NPRB Proposal Summary Page

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Reference No: 102

Date Submitted: December 12, 2005
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(To be filled in by applicant)

Project Title: Role of Walrus in distribution of human trichinellosis disease among indigenous people in Chukchi Peninsula

Project Period: From June 2006 To June 2007

Name, Address, Telephone Number and Email Address of Applicant:

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Research Priority and Subcategory:

Primary **2.g** Humans
Secondary **2.e.i** Distribution and abundance of ice seals and walrus

Summary of Proposed Work (250 words or less):

Trichinellosis is a natural focal disease dangerous for man. Because of its high incidence in the environment and as a human disease, trichinellosis has become a global challenge. The problem is especially pressing on the northern coasts where terrestrial carnivores and the helminthes circulation are supported by marine mammals, in particular walruses. The first walrus-related trichinellosis was reported by D.P. Kozlov in 1966. Walrus meat is a major source of food for indigenous populations. Walrus meat is fed to hogs, fur animals, sled dogs. N.I. Ovsyukova reported in 1966 that estimates of trichinellosis prevalence rates in polar fox held in captivity and sled dogs ranged from 18 to 64.7 percent. Canadian researchers reported that frozen meat contained infective Trichinella larvae. As for a product called igunaq, the results were controversial. An outbreak of human trichinellosis (34 clinical cases) was described in Canada. No statistics have been kept on human trichinellosis in Chukchi Peninsula. However, positive serology was observed in 39 percent of the population from the coastal villages examined for trichinellosis. A woman who came to Sakhalin Island from Chukchi Peninsula died of trichinellosis. In 1994 to 1997, trichinella antigen tests were positive in six of the nine regions of Russian North, including Chukchi Peninsula. Research is advisable both from scientific and practical points of view, as it will evaluate the food safety risk of walrus meat cooked by traditional methods.

Funding:

Total NPRB Funding Requested:	**$40,000.00 (Federal State Educational Institution of Higher Vocational Education, Vyatka State Agricultural Academy)**
Total Matching Funds Used:	**$3,585.00 (Federal State Educational Institution of Higher Vocational Education, Vyatka State Agricultural Academy)**

Legally Binding Authorizing Signature and Affiliation:

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RESEARCH PLAN (max 12 pages, including tables and figures)

***A. Project Title*:** (Provide a full and a suggested short title no more than 60 characters long)

The long title: Role of walrus in distribution of human trichinellosis disease among indigenous people in Chukchi Peninsula.

The short title: Trichinellosis of walrus and man in Chukchi Peninsula.

B. Proposal Summary: **(max 250 words)**

Trichinellosis is a natural-focal disease dangerous for man. Because of its high incidence in the environment and as a human disease, trichinellosis has become a global challenge. The problem is especially pressing on the northern coasts where, in addition to terrestrial carnivores, the helminthes circulation is supported by marine mammals, in particular walruses.

The first walrus-related trichinellosis was reported by D.P.Kozlov in 1966 (Bessonov, 1966). Walrus meat is a major source of food for the indigenous population. Walrus meat is fed to hogs, fur animals, sled dogs. N.I.Ovsyukova reported in 1966 that estimates of trichinellosis prevalence rates in polar fox held in captivity and sled dogs ranged from 18% to 64.7%. Canadian researchers reported that frozen meat contained infective Trichinella larvae. As for a product called "igunaq", the results were controversial. An outbreak of human trichinellosis (34 clinical cases) was described in Canada (Serhir et al., 2001).

No statistics have been kept on human trichinellosis in Chukchi Peninsula.

However, positive serology was observed in 39% of the population from the coastal villages examined for trichinellosis (Bessonov et al., 1969; Wolfson, 1969). A woman, who came over to Sakhalin Island from Chukchi Peninsula, died of trichinellosis (Britov, 1969). In 1994-1997, trichinella antigen tests were positive in six (66.7%) of the nine regions of Russian North, including Chukchi Peninsula (Poletayeva, 1998).

