



**Assessing Hunting Pressure on Common Eiders in Chukotka,
Russia, SDJV Project # 164, Agreement F21AC01463
Final Report**



Konergino village, one of the surveyed settlements.

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Summary

The aim of this project was to assess hunting pressure on eiders and other waterbirds to inform effective strategies for their conservation and sustainable use. The northeastern part of Chukotka was chosen because the bird hunting survey conducted there in 2001-2006 (Syroechkovsky, Klovov, 2010) showed that most hunting took place in Chukotskii Autonomous District i.e., at the northeastern part of Chukotka peninsula.

The survey was conducted using the anonymous questionnaire method. Each questionnaire was filled in by one household member for the whole household, i.e. a family living together in an apartment or a house. A questionnaire included a table with 46 color pictures of bird species that can be hunted or whose eggs can be collected. For each species, the respondent was asked to report the number of birds hunted and eggs collected by all members of the household in the last year. Households were sampled randomly or quasi-randomly, allowing confidence intervals to be calculated for estimates of the number of birds harvested ($p=0.95$). A total of 608 completed questionnaires were received from 10 localities in the Iultinskii, Providenskii and Chukotskii districts of the Chukotskii Autonomous Okrug.

Estimates of annual eider harvesting were obtained for four species of eider, seven species of geese, Northern Pintail, Ptarmigan and Sandhill Crane. Together these species represent 90% of the total number of all birds harvested (27300 ± 6000). All eider species accounted for 27% of the total number of harvested birds.

For 4 eider species, during the year (fall 2022 – summer 2023) the following species were harvested: Common Eider – 3100 (CI 2100-4200), King Eider – 3000 (CI 1200 – 4800), Spectacled Eider – 1100 (CI 500-1800), Steller's Eider – 100 (CI <300). The total take of all eider species was 7500 (CI 4600 – 10400). The number of eggs of all eider species collected in 2023 was 6900 (CI 4600 – 9200).

The estimates of other harvested birds were 11400 geese (CI 9500 – 13400), 2400 Northern Pintails (CI 1400 – 3400); 2000 Ptarmigans (CI 1700 – 2600); 1400 Sandhill Cranes (CI 1000 – 1800). Three species of geese accounted for 77% of the geese harvested: Bean Goose, Emperor Goose and Greater White-fronted Goose. The total number of harvested birds was estimated as 27300 (CI 21300 – 33300). The total number of collected eggs was estimated as 16900 (CI 12600 – 21100), 41% of all collected eggs were Great Gull eggs, 16% – Eider eggs.

We estimated that about 37% of households hunted birds, and about 27% collected wild bird eggs. There was no trade in harvested birds and eggs, but giving some of the harvested birds and eggs to relatives and friends was common. Eider deaths because of fishing nets were insignificant, and eider down was used only rarely.

The total number of eggs collected for all bird species was estimated as 16900 (CI 12600 – 21100), of which 41% were eggs of large gulls and 16% were eggs of eiders. The total number of collected eider eggs (all species) was 6900 (CI 4600 – 9200).

The majority of eiders were harvested in the settlements of Chukotskii District. Average eider harvest per hunter gradually increased along the Bering Sea coast towards the North. The average geese harvest is changing in the opposite direction.

Comparison of the 2023 survey data with data from surveys conducted in the same areas in 2001-2006 revealed that the number of bird hunters has decreased significantly between surveys, as has

the average hunting bag per hunter for most bird species. Consistent with these broader results, the average harvest of Steller's, Spectacled and Common Eider declined significantly. In general, the proportion of eiders among all harvested birds decreased, while the proportion of geese became greater than before. The proportion of Steller's Eider among all harvested eiders markedly decreased, the share of Common Eider slightly decreased; and the proportion of King Eider increased a little while Spectacled Eider's share remain the same. In addition, the proportion of Brant and Long-tailed Duck decreased strongly and the shares of Bean Goose, Greater White-fronted Goose and Snow Goose, in opposite, considerably increased.

Overall our findings demonstrate that the importance of bird hunting for local people has declined since the first survey two decades prior. In part, this is due to decreased opportunities for local people to hunt birds because obtaining permission to own hunting weapons has become more challenging. Thus, the pressure of eider hunting has decreased significantly in this region.

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INTRODUCTION

The impact of hunting pressure on animal populations is one of the key parameters that must be assessed to develop an effective strategy for the conservation or sustainable use of target species. The most common method of hunting impact assessment in Russia is the analysis of hunting permits (Gusakov 2002; Molochaev 2002; Blokhin 2004; Solokha, Gorokhovskiy 2015, 2018; Solokha, Blokhin 2023). A major disadvantage of this method is that the process of filling in permit reports is virtually uncontrolled, so that many hunters either do not report the number of birds harvested at all, or formally report the number of birds for which a permit was obtained, rather than the number of birds harvested. In addition, these data may contain inaccuracies and errors in both the number and species of birds harvested, so they need to be supplemented with estimates obtained by other methods (Gusakov 2002; Solokha and Blokhin 2023).

In the Far North of Russia, the quality of information collected by government agencies and hunters' associations on the number of harvested birds is poor. In many areas, it is not collected at all. At the same time, hunting pressure in Russian Arctic is substantial (e.g. Syroechkovskiy et al. 2003; Klokov et al. 2023). For the Indigenous People of Arctic, hunting is of critical cultural and socio-economic significance as a form of traditional nature management and for providing food security across people, families, and broader sharing networks.

Hunting pressure assessment on bird populations were conducted in the early 2000s in several areas of the Russian Far North, including Chukotka (Syroechkovskiy and Klokov 2003, 2005, 2011). We hypothesized that over the past 20 years hunting pressure has changed significantly; moreover, the methodology used at that time did not support statistically reliable data on bird hunting. Therefore, it is necessary to conduct new studies in the North, including Chukotka, using more advanced methodology.

In recent years, the assessment of migratory bird harvesting has become the subject of international collaboration (Gallo-Cajiao et al, 2020). For example, a number of projects have been carried out to assess hunting pressure on populations of migratory shorebirds, which nest in Russia and winter in Southeast Asian countries (Klokov, Syroechkovskiy, Gerasimov, 2021; Matsyna et al. 2021, 2023a, 2023b; Klokov, Gerasimov, Syroechkovskiy 2023). International collaboration is also needed to assess the hunting pressure on Arctic waterbird populations, including eiders that cross national borders during migration (Noel et al., 2021). Fortunately, methods to accomplish statistically valid estimates are improving rapidly (e.g., Naves et al. 2020).

The main project task was to evaluate approximately the number of harvested eider and other waterfowl in the region (orders of magnitude).

Additional tasks of the project were:

- to respond to Russian partner interests to address statistical shortcomings of earlier work with a more robust survey;
- to test a new methodology for the survey of hunting pressure in remote Russian communities;
- to reveal if the hunting pressure on eiders and other waterfowl has changed compared with the beginning of 2000s.

METHODOLOGY

Study area

Iultinskii, Providenskii and Chukotskii districts of the Chukotskii Autonomous Okrug were selected as the study area. These three districts represent the north-eastern part of the Chukotskii Autonomous Okrug (Fig. 1-1). In 2001-2006 (Syroechkovsky and Klovov, 2010), the most active hunting of waterfowl in general and eiders in particular by the local population was in these districts.

We asked respondents to provide information on bird hunting from fall 2022 to summer 2023 inclusive. This period covers two official hunting seasons for game birds: fall-winter (2022) and spring (2023), as well as the time between these seasons when hunting is officially closed, but local people sometimes keep hunting.



Figure 1-1. Iultinskii, Providenskii and Chukotskii municipal districts of Chukotskii Autonomous Okrug.

The following steps were conducted in 2023.

1. Completion of the anonymous questionnaire, the first version of which was developed and tested in Chukotka in 2022.
2. Development of instructions for administering the questionnaire.
3. Logistical preparation of the questionnaire.
4. Instruction of the participants.
5. Conducting anonymous survey in 10 settlements of Iultinskii, Providenskii and Chukotskii districts of Chukotskii Autonomous Okrug.

6. Conducting informal interviews to find out to what extent the local population of Chukotka is interested in the use of eider and other waterfowl hunting products, and whether the role of such hunting has increased or decreased in modern conditions compared to the situation in the early 2000s.
7. Examination and rejection of the received questionnaires.
8. Entering the data obtained from the questionnaires into the computer, creating tables in the Excel program.
9. Development of analytical tables for statistical processing and analysis of data.
10. Estimation of the number of harvested birds of four eider species and other bird species in the study area (i.e. Iultinskii, Providenskii and Chukotskii districts of Chukotskii Autonomous Okrug).
11. Estimation of the number of eggs of eiders and other bird collected by the population in the same area.
12. Comparison of the obtained results with the data of the surveys carried out in Chukotskii, Providenskii and Iultinskii districts in 2001-2006.
13. Critical evaluation of the results and development of comments and suggestions on the methodology of anonymous questionnaire survey in the northern areas.
14. Conclusions and proposals based on the results of the project.
15. Preparation and layout of the report.

Survey design and questionnaire

In Chukotka and northern Yakutia, the first projects to assess the pressure of bird hunting in coastal settlements were initiated in the early 2000s by E.E. Syroeckovsky and K.B. Klovov (Syroeckovsky and Klovov, 2010). The methodology was based on estimating waterfowl harvest in the Yukon-Kuskokwim Delta (Wentworth, 1998). The questionnaire was printed on a single sheet of paper with images of all major game bird species. A space was provided next to each picture to record the number of birds harvested and eggs collected in the past year. Additional questions were written on the back of the questionnaire. An interviewer showed the questionnaire with bird pictures to a respondent and then filled it in from the respondent's own words. If the respondents wished, they could complete the questionnaire themselves. Only hunters on a pre-defined list were interviewed.

As discussed below, the methodology of the 2023 survey was different. First, the questionnaire was larger (4 pages instead of than 1). Second, it was completed for a household – a family living together (in an apartment or a house). Using household as a unit of survey differs from the earlier work which focused on selected known hunters. We chose household survey to capture larger extent of respondents. Households were selected randomly or quasi-randomly. Third, the interviewers put even more emphasis on the fact that the questionnaire was voluntary. Before starting the interview, the interviewer first explained to the respondent the objectives of the survey and motivated him/her to participate, then asked for the respondent's consent to complete the questionnaire.

To obtain supplementary information about the importance of bird hunting and its products to local people, the interviewer could ask some additional questions after completing the questionnaire. The program of survey also included informal interviews with local experts on the role of bird hunting for local people.

A questionnaire used in similar studies in Alaska was adopted as the initial model (Naves 2019), but significantly modified for the Chukotka context during pilot testing in 2022. Since the survey unit for the questionnaire was assumed to be a household, as in Alaska, the main questions of the questionnaire referred to the family as a whole, including all its members. If there was more than one hunter in a household, the data were summed. The questionnaire also included the gender, age and ethnicity of the respondent, whose words were used to complete the questionnaire. The questionnaire was printed on four pages and consisted of four sections (available per request in Russian).

The first introductory section included questions about a household: number of people in the family, whether family members were born in Chukotka or came from other regions, if so, how long ago, and whether family members considered themselves Indigenous.

The second section contained general questions about hunting birds and using other useful products from birds: how many people in the family had hunted birds in the past year, how birds were obtained, how many people in the family and in what places (in the tundra, on the coast, on rocks, etc.) had collected birds' eggs, whether they had collected down any other useful products from birds. A special question was whether birds were caught in fishing nets, which species and what was done with such birds.

The third, main, section of the questionnaire contained a table with 46 color pictures of the main bird species in Eastern Chukotka that are or may be hunted, have their eggs collected, or are likely to be caught in fishing nets (a list of such species is given in Table 3.2-1). In case of similar and difficult to identify species, the picture was assigned to a species group. For example, 'large gull', 'dark-headed gull', 'tern', 'Loon of unknown species', etc. The table also included a row for "other species" or "unknown" birds. For species with strong sexual dimorphism, including all eider species, two images, male and female, were shown side by side. For some species, a larger image of the head was included.

Table 3.2-1. Russian and English names of bird species (species groups) included in the anonymous questionnaire.

#	Species (English names)	Species (Russian names)
1	Widgeon	Связь
2	Mallard	Кряква
3	Northern Pintail	Шилохвость
4	Northern Shoveler	Широконоска
5	Teal	Чирок
6	Scaups	Чернети
7	Common Goldeneye	Гоголь
8	Harlequin Duck	Каменушка
9	Merganser	Крохаль
10	Long-tailed Duck	Морянка
11	Black Scoter	Синьга
12	White-winged Scooter	Турпан
13	Common Eider	Обыкн. гага
14	King Eider	Гага-гребенушка
15	Spectacled Eider	Очковая гага
16	Steller's Eider	Сибирская гага
17	Emperor Goose	Гусь-белошей
18	Swans	Лебедь

19	Snow Goose	Белый гусь
20	Canada Goose	Канадская казарка
21	Brant	Черная казарка
22	Bean Goose	Гуменник
23	Greater White-fronted Goose	Белолобый гусь
24	Lesser White-fronted Goose	Пискулька
25	Sandhil Crane	Канадский журавль
26	Ptarmigan	Куропатка
27	Red-throated Loon	Кранозобая гагара
28	Pacific/Black-throated Loon	Белошейная гагара
29	Yellow-billed Loon	Гагара белоклювая
30	Loon sp.	Гагара sp
31	Cormorant	Баклан
32	Murre	Кайры
33	Guillemot	Чистик
34	Tufted Puffin	Топорок
35	Horned Puffin	Ипатка
36	Grebe	Поганка
37	Auklet	Конюга
38	Kittiwake	Моевка
39	Gulls with black head	Чайка с темн гол
40	Large Gulls	Крупная чайка
41	Fulmar	Глупыш
42	Tern	Крачка
43	Shearwater	Буревестник
44	Snowy Owl	Белая сова
45	Large wader	Крупный кулик
46	Small wader	Мелкий кулик
47	Unidentified bird	Птица неизвестного вида
48	Unidentified duck	Утка неизвестного вида
49	Unidentified goose	Гусь неизвестного вида

Each row of the table contained a color picture, the name of the species (group of species) in Russian, and three blank cells. In the first of these, the respondent was asked to record the number of birds harvested by all household members in the spring and summer of 2023, in the second – in the fall and winter of 2022, and in the third – the number of eggs of this species (or group of species) that they collected in 2023. In addition, each interviewer carried a field guide of Anseriformes of Chukotka or colored charts with larger pictures of birds.

The fourth section of the questionnaire (last page) contained additional questions. First, it asked whether any family members had to sell or buy wild birds or their eggs. We had assumed in advance that such a practice was unlikely in Chukotka, but we wanted to test this assumption. Second, there were questions about the four species of eider and Emperor Goose. Unlike the other questions in the questionnaire, which could be answered by any family member, these questions were designed for hunters as experts who might have observations and opinions on how and for what reasons the numbers of Eiders and Emperor Goose are changing in their area. We assumed that few respondents would answer them and felt that questions of this nature could, in a way, express our trust and respect for the opinions of local hunters and encourage more responsible completion of the questionnaire in general. There was also a space at the end of the questionnaire for people to write freely about interesting bird sightings.

Motivating respondents

The success of the survey depends on how the interviewers present themselves to the local people, and how they motivate them to answer the questionnaire and provide truthful information. To choose the best strategy, experience from similar work in Chukotka in the early 2000s and experience with hunter questionnaires in Alaska was analyzed.

In Alaska (Naves, 2019), to motivate hunters, it was explained that accurate information about how many birds they harvest is needed to properly manage bird hunting, ensure sustainable use of bird populations, prevent depletion of wildlife resources, and conserve biodiversity. To this end, it was recommended that awareness-raising activities are carried out in each settlement prior to the survey, and that notices are posted explaining the objectives of the survey. In this way, hunters are invited to participate in a common endeavor aimed at the conservation and sustainable use of bird populations. It is expected that the scientists conducting the survey will be able to use the results of the survey to improve the management of game resources.

In Chukotka, as we saw in the early 2000s, hunters were generally not inclined to cooperate with official hunting authorities, from whom they usually expect only the introduction of new hunting restrictions. From their point of view, the less the hunting authorities know about how many birds that hunters are taking in their area, the better. When Syroechkovsky and Klokov (2005) conducted an anonymous survey in Chukotka in the early 2000s, we positioned ourselves as independent scientists who believed that hunting regulations in the North contained many unjustified restrictions because they were mainly geared to the central regions of Russia, where hunting is mainly for sport, i.e. for entertainment, and not for food as in the Arctic. We explained that we wanted to prove that hunting in the Arctic of Russia is important for the subsistence of the local population, and this requires adequate information on how many birds are hunted here and how many eggs are collected.

Over the past 20 years, however, the situation in Chukotka, as in other northern regions of Russia, has changed significantly. While hunting regulations have become more liberal, access to firearms has become more complicated. Possession of firearms now requires a special permit, which is difficult to obtain for residents of remote villages. Possession of firearms is controlled not by hunting inspectors, of whom there are so few in Chukotka that most hunters have never met them, but by the police, who have representatives in every village. Almost all unregistered hunting guns, which were in abundance in rural Chukotka twenty years ago, have been confiscated by the police. The price of hunting ammunition has also risen dramatically. As a result, opportunities for local people to hunt birds have diminished significantly over the past decades. At the same time, the role of hunting as a source of food has declined. While the population of Chukotka was starving in the late 1990s as a repercussion of the collapse of the Soviet Union, the food supply has now improved and bird hunting may no longer be as critical a source of subsistence as it once was.

The complexity of the bureaucratic procedures involved in obtaining a gun license or a permit to hunt animals (and, currently of particular concern to Chukotka's inhabitants, a permit to fish) has led to massive dissatisfaction among the local population with the whole system of wildlife management. In addition, the changing situation in recent years has made the majority of the population wary of independent environmental and social research, which people tend to regard as the activities of foreign agents of unfriendly countries. For example, the activities of the international organization WWF in Chukotka were officially declared undesirable in the spring of 2022. Considering all the changes mentioned above, the motivation used in the questionnaire twenty years ago is no longer suitable.

We positioned our research as a study of local food sources' role in the food subsistence of the Chukotka people. This was justified by participation of the surveyors in nutritional studies of the Russian Arctic population in recent years. At the beginning of the interview with each respondent, we asked several questions about the local food sources (local fish, reindeer meat, marine mammal meat, game meat, food plants, etc.) used by the family. If the respondent mentioned game birds, we went straight to the anonymous questionnaire. If no game was mentioned, we asked again as a control whether any household member had hunted or collected wild bird eggs in the past year. In all cases, we asked questions from the introductory section of the questionnaire, i.e., we asked about gender, age, ethnic identity and how long the family had lived in Chukotka.

Before completing the questionnaire, we emphasized that our survey had nothing to do with the management of wildlife resources and that the results of the questionnaire would not be passed on to any hunting regulatory bodies but would only be used for scientific purposes. We also emphasized that the questionnaire was anonymous and that the answers could not be used as a formal basis for claims against the respondent that they/their family had violated hunting regulations.

If the questionnaire indicated that the respondent was actively involved in bird hunting, and if he/she was sufficiently motivated, we sometimes proceeded to an informal interview after completing the questionnaire, asking additional questions about how and where the residents of the settlement hunt, how important waterfowl hunting is to them, how often hunters share their bird harvest with other households, what problems local hunters face and how they solve them, etc. Information obtained through these informal interviews were not analyzed quantitatively but rather helped us to form an expert opinion.

