Goose, Swan and Duck Study Group
of Northern Eurasia

Unpublished Report

Development of Waterfowl Subsistence Harvest Survey Methodology in North-Eastern Russia and Evaluation of Waterfowl Harvest, with Special Reference to Eiders

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TABLE OF CONTENTS

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INTRODUCTION

Waterfowl are hunted for subsistence, particularly by indigenous peoples living in the Arctic. Geese and ducks constitute most of bird harvest in this region and in coastal areas eiders are a special focus. Two species of eiders, Steller's and spectacled eider, are the subject of special attention due to their declining trends in recent history and increasing importance for their conservation. Both species breed across vast areas of wet tundra in western and northern Alaska, as well as arctic Russia. Steller's eiders from northeast Russia- and Alaska-breeding populations converge in nearshore marine waters of southwest Alaska in fall and winter (Frederickson, 2001). The location of the wintering grounds of the spectacled eider was a scientific mystery until the mid-1990's, when it was confirmed that birds from both the Alaska- and Russia-breeding populations gather in winter among leads in the Bering Sea ice, south of St. Lawrence Island. From late December until mid-April, they form spectacularly dense flocks, resting on the ice and diving for clams to depths of 200 ft or more (Petersen et al., 1995; Petersen et al., 1999).

Steller's and spectacled eiders are notable from a wildlife-management perspective because populations of both were listed as "threatened species" under the U.S. Endangered Species Act, within the last decade (U.S. Federal Register 58:27474-27480; U.S. Federal Register 62:31748-31757). The spectacled eider population on the Yukon-Kuskokwim Delta declined by 96% from 1957-1992 (Stehn et al. 1993), and the species was designated as threatened throughout its range in 1993. The Alaska-breeding population of Steller's eider was designated as threatened in 1997, based primarily on a population decline inferred from a reduction in the breeding range; Russia-breeding Steller's eiders have not received similar legal protection.

Although much has been learned about these species over the last decade, reasons for their declines are still not clear, particularly for Steller's eider. Lead poisoning has been identified as a serious issue for spectacled eiders on the Yukon-Kuskokwim Delta (Flint et al., 1997). Potential threats to the spectacled eider population include changes in the abundance of the clams that comprise their winter diet (Lovvorn et al., 2003). Shooting and trapping of both species occurs, but is thought to be at a low level within the U.S. portion of the species' range (Petersen et al. 2000, Frederickson 2001). Considerable numbers of both species are taken in Yakutia, Chukotka, and Kamchatka (Petersen et al., 2000, Frederickson, 2001), but no reliable data were available regarding harvest levels in northeast Russia.

The overall goals of this project were to estimate the harvest of eiders and other waterfowl by indigenous peoples in the arctic villages of Yakutia and Chukotka, and to communicate these results both to the governmental agencies responsible for wildlife conservation and the affected local communities.

An important part of the project was to develop and test a methodology for conducting subsistence hunting surveys in Russia by adapting the protocol used in Alaska to the special conditions of Russian Arctic villages.

DEVELOPMENT OF SURVEY METHODOLOGY TO EVALUATE WATERFOWL HARVEST IN RUSSIAN ARCTIC

Determining harvest levels of animal populations is a key parameter needed for working out an effective strategy for conservation and sustainable use of species. The analysis of harvest statistics is the most wide-spread method of investigating hunting pressure impact on birds. This method has often been used in Russia, however, in the Russian Far North the quality of data on bird harvest collected by game inspectors and hunters' societies is usually quite low, and in many areas such data are not collected at all. At the same time, bird hunting in the north is considerably more valuable for local people than in the south, and the northern territories are important areas for many game and rare bird species. Harvest in the north can comprise a considerable portion of bird populations.

Besides that, hunting has great cultural, social and economic importance for indigenous local populations in the north, particularly as a traditional means of providing food for families, described by the term "subsistence hunting."

This chapter of the report provides a detailed description of survey methodology, recommendations for its practical use, and complications we encountered while conducting surveys and in interpreting data.

Developing the methodology

In developing our methodology, we evaluated survey designs from North America (Usher et al., 1985; Usher and Wenzel, 1987; Byers and Dickson, 2001). We considered the methods developed by U.S. Fish and Wildlife Service in Alaska for Yukon-Kuskokwim Delta (YKD). The YKD is the largest Alaskan wetland and an area where native people annually harvest over 100,000 birds (Wentworth & Wong, 2001). Generally we used the same methods; however, we extended and adapted it to suit Russian conditions.

Adapting the survey methods included considering the following:

1) developing a survey form to estimate bird harvest,
2) making general plans for investigations,
3) preparing surveys for different regions and settlement types,
4) conducting survey, and
5) survey analysis and extrapolation of data.

Let us consider each of these in detail.

Survey form

We used the Alaskan survey form as the basis for ours (Wentworth, 1998; Wentworth & Wong, 2001). Like in the American analog, the front side of our questionnaire (Appendix 1) shows game birds (in total about 45-50 pictures). For near every picture we included the Russian name of the bird and two blank columns where a hunter should fill in the number of bagged birds for the last year (including birds drowned in fish nets), and the number of eggs he (she) collected in the last spring. Since the game species lists differ between different northern regions, we prepared three regional variants of our questionnaire's front page: for southern Chukotka, northern Chukotka and northern Yakutia. The list of potential game species for every region was complied by considering hunting literature and other information we had on species' ranges. Along with typical game species, we also plotted pictures of large rare birds that are not

infrequently bagged by local hunters. Besides that, schematic pictures of a duck and a goose were plotted with notes “duck of unknown species” and “goose of unknown species.”

Although we used color copies of questionnaires, printed by color desk jet printer, we used more water-proof and dirt resistant black-and-white copies, printed by laser jet printer. When filling in a black-and-white questionnaire, a hunter was shown a laminated color copy. During survey sessions we also used an illustrated bird guide. It was useful in cases when a hunter was not certain of bird identification or bagged a bird not shown on the questionnaire.

Bird drawings on our survey forms are depicted in sitting positions. We considered depicting flying birds, although used in some studies, (Webb, 1999), to be less efficient.

The composition of species that were depicted on the front side of regional variants of our forms differed for ducks (different duck species penetrate to the north in different extent) and sea birds.

Following most our predecessors, we had to somewhat generalize bird pictures. So our questionnaire has only one picture of a swan and a merganser, one picture for both black-throated diver and Pacific diver, and also general images: “large gull,” “small shorebird” and “large shorebird.” Most hunters do not identify these species, so including more detailed pictures would only use extra space and confuse correspondents. The lesser white-fronted goose is a complicated case. Considering the importance of the information about this species, we presented it as a separate picture on the form and fit in larger pictures of lesser white-front and white-front geese heads for comparison. On our questionnaire we tried to do our best presenting key markers for this species identification: small size, white front and yellow eye. However, there is no doubt that sometime lesser white-fronts are mixed with white-fronts, and it is not always possible to reveal such misidentifications.

Pictures of both males and females for most ducks, the only group with well pronounced sex dimorphism, were shown, since it allows determining sex ratio in a hunting bag, which is important for waterfowl resources management.

Unlike our American colleagues, we also used the survey form’s back side (Appendix 1, version used in 2005), where we included additional questions to characterize hunting techniques and its meaning in local people’s lives. The proposed method suggests the possibility to change those questions in relation to the survey goals.

We used six categories of questions in our study:

1. Information about a hunter (nationality, age, hunting experience, family). This is probably the only section that is necessary in addition to the front side of the form, even when the study is conducted according to a minimal program.
2. Data on methods of hunting, numbers of spent cartridges, and transport means.
3. Evaluation of importance of waterfowl hunting in settlement life and information on distribution of harvest.
4. Questions on species targeted, mainly in regards to observed changes in individual species numbers. We should note that these questions help us obtain a general idea of trends for some species, which are almost impossible to evaluate any other way. These questions are also useful as it allows a hunter to feel included as a participant of the study by showing that researches are interested in a hunter’s opinion.
5. Questions that allow evaluation of a hunter’s knowledge on ecological problems and hunting regulations.
6. In the recent variant of our survey form we also included an additional section of questions on collection of bird eggs.

In different years, the composition of questions on the form's back side varied slightly. For instance, in 2004 we included two questions intended to reveal hunters' knowledge of ecological problems: "Do you know about cases of ducks being poisoned by lead pellets?" and "…about using steel pellets instead of lead ones?" Almost nobody was aware of these problems, and in the following years they were excluded from the questionnaire.

General study plan

Independent of study goals, the survey process should be preceded by consideration of basic regional information, including:

- Bird species composition and peculiarities of birds' spatial distribution during the main hunting seasons (spring and autumn migration, and molt).
- Main traditional uses of wildlife resources.
- Landscape features.
- Phenology dynamics in each region during the periods when bird hunting might occur.

Before starting the survey, it is very advisable to study a topography map of the area in detail in order to know the main geographic names in the study area. The best situation would be if researchers can participate in hunting together with at least one group of respondents. In this case researchers can personally analyze hunting productivity, migration dynamics and be aware first-hand of problems related to hunting in a key town.

Before surveys start, it is necessary to coordinate your planned activity and obtain administration support at the level of Russian Federation unit, or at least district authorities, explaining the goals of the study. It is useful to obtain letters of support from the towns you plan to visit. We received considerable help from local hunting societies. In some towns we also received information support, and to certain extent logistics support, especially for transportation, from the town administrations, nature protection committees, hunting inspection, police, organizations of indigenous minorities of the North, school teachers of biology, etc. It is useful to visit town administrations and above-mentioned institutions before starting surveys. This also helps with making contacts in towns with experienced hunters and old residents with good knowledge of the local conditions.

Also before starting surveys, it is advisable to conduct a questioning session with experienced and sociable hunters to reveal the main features of hunting in a region and to obtain criterion for determining the reliability of filled in survey forms. Later during the study we recommend periodically conducting test questioning sessions with hunters hunting in various landscapes (sea coast, river valleys, mountain lakes, islands, etc.), who combine bird hunting with other activities (fishing, seal and whale hunting, reindeer herding, etc.). Harvest composition and productivity of such hunting can vary to a great extent.

Survey Preparation

Local bird names

Before starting surveys it is important to learn the pronunciation of bird names in local languages. In Chukotka the majority of hunters know Russian bird names and fluently speak Russian. Knowledge of local names and attempts to pronounce them correctly, however, made data collection easier, as it enabled better social contact with respondents. In Yakutia the

knowledge of local bird names also considerably helped us. Many elder hunters do not know Russian bird names, and some are not used to identifying birds with pictures, but they comprehend as soon as they hear the local bird name. One should consider the fact that some species have different Yakutian common names in different regions. At the extreme is the Steller's eider, which has a different Yakutian name in the low reaches of almost every large river flowing into the Arctic Ocean.

One should also note some confusion occurs related to Russian names. Thus, hunters who do not read special literature (and most of them do not) do not know the common name "white-fronted goose." They call it "gray", "sailor", "spotted", etc. Partly this is related to the fact that east-Asian populations of this species have only very small white spot on the front, and young birds have no black spots on their breasts, as well as no white spot on their fronts until they are 2-3 years old. Often hunters consider them two species: they refer to young birds as "gray" geese and adults as "spotted" ones. Sometimes white-fronts are called "squeakers" (squeaker is the translation of the Russian name for the lesser white-fronted goose). In some cases we failed to find out whether lesser white-fronts really were harvested along with white-fronts, or if it was just a variation of a name for white-fronts, which also have a high "squeaky" call in comparison to the bean goose.

Misunderstandings related to similar common names also occur on a regular basis. Thus, the emperor goose (Russian name "white-necked goose") in Chukotka is called "white-headed," which better describes its appearance. The similarity in pronunciation of the names "white-headed" and "white-fronted" also confuses people.

The local Russian name "Canada goose" is used for snow goose in many places. However, in areas not inhabited by snow geese, this name is also used for the black brant. Therefore, the Canada goose included in Chukotkan questionnaire often confused respondents, and some questionnaires had to be additionally corrected. Quite often, especially among newcomers with poor hunting knowledge, one can come across hunters who do not distinguish between different "grey" geese. Thus the bean goose can be mixed with the white-fronted goose and even with other goose species. For some hunters all dabbling ducks are "mallards", others are "diving ducks", and pintails and long-tailed ducks are both called "pintails." There are even more complicated cases. For instance, residents of Uelkal town call murrelets, and probably some other small auklets, "nyrok," which is the same name used for diving ducks. To clarify what bird is being asked about, it was useful to be able to describe quite vividly the bird's behavior, its calls and its habitat. After that the respondent would have a better idea of what bird was being referred to.

Choosing towns to be surveyed

The towns chosen within a region depends on the study goals. If you need to conduct a study in towns with the highest harvest, the chosen towns should be those situated in the largest wetlands or along routes of mass bird migration. Close location of large seabird colonies is important in regions where large-scale seabird hunting is popular. Our experience suggests that critical distances are very short; 5-10 km. Convenient hunting sites are situated just in a town's surroundings or at a distance that can be walked by foot or a short drive by snow machine or boat. Even when the distance of sites with possible regular productive hunting is 20-50 km from town, the total harvest is considerably smaller.

To obtain the most reliable representative data over large regions, especially for long-term monitoring, our American colleagues use random sampling of towns within certain regions

(Wentworth and Wong, 2001). We should note that sampling was not random in first estimations of native Alaskan harvest, since towns were visited according to their accessibility (Klein, 1966). We used a non-random method to select representative communities while we conducted our study in Chukotka and Yakutia. We tried to uniformly cover towns that were representative for certain natural regions, with typical bird species that are hunted. In our selection we also considered features of traditional subsistence hunting (prevailing reindeer-breeding, fishing, or seal and whale hunting communities, where different ways of bird hunting are used). We also took into consideration the ethnic composition of hunters, population size, peculiarities of social and economic development of the regions in the recent decade, and logistics to reach towns during our study.

In such a study, much depends on the project goals and logistic possibilities. To obtain a rough impression of the bird harvest levels, it is adequate to conduct surveys in two or three dissimilar towns. When the task is to conduct larger-scale estimation, the sample needs to be greater. In random sampling of towns on the Yukon Delta in Alaska, 25% coverage of towns was considered adequate (Copp, 1985). Really the researches tried to cover 25% of potential hunters, thus biased sampling was allowed by decreasing the number of towns surveyed but increasing the proportion of respondents over 25% in other towns. This was related to logistic problems during study implementation, but resulted in decreased statistical reliability. However, it was acceptable considering that the main generalizations were performed for at the region (not town) level (Wentworth, 1998).

Differences in survey methods for rural versus urban settlements

The two main types of the settlements in the Russian Arctic are rural settlements with populations of about 200-1000 people, often with predominately indigenous residents, and cities and urban towns, usually with predominately non-native residents. From the point of view of survey methodology, the important difference between rural and urban settlements is that the former ones have special registers (which comprise the lists of all town residents by family). Those registers can be used to compile a complete list of potential hunters and to form a random sample. In urban settlements such lists do not exist, which makes sampling quite complicated. So we worked out two methods that are described below.

Sample selection

The possibility of surveying all hunters is a rare opportunity that can only occur in a small settlement. Therefore, we performed our survey on a random sampling basis. The correct sampling is very important; otherwise the results are inevitably overestimated, due to more frequently addressing more efficient hunters.

For random sampling it is necessary to have a previously compiled list of potential hunters. In rural settlements this is easy to do with the help of register books. In urban settlements, however, making such lists might be a complicated task, and often it becomes impossible. In the latter case we have to use a non-random sampling method.

Peculiarities of performing survey in rural settlements

The hunter list is compiled using the registry kept by the town administration. Of all potential hunters in a town, we selected those who actually hunted and stayed in the town during our study period with the help of an expert or expert group (head of administration, town elders and hunting societies leaders or hunting inspection staff members). Then we considered the

compiled list as a general set from which we selected the survey sample. Below we give an approximate estimation of a sample for the study according to our experience.

If we consider the population of an average town of 500 people, we can conventionally consider 250 are men (in most towns the numbers of men and women are approximately equal). Potential hunters are men from teenager's years up to 60-65 years old. Among women there are a few hunters (teenager girls hunt more often), so we can exclude women from the sample. It is important to define the age when teenage boys start to hunt on a large scale. We know of cases of boys hunting at 12-13 years old. In some towns, especially those distant from hunting control centers, 15-16 years old boys participate in hunting on a large scale. In Russia, hunting is officially legal at 18 years of age. Our experience suggests that in northern towns with a population about 500 people, the number of hunting-age residents usually comprises 130-150 people. A considerable portion of them do not participate in hunting because they are absent from the town during the hunting season, for instance, serving in the army, imprisonment, illness, away on business trips, or they actually live in other towns. Of the 100-200 men present in a town during the hunting season, the percentage of men actually hunting usually fluctuates from 40% to 90%, averaging about 60%. Under such conditions the list of hunters is usually 60-70 people.

The pattern of random selection of respondents from the list should in general provide random and uniform sampling. For that a row of random numbers can be used. However, having a small general set and high proportion of its coverage, this method can be changed for mechanical selection every k item from the list of hunters, as is recommended by sociological study techniques (Dobrenkov, Kravchenko, 2004). In Alaska, the selection was performed by pulling papers with names of potential hunters from a box (Wentworth, 1998). We usually questioned every second or every third hunter in order from their alphabetized list, getting 50% or 30% of the sample, respectively. Such "mechanical" sampling does not greatly differ from sampling with the help of a row of random numbers, and allows getting unbiased estimations.

In most northern towns it was possible to question about 50% of all hunters. To question over 50% of hunters for 10-15 days is usually difficult, since a considerable portion of residents turn out to be unavailable to researchers (people are on vacation, stay in distant areas, fishing or reindeer herding, are ill, mostly do not stay home due to personal matters, etc.). The questionnaires were seldom rejected by respondents, but we had such cases in almost in every town. Some percentage (usually very small) of survey forms turned out to be unfit for analysis and was rejected just after completion.

Peculiarities of performing survey in urban settlements

In urban settlements, with populations of several thousand people, the above-described procedure usually could not be applied for two reasons.

First, compiling a complete list of hunters is problematic. Where hunting societies do function and their members regularly pay fees, it is possible to use the hunting society members list as a basis for our list. Also the police have lists of registered shotgun owners. However, any official source should be modified with an additional list of illegal hunters (those hunting without a license). If this is not possible, we should at least determine the approximate proportion of illegal hunters among the hunting society members.

Secondly, when the survey is performed in summer, there is the high proportion of people from urban settlements who are on vacation or on business trips. Besides that, many hunters live

at different addresses from those listed in the hunting society files. Thus, much time is needed to locate hunters while visiting the addresses indicated on the list.

Let us point out more problems we encountered while performing the survey in large settlements.

1. Like in other Russian Federation units, hunting societies stopped their activities in Chukotka. So hunters use only free hunting licenses provided by hunting inspection (Game Management authority under Russian Federation Ministry of Agriculture), which is not always easy to cooperate with.

2. In Yakutia, many hunters have left hunting societies or stopped paying fees. Their names could be found only in old hunting societies lists, if they are still available. It is quite complicated and usually does not bring a satisfactory result.

3. Many citizens hunt without licenses and many shotguns are not registered. To compile a complete list, including such hunters, is actually impossible. We can only estimate their approximate number by questioning local experts.

All these complications resulted in us working out an alternative procedure for urban settlements. It is based on non-random sampling and combines two methods for its formation: "snow ball" and "typical representatives" methods (Dobrenkov, Kravchenko, 2004). In the first phase, all hunters who are possible to meet with are questioned. During the questioning each hunter is required to give the addresses of other hunters he knows ("snow ball" method). After a considerable number of questionnaires are obtained, a preliminary analysis is performed, and the questionnaires are divided into three groups according to hunting intensity. Extrapolation of harvest data is calculated separately for each of the three hunter groups. These numbers are derived from official sources and questioning of experts. When there are not enough questionnaires in one of these three groups, then additional surveying is performed among hunters of a certain category, i.e. "typical representatives" method is used.

Hunters were classified according to their activity and annual bird hunting bag. Three groups of hunters were separated in the following way.

1. "Efficient hunters" (bag many birds) – They are either devoted hunters that hunt all year round when they have a chance, or those who go on special hunting trips in spring or autumn. They effectively use hunter's whistles and decoys, and often they are good shots. There are many well-off people among them, VIPs or those who have free access to transport means for distant hunting trips due to their jobs.
2. "Common hunters" – Includes a large group of people (includes hunters with mean annual bag) with various social status. They spend a moderate amount of time and funds for hunting.
3. "Irregular hunters" – Those that do not hunt every year; usually restrict themselves to 1-2 trips per season to near-by hunting areas, hunting with minimal transport means or on foot. Typically represents poor people or those who are not so fond of hunting. Participants of hunting trips who hunt "for company" belong to this group. They may join a company of hunters from the first two groups, but for various reasons make only several shots, not always bagging even a single bird.

The sequence of arranging surveys in urban settlements consists of the following:

1. Surveys of hunters start on the first study day and continue until its end. The more questionnaires obtained, the better the result. As new contacts in the settlement are made, efforts are taken to cover the widest range of hunters of various nationalities, ages, professions, etc.

2. The official data are collected and analyzed (lists of hunters from hunting societies and inspections, lists of shotgun owners from the police, etc.), which allows approximate estimation of number of citizens who really hunt birds.

3. Informal questioning/interviews of experienced hunters and local elderly residents. During these interviews the following items are revealed:

a) the total number of hunters, distribution of hunting areas, locality of key informal hunting groups that are worth surveying;
b) approximate ratio of the hunters of above mentioned groups; and
c) approximate ratio of numbers of official hunters to those hunting without licenses and shotgun registration.

In the end we should obtain the ratio of hunters in the three groups. Those might be averaged figures from various sources, such as official numbers, as well as verbal data obtained from experts during informal interviews.

To get a relatively uniform sample, the efficient way is to survey in closed groups that are possible to easily contact, for instance, enterprises, military units, administration units, people living in a tenement-house, etc. Such approach also allows saving time searching for respondents.

To collect data on the most numerous group of hunters, those who hunt rarely and not every year, is the most challenging. Sometimes it is considered shameful to mention a small hunting bag, and such hunters are often missed to be named by others. When the survey is conducted in a group of five hunters that made a hunting trip together with four shotguns, it is important that all five hunters fill in forms. Thus the sample includes other hunters along with the best and lucky shots.

In exceptional cases when we were not able to meet all hunters of a group who hunt together, we used a method of "external filling in the questionnaire." In such cases only the form's front side is filled in along with minimum objective information on its back side, for instance a hunter's age and hunting record. It is performed on condition that a questioned hunter remembers individual hunting bags of all group members, which often occurs. We often have to use this method in urban settlements because the probability of some member(s) of a team being absent by the time of the survey is conducted is high. We should mention that in general, in comparison to rural settlements, methods of formally evaluating harvest in urban settlements is inferior, and obtained data are considered tentative estimates.

Survey Performance

Arranging surveys

Performing the survey in medium-size settlements usually takes 15-20 days. Sometimes, in especially favorable conditions and with cooperation from local institutions, it is possible to fulfill the task in shorter time, but it is not worth counting on that when planning the research. Besides, longer contact time with local hunters allows researchers to obtain much additional information, and in general it considerably improves the possibilities to interpret the survey data and increases the reliability of obtained results.

Surveying in a settlement is possibly conducted:

1) personally by the researcher;

2) with the help of hired assistants from local residents, who work along with the researcher for increasing questionnaire collection; or

3) by assistants, hired distantly, without visiting a settlement by the researcher.

Our experience suggests that the best quality and least biased data is obtained using the first option (researcher directly); the second option gives good results if the assistants are supervised by the researcher; and the third option, though it might give good results, includes some risk of obtaining questionable data, which are difficult to validate.

The selection of local residents as assistants is not an easy task. Such person(s) should meet the following criteria:

1) should be trusted, i.e. be "one of them," born or elderly resident that does not work in the police or hunting control institutions;
2) be reliable, thorough and available or easily contacted for supervision of work (living close by or having a phone); and
3) possess a certain ecological knowledge and basic knowledge of wildlife and ways of bird hunting in the region.

The assistant should be instructed in detail, or several survey forms should be filled in by hunters together with the assistant. Survey work should be evaluated every day or according to a certain schedule. The first evaluation should occur immediately after collection of the first questionnaires. The researcher should thoroughly look through filled in questionnaires and give recommendations to the assistant on what needs correction and what should be paid attention to. Misunderstanding of some details almost always occurs.

Working with respondents

The process of completing a survey form takes takes at least 15-20 minutes for a hunter to fill it out, and sometimes over an hour when including time for making contact with the hunter. Before a hunter fills in the questionnaire, the interviewer should explain the main study goals, stressing the following:

1. The questionnaire is performed anonymously and only for scientific purposes.

2. The results will form the basis for working out recommendations for hunting improvement and to help make hunting regulations meet the needs of the local population (considering that both researches and hunters are interested in having sustainable bird populations and conserving rare species, which are the common wealth of the area residents). It is best not to start complicated discussions on these points, instead it is best is to show the front side of the questionnaire and try to interest the hunter in the color pictures of birds.

3. If hunters in a certain town use local bird names, they all should be mentioned and related to the names on the questionnaire, making the hunter pay special attention to them. Thus, the risk of misidentification errors of a hunter's bagged birds can be minimized.

4. While the hunter fills in the questionnaire, comments should be provided to ensure attention is paid to points hunters often misunderstand or forget:

a) the questionnaire is filled in for a one-year period, including one spring, autumn and winter hunting season and anything that is bagged in between;

b) if hunting in a group, each hunter gives the number of birds he really bagged himself;

c) the number of bagged birds also includes birds entangled in fish nets; and

d) when the hunter does not know or remember a bird species' name, he can use the column "duck (goose) of unknown species" (our experience suggests that hunters often forget about this option).

5. In come cases it is possible to help a hunter identify a bagged bird by his verbal description, using a guide (for instance, if he bagged a bird, which rarely occurs in the area and which name he does not know).

6. In few cases (for instance, working with old people without good writing skills), the interviewer can fill in the back side of the questionnaire himself from a respondent's oral communication. If the hunter is not at home, it is acceptable to leave the questionnaire with his relatives or neighbors and pick it up the next day.

Survey Form Analysis

Preliminary analysis, rejection and correction of questionnaires

Before statistically analyzing questionnaires, we perform preliminary analysis and sorting with the following tasks: 1) revealing which questionnaires should be rejected due to obviously being filled in inadequately; 2) correction of bagged species composition. The latter is accepted only in a minimal way and only in the obvious cases. If the hunter names a species obviously not inhabiting the area, especially if he indicates a large hunting bag, it is possible to use three different ways of validating the entry. First, the hunter might be contacted to clarify what he meant. This is possible when you still have the survey in process or when the preliminary analysis of questionnaires is performed in the town.

Secondly, the number of bagged geese (ducks) could be shifted to the column "goose (duck) of unknown species." We did so with numerous "mallards" in some questionnaires. The problem is that in most regions of Russia the mallard is the main hunting species, and those hunters call all dabbling ducks (moreover, not only dabbling) with this conventional name. However, in Chukotka the mallard is a very rare visitor, and bagging a big amount of them is impossible. The replacement of obviously wrongly identified "mallards" to the other column allows information on a number of bagged birds to be saved and avoids strange unexplainable figures in certain species bag.

Thirdly, in some cases the correction of species composition of a hunting bag is possible. We performed it in two cases. When a hunter indicated a considerable amount of bagged "Canada geese" in an area where usually black brant are bagged, and at the same time did not indicate any bagged black brant. When a hunter indicated a big amount of bagged "lesser white-fronted geese" in an area they do not inhabit, but white-fronted geese are common, and at the same time did not indicate any "white-fronted geese". When a hunter indicated a single bagged lesser white-fronted goose or Canada goose, we made no corrections, since cases of bagging single birds of these species might occur. Sometimes we also made corrections in cases when hunters obviously mixed the greater scaup and tufted duck, or common eider and spectacled eider, as tufted duck and spectacled eider do not inhabit all areas. Only experts with good knowledge of the regional avifauna can make such corrections.

Data extrapolation

For rural settlements, the total estimated number of each bird species harvested in a town was obtained by direct multiplying the mean hunting bag by the total number of active hunters

(every hunter who bagged even a single bird in a given year we consider an active hunter). This method also allowed determination of the standard error.

Estimation of total harvest using survey data from urban settlements was performed by multiplying mean bag of each group of hunters by the tentative number of total hunters in a certain group, as determined by experts. Since the total number of hunters was not really known, estimation of the standard error was not possible.

We did not extrapolate data on the number of collected eggs because a reliable method for estimating the number of collectors has not yet been developed.

Discussion

Problems with Methodology:

Reliability of hunters' responses

There are several reasons why hunters may indicate a number of bagged birds in questionnaires that differs from what they actually bagged.

1) One of the typical problems we encountered is that after a year hunters might forget how many birds they bagged, for instance, last autumn. This was noticed for some native residents who in general were not used to recording or remembering their hunting bags. Most of our surveys were performed in the summer, so "forgot part" of the hunting bag might comprise some part of the bag from late summer and autumn, which is usually considerably smaller than the spring hunting bag. From our experience, the birds that are most often forgotten are divers and other seabirds caught in fish nets, and also ptarmigans and young ducks bagged in the previous autumn or winter (where winter hunting at polynias is possible).

2) A certain group of hunters intentionally underestimates their hunting bag for two possible reasons:

a) hunters know that they have bagged more than it is officially permitted, or they have bagged birds illegal to shoot (swans, cranes) so, in spite of anonymous questionnaires, they intentionally indicate less birds than they really bagged;

b) hunters do not know exactly what species and how many birds they are allowed to bag, and underestimate the number of all bagged species (also permitted to hunt), "just in case."

3) Some hunters intentionally overestimate their hunting bag. Almost every town holds 1-2 such people. If the hunting bag is only slightly overestimated, just "not to seem worse than others," than the data do not differ from the mean probability. That usually goes unnoticed, and such questionnaires are included in the analysis. Obviously overestimated data are rejected. We believe that overestimation is made in the following cases:

a) hunter's desire to dupe visiting Muscovites;

b) hunter's desire to show his "super hunting abilities" or just present his hunting knowledge in front of new-comers (due to this desire the boasting hunter could also state he has bagged a number of species which are very rare in the area);

c) the behavioral stereotype "I will write whatever comes to mind just to make them leave me alone."

4) The special and very rare category of hunters just invents everything they fill in the questionnaire. Such questionnaires are very easy to detect, since they contain obviously unlikely numbers of bagged species in improbable combinations, and the most commonly bagged species

usually are not mentioned (for instance, 100 Teals or 50 swans, or many Snow Geese in an area where the species is a rare visitor, at the same time no species common in the area, etc.).

Our experience suggests that imprecise data occurs in surveys conducted by both professionals and by local resident assistants. Questionnaires with obviously overestimated or improbable data are certainly excluded from analysis. For the rest of the questionnaires, under- and overestimated data should partly compensate each other when the sample size is large. However, we cannot rule out the possibility that our figures can be somewhat underestimated. In particular, in the cities where hunters think more about the potential threats from hunting inspection, underestimation should be more pronounced then in rural settlements. The data on some species, for instance, cranes, swans and other birds included in the Red Data Book, can appear considerably underestimated. The probability of errors should become the subject of a special study.

Hunters' species identification errors

Our experience in Chukotka and northern Yakutia indicates the vast majority of resident hunters and most visiting hunters who have lived more than 10-15 years in the North and hunt intensively have a good knowledge of bird species. However, errors are possible and occur regularly. We consider the main reasons errors occur are due to the small size of bird pictures on questionnaires, lack of time for filling in questionnaires, or lack of hunters' attention.

We have already mentioned the errors related to local species name confusion and differences between Russian and local common names. A good example is the use in Chukotka of the local name "cormorant" (its Russian equivalent) for large gulls, instead of using this name for the pelagic cormorant that does occur there. Based on our experience, the most common species identification errors are:

1) errors in identifying "grey geese": white-fronted, lesser white-fronted and bean geese;

2) errors in identifying ducks in eclipse or transitory to eclipse plumage (pintail, ,merganser, eiders);

3) errors in identifying young birds in autumn, in particular eiders, when birds of both sexes have similar female plumage. We believe that juvenile eiders of different species can be included in the reported number of females of the most common eider species in the area (usually common or king eider). However, such errors are rare.

Errors in compiling hunter lists and data extrapolation

It is complicated to get a completely uniform unbiased sample even when surveying in rural settlements, since certain groups of hunters (for instance, reindeer-breeders that always stay on the tundra) are less available to interviewers than others. Defining the age boundaries of a sample is also a problem. The likelihood of missing teenager or elder hunters on a list is always higher than for medium-aged hunters. In general, the more efficient a hunter, the lower probability he will be missed on the list, which should result in somewhat overestimated totals. On the other hand, more efficient hunters spend more time at their hunting sites, so they are less likely to be found at home during the survey period. Since the survey is always performed after the hunting season, some small portion of hunters have since left the town due to permanent migration of people from the North. Sometimes visitors may take part in hunting and then leave immediately afterwards. These circumstances, on the contrary, can provide underestimation of the extrapolation results.

Generally, from questioning local residents and based on our experience, all of the above-mentioned factors cannot bias the results too much in the typical northern rural settlements. Moreover, they act in opposite directions and compensate each other. Survey coverage of a high proportion of hunters (usually from 30% to 70%) provides reliable results. Data extrapolation from urban settlements, however, might contain considerable errors due to the mentioned factors. Therefore, it is useful to study these factors in detail.

Data reliability also greatly depends on the experience and honesty of hired assistants. Selection of such assistants needs to be very thorough. This is especially important when surveys are performed distantly such that researchers cannot oversee the survey process directly.

Prospects of using the methodology

The prospects of using the described techniques are obvious, considering that the data might be useful in a broad spectrum of inter-disciplinary studies. Also, in Russia, an evaluation of bird hunting bags as described has not been conducted before, and official statistics of hunting bag estimation for tundra regions are almost useless, or provide results considerably different from reality.

We think that in addition to conducting a one-time inventory study over the whole Russian Arctic, it is useful to select a number of key towns for a study that annually monitors hunting bags. It is especially important in areas inhabited by protected waterfowl species (e.g., spectacled and Steller's eiders, lesser white-fronted goose, emperor goose, black brant, red-breasted goose, etc.). Considering that in Alaska hunting bag numbers fluctuate up to 50% for many species between years (Wentworth, 1998), it is useful to conduct hunting bag monitoring studies that help reveal trends.

Results obtained using this technique can be used for optimizing use of game bird species resources, for working out a sustainable use strategy to support the traditional use of native birds by indigenous nations of the North, and also for use in global and regional plans for rare bird species conservation.

Investigation of bird hunting by native people has a special importance because it is one of the main ways they traditionally sustain themselves. The evaluation of hunting bag size and how the harvest is distributed (traditionally for many indigenous nations bagged birds are distributed between relatives, exchanged, or sold) comprises an important part of ethnic-and-ecological and ethnic-and-economic studies. The traditional subsistence life style is part of the original and yet poorly known system of "combined" economics of Arctic towns (Usher et al., 2003). From the point of view of economic theory, such a system in many ways is similar to the "labor" farm, described by A. N. Chayanov (Klokov, Shustrov, 1999).

ASSESSMENT OF EIDER HARVEST IN CHUKOTKA AND NORTHERN YAKUTIA

Russian tundras are inhabited by four eider species, common, king, spectacled, and Steller's. Present status of the Pacific eider populations is of particular concern. Steller's and spectacled eiders have dramatically declined in numbers in Alaska (Frederickson, 2001; Petersen et all. 2000). Certain evidence also indicates a gradual decrease in numbers of the Pacific subspecies of common eider. These observed declines are occurring in the background of general decline of all groups of Anseriforms in the East Asian region, including the north-eastern regions of Russia (Syroechkovskiy, 1997; Syroechkovskiy, 2006 a). The reasons for decline in the regions are unknown. Eider hunting is assumed to be one of them; however, almost no data on this activity in Russia is available.