In this connection research work is advisable both from scientific and practical points of view, as it will evaluate the food safety risk of walrus meat cooked by traditional methods.

C. Project Responsiveness to NPRB Research Priorities or identified project needs

On the basis of the obtained results, the researchers are to reveal the sources and ways of contamination of humans with trichinellosis, to reveal the role of walrus in the spread of trichinellosis, to determine the percentage infectivity of the indigenous population and visitors to the area and to evaluate the food safety risk of walrus meat cooked by traditional methods. The carrying out of research work is advisable both from scientific and practical points of view, as a prevention and treatment program will be worked out. The health of the individuals, who have positive results for trichinellosis, will be examined regularly (this will be done upon approval of the authorities of the local community) and in case of clinical features the individuals will receive medical treatment.

The project is related to two Research Priorities: Primary Priority «g» – Humans; Secondary Priority «e»– Marine Mammals, subcategory «i» – Distribution and abundance of ice seals and walrus.

For the first time, the walrus is not looked upon in regard to its commercial hunting, rather it is examined as a source of larvae contamination for humans, various species of synanthropic animals, domestic animals and wild game that may consume infected meat from walrus.

D. Project Design and Conceptual Approach

The bioresources of Chukotka Autonomous Region, in particular Chukchi Peninsula, are scarce enough, therefore marine mammals play a large part in sustaining life of the indigenous population. The closure of the majority of the fur-breeding farms (only 10 fur-breeding farms are in operation currently) and reduction of reindeer numbers caused the indigenous population to turn to hunting marine mammals.

The most of hunting in Chukotka Autonomous Region is done along the coast of Chukchi Peninsula: in Providenija District, Chukotka Region and Iultinski District (Cresta Bay). In the most recent 10 years, the total amount of hunting in the area was about 2,000 animals per year (Kochnev A.A., Smirnov G.P., 2000).

Walrus meat is the common food source both for the inhabitants of the coastal areas (so-called "coastal man", 42%) and for the non-nomadic inhabitants of the continental settlements in the tundra and forest tundra (so-called "reindeer man", 30%) (Kozlov, 2002). The total consumption of walrus meat stands at 690 tons per year. Marine mammal consumption is most common in coastal villages, less common among reindeer breeders, 356.3 gr and 121.0 gr per capita per day, respectively (Report, 1997).

A harvested marine animal is cut on village cutting grounds (more often just on the ground) or on the sea ice close to the shore, right where the animal was caught. After the animal has been cut, the unused parts of the carcass are sent to fur-breeding farms, are fed to sled dogs and domestic dogs or are taken to the tundra to serve as a bait in hunting fur-animals. About 25 % of the harvested marine animals are used by the 10 remaining fur-breeding farms. The other meat from harvested marine animals and reindeer is stored for further consumption: 9.3% of the meat is stored in an ice larder, 14.8% in a meat pit, 39.9% in a cold larder, 11.0% in a refrigerator (Report, 1997).

The high viability of Trichinella larvae in frozen carcasses, fermented, cured and other kinds of meat, and in dead animals plays an important role in Trichinellosis circulation in nature. This is especially actual for Chukotka, as the indigenous population up till now upholds the traditional methods of cooking meat.

Bessonov A.S. et al. (1969), Wolfson A.G. (1969) performed serologic testing of the Chukchi indigenous population, which showed high susceptibility to trichinellosis of the indigenous population. The majority of positive responses were reported from the villages of Walen and Enurmino, 39.3% and 31.8% respectively, whose indigenous population consumed walrus meat. The highest susceptibility to Trichinella antigens was observed in the Chukchi (27.9 %) and the Eskimo (26.6 %), while Russians were less susceptible. The susceptibility increased with the age of the patients. The direct (not inverse) relationship existing between the sensitiveness of the indigenous Chukchi population to Trichinella antigens and unfavorable Trichinella situation among animals in the area indicates high incidence of the helminthosis among the residents of the Chukotka Region. The investigation conducted by Poletayeva O.G. et al. (2001) revealed that the indigenous population of Noonligran settlement in the North of Chukchi Peninsula was infected with Trichinellosis. The source was the swine meat from the local swine farm. The cause of swine contamination was not studied (Poletayeva et al., 2001).