Sampling

A two-stage, near random sampling design was used for the surveys. The first stage of sampling was settlement selection. It would have been methodologically most appropriate to select settlements from a common list of settlements in the three study districts (21 settlements in total) using a random number generator. However, due to logistic challenges, it would have been very problematic to reach all the settlements selected in this way. Therefore, our choice was based on logistical opportunities – we selected 10 settlements that could be reached within a relatively short survey period. In the Chukotskii District, four villages were selected: Inchoun, Uelen, Lorino and the center of Chukotskii District – the village of Lavrentiia. In Providenskii District the center of the district – Provideniia town was selected. In Iultinskii District – Amguema, Konergiono and Uelkal villages, as well as the center of the district – Egvekinot town and a small town Ozernyi located 10 km away from it. In terms of bird flyways and population composition, this choice can be considered as almost random.

Second stage of sampling – selection of households in settlements. In the second stage, we were to randomly select a certain number of households in each of the villages and towns selected in the first stage. We adopted the target norm of interviewing approximately 60% of all households in small settlements and 100 households each in large settlements (with a population of more than 1,000).

Due to the high mobility of the local human population, about one third of the population in the settlements was absent for different reasons during the survey period. Many people were on holiday 'on the mainland', moved to other settlements for various reasons, went to the tundra or

the coast to fish, gather berries and mushrooms, and many reindeer herders were in nomadic camps. Therefore, the 60% norm we used was close to a complete coverage of all households we could interview in the small settlements at the time of the survey.

To ensure a random sample, we used maps of settlements published on the municipal websites of Chukotka Autonomous Okrug or obtained from their administrations. On the maps, we first marked all the residential buildings and then walked around them to count the number of flats in the blocks of flats. Within villages, most families live in two- or three-story buildings, and in urban settlements in three- or four-story buildings. Few people live in detached houses. Next, the houses on the settlement plan were numbered in random order (by drawing numbers from a hat) and the interviewers went around the houses in the order of the random numbers until the sampling norm was met. The work was mainly carried out in the evenings and at weekends, when most people are at home. Dwellings (individual houses) where no one was at home were re-visited twice more.

We surveyed settlements in Chukotskii District on July 1-30, Iultinskii District on July 24 – August 25, Providenskii District on September 7-15. We chose these dates to maximize our chances to reach remote settlements. Helicopters flights operate more often at this time, and the ship ‘Captain Sotnikov’ runs along Bering Sea. Also, one can rent motorboats from local people.

Data analysis

The processing of the questionnaire results included:

- Critically reviewing and screening the questionnaires;
- Compiling analysis tables for each settlement and for the entire data set;
- Calculating average values for the number of each species harvested for the two hunting seasons and for the year as a whole, as well as average number of eggs collected by species or group of species; the total number of birds harvested and eggs collected was calculated by multiplying the average values for all households surveyed by the total number of households in all areas surveyed;
- Spatial distribution analysis of the main species take and species groups, as well as the species structure of the harvest;
- Comparison current results with our findings in 2001-2006.

RESULTS

According to the Federal State Statistics Service of Russia (<https://rosstat.gov.ru>), there are a total of 21 settlements in the Iultinskii, Providenskii and Chukotskii districts with a total population of 13,668 on 1 January 2023 (Figure 4-1; Table 4.1-1). We surveyed 10 settlements.



Figure 4-1. Surveyed settlements: 1 – 2001-2006; 2 – 2023; 3 – both 2001-2006 & 2023.

A total of 750 questionnaires were received, but unfortunately the 142 questionnaires collected by one of the interviewers were later disqualified. This interviewer did not follow our protocol, and we could not use the questionnaires for the analysis. As each village usually had two interviewers, elimination of 142 questionnaires did not reduce the number of villages surveyed, but only the total number of questionnaires in some of them. A total of 608 questionnaires were analyzed.

Table 4.1-1. Surveyed settlements. Out of all 21 settlements, 10 settlements were surveyed in 2003-2006, and 10 settlements were surveyed in 2023 (in bold). Four settlements overlapped i.e. were surveyed in both 2003-2006 and 2023.

#	Settlement	District	Human population, 2023	Settlement type	Survey in 2023	First survey year	Population in the year of first survey
1	Ryrkarpii	Iultinskii	568	Village			
2	Mas Shmidta	Iultinskii	34	Urban			
3	Vankarem	Iultinskii	122	Village			
4	Nutepelmen	Iultinskii	114	Village		2003	153
5	Neshkan	Chukotskii	640	Village		2001	678
6	Enurmino	Chukotskii	305	Village			
7	Inchoun	Chukotskii	416	Village	Yes	2004	373
8	Uelen	Chukotskii	673	Village	Yes		
9	Lavrentiia	Chukotskii	1451	Village	Yes	2004	1388
10	Лорино	Chukotskii	1456	Village	Yes	2005	1146

11	Ianrykinot	Providenskii	241	Village		2005	366
12	Novoe Chaplino	Providenskii	425	Village		2004	466
13	Provideniia	Providenskii	2212	Urban	Yes		
14	Sireniki	Providenskii	325	Village		2004	610
15	Nuligran	Providenskii	295	Village			
16	Enmelen	Providenskii	281	Village		2004	388
17	Konergino	Iultinskii	257	Village	Yes		
18	Ozernyi	Iultinskii	468	Urban	Yes		
19	Egvekinot	Iultinskii	2880	Urban	Yes		
20	Uelkal	Iultinskii	126	Village	Yes	2006	240
21	Amguema	Iultinskii	463	Village	Yes		

We conducted the survey in 10 settlements, almost half of the settlements in the area. Four of them were urban-type settlements, and the rest – villages. Urban settlements by definition have at least 1 manufacture e.g. garment factory while all people in a village could make a living by agriculture or hunting. De facto, however, this status does not translate to much difference. There are 10,402 people living in these 10 settlements, which is the majority of the population of the three study districts (76 %). In total, 608 questionnaires which we analyzed represented 608 households with 1,945 people or 14% of the total population of the three districts (Table 4.1-2). Surveyed population was 9 (in big settlement) - 74% (small villages) of the total population.

Table 4.1-2. Population size and survey coverage in settlements surveyed in this study (2023).

Settlement	Human population number	Number of completed questionnaires	Total number of people in the interviewed households	Proportion of surveyed, %	Average number of people in a household
Inchoun	416	35	168	40%	4.80
Uelen	673	63	218	32%	3.46
Lavrentiia	1451	50	173	12%	3.46
Lorino	1456	51	207	14%	4.06
Provideniia	2212	108	237	11%	2.19
Konergino	257	50	186	72%	3.72
Uelkal	126	34	94	74%	2.76
Egvekinot	2880	102	268	9%	2.63
Ozernyi	468	34	113	24%	3.32
Amguema	463	81	281	61%	3.47
Total	13799	608	1945	14%	3.20

There are no official statistics on the number of households by settlement. The available statistics does not reflect the real situation. Official statistics also do not account for cohabitant, and 2 cohabitant will be counted as 2 households if they are not official married. Therefore, to calculate the average household size, we used the data collected through the questionnaire. The questionnaire included a question: "How many people are there in your family (who live permanently in Chukotka)?" The specification "those who live permanently in Chukotka" was necessary because many people consider children who study in other regions or serve in the army and come to Chukotka only for short holidays as members of their family.

According to our data, an average household size was 3.2 people. Using this value and the total population (13,668 people), we calculated the total number of households in all three districts, which was 4,298. Our sample of 608 households therefore represented 14.1% of the total

household number. The structure of the sample is shown in Table 4.1-3. The predominance of women among the respondents, which is particularly noticeable in large settlements, is because men are more often at work often leaving the settlement for several days to be on rotation or fishing. However, as the main questions in the questionnaire related to the household, they could be answered by any member of the family.

In Chukotka, ethnic self-identification as Indigenous people, most often as Chukchi and Eskimo, is significant in terms of local people's participation in hunting. In northern Russia, participation in hunting is considered one of the indicators of a person's traditional lifestyle, which confirms their status as an Indigenous person. On average, Indigenous Peoples spend significantly more time hunting than Non-Indigenous people, and the products of hunting – wild birds and their eggs – are more important as a traditional food source for Indigenous Peoples than for Non-Indigenous people. It is also known from informal interviews that some Non-Indigenous hunters find eider meat unpalatable and avoid shooting eiders, preferring geese, while Indigenous people are happy to hunt and eat eider.

The Indigenous/Non-Indigenous dichotomy also has a social aspect, as the majority of Chukotka's residents identify themselves as Indigenous in villages, while the majority of urban residents identify themselves as Non-Indigenous (Table 4.1-3).

Table 4.1-3. Structure of the obtained sample.

Indicators	Inchoun	Uelen	Lavrentia	Lorino	Providenia	Konergino	Uelkal	Ozernyi	Egvekinot	Anguema	Total
Total number of questionnaires received. pcs. including from	35	63	50	51	108	50	34	34	102	81	608
Indigenous people	35	59	17	49	69	42	29	13	25	58	396
Indigenous residents	0	4	33	2	39	8	5	21	77	23	212
males	16	26	19	18	60	23	19	11	46	41	279
females	19	37	31	33	48	27	15	23	56	40	329
Age of respondents											
maximum	75	75	75	82	67	78	81	76	87	75	
minimum	21	18	18	19	19	17	18	19	17	18	
median	42	50	50	44	44	44	48	39	46	38	
Percentage of questionnaires filled by											
Indigenous people	100.0%	93.7%	34.0%	96.1%	63.9%	84.0%	85.3%	38.2%	24.5%	71.6%	65.1%
Non-Indigenous people	0.0%	6.3%	66.0%	3.9%	36.1%	16.0%	14.7%	61.8%	75.5%	28.4%	34.9%
males	45.7%	41.3%	38.0%	35.3%	55.6%	46.0%	55.9%	32.4%	45.1%	50.6%	45.9%
females	54.3%	58.7%	62.0%	64.7%	44.4%	54.0%	44.1%	67.6%	54.9%	49.4%	54.1%

A significant proportion of the residents of urban settlements (towns) and administrative centers are people who have moved from other regions. Indigenous people who have moved to urban settlements adopt the lifestyles of the Indigenous population in the process of assimilation and pay less attention to hunting. However, this does not happen immediately; many Indigenous people maintain lifelong links with their families in the villages and often go there to hunt. On the other hand, some Indigenous people living in small villages do not differ much from Non-Indigenous people in their lifestyle and participation in bird hunting.

Ethnic differences are therefore linked to social differences. We included a question in the questionnaire about whether the respondent considered his or her family to be Indigenous or Non-Indigenous, as this may play a role in the analysis of the results.

In our sample, the proportion of Indigenous people was 65.1%. It was much higher in the villages than in the urban settlements, 79.4% and 43.9% respectively. In one of the villages (Inchoun village) all respondents identified themselves as Indigenous.

The minimum and maximum ages of respondents were 17 and 87 years respectively, and the median age was 44 years (Table 4.1-3).

In general, sample analysis revealed that our sample represents well 3 surveyed districts. The above comments on the sample structure do not affect the results of the extrapolation of the bird harvest data. However, they should be kept in mind for correct interpretation and further improvement of the methodology.

Summary tables of the data collected

We calculated proportion of the local population involved in bird hunting (Tables 4.1-4) and collecting bird eggs (Tables 4.1-5) as well as a share of households with at least one hunter for each settlement (Tables 4.1-4). It ranged from 22% to 63% and generally tended to increase towards the north. Thus, in Inchoun and Uelkal the number of families with hunters was over 60%, in Uelen, Provideniia and Konergino it was over 40%, and in other settlements it was 20-30%. As expected, the proportion of families with hunters is generally lower in large settlements than in small villages.

Table 4.1-4. Proportion of households participating in bird hunting, 2023.

Settlement	Questionnaire number	Including households with hunters	
		units	%
Inchoun	35	22	62.9%
Uelen	63	29	46.0%
Lavrentiia	50	11	22.0%
Lorino	51	16	31.4%
Provideniia	108	48	44.4%
Konergino	50	23	46.0%
Uelkal	34	22	64.7%
Ozernyi	34	7	20.6%
Egvekinot	102	23	22.5%
Amguema	81	22	27.2%
Total	608	223	36.2%

Table 4.1-5. Number of bird hunters and number of collectors of wild bird eggs, 2023.

Settlement	Inchoun	Uelen	Lavrentiia	Lorino	Provideniia	Konergino	Uelkal	Ozernyi	Egvekinot	Amguema	Total
Including households with											
4 hunters	1						1				2
3 hunters	2			2		1	2		2		9
2 hunters	3		4	1	3	6	1	2	2	4	26
1 hunter	16	29	7	13	45	16	18	5	19	18	186
Total number of hunters in surveyed households	32	36	15	21	51	31	30	9	29	26	280
Average number of hunters per 1 household	1.5	1.2	1.4	1.3	1.1	1.3	1.4	1.3	1.3	1.2	1.3
Number of households collecting eggs											
Units	7	3	17	25	20	36	24	10	11	13	166
%	20.0	4.8	34.0	49.0	18.5	72.0	70.6	29.4	10.8	16.0	27.3

In total, 223 out of 608 households had included at least one hunter, with 26 households with 2 hunters, 9 households with 3 hunters and 2 households with 4 hunters. A total of 280 hunters were recorded in the questionnaires, an average of 1.3 hunters per household.

A total of 3,866 birds belonging to 32 species were recorded in the questionnaires. In addition, some of the harvested birds were marked as 'duck of unknown species' (duck sp.), 'goose of

unknown species' (goose sp.) and 'bird of unknown species'. Fortunately, there were not many such cases: ducks sp. – 19, geese sp. – 190, birds sp. – 48.

The average annual harvest of all bird species per household was 6.36. At the same time, only 12 species had an annual harvest of more than 0.1 birds per household. These species can be considered as the main hunting targets and are listed in descending order of harvested bird numbers: Common Eider, Bean Goose, King Eider, Greater White-fronted Goose, Northern Pintail, Ptarmigan, Snow Goose, Sandhill Crane, Spectacled Eider, Emperor Goose, Lesser White-fronted Goose, Canada Goose.

A summary of bird harvests for fall-winter 2022, spring-summer 2023 and the whole year, as well as the number of eggs collected, is summarized for each village in Tables 4.2-1, 2, 3 and 4. The species are arranged in the same order (under the same numbers) as they appear on the questionnaire. Tables 4.2-5 to 4.2-8 present the average take of each species and egg collection per household, and Table 4.2-9 shows the percentage of the most important species in the total harvest.

Table 4.2-1. Total number of harvested birds in fall 2022 and winter 2023. Raw numbers combined for each community.

	Settlement	Inchoun	Uelen	Lavrentia	Lorino	Providenia	Konergino	Uelkal	Ozernyi	Egvekinot	Amguema	Total
	Number of questionnaires	35	63	50	51	108	50	34	34	102	81	608
1	Widgeon	0	2	0	0	0	0	0	0	0	0	2
2	Mallard	0	0	0	0	0	0	5	0	1	0	6
3	Northern Pintail	41	0	0	0	41	0	0	0	0	0	82
4	Northern Shoveler	0	0	0	0	0	0	0	0	0	0	0
5	Teal	0	0	0	0	0	0	0	0	0	0	0
6	Scaups	0	0	0	0	0	0	0	0	0	0	0
7	Common Goldeneye	0	0	0	0	0	0	0	0	0	0	0
8	Harlequin Duck	0	0	0	0	9	0	0	0	0	0	9
9	Merganser	0	0	0	0	0	0	1	0	0	0	1
10	Long-tailed Duck	0	0	0	0	3	0	0	0	0	0	3
11	Black Scoter	0	0	0	0	0	0	0	0	0	0	0
12	White-winged Scooter	0	0	0	0	0	0	0	0	0	0	0
13	Common Eider	72	0	0	0	24	0	4	0	5	0	105
14	King Eider	138	1	5	0	2	0	0	0	0	0	146
15	Spectacled Eider	35	0	5	0	1	0	0	0	0	0	41
16	Steller's Eider	0	0	0	0	0	0	0	0	0	0	0
17	Emperor Goose	3	0	0	0	5	0	0	0	0	0	8
18	Swans	0	0	0	0	1	0	0	0	0	0	1
19	Snow Goose	47	0	0	0	0	0	0	0	10	0	57
20	Canada Goose	5	0	0	0	0	0	0	0	0	0	5
21	Brant	2	0	0	0	5	0	0	0	0	0	7
22	Bean Goose	0	0	0	0	12	0	0	0	0	3	15
23	Greater WF Goose	6	0	0	0	8	0	0	0	0	18	32
24	Lesser WF Goose	1	0	0	0	0	0	0	0	0	0	1
25	Sandhil Crane	2	0	0	0	63	0	0	0	0	1	66
26	Ptarmigan	10	13	0	15	110	3	14	2	8	12	187

27	Red-throated Loon	1	0	0	0	0	0	0	0	0	0	0	1
28	Pacific/Black-throated Loon	0	0	0	0	0	0	0	0	0	0	0	0
29	Yellow-billed Loon	0	0	0	0	0	0	0	0	0	0	0	0
30	Loon sp.	0	0	0	0	0	3	0	0	0	0	0	3
31	Cormorant	1	0	0	0	0	0	0	0	0	0	0	1
32	Murre	4	0	0	0	0	0	0	0	0	0	0	4
33	Guillemot	0	0	0	0	0	0	0	0	0	0	0	0
34	Tufted Puffin	0	0	0	0	0	0	0	0	0	0	0	0
35	Horned Puffin	0	0	0	0	0	0	0	0	0	0	0	0
36	Grebe	0	0	0	0	0	0	0	0	0	0	0	0
37	Auklet	0	0	0	0	0	0	0	0	0	0	0	0
38	Kittiwake	0	0	0	0	0	0	0	0	0	0	0	0
39	Gulls with black head	0	0	0	0	0	0	0	0	0	0	0	0
40	Large Gulls	0	0	0	0	0	0	0	0	0	0	0	0
41	Fulmar	0	0	0	0	0	0	0	0	0	0	0	0
42	Terns	0	0	0	0	0	0	0	0	0	0	0	0
43	Shearwater	0	0	0	0	0	0	0	0	0	0	0	0
44	Snowy Owl	0	0	0	0	0	0	0	0	0	0	0	0
45	Large wader	0	0	0	0	0	0	0	0	0	0	0	0
46	Small wader	0	0	0	0	0	0	0	0	0	0	0	0
47	Unidentified bird	0	0	0	0	0	0	0	0	0	0	0	0
48	Unidentified duck	0	0	0	0	5	0	0	0	0	0	0	5
49	Unidentified goose	0	0	0	0	0	0	0	0	5	10	0	15
	Total	368	16	10	15	289	6	24	2	29	44	0	803

Table 4.2-2. Total number of harvested birds by households for spring and summer 2023. Raw numbers combined for each community.