No official assessment of game hunting (harvest of birds) has been performed by the governmental agencies for north-east Russia (Molotchaev, 2002). In some northern regions, official statistics of Anseriform harvest derived from license recoveries is being regularly analyzed. However, even those materials are usually missing data on harvest by indigenous hunters (Gusakov, 2002).

This study presents the data analysis of eider harvest obtained by surveying hunters in more than 20 Arctic villages. Since there are more than twenty villages in the region, our assessment is not complete and provides a tentative estimate of harvest in the region.

Materials and Methods

Studies to assess hunting pressure on waterfowl by conducting anonymous surveys were launched in 1999 (Syroechkovskiy et al., 2003 a). Over the period 1999 to 2006, 21 villages and a number of small settlements were surveyed in the north-eastern part of the Russian Federation (Syroechkovskiy et al., 2003 a & b; Syroechkovskiy, Klokov, 2003 a & b; 2004). The survey methodology was based on our experience of interviewing people in various regions of the Russian Arctic during the course of traditional nature management studies, as well as the experience of U.S. Fish and Wildlife Service in anonymous surveying waterfowl hunters in Alaska for more than 20 years. Various bird species were depicted on the front side of a questionnaire; the hunters were asked to indicate the number of birds of each species harvested over the last year, along with the number of collected eggs. The back side contained additional questions concerning the process of hunting itself (e.g., time spent hunting in different seasons, distance from village to hunting lands, use of various transport means, number of spent cartridges, mode of sharing of bagged birds), hunter's attitude to game hunting and hunting regulations, his view on changes in number of basic game species, etc. Methodology is described in detail in the previous chapter.

Study Area

The breeding range of the Anseriform populations belonging to the East-Asian flyways encompasses a vast territory. Fig 1-1 shows the distribution of human communities in northern Yakutia and Chukotka by population and dominant ethnic group.

We reasonably restricted our study area to the coastal tundra belt from the Yana-Indigirka Lowland to the northern part of the Koryak Upland (Fig. 1.2) within the administrative territory of the Republic of Sakha (Yakutia) and Chukchi Autonomous area. Within the study area, we

selected a number of typical northern villages situated within 100 km from the coast. The only exception was Andriushkino village in Yakutia because it is located in the lower reaches of the Alazeya River with no settlements at its mouth.

Typical representative villages situated in the coastal tundra at the edge of wetlands and located in regions of intensive bird migrations were chosen. Transport and logistics were also taken into consideration, so that as many villages as possible could be surveyed over the field season.

The surveyed territory was divided into three regions: southern Chukotka (from Kresta Bay up to the boundaries with Kamchatka Kray in the south); Chukchi Peninsula and the northern coast of Chukotka up to Chaun Bay; and the eastern coast of Yakutia, including the Yana, Indigirka, and Kolyma river deltas. Three villages were surveyed in southern Chukotka, 12 in northern Chukotka, and 7 in coastal regions of eastern Yakutia. The 22 surveyed villages are shown on in figure 1-2 and general characteristics of obtained data are presented in Table 1.

Table 1. General characteristics of collected data from 22 villages surveyed, 1999-2005.

	Village	Year	Population (# people)	% indigenous people	Total number of hunters	Number of hunters interviewed	% of hunters interviewed
YAKUTIA							
1	Ust-Yansk	2005	340	89	106	33	31
2	Kazachie	2005	1,552	76	247	42	17
3	Russkoe Ustie	1999	207	More than 90	66	34	52
4	Fishermen's settlements in the Indigirka Delta	1999	300	More than 90	39	15	38
5	Chokurdakh	1999	3,200	X	406	19	5
6	Andriushkino	2003	835	72	166	42	25
7	Pokhodsk	2003	242	95	54	35	65
	Subtotal		6,676	X	1,084	220	20
NORTHERN CHUKOTKA							
8	Yanraniay	2003	236	66	44	24	55
9	Pevek	2003	5,112	2	465	137	29
10	Rytkuchi	2003	487	72	84	51	61
11	Nutepelmen	2003	153	97	26	20	77
12	Neshkan	2002	678	97	250	98	39
13	Inchoun	2004	373	99	69	25	36
14	Lavrentia	2004	1,388	57	187	35	19
15	Lorino	2005	1,146	88	221	64	29
16	Yanrakynnot	2005	366	94	44	20	46
17	Novoe Chaplino	2004	466	90	62	25	40
18	Sireniki	2004	610	91	104	41	39
19	Enmelen	2004	388	88	75	40	53
	Subtotal		11,403	X	1,631	580	36
SOUTHERN CHUKOTKA							
20	Alkatvaam	2005	326	87	56	31	55
21	Meinypilgyno	2003	466	82	52	35	67
22	Khatyrka	2005	328	87	60	44	73
	Subtotal		1,120	X	168	110	65
	TOTAL		19,199	X	2,883	910	32

Results

Processing of questionnaires, along with additional information collected during surveys, allowed us to obtain tentative data on presently used eider hunting methods, territorial distribution of hunters, and the amounts of harvested birds, as well as evaluate harvest according to bird groups (eiders, geese, ducks, seabirds, etc.) and individual species for eiders.

Procedures and harvest methods of in arctic settlements

Even a century ago, when firearms were a rarity, geese and ducks were traditionally harvested during the molting period (July-August), when they are unable to fly (Zenzinov, 1987). At that time, eiders were seldom harvested, with the exception of traditional hunting for molting birds in Mechigmenskaya Bay, which is still practiced by the residents of Lorino village using boats. The situation has changed since the mid-20th century, when hunting with guns was adopted from non-resident visitors. This method has now been used by three to four generations of hunters and local people now consider it traditional. According to federal hunting regulations, hunting for molting birds is prohibited and considered to be poaching. Despite this fact, it is still practiced, mostly for geese. Molting birds are hunted by residents of some villages in northern Yakutia, particularly residents of Alkatvaam, Nagornyi, Meinypilgyno, Neshkan, Nutepelmen, and Ugolnye Kopi villages in Chukotka, as well as reindeer breeders on the Chukchi Peninsula.

Although hunting is officially allowed only during a week-long period in spring and a few months in autumn, residents of most villages actually hunt at any time convenient for them. It is fair to say that the same situation is common to Alaska: for example, in the Yukon Delta an average of 60% of waterfowl are harvested during the period when hunting is officially banned (Wentworth, 1998). In a number of villages (in the Chaunskiy district, Chukotka, most of the district centers except for Lavrentia and Providenia, and in some districts of Yakutia) enforcement measures are stricter and illegally kept and used guns have been confiscated.

Eiders are shot primarily from shelters in spring and by approaching them in summer and autumn. They are also shot from fast ice on the sea and from motorboats during sealing. Decoys are virtually not used at all. Eiders are often shot in midair, with hunters waiting for them in places where birds traditionally migrate over the sea spits and along streams in river deltas. Although the traditional Chukchi method of harvesting low flying eiders with the use of 'bolo' ('eplikatet' in Chukchi and 'avlykakhtakh' in Eskimo) has been almost forgotten, it is still known in Neshkan, Uelen, Inchoun, Lavrentia, and Novoe Chaplino. Some elderly residents of these villages have used these devices and are able to manufacture them.

Hunter distribution

Waterfowl hunting plays an important role in life of residents of the northern regions of Russia, first of all as a traditional occupation and as a means of obtaining food and income. Almost all adult men and teenagers are engaged in waterfowl hunting in the villages and small towns. The number of hunters in the urban settlements and cities is smaller, though also fairly high.

Since the meaning of the word "hunter" can be ambiguous, we introduced the term "effective hunter." We considered an effective hunter as a person who had shot at least one bird during the year proceeding the survey year. Unless special reference is made, "hunter" means "effective hunter."

Distribution of hunters in the surveyed villages is shown in Figure 2. The percentage of adult male hunters among village populations ranges from 28 to 93% (50 to 70% in most villages). Based on our study, women are not engaged in eider hunting, except in rare cases. Many of them collect eggs (egg collecting data will be analyzed in a special publication).

Most hunters are representatives of indigenous minorities of the North (Chukchi, Eskimo, Evens, Yukagirs, etc.) or of indigenous ethnic groups (Yakut and several specific northern ethnic groups of Russia, such as the residents of Russkoe Ustie and Pokhodsk). The share of newcomers, primarily Russians and Ukranians, is greater in large villages and small towns. The overall population of surveyed villages was about 20,000. About 2,500 (13%) could be referred to as "effective hunters" who hunted and harvested birds during the survey year. About one third of all hunters (910 persons) were questioned.

Attributes of surveyed settlements categorized them into two fundamentally different groups:

a) small villages with the prevalence of indigenous people involved mostly in traditional economics (reindeer breeding and local trades);

b) local (district) administration centers, which are relatively large settlements with a large percentage of non-local people. Residents of such settlements are mostly engaged in industrial production (coal and gold mining), transport services (sea ports, airports, automobile transportation business), social infrastructure (administrative bodies, educational institutions, medical service, cultural agencies, etc.), and trade.

In the first group of settlements (small villages), waterfowl hunting could be considered one form of traditional maintenance of self-sufficiency among the indigenous people. According to most hunters, their hunting bags are, first of all, a source of food for their families. Many families store harvested birds for future needs. Most of these hunters share their harvest not only with their relatives, but also with their friends and neighbors. Most of the adult men and teenagers are engaged in hunting. Almost no control over hunting exists; the people are virtually unaware of any hunting regulations. Waterfowl hunting is regulated primarily by local habits and traditions. Actual duration of the hunting season often greatly exceeds legal terms. Most of the birds are harvested near settlements, so its location relative to the flyways greatly affects individual harvest. Certain groups of people, such as nomadic reindeer herdsmen and fishermen, spend the majority of the year in the hunting grounds, or even live there permanently. They hunt constantly, but shoot birds in numbers they need for food supply.

In settlements of the second group, the percentage of hunters in the adult population is much smaller. Hunting is a popular sport and recreation rather than the means of supplying food for the families. The role of bird game in the family food budget is much smaller than in small villages. The control over hunting is stricter and hunters are usually aware of the regulations. Average time spent hunting by the residents is shorter, whereas the average number of cartridges spent over a day of hunting is larger. Hunters leave their homes for the hunting grounds for a few days and try to shoot as many birds as possible. That is why they choose places with waterfowl aggregations on migration stopovers. The hunters take advantage of many roads passing along the large settlements to reach the hunting grounds. Additionally, some hunters use cross-country vehicles and even helicopters to get to remote hunting lands. In those cases, harvest could be very large, though the number of such hunters is very low. On the whole, average individual harvest in larger settlements is considerably smaller than in small villages; however, the overall number of harvested birds is high due to the greater number of hunters.

Harvest distribution

Common Eider

Common eiders are the largest eiders; they are desired by most local people in Chukotka villages. This species is rarely found west of the Chukchi Peninsula; that is why common eiders are represented in very small numbers in the hunting bags of Chauna Bay villages and were not recorded in Yakutia at all. Most common eiders are harvested on Chukchi Peninsula coasts, and the harvest is evenly distributed among all coastal villages in this region (Fig. 3-1). Common eiders were shot primarily in three of the surveyed villages: Lorino, Neshkan (about 1700 birds in each), and Enmelen (more than 1150 birds) (Fig. 5-1). These are record figures for monospecific bags of any Anseriform species in a single village. Enmelen and Novoe Chaplino lead villages in individual harvest (16 and 13 eiders per hunter, respectively). In most of the other villages of the Chukchi Peninsula, a hunter bags 6 to 8 eiders.

Common eiders are harvested over a long time period, with most shot in spring and summer, but some birds are bagged during sealing as they arrive in April and some in October and November. Common eider aggregations are recorded in certain water areas near Sireniki village in the Sinyavinskie straits and Mechigmenskaya Bay until late autumn, because some birds winter in the Sirenikovskaya Polynia and leave coastal waters for only 2 to 3 months during the most severe weather.

Relatively small numbers of common eiders are harvested in Southern Chukotka. In any village, the bag does not exceed one hundred birds and two birds per hunter. This may be partly explained by the presence of many non-resident hunters who usually neglect eiders considering them a hard food. There are few indigenous hunters and almost no sealing (a great number of eiders are bagged during sealing in other regions of Chukchi Peninsula).

King Eider

King eider is a common game species for indigenous people in Chukotka and Yakutia. Harvest of this species is fairly large in two regions: on the Chukchi Peninsula and the Indigirka and Yana river deltas in Yakutia (Fig. 3-2). The former is associated with areas of mass migration and aggregations of non-breeding birds, the latter provides habitat for large numbers of breeding eiders. King eiders were harvested in greatest numbers in four of the surveyed villages: Ust-Yansk (over 1350), Lorino (1170), Neshkan (about 900), and Kazachie (over 700) (Fig. 5-2). Individual hunting bags are larger in Yakutia, where they can reach 10 to 15 eiders per hunter (gun); they are somewhat smaller in Chukchi Peninsula villages, with 4 to 6 birds per individual hunting bag (Fig. 4-2).

Harvest appeared to be surprisingly small in Chaun Bay and the lower reaches of the Kolyma River, which could be due to remoteness of the villages from the species' main flyway along the coast. We assume that in other years the number of king eiders harvested in this region, especially in the lower reaches of the Kolyma River, could be larger. There are almost no king eiders harvested in Southern Chukotka. This species is very rare in the region; the birds occur there only during the migration period and are usually flying over the sea.

General patterns of hunting for king eiders in Chukotka are similar to those of hunting for common eiders. King eiders are shot during migration, when they fly over sea spits, and during sealing. Spring and autumn hunting is of great importance, because few immature one- or two-year-old birds occur on the Chukchi Peninsula in summer. In Chukotka, the percentage of king eiders in the hunting bags was smaller than that of the common eiders. King eider was the

predominate Anseriform species harvested only in the lower reaches of the Yana River and in Andriushkino village, where it comprised half of all bagged eiders (overall number of all eiders harvested in the region is small). In Yakutia, the hunters purposefully go by boats and snowmobile to the coast and wait for king eiders passing along their usual migration routes.

Spectacled Eider

Spatial distribution of spectacled eider harvest is similar to that of common eider. Two areas with large harvest are Chukchi Peninsula and Indigirka River Delta (Fig. 3-3). The main breeding ground of the species is the Indigirka River Delta and more than a half of all spectacled eiders are harvested there. In 1999, hunters from Russkoe Ustie village and small settlements in the Indigirka River delta bagged 2,300 spectacled eiders (Fig. 5-3). Another location with large hunting pressure is located in Mechigmenskaya Bay near Lorino village, where spectacled eiders form molting aggregations in summer and autumn. About one hundred birds were shot; the rest were harvested using a traditional technique. The hunters use boats to chase eiders and drive them out of the sea onto the spit; then the birds are encircled by people and caught with a lasso ('chaat'). Some birds are always released. The stability and regularity of such captures are uncertain. According to interview data, the eiders are not caught annually because people may be engaged in other activities; sometimes the procedure is not successful and only a few hundred birds are caught. In successful years, the overall harvest by several teams may reach up to a thousand birds.

Individual hunting bags reflect regional tendencies. The absolute record (16 to 32 eiders per gun) was registered in the Indigirka River delta (Fig. 4-3). In three villages on the Chukchi Peninsula (Inchoun, Novoe Chaplino, and Lorino), average individual harvest was about four birds.

In the lower reaches of the Indigirka River, spectacled eiders are hunted along with other eider species. The number of birds of different species fluctuates from year to year, but spectacled eiders are the stable component of the hunting bag. The birds are harvested primarily in spring, though the hunting lasts during the whole warm period of the year (we witnessed this more than once).

Small numbers of spectacled eiders, with their total number not exceeding a few hundred, are harvested in other Chukchi Peninsula villages, mostly in spring and during sealing, as well as during migration in the Yana and Kolyma river deltas. Almost no spectacled eiders occur in southern Chukotka.

Steller's Eider

Although the spatial distribution of Steller's eider harvest (like those of king eider and spectacled eider) also had two 'clusters', most of the birds were harvested in Yakutia (Fig. 3-4). Our observations in the western regions of Yakutia, at the Anabar and Oleniok rivers, and in the Lena Delta are not considered in the present report, but they also indicate mass harvest of Steller's eiders along the entire coast of Yakutia.

Five villages with large Steller's eider harvest are situated in the Indigirka and Yana river deltas. In Ust-Yansk and in the Indigirka Delta the harvest exceeded 800 eiders; in Russkoe Ustie and Kazachie it reached 600 birds (Fig. 5-4). Each Chukotka hunter harvests, on average, less than two birds; in Yakutia, individual harvest is largest in the Indigirka and Yana river deltas, where each hunter shoots an average of 5 to 22 Steller's eiders (Fig. 4-4).

It should be taken into consideration that Steller's eider is a nomadic species and the number of migrating and breeding birds may greatly vary from year to year in the same region. That is why repetitive surveys of the same villages are likely to yield different results. At the same time, the great role of the Yakutian coastal villages in hunting Steller's eiders will persist. In some years, larger numbers of Steller's eiders can be harvested in villages located in the lower reaches of the Kolyma River, in Chauna Bay, and along the northern coast of Chukotka.

On the Chukchi Peninsula, Steller's eider are not shot purposefully, but together with other game on the coast and at sea. In spring, migrating eiders are abundant everywhere, athough their migration period is relatively short. In summer, Steller's eiders are less evenly distributed than other eider species. During that period, they could be reliably hunted in their pre-molting concentration areas, such as the outlet of Koliuchinskaya Bay (north of Lavrentia village), in Senyavinskie straits, and north of Enmelen close to Rudder's Spit. This is reflected in the observed harvest distribution (Fig. 3-4). In the southern regions of Chukotka Steller's eiders were shot occasionally. The birds were harvested in the second half of summer, when they migrated directly south to their wintering grounds in Kamchatka.

In areas where large numbers of Steller's eider were bagged, this species was shot both purposefully and together with other game. In Nizhneyansk and Russkoe Ustie, we met hunters who left their villages for hunting grounds in early June in order to hunt this particular species. Dense flocks of migrating Steller's eiders and the use of automatic shotguns allows hunters to hit 5–6 eiders with one shot and up to 40–50 and even more birds per day.

Overall number of Steller's eiders harvested in the villages surveyed reached almost 4.5 thousand birds. Our previous experience with similar surveys in other regions of Yakutia and Chukotka taken into account, we assume that multiplication of this figure by three (considering extensive hunting for this species within its entire range up to the eastern Taimyr villages of Novorybnoe and Syndasko) would produce an actual overall annual number of bagged Steller's eiders at approximately 13,000 birds.

Proportion of harvested males and females

We added the option to note the sex of harvested birds on the questionnaire while our survey was already in progress, so this data is incomplete. Data obtained are conclusive evidence for selectivity (Figs. 7-4, 8-1 through 8-4; Table 2). Males prevailed in hunting bags of almost all villages. For all four eider species, the percentage of harvested males was larger than females and reached 59 to 73%. We had an opportunity to compare these results with the sex ratio of bagged pintails; the trend was similar with more than 70% males.

On one hand, both in pintails and eiders, some females look like "common grey ducks" to inexperienced hunters and could be referred to by them in the category "duck of uncertain species." This could result in an increase in males' percentage of harvested numbers. On the other hand, the young males acquire eclipse plumage in summer and look like females; such males bagged in autumn are undoubtedly registered as "females," and in this case the percentage of males harvested could be even underestimated.

The opposite tendency (5–10-% prevalence of females in hunting bags) was recorded only for spectacled eider in Kazachie, for common eider in Sireniki, and for king eider in Novoe Chaplino. In Kazachie, this could be explained by the small sample size (less than 20 birds). In the two villages in southern Chukchi Peninsula (Sireniki and Novoe Chaplino), it could reflect the phenomenon described above. The eiders stay in the vicinity of these two particular villages situated close to the Sirenikovskaya Polynia for a long time, and the sealers hunt for them until

late autumn. The number of young and eclipse birds harvested could be larger than in other villages and the hunters likely refer to them as "females" in questionnaires.

Table 2. Proportion of male and female eiders in the hunting bags of 8 indigenous villages in Chukotka and Yakutia

Species	**Males, %**	**Females, %**
Somateria mollissima	59	41
Somateria spectabilis	62	38
Somateria fisheri	73	27
Polysticta stelleri	70	30
All eider species	62	38

Overall Review of Eider Harvest

Percentage of eiders in the overall waterfowl harvest

Data on all groups of birds harvested in the region should be analyzed to evaluate the role of eiders in the overall harvest of all bird species and in particular Anseriforms. A series of figures (Figs. 6-1 through 6-8) shows proportion of various groups of birds harvested by surveyed villages. Average percentage of eiders harvested within the surveyed territory is fairly large, up to 30% of all bagged birds (Fig. 6-7) and 37.5% of all Anseriforms (Fig. 6-8). In almost all surveyed villages the percentage of eiders in hunting bags exceeded 20%. In many Chukchi Peninsula villages it ranged from 40 to 50% and even reached 70% in the Indigirka River Delta and in Inchoun (Fig. 4-6). In comparing average harvest in the three regions (Fig. 9), harvest in Northern Chukotka is, relatively, slightly larger than average and Yakutia is smaller than average.

Settlements with a small amount of eiders harvest are either villages located in forest-tundra (Andriushkino, Kazachie) and, thus, out of eider breeding range and on the periphery of the main flyways, or urban settlements with predominantly non-resident inhabitants that are not interested in eider hunting (e.g., Pevek).

Analysis of individual harvest (number of birds bagged by a hunter) revealed similar tendencies. The Indigirka River delta, including Russkoe Ustie village, with an average harvest of 30 to 65 eiders per hunter, stands out (Figs. 4-5, 6-4). Besides it, a small Ust-Yansk village is also to be noted; its residents hunt in the outer part of the Yana River delta and bag 25 eiders per hunter, on average. The second region of efficient eider hunting is the Chukchi Peninsula with fairly even harvest distribution. Five settlements (Novoe Chaplino, Enmelen, Lorino, Inchoun, and Neshkan) are the most efficient ones from this point of view; most of the hunters bag 10 to 20 eiders per season. At least two more villages (Uelen and Vankarem) not surveyed in our investigation could be undoubtedly added to this list. Hunters from all over Chukotka name these villages among those with the most efficient waterfowl hunting, hunting for eiders first of all. Hunting bags in the rest of the Chukchi Peninsula villages are also fairly large (5 to 10 eiders per gun).

Average overall harvest (including all eider species) slightly exceeded 1,100 birds per village (Fig. 10-3). Harvest was largest in Northern Chukotka, where harvest averaged 1,400 eiders per village; it was slightly lower in Yakutia with an average of 1,000 eiders, and was lowest in Southern Chukotka with an average of only 200 eiders bagged in each village. Comparing eider harvest with other Anseriform species (Figs.10-2 through 10-5) revealed that

the average number of eiders harvested in a village was approximately the same as the average number of harvested ducks and noticeably exceeds the number of geese (730 birds per village) and swans (25 birds per village).

The number of harvested eider species in each village are shown in Figure 7-1 (and extrapoled numbers in Figure 7-2). Taking into consideration the distribution patterns of various eider species within the surveyed territory, predominately common eiders were harvested in Southern Chukotka, with the number other either species being negligible. In Northern Chukotka, common eider also comprised more than a half of the average harvest. The number of harvested king eiders was much smaller, and spectacled eiders and, particularly, Steller's eiders were harvested in even smaller numbers. Such distribution of the harvest of various eider species is proportional to their numbers in the wild, on average in all seasons. In Yakutia, all three species inhabit the region in equal proportion and harvested numbers were also equal. Thus, harvest of common eider species is relatively even in the surveyed regions.

Let us compare the structure of the hunting bags in the three regions. The largest percentage of eiders in the overall waterfowl hunting bag was recorded in Northern Chukotka, where it reached almost 52% (Fig. 9). In Southern Chukotka, eiders composed about one-third of the harvest, with geese predominating. In Yakutia, despite very large overall harvest, eiders composed only 28% of the harvest due to the large number of other duck species bagged by the residents of Chokurdakh and Kazachie villages.

Data on overall eider harvest in all villages surveyed within three regions are presented in Table 3.

Table 3. Overall annual eider harvest in the surveyed villages in three regions.

Species	Yakutia (6 villages and small fishermen's settlements in the Indigirka River delta)	Northern Chukotka (12 villages)	Southern Chukotka (3 villages)	Overall sample territory
Somateria mollissima	0	7,022	536	7,558
Somateria spectabilis	3,068	1,756	0	4,823
Somateria fisheri	3,397	3,379	5	6,781
Polysticta stelleri	3,538	879	18	4,435
All eider species	10,002	13,035	559	23,598

Discussion

Dependence of harvest on the number of hunters and settlement population size

Data obtained allowed us to analyze the dependence of harvest numbers on the number of efficient hunters and population size in surveyed villages (Fig. 11-1 through 11-4). In addition, dependence of average individual harvest on the total number of hunters in the village was analyzed (Fig. 11-5).

Overall number of harvested birds, number of efficient hunters, and village population size should be positively correlated. It could be assumed that in small villages with predominately indigenous populations this correlation would be more pronounced than in large district centers. Results of our investigation confirmed these assumptions. Additional analysis showed that an increase in the number of hunters in a village results in an increased number of harvested eiders (Fig. 11-6).

If the area of the hunting lands is restricted, the average individual hunting bag and the overall number of hunters in the village should be negatively correlated because of the inevitable competition among the hunters. Such dependence actually exists (Fig 11-5) but is very weak. The lack of pronounced negative correlation means that there is no strong competition for the hunting lands around indigenous settlements.

Territorial distribution of hunting pressure

Within the surveyed territory, three areas with high hunting pressure could be distinguished. They are the Indigirka and Yana river deltas in Yakutia and the Chukchi Peninsula in the north-eastern part of the Chukchi Autonomous Area. Within the Chukchi Peninsula, the hunting is the most extensive in Neshkan lagoons (Neshkan village), Mechigmenskaya Bay (Lorino and Lavrentia), close to Enmelen, and in the vicinities of Inchoun and Uelen. The latter place was revealed during the course of extra investigations and was not reflected in the results of the main survey, because Uelen was omitted from the sample and interviewing in Inchoun was not very effective.

In the future, particular attention should be paid to the places mentioned above to monitor hunting pressure and develop measures aimed at mitigating intense pressure.

Factors that affect village harvest level

Why does eider harvest differ in various villages?

According to our assessment, the following factors affect harvest level:

1) Village location in relation to the eiders' migration routes, as well as their key breeding grounds and places where non-breeding and molting birds aggregate;
2) Length of time spent by large numbers of birds near a village;
3) Presence or absence of alternative game;
4) The number of indigenous hunters in the village;
5) Distance from a village and availability of roads to places regularly visited by hunters (reindeer herdsmen, sealers, etc.);
6) Strictness of enforcement of hunting regulations, including control of illegal arms;
7) General social and economic situation in a village and a region as a whole, in particular availability of ammunition, fuel, and transport means.

Let us consider the impact of each factor mentioned above.

Village Location

Village location seems to be one of the most important factors. Large numbers of birds are necessary for efficient hunting. This would explain why a number of villages located close to the coast but distant from major flyways and extensive breeding wetlands (e.g., Alkatvaam, Yanrakynnot, Lavrentia, Yanranay, etc.) do not have high harvest levels, even though very promising hunting lands could be found no farther than 30 to 50 km away.

Even if a village is situated close to breeding grounds and areas where birds seasonally aggregate, the distance from the village to these hunting areas is important. Our observations indicate that a distance of a few kilometers could be critical. Hunting is most efficient if the birds' migration route passes over the village, as happens in Neshkan, Inchoun, many settlements in the Indigirka River delta, and Ust-Yansk (as well as Uelen and Vankarem, which were not surveyed). The situation is also favorable for hunters in Lorino, where an intensively used migration route passes over the spit south of the village; the spit is accessible on foot, by motorbike, and sledge. Similar situations occur in many villages in the deltas of large rivers in Yakutia, where almost every family has a the motorboat. Distances up to 10 km are critical, because this distance can be covered on foot if roads are absent. Most hunters, as common village residents, have no cross-country vehicles and various village activities restrict their time spent on hunting. Extended hunting expeditions (several days) are available to a limited number of hunters; efficient harvest by many hunters near a village considerably increases the number of bagged birds (including eiders for villages situated close to the seacoast).

Length of time birds are available to hunters

The longer game reside close to settlements, the potential for more harvest increases (hunters have more opportunities to conduct hunting trips), particularly if enforcement of hunting regulations is poor. Among the villages surveyed, harvest was relatively large in such locations, particularly where birds can be found for most of the warm season, such as:

a) villages where bird migration routes passed by them not only in spring and autumn, but also in summer when many birds migrate to their molting grounds (in Lorino, Neshkan, and many villages along northern coast of Chukotka eiders and geese migrate over them during June and July);

b) villages located close to the coast where large numbers of eiders aggregate in summer and autumn (Novoe Chaplino, Sireniki, Enmelen, Uelkal, Uelen, etc.); eiders can be harvested there from their first arrival in April until departure in November;

c) villages in the deltas of Yakutia, where waterfowl breed and migrate from one place to another near villages during the entire breeding and migration seasons.

Alternative game

Hunters harvesting birds for food are known to prefer relatively large game. In areas with high goose numbers (e.g., tundra of Kanin Peninsula, Kolguev Island, and Taimyr) hunters usually pay little attention to ducks and eiders. Eiders are desirable in many regions of the Chukchi Peninsula, particularly along its mountainous seacoasts where many villages are populated by sealers and geese numbers are low. Northern Yakutia is a noteworthy example. The residents of Russkoe Ustie, Chokurdakh, and Ust-Yansk reported in 1996–1999 that they switched to hunting eiders because of a dramatic decline in goose numbers connected with a general population depression in East Asia (Syroechkovskiy, 2006 a). Spring goose hunting

became expensive, time-consuming, and disappointing, which forced many hunters to switch over to eiders.

The number of indigenous hunters in a village

As we have mentioned above, most of the non-resident (visiting) hunters do not hunt for eiders because of the specific taste of their meat. That is why in large villages, such as Pevek, Anadyr, Egvekinot, Providenia, and some others, eiders are harvested in small amounts despite the great number of hunters. In villages with predominately indigenous residents, large numbers of eiders are harvested.

A comparison of the coastal villages of Southern Chukotka and Chukchi Peninsula provides a vivid example of this phenomenon. In both regions, the villages are located on the seacoast in areas with fairly extensive migrations by various eider species and large numbers of breeding common eiders. In Southern Chukotka, the number of non-resident hunters that consider eiders undesirable is larger, and sealing is poorly developed. As a result, the number of eiders harvested there by active hunters is considerably lower.

Distance from villages to hunting locations

Bird harvest is larger in villages where hunting is an activity conducted concurrently with day-to-day activities. If residents can obtain their basic needs and conduct activities within a few kilometers from their village, then birds are harvested in small numbers. This is true for Meinypilgyno and Khatyrka where fishing is done close to the villages, as well as for Yanranay and Alkatvaam where basic economic activities are restricted to the villages themselves. In areas of extensive sealing (in most of the villages of Northern Chukotka) and commercial fishing (villages of the Northern Yakutia), hunters spend a lot of time in natural eider habitats in the sea and river channels and thus harvest more eiders.

Although reindeer herdsmen stay on the tundra permanently, they harvest birds in relatively small numbers because they have little time for hunting, few of them have smooth-bore guns, and they seldom carry guns with them. They spend most of their time in the watershed tundra with relatively poor bird populations and virtually no eiders.

Construction of new roads provides additional possibilities. Near Anadyr and Egvekinot, hunters have an opportunity to use roads to reach formerly inaccessible areas; those who pass along the roads regularly can hunt in conjunction with the other activities. However, the roads are not as important for eider hunting because most of them pass far from optimal eider habitats.

Enforcement of hunting regulations

Enforcement is an important factor affecting eider harvest. In most villages of Northern Chukotka such control is extremely poor. Birds are harvested near villages in any season, which undoubtedly provides for increased harvest. In the Chaun district of Chukotka enforcement is stricter, and harvest is lower. As a rule, enforcement of hunting regulations is relatively strict in the immediate vicinity of large villages and district centers (Anadyr, Pevek, Chokurdakh, etc.). However, this probably does not affect eider hunting, because most of the birds are harvested along remote seacoasts.

The number of illegal (not registered by legal bodies) guns is another important factor. This is particularly crucial in Chukotka because in Yakutia the process of gun registration is not complicated and most guns and rifles are kept legally. In Chukotka, registration of guns is complicated, time-consuming, and can be accomplished only in the district centers. As a result,

in many Northern Chukotka villages up to 90 % of guns are illegal or have out-of-date licenses. Shortly before our survey, policemen visited Rytkuchi village and confiscated almost all sport guns. Opportunities for hunting then became very limited; this could possibly explain the very small harvest recorded in this village, which is located on the Chauna lowland rich in waterfowl.

Almost everywhere in both Chukotka and Yakutia, control over legality of arms and hunting has been tending to get stricter in recent years; this factor could become more important for restriction of eider hunting in the future.

General social and economic situation

Adverse economic situations in Chukotka and Yakutia in the late 1990s favored a reduction in hunting pressure on birds due to the following reasons:

1. Human population declined in these regions. For example, almost all non-residents of Neshkan (about 30% of the population), many of which were active hunters, have left the village.

2. Access to hunting lands was hampered because of the difficulties with purchasing, maintaining, and repairing transport means, as well as the lack of fuel and/or increased fuel prices.

3. Ammunition was unavailable in villages and its transportation from the district centres was expensive and complicated. Sometimes hunters even took apart old automobile batteries to get lead from them to manufacture homemade pellets.

Due to a concentration of hunters near villages, local harvest of birds increased. However, according to opinions of almost all interviewed persons, in the 1990s overall hunting pressure was considerably lower than in the 1980s.

More recently, in 2000s, the population numbers in the North have stabilized and are growing in some places. Transport means, fuel, and ammunition have become more available. Birds are harvested in larger numbers, particularly in better supplied villages, such as Lavrentia and Lorino on Chukchi Peninsula, Chokurdakh and Russkoe Ustie in Indigirka River delta, in the vicinities of Anadyr, Pevek, and Egvenkinot, etc.

Eider harvest is most efficient in the following settlements:

1. villages situated no farther than 10 km from the seacoast in areas where large numbers of eiders migrate and where they concentrate on the sea;
2. villages located along river channels of big deltas in areas with large numbers of breeding eiders;
3. villages with predominately indigenous residents that are actively engaged in extensive marine mammal hunting (Chuktoka);
4. villages with increasing standard of living and poor enforcement of hunting regulations.

Conclusions and Recommendations

The number of eiders harvested in a village depends first of all on its location relative to eider migration routes and places they aggregate. As a result, data obtained for certain villages can not be extrapolated to others, considering such formal parameters as population size, the number and social status of hunters, etc. Reliable quantitative estimates can only be obtained in cases where every village is surveyed. That is why it is important that all villages located along flyways and near key wetlands should be the first priority for surveying, as most migrating birds are harvested in these locations. For a rough estimate, a complete list of settlements of all northern regions could be compiled. The regions could then be grouped according to their location relative to eider flyways, breeding grounds, and molting sites. However, in this example it would be difficult to predict harvest levels without visiting the villages and interviewing hunters, because a distance of 10 to 20 km could be critical for successful hunting. For example, in Yanranay village, in the Chaunskiy district, very few birds are harvested, because the flyway passes about 30 km to the north and hunters are not able to visit those places because of the lack of transport.

Evaluation of total eider harvest in Eastern Russia

Our survey had shown that hunting pressure on eider populations is serious, with 23.5 thousand eiders shot annually in 22 villages (over 1000 eiders per village). Threatened spectacled and Steller's eiders compose nearly half (48%) of this harvest. As there are at least 35 more settlements with existing potential serious eider harvest within the range of all four species within four regions of Russian Federation (Taimyr, Yakutia, Chukotka and Kamchatka) total estimation is not easy. Additional surveys are clearly needed. Taking into account our knowledge of species distribution and harvest activities we could preliminarily estimate the total harvest level for North-East Russia:

1) for Steller's eider it would be about three times more than our survey numbers, for a total of about 13,000 + birds shot annually;
2) for spectacled eider it would be about two times higher or a bit less, for a total estimate of 10-14,000 birds shot every year;
3) for king eider it would be about four times higher for a total estimate of 15-20.000 birds; and
4) for common eider it would be about two times higher or a bit less, for a total estimate of 12-15,000 birds harvested.

