsy Settlement. Probably some specimens were adapted to the human presence, although disturbance did not favour establishment of breeding colonies (Kondakov *et al.* 1998).

Detailed investigations during the breeding season were only made in the Ivanovskaya Bay, the main breeding colony in eastern Murman (Fig. 2). The rapid decline in numbers of seals present in the breeding season in the Ivanovskaya Bay (from about 100 adult seals in 1993 to about 20 seals in 2007 and 2008) is assumed to be a result of poaching and hunting. The seals were shot at salmon nets. Fishing nets may also cause incidental entanglements and drowning of seals. Also depletion of food supply (mostly arctic char) in the bay may be a possible additional cause for the observed decline in the seal population.

Conservation

Harbour seals are listed in the Red List of the Murmansk Region (Zyryanov 2003). Therefore, harvesting, hunting and capturing of the species are banned. However, poaching and illegal shooting of seals at fishing nets still occur. Legal protection of the species does not provide sufficient protection against disturbance by humans and habitat degradation. In particular, disturbance at breeding sites has had a detrimental impact, in particular in the Ivanovskaya Bay (Zyryanov 1997, 2000).

Since 1995, scientists from the Murmansk Marine Biological Institute, PINRO, the Murmansk Regional Committee on Natural Resources and recently also the WWF, made an effort to establish a harbour seal protected area in the Ivanovskaya Bay. The aim is the conservation of the harbour seal through the preservation of an important breeding habitat and a valuable natural area of the Ivanovskaya Bay (Goryachev and Zyryanov 1998). The process of establishing this protected area is now in the final stages. However, a protected area of limited geographic range will not protect the harbour seals against threats operating on a wider range (*e.g.* pollutants and climate change).

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