	Settlement	Inchoun	Uelen	Lavrentia	Lorino	Providenia	Konergino	Uelkal	Ozernyi	Egvekinot	Anguema	Total
	Number of questionnaires	35	63	50	51	108	50	34	34	102	81	608
1	Widgeon	1	14	2	6	0	0	0	0	3	2	28
2	Mallard	0	0	0	2	21	0	0	0	2	1	26
3	Northern Pintail	38	78	29	8	92	7	0	2	0	4	258
4	Northern Shoveler	0	31	3	0	0	0	0	0	0	0	34
5	Teal	0	5	6	0	0	0	0	0	2	0	13
6	Scaups	0	0	0	1	0	0	0	0	0	5	6
7	Common Goldeneye	0	25	0	0	0	0	0	0	0	0	25
8	Harlequin Duck	0	3	20	0	23	0	0	0	0	0	46
9	Merganser	0	0	2	3	0	0	0	0	0	0	5
10	Long-tailed Duck	0	0	5	0	0	0	3	0	0	0	8
11	Black Scoter	0	0	0	0	0	0	0	0	0	0	0
12	White-winged Scooter	0	7	0	0	0	3	0	0	3	2	15
13	Common Eider	69	105	6	48	39	12	36	0	24	0	339
14	King Eider	54	129	57	9	7	26	0	0	0	0	282
15	Spectacled Eider	30	65	11	11	3	0	1	0	0	0	121
16	Steller's Eider	0	18	0	2	0	0	0	0	0	0	20
17	Emperor Goose	7	25	20	50	4	27	9	0	3	0	145
18	Swans	3	6	4	0	0	0	0	0	0	0	13
19	Snow Goose	55	82	19	3	15	0	1	0	2	10	187
20	Canada Goose	8	6	3	6	35	0	6	0	0	0	64
21	Brant	0	0	3	6	13	0	14	0	0	0	36
22	Bean Goose	3	21	8	14	135	89	95	8	33	12	418
23	Greater WF Goose	13	13	3	16	75	65	79	5	87	16	372
24	Lesser WF Goose	3	5	5	3	8	0	19	33	0	5	81
25	Sandhil Crane	0	0	5	9	97	6	3	2	5	1	128
26	Ptarmigan	0	4	27	0	0	0	0	5	37	17	90

27	Red-throated Loon	1	0	0	0	0	0	0	0	0	0	0	1
28	Pacific/Black-throated Loon	0	0	0	0	0	0	0	0	0	0	0	0
29	Yellow-billed Loon	0	0	0	0	0	0	1	0	0	0	0	1
30	Loon sp.	1	0	0	0	0	0	0	0	6	0	0	7
31	Cormorant	4	30	0	0	0	0	0	0	0	0	0	34
32	Murre	10	0	0	0	0	0	0	0	0	0	0	10
33	Guillemot	0	0	0	0	0	0	0	0	0	0	0	0
34	Tufted Puffin	1	3	0	0	0	0	0	0	0	0	0	4
35	Horned Puffin	0	0	0	0	0	0	0	0	0	0	0	0
36	Grebe	0	0	0	0	0	0	0	0	0	0	0	0
37	Auklet	0	0	0	0	0	0	0	0	0	0	0	0
38	Kittiwake	0	0	0	0	0	0	0	0	0	0	0	0
39	Gulls with black head	0	0	0	0	0	0	0	0	0	0	0	0
40	Large Gulls	0	0	0	0	0	0	0	0	0	8	0	8
41	Fulmar	0	0	0	0	0	0	0	0	0	0	0	0
42	Terns	0	0	0	0	0	0	0	0	0	0	0	0
43	Shearwater	0	0	0	0	0	0	0	0	0	0	0	0
44	Snowy Owl	0	1	0	0	0	0	0	0	0	0	0	1
45	Large wader	0	0	0	0	0	0	0	0	0	0	0	0
46	Small wader	0	0	0	0	0	0	0	0	0	0	0	0
47	Unidentified bird	0	0	0	0	48	0	0	0	0	0	0	48
48	Unidentified duck	0	0	0	0	0	0	0	10	1	3	0	14
49	Unidentified goose	0	0	0	0	15	15	55	20	12	58	0	175
	Total	301	676	238	197	630	250	322	85	220	144	0	3063

Table 4.2-3. Total number of birds by households from the fall 2022 to summer 2023. Raw numbers combined for each community.

Towns. villages		Inchoun	Uelen	Lavrentia	Lorino	Providenia	Konergino	Uelkal		Ozernyi	Egvekinot	Amguema	Total
	Number of questionnaires	35	63	50	51	108	50	34		34	102	81	608
1	Widgeon	1	16	2	6	0	0	0		0	3	2	30
2	Mallard	0	0	0	2	21	0	5		0	3	1	32
3	Northern Pintail	79	78	29	8	133	7	0		2	0	4	340
4	Northern Shoveler	0	31	3	0	0	0	0		0	0	0	34
5	Teal	0	5	6	0	0	0	0		0	2	0	13
6	Scaups	0	0	0	1	0	0	0		0	0	5	6
7	Common Goldeneye	0	25	0	0	0	0	0		0	0	0	25
8	Harlequin Duck	0	3	20	0	32	0	0		0	0	0	55
9	Merganser	0	0	2	3	0	0	1		0	0	0	6
10	Long-tailed Duck	0	0	5	0	3	0	3		0	0	0	11
11	Black Scoter	0	0	0	0	0	0	0		0	0	0	0
12	White-winged Scooter	0	7	0	0	0	3	0		0	3	2	15
13	Common Eider	141	105	6	48	63	12	40		0	29	0	444
14	King Eider	192	130	62	9	9	26	0		0	0	0	428
15	Spectacled Eider	65	65	16	11	4	0	1		0	0	0	162
16	Steller's Eider	0	18	0	2	0	0	0		0	0	0	20
17	Emperor Goose	10	25	20	50	9	27	9		0	3	0	153
18	Swans	3	6	4	0	1	0	0		0	0	0	14
19	Snow Goose	102	82	19	3	15	0	1		0	12	10	244
20	Canada Goose	13	6	3	6	35	0	6		0	0	0	69
21	Brant	2	0	3	6	18	0	14		0	0	0	43
22	Bean Goose	3	21	8	14	147	89	95		8	33	15	433

23	Greater WF Goose	19	13	3	16	83	65	79		5	87	34	404
24	Lesser WF Goose	4	5	5	3	8	0	19		33	0	5	82
25	Sandhil Crane	2	0	5	9	160	6	3		2	5	2	194
26	Ptarmigan	10	17	27	15	110	3	14		7	45	29	277
27	Red-throated Loon	2	0	0	0	0	0	0		0	0	0	2
28	Pacific/Black- throated Loon	0	0	0	0	0	0	0		0	0	0	0
29	Yellow-billed Loon	0	0	0	0	0	0	1		0	0	0	1
30	Loon sp.	1	0	0	0	0	3	0		0	6	0	10
31	Cormorant	5	30	0	0	0	0	0		0	0	0	35
32	Murre	14	0	0	0	0	0	0		0	0	0	14
33	Guillemot	0	0	0	0	0	0	0		0	0	0	0
34	Tufted Puffin	1	3	0	0	0	0	0		0	0	0	4
35	Horned Puffin	0	0	0	0	0	0	0		0	0	0	0
36	Grebe	0	0	0	0	0	0	0		0	0	0	0
37	Auklet	0	0	0	0	0	0	0		0	0	0	0
38	Kittiwake	0	0	0	0	0	0	0		0	0	0	0
39	Gulls with black head	0	0	0	0	0	0	0		0	0	0	0
40	Large Gulls	0	0	0	0	0	0	0		0	0	8	8
41	Fulmar	0	0	0	0	0	0	0		0	0	0	0
42	Terns	0	0	0	0	0	0	0		0	0	0	0
43	Shearwater	0	0	0	0	0	0	0		0	0	0	0
44	Snowy Owl	0	1	0	0	0	0	0		0	0	0	1
45	Large wader	0	0	0	0	0	0	0		0	0	0	0
46	Small wader	0	0	0	0	0	0	0		0	0	0	0
47	Unidentified bird	0	0	0	0	48	0	0		0	0	0	48
48	Unidentified duck	0	0	0	0	5	0	0		10	1	3	19

49	Unidentified goose Total	0 669	0 692	0 248	0 212	15 919	15 256	55 346		20 87	17 249	68 188	190 3866
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Table 4.2-4. Total number of each species' eggs collected by households for spring 2023. Raw numbers combined for each community.

Settlement		Inchoun	Uelen	Lavrentia	Lorino	Providenia	Konergino	Uelkal	Ozernyi	Egvekinot	Amguema	Total
	Number of questionnaires	35	63	50	51	108	50	34	34	102	81	608
1	Widgeon	0	0	0	0	0	0	0	0	20	4	24
2	Mallard	0	0	0	0	0	0	0	0	0	0	0
3	Northern Pintail	0	0	0	0	0	10	0	0	0	0	10
4	Northern Shoveler	0	0	0	0	0	0	0	0	0	0	0
5	Teal	0	0	0	0	0	0	0	0	0	0	0
6	Scaups	0	0	0	0	0	0	0	0	0	0	0
7	Common Goldeneye	0	0	0	0	0	0	0	0	0	0	0
8	Harlequin Duck	0	0	0	0	0	0	0	0	0	0	0
9	Merganser	0	0	0	0	0	0	0	0	0	0	0
10	Long-tailed Duck	0	0	0	0	0	0	0	0	0	0	0
11	Black Scoter	0	0	0	0	0	0	0	0	0	0	0
12	White-winged Scooter	0	0	0	0	0	0	0	0	0	0	0
13	Common Eider	0	0	120	56	0	46	107	57	36	0	422
14	King Eider	0	0	20	0	0	0	0	0	0	0	20
15	Spectacled Eider	0	0	0	0	0	0	0	0	0	0	0
16	Steller's Eider	0	0	0	0	0	0	0	0	0	0	0
17	Emperor Goose	0	0	0	5	0	0	3	0	0	0	8
18	Swans	0	0	0	2	0	16	0	0	0	0	18
19	Snow Goose	4	0	0	0	0	0	0	0	0	0	4
20	Canada Goose	0	0	0	10	0	0	0	0	0	0	10
21	Brant	0	0	0	0	0	0	0	0	0	0	0
22	Bean Goose	0	0	0	0	0	0	11	0	0	22	33
23	Greater WF Goose	0	0	0	0	0	31	7	0	0	26	64
24	Lesser WF Goose	0	0	0	0	0	0	0	0	0	0	0

25	Sandhil Crane	0	0	0	0	0	0	0	0	0	15	15
26	Ptarmigan	0	0	0	0	0	10	0	0	0	22	32
27	Red-throated Loon	0	0	0	0	0	12	0	0	0	0	12
28	Pacific/Black-throated Loon	0	0	0	0	0	0	0	0	0	0	0
29	Yellow-billed Loon	0	0	0	0	0	0	0	0	0	0	0
30	Loon sp.	0	0	0	0	0	0	0	0	0	0	0
31	Cormorant	0	0	40	10	0	0	0	0	0	0	50
32	Murre	0	0	45	16	0	0	0	0	0	0	61
33	Guillemot	0	0	0	0	0	0	0	0	0	0	0
34	Tufted Puffin	0	0	10	0	0	0	0	0	0	0	10
35	Horned Puffin	0	0	0	0	0	0	0	0	0	0	0
36	Grebe	0	0	0	0	0	0	0	0	0	0	0
37	Auklet	0	0	0	0	0	0	0	0	0	0	0
38	Kittiwake	0	0	0	84	0	0	0	0	0	0	84
39	Gulls with black head	0	0	10	56	0	30	0	0	0	0	96
40	Large Gulls	50	10	145	97	296	173	96	10	45	59	981
41	Fulmar	0	0	0	0	0	0	0	0	0	0	0
42	Terns	0	0	0	0	0	4	6	0	0	0	10
43	Shearwater	0	0	0	0	0	0	0	0	0	0	0
44	Snowy Owl	0	0	0	0	0	0	0	0	0	0	0
45	Large wader	0	0	0	0	0	0	0	0	0	4	4
46	Small wader	0	0	0	0	0	0	0	0	0	0	0
47	Unidentified bird	0	0	0	0	265	0	0	0	0	0	265
48	Unidentified duck	0	0	0	0	0	0	0	31	0	15	46
49	Unidentified goose	0	0	0	0	0	70	0	10	0	27	107
	Total	54	10	390	336	561	402	230	108	101	194	2386

Table 4.2-5. Average number of harvested birds per household, fall 2022 and winter 2023

	Settlement	Inchoun	Uelen	Lavrentia	Lorino	Providenia	Konergino	Uelkal	Ozernyi	Egvekinot	Amguema	Total
1	Widgeon	-	0.03	-	-	-	-	-	-	-	-	0.00
2	Mallard	-	-	-	-	-	-	0.15	-	0.01	-	0.01
3	Northern Pintail	1.17	-	-	-	0.38	-	-	-	-	-	0.13
4	Northern Shoveler	-	-	-	-	-	-	-	-	-	-	-
5	Teal	-	-	-	-	-	-	-	-	-	-	-
6	Scaups	-	-	-	-	-	-	-	-	-	-	-
7	Common Goldeneye	-	-	-	-	-	-	-	-	-	-	-
8	Harlequin Duck	-	-	-	-	0.08	-	-	-	-	-	0.01
9	Merganser	-	-	-	-	-	-	0.03	-	-	-	0.00
10	Long-tailed Duck	-	-	-	-	0.03	-	-	-	-	-	0.00
11	Black Scoter	-	-	-	-	-	-	-	-	-	-	-
12	White-winged Scooter	-	-	-	-	-	-	-	-	-	-	-
13	Common Eider	2.06	-	-	-	0.22	-	0.12	-	0.05	-	0.17
14	King Eider	3.94	0.02	0.10	-	0.02	-	-	-	-	-	0.24
15	Spectacled Eider	1.00	-	0.10	-	0.01	-	-	-	-	-	0.07
16	Steller's Eider	-	-	-	-	-	-	-	-	-	-	-
17	Emperor Goose	0.09	-	-	-	0.05	-	-	-	-	-	0.01
18	Swans	-	-	-	-	0.01	-	-	-	-	-	0.00
19	Snow Goose	1.34	-	-	-	-	-	-	-	0.10	-	0.09
20	Canada Goose	0.14	-	-	-	-	-	-	-	-	-	0.01
21	Brant	0.06	-	-	-	0.05	-	-	-	-	-	0.01
22	Bean Goose	-	-	-	-	0.11	-	-	-	-	0.04	0.02
23	Greater WF Goose	0.17	-	-	-	0.07	-	-	-	-	0.22	0.05
24	Lesser WF Goose	0.03	-	-	-	-	-	-	-	-	-	0.00
25	Sandhil Crane	0.06	-	-	-	0.58	-	-	-	-	0.01	0.11

26	Ptarmigan	0.29	0.21	-	0.29	1.02	0.06	0.41	0.06	0.08	0.15	0.31
27	Red-throated Loon	0.03	-	-	-	-	-	-	-	-	-	0.00
28	Pacific/Black-throated Loon	-	-	-	-	-	-	-	-	-	-	-
29	Yellow-billed Loon	-	-	-	-	-	-	-	-	-	-	-
30	Loon sp.	-	-	-	-	-	0.06	-	-	-	-	0.00
31	Cormorant	0.03	-	-	-	-	-	-	-	-	-	0.00
32	Murre	0.11	-	-	-	-	-	-	-	-	-	0.01
33	Guillemot	-	-	-	-	-	-	-	-	-	-	-
34	Tufted Puffin	-	-	-	-	-	-	-	-	-	-	-
35	Horned Puffin	-	-	-	-	-	-	-	-	-	-	-
36	Grebe	-	-	-	-	-	-	-	-	-	-	-
37	Auklet	-	-	-	-	-	-	-	-	-	-	-
38	Kittiwake	-	-	-	-	-	-	-	-	-	-	-
39	Gulls with black head	-	-	-	-	-	-	-	-	-	-	-
40	Large Gulls	-	-	-	-	-	-	-	-	-	-	-
41	Fulmar	-	-	-	-	-	-	-	-	-	-	-
42	Terns	-	-	-	-	-	-	-	-	-	-	-
43	Shearwater	-	-	-	-	-	-	-	-	-	-	-
44	Snowy Owl	-	-	-	-	-	-	-	-	-	-	-
45	Large wader	-	-	-	-	-	-	-	-	-	-	-
46	Small wader	-	-	-	-	-	-	-	-	-	-	-
47	Unidentified bird	-	-	-	-	-	-	-	-	-	-	-
48	Unidentified duck	-	-	-	-	0.05	-	-	-	-	-	0.01
49	Unidentified goose	-	-	-	-	-	-	-	-	0.05	0.12	0.02
	Total	10.51	0.25	0.20	0.29	2.68	0.12	0.71	0.06	0.28	0.54	1.32

Table 4.2-6. Average number of harvested birds per household, spring and summer 2023

	Settlement	Inchoun	Uelen	Lavrentia	Lorino	Providenia	Konergino	Uelkal	Ozernyi	Egvekinot	Amguema	Total
1	Widgeon	0.03	0.22	0.04	0.12	-	-	-	-	0.03	0.02	0.05
2	Mallard	-	-	-	0.04	0.19	-	-	-	0.02	0.01	0.04
3	Northern Pintail	1.09	1.24	0.58	0.16	0.85	0.14	-	0.06	-	0.05	0.42
4	Northern Shoveler	-	0.49	0.06	-	-	-	-	-	-	-	0.06
5	Teal	-	0.08	0.12	-	-	-	-	-	0.02	-	0.02
6	Scaups	-	-	-	0.02	-	-	-	-	-	0.06	0.01
7	Common Goldeneye	-	0.40	-	-	-	-	-	-	-	-	0.04
8	Harlequin Duck	-	0.05	0.40	-	0.21	-	-	-	-	-	0.08
9	Merganser	-	-	0.04	0.06	-	-	-	-	-	-	0.01
10	Long-tailed Duck	-	-	0.10	-	-	-	0.09	-	-	-	0.01
11	Black Scoter	-	-	-	-	-	-	-	-	-	-	-
12	White-winged Scooter	-	0.11	-	-	-	0.06	-	-	0.03	0.02	0.02
13	Common Eider	1.97	1.67	0.12	0.94	0.36	0.24	1.06	-	0.24	-	0.56
14	King Eider	1.54	2.05	1.14	0.18	0.06	0.52	-	-	-	-	0.46
15	Spectacled Eider	0.86	1.03	0.22	0.22	0.03	-	0.03	-	-	-	0.20
16	Steller's Eider	-	0.29	-	0.04	-	-	-	-	-	-	0.03
17	Emperor Goose	0.20	0.40	0.40	0.98	0.04	0.54	0.26	-	0.03	-	0.24
18	Swans	0.09	0.10	0.08	-	-	-	-	-	-	-	0.02
19	Snow Goose	1.57	1.30	0.38	0.06	0.14	-	0.03	-	0.02	0.12	0.31
20	Canada Goose	0.23	0.10	0.06	0.12	0.32	-	0.18	-	-	-	0.11
21	Brant	-	-	0.06	0.12	0.12	-	0.41	-	-	-	0.06
22	Bean Goose	0.09	0.33	0.16	0.27	1.25	1.78	2.79	0.24	0.32	0.15	0.69
23	Greater WF Goose	0.37	0.21	0.06	0.31	0.69	1.30	2.32	0.15	0.85	0.20	0.61
24	Lesser WF Goose	0.09	0.08	0.10	0.06	0.07	-	0.56	0.97	-	0.06	0.13
25	Sandhil Crane	-	-	0.10	0.18	0.90	0.12	0.09	0.06	0.05	0.01	0.21

26	Ptarmigan	-	0.06	0.54	-	-	-	-	0.15	0.36	0.21	0.15
27	Red-throated Loon	0.03	-	-	-	-	-	-	-	-	-	0.00
28	Pacific/Black-throated Loon	-	-	-	-	-	-	-	-	-	-	-
29	Yellow-billed Loon	-	-	-	-	-	-	0.03	-	-	-	0.00
30	Loon sp.	0.03	-	-	-	-	-	-	-	0.06	-	0.01
31	Cormorant	0.11	0.48	-	-	-	-	-	-	-	-	0.06
32	Murre	0.29	-	-	-	-	-	-	-	-	-	0.02
33	Guillemot	-	-	-	-	-	-	-	-	-	-	-
34	Tufted Puffin	0.03	0.05	-	-	-	-	-	-	-	-	0.01
35	Horned Puffin	-	-	-	-	-	-	-	-	-	-	-
36	Grebe	-	-	-	-	-	-	-	-	-	-	-
37	Auklet	-	-	-	-	-	-	-	-	-	-	-
38	Kittiwake	-	-	-	-	-	-	-	-	-	-	-
39	Gulls with black head	-	-	-	-	-	-	-	-	-	-	-
40	Large Gulls	-	-	-	-	-	-	-	-	-	0.10	0.01
41	Fulmar	-	-	-	-	-	-	-	-	-	-	-
42	Terns	-	-	-	-	-	-	-	-	-	-	-
43	Shearwater	-	-	-	-	-	-	-	-	-	-	-
44	Snowy Owl	-	0.02	-	-	-	-	-	-	-	-	0.00
45	Large wader	-	-	-	-	-	-	-	-	-	-	-
46	Small wader	-	-	-	-	-	-	-	-	-	-	-
47	Unidentified bird	-	-	-	-	0.44	-	-	-	-	-	0.08
48	Unidentified duck	-	-	-	-	-	-	-	0.29	0.01	0.04	0.02
49	Unidentified goose	-	-	-	-	0.14	0.30	1.62	0.59	0.12	0.72	0.29
	Total	8.60	10.73	4.76	3.86	5.83	5.00	9.47	2.50	2.16	1.78	5.04