These figures should be viewed cautiously as they may be seriously underestimated. These are the first preliminary estimates of harvest made for regions of north-east Russia that hunt eiders.

Estimation of total eider harvest for the Beringia area that covers the whole migratory population range would only be possible with availability of recent eider harvest data from Alaska, which were not available for us during our analysis.

Year-to year differences in harvest can influence the results of these evaluations, especially for species with a nomadic breeding strategy, such as Steller's eider.

An evaluation of harvest influence on population structure should be made considering serious disproportionate harvest of birds of different sex. More harvest of males could play a serious negative role on population status.

Recommendations for hunting regulation and eider conservation

Any noticeable reduction of hunting pressure on birds within the surveyed territory in the future is doubtful. We predict the pressure could even increase with stabilization of the Russian economy and increased wealth of residents. Indigenous village residents have a right to traditional subsistence hunting that can be restricted only to certain extent. Taking this fact into consideration, an optimal solution would be to create conditions to transfer hunting pressure from protected species (spectacled eider, Steller's eider) and species declining in numbers (some populations of common eider) to species with safer status. It is a complex but manageable task, which has been demonstrated by the experience of taking similar measures in the Yukon Delta, Alaska (Wentworth &Wong, 2001). Principal complexities seem to be:

a) low flexibility of the efficient Russian legislation in the sphere of hunting regulation;

b) necessity for development and implementation of a long-term educational program for the local people; and

c) necessity for flexible activities by the local enforcement agencies.

The harvest surveys have demonstrated that the overwhelming majority of hunters are unaware of the conservation status of bird species. Professional experience of many game inspectors is also insufficient. Some forms of activities, such as egg collecting, should be restricted. Coordinated activities of governmental bodies, game management agencies, scientific advisers, NGOs, and local people are required for proposed measures to be efficient.

Recommendations for potential project follow up

If more precise estimation of eider and other waterfowl harvest is needed for North-East Asia the survey should be continued with the following goals:

1) Continue to survey representative villages in all regions and expand the survey to cover most of the western range of eiders in easternmost Taimyr and West Yakutia (important for Steller's eider harvest as shown by American band recoveries), as well as the southern part of the range in Kamchatka, where eiders are shot during migration and wintering periods.
2) Develop and apply a methodology that could help extrapolate subsistence hunting survey results in selected villages to the larger regions.
3) Establish a regular survey in selected villages to learn about year-to-year harvest differences in key eider hunting areas and obtain coefficients for more precise extrapolations.
4) Combine Alaska and Russia waterfowl population and harvest data to calculate a total estimate of population sizes, trends, and harvest data for the Beringia area to inform recommendations for species conservation measures.
5) Appropriate measures should be taken by local administrations and responsible state agencies in the region to make ensure hunting pressure on threatened eider species is decreasing and that following hunting regulations result in positive trends.

References

Byers, T., and D. L. Dickson. 2001. Spring migration and subsistence hunting of King and Common Eiders at Holman, Northwest Territories, 1996-98. Arctic. Vol. 54, No. 2, pp. 122-134.

Copp J.D. 1985. Critique and analyses of Eskimo waterfowl hunter surveys conducted by the U.S.Fish and Wildlife Service on the Yukon-Kuskokwin delta. 1980-84. Oregon State Univeristy, Corvallis: 1-65.

Dobrenkov V. I., A. I. Kravchenko 2004. Methods of sociological studies. Textbook. M., INFRA-M: 1-768.

Flint, P.L., M.R. Petersen, and J.B. Grand. 1997. Exposure of spectacled eiders and other diving ducks to lead in western Alaska. Can. J. Zool. 75:439-443.

Frederickson, L.H. 2001. Steller's eider (*Polysticta stelleri*). *In* The Birds of North America, No. 571 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Gusakov, E. S. 2002. Statistical characteristics of hunting and control of waterfowl hunting bag in Western Siberia. Problems of rational use of the waterfowl birds in Russia. Modern Hunt science issues. M., pp. 263-275 (in Russian).

Klein D.R. 1966. Waterfowl in the economy of the Eskimos of the Yukon-Kuskokwin delta, Alaska. Arctic 19 (4): 319-336.

Klokov K. B., D. N. Shustrov. Traditional reindeer-breeding and hunting in Taimyr. Edited by E. E. Syroechkovskiy. Publication Russian Agricultural Academy of Science, Moscow: 1-123

Klokov K. B., E. E. Syroechkovski, Jr. Traditional ecological knowledge of the native people of the eastern Chukotka about waterfowl. // Studying and conservation of Anseriforms in Eastern Europe and North Asia. Abstracts. Publication of Goose and Swan Study Group of Eastern Europe and North Asia and MSU, Moscow, 2001. Pp. 63-64.

Lovvorn, J.R., S.E. Richman, J.M. Grebmeier, and L.W. Cooper. 2003. Diet and body condition of spectacled eiders wintering in pack ice of the Bering Sea. Polar Biol. 26:259-267.

Molotchaev A.V. 2002. Problems of rational use of the waterfowl birds in Russia. Modern Hunt science issues. M., pp. 263-275. (in Russian).

Petersen, M.R., D.C. Douglas, and D.M. Mulcahy. 1995. Use of implanted satellite transmitters to locate spectacled eiders at-sea). Condor 97:276-278.

Petersen, M.R., J.B. Grand, and C.P. Dau. 2000. Spectacled Eider (*Somateria fischeri*). *In* The Birds of North America, No. 547 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Petersen, M.R., W.W. Larned, and D. C. Douglas. 1999. At-sea distributions of spectacled eiders (*Somateria fischeri*): a 120 year-old mystery resolved. Auk 116:1009-1020.

Stehn, R.A., C.P. Dau, B.Conant, and W.I. Butler, Jr. 1993. Decline of spectacled eiders nesting in western Alaska. Arctic 46: 264-277.

Syroechkovskiy, Jr., E.E. 1997. Species, status and population distribution of Russian Arctic Geese. - Giber Faune Sauvage (Game and Wildlife), Vol.13: 381-396

Syroechkovski, Jr. E.E. 2006 a. Long-term declines in Arctic goose populations in eastern Asia. Waterbirds around the World. Eds. G.C.Boere, C.A.Galbraith & D.A.Stroud. The Stationery Office, Edinburgh, UK: 629-642.

Syroechkovskiy, Jr. E.E.. 2006 b. The impact of indigenous people subsistence hunting on Russian Arctic duck populations. Abstracts of First Pan-European Duck Symposium, Kalo, Denmark: 78-79

Syroechkovskiy, Jr. E. E., Jr. K. B. Klokov. 2001. Usage of traditional ecological knowledge of northern peoples in ornithological studies. Bird study and conservation in Eastern Europe and North Asia. Abstracts persented to the International conference (XI Ornithological Conference). Kazan: 581-583.

Syroechkovski, Jr. E., and K. Klokov. 2003 a. Waterfowl subsistence harvest survey in Chukotka, 2003. Unpublished report of the Goose, Swan and Duck Study Group. Moscow. 27 pp.

Syroechkovski, Jr. E.E., K.B.Klokov. 2003 b. The Effect of Hunting by Indigenous Peoples of the North on Waterfowl: Methodological Approaches. Management and Conservation of Waterfowl Populations in Northern Eurasia. International Symposium Abstracts, 23-28 April 2003, Olonets, Karelia, Russia. Petrozavodsk: 236-237.

Syroechkovskiy, Jr. E., and K. Klokov. 2004. Waterfowl subsistence harvest survey in Chukotka, 2004. Unpublished report of the Goose, Swan and Duck Study Group. Moscow. 36 pp.

Syroechkovskiy, Jr. E., K. Klokov, E. Lappo. 2003 a. Waterfowl subsistence hunting in Lower Indigirka with special focus on Eider harvest. Results of the year 1999. Unpublished report of the Goose, Swan and Duck Study Group. Moscow: 1-19

Syroechkovskiy, Jr. E., V. Buzun, E. Lappo, and K. Klokov. 2003 b. Steller's Eider in Chukotka: results of distribution and subsistence hunting surveys in 2002. Unpublished report of the Goose, Swan and Duck Study Group. Moscow: 1-29

Usher, P.J., D. Delancey, G. Wenzel, M. Smith, and P. White. 1985. An evaluation of Native harvest survey methodologies in northern Canada. Ottawa: Environmental Studies Revolving Funds. Report No. 004. xi + 249 pp.

Usher P.J., and G. Wenzel. 1987. Native Harvest surveys and statistics: a critique of their construction and use. Arctic. Vol. 40, No. 2, pp. 145-160.

Usher, P.J., Duhaime G., Searles E. 2003. The Household as an Economic Unit in Artic Aboriginal Communities, and its Measurement by Means of a Comprehensive Survey // Social Indicators Research. V. 61. Pp. 175-202.

Webb D.D. 1999. Subsistence waterfowl harvest survey Galena, Huslia, Nulato, Koyukuk, Kaltag, Hughes, Ruby, 1998. US FWS. Progress Report FY99-02: 1-34.

Wentworth C. 1998. Subsistence waterfowl harvest survey Yukon-Kuskokwin delta. Comprhensive report 1987-97. US FWS & Yukon Delta NWR unpublished report: 1-148.

Wentworth, C. and D. Wong, 2001. Subsistence waterfowl harvest survey, Yukon-Kuskokwim Delta 1995-1999. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AlaskaЖ 1 -125.

Zenzinov V.M. 1987. Russkoe Ust'e (dairy of 1911-12). Moscow. 1-112.

Figure 1.1.

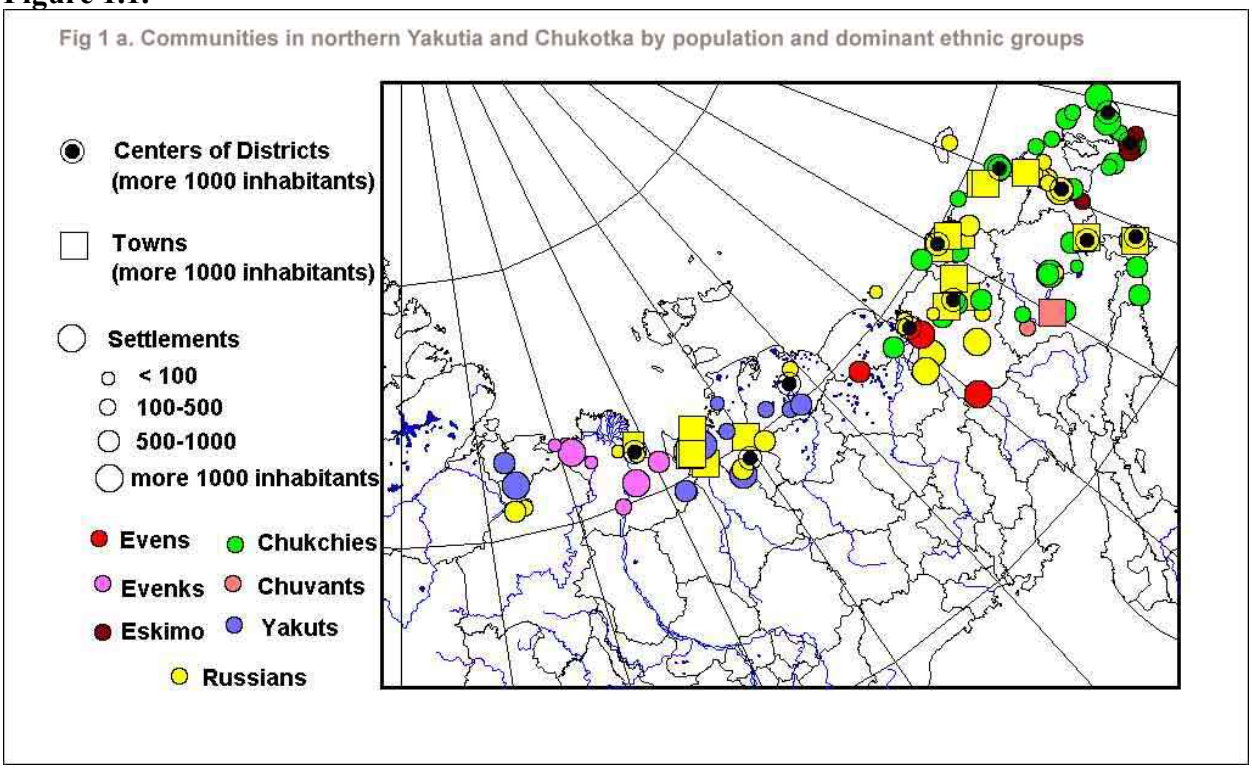
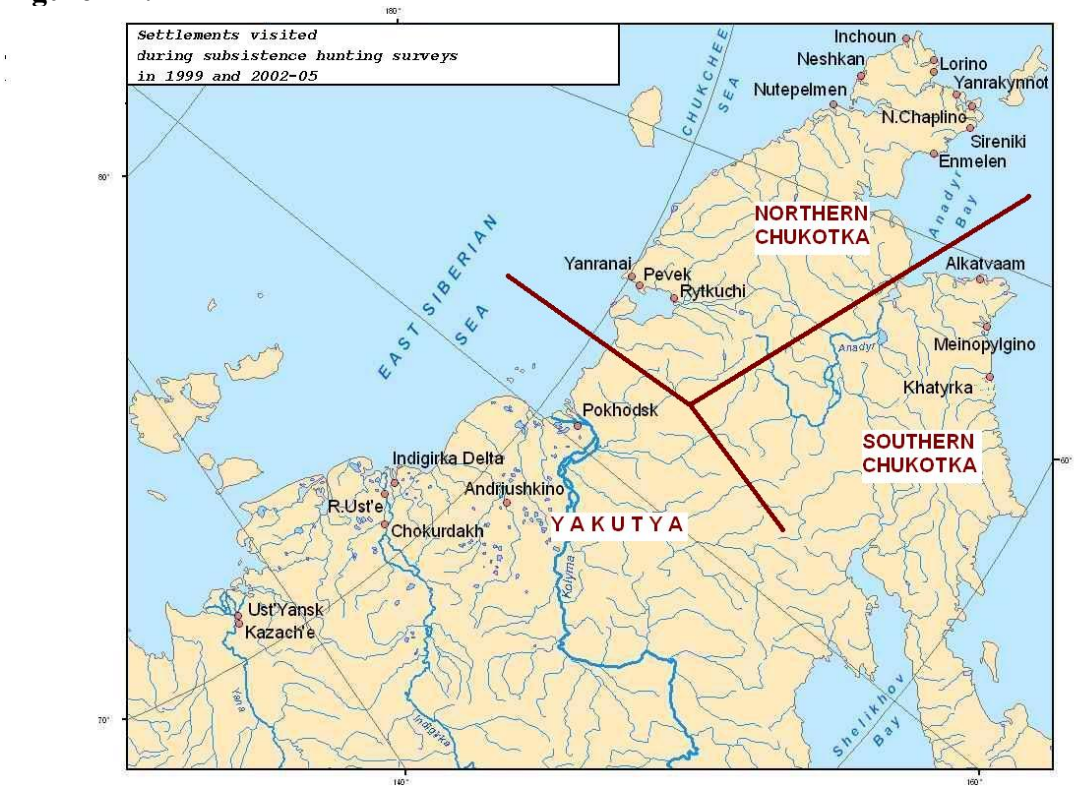


Figure 1-2.



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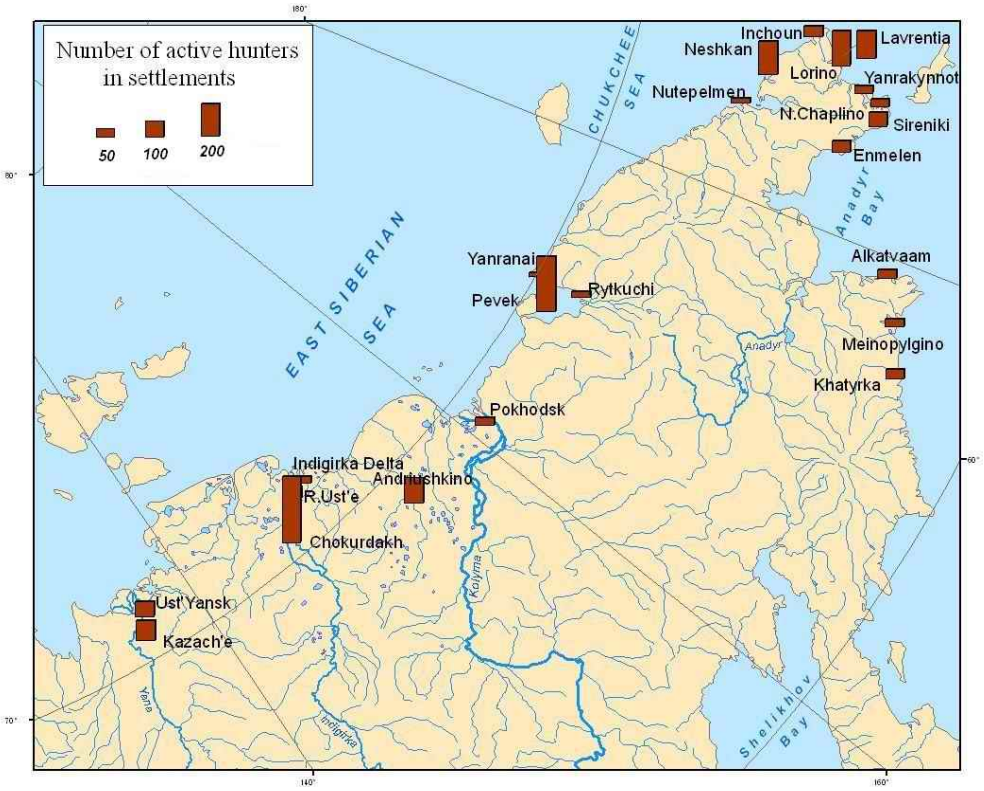

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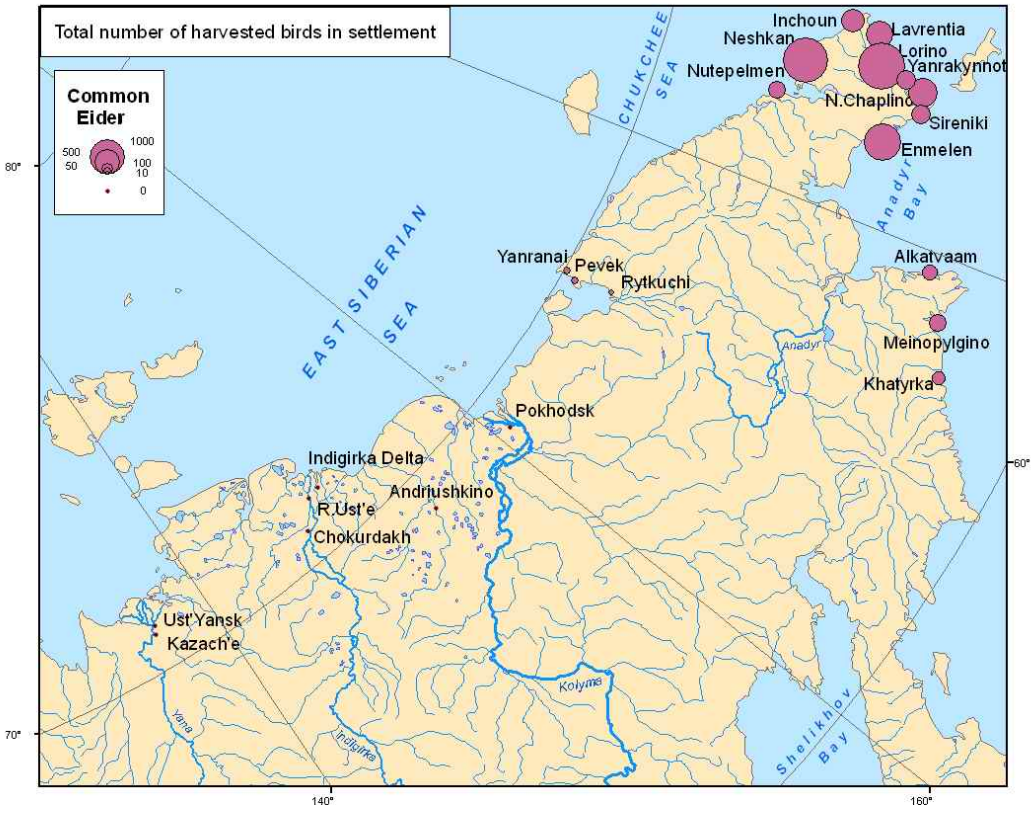


Figure 3-2.

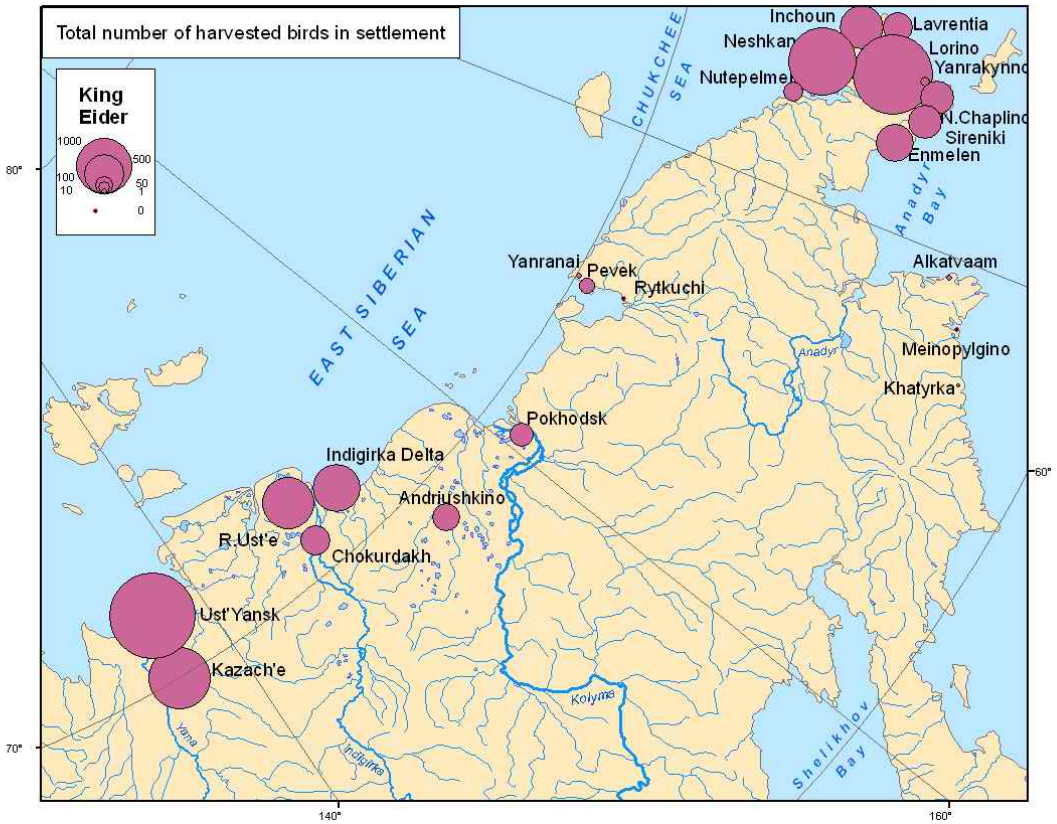


Figure 3-3.

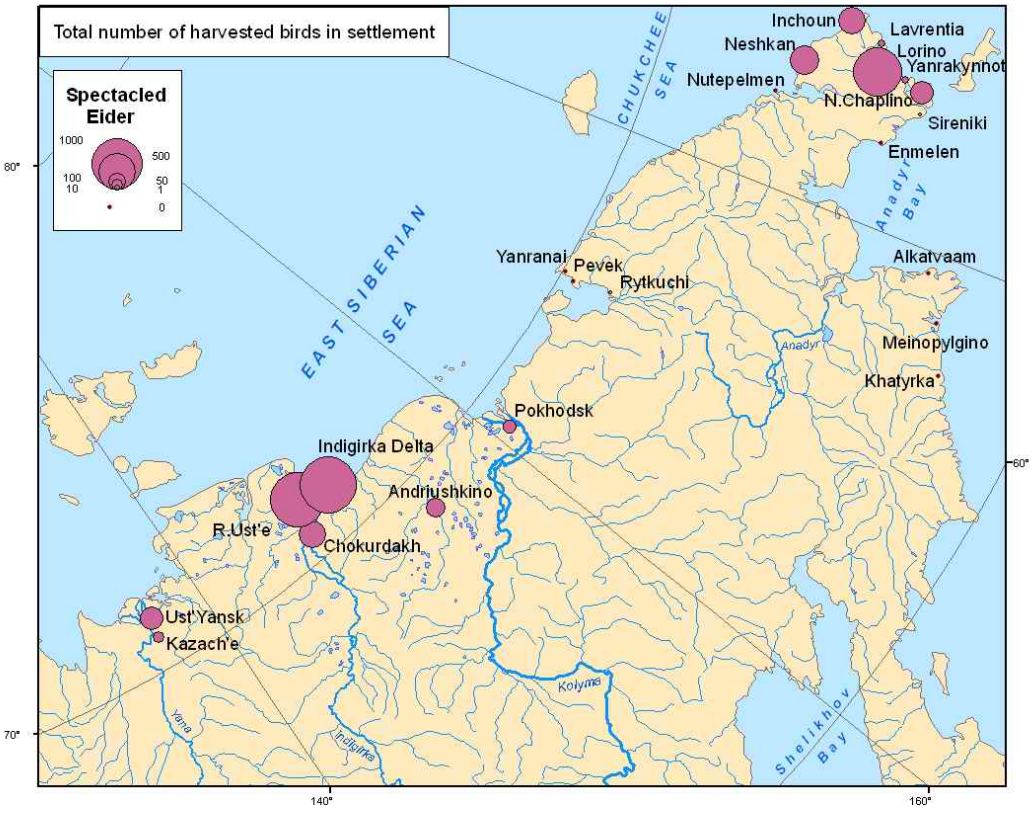


Figure 3-4.

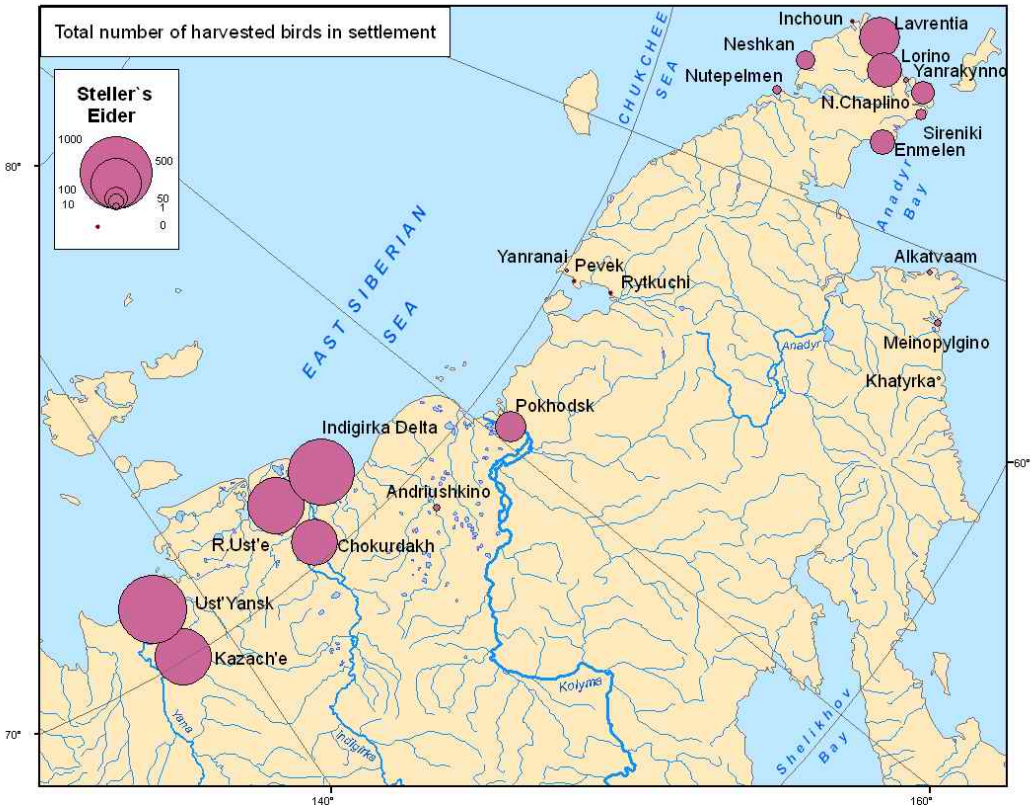


Figure 3-5.

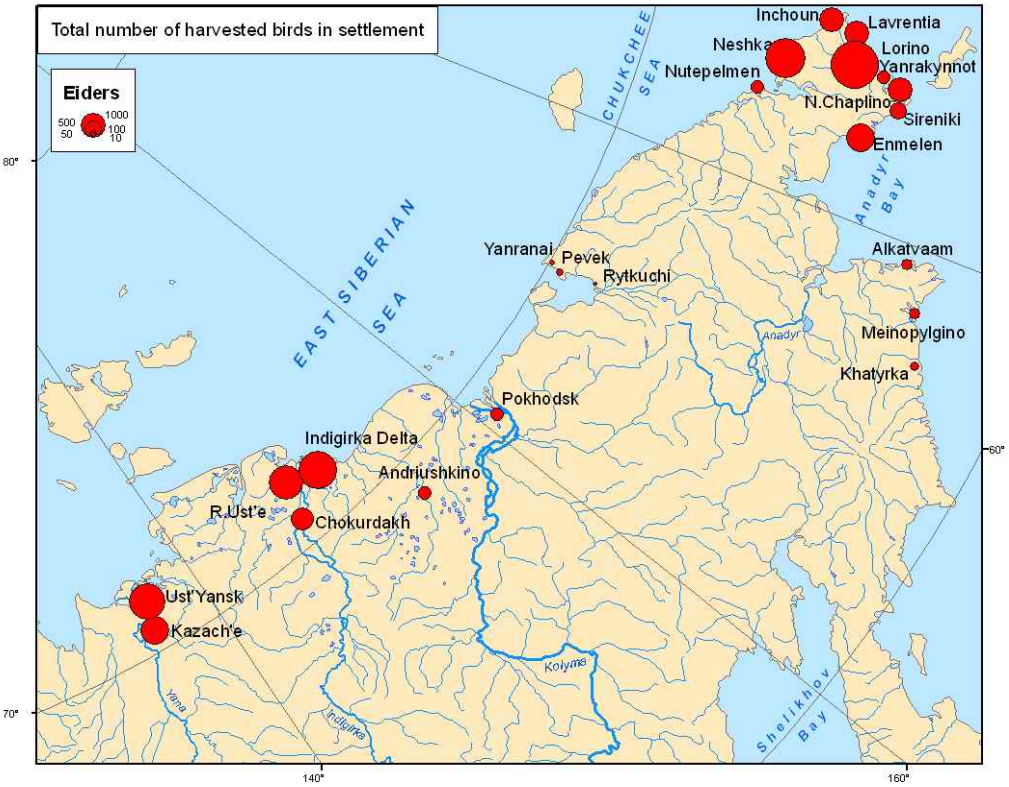


Figure 4-1.

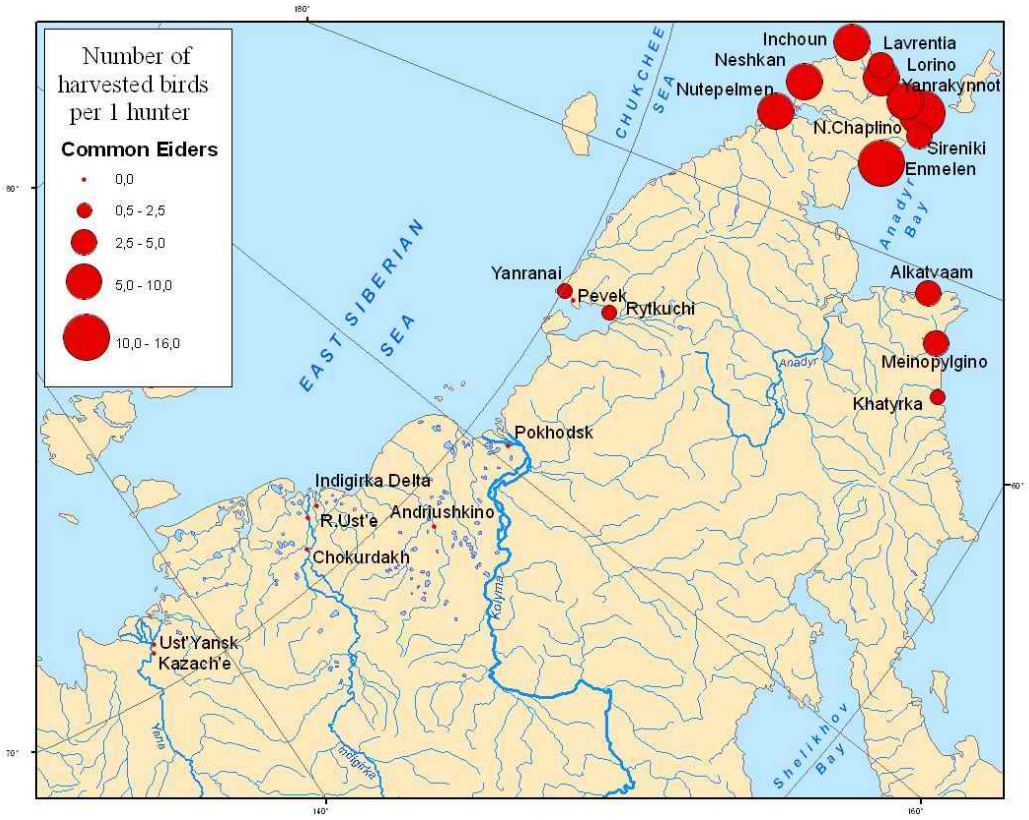


Figure 4-2.

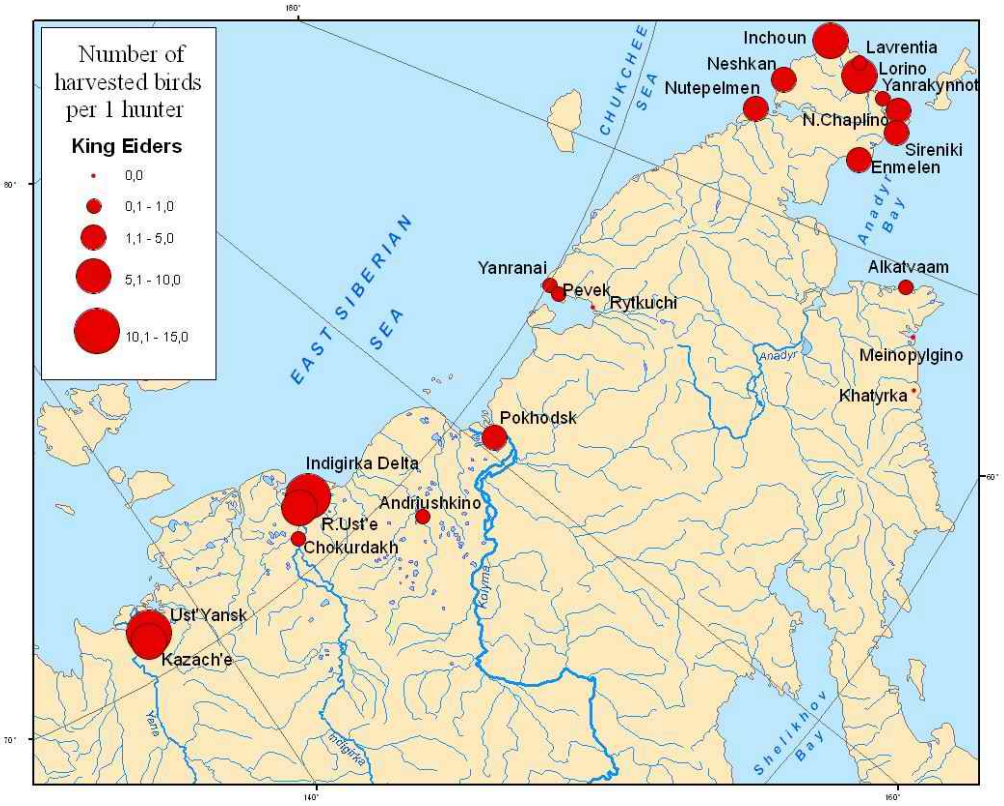


Figure 4-3.