The samples of walrus intercostal and tongue muscles, which had remained frozen for 20 months, were tested by Canadian researchers Proulx et al. (2002) in Northern Quebec, and live Trichinella larvae were revealed. When the larvae were fed to white mice and guinea pigs, the latter became infected. In 1999 on the territory Aikiqtarjuag, which is on the eastern coast of Baffin Island, the researchers experimentally infected mice and guinea pigs with Trichinella larvae recovered from fermented walrus meat (a product called "igunaq") stored under different storage times, but none of the experimental animals became infected. The researchers did not arrive at a conclusion yet, as there was not enough sampling, and they are going to continue the investigation. Forbes et al. (2003) recovered Trichinella larvae from igunaq preparation from seal meat (he did not specify the seal species) and infected cats and mice. The Trichinella larvae were invasive as the latter became infected. A further research is needed to evaluate the food safety risk of traditional walrus igunaq aged under different field conditions and storage times. No such research has been conducted on the territory of Russian Federation.

The given project is based upon the Primary Investigators' experience in researching marine mammals (Northern fur seal and harp seal) and monitoring wild game trichinellosis. Bukina L.A. and

Kolevatova A.I. have a practical experience in organization and undertaking of expeditions to study animal and human helminthosis.

Over a 10-year period the Primary Investigators have supervised research work on Northern fur seal uncinariasis (the pathogen is Uncinara lucasi). They studied the aspects of pathogen biology, clinical features, pathogenesis and developed methods of treatment. They conducted mass treatment which reduced pups mortality more than three times.

Over the most recent years, Bukina L.A. supervises studies of morpho-physiological state of harp seal pups in an increasingly worsening ecological situation.

Natural focuses of trichinellosis have been studied in Kirov Region over 30 years. The studies revealed the pathogenic species that continue their permanent circulation in natural and synanthropic focuses and determined the intensity and extensiveness of the invasion. “Recommendations for specialists of veterinary and hunting associations” (Kolevatova, 1989) and “Recommendations on prevention of zoonotic diseases (Trichinellosis, echinococcosis, alveococcosis)” (Maslennikova and Kolevatova, 2005) have been developed and applied for professional use.

The result of the project is to determine possible trophic ways of contamination of humans, walrus, and synanthropic animal species and to develop prevention measures to prevent infection of humans with Trichinella larvae.

This project does not build on a project previously funded by NPRB.

In the Arctic an epizootic focus of trichinellosis is formed not only by terrestrial carnivores, but to a large extent by marine mammals, who sometimes are the main cause of the incidence of trichinellosis on a previously Trichinella-clean area. There was no special research on revealing contamination of walrus with trichinellosis. Trichinellosis in walrus was mostly reported by researchers who studied helminth fauna of marine mammals Delamure S.L., Alekseyev Y.V. (1963), Yurakhno M.B., Treschev V.V. (1972); Delamure S.L. et al. (1975; 1976), Yurakhno M.B. (1990). In 1976 Delamure et al. tested the walrus harvested in Chukchi Sea and found exceptionally high Trichinella larvae invasion. One square millimeter of the walrus diaphragm contained 8-12 encysted Trichinella larvae. In search of food, wild game (polar and brown bear, polar fox, fox, wolverene) visit coastal areas and walrus breeding-grounds. If they consume sick animals or carrion, they become infected with Trichinella. Lukashenko N.O. (1970) reported 48 cases of trichinellosis in Chukotka Region. The humans were infected by brown bear meat and were non-residents of Chukotka Region, as the indigenous population does not consume brown bear meat.