Table 4.2-7. Annual average number of harvested birds per household, fall 2022 to summer 2023

Settlement		Inchoun	Uelen	Lavrentia	Lorino	Providenia	Konergino	Uelkal	Ozernyi	Egvekinot	Amguema	Total
1	Widgeon	0.03	0.25	0.04	0.12	-	-	-	-	0.03	0.02	0.05
2	Mallard	-	-	-	0.04	0.19	-	0.15	-	0.03	0.01	0.05
3	Northern Pintail	2.26	1.24	0.58	0.16	1.23	0.14	-	0.06	-	0.05	0.56
4	Northern Shoveler	-	0.49	0.06	-	-	-	-	-	-	-	0.06
5	Teal	-	0.08	0.12	-	-	-	-	-	0.02	-	0.02
6	Scaups	-	-	-	0.02	-	-	-	-	-	0.06	0.01
7	Common Goldeneye	-	0.40	-	-	-	-	-	-	-	-	0.04
8	Harlequin Duck	-	0.05	0.40	-	0.30	-	-	-	-	-	0.09
9	Merganser	-	-	0.04	0.06	-	-	0.03	-	-	-	0.01
10	Long-tailed Duck	-	-	0.10	-	0.03	-	0.09	-	-	-	0.02
11	Black Scoter	-	-	-	-	-	-	-	-	-	-	-
12	White-winged Scooter	-	0.11	-	-	-	0.06	-	-	0.03	0.02	0.02
13	Common Eider	4.03	1.67	0.12	0.94	0.58	0.24	1.18	-	0.28	-	0.73
14	King Eider	5.49	2.06	1.24	0.18	0.08	0.52	-	-	-	-	0.70
15	Spectacled Eider	1.86	1.03	0.32	0.22	0.04	-	0.03	-	-	-	0.27
16	Steller's Eider	-	0.29	-	0.04	-	-	-	-	-	-	0.03
17	Emperor Goose	0.29	0.40	0.40	0.98	0.08	0.54	0.26	-	0.03	-	0.25
18	Swans	0.09	0.10	0.08	-	0.01	-	-	-	-	-	0.02
19	Snow Goose	2.91	1.30	0.38	0.06	0.14	-	0.03	-	0.12	0.12	0.40
20	Canada Goose	0.37	0.10	0.06	0.12	0.32	-	0.18	-	-	-	0.11

21	Brant	0.06	-	0.06	0.12	0.17	-	0.41	-	-	-	0.07
22	Bean Goose	0.09	0.33	0.16	0.27	1.36	1.78	2.79	0.24	0.32	0.19	0.71
23	Greater WF Goose	0.54	0.21	0.06	0.31	0.77	1.30	2.32	0.15	0.85	0.42	0.66
24	Lesser WF Goose	0.11	0.08	0.10	0.06	0.07	-	0.56	0.97	-	0.06	0.13
25	Sandhil Crane	0.06	-	0.10	0.18	1.48	0.12	0.09	0.06	0.05	0.02	0.32
26	Ptarmigan	0.29	0.27	0.54	0.29	1.02	0.06	0.41	0.21	0.44	0.36	0.46
27	Red-throated Loon	0.06	-	-	-	-	-	-	-	-	-	0.00
28	Pacific/Black- throated Loon	-	-	-	-	-	-	-	-	-	-	-
29	Yellow-billed Loon	-	-	-	-	-	-	0.03	-	-	-	0.00
30	Loon sp.	0.03	-	-	-	-	0.06	-	-	0.06	-	0.02
31	Cormorant	0.14	0.48	-	-	-	-	-	-	-	-	0.06
32	Murre	0.40	-	-	-	-	-	-	-	-	-	0.02
33	Guillemot	-	-	-	-	-	-	-	-	-	-	-
34	Tufted Puffin	0.03	0.05	-	-	-	-	-	-	-	-	0.01
35	Horned Puffin	-	-	-	-	-	-	-	-	-	-	-
36	Grebe	-	-	-	-	-	-	-	-	-	-	-
37	Auklet	-	-	-	-	-	-	-	-	-	-	-
38	Kittiwake	-	-	-	-	-	-	-	-	-	-	-
39	Gulls with black head	-	-	-	-	-	-	-	-	-	-	-
40	Large Gulls	-	-	-	-	-	-	-	-	-	0.10	0.01
41	Fulmar	-	-	-	-	-	-	-	-	-	-	-
42	Terns	-	-	-	-	-	-	-	-	-	-	-
43	Shearwater	-	-	-	-	-	-	-	-	-	-	-
44	Snowy Owl	-	0.02	-	-	-	-	-	-	-	-	0.00
45	Large wader	-	-	-	-	-	-	-	-	-	-	-
46	Small wader	-	-	-	-	-	-	-	-	-	-	-

47	Unidentified bird	-	-	-	-	0.44	-	-	-	-	-	0.08
48	Unidentified duck	-	-	-	-	0.05	-	-	0.29	0.01	0.04	0.03
49	Unidentified goose	-	-	-	-	0.14	0.30	1.62	0.59	0.17	0.84	0.31
	Total	19.11	10.98	4.96	4.16	8.51	5.12	10.18	2.56	2.44	2.32	6.36

Table 4.2-8. Average number of collected eggs per household, spring 2023

Settlement		Inchoun	Uelen	Lavrentia	Lorino	Providenia	Konergino	Uelkal	Ozernyi	Egvekinot	Amguema	Total
1	Widgeon	-	-	-	-	-	-	-	-	0.20	0.05	0.04
2	Mallard	-	-	-	-	-	-	-	-	-	-	-
3	Northern Pintail	-	-	-	-	-	0.20	-	-	-	-	0.02
4	Northern Shoveler	-	-	-	-	-	-	-	-	-	-	-
5	Teal	-	-	-	-	-	-	-	-	-	-	-
6	Scaups	-	-	-	-	-	-	-	-	-	-	-
7	Common Goldeneye	-	-	-	-	-	-	-	-	-	-	-
8	Harlequin Duck	-	-	-	-	-	-	-	-	-	-	-
9	Merganser	-	-	-	-	-	-	-	-	-	-	-
10	Long-tailed Duck	-	-	-	-	-	-	-	-	-	-	-
11	Black Scoter	-	-	-	-	-	-	-	-	-	-	-
12	White-winged Scooter	-	-	-	-	-	-	-	-	-	-	-
13	Common Eider	-	-	2.40	1.10	-	0.92	3.15	1.68	0.35	-	0.69
14	King Eider	-	-	0.40	-	-	-	-	-	-	-	0.03
15	Spectacled Eider	-	-	-	-	-	-	-	-	-	-	-
16	Steller's Eider	-	-	-	-	-	-	-	-	-	-	-
17	Emperor Goose	-	-	-	0.10	-	-	0.09	-	-	-	0.01
18	Swans	-	-	-	0.04	-	0.32	-	-	-	-	0.03
19	Snow Goose	0.11	-	-	-	-	-	-	-	-	-	0.01
20	Canada Goose	-	-	-	0.20	-	-	-	-	-	-	0.02
21	Brant	-	-	-	-	-	-	-	-	-	-	-
22	Bean Goose	-	-	-	-	-	-	0.32	-	-	0.27	0.05
23	Greater WF Goose	-	-	-	-	-	0.62	0.21	-	-	0.32	0.11
24	Lesser WF Goose	-	-	-	-	-	-	-	-	-	-	-

25	Sandhil Crane	-	-	-	-	-	-	-	-	-	0.19	0.02
26	Ptarmigan	-	-	-	-	-	0.20	-	-	-	0.27	0.05
27	Red-throated Loon	-	-	-	-	-	0.24	-	-	-	-	0.02
28	Pacific/Black-throated Loon	-	-	-	-	-	-	-	-	-	-	-
29	Yellow-billed Loon	-	-	-	-	-	-	-	-	-	-	-
30	Loon sp.	-	-	-	-	-	-	-	-	-	-	-
31	Cormorant	-	-	0.80	0.20	-	-	-	-	-	-	0.08
32	Murre	-	-	0.90	0.31	-	-	-	-	-	-	0.10
33	Guillemot	-	-	-	-	-	-	-	-	-	-	-
34	Tufted Puffin	-	-	0.20	-	-	-	-	-	-	-	0.02
35	Horned Puffin	-	-	-	-	-	-	-	-	-	-	-
36	Grebe	-	-	-	-	-	-	-	-	-	-	-
37	Auklet	-	-	-	-	-	-	-	-	-	-	-
38	Kittiwake	-	-	-	1.65	-	-	-	-	-	-	0.14
39	Gulls with black head	-	-	0.20	1.10	-	0.60	-	-	-	-	0.16
40	Large Gulls	1.43	0.16	2.90	1.90	2.74	3.46	2.82	0.29	0.44	0.73	1.61
41	Fulmar	-	-	-	-	-	-	-	-	-	-	-
42	Terns	-	-	-	-	-	0.08	0.18	-	-	-	0.02
43	Shearwater	-	-	-	-	-	-	-	-	-	-	-
44	Snowy Owl	-	-	-	-	-	-	-	-	-	-	-
45	Large wader	-	-	-	-	-	-	-	-	-	0.05	0.01
46	Small wader	-	-	-	-	-	-	-	-	-	-	-
47	Unidentified bird	-	-	-	-	2.45	-	-	-	-	-	0.44
48	Unidentified duck	-	-	-	-	-	-	-	0.91	-	0.19	0.08
49	Unidentified goose	-	-	-	-	-	1.40	-	0.29	-	0.33	0.18
	Total	1.54	0.16	7.80	6.59	5.19	8.04	6.76	3.18	0.99	2.40	3.92

Table 4.2-9. Harvested species composition, %. The tables includes species which together account for 90% of the total harvested birds. The bold is the highest values in each column.

Settlement	Inchoun	Uelen	Lavrentia	Lorino	Providenia	Konergino	Uelkal	Ozernyi	Egvekinot	Amguema	Total
Common Eider	21.1%	15.2%	2.4%	22.6%	6.9%	4.7%	11.6%	0.0%	11.6%	0.0%	11.5%
Bean Goose	0.4%	3.0%	3.2%	6.6%	16.0%	34.8%	27.5%	9.2%	13.3%	8.0%	11.2%
King Eider	28.7%	18.8%	25.0%	4.2%	1.0%	10.2%	0.0%	0.0%	0.0%	0.0%	11.1%
Greater White-fronted Goose	2.8%	1.9%	1.2%	7.5%	9.0%	25.4%	22.8%	5.7%	34.9%	18.1%	10.5%
Northern Pintail	11.8%	11.3%	11.7%	3.8%	14.5%	2.7%	0.0%	2.3%	0.0%	2.1%	8.8%
Ptarmigan	1.5%	2.5%	10.9%	7.1%	12.0%	1.2%	4.0%	8.0%	18.1%	15.4%	7.2%
Snow Goose	15.2%	11.8%	7.7%	1.4%	1.6%	0.0%	0.3%	0.0%	4.8%	5.3%	6.3%
Sandhil Crane	0.3%	0.0%	2.0%	4.2%	17.4%	2.3%	0.9%	2.3%	2.0%	1.1%	5.0%
Goose sp.	0.0%	0.0%	0.0%	0.0%	1.6%	5.9%	15.9%	23.0%	6.8%	36.2%	4.9%
Spectacled Eider	9.7%	9.4%	6.5%	5.2%	0.4%	0.0%	0.3%	0.0%	0.0%	0.0%	4.2%
Emperor Goose	1.5%	3.6%	8.1%	23.6%	1.0%	10.5%	2.6%	0.0%	1.2%	0.0%	4.0%
Lesser White-fronted Goose	0.6%	0.7%	2.0%	1.4%	0.9%	0.0%	5.5%	37.9%	0.0%	2.7%	2.1%
Brant	1.9%	0.9%	1.2%	2.8%	3.8%	0.0%	1.7%	0.0%	0.0%	0.0%	1.8%
Harlequin Duck	0.0%	0.4%	8.1%	0.0%	3.5%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%
Other species	4.3%	20.5%	10.1%	9.4%	10.4%	2.3%	6.9%	11.5%	7.2%	11.2%	10.0%
Total	100.0%										

Estimates of harvested birds and collected eggs

Fours species of eiders

Steller's Eider was recorded in only two questionnaires, one with 18 birds (from the village of Uelen) and the other with 2 birds (from the village of Lorino). King Eider and Spectacled Eider were only harvested in the northern villages. In the settlements along the Bering Sea coast south of Provideniia, only one eider species, the Common Eider, was recorded in the questionnaires. Average (Table 4.3-1, Figure 4.3-2) eider harvest indicated that King and Spectacled Eiders are more popular among hunters. Total (Table 4.3-2, Figures 4.3-1) harvest of eiders in 3 districts was calculated by multiplying the average harvest of one household by the total number of households (4,298 households).

Average eider harvest for all households as well as for households with hunters (Figure 4.3-3) clearly showed a pattern of increasing eider harvest along the Bering Sea coast towards the north. This pattern appears to be broken in the village of Uelkal, south of Konergino. However, the waterfowl hunting grounds of Uelkal residents were mainly in the area of Rudera Spit, i.e. between Konergino and Provideniia. In the questionnaires from the village of Amugema (the only village far from the seacoast) eider harvest was not recorded at all.

Most eiders were harvested during the spring hunting season. Only the questionnaires from Inchoun had a significant number of birds taken in fall (Figure 4.3-3).

Some species were harvested in almost all settlements, while the harvest of others was settlement-specific (Figures 4.3-4, 4.3-5; Table 4.2-9). For example, Common Eider and King Eider were harvested almost in all settlements, increasing towards the north. In contrast, 90% of Steller's Eider and 80% of Spectacled Eider were taken in Uelen and Inchoun. Settlement-specific harvest was also observed for other species, e.g. all Northern Shoveler and Common Goldeneye were harvested in Uelen, and 82% of Sandhill Crane were harvested in Provideniya.

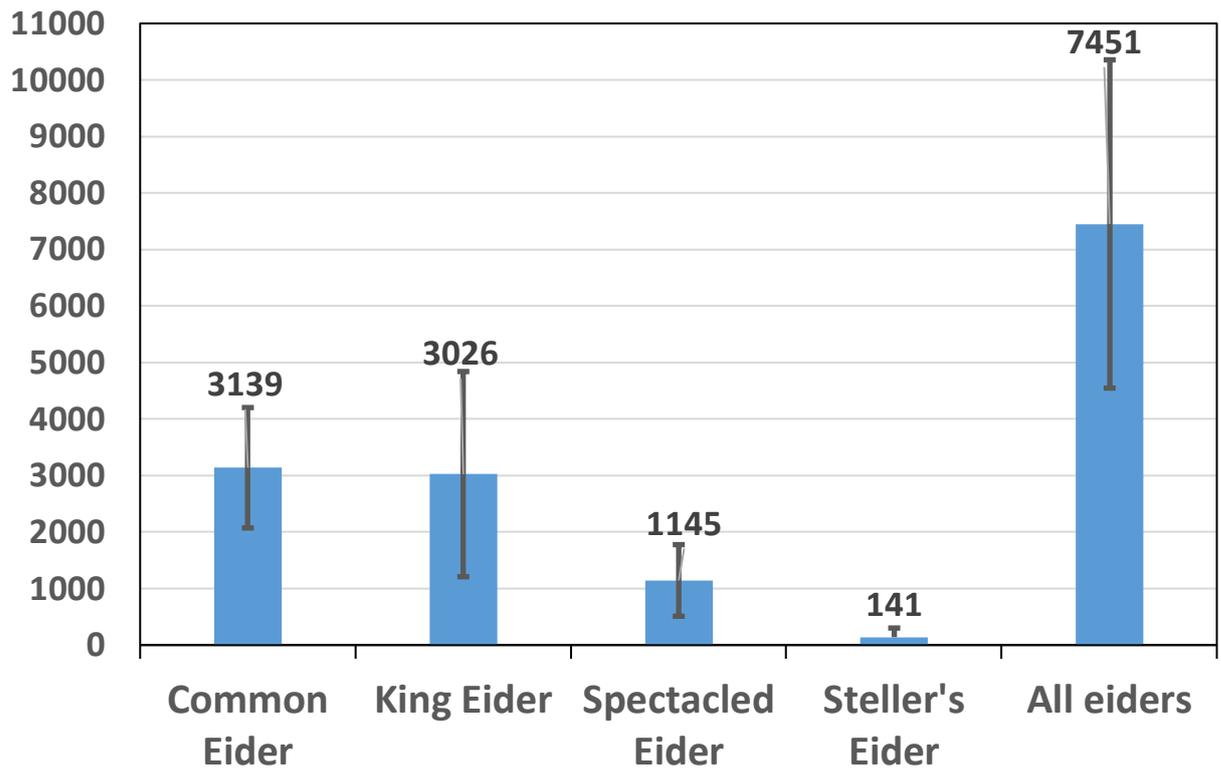


Figure 4.3-1. Estimated total number of harvested eiders in Iultinskii, Providenskii and Chukotskii districts (P=0.95).