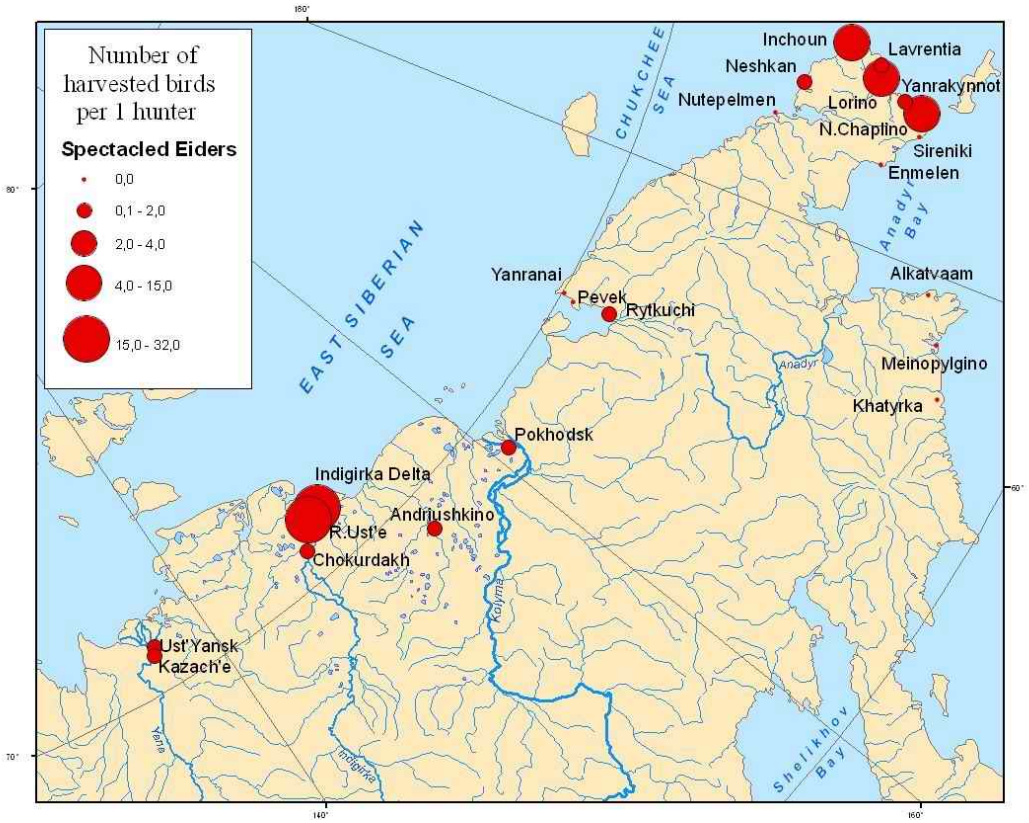


Figure 4-4.

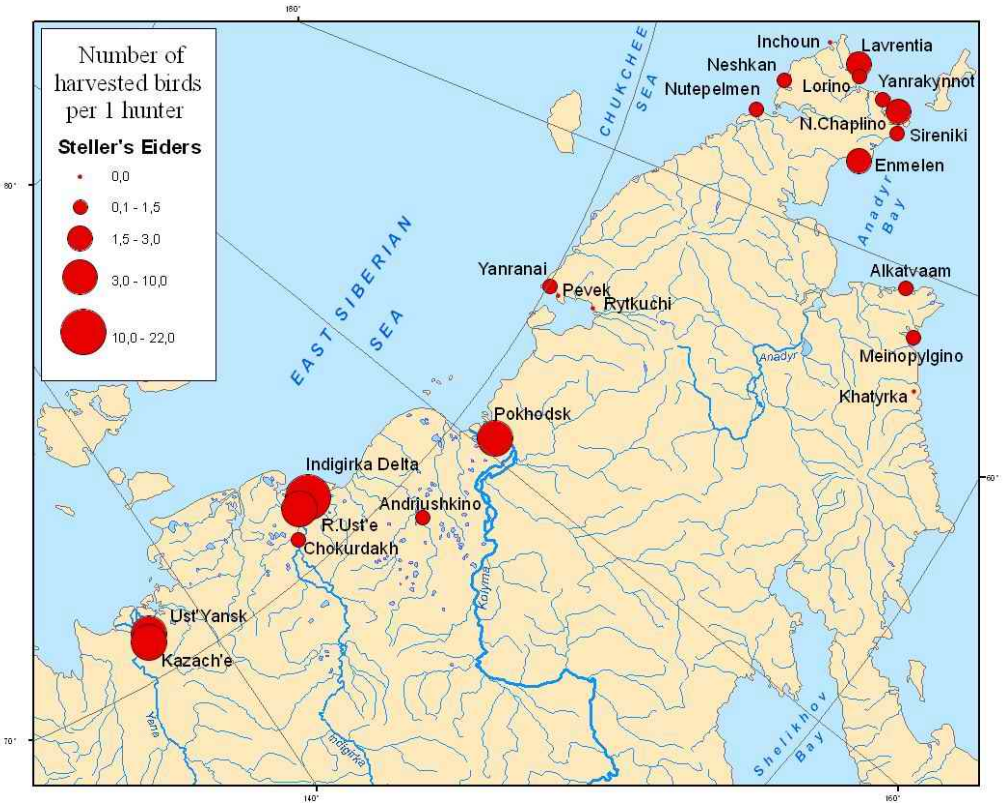


Figure 4-5.

Figure 4-6.

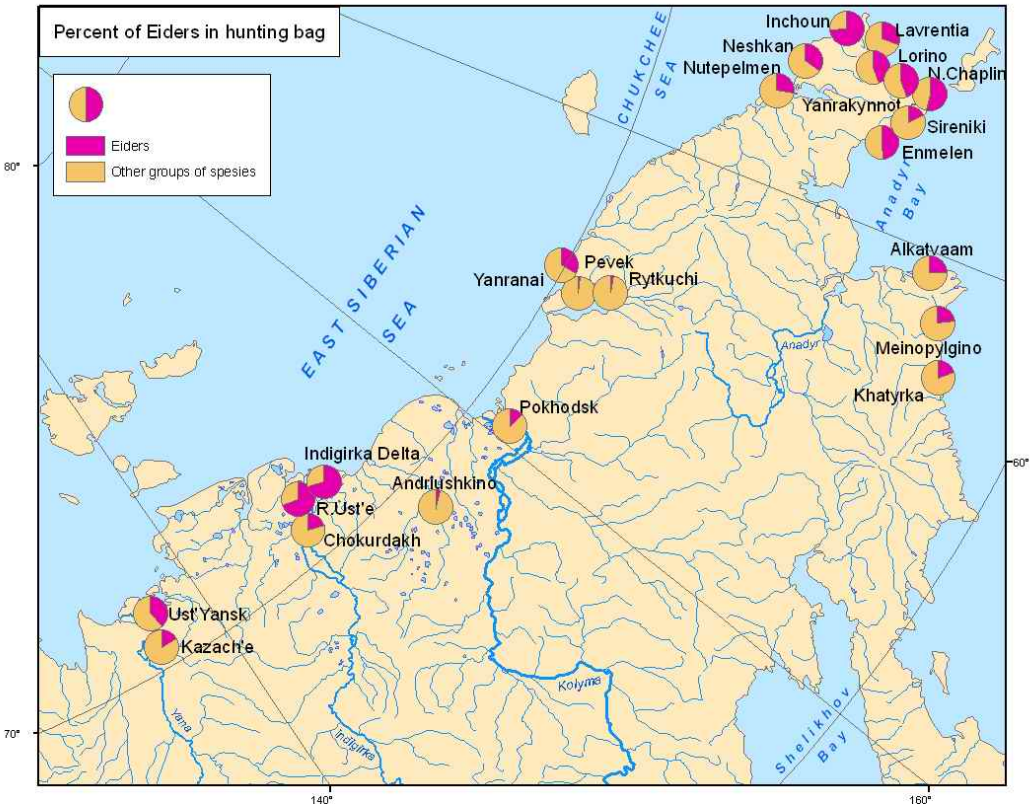


Figure 4-7. Comparative distribution of total eider hunting bag for settlement and harvested by one hunter in the same place.

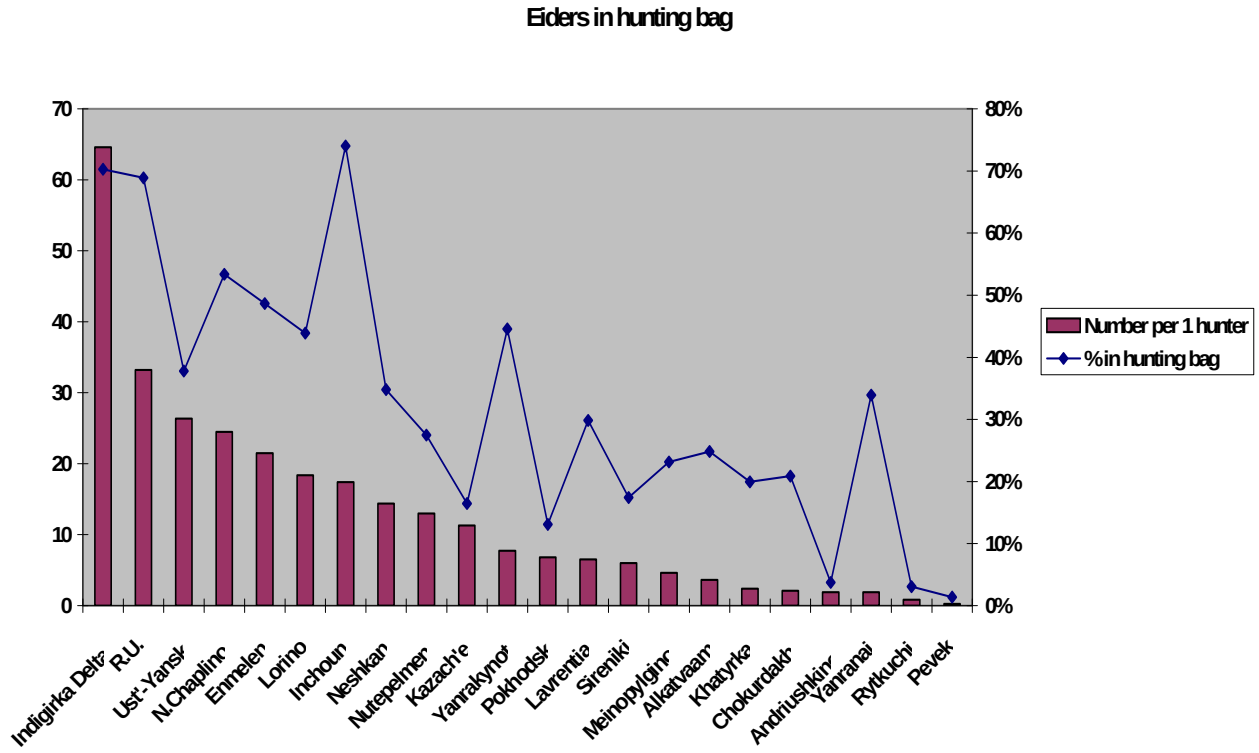


Figure 5-1. Common Eider harvest in different settlements of different regions.

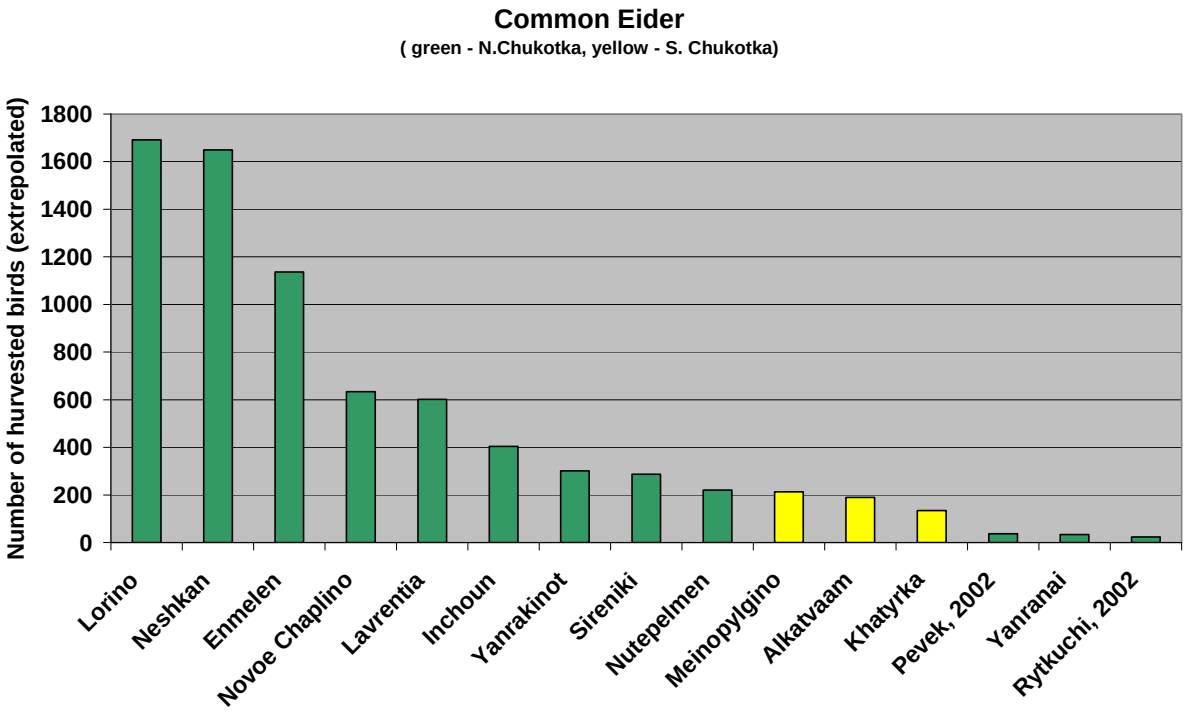


Figure 5-2. King Eider harvest in different settlements of different regions.

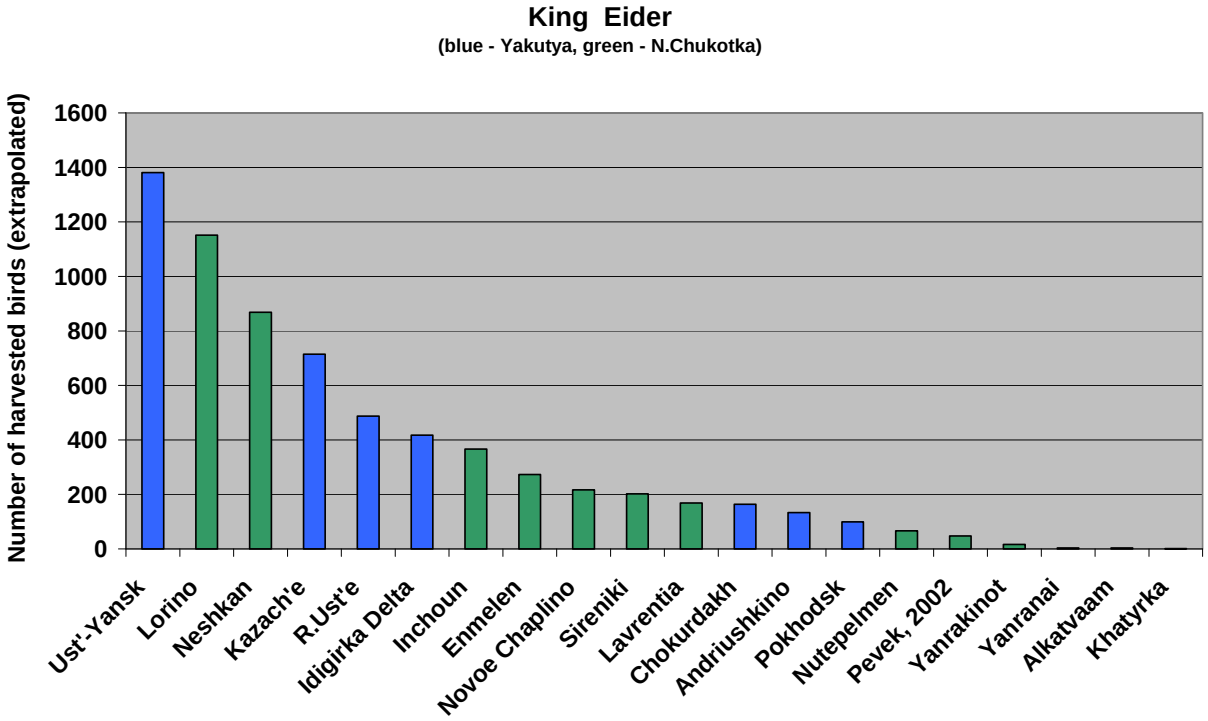


Figure 5-3. Spectacled Eider harvest in different settlements of different regions.

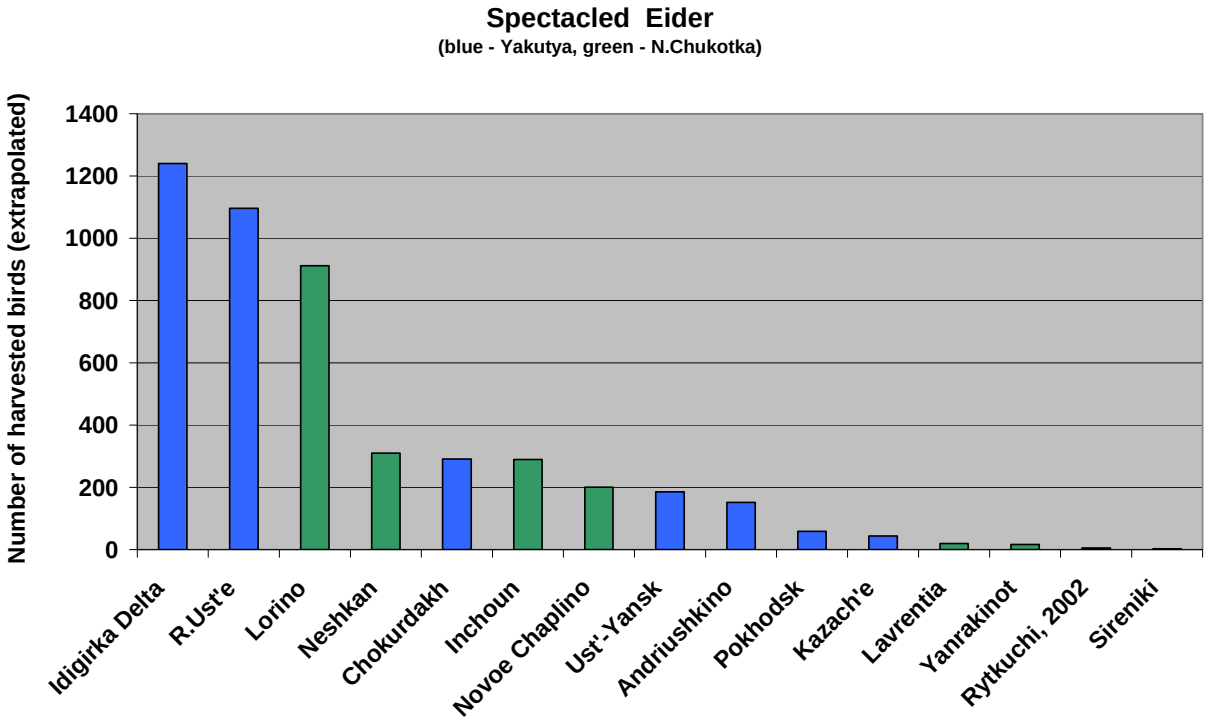


Figure 5-4. Steller's Eider harvest in different settlements of different regions.

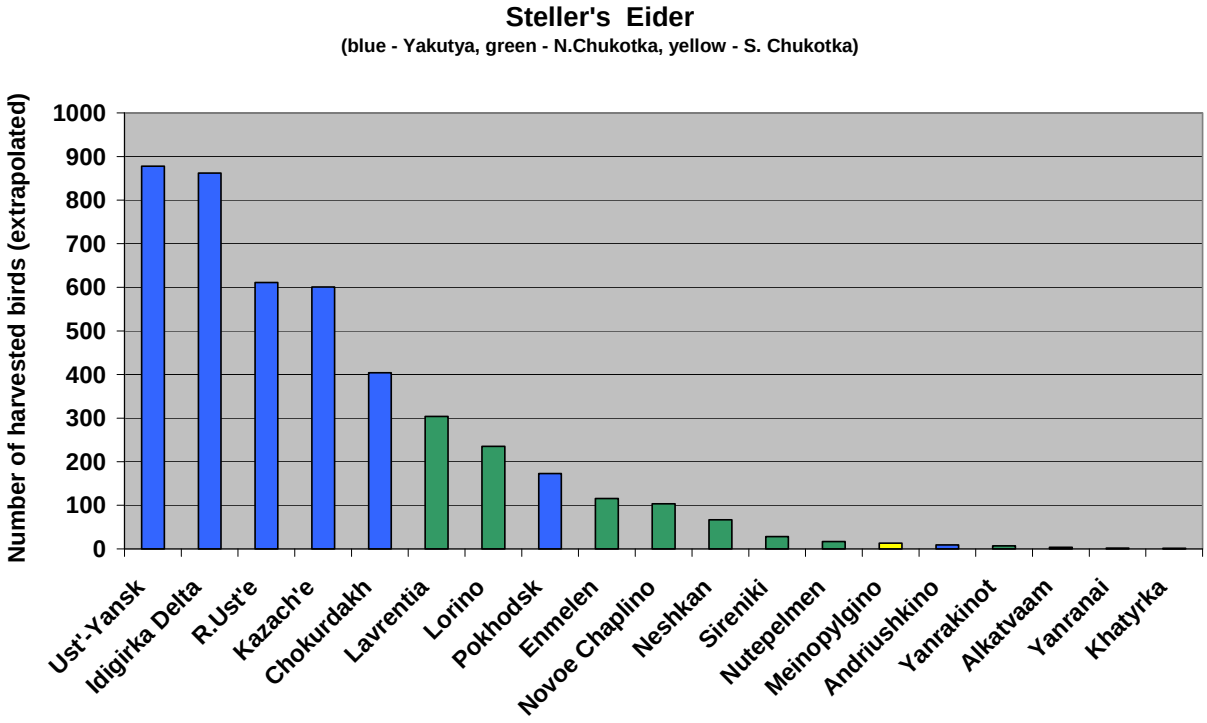


Figure 6-1.

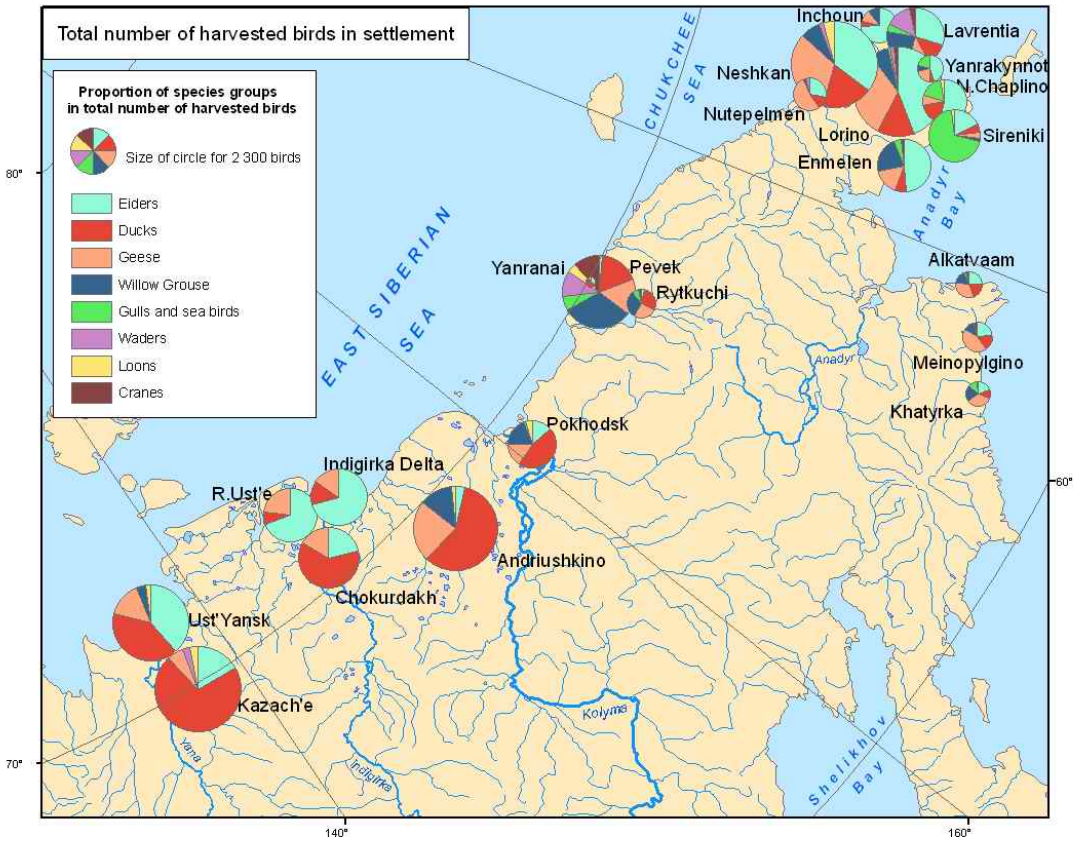


Figure 6-2.

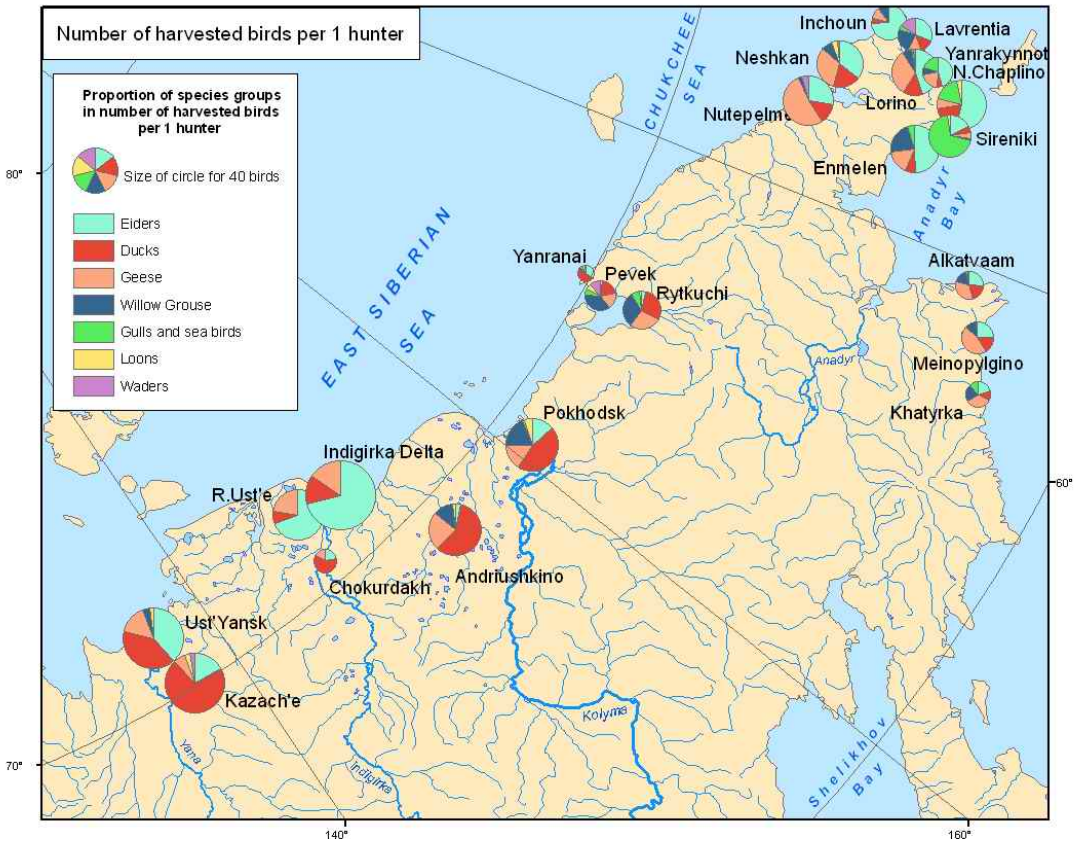


Figure 6-3. Total numbers of all groups of birds harvested in each settlement.

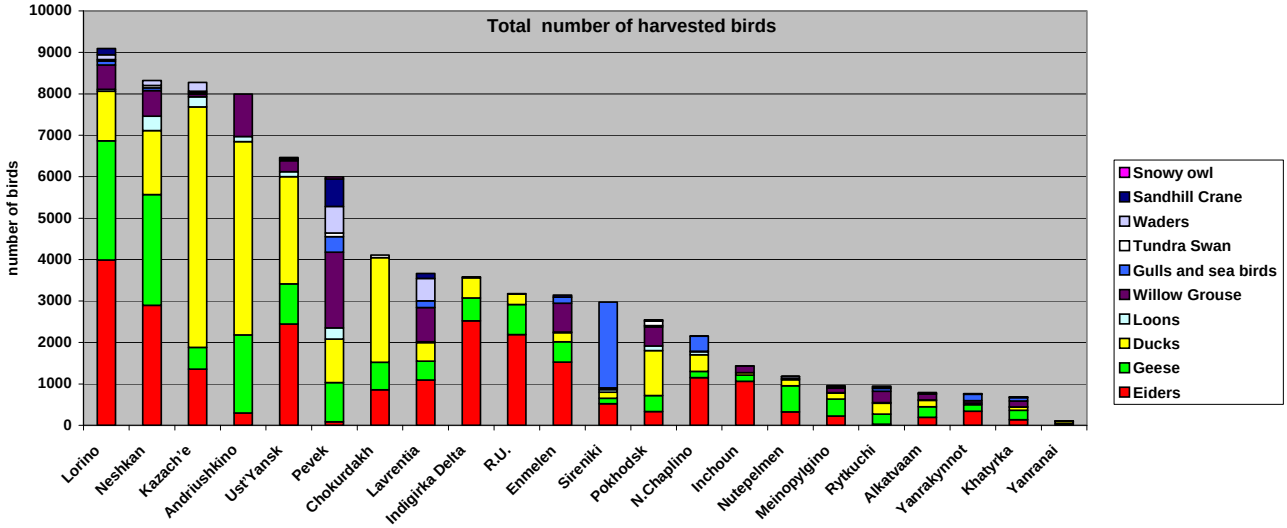


Figure 6-4. Average hunting bag of 1 hunter in settlements. All groups of birds.

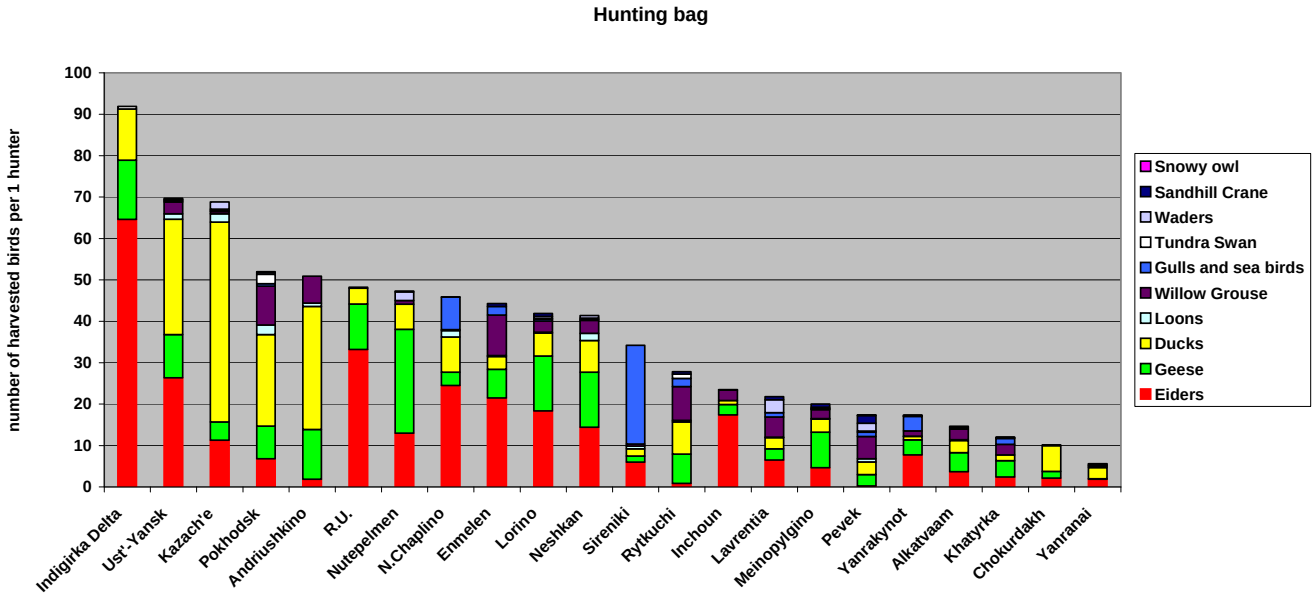


Figure 6-5. Structure of hunting bag (in %) in settlements. All groups of birds.

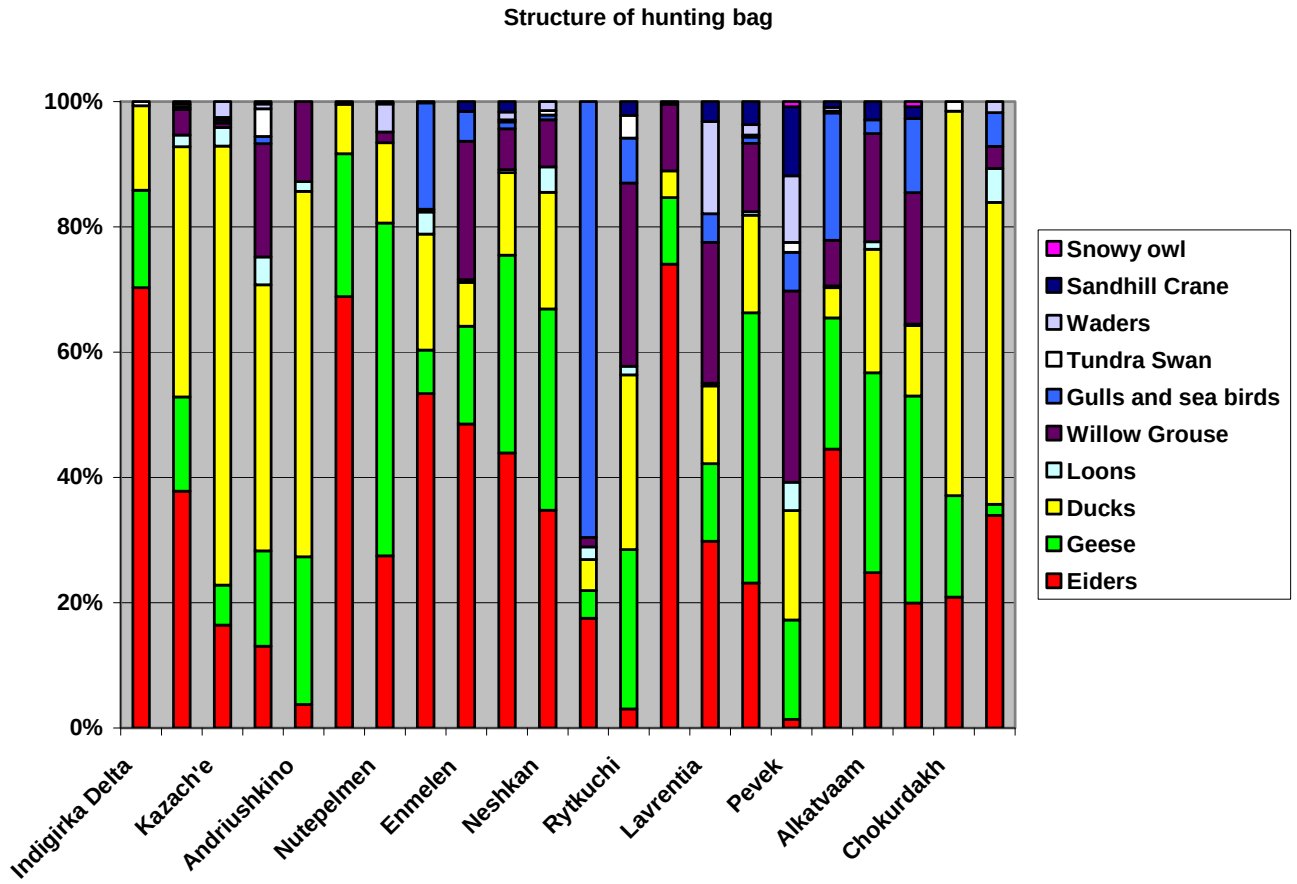


Figure 6-6. Total numbers of all groups of harvested birds in a settlement sorted for 4 regions.