According to their eating habits, walruses are classified into predating walruses and benthic walruses, there being two types of predating walruses – some feed on animal food accidentally when there are no invertebrates or when invertebrates are inaccessible, others predate on the constant basis. These are mostly males who haul out alone (Fey, 1982, Perry, 1976). When Kibalchich A.A. (1986; 1984) examined the stomach contents of a predating walrus from the Anadyr Gulf, he found out that the stomach content was mainly skin scraps of Pusa hispida and Erignathus barbatus, lumps of fat from underneath the skin, parts of skeletons, intestines, etc. There were cases of predating walrus eating Monodon monoceros and Delphinapterus leucas. On the shore, predating walruses may attack polar bear cubs. Cannibalism and eating carrion were also reported. Therefore, predating walruses become infected when eating their prey, carrion or through cannibalism. Carcasses of infected animals (natural and synanthropic biocoenoses) store invasive larvae. Larvae are widely disseminated through invertebrate and vertebrate transit hosts (crustacean, mollusks, birds, fish), thus supporting constant circulation in the nature.

The most important sources of food for benthic walruses are some kinds of bivalve mollusks (Mya truncate, Saxicava arctica, Saxicava rugosa, Clinocardium nuttali), crustacean (Chionoecetes opilio, Gammaridae, Musicae, Pandalus), Anndelida (Priapulus caudatus, Echiuras echiuras, Maldane sarsi), echinodermata (Cucumaria), Ascidia (Pelonaria corrugate, Tethyum aurantium), fish (Blennidae, Lumpenidae).

Some researchers conclude that invertebrate animals may be intermediate hosts for Trichinella (Britov, 2000; Asatryan, Movsessyan, 2000; Penkova,1975; Bessonov, 1993). If invertebrate species

become accidentally infected with Trichnella larvae, the larvae stay viable in them for 1 to 9 days, which makes the invertebrates a major source of infection for walrus.

Other possible hosts are marine birds and carnivores, which may become infected with Trichinella when consuming infected invertebrates (mollusks, crustaceans, etc.), fish and carcasses of marine and terrestrial mammals. Birds' or (sometimes) mammals' excrements containing T. spiralis pollute water, rookeries and are a cause of infection.

Humans consuming meat from predating walrus may become infected with Trichinella. The unconsumed meat is stored to feed fur animals bred in captivity. N.P.Lukashenko (1970), N.I.Ovsyukova (1969) reported the highest trichinellosis prevalence rates in polar fox held in captivity, as they are fed with the carcasses of harvested animals of the same species or with meat from marine mammals. The meat, which is stored, attracts synanthropic species (rats, mice, stray and domestic dogs and cats), which may cause Trichinella infection in them. Ovsyukova (1966) studied the helminth fauna of commercial and synanthropic animals and rodents in Chukchi Peninsula and found the lowest trichinellosis prevalence rate in ermine (3%) and the highest trichinellosis prevalence rate in sled dogs (58%).

Therefore, we may consider walrus to be a source of larvae contamination for humans, terrestrial wild game and domestic animals, as well as animals bred in captivity. Most walrus rookeries in Chukchi Peninsula are located close by tribal villages, thus forming close biocoenotic links and forming a trichinellosis focus of a mixed type. A number of factors may add to the intensiveness of the epizootic Trichinella situation. The factors are a broad variety of susceptive hosts (such as rats, domestic pets and wild game), high numbers of stray animals and rodents that migrate on the constant or permanent basis, inadequate veterinary inspection, primitive storage and food preparation techniques used by fur-breeding farms and animal-breeding complexes.

To fulfill the project we will co-operate with the indigenous Chukchi population, hunters, members of Association of Traditional Marine Mammal Hunters of Chukotka and medical officers of the village of Lavrentiya.

The research will include four types of activities:

- Collection of biological material from walrus and other inhabitants of the coastal areas and examining the material for Trichinella larvae;
- Collection of biological material from terrestrial animals (carcasses and dead animals), including synanthropic species and examining them for Trichinella larvae;
- Diagnostics of the indigenous population and non-residents for Trichinellosis. We are going to take into account the duration of their stay in Chukchi Peninsula, the age category of humans;
- Laboratory tests of walrus meat to determine Trichinella larvae viability in meat cooked by various methods and stored under various conditions.