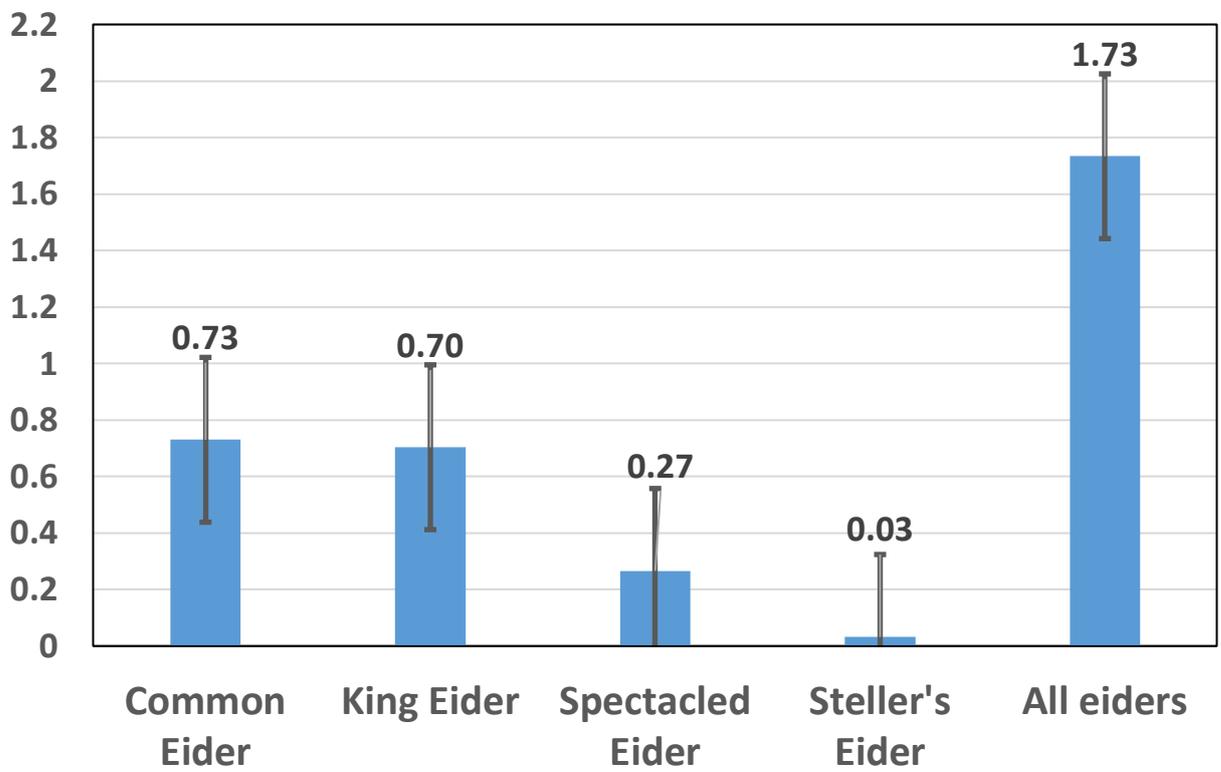
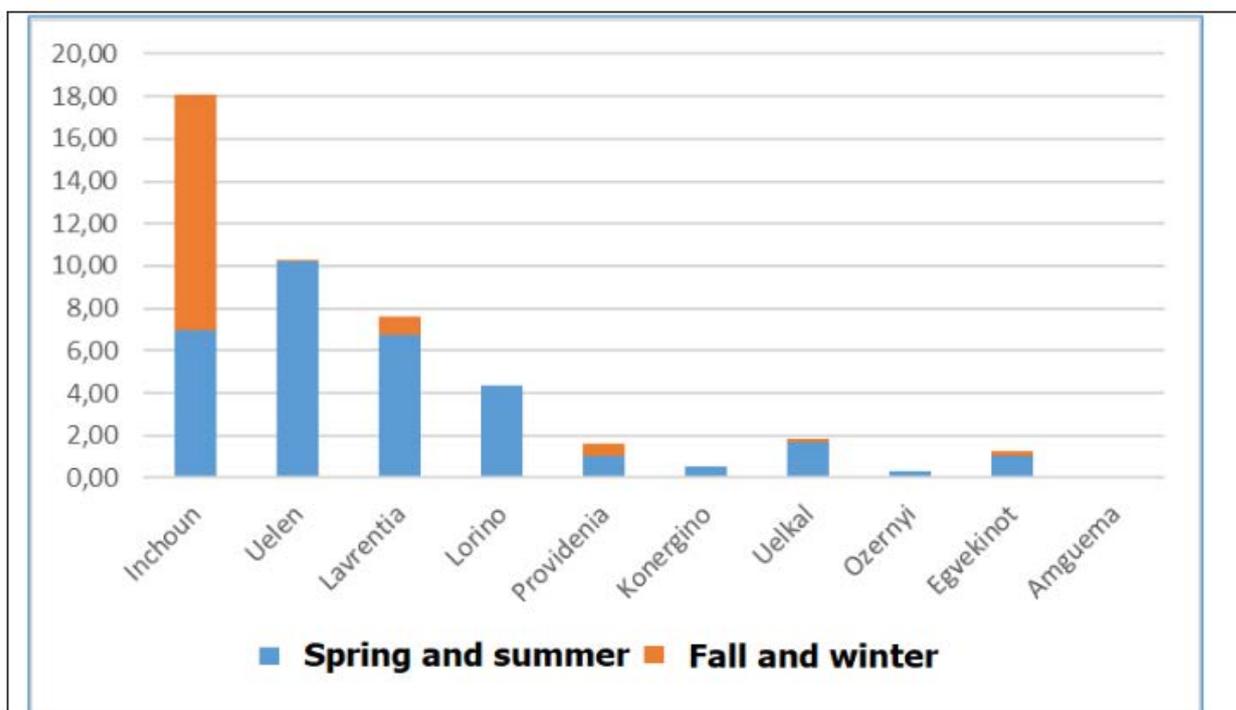
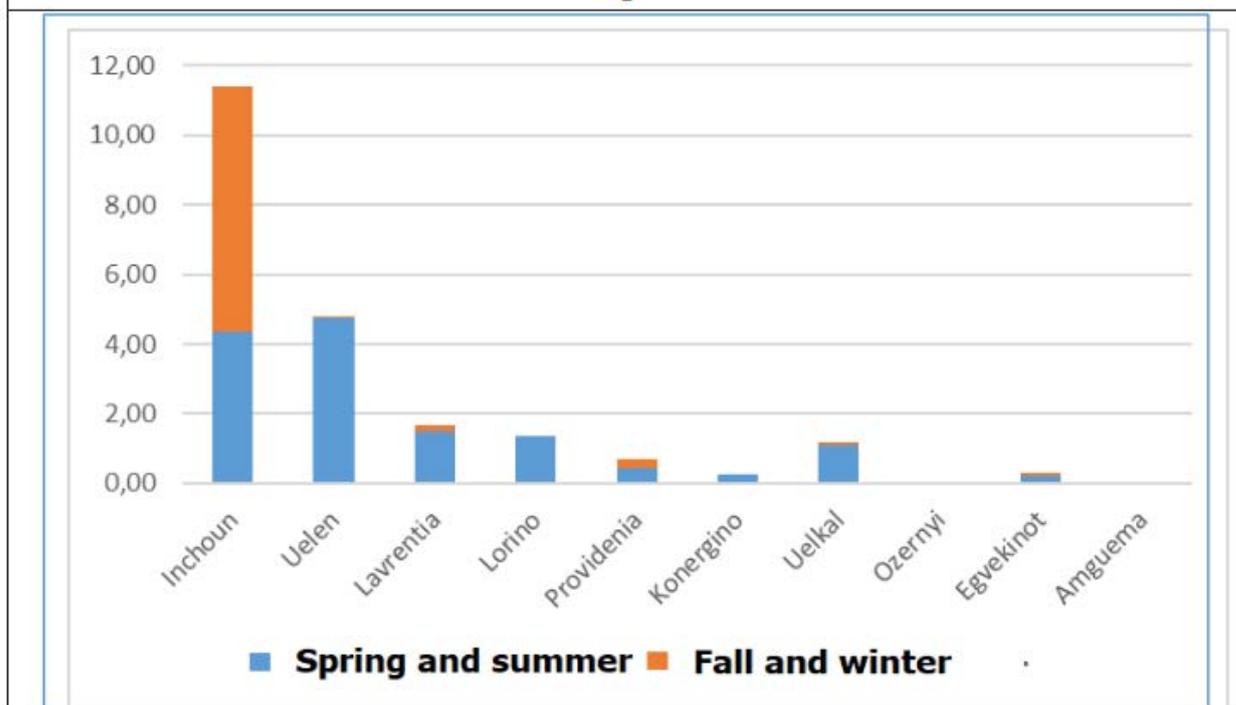


Figure 4.3-2. Estimated average number of eider harvested per household (P=0.95).



1



2

Figure 4.3-3. Number of eiders harvested per household in spring/summer and in fall/winter seasons.

1 – average number of all eiders for households with hunters;

2 – average number of all eiders for all households.

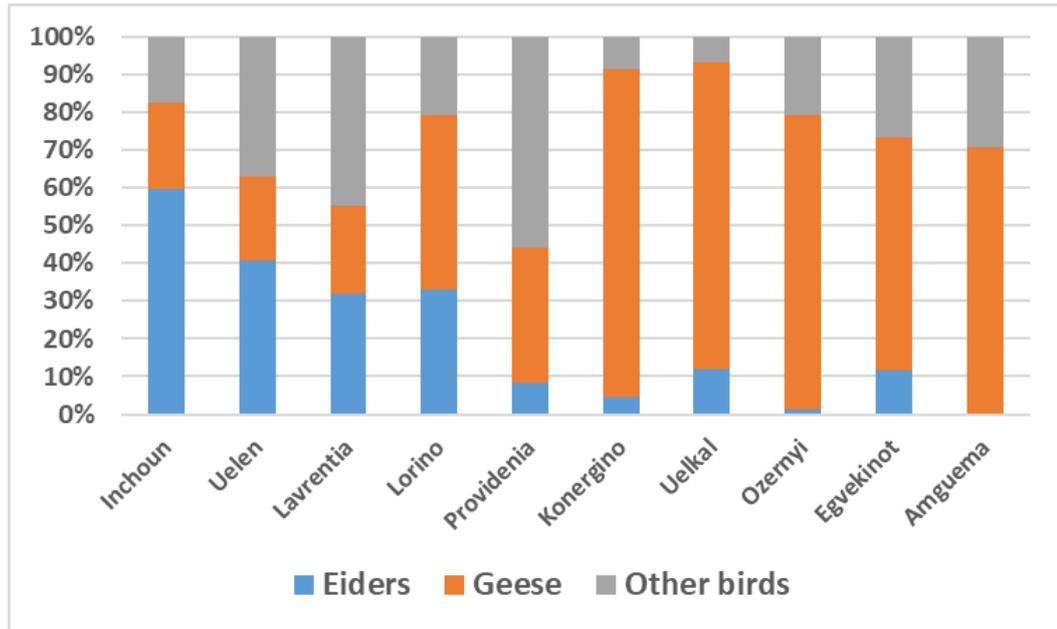


Figure 4.3-4. Proportion of eiders, geese and other bird species harvested (as reported in the questionnaires).

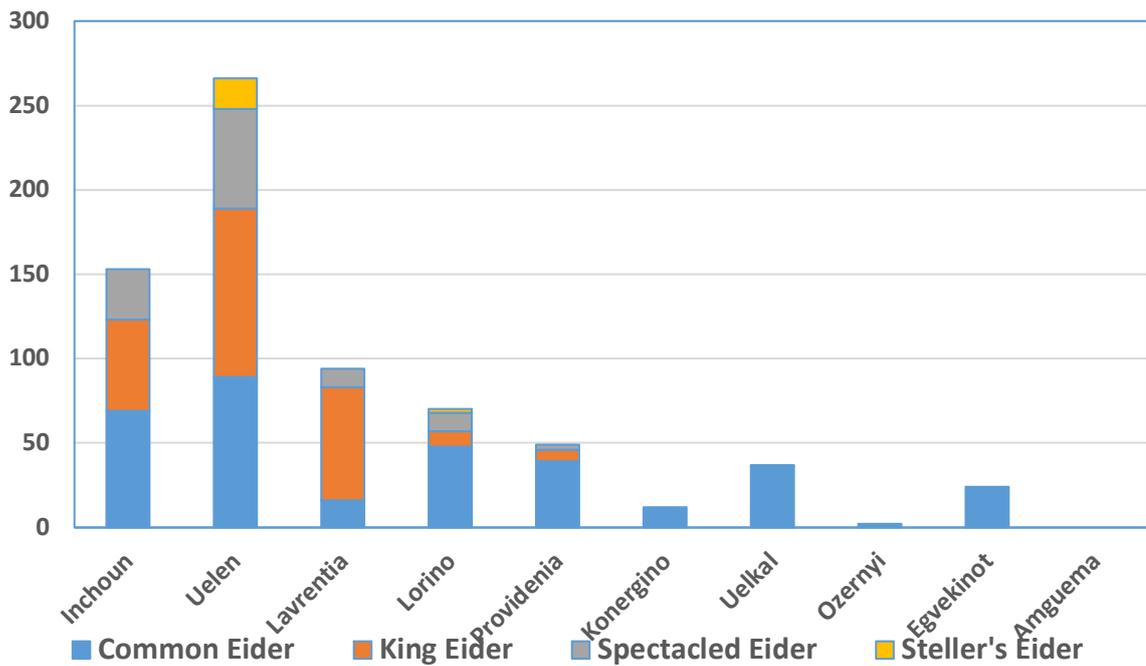


Figure 4.3-5. Number of eider' species harvested (as reported in questionnaires).

Table 4.3-1: Average eider harvest per household (n=608).

	Common Eider	King Eider	Spectacled Eider	Steller's Eider	All eiders
Total number of birds harvested	444	428	162	20	1054
Mean (birds harvested per 1 household)	0.73	0.70	0.27	0.03	1.73
Standard error	0.13	0.22	0.08	0.02	0.34
Standard deviation	3.11	5.31	1.85	0.48	8.49
Minimum value	0	0	0	0	0
Maximum value	40	100	30	10	113
Student's criterion	0.25	0.42	0.15	0.04	0.68
Confidence interval (P=0.95)					
Lower limit of confidence interval	0.48	0.28	0.12		1.06
Upper limit of the confidence interval	0.98	1.13	0.41	0.07	2.41

Table 4.3-2. Estimated total eiders harvested in surveyed areas (P=0.95).

Eider species	Average	Minimum	Maximum
Common Eider	3139	2073	4204
King Eider	3026	1209	4842
Spectacled Eider	1145	512	1779
Steller's Eider	141	20	304
Total	7451	4545^{*)}	10356^{*)}

^{*)} Calculated by extrapolating the data for each species and then adding them together.

Table 4.3-3. Average goose harvest per household (n=608).

	Bean Goose	Greater White-fronted Goose	Snow Goose	Emperor Goose	Lesser White-fronted Goose	Canada Goose	Brant	Goose sp.	All geese
Total number of birds harvested	433	404	244	153	82	69	43	190	1618
Mean (birds harvested per 1 household)	0.71	0.66	0.40	0.68	0.13	0.11	0.07	0.31	2.66
Standard error	0.09	0.11	0.08	0.06	0.04	0.03	0.03	0.08	0.23
Standard deviation	2.10	2.66	1.88	1.54	0.87	0.86	0.65	2.04	5.70
Minimum value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum value	15	45	20	30	10	10	10	30	55
Student's criterion	0.17	0.21	0.15	0.12	0.07	0.07	0.05	0.16	0.45
Confidence interval (P=0.95)									
Lower limit of confidence interval	0.55	0.45	0.25	0.56	0.07	0.04	0.02	0.15	2.21
Upper limit of the confidence interval	0.88	0.88	0.55	0.80	0.20	0.18	0.12	0.48	3.12

Table 4.3-4. Estimated total goose harvest in the surveyed area (P=0.95).

Geese species	Average	Minimum	Maximum
Bean Goose	3061	2343	3779
Greater White-fronted Goose	2856	1945	3767
Snow Goose	1725	1083	2366
Emperor Goose	2922	2396	3448
Lesser White-fronted Goose	580	282	877
Canada Goose	488	193	783
Brant	304	83	525
Goose sp	1343	644	2042
Total	11438	9487 ^{*)}	13389 ^{*)}

^{*)} Calculated by extrapolating the data for each species and then adding them together.

Other bird species

Average harvest of geese per household (average harvest of one household multiplied by total of 4,298 households; Table 4.3-3, Figure 4.3-6) showed that Brant was the least common and Bean Goose – the most common species. Average harvest of birds per household (Table 4.3-5) and total harvest (Table 4.3-6, Figure 4.3-7) for the main species, which all together account for 90% of the total bird harvest, showed that geese are harvested more than eiders, but eiders all together are harvested more than other duck species or cranes and ptarmigan.

Table 4.3-5. Average harvest of main bird species groups per household (n=608). Included groups represent 90% of all harvested birds.

Items of data	Eiders	Geese	Northern Pintail	Sandhil Crane	Ptarmigan	All species
Total number of birds harvested	1054	1 618	340	194	277	3866
Mean (birds harvested per 1 household)	1.73	2.66	0.56	0.32	0.45	6.36
Standard error	0.34	0.23	0.12	0.05	0.08	0.71
Standard deviation	8.49	5.70	2.84	1.20	2.01	17.60
Minimum value	0	0.00	0.00	0.00	0.00	0
Maximum value	113	55	50.00	10.00	20.00	283
Student's criterion	0.68	0.45	0.23	0.10	0.16	1.40
Confidence interval (P=0.95)						
Lower limit of confidence interval	1.06	2.21	0.33	0.22	0.30	4.96
Upper limit of the confidence interval	2.41	3.12	0.79	0.41	0.61	7.76

Table 4.3-6. Total harvest of the most important bird groups in the surveyed area (P=0.95).

Group of species	Average	Minimum	Maximum
All birds	27329	21309	33349
Incl.			
Eiders (all species)	7451	4545	10356
Geese (all species)	11438	9487	13389
Northern Pintail	2403	1433	3374
Sandhil Crane	1369	960	1779
Ptarmigan	1955	1268	2641

Uelkal, Ozernyi and Konergino are settlements with the largest geese harvest per household (Figure 4.3-8). For species other than eiders and geese, Lavrentia and Providenia had the largest per household harvest (Figure 4.3-9). For all birds, Inchoun had the largest estimate (Figure 4.3-10). Proportion of eider, geese and other birds in each settlement's harvest is shown at the Figure 4.3-4.

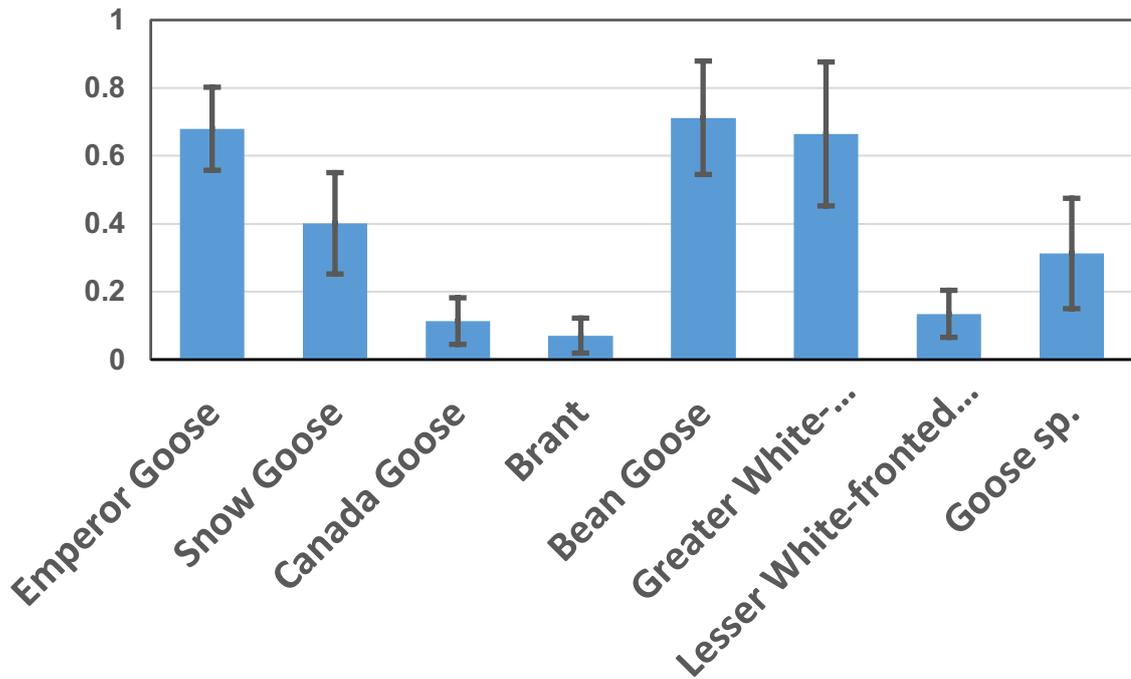


Figure 4.3-6. Average number of geese species harvested per household (P=0.95).