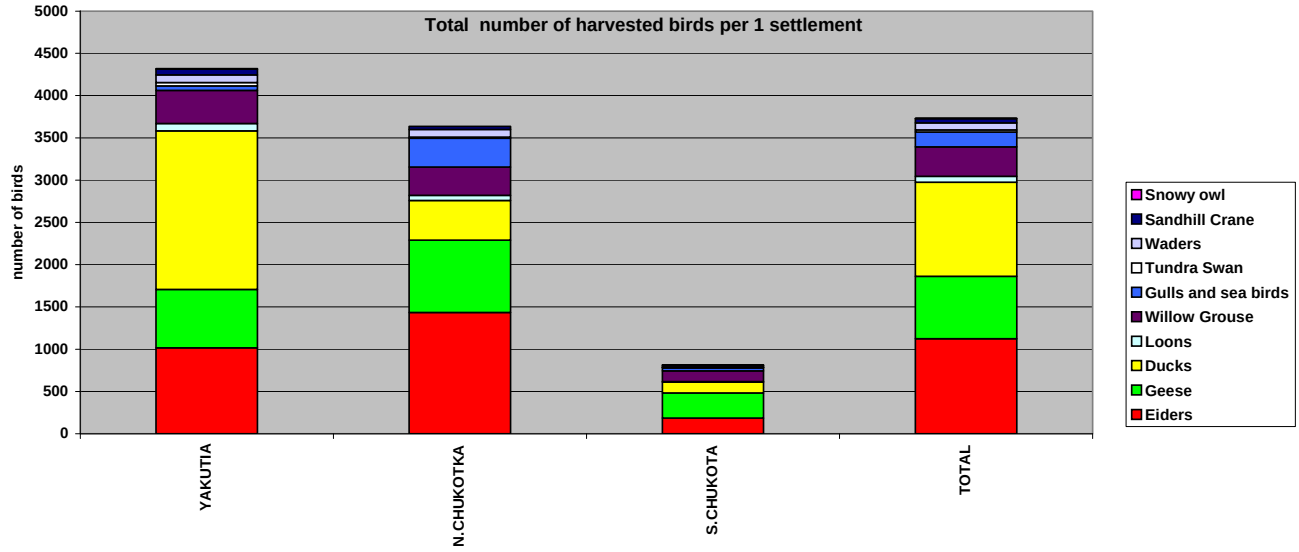


Figure 6-7. Total harvest of all groups of birds in %.

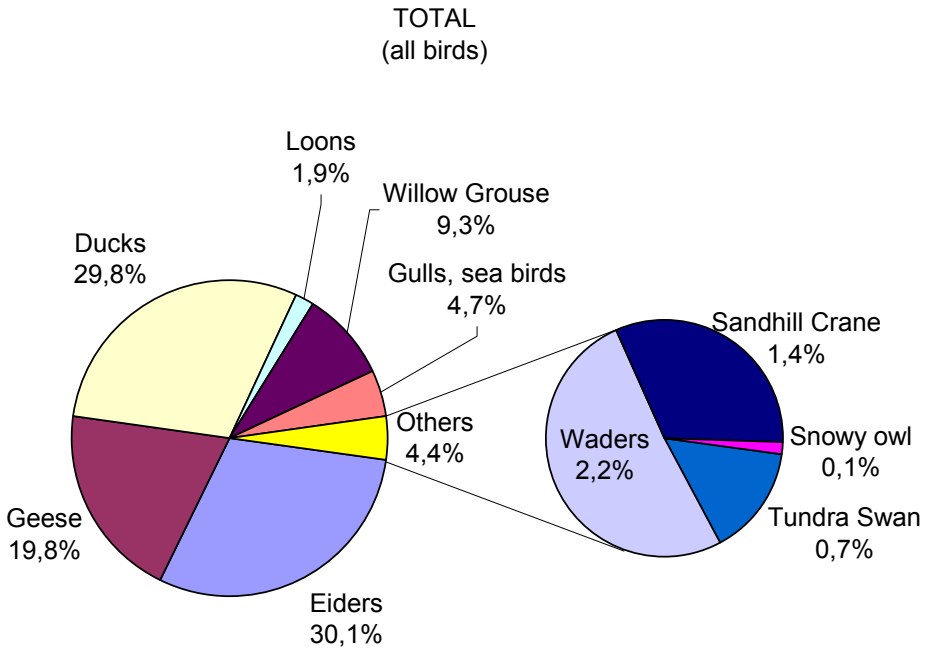


Figure 6-8. Total harvest of different groups of waterfowl in %.

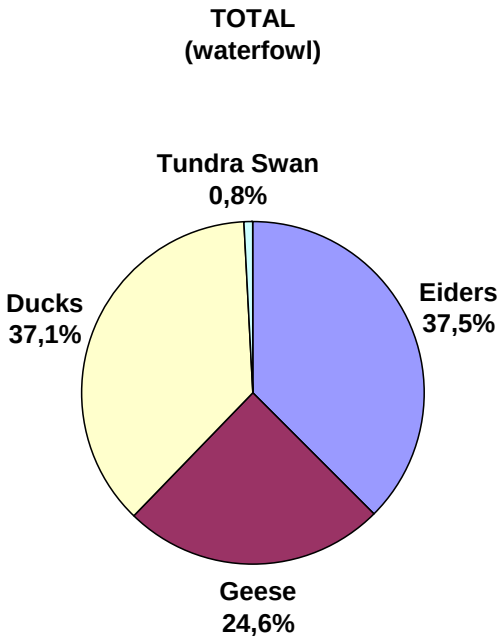


Figure 7-1.

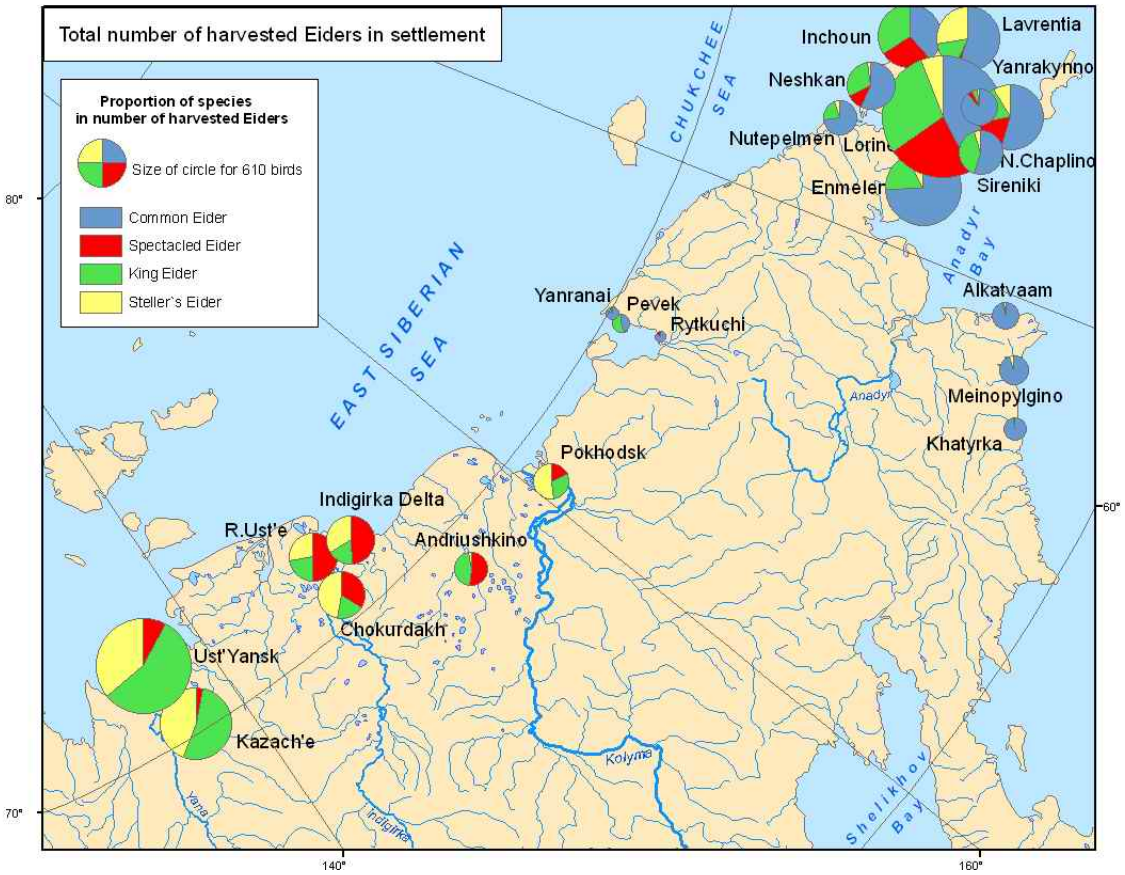


Figure 7-2. Extrapolated numbers of harvested Eiders in each settlement.

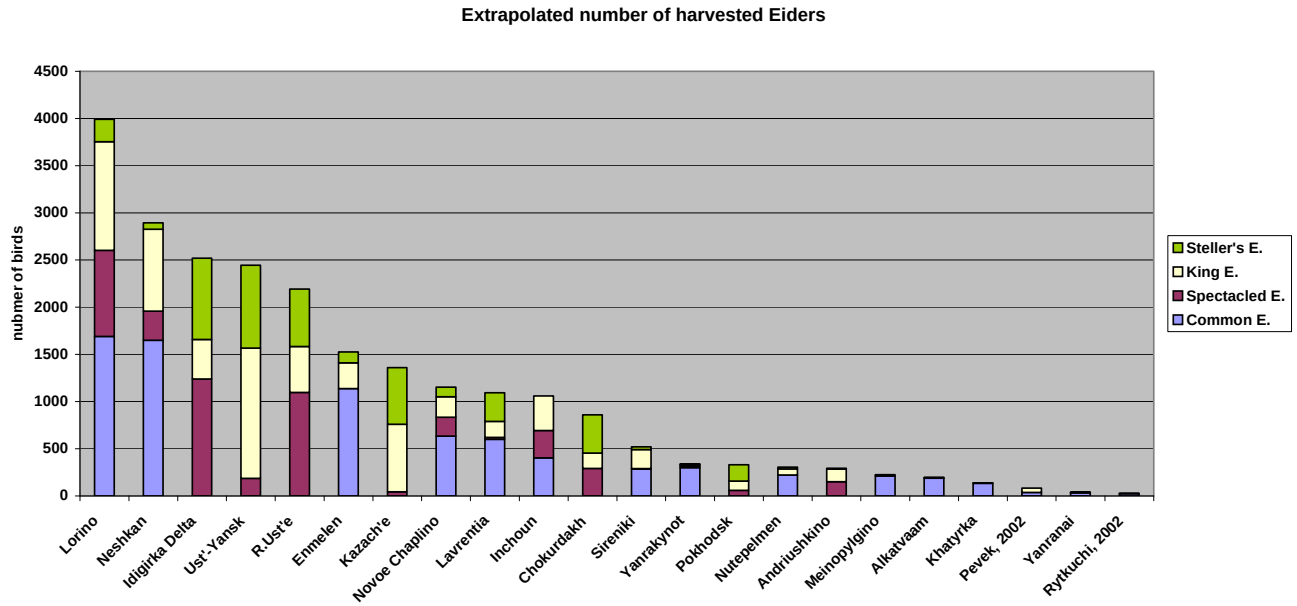


Figure 7-3. Extrapolated numbers of harvested Eiders in each settlement sorted for 4 regions.

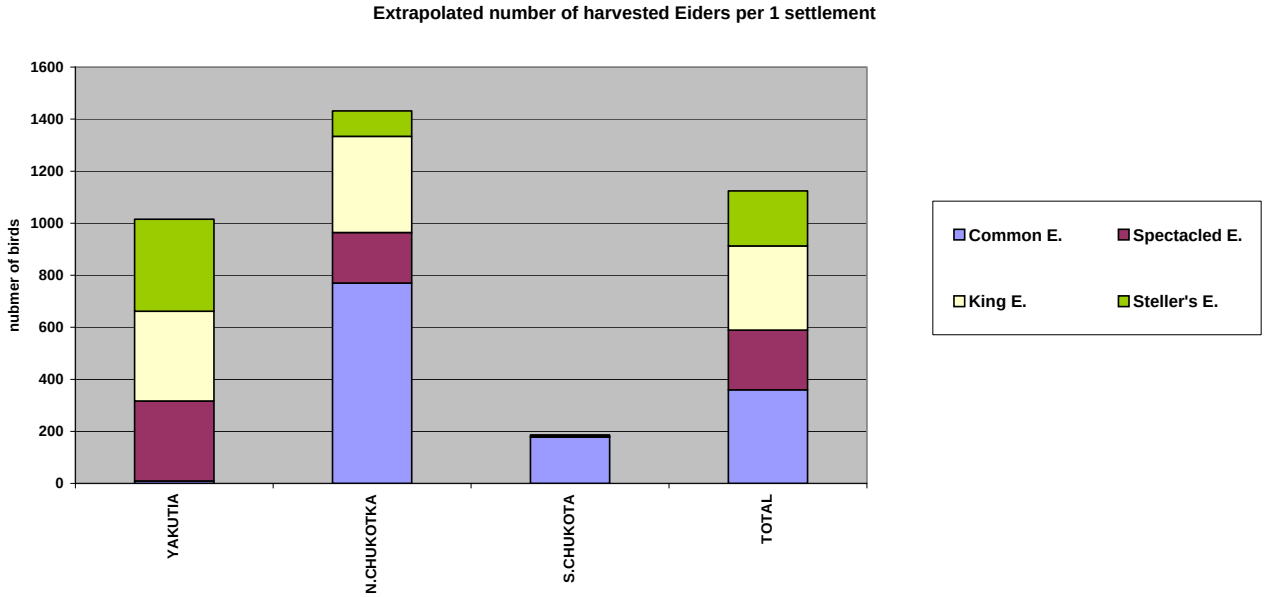


Figure 7-4. Extrapolated numbers of harvested Eiders in each settlement (MALES AND FEMALES).

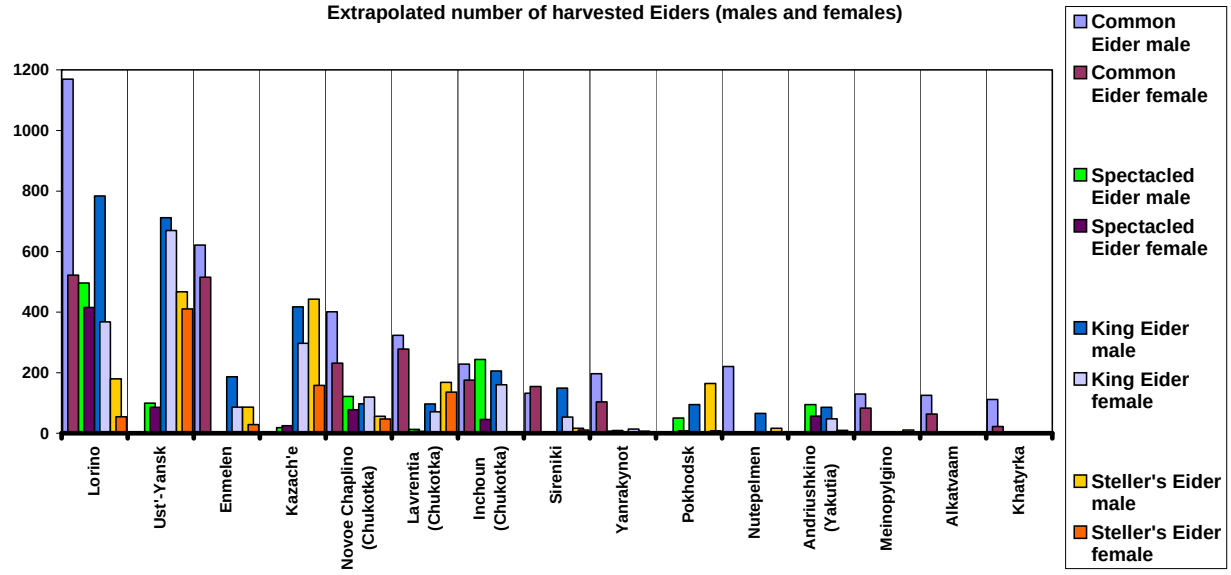


Figure 8-1.

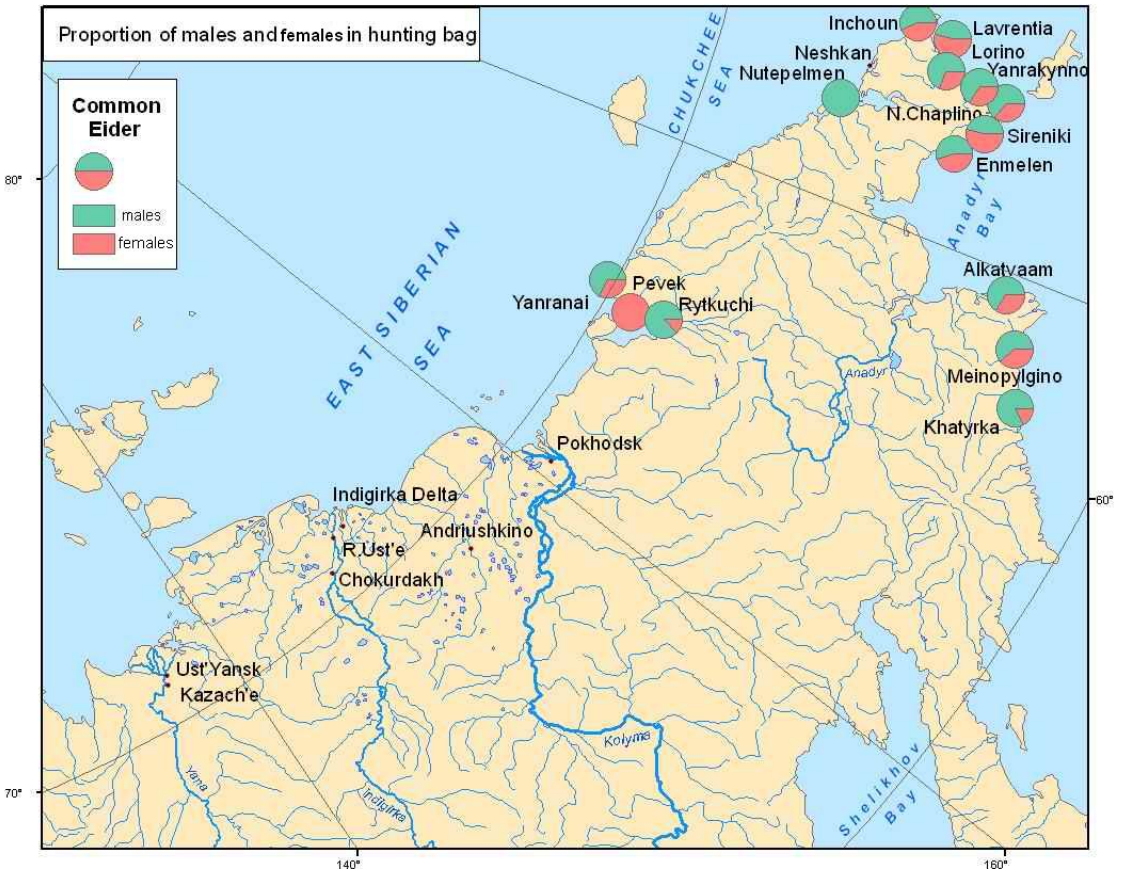


Figure 8-2.

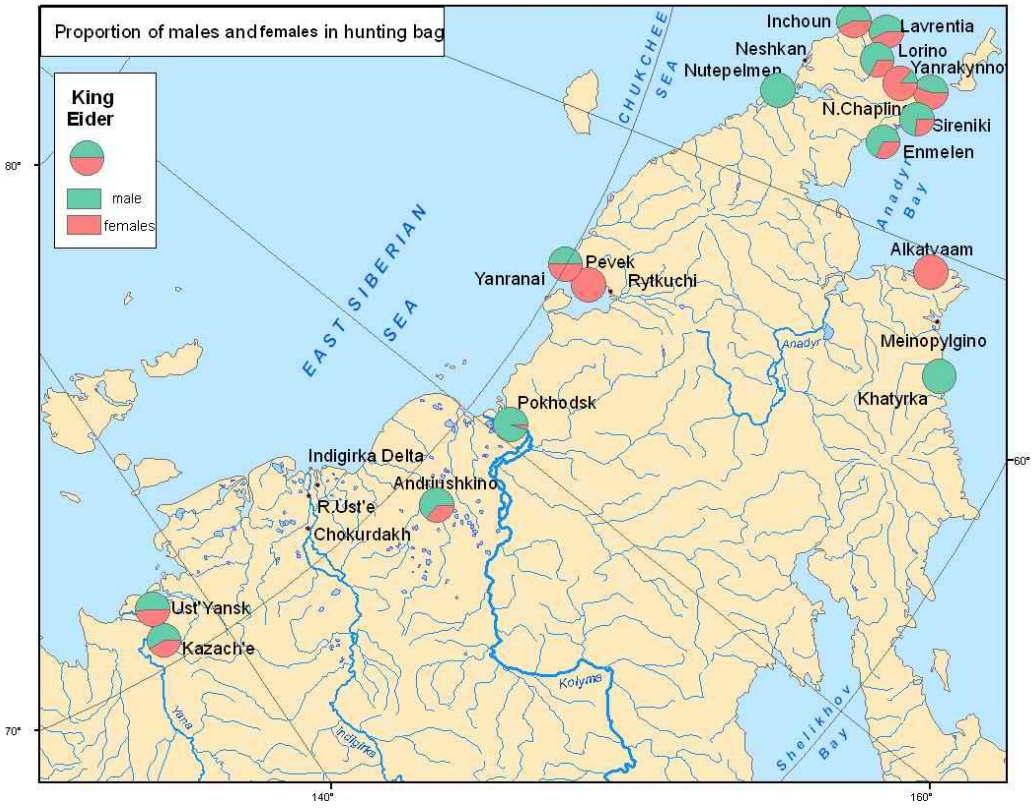


Figure 8.3.

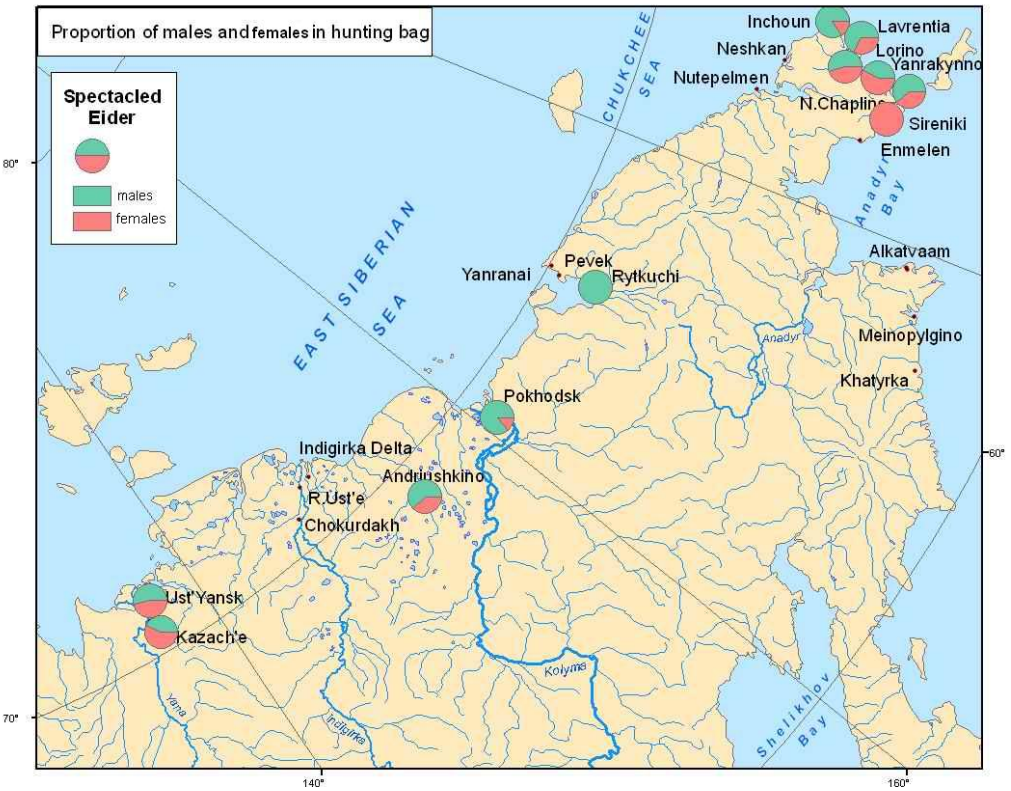


Figure 8.4.

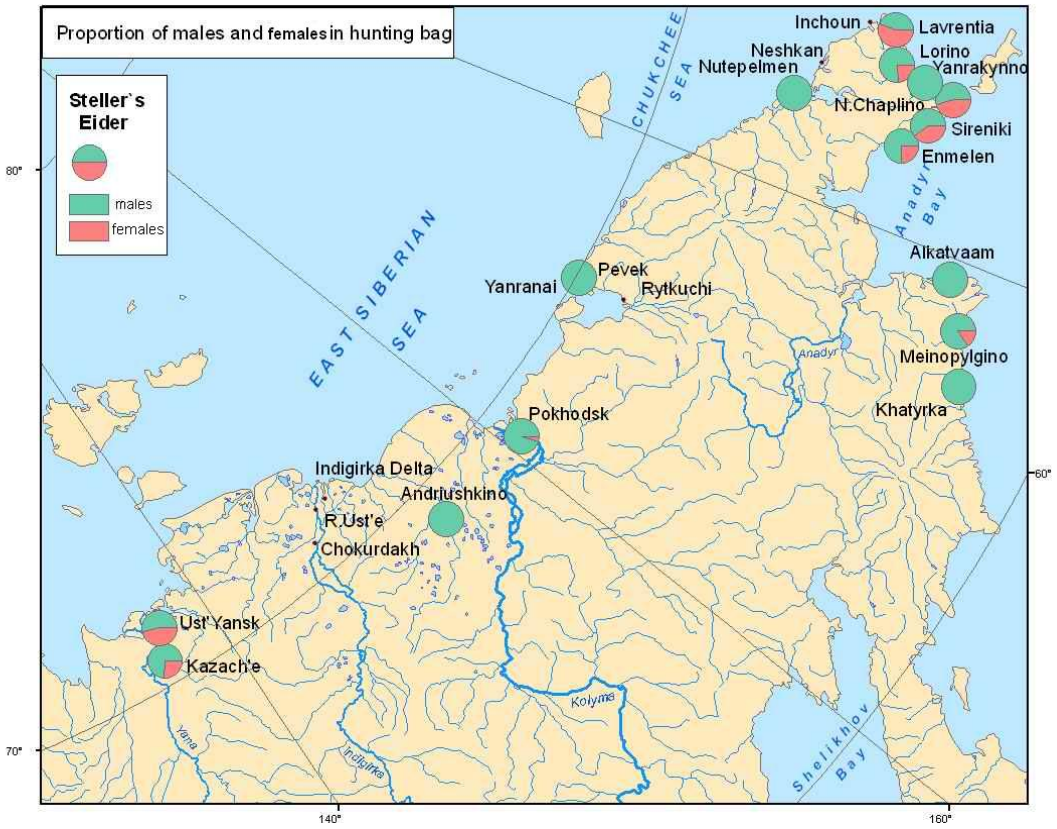

Proportion of males and females in hunting bag
Steller`s Eider
males
females
CHUKCHEE SEA
EAST SIBERIAN SEA
Anadyr Bay
Shelikhov Bay
Inchoun
Lavrentia
Neshkan
Lorino
Nutepelmen
Yanrakynno
N.Chaplino
Sireniki
Enmelen
Alkatvaam
Yanranai
Pevek
Rytkuchi
Meinopylgino
Khatyrka
Pokhodsk
Indigirka Delta
Andriushkino
R.Ust'e
Chokurdakh
Ust'Yansk
Kazach'e
Anadyr
Kolyma
Yana
Indigirka
80°
70°
60°
140°
160°

Figure 9. Proportion of different waterfowl groups harvested in three regions.

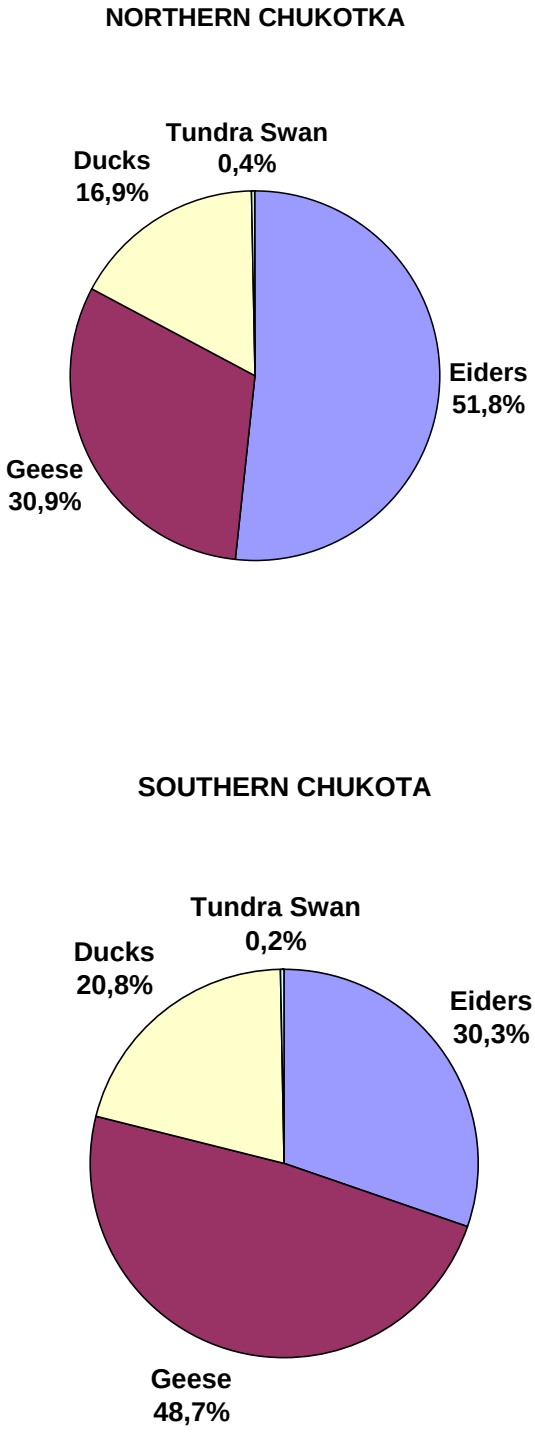


Figure 9 continued

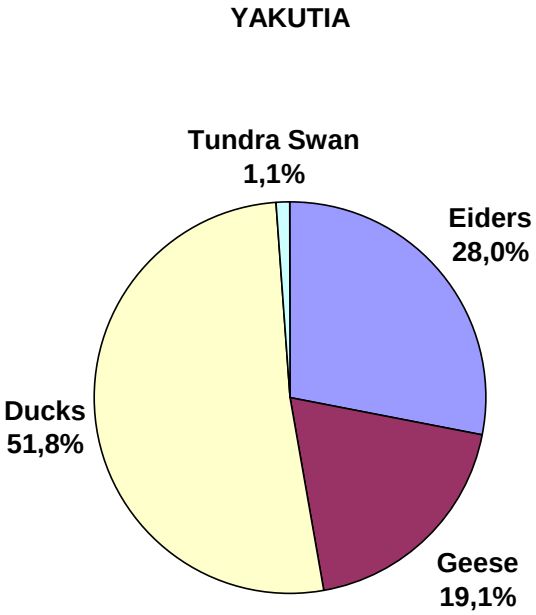


Figure 10-1. Region pattern of bird harvest per settlement. All bird groups.

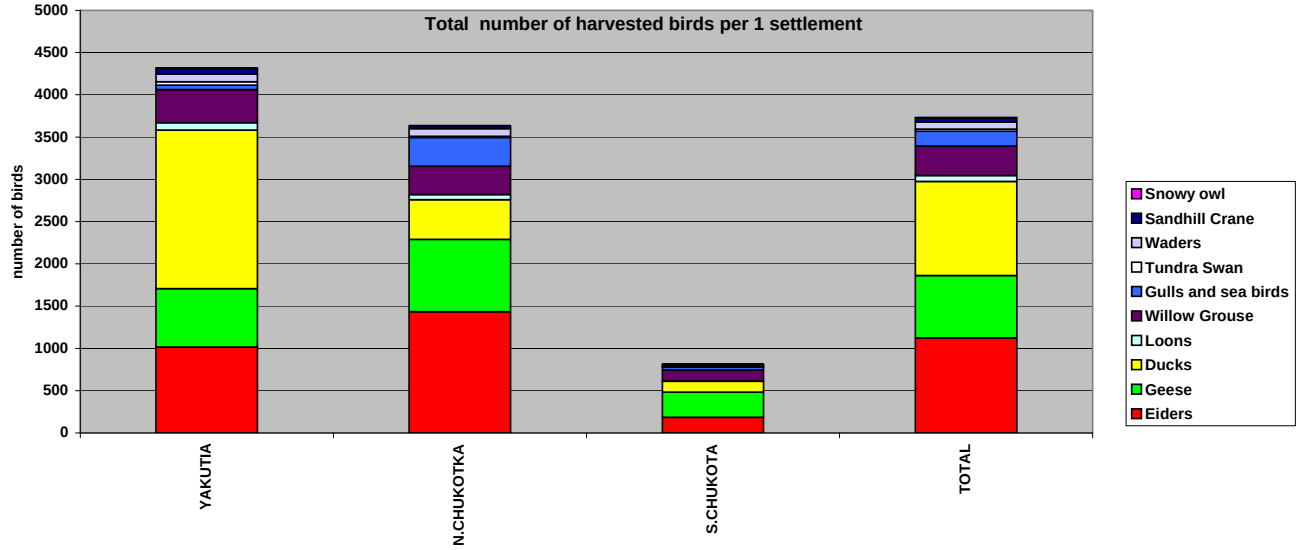


Figure 10-2. Region pattern of geese harvest per settlement.