Each sample will be examined three times (Please see table 1). The formula for calculations:

M = A multiplied by B multiplied by C.

M – total amount of samples from one animal species

A – number of examined animals

B – number of examined muscles and groups of muscles

C – multiple of reiteration of examination

Table 1.

Animal species	number of examined animals	number of examined muscles	Multiple of reiteration of examination	Samples, total
	A	B	C	M
1.Walrus	50	5	3	750
2.Whale, seal	10	5	3	150
3.Terrestrial animals:				
Commercial species	10	5	3	150
Stray dogs and cats	20	5	3	300
Mice, rodents	30	4	3	360
Fur animals bred in captivity	30	4	3	360
Swine	5	5	3	75
4. Walrus meat cooked traditionally	50		3	150
TOTAL	205	28	24	1935

The examination will be carried out by the compressor technique using trichinelloscopes "Stake" or by technique of group digestion. All samples from the animals will be processed during the expedition at the place of investigation. Walrus meat cooked by different methods will be tested at Vyatka State Agricultural Academy for Trichinella infectivity.

According to the Veterinary Inspection of RF (3.2.569-96 "Preventive program for parasitic diseases on the territory of Russia Federation" certified by State Sanitary Control Committee 31.10.96 43), we plan to examine the samples of diaphragm, chewing muscles, intercostal muscles and the samples of tongue muscles and extraocular muscles from carcasses of marine mammals.

Sample mass from each muscle group should not exceed 20 gr., the total sample mass from one animal should not be less than 100gr.

Simultaneously with trichinelloscopy, Trichinella infectivity will be differentiated from sarcocysts which often occur in meat. Trichinellosis diagnostics in humans will be conducted in cooperation with the local medical service of Chukotka and Association of Traditional Marine Mammal Hunters of Chukotka. Human trichinellosis examination will be conducted by immuno-enzyme analysis. As previously arranged with Poletaeva O.G. (Ph.D., Head of Immunology Laboratory at the Institute of Medical Parasitology and Tropical Medicine), kits for diagnosing and laboratory processing will be carried out at the above name Institute. We plan to examine about 700 individuals.

E. Project Management

The Applicant is Bukina L.A., Ph.D., Associate Professor, the Head of Zoology Department at FSEI HVE Vyatka State Agricultural Academy, member of Science Council of the Vyatka State Agricultural Academy, member of Marine Mammal Council.

Bukina L.A. is a lecturer on "Biology and Basic Ecology" and "Biology and Marine Mammals Hunting" for students of biology. As for her research work, Bukina L.A. specializes in marine mammals and spent a number of years studying uncinariasis in northern fur seal pups on Commander Islands and Bering Island (pathogen is nematode Uncinaria lucasi). The research led to working out of recommendations on uncinariasis treatment. Over the most recent years, Bukina L.A. researches into the morpho-physiological features of harp seal under the conditions of increasingly worsening current ecology. The biological material is collected at the White Sea during commercial hunting for harp seal pups. The research interests are helminthology, toxicology and immunology.

Kolevatova A.I., Ph.D., Professor of Zoology Department at FSEI HVE Vyatka State

Agricultural Academy, member of Science Council of the Vyatka State Agricultural Academy, member of Marine Mammal Council. Teaching experience is over 40 years. She lectures on Zoology of invertebrates. The research interests are helminthology, morphology of parasitic worms, biology, pathogenesis, clinical course, therapy. For 10 years (from 1982 to 1992) she studied uncinariasis in northern fur seal on Commander Islands during an epizootics at the rookeries. She worked out uncinariasis treatment that gives positive results. For 30 years now she has been studying contamination of wild game with parasitic worms, in particular zoonosis pathogens: trichinellosis, echinococcosis.

Working at the same Department, the Principal Investigators have an opportunity for close mutual collaboration.

Approximate schedule of the project.

The project is planned for one year (June 1, 2006 to June 1, 2007).