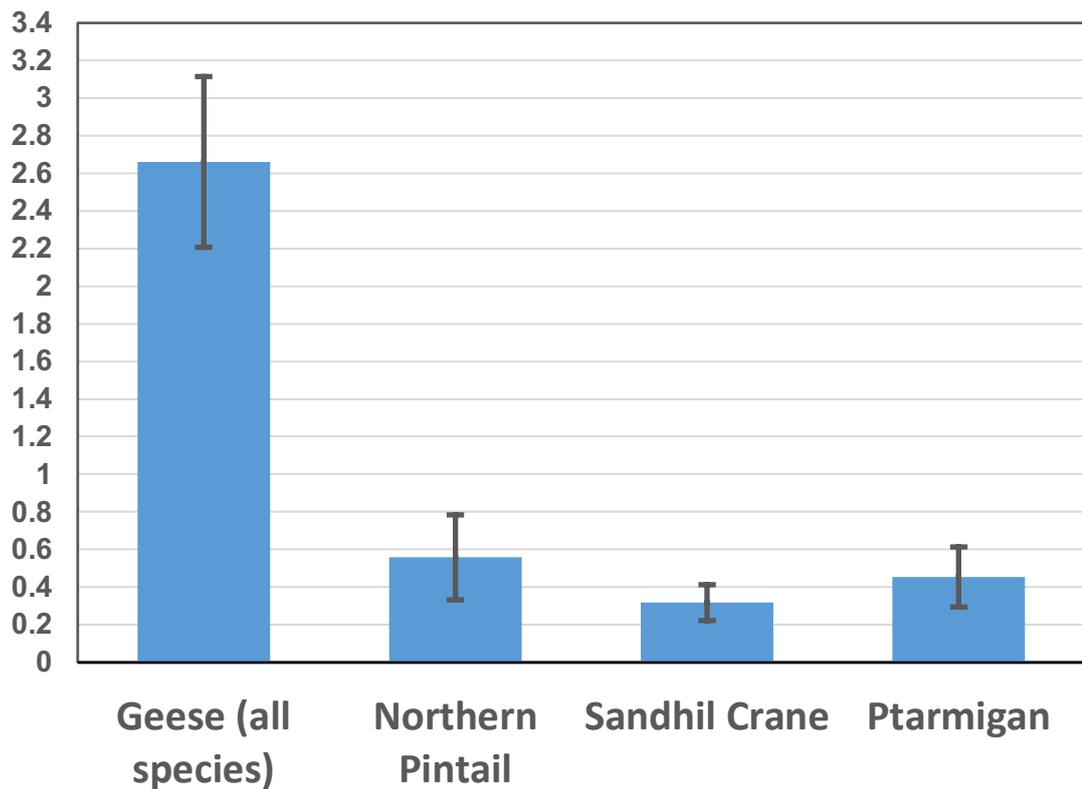
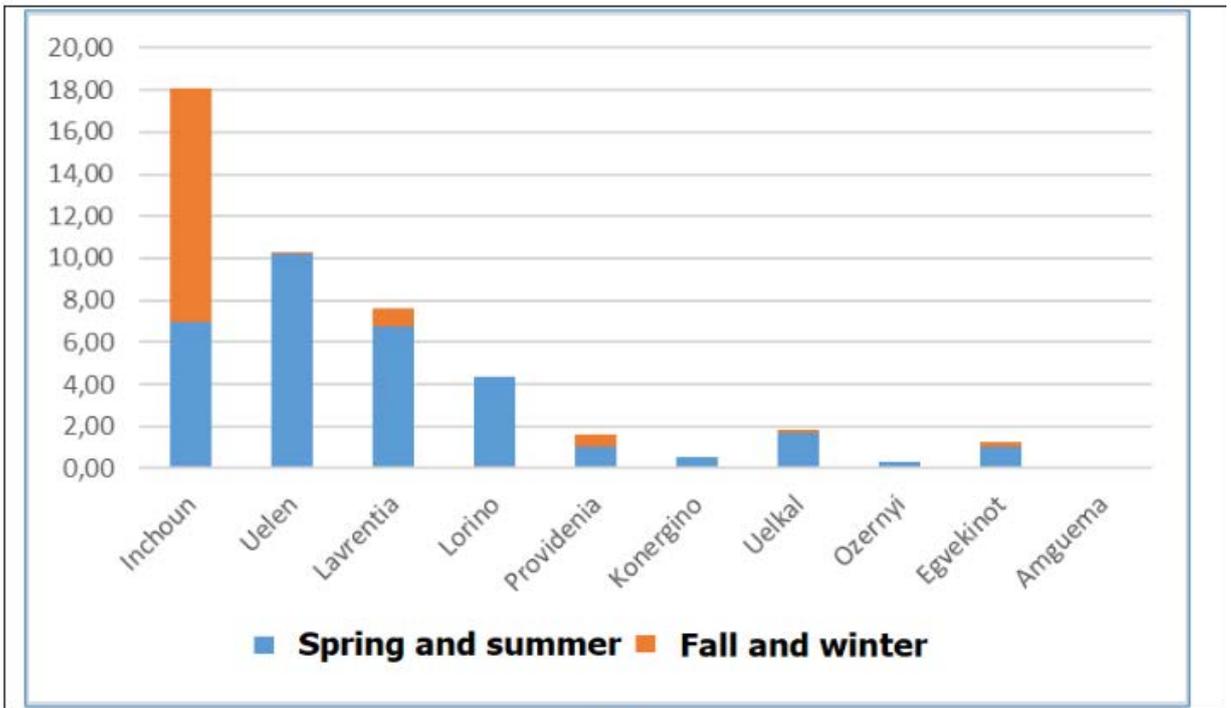
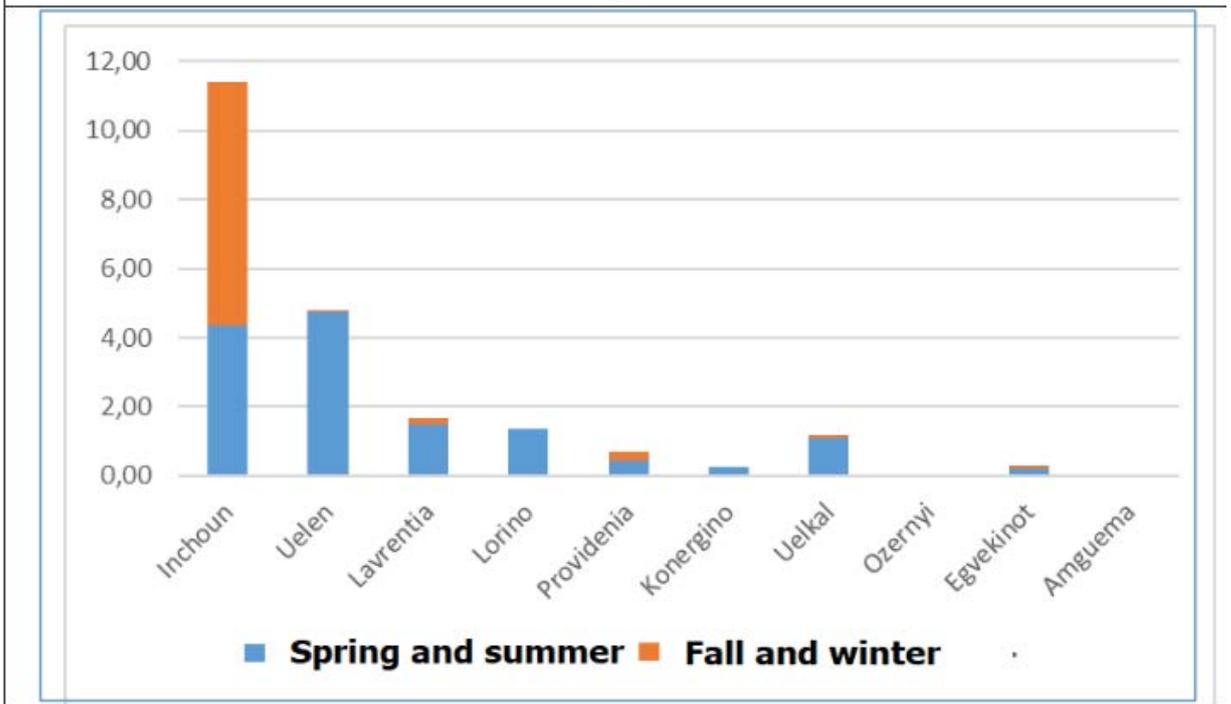


Figure 4.3-7. Average number of geese, Pintails, Sandhill Granes and Ptarmigan harvested per household (P=0.95).



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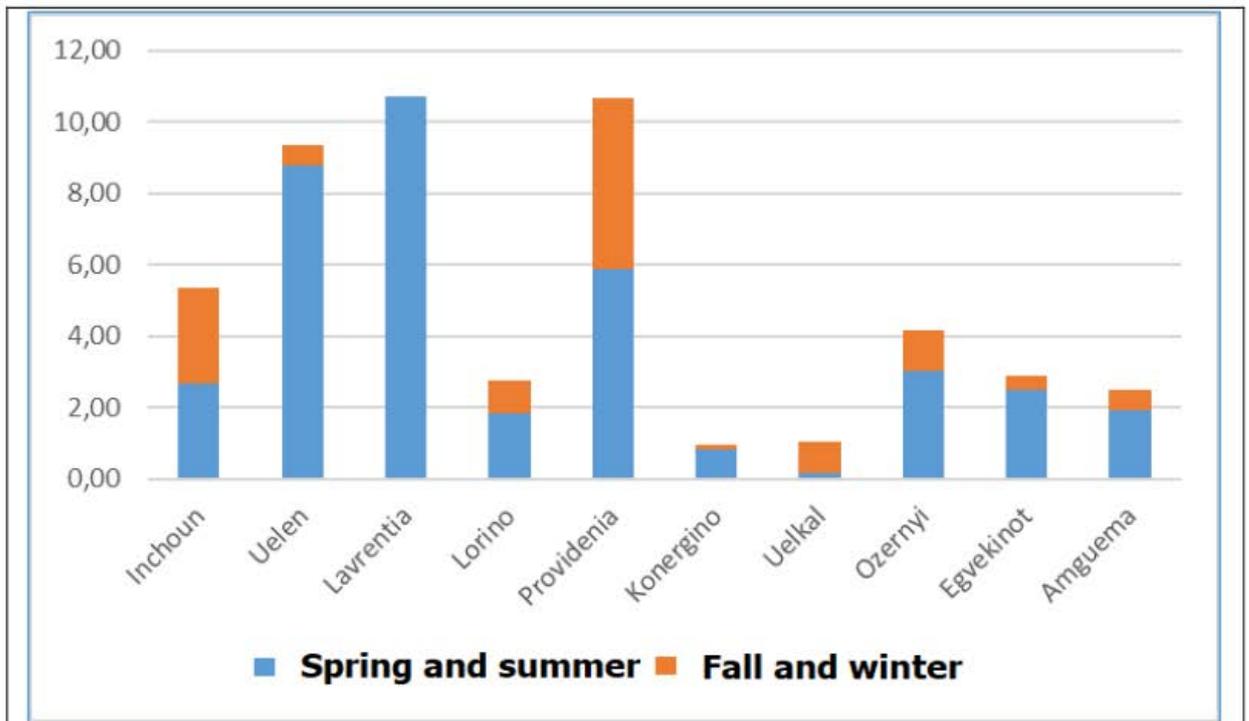


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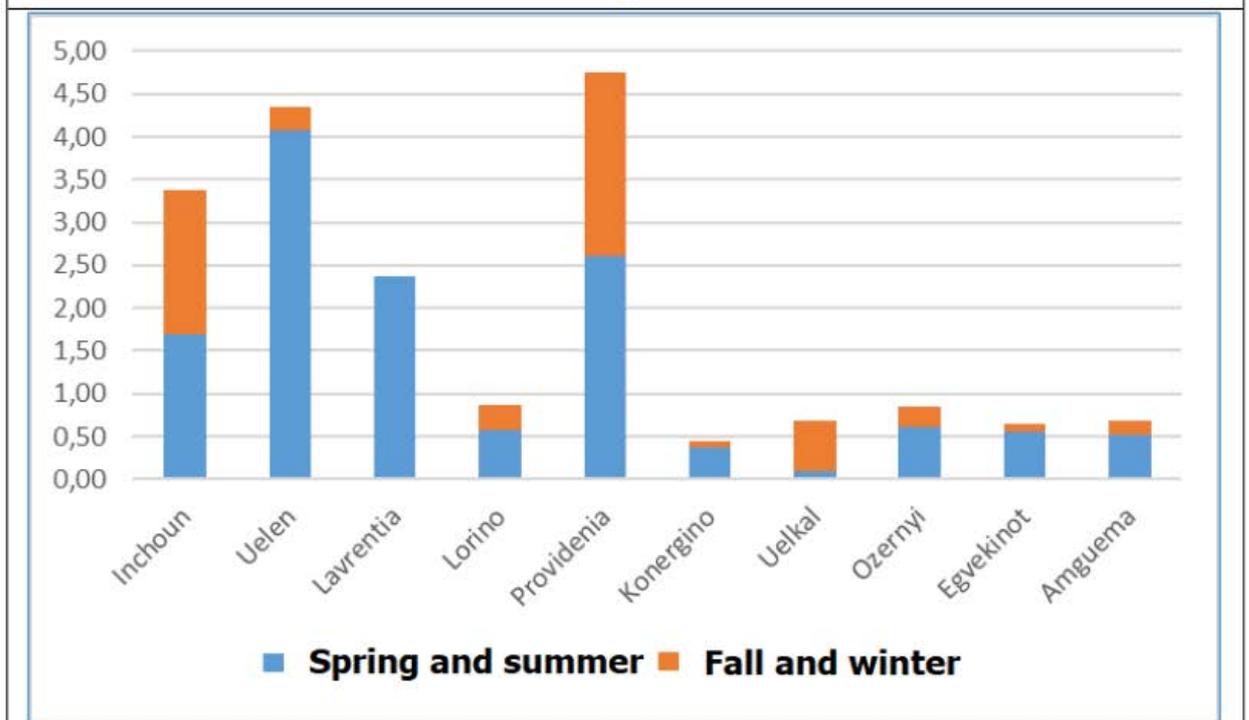
Figure 4.3-8. Number of geese harvested per household in spring/summer and in fall/winter seasons.

1 – all species of geese averaged for households with hunters;

2 – all species of geese averaged for all households.



1



2

Figure 4.3-9. Number of birds other than eiders and geese harvested per household in spring/summer and in fall/winter seasons.

1 – all bird species except eiders and geese, averaged for households with hunters;

2 – all bird species except eiders and geese, averaged for all households.

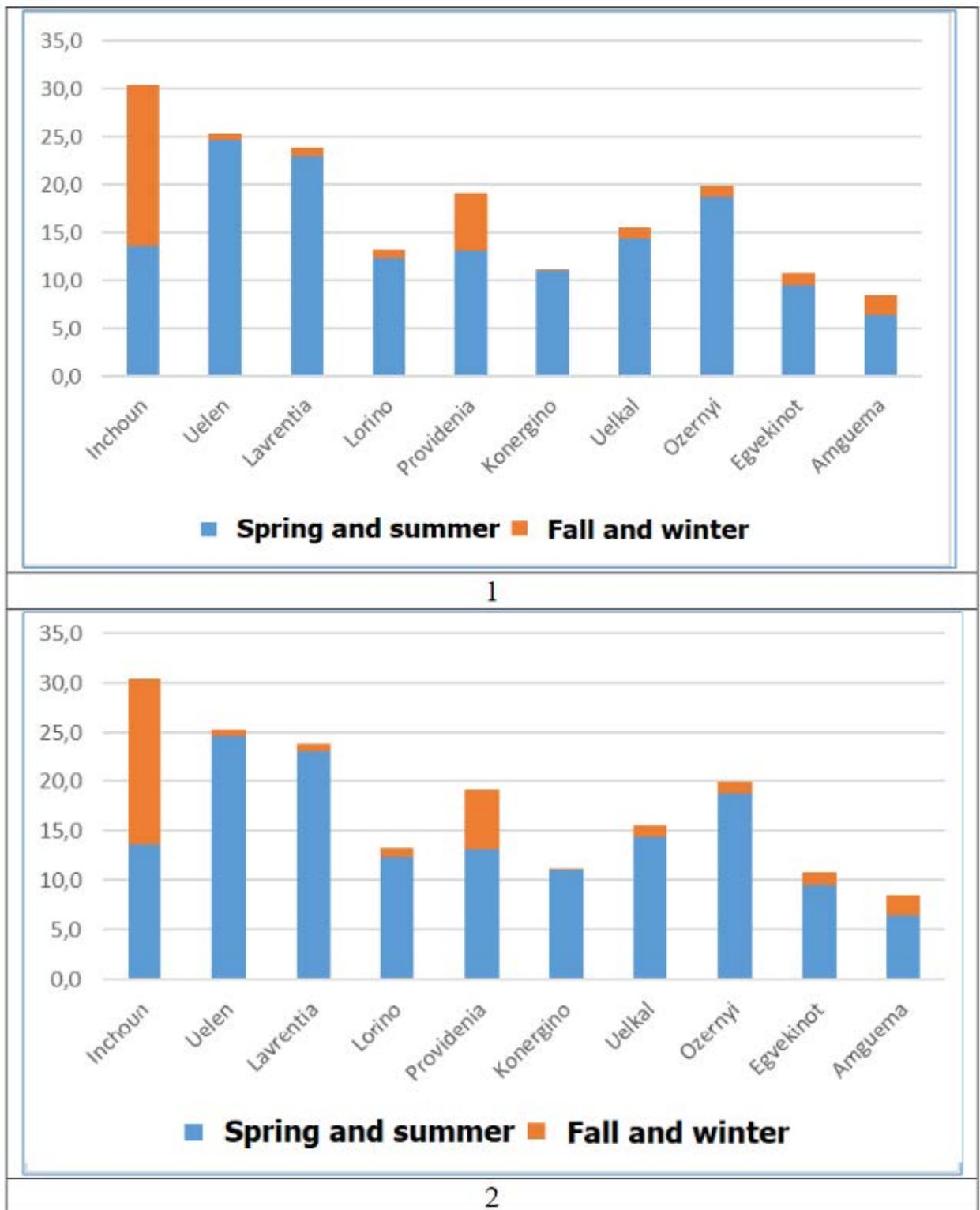


Figure 4.3-10. Number of all birds harvested per household in spring/summer and in fall/winter seasons.

- 1 – all bird species averaged for households with hunters;
- 2 – all bird species averaged for all households.

Our results show that goose harvest generally changed in the opposite direction to the harvest of eiders. In settlements where more geese were harvested, fewer eiders were harvested and vice versa. The majority of waterfowl were harvested in spring. Fall hunting took place mainly in Provideniia and Inchoun. Many Ptarmigan and Sandhill Cranes were harvested in fall.

Eggs of eiders and other birds

Collecting eggs from wild bird nests was widespread in the late 1990s, when Chukotka was experiencing severe food shortages and almost famine, and it was almost impossible to buy eggs in shops. In the current survey, egg collection was mentioned only in 166 questionnaires (27%). In Konergino and Uelkal, >70% of households were engaged in egg collection (Table 4.1-5, 4.2-8). When asked about egg collection, the majority of respondents emphasized that they never took all the eggs from the nest. A total of 2386 eggs were collected by all respondents, with an average of 3.9 eggs per household. People from Konergino, Lavrentiia and Uelkal were the most intensively collected with 7-8 eggs per household (Table 4.3-7; Table 4.3-8).

Table 4.3-7. Average number of eggs collected per household (n=608).

Items of data	Eggs (total)	Eider eggs	Large gull eggs
Total number of collected eggs	2386	442	981
Mean (eggs collected per 1 household)	3.92	0.73	1.61
Standard error	0.51	0.17	0.27
Standard deviation	12.51	4.15	6.75
Minimum value	0	0	0
Maximum value	160	40	60
Student's criterion	1.00	0.33	0.54
Confidence interval (P=0.95)			
Lower limit of confidence interval	2.93	0.40	1.08
Upper limit of the confidence interval	4.92	1.06	2.15

Table 4.3-8. Estimates of total number collected eggs in the surveyed area (P=0.95).