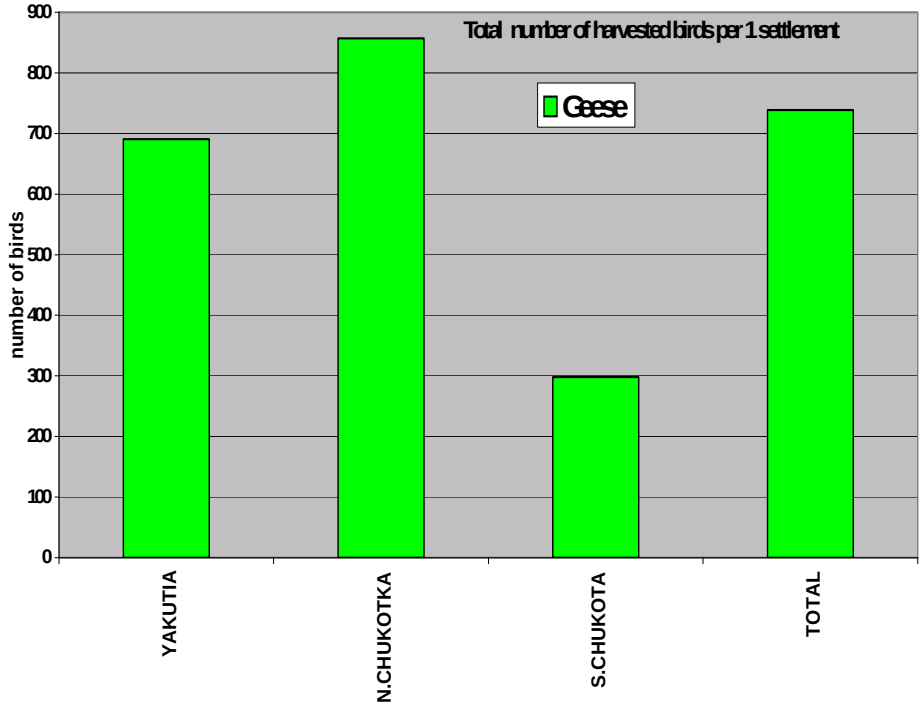


Figure 10-3. Region pattern of eider harvest per settlement.

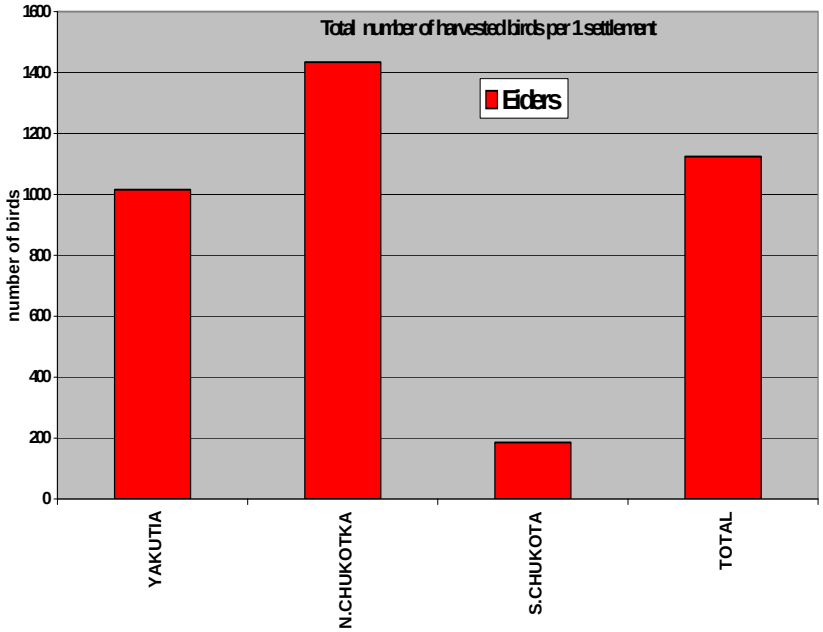


Figure 10-4. Region pattern of duck harvest per settlement, excluding eiders.

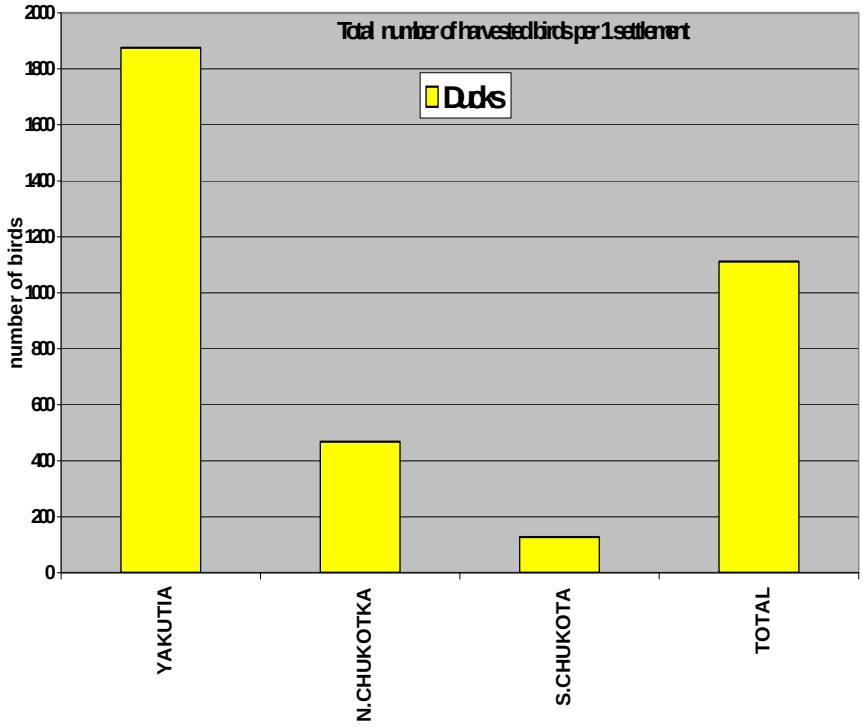


Figure 10-5. Region pattern of swan harvest per settlement (mainly Bewicks and Tundra Swan, with some proportion of Whooper Swans, estimated 10-20%).

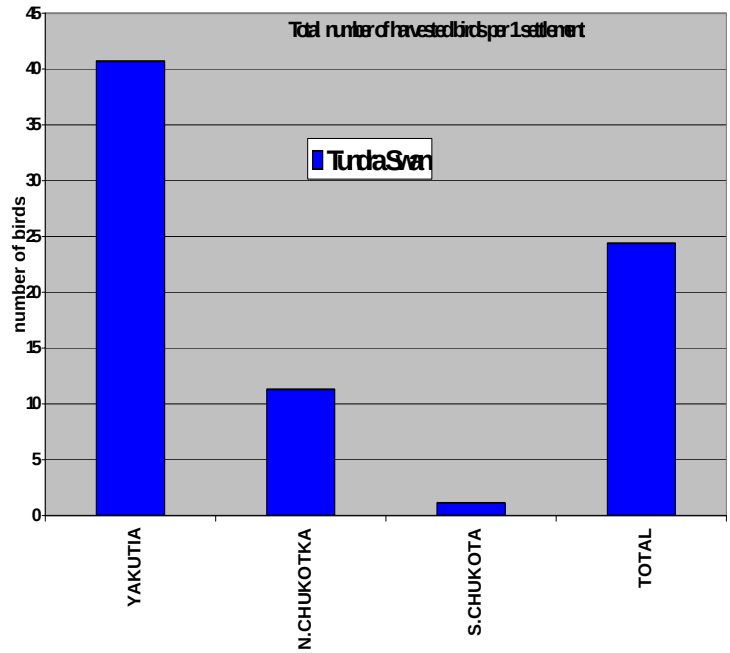


Figure 11-1. Correlation of total number of harvested birds with number of hunters in settlements (red – urban settlements).

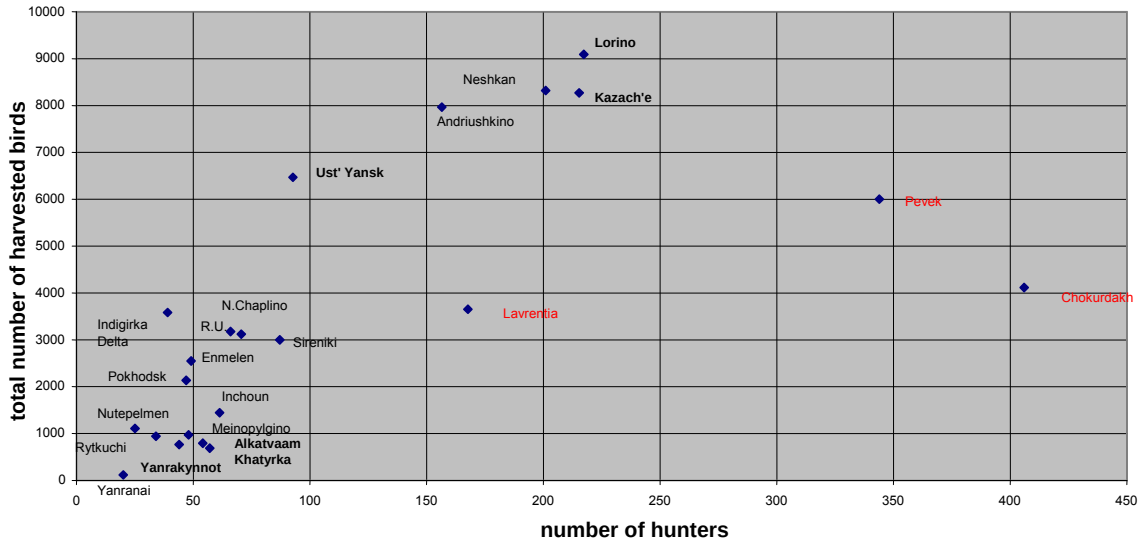


Figure 11-2. Correlation of total number of harvested birds with number of hunters in indigenous settlements.

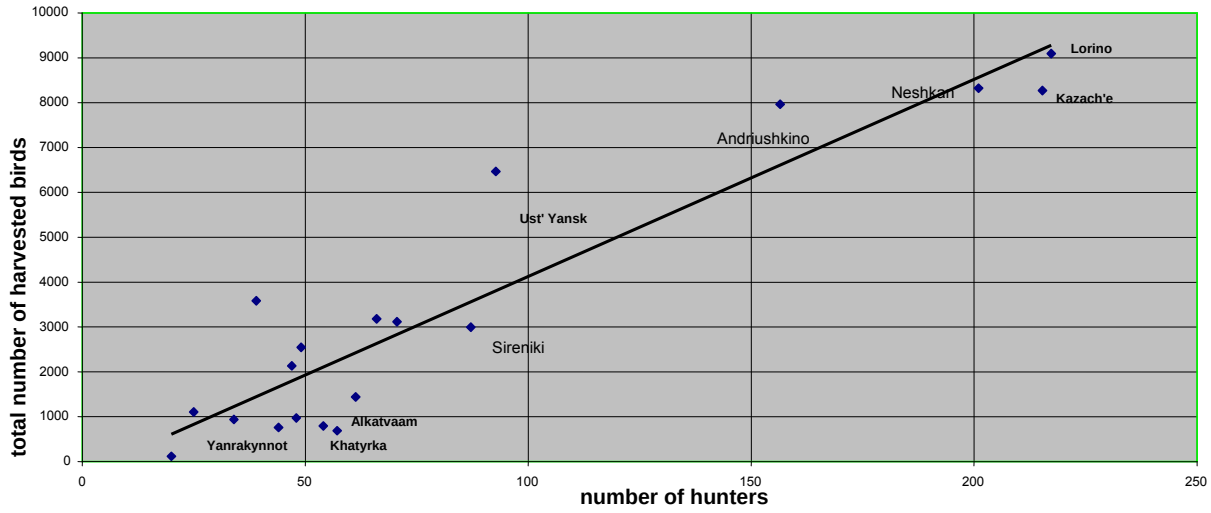


Figure 11-3. Correlation of total number of harvested birds with the size of settlements (red – urban settlements).

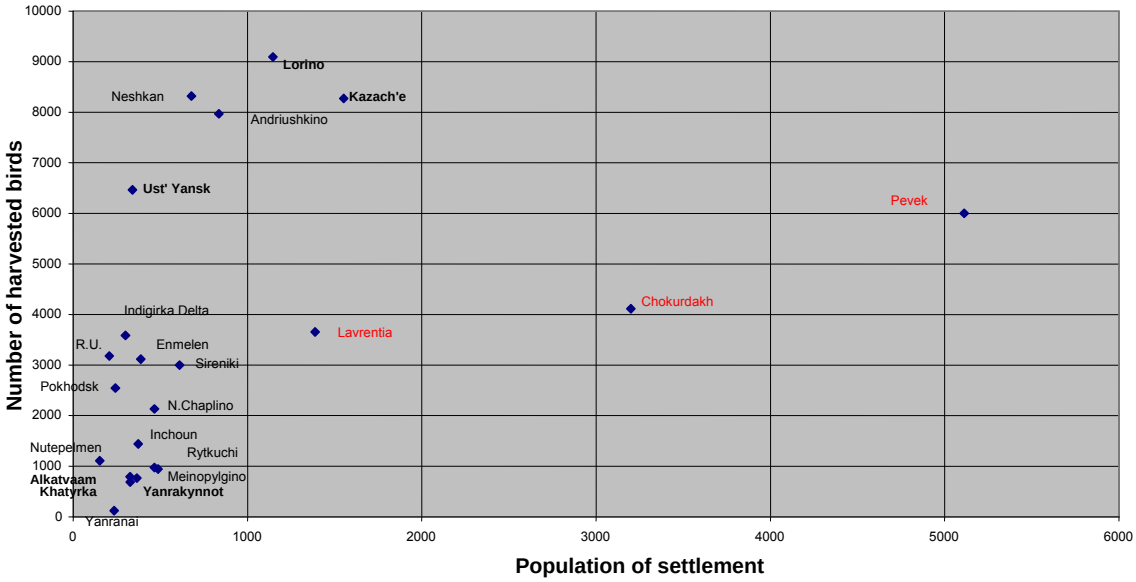


Figure 11-4. Correlation of total number of harvested birds with the size of settlements (only indigenous settlements).

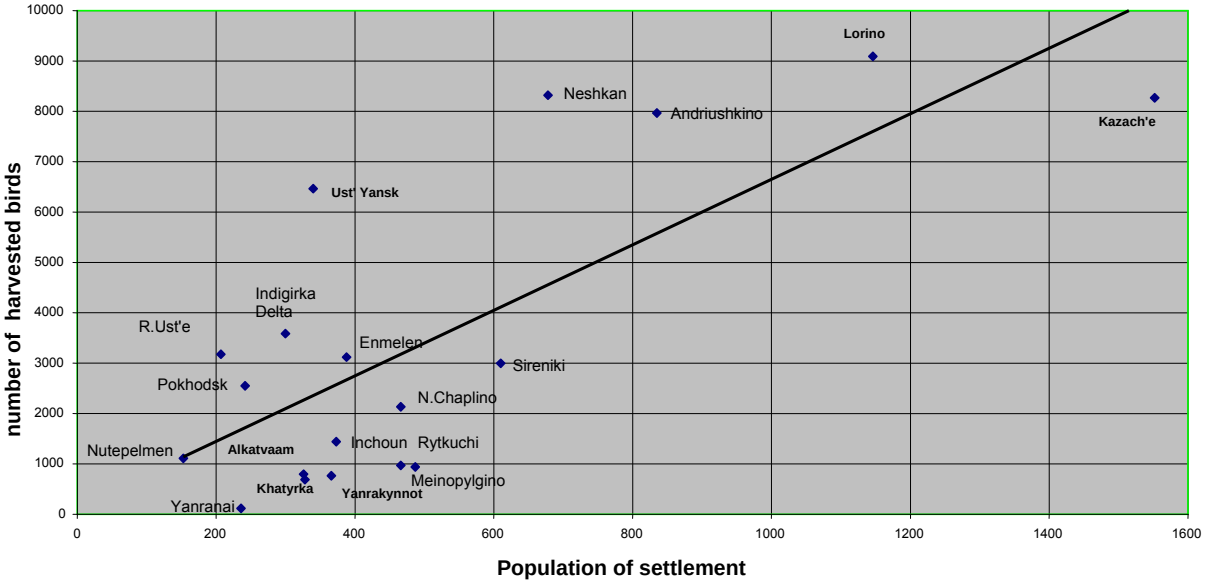


Figure 11-5. Correlation of individual hunting bag size with the number of hunters (only indigenous settlements).

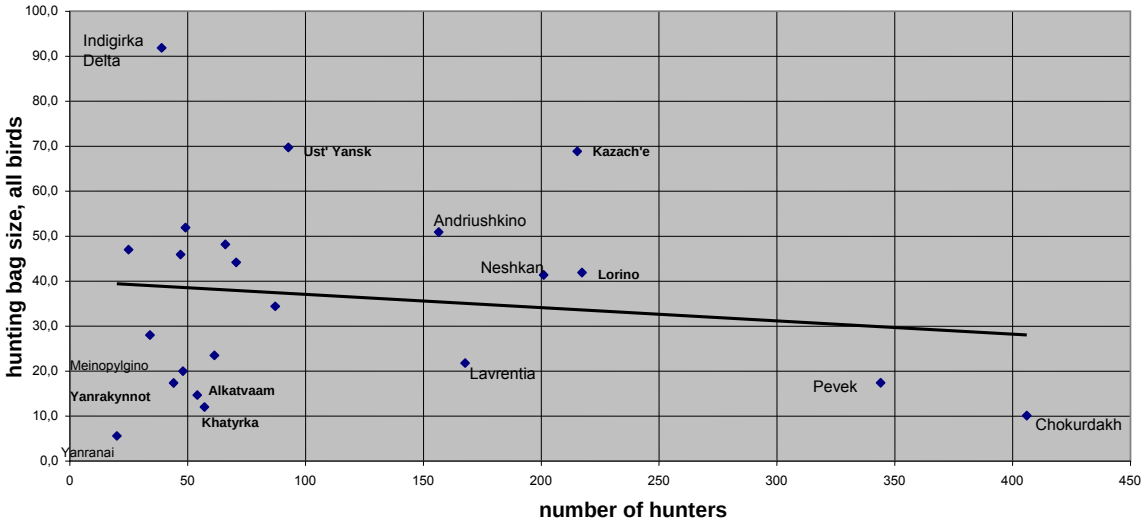
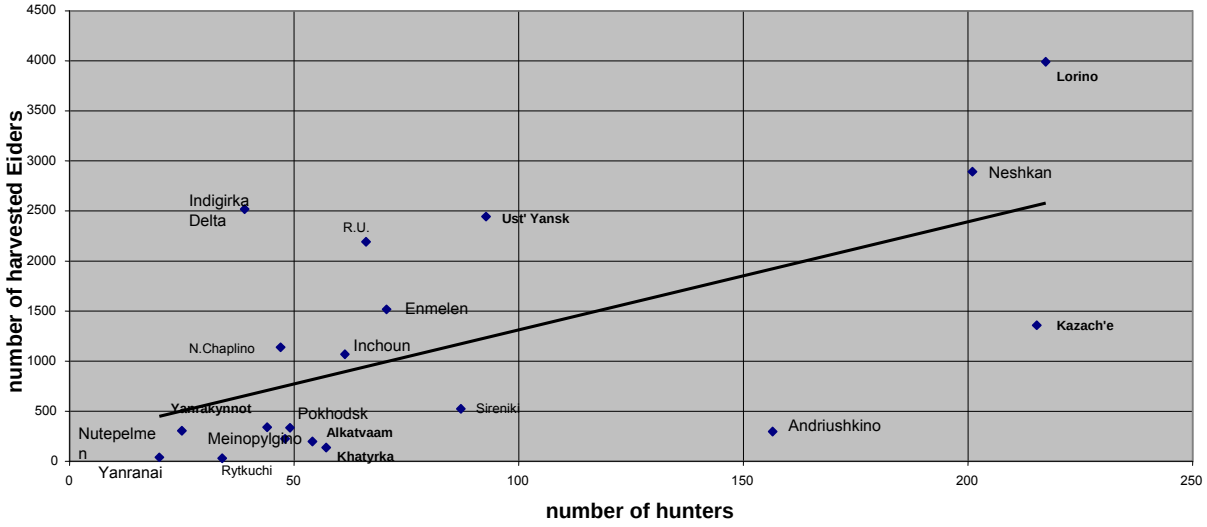
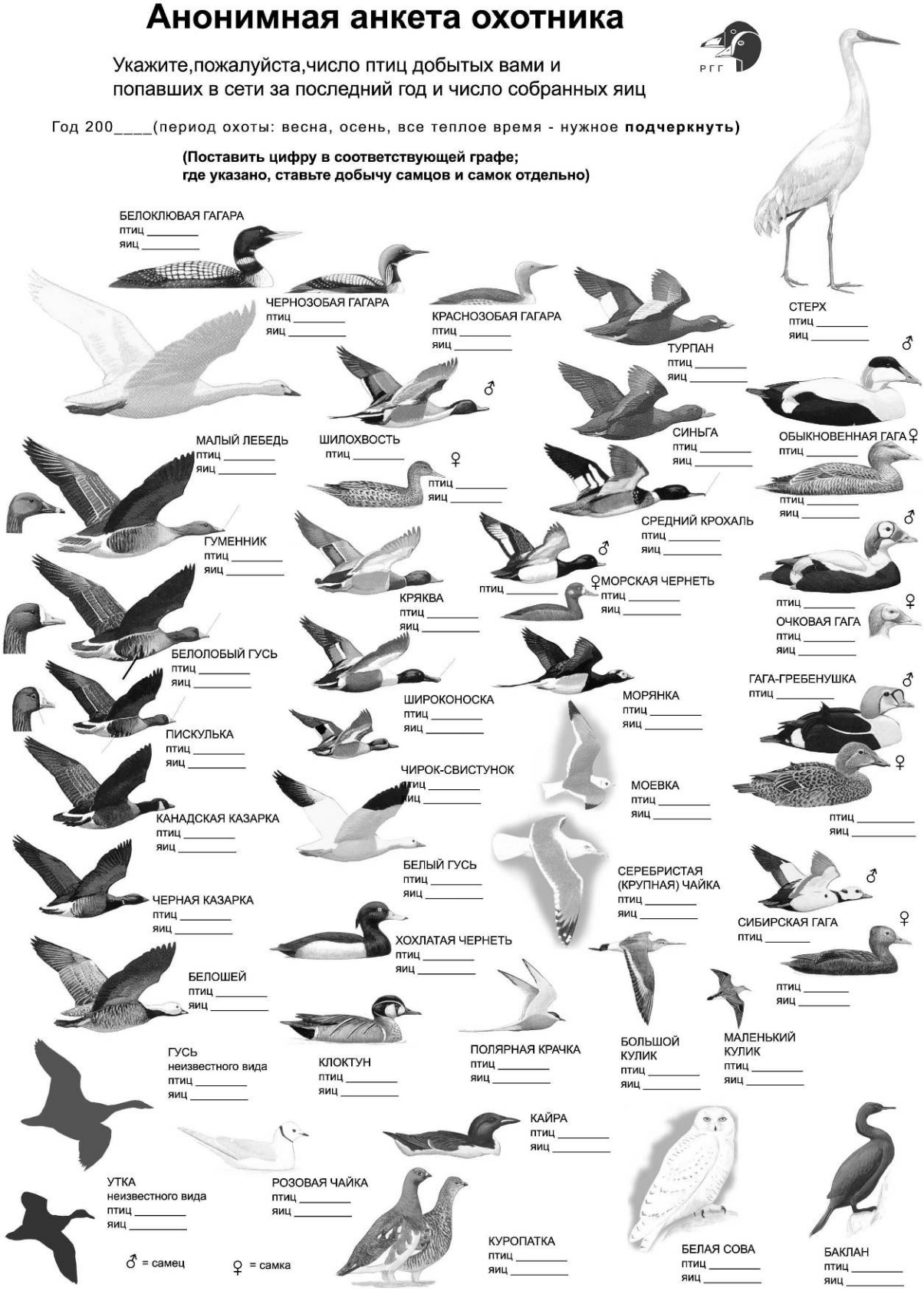


Figure 11-6. Correlation of total number of harvested Eiders with number of hunters in indigenous settlements.



Appendix 1. Example of Survey Form



Appendix 1 continued. Example of Backside of Survey Form (in Russian)

Пожалуйста, ответьте на следующие вопросы ***(подчеркните или впишите нужное):***

Ваш возраст: *менее 20 лет, 20-30, 30-40, 40-50, 50-60, более 60 лет.*
Охотничий стаж (сколько примерно лет охотитесь) __ *лет.* **Пол:** *муж.__., жен.__*

Давно ли Вы живете в этом районе: *с рожденья, более 10 лет, 5-10 лет, менее 5 лет.*

Ваша национальность: *чукча, керек, коряк, эвен, русский, украинец, иная_____*

Сколько всего человек в вашей семье? *___ чел.* **Сколько из них охотится?** *__ чел.*
Делитесь ли вы добычей гусей и уток с другими семьями: *1) нет; 2) да, только с семьями родственников; 3) да, с соседями, друзьями* **(подчеркните).**

Сколько дней Вы охотились в прошлом году ? _____ Сколько Вы потратили патронов ? _____, Сколько патронов Вы заряжаете сами: *1) все, 2) большую часть, 3) немного, 4) не заряжаю* **(подчеркните). Был ли прошлый сезон охоты удачным:** *1) удачный,*
2) неудачный, 3)обычный, 4)не знаю **(подчеркните).**

Играют ли гуси и утки важную роль в питании вашей семьи? *1) Да. 2)Нет 3) Только весной, осенью.*

Можно ли сказать, что в течение нескольких дней в году гуси и утки – основная еда в вашей семье?
1) Да, примерно в течение _____ дней, 2) Нет. 3) Трудно сказать.

Приходилось ли Вам покупать, продавать, обменивать птиц____ яйца *_____(да/нет);*

Как далеко от дома Вы охотитесь на водоплавающих: ____**1) рядом;2) выезд до 20 км, 3)дальше;** *Укажите, какой транспорт используете на охоте*

_____

В этом году Вы добыли по сравнению с другими годами:

сибирской гаги **1) больше, 2)меньше, 3) столько же, (Изображение вида на обороте)**

черной казарки **1) больше, 2)меньше, 3) столько же (Изображение вида на обороте)**

Добывали (находили) ли Вы окольцованных птиц, в том числе раньше? Если да, укажите цифры и текст, написанные на кольце, место и сроки добычи или находки

_____

Добывали ли вы птиц не указанных на обороте анкеты, напишите название_____

Как изменилась численность этих птиц в Вашем районе, за последние 10 лет (подчеркните):

ГУСЯ-БЕЛОГОЛОВИКА (БЕЛОШЕЯ) (см.	**возросла;**	**снизилась,**	**осталась прежней**;
ДРУГИХ ГУСЕЙ: ***изображения***	*возросла;*	*снизилась,*	*осталась прежней;*
ЧЕРНОЙ КАЗАРКИ: ***птиц***	*возросла;*	*снизилась,*	*осталась прежней;*
ОБЫКНОВЕННОЙ ГАГИ*:* ***обороте***	*возросла;*	*снизилась,*	*осталась прежней;* ***на***
МОРЯНКИ ***анкеты)***	*возросла;*	*снизилась,*	*осталась прежней;*
ЛЕБЕДЕЙ:	*возросла;*	*снизилась,*	*осталась прежней*

Чаще ли вы охотитесь на птиц, чем 5-10 лет назад*: 1)чаще, 2) реже, 3) так же, 4) не знаю*

Считаете ли Вы, что действующие сроки и правила охоты соответствуют условиям вашей местности: *1) да;2) нет;3) частично; 4) затрудняюсь ответить* **(подчеркните)**

Как бы Вы предложили изменить сроки охоты?

_____

Какая Ваша любимая птица, напишите*:*

_____

Выразите <u>свое отношение к птицам</u>, выбрав один из ответов внизу или дав свой:

1) это источник пищи; 2) это часть природы, на них можно охотиться, но нужно и охранять, 3) птицы красивы, их интереснее наблюдать, чем стрелять; 3) другое

_____

Оцените, пожалуйста, <u>значение охоты</u> на гусей и уток для населения вашего поселка:

1) эта охота важна для всего населения; 2) важна только для коренного населения; 3) важна лишь для отдельных семей; 4) не имеет большого значения; 5) не имеет практически никакого значения

Считаете ли Вы, что добывать редких птиц занесенных в Красную Книгу*: 1) недопустимо; 2)можно, если это нужно для еды; 3) допустимо всегда; 4) не знаю*

<u>Анкету не нужно подписывать</u>

Данная анкета подготовлена Рабочей группой по гусеобразным (РГГ). Адрес: Москва, Ленинский пр-т 86-310, тел. 246 71 54, e-mail rgg@eesjr.msk.ru

Мы благодарим Вас за содействие в проведении научного исследования и гарантируем,

что ваши ответы будут использованы только в научных целях.

Appendix 2. Tables for North Chukotka Surveys

HUNTERS AND THEIR FAMILIES

Table 1. **Hunters covered by survey**

Year	**2004**	**2004**	**2004**	**2005**	**2001**	**2004**	**2003**	**2003**	**2003**	**2004**	**2005**	**2003**	
Settlement	**Enmelen**	**Inchoun**	**Lavrentia**	**Lorino**	**Neshkan**	**Novoe Chaplino**	**Nutepelmen**	**Pevek**	**Rytkuchi**	**Sireniki**	**Yanraky not**	**Yanranai**	**Total**
Population number	388	373	1388	1,146	678	466	153	5112	487	610	366	236	11,403
Number of indigenous people	343	371	786	1,009	661	419	148	97	352	555	343	156	5,240
% of population indigenous	88.4%	99.5%	56.6%	88.0%	97.5%	89.9%	96.7%	1.9%	72.3%	91.0%	93.7%	66.1%	46.0%
Number of men of potential “hunter’s age” (older than 18)	133	101	442	464	270*	146	56**	1,636	142	177	123	71	3761
% of hunters form men of potential "hunting age”	56.4%	68.3%	42.3%	47.6%	92.6%	42.5%	46.4%	28.4%	59.2%	58.8%	35.8%	62.0%	43.4%
Number of hunters in the list	75	69	187	221	250	62	26	465	84	104	44	44	1,631
% of hunters surveyed	53.3%	36.2%	18.7%	29.0%	42.4%	40.3%	76.9%	29.5%	60.7%	39.4%	45.5%	54.5%	35.6%
Number of hunters surveyed	40	25	35	64	106	25	20	137	51	41	20	24	580

*older than 10 years
** older than 16 years

Table 2. Sample structure

Year	**2004**	**2004**	**2004**	**2005**	**2001**	**2004**	**2003**	**2003**	**2003**	**2004**	**2005**	**2003**
Settlement	**Enmelen**	**Inchoun**	**Lavrentia**	**Lorino**	**Neshkan**	**Novoe Chaplino**	**Nutepel men**	**Pevek**	**Rytkuchi**	**Sireniki**	**Yanrakynot**	**Yanranai**
Indigenous hunters (%)												
Less than 20 years	13%	9%	12%	12%	27%	0%	12.5%	X	X	17%	1	14.3%
20-29 years	25%	30%	35%	26%	17%	22%	25%	X	X	24%	2	14.3%
30-39 years	31%	22%	18%	24%	25%	17%	37.5%	X	X	41%	4	42.9%
40-49 years	28%	35%	18%	26%	15%	39%	25%	X	X	17%	4	28.6%
50-59 years	3%	4%	6%	8%	8%	17%	0%	X	X	0%	1	0%
> 60 years	0%	0%	12%	4%	8%	6%	0%	X	X	0%	1	0%
Total number of indigenous hunters	32	23	17	50	103	18	16	4	6	29	17	7
% of indigenous hunters	97%	96%	62%		97%	95%	88.9%	10.8%	46.2%	78%	89.4%	70.0%
Non-indigenous hunters												
Total number of non-indigenous hunters	1	1	10	10	3	1	2	33	7	8	2	3
% of non-indigenous hunters	2.9%	4.1%	34.4%	16.6%	3%	5%	11.1%	89.1%	53.8%	21.6%	10.5%	30.0%
Total number of hunters*	34	24	29	60	106	20	18	37	13	37	19	10

*Several hunters did not report their age or/and ethnicity

Table 3. Hunters' families.

Year	2004	2004	2004	2005	2004	2003	2003	2003	2004	2005	2003
Settlement	**Enmelen**	**Inchoun**	**Lavrentia**	**Lorino**	**Novoe Chaplino**	**Nutepelmen**	**Pevek**	**Rytkuchi**	**Sireniki**	**Yanrakynot**	**Yanranai**
Indigenous hunters-respondents											
Average number of persons in family	5.2	5.3	4.6	5.40	5.9	4.5	4.5	4.1	3.9	4.62	3.8
Total number of responses	32	23	16	50	15	16	6	30	29	17	16
Average number of hunters in family	1.6	1.8	1.9	1.76	1.6	1.7	2.2	1.4	1.5	1.53	1.4
Total number of responses	31	21	16	49	12	16	6	12	20	15	8
Non-indigenous hunters-respondents											
Average number of persons in family	5	3	3.3	4.20		3.0	3.2	3.3	3.0	3.50	3.8
Total number of responses	1	1	1.1	10	0	2	103	10	6	2	5
Average number of hunters in family	2	1	1.1	1.10		1.0	1.1	1.2	1.4	1.00	1.0
Total number of responses	1	1	1.1	10	0	2	102	17	5	2	3

Table 4. Hunter experience

Year	2004	2004	2004	2005	2004	2004	2005
Settlement	**Enmelen**	**Inchoun**	**Lavrentia**	**Lorino**	**Novoe Chaplino**	**Sireniki**	**Yanrakynot**
Number of respondents							
< 5 years	6	5	6	12	1	9	6
≥ 5 years	26	13	19	40	13	25	13
Total	32	18	25	52	14	34	19
% of respondents							
< 5 years	19%	28%	24%	23.1%	7%	26%	31.6%
≥ 5 years	81%	72%	76%	76.9%	93%	74%	68.4%
Total	100%	100%	100%	100%	100%	100%	100%

Table 5. Intensity of hunting

Year	2004	2004	2004	2005	2002	2004	2003	2003	2003	2004	2005	2003
Settlement	**Enmelen**	**Inchoun**	**Lavrentia**	**Lorino**	**Neshkan**	**Novoe Chaplino**	**Nutepelmen**	**Pevek**	**Rytkuchi**	**Sireniki**	**Yanraky not**	**Yanranai**
Average number of hunting days	17.7	14.3	17.2	14.7	24.8	32.5	15.1	5.0	5.7	17.2	16.3	3.3
Average number of shots	58	78	51	61.7	54.5	122	69.2	30.3	33.6	24	43.4	7.5
% of hunters that spent more than 7 days hunting	84%	67%	77%	78%	X	83%	88.2%	10%	33.3%	63%	62.5%	0%

Table 6. Harvet rate for eiders, geese and ducks, %.
(Number of hunters that harvested one or more bird/total number of hunters-respondents)

Year	2004	2004	2004	2005	2004	2002	2003	2003	2004	2005	2003
Settlement	**Enmelen**	**Inchoun**	**Lavrentia**	**Lorino**	**Novoe Chaplino**	**Nutepelmen**	**Pevek**	**Rytkuchi**	**Sireniki**	**Yanrakynot**	**Yanranai**
Hunters killed eiders:											
Indigenous	97%	100%	94%	86.8%	79%	87.5%	0%	16.7%	61%	93.3%	42.9%
Non-indigenous	100%	0%	30%	13.2%	0%	0%	3.0%	28.6%	63%	6.7%	66.7%
Hunters killed geese:											
Indigenous	74%	57%	75%	82.1%	50%	100%	75.0%	83.3%	9%	83.3%	0%
Non-indigenous	100%	0%	40%	17.9%	0%	100%	87.9%	100%	38%	16.7%	33.3%
Hunters killed ducks:											
Indigenous	32%	43%	44%	76.9%	50%	37.5%	100%	50%	22%	100%	57.1%
Non-indigenous	0%	100%	70%	23.1%	100%	0%	69.7%	85.7%	88%	0%	66.7%

HUNTING BAGS

Table 7. Average harvest

Year	**2004**	**2004**	**2004**	**2005**	**2001**	**2004**	**2003**	**2002**	**2002**	**2004**	**2005**	**2003**
Settlement	**Enmelen**	**Inchoun**	**Lavrentia**	**Lorino**	**Neshkan***	**Novoe Chaplin**	**Nutepelmen**	**Pevek**	**Rytkuchi**	**Sireniki**	**Yanrakynnot**	**Yanranai**
Eiders	21.5	17.4	6.5	18.4	14.4	24.5	13.0	0.2	0.85	6.0	7.7	1.9
Geese	6.9	2.5	2.7	13.2	13.3	3.2	25.1	2.8	7.08	1.5	3.6	0.1
Ducks	3.1	1.0	2.7	5.5	7.7	8.5	6.1	3.0	7.77	1.7	0.8	2.7
Loons	0.2	0	0.1	0.2	1.7	1.6	0	0.8	0.38	0.7	0.1	0.3
Willow Grouse	9.8	2.5	4.9	2.7	3.1	0.2	0.8	5.3	8.15	0.5	1.2	0.2
Gulls and sea birds	2.1	0	1.0	0.4	0.3	7.8	0	1.1	2.00	2.8	3.5	0.3
Tundra Swan	0	0.1	0.0	0.2	0.3	0	0	0.3	1.00	0	0.1	0
Waders	0	0	3.2	0.5	0.6	0	2.1	1.9	0	0	0.1	0.1
Sandhill	0.7	0	0.7	0.7	0	0.1	0.2	1.0	0.62	0	0.2	0
Snowy owl	0	0	0	0	0	0	0	0.1	0	0	0	0
Total	44.2	23.5	21.8	41.9	41.4	45.9	47.3	17.4	27.85	34.4	17.4	5.6

*Average hunting bag of adult hunters

Table 7 a. Average (± SD) harvest in 2003 (spring).