Preparatory stage: June, 2006

1.Receiving funds needed for the research, filling out the documents, funding agreements.

2.Verification of walrus hunting period, making agreements with the local authorities and representatives of Marine Hunters Union (in the city of Anadyr).

3.Purchasing the equipment required, tools, reagents; forming kits for diagnosis and their conservation.

4.Receiving the Visa, purchasing tickets, luggage shipping issues.

Expedition: from July 1, 2006 to November 1, 2006.

1.Appointments with Anadyr authorities, Association of Traditional marine Mammals Hunters of Chukotka, hunting association, sanitary and medical service, medical officers, veterinary associations to coordinate mutual activities.

2. Expedition equipment preparatory work (adjustment of devices, testing reagents, deployment of the laboratory).

Collecting and examination of biological material

1. The indigenous population, during hunting, will take the necessary assays from wild game (as places for taking assays they will use rookeries, hunting places, the coast; the supposed biological material is walrus, harp seal, whale, terrestrial wild game, marine birds). Duration: June to November;

The researchers will take assays from carcasses and harvested animals (farm and domestic animals, animals bred in captivity, cats, dogs, rodents). The researchers will examine the assays using trichinelloscopy and histo-chemical methods. Duration: July to November;

2. In coordination with the local medical officers, the researchers will conduct blood diagnostics for trichinellosis of the indigenous population and non-residents. The results will grouped by sex and age, residents and non-resident. Duration: July to December;

3. The laboratory of Vyatka State Agricultural Academy will conduct laboratory tests of walrus meat cooked by traditional methods for its contamination with Trichinella larvae. The laboratory will examine larvae viability and infectivity.

Conservation of the biological material.

The laboratory of Vyatka State Agricultural Academy will conduct conservation of the biological material needed for histological and biochemical studies.

A local report.

A report describing the findings of the project will be submitted to the local authorities;

Submitting a semiannual report. Duration: November to December, 2006.

Submitting the final report. Duration: April to May, 2007.

When the expedition period is over, the Principal Investigators and the Collaborator on the project will continue their work according to a specific schedule.

The success of the project can be measured by reports, articles, theses published both in Russian and foreign journals. The people working on the project will participate in Russian and international conferences, making clear to the public the findings of the project.

To prevent human contamination with trichinellosis prospects, booklets, mass media lectures on trichinellosis and its pathogens are planned. Lectures for schoolchildren, hunters and workers of swine-

breeding and fur-breeding farms are planned. Together with the Chukotka Region authorities, the researchers plan to develop a prevention and treatment program for trichinellosis.

The results of the research will be useful for lectures on Zoology, Biology and Marine Mammals Commercial Hunting, Veterinary and Sanitation Expertise of Farm Animals and Wild game, Parasitology.

Principal Investigators are Bukina L.A. and Kolevatova A.I., who are in charge of the project. Principal Investigator Bukina L.A. will be responsible for the overall work. There is only one binding contract envisioned.

Collaborator is Poletayeva A.G.

Poletayeva Olga Gustavovna – Ph. D., Professor, Head of Immuno-Diagnostic Laboratory at the Institute of Medical Parasitology and Tropical Medicine (Moscow). Phone: 495-246-67-64.

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F. Project Costs

FSEI HVE Vyatka State Agricultural Academy is a budgetary institution, which is financed by Agriculture Ministry of Russian Federation. FSEI HVE Vyatka State Agricultural Academy does not support this type of research.

Cost of the project for one year is $40,000.

No additional funds are needed for ship time.