Species	Average	Minimum	Maximum
Eggs (total)	16867	12587	21147
Incl.			
Eider eggs	3125	1705	4545
Large gull eggs	6935	4627	9242

The intensity of egg collection depends mainly on the presence of large bird colonies on cliffs close to settlements, where seabirds (gulls, guillemots, etc.) nest, as well as mass nesting sites of gulls and geese in the tundra along the seacoast or on islands, where many eggs can also be collected, mostly gull and duck eggs. 41% of all eggs collected were from large gulls. Eider eggs (a total of 442 eider eggs were recorded in the questionnaires) accounted for 18.5% of all eggs collected. On average, a household collects 0.73 eider eggs. Multiplying this value by the total number of households in the three districts (4298) gives an estimate of the total number of eider eggs collected – 6935, with a 95% confidence interval 4627-9242 (Table 4.3-8). This is close to the total number of eiders taken during the hunt, which was 7451 (Table 4.3-2).

Additional information from the questionnaire survey

Down collection

Only 20 people said 'yes' to the question "Do you collect eider down or anything else useful from birds?" Six of them said that they collected down from geese and other birds for pillows, and 14 collected birds' wings, which were used as brooms in the household and for amulets and rituals. There was no special collection of eider down in the study area.

Sale and exchange of harvested birds

Only 3 people said 'yes' to the question "Did you or anyone from your family ever sell or exchange harvested birds or eggs of wild birds". One hunter admitted that he had traded his birds for vodka, another for ammunition. The third said that when he did not have petrol to go hunting, he asked his neighbor for petrol and in return brought him a plucked and gutted goose. There were no cases of selling birds or eggs.

It should be noted that it is widely accepted among the population of all Chukotka to share all kinds of wildlife harvest – most often fish and meat of marine mammals, venison, as well as harvested bird. Venison and fish are not only always given away for free but are often sold. However, it is not customary in Chukotka to sell birds and meat of marine animals.

Birds caught in nets

Respondents were willing to answer the question about birds being caught in fishing nets, but few could recall and name the number and species of birds they had caught in their nets. Almost half of the surveyed households (46.4%) used nets to fish. About 1/3 of those who fished said that birds were caught in their nets, and about 1/3 of these said that these birds included ducks, including eiders. In total, 99 questionnaires reported that birds were caught in nets, including ducks in 34 questionnaires. Cormorants, Murre, Tufted Puffin, Gulls and other seabirds, and Loons were the most frequently netted birds.

Birds caught in nets were usually discarded if they were already dead and released if they were still alive. Only a few people replied that they used them for food or to feed dogs.

A few people mentioned the number of birds caught in the net: in the last year – usually 1-2 birds, less often 3-4 birds. Only one questionnaire mentioned 10 eiders (most of which were released).

Thus, according to our survey, the total number of eiders killed in fishing nets is negligible compared to the number of eiders killed during hunting.

Table 4.4-1. Birds caught in fishing nets.

Settlement	Inchoun	Uelen	Lavrentiia	Lorino	Provideniia	Konergino	Uelkal	Ozernyi	Egyekinot	Anguema	Total
Number of households that fished with nets with birds caught in nets	27	36	23	21	79	30	21	8	17	20	282
including ducks and/or eiders*)	15	14	15	12	10	6	8	2	9	8	99
	0	5	6	12	6	1	2	1	1	0	34

*) Some respondents did not distinguish between eiders and other ducks.

Perceived estimated trends of Eider and Emperor Goose populations according to respondents

There were few reports on trends in the abundance of the four species of Eider and Emperor Goose. Most respondents chose the 'difficult to answer' option. Half of the respondents chose "abundance has remained the same" for all species (Table 4.4-2). Figure 4.4-1 shows only 'increased' or 'decreased' responses. For all species, 'increased' responses were more common than 'decreased' responses. The most significant prevalence of optimistic over pessimistic answers was 2.0 times for the Emperor Goose and 1.4 times for the Common Eider.

We believe, due to additional questions after the interview, that such answers often reflected the situation of the previous year rather than a long-term trend. If there were slightly more birds than usual in the current year, some respondents chose the answer "the number of birds has increased".

Table 4.4-2. Hunters' reports on population trends for four species of Eiders and Emperor Goose.

Species	Answer	No change	Decreased	Increased	Total
Common Eider	Number of reports	76	42	56	174
	%	43.7	24.1	32.2	100
King Eider	Number of reports	78	30	43	151
	%	51.7	19.9	28.5	100
Spectacled Eider	Number of reports	72	35	46	153
	%	47.1	22.9	30.1	100
Steller's Eider	Number of reports	70	37	41	148
	%	47.3	25	27.7	100
Emperor Goose	Number of reports	87	27	55	169
	%	51.5	16	32.5	100

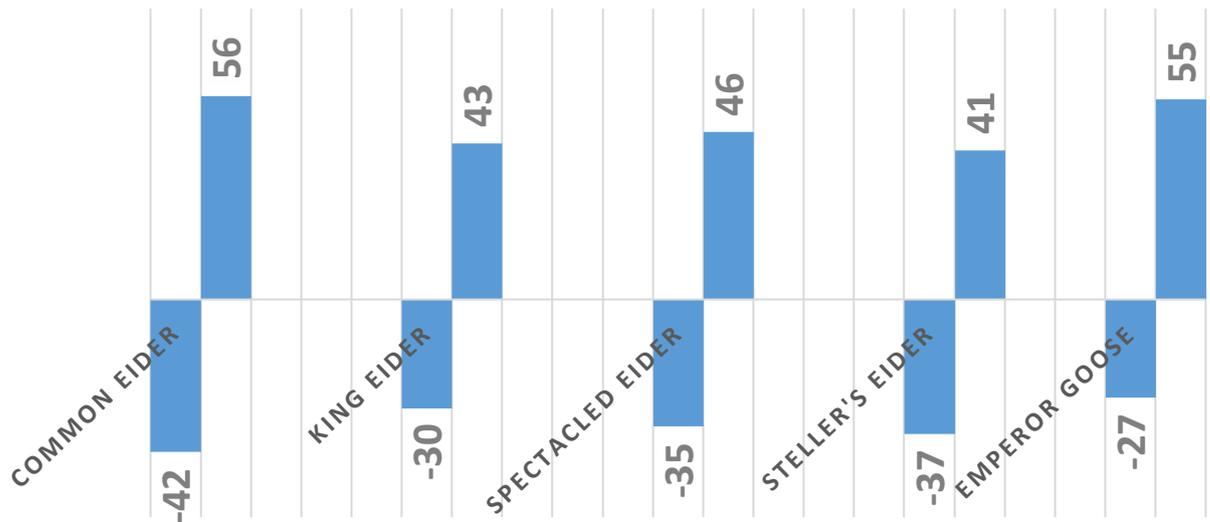


Figure 4.4-1. Population trend assessment by respondents for four eider species and Emperor Goose. Numbers indicate positive or negative assessments. For example, 56 respondents believed that Common Eider population increased.



In total, we estimated that 27,329±6,020 birds of all species were hunted at Chukotka during fall of 2022 and spring of 2023.

Table 4.4-3. Final estimates of total bird harvest in Iultinskii, Providenskii and Chukotskii districts of the Chukotskii Autonomous Okrug, 2023.

Species and groups of species of birds	Estimation of the number of birds harvested (P=0,95)
All species incl.	27,329±6,020
Eiders	
Common Eider	3,139±1,065
King Eider	3,026±1,816
Spectacled Eider	1,145±633
Steller's Eider	141±163
All eider species	7,451±2,905
Geese	
Bean Goose	3,061±718
Greater White-fronted Goose	2,856±911
Snow Goose	1,725±641
Emperor Goose	2,922±526
Lesser White-fronted Goose	580±297
Canada Goose	488±295
Brant	304±211
Goose sp	1,343±699
All geese species	11,438±1,951
Other important bird species	
Northern Pintail	2,403±970
Sandhill Crane	1,369±409
Ptarmigan	1,955±686
Other species and unspecified birds	2,713

COMPARISON OF 2023 AND 2001-2006 SURVEYS

An anonymous survey on bird hunting was conducted in 2001-2006 in 13 settlements at the north of Chukotka (Table 4.1-1, Figure 4-1). Ten of these 13 settlements were in the Iultinskii, Providenskii and Chukotskii districts. Four of them were also surveyed in 2023 (Table 4.1-1).

Comparison of the two surveys is challenging as the sampling methodology was different (a new methodology was requested by Russian partners as the impetus for this work rather than seeking direct comparison between the time periods using the same methods which were felt insufficient). In 2001-2006, systematic sampling was used. In villages, a list of hunters was compiled prior to the survey via discussion with a village administration). Hunters were then interviewed using an anonymous questionnaire (Figure 5-1). In villages with < 1,000 people, all hunters present during the survey were interviewed. The proportion of hunters interviewed ranged from 36% to 77%. In larger settlements, approximately half of the present hunters was interviewed using the same principle (Table 5-1).

A comparison of the new data for 2001-2006 revealed a decrease in the number of hunters. Four settlements were surveyed twice. For the first survey, the lists of hunters compiled by village administrations included 542 hunters. Mostly likely, those lists did not include residents with low hunting activity. In 2023, 98 hunters were among the respondents in the same villages. Taking into account the proportion of families interviewed in each settlement, the total number of hunters in the four settlements could be estimated as 400 people. Such a decrease (about 30%) can be explained by more complicated bureaucratic procedures related to hunting guns, confiscation of guns with overdue permits, higher prices for ammunition, as well as the decreasing role of hunting as a source of food for the local population.

A total of 405 questionnaires were received from hunters in Chukotskii and Providenskii and Iultinskii districts for the first survey, almost twice as many as in 2023, when only 223 hunting households were surveyed. However, the 2001-2006 sample was not random and it is impossible to assess its statistical reliability. For this reason, the assessment of the total number of birds hunted, including eiders, has not been calculated for the entire territory of the three districts. It has been only calculated for individual settlements, without determining statistical characteristics and confidence intervals.

Table 5-1. Data on 2001-2006 survey.

Settlement	Year of survey	Population size	% of Indigenous population	Total # of hunters	# of hunters surveyed	% of hunters surveyed
Ianranai	2003	236	66	44	24	55
Pevek town	2003	5112	2	465	137	29
Rytkuchi	2003	487	72	84	51	61
Nutepelmen	2003	153	97	26	20	77
Neshkan	2002	678	97	250	98	39
Inchoun	2004	373	99	69	25	36
Lavrentiia	2004	1388	57	187	35	19
Lorino	2005	1146	88	221	64	29

Ianrykinot	2005	366	94	44	20	46
Novoe Chaplino	2004	466	90	62	25	40
Sireniki	2004	610	91	104	41	39
Enmelen	2004	388	88	75	40	53
Uelkal	2006	240	84	...	29	...
Total		11643	X	1631	609	36

In general, we see a very significant decrease in harvest since 2003-2006: the total number of birds harvested by one hunter (average for the three districts) decreased by half (Table 5-2). Figure 5-2 reflects average harvest by 1 hunter in 2000s while Figures 4.3-3 (1), 4.3-8 (1), 4.3-9 (1) and 4.3-10 (1) reflect average household harvest in 2022-2023. This comparison is presented in more detail in Tables 5-2 and 5-3.

At the same time, in four settlements where the survey was conducted twice, and where waterfowl hunting is particularly developed, this decline is smaller (Table 5-3). Average harvest of Geese and King Eider in these settlements remained the same, while the other eider species, and especially Steller's Eider, decreased quite significantly. The reason for such differences may be due to both different calculation methods and actual decrease in harvest of birds. Even on the assumption that the average hunting bag of one hunter was roughly the same, there was undoubtedly a reduction in the total number of harvested eider as there were significantly fewer hunters.

Due to the small number of questionnaires received from a settlement (30-50), it is not statistically reliable to compare the data from the two surveys on average eider harvest for individual settlements. In fact, only for two settlements, Inchoun and Lorino, the estimates were close: 1060 and 1093 in 2004 and 700 and 995 in 2023. Here, a slight decrease in harvest seems plausible. In Uelkal, the 2005 estimate was 224 and the 2023 estimate was only 55 eiders, but the larger decrease is just as plausible, as the significant decline in eider numbers over the last decade was noted in an informal interview with an experienced hunter. For Lorino, however, the estimates differ greatly: 3991 eiders in 2005 and 493 eiders in 2023. It is likely that the first estimate was significantly overestimated.



Figure 5-1. The front side of the anonymous questionnaire used in Chukotka and northern Yakutia in the early 2001-2006.

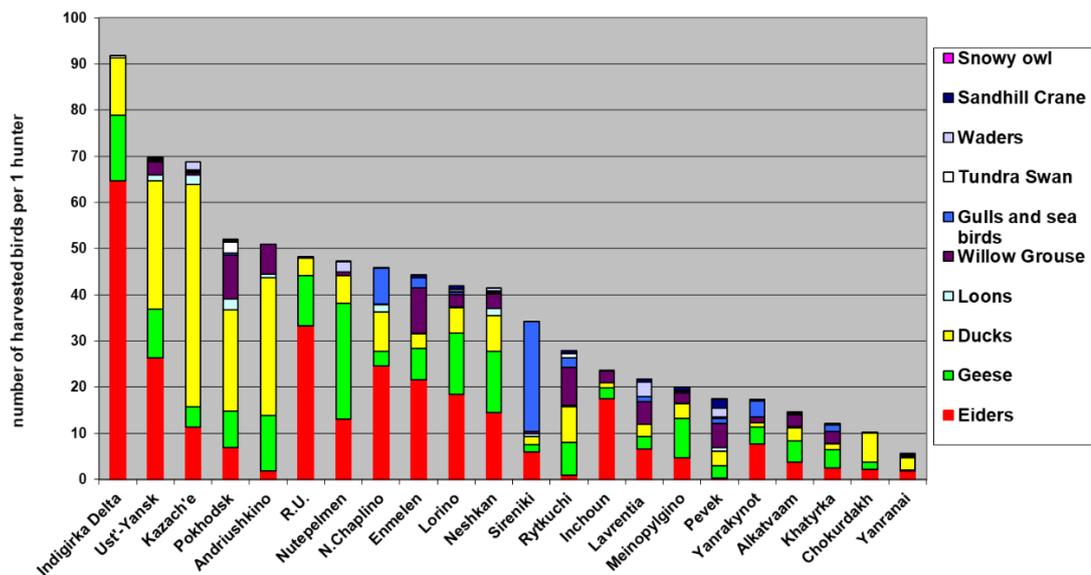


Figure 5-2. Structure of bird harvest by species groups. Based on the results of the surveys in Chukotka and Northern Yakutia in 2001-2006.

Table 5-2. Comparison of 2001-2006 and 2023 surveys in the Iultinskii, Providenskii and Chukotskii districts.

Species	Total # of birds harvested, all surveyed households		Average per 1 questionnaire			Average per 1 hunter		
			2001-2006	2023	2004 / 2023 ratio	2001 - 2006	2023	2004/2023 ratio
	2001-2006	2023	# of questionnaires		# of hunters			
			405	223		405	280	
Common Eider	2509	444	6.2	2	3.1	6.2	1.6	3.9
King Eider	1075	428	2.7	1.9	1.4	2.7	1.5	1.7
Spectacled Eider	484	162	1.2	0.7	1.7	1.2	0.6	2.1
Steller's Eider	258	20	0.6	0.1	6.7	0.6	0.1	8.9
Eider (all species)	4326	1054	10.7	4.7	2.3	10.7	3.8	2.8
Geese (all species)	3150	1681	7.8	7.5	1.0	7.8	6.0	1.3
Total	11524	3866	28.5	17.3	1.6	28.5	13.8	2.1

Table 5-3. Comparison of 2001-2006 and 2023 surveys in the villages of Inchoun, Vivrentiia, Lorino and Uelkal.

Species	Total number of birds harvested all surveyed households		Average per 1 questionnaire			Average per 1 hunter		
			2001-2006	2023	2004 / 2023 ratio	2001 - 2006	2023	2004/2023 ratio
	2001-2006	2023	# of questionnaires		# of hunters			
			153	71		153	99	
Common Eider	680	235	4.4	3.3	1.3	4.4	2.4	1.9
King Eider	403	263	2.6	3.7	0.7	2.6	2.7	1.0
Spectacled Eider	289	93	1.9	1.3	1.4	1.9	0.9	2.0
Steller's Eider	119	2	0.8	0.03	27.6	0.8	0.0	38.5
Eider (all species)	1491	593	9.7	8.4	1.2	9.7	6.0	1.6
Geese (all species)	1174	590	7.7	8.3	0.9	7.7	6.0	1.3
Total	3693	1475	24.1	20.8	1.2	24.1	14.9	1.6

Proportion of eiders in the total bird harvest. Twenty seven percent of all harvest birds were eiders (Figure 4.3-4). However, only in four northern villages of the Chukotskii district eiders account for >30% of the harvest: Inchoun, Uelen, Lavrentiia and Lorino. In more southern villages eider share is <12%. In Amguema, eiders were completely absent from the hunting bag.

The northernmost settlements of the Chukotskii Peninsula i.e. Novoye Chaplino, Enmelen, Lorino, Inchoun and Neshkan had the highest eider harvest. Our data from 2001-2006 survey suggest that at least two other settlements not covered by 2023 survey, Uelen and Vankarem, could undoubtedly be added to this list.

Thus, both surveys indicated that the highest take of eider takes place at the northern part of the Chukotskii peninsula. The highest share of eiders was observed in Inchoun both in 2004 (74%) and 2023 (59.5%). However, over the last two decades, the share of eiders in hunting bag has decreased, while the share of geese has increased. This pattern can be observed both for the whole

study area i.e. three districts of northeastern Chukotka (Figure 5-3, Table 5-2), and for four settlements where the survey was conducted both times – Inchoun, Lavrentia, Lorino and Uelkal (Figure 5-4, Table 5-3).

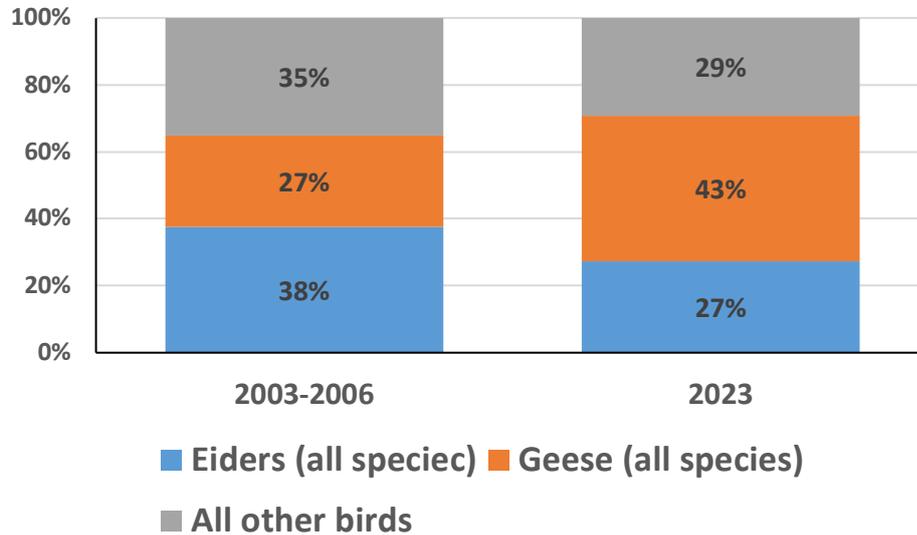


Figure 5-3. Eiders, geese and other bird shares in the harvests in Iultinskii, Providenskii and Chukotskii districts in 2001-2006 and 2023.