Settlement	Rytkuchi	Pevek
Eiders	0.35 ± 0.29	0.09 ± 0.05
Geese	2.29 ± 0.57	1.83 ± 0.23
Ducks	1.06 ± 0.37	2.03 ± 0.27
Loons	0.24 ± 0.18	0.11 ± 0.07
Willow Grouse	1.29 ± 0.88	3.43 ± 0.40
Gulls and sea birds	0.35 ± 0.25	0.36 ± 0.09
Tundra Swan	0.24 ± 0.18	0.14 ± 0.05
Waders	0.65 ± 0.43	0.13 ± 0.06
Sandhill Crane	0.35 ± 0.20	0.95 ± 0.11
Snowy owl	0.00 ± 0.00	0.05 ± 0.03
Total number of birds	6.82 ± 1.38	9.12 ± 0.57

Table 8. Total number of harvested birds (to be continued).

Year	2004	2004	2004	2005	2004	2003	2003	2003	2004	2005	2003	
NUMBER OF BIRDS HARVESTED BY HUNTER RESPONDENTS												
Settlement	**Enmelen**	**Inchoun**	**Lavrentia**	**Lorino**	**Novoe Chaplino**	**Nutepelmen**	**Pevek**	**Rytkuchi**	**Sireniki**	**Yanrakynot**	**Yanranai**	**Total**
Eiders	687	139	169	1,085	368	234	7	6	185	147	19	3,046
Geese	221	20	69	781	48	452	139	39	48	69	1	1,887
Ducks	98	8	69	326	127	109	154	18	54	16	27	1,006
Loons	5	0	3	12	24	0	8	4	23	1	3	83
Willow Grouse	313	20	128	161	3	15	261	22	17	24	2	966
Gulls and sea birds	66	0	26	26	117	0	27	6	738	67	3	1,076
Tundra Swan	0	1	0	9	0	0	11	4	0	1	0	26
Waders	0	0	82	31	0	38	10	11	0	2	1	175
Sandhill Crane	22	0	19	41	1	3	72	6	0	3	0	167
Snowy Owl	1	0	1	0	0	0	4	0	0	0	0	6
Total number of birds	1,413	188	566	2,472	688	851	693	116	1,065	330	56	8,438

Table 8a. Total number of harvested birds (continuation).

Year	2004	2004	2004	2005	2001	2004	2003	2003	2003	2004	2005	2003	
TOTAL NUMBER OF HARVESTED BIRDS CALCULATED BY EXTRAPOLATION													
Settlement	**Enmelen**	**Inchoun ***	**Lavrentia**	**Lorino**	**Neshkan**	**Novoe Chaplino**	**Nutepelmen**	**Pevek**	**Rytkuchi**	**Sireniki**	**Yanrakynot**	**Yanranai**	**Total**
Eiders	1,526		1,092	3,991	3,200	1,152	304	32	12	522	340	40	12,211
Geese	490		453	2,872	2,860	150	588	626	78	130	160	2	8,409
Ducks	220		454	1,199	1,880	399	142	693	36	148	37	57	5,265
Loons	14		17	44	350	75	0	36	8	61	2	6	613
Willow Grouse	696		823	592	740	9	20	1,175	44	44	56	4	4,203
Gulls and sea birds	149		168	96	90	367	0	122	12	2,071	155	6	3,236
Tundra Swan	0		0	33	60	0	0	50	8	0	2	0	153
Waders	0		538	114	210	0	50	45	22	0	5	2	986
Sandhill Crane	50		117	151	10	5	4	324	12	0	7	0	680
Snowy Owl	0		0	0	0	0	0	18	0	0	0	0	18
Total number of birds	3,145		3,662	9,092	9,400	2,157	1,108	3,119	232	2,976	764	118	35,773

* Excluded from extrapolation

Table 9. Total number of harvested eiders calculated by extrapolation.

Year	2004	2004	2004	2005	2001	2004	2003	2003	2003	2004	2005	2003	
Settlement	**Enmelen**	**Inchoun***	**Lavrentia**	**Lorino**	**Neshkan**	**Novoe Chaplino**	**Nutepelmen**	**Pevek**	**Rytkuchi**	**Sireniki**	**Yanrakynot**	**Yanranai**	**Total**
Common Eider male	622	229	324	1,170	1,879	401	221	0	21	132	197	23	5,219
Common Eider female	515	175	278	522	0	232	0	37	3	155	104	11	2,032
Spectacled Eider male	0	244	13	497	324	122	0	0	5	0	7	0	1,212
Spectacled Eider female	0	46	6	416	0	78	0	0	0	3	9	0	558
King Eider male	187	206	97	783	923	97	66	0	0	149	2	2	2,512
King Eider female	87	160	71	368	0	119	0	47	0	53	14	2	921
Steller's Eider male	87		136	180	74	47	17	0	0	17	7	2	567
Steller's Eider female	29		168	55	0	56	0	0	0	11	0	0	319
Total number of Eiders	1,527	1,060	1,093	3,991	3,200	1,152	304	84	29	520	197	40	13,197

*Excluded from extrapolation.

Table 10. **Number of different bird species harvested by hunter respondents.**

Year	2004	2004	2004	2005	2001	2004	2003	2003	2003	2004	2005	2003	
NUMBER OF BIRD HARVESTED BY HUNTER RESPONDENTS													
Species	**Enmelen**	**Inchoun**	**Lavrentia**	**Lorino**	**Neshkan**	**Novoe Chaplino**	**Nutepelmen**	**Pevek**	**Rytkuchi**	**Sireniki**	**Yanrakynot**	**Yanranai**	**Total**
EIDERS	**687**	**139**	**169**	**1,085**	**1,214**	**368**	**234**	**9**	**11**	**185**	**147**	**19**	**4,267**
Common Eider	280	30	50	318	713	128	170	0	8	47	85	11	2,464
Common Eider hen	232	23	43	142		74	0	4	1	55	45	5	
Spectacled Eider	0	32	2	135	123	39	0	0	2	0	3	0	486
Spectacled Eider hen	0	6	1	113		25	0	0	0	1	4	0	
King Eider	84	27	15	213	350	31	51	0	0	53	1	1	1,066
King Eider hen	39	21	11	100		38	0	5	0	19	6	1	
Steller's Eider	39	0	26	49	28	18	13	0	0	6	3	1	251
Steller's Eider hen	13	0	21	15		15	0	0	0	4	0	0	
GEESE	**221**	**20**	**69**	**781**	**1,138**	**48**	**452**	**102**	**92**	**48**	**69**	**1**	**3,041**
Bean Goose	31	0	9	52	110	0	66	83	45	16	13	1	426
Greater WF Goose	50	0	1	113	68	0	53	3	16	9	11	0	324
Lesser WF Goose	4	0	0	15	5	0	8	0	1	0	0	0	33
Canada Goose	6	0	2	9	47	0	4	4	0	4	1	0	77
Brant	86	0	12	232	389	24	66	3	20	7	21	0	860
Emperor Goose	26	17	22	245	431	24	226	0	0	9	21	0	1,021
Snow Goose	5	2	12	95	72	0	29	5	1	3	2	0	226
Goose sp.	13	1	11	20	16	0	0	4	9	0	0	0	74
DUCKS	**98**	**8**	**69**	**326**	**651**	**127**	**109**	**113**	**101**	**54**	**16**	**27**	**1,699**
Pintail drake	39	1	17	109	244	6	5	89	40	16	9	2	577
Pintail hen	10	3	20	19	0	3	0	6	7	8	2	12	90
Mallard	1	0	0	7	2	1	0	10	4	12	0	0	37
Shoveler	8	0	1	15	9	0	0	0	3	0	0	0	36
Teal	7	0	3	5	5	0	0	0	1	3	0	0	24
Baikal Teal	0	0	0	0	0	0	0	0	0	0	0	0	0
American Scooter	0	0	0	0	0	1	0	0	0	0	0	0	1
Red-breasted Merganser	2	0	1	78	2	106	0	0	21	2	0	0	212
Scaup	0	0	0	15	3	0	0	6	0	0	2	1	27
Long-tailed Duck	6	0	7	59	345	4	104	0	25	10	3	12	575

Harlequin Duck	4	0	16	0	0	4	0	0	0	1	0	0	25
White-winged Scooter	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified Duck	21	4	4	19	41	2	0	2	0	2	0	0	95
LOONS	**5**	**0**	**3**	**12**	**143**	**24**	**15**	**226**	**111**	**23**	**1**	**5**	**568**
Yellow-billed Loon	2	0	0	2	58	12	0	0	0	8	1	1	84
Pacific/Black-throated L	3	0	2	9	70	12	0	29	4	15	0	2	146
Red-throated Loon	0	0	1	1	15	0	0	0	1	0	0	0	18
WILLOW GROUSE	**313**	**20**	**128**	**161**	**246**	**3**	**15**	**197**	**106**	**17**	**24**	**2**	**1,232**
SEABIRDS & GULLS	**66**	**0**	**26**	**26**	**22**	**117**	**0**	**40**	**26**	**738**	**67**	**3**	**1,131**
Cormorant	26	0	8	24	4	69	0	33	0	7	12	0	183
Vega Gull	12	0	11	0	12	27	0	7	26	10	4	3	112
Kittiwake	3	0	0	0	0	0	0	0	0	0	0	0	3
Arctic Tern	0	0	0	0	0	0	0	0	0	0	0	0	0
Murre sp.	0	0	0	0	6	0	0	0	0	0	50	0	56
Tifted and Horned Piffins	0	0	0	2	0	0	0	0	0	0	1	0	3
SWAN sp	**0**	**1**	**0**	**9**	**25**	**0**	**0**	**10**	**13**	**0**	**1**	**0**	**59**
WADERS	**0**	**0**	**82**	**31**	**30**	**0**	**38**	**69**	**8**	**0**	**2**	**1**	**261**
Big wader	0	0	40	8	1	0	33	0	0	0	2	1	85
Small wader	0	0	42	23	29	0	5	69	0	0	0	0	168
SANDHIL CRANE	22	0	19	41	4	1	3	71	8	0	3	0	172
SNOWY OWL	1	0	1	0	0	0	0	5	0	0	0	0	7
Total number of birds	**1,413**	**187**	**566**	**2,472**	**3,469**	**688**	**851**	**645**	**362**	**1,065**	**330**	**56**	**12,104**

HUNTING METHODS

Table 11. Answers to question: "Where do you hunt?"

Year	2004	2004	2004	2005	2001	2004	2003	2003	2003	2004	2005	2003
Possible answers*:	**Enmelen**	**Inchoun**	**Lavrentia**	**Lorino**	**Neshkan**	**Novoe Chaplino**	**Nutepelmen**	**Pevek**	**Rytkuchi**	**Sireniki**	**Yanrakynnot**	**Yanranai**
Near the village (or near your home)	64%	48%	12%	10%	33%	40%	88.9%	12.3%	31.2%	68%	41%	76.5%
At a distance up to 15-20 km	24%	57%	68%	57%	49.1%	40%	11.1%	51.9%	28.1%	18%	59%	17.6%
Further than 15-20 km	30%	4%	20%	38%	17.9%	33%	11.1%	50%	46.9%	18%	0%	11.8%
Total number of answers	33	23	25	58	81	15	18	106	32	34	17	17

*Some respondents noted several answers.

Table 12. Answers to question: "What transport do you use when you are hunting?"

Year	2004	2004	2004	2005	2004	2003	2003	2003	2004	2005	2003
Possible answers*:	**Enmelen**	**Inchoun**	**Lavrentia**	**Lorino**	**Novoe Chaplino**	**Nutepelmen**	**Pevek**	**Rytkuchi**	**Sireniki**	**Yanrakynnot**	**Yanranai**
Car	3%	0%	24%	1.8%	0%	0%	72.8%	0%	0%	0%	0%
Motorcycle	36%	0%	33%	8.8%	0%	34.8%	12%	0%	0%	5.3%	16.7%
Snowmobile	0%	11%	24%	21%	33%	21.7%	1.1%	27.8%	0%	26%	0%
Boat	33%	50%	38%	32%	42%	0%	2.2%	38.9%	41%	47%	33.3%
Caterpillar vehicle	0%	0%	19%	1.8%	0%	2.7%	12%	5.6%	10%	0%	0%
Dog team	0%	39%	0%	28%	17%	4.3%	0%	0%	0%	11%	0%
Does not use any transport	36%	17%	0%	11%	33%	0%	0%	0%	48%	37%	0%
Tractor	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Horse	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Reindeer sledge	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total number of answers	33	18	21	57	12	23	92	18	29	19	6

*Some respondents noted several means of transport.

Table 13. Answers to question: "Do you charge cartridges yourself?"

Year	2004	2004	2004	2005	2004	2003	2003	2003	2004	2005	2003
Possible answers*:	Enmelen	Inchoun	Lavrentia	Lorino	Novoe Chaplino	Nutepelmen	Pevek	Rytkuchi	Sireniki	Yanrakynnot	Yanranai
Yes, all cartridges	47%	39%	58%	52%	8%	61.1%	4.1%	21.4%	10%	38%	7.7%
Most part of cartridges	6%	13%	29%	24%	8%	27.8%	15.3%	3.6%	0%	25%	15.4%
Only a few cartridges	24%	43%	0%	8.6%	0%	5.6%	31.6%	7.1%	0%	19%	0%
No	24%	4%	13%	16%	83%	5.6%	49%	67.9%	90%	19%	76.9%
Total number of answers	34	23	24	58	12	18	98	28	29	16	13

*Some of respondents noted several answers.

The importance of hunt for local population

Table 14. Answers to question: "Is waterfowl hunting important for inhabitants of your settlement?"

Year	2004	2004	2004	2005	2004	2003	2003	2003	2004	2005	2003
Possible answers*:	Enmelen	Inchoun	Lavrentia	Lorino	Novoe Chaplino	Nutepelmen	Pevek	Rytkuchi	Sireniki	Yanrakynnot	Yanranai
Yes, for all inhabitants	47%	82%	48%	54%	25%	70.6%	1.9%	4.7%	59%	40%	4.8%
Only for indigenous families	26%	9%	22%	24%	44%	17.6%	72.4%	9.3%	13%	60%	9.5%
Only for several families	6%	0%	22%	12%	0%	5.9%	28.6%	20.9%	3%	0%	28.6%
Hunting is not really important for anybody	18%	9%	9%	8.5%	31%	5.9%	10.5%	30.2%	25%	0%	28.6%
Hunting is not important at all	3%	0%	0%	1.7%	0%	0%	1.9%	34.9%	0%	0%	33.3%
Total number of answers	34	22	23	59	16	17	105	43	32	15	21

*Some of respondents noted several answers.

Table 15. Answers to question: "Are birds an important food source for your family?"

Year	2004	2004	2004	2005	2004	2003	2003	2003	2004	2005	2003
Possible answers*:	**Enmelen**	**Inchoun**	**Lavrentia**	**Lorino**	**Novoe Chaplino**	**Nutepelmen**	**Pevek**	**Rytkuchi**	**Sireniki**	**Yanrakynnot**	**Yanranai**
Indigenous hunters											
Yes	70%	37%	53%	26%	33%	93.7%	100%	18.5%	14%	41.2%	30.8%
No	6%	16%	6%	4%	33%	6.3%	0%	81.5%	54%	11.8%	69.2%
Only in spring and autumn	24%	47%	41%	70%	33%				32%	47.1%	
Total number of answers	33	19	17	50	15	16	6	27	28	17	13
Non –indigenous hunters											
Yes	0%	0%	9%	30%	0%	0%	10.8%	9.5%	0%	0%	20%
No	0%	100%	64%	20%	0%	100%	89.2%	90.5%	83%	0	80%
Only in spring and autumn	0%	0%	27%	5	0%	0%	0%	0%	17%	2	0%
Total number of answers	0%	1	11	10	0%	2	102	21	6	2	5

*Some of respondents noted several answers.

Table 16. Answers to question: "With whom do you share your hunting bag ?"

Year	2004	2004	2004	2005	2001	2004	2003	2003	2003	2004	2005	2003
Possible answers*:	**Enmelen**	**Inchoun**	**Lavrentia**	**Lorino**	**Neshkan**	**Novoe Chaplino**	**Nutepelmen**	**Pevek**	**Rytkuchi**	**Sireniki**	**Yanrakynnot**	**Yanranai**
I do not share my hunting bag with anybody	0%	54%	16%	10%	10%	20%	0%	36%	53.1%	24%	0%	56.3%
I share my hunting bag only with families of my relatives	59%	13%	36%	66.7%	50%	53%	50%	13%	15.6%	18%	88.2%	43.8%
I share my hunting bag with friends and neighbors	41%	33%	48%	31.7%	40%	27%	83.3%	51%	37.5%	58%	23.5%	18.8%
Total number of answers	34	24	25	60	84	15	18	100	32	33	17	16

*Some of respondents noted several answers.

Table 17. Answers to question: "Do you hunt more often or more rarely than you did 5-10 years ago?"

Year	2004	2004	2004	2005	2001	2004	2003	2003	2003	2004	2005	2003
Possible answers*:	**Enmelen**	**Inchoun**	**Lavrentia**	**Lorino**	**Neshkan**	**Novoe Chaplino**	**Nutepelmen**	**Pevek**	**Rytkuchi**	**Sireniki**	**Yanrakynnot**	**Yanranai**
More often	24%	29%	13%	17.2%	13.2%	7%	27.8%	27.2%	0%	10%	6.3%	6.3%
More rarely	27%	43%	57%	41.4%	23.6%	57%	44.4%	58.3%	43.8%	42%	43.8%	50%
The same	42%	19%	30%	32.8%	19.8%	21%	27.8%	14.6%	15.6%	39%	50%	18.8%
I do not know	6%	10%	0%	8.6%	14.2%	14%	0%	0%	40.6%	10%	0%	25%
Total number of answers	33	21	23	58	71	14	18	103	32	31	16	16

*Some of respondents noted several answers.

HUNTER ATTITUDE

Table 18. Answers to question: "Do you consider that birds (not only waterfowl) are:

Year	2004	2004	2004	2005	2004	2003	2003	2003	2004	2005	2003
Possible answers*:	**Enmelen**	**Inchoun**	**Lavrentia**	**Lorino**	**Novoe Chaplino**	**Nutepelmen**	**Pevek**	**Rytkuchi**	**Sireniki**	**Yanrakynnot**	**Yanranai**
only a food source	53%	33%	33%	25%	50%	41.2%	7.5%	9.3%	35%	16.7%	9.5%
part of nature	56%	62%	63%	73.3%	50%	52.9%	93.5%	44.2%	65%	83.3%	71.4%
beautiful thing for watching	3%	5%	4%	1.7%	0%	0%	3.7%	44.2%	0%	0%	19%
Other	0%	5%	0%	0%	6%	5.9%	0.9%	4.7%	0%	0%	4.8%
Total number of answers	34	21	24	60	16	17	107	43	37	18	21

*Some of respondents noted several answers

Table 19. What is your favorite bird? *

Year	2004	2004	2004	2005	2004	2004	2005
Possible answers:*	**Enmelen**	**Inchoun**	**Lavrentia**	**Lorino**	**Novoe Chaplino**	**Sireniki**	**Yanrakynnot**
Goose	17	9	14	39	1	7	5
Swan	3	2	2	9		6	1
Duck		2	5	2	2	3	1
Crane	2		1	4	2	5	0
Willow Grouse			3				
Eider	14	5	4	15	4	10	12
Eagle	1		1			4	
Long-tailed Duck							
Snowy Owl	1	1					
Others	1		1		1	1	2
All birds							2
Total number of answers	32	17	10	59	10	35	17

*Some of respondents noted several birds.

Table 20. Answers to question: "Do you consider hunting rules and periods when the hunt is permitted suitable for your district?"

Year	2004	2004	2004	2005	2001	2004	2003	2003	2003	2004	2005	2003
Possible answers*:	**Enmelen**	**Inchoun**	**Lavrentia**	**Lorino**	**Neshkan**	**Novoe Chaplino**	**Nutepelmen**	**Pevek**	**Rytkuchi**	**Sireniki**	**Yanrakynnot**	**Yanranai**
Yes	29%	21%	19%	20.7%	24.5%	38%	5.6%	21.7%	41.5%	58%	20%	23.5%
No	15%	11%	46%	15.5%	3.8%	38%	66.7%	26.4%	14.6%	6%	26.7%	35.3%
Partly	24%	32%	12%	31%	5.7%	8%	0%	50.9%	4.9%	3%	40%	11.8%
Difficult to answer	32%	37%	23%	32.8%	31.1%	15%	27.8%	0.9%	39%	33%	13.3%	29.4%
Total number of answers	34	19	26	58	69	13	18	106	41	36	15	17

*Some of respondents noted several answers.

EGG COLLECTING

Table 21. Number of active and incidental egg collectors* among respondents

Year	2004	2004	2004	2005	2004	2004	2002	2003	2003	2004	2005	2003
Settlement	**Enmelen**	**Inchoun**	**Lavrentia**	**Lorino**	**Neshkan**	**Novoe Chaplino**	**Nutepelmen**	**Pevek**	**Rytkuchi**	**Sireniki**	**Yanra-kynnot**	**Yanranai**
Total number of respondents that collected eggs	31	1	13	39	77	11	10	5	15	24	10	17
Number of active collectors (> 30 eggs)	26	0	4	20	59	9	5	1	7	16	7	16
% from total number of collectors	83.8%	0%	30.7%	51.2%	76.6%	81.8%	50%	20%	46.7%	66.6%	70%	94.1%
incl. indigenous people	25	X	3	18	58	9	4	1	6	15	7	14
%	96%	X	75%	90%	98.3%	100%	80%	100%	85.7%	94%	100%	87.5%
Incidental collectors (less than 30 eggs)	5	1	9	19	18	2	5	4	8	8	3	
Incl. indigenous	5	1	8	16	17	1				7	3	
%	100%	100%	89%	84.2%	94.4%	50%				88%	100%	

*Active collectors are those who collect eggs on purpose and harvest more than 30 eggs a year.

Table 22. Average number of collected eggs per person who went out egging.

22a. Active and incidental collectors together

Year	2005	2001	2003	2003	2003	2005	2003
Settlement	**Lorino**	**Neshkan***	**Nutepelmen**	**Pevek**	**Rytkuchi**	**Yanrakynnot**	**Yanranai**
Eiders	10	12.7/9.4	26.1	10.4	0	8.8	1
Geese	0.5	6.8/8.3	0.8	1.2	1.9	0	2.2
Ducks	0.6	9.9/13.1	0.5	2.2	1.4	0.8	1.1
Loons	0	2.7/1.3	0	0	0	0	0
Willow Grouse	0	4.2/2.6	0	0	3	1.8	2.1
Gulls and sea birds	29.79	38.2/16.5	8.2	60	6	32.6	140
Tundra Swan	0	0.4/0.7	0	0	11.5	0	1.3
Waders	0	0.6/4.6	0	0	0.1	0	0.5
Sandhill Crane	0.1	0.7/0	0	1	1.1	0.2	0
Snowy owl	0	0/0	0	0	0	0	0
Total number of eggs	41.13	76.1/56.5	35.6	74.8	25.1	44.2	148.1

*Adult collectors / adolescent (10-15 years) collectors.

22b. Active collectors (more than 30 eggs)

Year	2004	2004	2005	2004	2002	2003	2003	2004	2005	2003
Settlement	**Enmelen**	**Lavrentia**	**Lorino**	**N.Chaplino**	**Nutepelmen**	**Pevek**	**Rytkuchi**	**Sireniki**	**Yanrakynnot**	**Yanranai**
Eiders	12.8	11.8	13.5	53.2	44	35	0	0	12.6	1.2
Geese	10.8	1.3	0	0	0	6	3.1	0	0	1.6
Ducks	0.2	1.8	0.45	0.8	1	0	2.1	0	1.1	1.1
Loons	0.1	0	0	0	0	0	0	0	0	0
Willow Grouse	5.2	0	0	0	0	0	5.7	0	2.6	2.3
Gulls and sea birds	176.7	77.3	53	534.4	12	300	6.4	127	41.1	148.8
Tundra Swan	0	0	0	0	0	0	20.3	0	0	1.4
Waders	0	0	0	0	0	0	0.1	0	0	0.5
Sandhill Crane	0.2	0.5	0.2	0	0	2	1.9	0	0.3	0
Snowy owl	0	0	0	0	0	0	0	0	0	0
Total number of eggs	205.8	92.5	67.1	588,4	57	343	39.7	127	57.7	156.8

*Some of respondents noted several birds.

22c. Incidental collectors (less than 30 eggs)

Year	2002	2003	2005	2005	2003	2003
Settlement	**Nutepemen**	**Rytkuchi**	**Yanrakynnot**	**Lorino**	**Yanranai**	**Pevek**
Eiders	8.2	0	0	6.5	0	4.3
Geese	1.6	0.8	0	1.1	12	0
Ducks	0	0.8	0	0.8	0	2.8
Loons	0	0	0	0	0	0
Willow Grouse	0	0.8	0	0	0	0
Gulls and sea birds	4.4	5.8	12.7	5.4	0	0
Tundra Swan	0	3.9	0	0	0	0
Waders	0	0	0	0	0	0
Sandhill Crane	0	0.5	0	0	0	0.8
Snowy owl	0	0	0	0	0	0
Total number of eggs	14.2	12.4	12.7	13.8	12	7.8

Table 23. Number of eggs of different bird species harvested by collectors that responded to survey.

Year	2004	2004	2004	2005	2004	2004	2002	2003	2003	2004	2005	2003	
Species	**Enmelen**	**Inchoun**	**Lavrentia**	**Lorino**	**Neshkan**	**Novoe Chaplino**	**Nutepelmen**	**Pevek**	**Rytkuchi**	**Sireniki**	**Yanrakynnot**	**Yanranai**	**Total**
EIDERS	**339**	**0**	**144**	**392**	**1,293**	**489**	**261**	**52**	**0**	**0**	**88**	**0**	**3,058**
Common Eider	329	0	134	360	943	489	241	52	0	0	84	19	2,651
Spectacled Eider	0	0	0	15	59	0	0	0	0	0	0	0	74
King Eider	10	0	10	17	291	0	0	0	0	0	4	0	332
Steller's Eider	0	0	0	0	0	0	20	0	0	0	0	0	20
GEESE	**294**	**0**	**5**	**21**	**700**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,020**
Bean Goose	57	0	0	2	158	0	8	6	6	0	0	5	242
Greater WF Goose	22	0	0	2	40	0	0	0	0	0	0	0	64
Lesser WF Goose	0	0	0	0	0	0	0	0	0	0	0	0	0
Canada Goose	0	0	0	0	7	0	0	0	0	0	0	0	7
Brant	184	0	0	6	175	0	0	0	0	0	0	3	368
Emperor Goose	24	0	5	11	282	0	0	0	0	0	0	0	322
Snow Goose	0	0	0	0	16	0	0	0	0	0	0	0	16
Goose sp.	7	0	0	0		0	0	0	0	0	0	0	7
Unidentified goose		0			22		0	0	22	0	0	30	74
DUCKS	**4**	**0**	**14**	**25**	**945**	**12**	**0**	**0**	**0**	**0**	**8**	**0**	**1,008**
Pintail drake	0	0	7	0	512	7	0	0	0	0	8	3	537
Mallard	0	0	0	0		0	0	0	0	0	0	0	0
Shoveler	0	0	0	0	14	0	0	0	0	0	0	0	14
Teal	0	0	0	0		0	0	0	0	0	0	0	0
American Scooter	0	0	0	0		0	0	0	0	0	0	0	0
Red-breasted Merganser	0	0	0	0	5	0	0	0	0	0	0	0	5
Scaup	0	0	0	0		0	0	0	0	0	0	0	0
Tufted Duck	0	0	0	0		0	0	0	0	0	0	0	0
Long-tailed Duck	0	0	7	5	237	0	5	0	0	0	0	0	254
Harlequin	0	0	0	0	50	0	0	0	0	0	0	0	50

Duck													
White-winged Scooter	0	0	0	0		0	0	0	0	0	0	0	0
Unidentified Duck	4	0	0	20	127	5	0	11	21	0	0	15	203
LOONS	**2**	**0**	**1**	**0**	**232**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**235**
Yellow-billed Loon	0	0	0	0	44	0	0	0	0	0	0	0	44
Pacific/Black-throated L.	2	0	0	0	172	0	0	0	0	0	0	0	174
Red-throated Loon	0	0	1	0	16	0	0	0	0	0	0	0	17
WILLOW GROUSE	**136**	**0**	**0**	**0**	**362**	**0**	**0**	**0**	**46**	**0**	**18**	**36**	**598**
SEABIRDS & GULLS	**4,611**	**0**	**355**	**1,162**	**3,525**	**4,810**	**0**	**0**	**0**	**2,037**	**326**	**0**	**16,826**
Cormorant	378		72	20		397				20	8		895
Vega Gull	927	5	83	174	2,921	664	30	100	91	308	135	1,440*	5,438
Kittiwake	198	0	0	0	90	70	0	200	0	0	45	940*	603
Arctic Tern	48	0	0	0	122	0	0	0	0	0	0	0	170
Murre sp.	2,926	0	200	958	2	3,590	52	0	0	327	130	0	8,185
Gull sp.		0	0	0	390	0	0	0	0	0	0	0	390
Pigeon and Black Guillemots	0	0	0	10	0	0	0	0	0	128	0	0	138
Tufted and Horned Puffins	134	0	0	0	0	89	0	0	0	2	8	0	233
Fulmar	0	0	0	0	0	0	0	0	0	1,160	0	0	1,160
Crested Aucklet	0	0	0	0	0	0	0	0	0	92	0	0	92
Shotr-tailed Shearwater	0	0	0	0	0	0	0	0	0	0	0	0	0
SWAN sp.	**0**	**0**	**0**	**0**	**45**	**0**	**0**	**0**	**173**	**0**	**0**	**22**	**240**
WADERS	**0**	**0**	**0**	**0**	**47**	**0**				**0**	**0**		**47**
Big wader	0	0	0	0	11	0		0	1	0	0	0	12
Small wader	0	0	0	0	36	0	0	0	0	0	0	8	44
SANDHIL CRANE	**4**	**0**	**2**	**4**	**61**	**0**	**0**	**5**	**17**	**0**	**2**	**0**	**95**
SNOWY	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

OWL													
Total number of eggs	**5,390**	**5**	**521**	**1,604**	**7,210**	**5,311**	**2,051**	**374**	**377**	**2,037**	**442**	**2521**	**27,843**

* likely

Appendix 3. Tables for South Chukotka Surveys

HUNTERS AND THEIR FAMILIES

Table 1. Hunters covered by survey

Year	2005	2005	2003	
Settlement	**Alkatvaam**	**Khatyrka**	**Meinopylgino**	**Total**
Population number	326	328	466	1120
Number of indigenous people	283	286	383	952
% of population indigenous	87%	87%	82%	85%
Number of men of potential “hunter’s age”	103	119	156	378
% of hunters form men of potential "hunting age"	54%	50%	33%	65.5%
Number of hunters in the list	56	60	52	168
% of hunters surveyed	55.4%	73.3%	67%	32%
Number of hunters surveyed	31	44	35	110

Table 2. Sample structure

Year	2005	2005	2002
Settlement	**Alkatvaam**	**Khatyrka**	**Meinopylgino**
Indigenous hunters			
Less than 20 years, %	3%	7%	30.8%
20-29 years	7%	5%	30.8%
30-39 years	5%	11%	7.69%
40-49 years	6%	13%	15.4%
50-59 years	2%	1%	15.4%
> 60 years	0%	0%	0
Total number of indigenous hunters	23	37	13
% of indigenous hunters	82.1%	74%	48.1%
Non-indigenous hunters			
Total number of non-indigenous hunters	5	13	14
% of non-indigenous hunters	17.8%	26%	51.8%
Total number of hunters*	28	50	27

*Several hunters did not report their age or/and ethnicity.

Table 3. Hunters’ families

Year	2005	2005	2003
Settlement	**Alkatvaam**	**Khatyrka**	**Meinopylgino**
Indigenous hunters-respondents			
Average number of persons in family	3.75	4.44	4.4
Total number of responses	20	32	8
Average number of hunters in family	1.2	1.48	1.3
Total number of responses	20	25	8
Non-indigenous hunters-respondents			
Average number of persons in family	3.6	4.18	5.0
Total number of responses	5	11	14
Average number of hunters in family	1.4	1.45	1.3
Total number of responses	5	11	15

Table 4. Hunter experience

Year	2005	2005
Settlement	**Alkatvaam**	**Khatyrka**
Number of responses		
< 5 years	13	8
≥ 5 years	13	11
Total	26	19
% of respondents		
< 5 years	50%	42.1%
≥ 5 years	50%	57.9%
Total	100%	100%

Table 5. Intensity of hunting.

Year	2005	2003	2002
Settlement	**Alkatvaam**	**Khatyrka**	**Meinopylgino**
Average number of hunting days	10.9	6.8	6.7
Average number of shots	36.1	41.8	79.2
% of hunters that spent more than 7 days hunting	61.9%	21.9%	38.9%

Table 6. Harvest rate for eiders, geese and ducks, %.
(Number of hunters that harvested one or more bird/total number of hunters-respondents)

Year	2005	2005	2002
Settlement	**Alkatvaam**	**Khatyrka**	**Meinopylgino**
Hunters killed eiders:			
Indigenous	83.3%	65%	100%
Non-indigenous	16.7%	35%	78.6%
Hunters killed geese:			
Indigenous	81.5%	70.4%	76.9%
Non-indigenous	18.5%	29.6%	85.7%
Hunters killed ducks:			
Indigenous	88.9%	57.1%	69.2%
Non-indigenous	11.1%	42.9%	50%

HUNTING BAGS

Table 7. Average size (± SD) of harvest.

Year	2005			2005			2002		
Settlement	**Alkatvaam**			**Khatyrka**			**Meinopylgino**		
Eiders	3.64	±	0.63	2.40	±	0.49	4.63	±	0.99
Geese	4.68	±	0.81	3.98	±	0.66	8.63	±	1.72
Ducks	2.89	±	0.60	1.35	±	0.41	3.11	±	0.94
Loons	0.18	±	0.09	0.03	±	0.02	0.11	±	0.08
Willow Grouse	2.54	±	0.49	2.53	±	0.58	2.19	±	1.16
Gulls and sea birds	0.32	±	0.32	1.43	±	0.73	0.19	±	0.09
Tundra Swan	0	±	0	0	±	0	0.07	±	0.05
Waders	0	±	0	0	±	0	0.33	±	0.21
Sandhill Crane	0.43	±	0.13	0.23	±	0.11	0.74	±	0.21
Snowy owl	0	±	0	0.10	±	0.06	0	±	0
Total number of birds	14.68	±	1,.52	12.03	±	1.51	20.00	±	3.35

Table 8. Total number of harvested birds.