RESUMES (limit to 2 pages per Principal Investigator)

RESUME
Lidiya Alexandrovna Bukina
Principal Investigator

Qualifications achieved

- Diploma no 916274, 1979 – Game Manager
- Diploma no 065980, 1992 – Ph.D. in Biology
- Diploma no 009866, 2001 – Professor of Biology

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List of Publications

1. Kolevatova A.I., **Bukina L.A.**, Vasenin Yu.A. 1986. Working out of uncinariasis treatment in northern fur seal pups. pp. 862-892 *in* Proceedings of the Xth Conference of the Ukrainian Society of Parasitologists. – Kiev: Naukova Dumka, Vol. 1.
2. Kolevatova A.I., **Bukina L.A.**, Vasenin Yu.A. 1988. Diseases and parasites of northern fur seal *in* Northern fur seal. Vol. 2. Systematics, morphology, ecology, behaviour. Moscow.
3. **Bukina L.A.**, Suntsova N.A., Gazizov V.Z., Lukin N.N., Klepikovski R.N. 2002. Topography of intestine-associated lymphoid tissue of Greenland seal pups. pp. 50-52 *in* Marine mammals of Holarctic. Proceedings of the Second International Conference, Baikal, Russia, September 10-15, 2002. – Moscow.

4. Kolevatova A.I., **Bukina L.A**., Vasenin Yu. A. 2002. Formation of erythropoiesis in northern fur seal. pp. 131-133 *in* Marine mammals of Holarctic. Proceedings of the Second International Conference. Baikal. Russia. September 10-15, 2002. Moscow.

5. **Bukina L.A**., Suntsova N.A. 2003. Comparative characteristics of lymphatic mesenteric ganglions in males and females of harp seal pups of the White Sea population. pp. 382-385 *in* Conservation and rational use of animal and plant resources of Russia. Proceedings of International Scientific and Practical Conference. May 28 –June 1, 2003. Irkutsk.

6. **Bukina L.A.,** Bukin V.Yu., Suntsova N.A., Lukin N.N., Klepikovski R.N. 2004. Macro- and micromorphology of lymphoid tissue of mesenterial intestine wall in harp seal pups (*Pagophilus groenlandica*). pp. 92-95 *in* Marine mammals of Holarctic. Collection of Articles based on the Proceedings of the Third International Conference. Koktebel, Crimea, Ukraine. October, 2004. Moscow.

7. **Bukina L.A**., Kolevatova A.I., Bukin D.Yu. 2004. Ecological pressure on helminth fauna formation in northern fur seal (*Callorhinus ursinus*). pp. 257-260 *in* Marine mammals of Holarctic. Collection of Articles based on the Proceedings of the Third International Conference. Koktebel, Crimea, Ukraine. October, 2004. Moscow.

LIST OF CO-AUTHORS

1. Bukin V.Yu. – an expert in software, “Fa-Studio” Company
2. Vasenin Yu.A. – Head of Research Service, FSEI HVE Vyatka State Agricultural Academy
3. Gazizov V.Z. – Ph.D., Professor, Head of Zoohygiene Department, FSEI HVE Vyatka State Agricultural Academy
4. Kolevatova A.I. – Ph.D., Professor of Zoology Department, FSEI HVE Vyatka State Agricultural Academy
5. Klepikovski R.N. – a graduate student at FSEI HVE Vyatka State Agricultural Academy, laboratory assistant at the Laboratory of Remote Studies and Marine Mammals and Birds, Murmansk
6. Lukin N.N. – a graduate student of FSEI HVE Vyatka State Agricultural Academy, laboratory assistant at the Laboratory of Remote Studies and Marine Mammals and Birds, Murmansk
7. Suntsova N.A. – MSc., Head of Histoimmunological Laboratory at FSEI HVE Vyatka State Agricultural Academy

RESUME

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Principal Investigator

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LIST OF PUBLICATIONS:

1. Gordin A.F., **Kolevatova A.I.,** Kozlovsky I.S. 1989. Trichinellosis in wild game and its danger for man. *in* Recommendations for specialists of veterinary and hunting associations. Kirov. 12 pages.

2. Kolevatova A.I., Kozlovsky I.S. 1999. Prevention of trichinellosis in the natural environment. pp. 305-307 *in* Contemporary problems of infectious and invasive diseases in animal breeding:

Proceedings of International Conference dedicated to the 80th anniversary of Moscow State Academy of Veterinary Medicine and Biotechnology. Moscow.

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