Number of birds harvested by hunter respondents					Total number of harvested birds calculated by extrapolation			
Year	**2005**	**2005**	**2002**		**2005**	**2005**	**2002**	
Settlement	**Alkatvaam**	**Khatyrka**	**Meinopylgino**	**Total**	**Alkatvaam**	**Khatyrka**	**Meinopylgino**	**Total**
Eiders	102	96	125	323	197	137	225	559
Geese	131	159	233	523	253	227	419	899
Ducks	81	54	84	219	156	77	151	384
Loons	5	1	3	9	10	1	5	16
Willow Grouse	71	101	59	231	137	144	106	387
Gulls and sea birds	9	57	5	71	17	81	9	107
Tundra Swan	0	0	2	2	0	0	4	4
Waders	0	0	9	9	0	0	16	16
Sandhill Crane	12	9	20	41	23	13	36	72
Snowy owl	0	4	0	4	0	6	0	6
Total number of birds	411	481	540	1,432	794	687	972	2,453

Table 9. Total number of harvested eiders calculated by extrapolation

Settlement	Alkatvaam	Khatyrka	Meinopylgino
Common Eider male	126	111	130
Common Eider hen	64	23	83
Spectacled Eider male	-	-	0
Spectacled Eider hen	-	-	0
King Eider male	-	1	0
King Eider hen	4	-	0
Steller's Eider male	4	1	11
Steller's Eider hen	-	-	2
Total	197	137	225

Table 10. Number of different bird species harvested by hunter respondents

Year	2005	2005	2003	
Species	**Alkatvaam**	**Khatyrka**	**Meinopylgino**	**Total**
EIDERS	102	96	125	198
Common Eider	65	78	72	215
Common Eider hen	33	16	46	95
Spectacled Eider	0	0	0	0
Spectacled Eider hen	0	0	0	0
King Eider	0	1	0	1
King Eider hen	2	0	0	2
Steller's Eider	2	1	6	9
Steller's Eider hen	0	0	1	1
GEESE	131	159	233	290
Bean Goose	25	24	6	55
Greater WF Goose	51	64	184	299
Lesser WF Goose	0	1	0	1
Canada Goose	2	0	0	2
Brant	14	2	18	34
Emperor Goose	7	17	15	39
Snow Goose	0	0	0	0
Goose sp.	32	51	10	93
DUCKS	81	54	84	135
Pintail drake	10	17	38	65
Pintail hen	4	5	24	33
Mallard	0	0	0	0
Shoveler	3	0	0	3
Teal	3	0	3	6
Baikal teal	1	0		1
American Black Scooter	0	1	1	2
Red-breasted Merganser	2	2	3	7
Scaup	13	2	4	19
Long-tailed Duck	11	12	1	24
Harlequin Duck	3	3	4	10
White-winged Scooter	4	1	4	9
Eurasian Wigeon	2	1		3
Unidentified Duck	25	10	2	37
LOONS	5	1	3	9
Yellow-billed Loon	0	0	1	1
Pacific/Black-throated L.	1	1	0	2
Red-throated Loon	4	0	2	6
WILLOW GROUSE	71	101	59	231
SEABIRDS & GULLS	9	57	7	73
Cormorant	0	0	1	1
Vega Gull	3	50	2	55
Kittiwake	0	7	2	9
Arctic Tern	0	0	0	0
Murre sp.	6	0		6
SWAN sp.	0	0	2	2
WADERS	0	0	9	9
Big wader	0	0	0	0
Small wader	0	0	9	9
SANDHIL CRANE	12	9	20	41
SNOWY OWL	0	4	0	4
Total number of birds	411	481	540	1,432

METHODS OF HUNTING

Table 11. Answers to question: "Where do you hunt?",%

Year	2005	2005	2003
Possible answers:*	**Alkatvaam**	**Khatyrka**	**Meinopylgino**
Near the village (or near your home)	41%	47%	10%
At a distance up to 15-20 km,	48%	29%	50%
Further than 15-20 km,	15%	29%	40%
Total number of answers	27	34	20

*Some respondents noted several answers.

Table 12. Answers to question: "What transport do you use when you are hunting?"

Year	2005	2005	2003
Possible answers: *	**Alkatvaam**	**Khatyrka**	**Meinopylgino**
Car	0%	0%	0%
Motorcycle	0%	0%	34.8%
Snowmobile	25%	64%	21.7%
Boat	10%	12%	0%
Caterpillar vehicle	25%	0%	2.7%
Dog team	10%	0%	4.3%
Does not use any transport	35%	28%	
Total number of answers	20	25	23

*Some respondents noted several means of transport.

Table 13. Answers to question: "Do you charge cartridges yourself?"

Year	2005	2005	2003
Possible answers:*	**Alkatvaam**	**Khatyrka**	**Meinopylgino**
Yes, all cartridges	40%	22%	62.5%
Most part of cartridges	32%	25%	20.8%
Only a few cartridges	16%	38%	0%
No	12%	16%	16.7%
Total number of answers	25	32	24

*Some respondents noted several answers.

The importance of hunt for local population

Table 14. Answers to question: "Is waterfowl hunting important for inhabitants of your settlement?"

Year	2005	2005	2003
Possible answers:*	**Alkatvaam**	**Khatyrka**	**Meinopylgino**
Yes, for all inhabitants,	52%	15%	62.5%
only for indigenous families	12%	23%	20.8%
only for several families	24%	46%	4.2%
hunting is not really important for anybody	8%	10%	12.5%
hunting is not important at all	4%	5.1%	0%
Total number of answers	25	39	24

*Some respondents noted several answers.

Table 15. Answers to question: "Are birds an important food source for your family?"

Year	2005	2005	2003
Possible answers:	**Alkatvaam**	**Khatyrka**	**Meinopylgino**
Indigenous hunters			
Yes	15%	20%	100%
No	40%	40%	0%
Only in spring and autumn	45%	40%	
Total number of answers	20	25	8
Non –indigenous hunters			
Yes	60%	10%	66.7%
No	20%	20%	33.3%
Only in spring and autum	20%	70%	
Total number of answers	5	10	15

*Some respondents noted several answers.

Table 16. Answers to question: "With whom do you share your hunting bag?"

Year	2005	2005	2003
Possible answers:*	**Alkatvaam**	**Khatyrka**	**Meinopylgino**
I do not share my hunting bag with anybody	12%	20%	21.7%
I share my hunting bag only with families of my relatives	72%	42.5%	69.6%
I share my hunting bag with friends and neighbors	40%	52.5%	47.8%
Total number of answers	25	40	23

*Some respondents noted several answers.

Table 17. Answers to question: "Do you hunt more often or more rarely than you did 5-10 years ago?"

Year	2005	2005	2003
Possible answers:*	**Alkatvaam**	**Khatyrka**	**Meinopylgino**
More often	8.7%	9.4%	19%
More rarely	52.2%	31.3%	23.8%
The same	39.1%	18.8%	52.4%
I do not know	0%	40.6%	4.8%
Total number of answers	23	32	21

*Some respondents noted several answers.

HUNTER ATTITUDE

Table 18. Answers to question: "Do you consider that birds (not only waterfowl) are:

Year	2005	2005	2003
Possible answers:*	**Alkatvaam**	**Khatyrka**	**Meinopylgino**
only a food source,	16%	9.1%	43.5%
part of nature	80%	72.7%	47.8%
beautiful thing for watching	8%	15.9%	0%
Other	0%	2.3%	8.7%
Total number of answers	25	44	23

*Some respondents noted several answers.

Table 19. What is your favorite bird?

Year	2005	2005
Possible answers:	**Alkatvaam**	**Khatyrka**
Goose	12	14
Swan	7	4
Duck	1	1
Crane	2	2
Willow Grouse	0	3
Eider	3	5
Gull	0	5
Others	2	8
Total number of answers	20	41

*Some of respondents noted several birds.

Table 20. Answers to question: "Do you consider hunting rules and periods when the hunt is permitted suitable for your district?"

Year	2005	2005	2003
Possible answers:	**Alkatvaam**	**Khatyrka**	**Meinopylgino**
Yes	58.3%	54.1%	69.6%
No	16.7%	18.9%	8.7%
Partly	12.5%	5.4%	13.0%
Difficult to answer	12.5%	21.6%	8.7%
Total number of answers	24	37	23

EGG COLLECTING

Table 21. Number of active and incidental egg collectors* among respondents.

Year	2005	2005	2002
Settlement	**Alkatvaam**	**Khatyrka**	**Meinopylgino**
Total number	15	36	20
Active collectors (more than 30 eggs)	5	22	15
Incl. indigenous	5	17	6
%	100%	77.3%	40%
Incidental collectors (less than 30 eggs)	10	14	5
Incl. indigenous	10	11	4
%	100%	78.6%	80%

*Active collectors are those who collect eggs on purpose and harvest more than 30 eggs a year.

Table 22. Average number of eggs collected per person by active and incidental collectors.

22.1. Active and incidental collectors together

Year	**2005**			**2005**			**2002**		
Settlement	**Alkatvaam**			**Khatyrka**			**Meinopylgino**		
Eiders	3.1	±	1.1	3.4	±	1.5	12.0	±	2.3
Geese	4.0	±	1.5	0.1	±	0.1	0.7	±	0.7
Ducks	3.5	±	1.5	0.2	±	0.2	0.6	±	0.4
Loons	0	±	0	0	±	0	0	±	0
Willow Grouse	0	±	0	0.5	±	0.3	0.2	±	0.2
Gulls and sea birds	18.7	±	9.2	71.6	±	23.9	89.0	±	20.6
Tundra Swan	0	±	0	0	±	0	0	±	0
Waders	0	±	0	0	±	0	0	±	0
Sandhill Crane	0	±	0	0	±	0	0	±	0
Snowy owl	0	±	0	0	±	0	0	±	0
Total number of eggs	29.3	±	9.0	75.9	±	23.7	102.5	±	21.0

22.2. Average number of eggs harvested per active collector (> 30 eggs)

Year	**2005**			**2005**			**2002**
Settlement	**Alkatvaam**			**Khatyrka**			**Meinopylgino**
Eiders	4.2	±	2.63	3.59	±	1.81	14.7
Geese	8.2	±	3.40	0	±	0	0.9
Ducks	6.6	±	3.64	0	±	0	0.4
Loons	0	±	0	0	±	0	0
Willow Grouse	0	±		0.45	±	0.44	0.3
Gulls and sea birds	46.0	±	22.91	110.68	±	36.68	115.7
Tundra Swan	0	±	0	0	±	0	0
Waders	0	±	0	0	±	0	0
Sandhill Crane	0	±	0	0	±	0	0
Snowy owl	0	±	0	0	±	0	0
Total number of eggs	65.0	±	18.06	114.73	±	36.48	132.1

22.3. Average number of eggs harvested per incidental collector (< 30 eggs)

Year	**2005**			**2005**			**2002**
Settlement	**Alkatvaam**			**Khatyrka**			**Meinopylgino**
Eiders	2.5	±	1.0	3.1	±	1.5	3.8
Geese	1.9	±	0.7	0.3	±	0.3	0
Ducks	2.0	±	0.9	0.5	±	0.5	1.2
Loons	0	±	0	0	±	0	0
Willow Grouse	0	±	0	0.6	±	0.5	0
Gulls and sea birds	5.0	±	1.6	10.3	±	2.5	8.8
Tundra Swan	0	±	0	0	±	0	0
Waders	0	±	0	0	±	0	0
Sandhill Crane	0	±	0	0	±	0	0
Snowy owl	0	±	0	0	±	0	0
Total number of eggs	11.4	±	2.6	14.9	±	2.2	13.8

Table 23. Number of eggs of different bird species harvested by collectors that responded to survey.

NUMBER OF EGGS HARVESTED BY COLLECTOR RESPONDENTS				
Year			**2002**	
Species	**Alkatvaam**	**Khatyrka**	**Meinopylgino**	**Total**
EIDERS	**46**	**123**	**240**	**409**
Common Eider	46	123	240	409
Steller's Eider	0	0	0	0
GEESE	**60**	**5**	**14**	**79**
Bean Goose	9	0	0	9
Greater WF Goose	40	5	9	54
Brant	0	0	0	0
Emperor Goose	11	0	5	16
Unidentified goose	0	0	0	0
DUCKS	**53**	**7**	**12**	**72**
Pintail	7	7	0	14
Long-tailed Duck	0	0	6	6
Unidentified duck	46	0	6	52
WILLOW GROUSE	0	18	5	23
SEABIRDS	**280**	**2,579**	**1,780**	**4,639**
Cormorants	0	64		64
Vega Gull	280	2,114	1,774	4,168
Kittiwake	0	360	0	360
Arctic Tern	0	0	6	6
Murre sp.	0	41	0	41
SWANS sp	**0**	**0**	**0**	**0**
WADERS	**0**	**0**	**0**	**0**
“Big wader”	0	0	0	0
“Small wader”	0	0	0	0
Sandhill CRANE	**0**	**0**	**0**	**0**
Total number of eggs	**439**	**2,732**	**2,051**	**5,222**

Appendix 4. Tables for Yakutia Surveys

HUNTERS AND THEIR FAMILIES

Table 1. **Hunters covered by survey**

Year	**2003**	**1999**	**1999**	**2005**	**2003**	**1999**	**2005**	
Settlement	**Andriushkino**	**Chokurdakh**	**Indigirka Delta**	**Kazach'e**	**Pokhodsk**	**Russkoe Ustie**	**Ust-Yansk**	**Total**
Population number	835	3,200	300	1,552	242	200	340	2,969
Number of indigenous people	607	X	X	1,179	229	X	304	2,319
% of indigenous population	72%	X	X	76%	95%	X	89	78.1%
Number of men of potential "hunter's age" , persons	243	X	X	518	83	X	140	984
% of hunters form men of potential "hunting age"	68%	X	X	47.7%	65%	X	75.7%	33.1%
Number of hunters in the list	166	406	39	247	54	66	106	573
Number of hunters surveyed	42	19	15	42	35	34	33	152
% of hunters surveyed	25%	5%	38%	17%	65%	52%	31.1%	26.5%

*Excluded of calculation and extrapolation as the number of good questionnaires is not enough.

Table 2. Sample structure.

Year	**2003**	**2005**	**2003**	**2005**
Settlement	**Andriushkino**	**Kazach'e**	**Pokhodsk**	**Ust-Yansk**
Indigenous hunters				
Less than 20 years	6%	8.8%	7%	10.7%
20-29 years	12%	29.4%	20%	17.8%
30-39 years	12%	26.4%	27%	35.7%
40-49 years	39%	14.7%	27%	25%
50-59 years	21%	8.8%	7%	3.5%
> 60 years	9%	5.8%	13%	0%
Total number of indigenous hunters	33	33	30	26
% of indigenous hunters	100%	97%	100%	92.8%
Non-indigenous hunters				
Total number of non-indigenous hunters	0	1	0	2
% of non-indigenous hunters	0%	3%	0%	7.2%
Total number of hunters*	33	34	30	28

*Several hunters did not report their age or/and ethnicity.

Table 3. Hunters' families.

Year	2003	2005	2003	2005	
Settlement	**Andriushkino**	**Kazach'e**	**Pokhodsk**	**Ust-Yansk**	**Total**
Indigenous hunters-respondents					
Average number of persons in family	5.3	4.33	4.5	4.85	
Total number of responses	33	33	30	26	122
Average number of hunters in family	1.9	1.72	1.6	1.85	
Total number of responses	33	32	29	26	120
Non-indigenous hunters-respondents					
Average number of persons in family		7		5.5	
Total number of responses		1		2	3
Average number of hunters in family		1		2.5	
Total number of responses		1		2	3

Table 4. Hunter experience

Year	2003	2005	2003	2005
Settlement	**Andriushkino**	**Kazach'e**	**Pokhodsk**	**Ust-Yansk**
Number of respondents				
< 5 years	2	2	1	2
≥ 5 years	29	29	25	26
Total	31	31	26	28
% of respondents				
< 5 years	6%	6.5	4%	7.1
≥ 5 years	94%	93.5	96%	92.9
Total	100%	100%	100%	100%

Table 5. Intensity of hunting.

Year	2003	2005	2003	2005
Settlement	**Andriushkino**	**Kazach'e**	**Pokhodsk**	**Ust-Yansk**
Average number of hunting days	9.4	9.9	11.2	10.9
Average number of shots	106	112.6	98	144.4
% of hunters that spent more than 7 days hunting	50%	44.1%	55%	46.4%

Table 6. Ratio of hunters that harvested at least one eider, goose or duck to total number of active hunters-respondents (%)

Year	2003	2005	2003	2005
Settlement	**Andriushkino**	**Kazach'e**	**Pokhodsk**	**Ust-Yansk**
Hunters killed eiders:				
Indigenous ,%	24%	100 %	53%	91.3%
Non-indigenous ,%	X	0%	X	8.7%
***Hunters killed geese**:*				
Indigenous , %	94%	95.5%	83%	91.7%
Non-indigenous ,%	X	4.5%	X	8.3%
Hunters killed ducks:				
Indigenous , %	97%	97.1%	90%	92.9%
Non-indigenous ,%	X	2.9%	X	7.1%

HUNTING BAGS

Table 7. Average (± SD) harvest

Year	2003			2005			2003			2005		
Settlement	**Andriushkino**			**Kazach'e**			**Pokhodsk**			**Ust-Yansk**		
Eiders	1.9	±	1.2	11.3	±	2.4	6.8	±	1.9	26.4	±	4.3
Geese	12.0	±	1.7	4.4	±	0.5	7.9	±	1.6	10.5	±	2.3
Ducks	29.7	±	3.2	48.3	±	3.2	22.1	±	3.6	27.9	±	3.3
	0.8	±	0.4	2.0	±	0.2	2.3	±	0.6	1.3	±	0.6
Willow Grouse	6.5	±	3.5	0.5	±	0.2	9.4	±	2.7	2.8	±	1.4
Gulls and sea birds	0	±	0	0.3	±	0.1	0.6	±	0.4	0.2	±	0.9
Tundra Swan	0	±	0	0.3	±	0.1	2.3	±	0.7	0.3	±	0.1
Waders	0	±	0	1.8	±	0.6	0.4	±	0.4	0.3	±	0.3
Sandhill Crane	0	±	0	0	±	0	0.2	±	0.1	0	±	0
Snowy owl	0	±	0	0	±	0	0	±	0	0	±	0
Total number of birds	50.9	±	6.0	68.8	±	3.8	51.9	±	8.3	69.8	±	7.6

Table 8. Number of birds harvested by hunter respondents

Year	2003	2005	2003	2005	
Settlement	**Andriushkino**	**Kazach'e**	**Pokhodsk**	**Ust-Yansk**	**Total**
Eiders	62	215	203	738	1,218
Geese	396	83	238	293	1,010
Ducks	980	917	664	780	3,341
Loons	28	39	68	37	172
Willow Grouse	214	9	282	79	584
Gulls and sea birds	0	6	17	7	30
Tundra Swan	0	6	68	9	83
Waders	0	33	12	9	54
Sandhill Crane	0	0	6	0	6
Snowy Owl	0	0	0	0	0
Total number of birds	1,680	1,308	1,558	1,952	6,498

Table 8a. Total number of harvested birds calculated by extrapolation.

Year	2003	1999	1999	2005	2003	1999	2005	
Settlement	**Andriushkino**	**Chokurdakh**	**Indigirka Delta**	**Kazach'e**	**Pokhodsk**	**Russkoe Ustie**	**Ust-Yansk**	**Total**
Eiders	298	859	2,519	1,360	333	2,194	2,445	10,008
Geese	1,884	671	558	525	387	723	971	5,719
Ducks	4,663	552	484	5,799	1,083	247	2,584	15,412
Loons	126	0	0	247	113	0	123	609
Willow Grouse	1,020	0	0	57	460	0	262	1,799
Gulls and sea birds	0	0	0	38	29	0	23	90
Tundra Swan	0	63	23	38	113	16	30	283
Waders	0	0	0	209	19	0	30	258
Sandhill Crane	0	0	0	0	10	0	0	10
Snowy Owl	0	0	0	0	0	0	0	0
Total number of birds	7,991	2,145	3,584	8,271	2,547	3,180	6,466	47,180

Table 9. Total number of harvested eiders.

Year	2003	1999	1999	2005	2003	1999	2005	
Settlement	**Andriushkino**	**Chokurdakh**	**Indigirka Delta**	**Kazach'e**	**Pokhodsk**	**Russkoe Ustie**	**Ust-Yansk**	**Total**
Common Eider male	0	0	0	0	0	0	0	0
Common Eider female	0	0	0	0	0	0	0	0
Spectacled Eider male	95	291	1240	19	51	1,096	99	3,067
Spectacled Eider female	57			25	8		86	
King Eider male	86	164	417	417	95	487	712	3,397
King Eider female	48			297	5		669	
Steller's Eider male	10	404	862	443	165	611	467	3,539
Steller's Eider female	0			158	8		411	
Total number of Eiders	296	859	2,519	1,360	332	2,194	2,445	10,005

Table 10. Number of different bird species harvested by hunter respondents

Year	2003	2005	2003	2005	
Settlement	**Andriushkino**	**Kazach'e**	**Pokhodsk**	**Ust-Yansk**	**Total**
EIDERS	**62**	**215**	**203**	**738**	**1,218**
Common Eider male	0	0	0	0	0
Common Eider female	0	0	0	0	0
Spectacled Eider male	20	3	31	30	84
Spectacled Eider female	12	4	5	26	47
King Eider male	18	66	58	215	357
King Eider female	10	47	3	202	262
Steller's Eider male	2	70	101	141	314
Steller's Eider female	0	25	5	124	154
GEESE	**396**	**83**	**238**	**293**	**1,010**
Bean Goose	263	33	103	83	482
Greater WF Goose	72	26	45	76	219
Lesser WF Goose	20	12	8	13	53
Canada Goose	0	0	7	0	7
Brant	10	12	74	121	217
Emperor Goose	0	0	0	0	0
Snow Goose	0	0	1	0	1
Goose sp	31	0	0	0	31
DUCKS	**980**	**917**	**664**	**780**	**3,341**
Pintail drake	153	101	86	152	492
Pintail female	19	64	19	110	212
Mallard	2	3	0	2	7
Shoveler	16	3	31	2	52
Teal	21	33	99	43	196
Baikal Teal	10	18	0	18	46
American Black Scooter	0	11	0	13	24
White-winged Scooter	133	228	31	116	508
Red-breasted Merganser	0	11	3	9	23
Scaup	118	113	90	57	378
Tufted Duck	0	20	4	7	31
Long-tailed Duck	470	301	301	245	1317
Harlequin Duck	0	0	0	0	0
Unidentified Duck	38	11	0	6	55
LOONS	**28**	**39**	**68**	**37**	**172**
Yellow-billed Loon	4	3	6	10	23
Pacific/Black-throated L.	13	33	61	17	124
Red-throated Loon	11	3	1	10	25
WILLOW GROUSE	**214**	**9**	**282**	**79**	**584**
SEABIRDS & GULLS	**0**	**6**	**17**	**7**	**30**
Cormorant	0	0	0	0	0
Vega Gull	0	5	6	4	15
Kittiwake	0	0	0	0	0
Arctic Tern	0	0	9	0	9
Ross's Gull	0	1	2	3	6

Murre sp.	0	0	0	0	0
Pigeon Gullemot & Black Guleemot	0	0	0	0	0
Tufted and Horned Puffins	0	0	0	0	0
Fulmar	0	0	0	0	0
Created Aucklet	0	0	0	0	0
Short-tailed Shearwater	0	0	0	0	0
SWAN sp.	**0**	**6**	**68**	**9**	**83**
WADERS (in total)	**0**	**33**	**12**	**9**	**54**
Big wader	0	2	12	0	14
Small wader	0	31	0	9	40
SANDHIL CRANE	**0**	**0**	**6**	**0**	**6**
SNOWY OWL	**0**	**0**	**0**	**0**	**0**
Total	**1,680**	**1,308**	**1,490**	**1,952**	**6,430**

HUNTING METHODS

Table 11. Answers to question: "Where do you hunt?"

Year	**2003**	**2005**	**2003**	**2005**
Possible answers*:	**Andriushkino**	**Kazach'e**	**Pokhodsk**	**Ust'Yansk**
Near the village (or near your home)	14%	29%	18%	11%
At a distance up to 15-20 km	45%	29%	36%	18%
Further than 15-20 km	41%	47%	57%	79%
Total number of answers	29	34	28	28

*Some respondents noted several answers.

Table 12. Answers to question: "What transport do you use when you are hunting?"

Year	**2003**	**2005**	**2003**	**2005**
Possible answers*:	**Andriushkino**	**Kazach'e**	**Pokhodsk**	**Ust'Yansk**
Car	0%	13%	0%	3.8%
Motorcycle	0%	0%	0%	0%
Snowmobile	35%	10%	70%	50%
Boat	32%	73%	90%	96%
Caterpillar vehicle	0%	0%	0%	0%
Dog team	0%	0%	0%	0%
Does not use any transport	29%	10%	0%	0%
Total number of answers	31	30	30	26

*Some respondents noted several answers.

Table 13. Answers to question: "Do you charge cartridges yourself?"

Year	2003	2005	2003	2005
Possible answers*:	**Andriushkino**	**Kazach'e**	**Pokhodsk**	**Ust'Yansk**
Yes, all cartridges,	7%	5.9%	7%	3.6%
Most part of cartridges	0%	0%	23%	3.6%
Only a few cartridges	30%	12%	17%	3.6%
No	63%	82%	53.5	89%
Total number of answers	30	34	30	28

*Some respondents noted several answers.

The importance of hunt for local population

Table 14. Answers to question: "Is waterfowl hunting important for inhabitants of your settlement?"

Year	2003	2005	2003	2005
Possible answers*:	**Andriushkino**	**Kazach'e**	**Pokhodsk**	**Ust'Yansk**
Yes, for all inhabitants	87%	41%	77%	79%
only for indigenous families	10%	38%	10%	21%
only for several families	0%	0%	7%	0%
hunting is not really important for anybody	3%	21%	7%	0%
hunting is not important at all	0%	0%	0%	0%
Total number of answers	31	34	30	28

*Some respondents noted several answers.

Table 15. Answers to question: "Are birds an important food source for your family?"

Year	2003	2005	2003	2005
Possible answers*:	**Andriushkino**	**Kazach'e**	**Pokhodsk**	**Ust'Yansk**
Indigenous hunters				
Yes	30%	45.5%	70%	46.2%
No	6%	3%	10%	3.8%
Only in spring and autumn	58%	5.5%	20%	50%
Total number of answers	33	33	30	26
Non –indigenous hunters				
Yes		0%		0%
No		0%		0%
Only in spring and autumn		100%		100%
Total number of answers		1		2

*Some respondents noted several answers.

Table 16. Answers to question: "With whom do you share your hunting bag ?"

Year	2003	2005	2003	2005
Possible answers*:	**Andriushkino**	**Kazach'e**	**Pokhodsk**	**Ust'Yansk**
I do not share my hunting bag with anybody	0%	0%	7%	3.6%
I share my hunting bag only with families of my relatives	48%	87.1%	27%	89.3%
I share my hunting bag with friends and neighbors	52%	64.5%	67%	71.4%
Total number of answers	33	31	30	28

*Some respondents noted several answers.

Table 17. Answers to question: "Do you hunt more often or more rarely than you did 5-10 years ago?"

Year	2003	2005	2003	2005
Possible answers*:	**Andriushkino**	**Kazach'e**	**Pokhodsk**	**Ust'Yansk**
More often	3%	21.9%	13%	22.2%
More rarely	35%	40.6%	43%	29.6%
The same	61%	31.3%	43%	48.1%
I do not know	0%	6.3%	0%	0%
Total number of answers	31	32	30	27

*Some respondents noted several answers.

HUNTERS ATTITUDE

Table 18. Answers to question: "Do you consider that birds (not only waterfowl) are:

Year	2003	2005	2003	2005
Possible answers*:	**Andriushkino**	**Kazach'e**	**Pokhodsk**	**Ust'Yansk**
only a food source	30%	21.9%	37%	17.9%
part of nature	76%	78.1%	60%	82.1%
beautiful thing for watching	0%	0%	13%	0%
Other	0%	3.1%	3%	0%
Total number of answers	33	32	30	28

*Some respondents noted several answers.

Table 19. What is your favorite bird? *

Year	2003	2005	2003	2005
Possible answers*:	**Andriushkino**	**Kazach'e**	**Pokhodsk**	**Ust'Yansk**
Goose	7	8	10	6
Swan	2	2	4	3
Duck	4	14	0	3
Crane	0	2	0	2
Willow Grouse	0	0	0	0
Eider	0	8	4	15
Gull	0	2	0	3
Eagle	0	0	1	0
Scoter	10	0	2	0
Ross Gull	3	0	0	0
Siberian Crane	2	0	0	0
Long-tailed Duck	1	0	4	0
Snowy Owl	1	0	0	0
Others	2	0	2	0
Total number of answers	28	32	26	28

*Some respondents noted several answers.

Table 20. Answers to question: "Do you consider hunting rules and periods when the hunt is permitted suitable for your district?"

Year	2003	2005	2003	2005
Possible answers*:	**Andriushkino**	**Kazach'e**	**Pokhodsk**	**Ust'Yansk**
Yes	88%	35.3%	57%	35.7%
No	6%	29.4%	23%	35.7%
Partly	3%	23.5%	13%	17.9%
Difficult to answer	3%	11.8%	7%	10.7%
Total number of answers	33	34	30	28

*Some respondents noted several answers

EGG COLLECTING

Table 21. Number of active and incidental egg collectors* among respondents

Year	2003	2005	2003	2005
Settlement	**Andriushkino**	**Kazach'e**	**Pokhodsk**	**Ust'Yansk**
Total number of respondents that collected eggs	7	5	6	19
Active collectors (more than 30 eggs)	2	1	2	12
Incl. indigenous	2	1	2	10
%	100%	100%	100%	83.3%
Incidental collectors (less than 30 eggs)	5	4	4	7
Incl. indigenous	5	4	4	7
%	100%	100%	100%	100%

*Active collectors are those who collect eggs on purpose and harvest more than 30 eggs a year.

Table 22. Average number of collected eggs per person who went out egging.

22a. Active and incidental collectors together

Year	2003			2005			2005		
Settlement	**Andriushkino**			**Kazach'e**			**Ust'Yansk**		
Eiders	0	±	0	2.0	±	1.8	11.5	±	3.5
Geese	3.3	±	0.9	0.6	±	0.5	3.5	±	1.4
Ducks	5.0	±	2.0	2.0	±	0.8	6.3	±	3.2
Loons	0.6	±	0.4	0	±	0	0.4	±	0.2
Willow Grouse	7.3	±	3.2	2.6	±	2.3	1.3	±	0.9
Gulls and sea birds	0	±	0	4.0	±	3.6	21.1	±	4.5
Tundra Swan	1.6	±	1.0	0	±	0	0.9	±	0.4
Waders	0.7	±	0.7	1.6	±	1.4	0	±	0
Sandhill Crane	0.3	±	0.3	0	±	0	0	±	0
Snowy owl	0	±	0	0	±	0	0	±	0
Total number of birds	18.7	±	5.6	12.8	±	4.9	45.2	±	6.8

22b. Active collectors (more than 30 eggs)

Year	2003			2005			2005		
Settlement	**Pokhodsk**			**Kazach'e**			**Ust'Yansk**		
Eiders	0	±	0	10	±	0	17	±	4.9
Geese	0	±	0	0	±	0	4.5	±	2.1
Ducks	0	±	0	0	±	0	9.6	±	4.7
Loons	0	±	0	0	±	0	0.5	±	0.3
Willow Grouse	0	±	0	0	±	0	2.1	±	1.3
Gulls and sea birds	35	±	3.5	20	±	0	27.5	±	6.2
Tundra Swan	5	±	3.5	0	±	0	0.9	±	0.5
Waders	0	±	0	0	±	0	0	±	0
Sandhill Crane	0	±	0	0	±	0	0	±	0
Snowy owl	0	±	0	0	±	0	0	±	0
Total number of birds	40	±	0	30	±	0	62.1	±	7.0

22c. Incidental collectors (less than 30 eggs)

Year	2003			2005			2005		
Settlement	Pokhodsk			Kazach'e			Ust'Yansk		
Eiders	0	±	0	0	±	0	2.1	±	1.3
Geese	0	±	0	0.7	±	0.6	1.9	±	1.1
Ducks	3.5	±	1.9	2.5	±	0.9	0.7	±	0.7
Loons	0	±	0	0	±	0	0.3	±	0.3
Willow Grouse	2.8	±	2.4	3.2	±	2.8	0	±	0
Gulls and sea birds	0.8	±	0.6	0	±	0	10.1	±	2.7
Tundra Swan	5.3	±	2.2	0	±	0	1.0	±	0.6
Waders	0	±	0	2	±	1.7	0	±	0
Sandhill Crane	0	±	0	0	±	0	0	±	0
Snowy owl	0	±	0	0	±	0	0	±	0
Total number of birds	12.3	±	3.5	8.5	±	3.8	16.1	±	1.1

Table 23. Number of eggs of different bird species harvested by collectors that responded to survey.

Year	2003	2005	2003	2005	
Species	**Andriushkino**	**Kazach'e**	**Pokhodsk**	**Ust'Yansk**	**Total**
EIDERS	**0**	**10**	**0**	**219**	**229**
Common Eider	0	0	0	0	0
Spectacled Eider	0	0	0	10	10
King Eider	0	10	0	145	155
Steller's Eider	0	0	0	64	64
Steller's Eider hen	0	0	0	0	0
GEESE	**23**	**3**	**0**	**67**	**93**
Bean Goose	0	0	0	10	10
Greater WF Goose	0	0	0	13	13
Lesser WF Goose	0	0	0	0	0
Canada Goose	0	0	0	0	0
Brant	0	3	0	39	42
Emperor Goose	0	0	0	0	0
Snow Goose	0	0	0	0	0
Goose sp.	23	0	0	5	28
DUCKS	**35**	**10**	**14**	**120**	**179**
Pintail drake	9	5	2	10	26
Mallard	0	0	0	0	0
Shoveler	0	0	0	0	0
Teal	0	3	0	0	3
American Scooter	0	0	0	0	0
Red-breasted Merganser	0	0	0	0	0
Scaup	0	0	0	0	0
Tufted Duck	9	0	0	0	9
Long-tailed Duck	13	2	0	30	45
Harlequin Duck	0	0	0		0
White-winged Scooter	0	0	0	10	10
Unidentified Duck	13	0	12	70	95
LOONS	**4**	**0**	**0**	**8**	**12**
Yellow-billed Loon		0	0	0	0
Pacific/Black-throated L.	4	0	0	3	7
Red-throated Loon		0	0	5	5
WILLOW GROUSE	**51**	**13**	**11**	**25**	**100**
SEABIRDS & GULLS	**0**	**20**	**73**	**401**	**494**
Pelagic Cormorant	0	0	0	0	0
Vega Gull	0	20	70	340	430
Kittiwake	0	0	0		0
Arctic Tern	0	0	0	21	21
Ross's Gull	0	0	3	40	43
Murre sp.	0	0	0	0	0
Pigeon and Black Guillemots	0	0	0	0	0
Tufted and Horned Puffins	0	0	0	0	0
Fulmar	0	0	0	0	0
Crested Aucklet	0	0	0	0	0
Shotr-tailed Shearwater	0	0	0	0	0
SWAN sp.	**11**	**0**	**31**	**18**	**60**
WADERS	**5**	**8**	**0**	**0**	**13**
Big wader	0	0	0	0	0
Small wader	5	0	0	0	5
SANDHIL CRANE	**2**	**0**	**0**	**0**	**2**
SNOWY OWL	**0**	**0**	**0**	**0**	**0**
Total	**131**	**64**	**129**	**858**	**1,182**