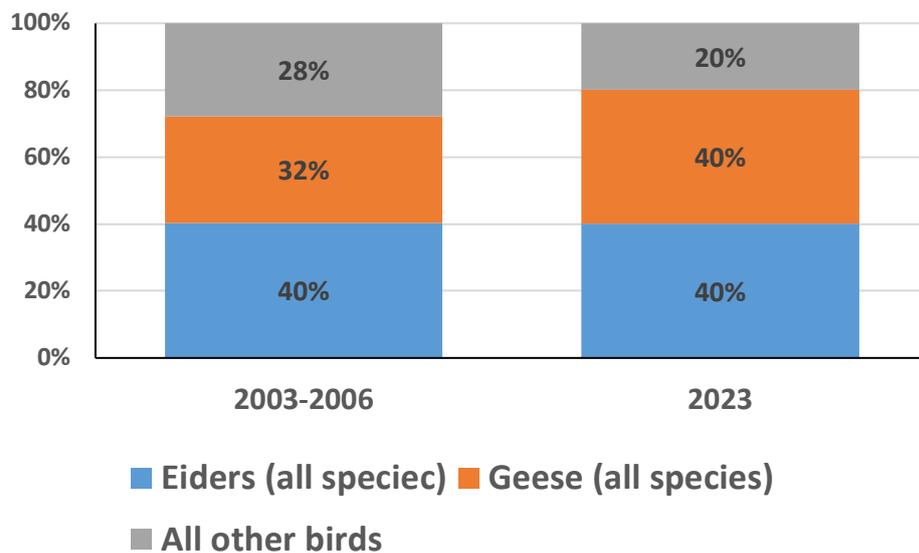


Figure 5-4. Comparison of percentages of eiders, geese and other bird species in the harvests in Inchoun, Lavrentia, Lorino, and Uelkal villages in 2001-2006 and 2023.

The share of the various eider species in the total harvest has also changed: Steller's Eider is less hunted now, and so is Common Eider, to less extent (Figures 5-5 and 5-6, Tables 5-2 and 5-3). However, it should be noted that the second survey was carried out within one year only (2023) and these trends could result from random fluctuations.

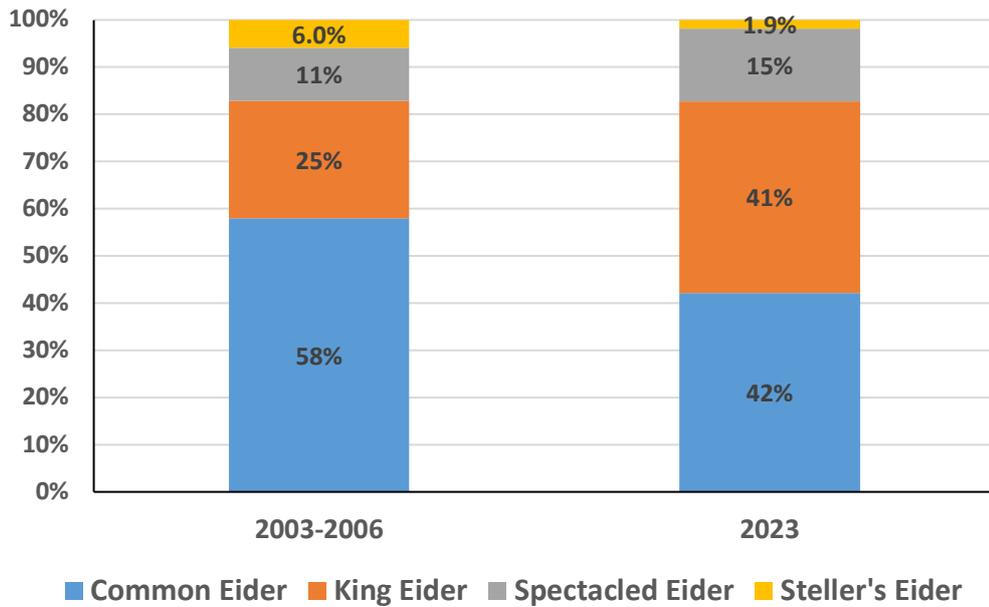


Figure 5-5. Comparison of percentages of eiders species in the harvests in Iultinskii, Providenskii and Chukotskii districts in 2001-2006 and 2023.

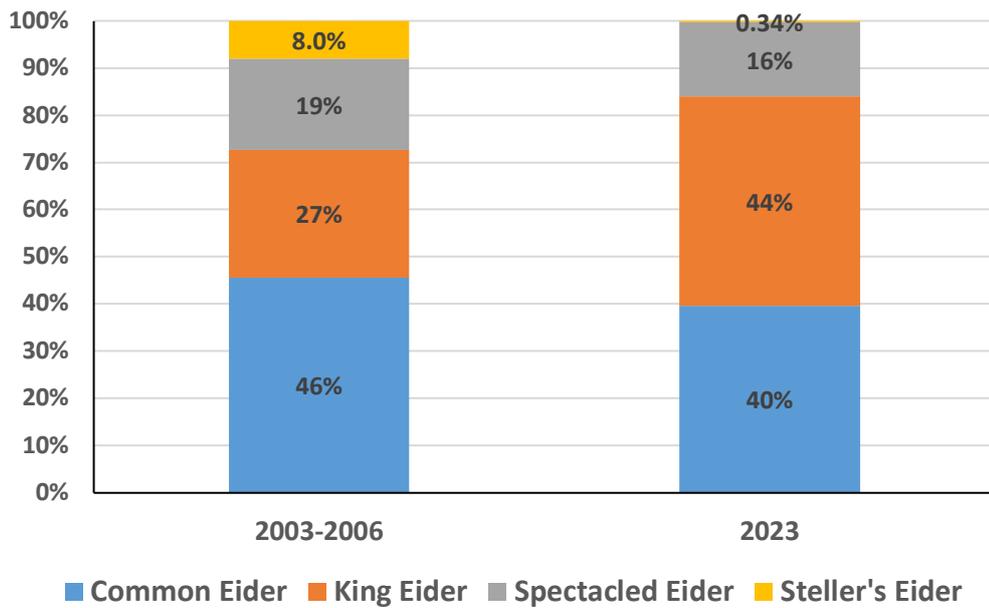


Figure 5-6. Eider shares in the harvest in Inchoun, Lavrentiia, Lorino and Uelkal villages in 2001-2006 and 2023.

In all settlements south of Lavrentiia (starting with Lorino, 40 km south of Lavrentiia), Common Eider dominated the hunting bag and accounts for at least 2/3 of all eiders harvested there (Figure 4.3-5). In the north, in Inchoun, Uelen and Laurenia, Common Eider accounted for less than half of all eider species, and harvest was dominated by King Eider and Spectacled Eider.

This distribution differed from 2001-2006. At that time, Common Eider accounted for more than half of the hunting bag in the whole northern Chukotka. The King Eider was considerably lower, and Spectacled Eiders and especially Steller's Eiders was insignificant. Thus, the share of the

Common Eider in the total number of eiders harvested in the north (in the Chukotskii district) has decreased.

Relationship between number of harvested birds, the number of hunters and the human population size of the settlements. Both surveys demonstrated no correlation between harvested eider numbers and the human population size of a settlement. The harvested eider numbers seemed to depend mainly on the geographical location of settlements in regard to the eider flyways. Within the Chukotskii peninsula, the most intensive hunting areas are near the villages of Inchoun and Uelen, in the area of the Neshkan lagoons (near Neshkan village), Mechigmen Bay (near Lorino and Lavrentiia villages), and also near Enmelen.

Ethnic composition of human population probably played a role in the extent of eider hunting. In all the settlements mentioned above, there are many Indigenous hunters, including those involved in the sea mammal hunting, who more often than others visit eider habitats.

Two surveys allow us to list the main **drivers** of hunting pressure on eiders and other birds.

- 1) a settlement's location regarding to birds' migration routes and breeding habitats;
- 2) the number of Indigenous hunters for whom hunting is an important source of food;
- 3) how long birds are present in significant numbers near a settlement;
- 4) presence of other game species;
- 5) distance of regular movement of hunters from the settlement for business purposes (reindeer husbandry, hunting of sea animals, fishing);
- 6) the strictness of firearms control;
- 7) the level of life of local population, in particular the availability of ammunition, fuel and transport for hunters.

We think that a settlement's location is one of the most important factors. For hunting to be effective, birds must be abundant. For example, in Amguema, far from the sea, no eiders were recorded in the questionnaires.

If a settlement is close to a flyway, distance from a settlement to birds' habitat is important. A regular hunter, one of the settlement residents, is usually limited in time due to their main occupation. Special expeditions to hunt for several days are only available to a limited number of hunters, and effective mass hunting near a settlement significantly increases the number of eiders harvested. The most effective hunting takes place when a settlement is located on a flyway, for example Inchoun, Uelen, Neshkan, or Vankarem (E.E. Syroechkovsky, unpublished data), especially if birds happen to be close to a settlement during moult.

Informal interviews revealed that the situation has changed since 2006. There is better law enforcement over firearms, and hunters are cautious out of season. In addition, local people are much less likely to leave their villages to fish and hunt marine animals than they were 20 years ago.

The data from the two surveys also showed some patterns in the harvest geography. In 2001-2006, largest harvest of King Eider and Spectacled Eider took place in the North-Eastern Chukotka and Northern Yakutia, namely in the Kolyma, Indigirka and Yana River deltas (Figures 5-8 and 5-9). Common Eiders were mostly hunted in Chukotka (Figure 5-7). The spatial distribution of Steller's Eider harvest also had two "hotspots" but the main harvests took place in Yakutia (Fig. 5-10).

In western Chukotka, surveys were carried out in 2003 in Pevek, Rytkuchy and Yanranai, with few eiders being harvested in all three settlements. No surveys were conducted west of Yana River. In southeastern Chukotka (on the Bering Sea coast, south of Anadyr), small numbers of only one eider species, the Common Eider, were recorded in 2002-2005 (Figures 5-7).

The 2023 survey revealed a complete absence of eider harvest in Anguema and low harvest in the southern part of Iultinskii District compared to villages further north. This confirms our 2001-2006 hypothesis that Chukotskii and Providenskii districts are the main sites of eider hunting at Chukotka. Further south along the Bering Sea coast, only small numbers of Common Eiders are harvested (Figures 4.3-5). Thus, our second survey complemented the first survey and clarified eider harvesting situation at Zaliv Kresta Bay (Konergino, Egvekinot, Uelkal). The situation on the northern coast of Chukotka within the Iultinskii district, i.e., in Vankarem and Ryrkarpaii, where we could not reach either in the early 2000s or in 2023, remains unclear. A quite high level of eider harvesting can be assumed there.

To summarize, while it is challenging to make a statistical conclusion, we think that eider harvest did not increase and most likely significantly decreased. We also suggest that the eider harvesting estimates from extrapolation of 2001-2006 data (Figures 5-7 to 5-10) were overestimated. It is most likely that differences in the harvest estimates are related to both the overestimation in the 2000s and harvest decrease since 2006.

In the early 2000s, evidence of multiple declines in eider abundance was obtained from most settlements, including former mass breeding sites on spits in Meynypilgyno, Beringovskii, Lorino, Neshkan, etc. (E.E. Syroechkovsky, unpublished data).

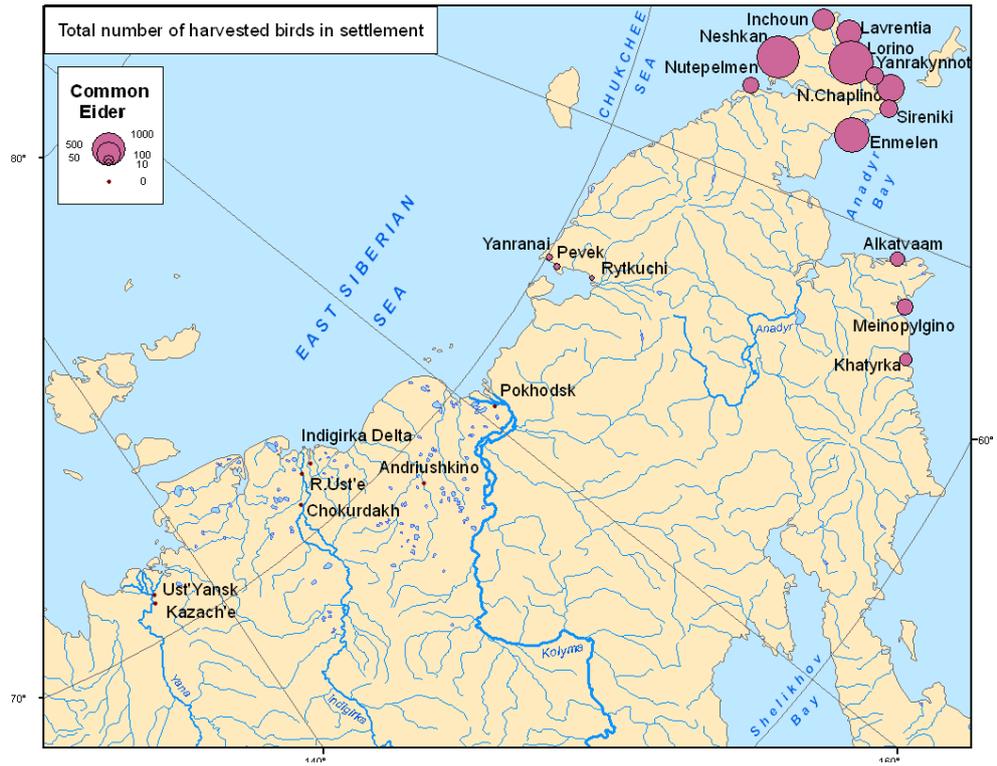


Figure 5-7. Common Eider harvest in the northern Yakutia and Chukotka in 2001-2006.

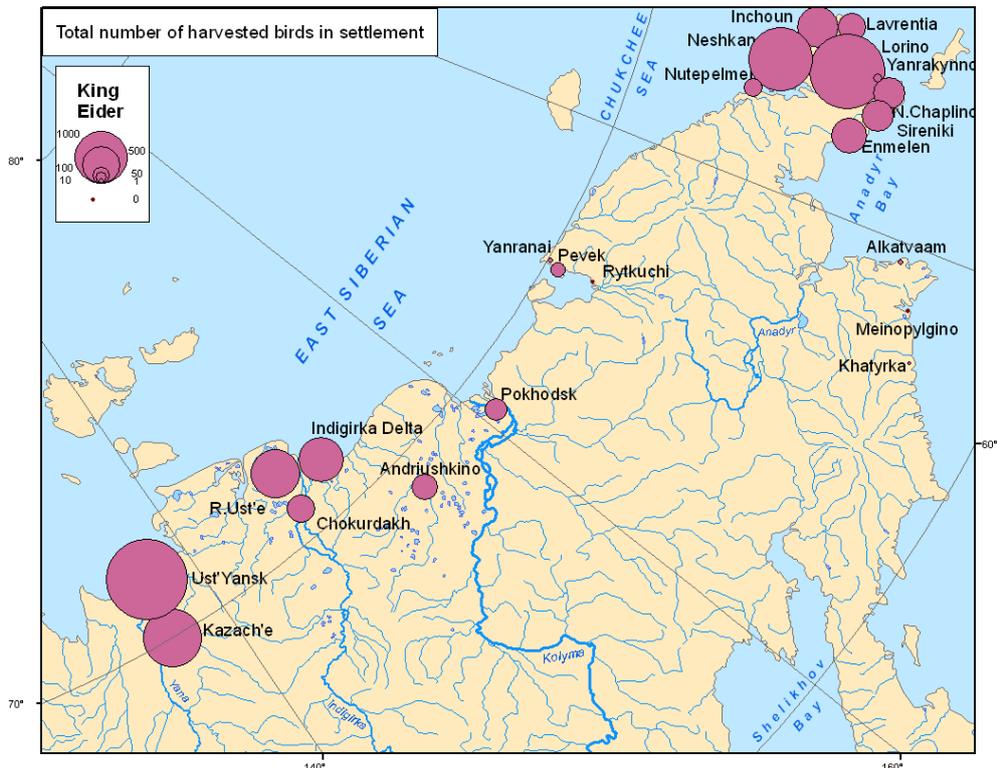


Figure 5-8. King Eider harvest in the northern Yakutia and Chukotka in 2001-2006.

The role of eider hunting in the subsistence of the population of Eastern Chukotka

Waterfowl hunting have always been and still is an important subsistence activity for Arctic People. The socio-economic situation in Chukotka has changed several times in recent decades, weakening and strengthening the hunting pressure on birds. The unfavorable economic environment in 1990s has contributed to decrease of hunting pressure as compared to the Soviet period for the following reasons.

First, a lot of people left Chukotka including many active hunters. Second, it became impossible to buy ammunition in small villages, and it was expensive and difficult to get it from district centers, up to the point where hunters were dismantling old car batteries to extract lead to make their own ammunition. Third, logistics became challenging. The inability to buy new vehicles and repair existing ones, as well as the shortage and high cost of fuel, kept hunters in villages. At the same time, there was a concentration of hunters near the settlements, where local pressure to hunt birds increased, also encouraged by low income and food shortages. The practice of collecting wild bird eggs, almost forgotten during the Soviet era, became popular again. In the opinion of many residents, this led to a decline of nesting eiders around the villages.

However, since the early 2000s, when the first survey was conducted, wealth of Chukotka people has begun to improve, and transport, fuel and ammunition have become much more accessible. New kinds of off-road transport appeared. This led to a gradual increase in hunting pressure on birds, including eiders.

Strict enforcement of firearms legislation is an important factor for eider harvest. In 1990s, hunting law enforcement in remote villages of northern Chukotka was extremely low. Hunting at any time of the year just outside the settlement was a norm, and the population had many unregistered weapons. Gun registration in Chukotka became complicated, time-consuming and only possible in district centers. Initially, this meant that in many settlements in northern Chukotka a large proportion of hunting guns were unregistered or had not had their permits renewed. In the last 15-20 years, however, police raids have been conducted and almost all unregistered hunting weapons have been confiscated. As a result, hunting opportunities for the local population have been greatly reduced. In this context, decline of hunting pressure on eiders in the north-east of Chukotka looks quite plausible.

For hunting waterfowl in Chukotka, the main options are to hunt eiders or geese. In Chukotka, eiders are generally considered to be less valuable and tasty than geese, especially by the non-native population. On the other hand, hunting geese is generally more expensive and more challenging than hunting eiders. In short, eiders are hunted more for food and geese more for pleasure. Apparently, the general improvement of living standards in recent years has contributed to the increased popularity of goose hunting. In the late 1990s and early 2000s (before Roman Abramovich became governor), the standard of living in Chukotka was extremely low and the population was practically starving, which apparently contributed to increased hunting pressure on the eider population.

According to one of the local hunters from Uelkal village, geese were almost never shot there in the past, but mainly eiders, which were relatively easy to take in spring. In the 1970s and 1980s, however, many Russian hunters came to the village and "taught" the locals how to shoot geese using plywood profiles. Compared to eider hunting, this is a more difficult, but more exciting and challenging hunt, which soon became popular here. Moreover, in the 1980s the number of nesting

eiders in the traditional hunting grounds of the locals (in the area of Rudera Spit) decreased for some reason. Today, there is practically no eider hunting in Uelkal, but goose hunting is flourishing.

In large settlements with a large number of new residents, the popularity of eider hunting is lower than in small settlements where the Indigenous population are the majority. Eider hunting pressure is higher in settlements where hunting is compatible with a hunter's main occupation. Thus, in places with active sea mammal hunting (most settlements in northern Chukotka), hunters spend a lot of time in eider habitats at sea and have more opportunities to hunt them. In contrast, as our interviews in Anguema and Konergino showed, Chukchi reindeer herders, although permanently residents of tundra, hunt relatively few birds because they have little free time, and rarely carry guns. They spend a lot of time in watershed tundras with relatively poor bird populations and almost no eiders.

The subsistence use of local biological resources is an important source of nutrition not only for the Indigenous population, but for all Chukotka residents. The results of our survey showed that the most important of all local resources are (in descending order): venison, fish, berries, mushrooms, marine mammal meat, and game birds. Marine mammal meat is mainly important for Indigenous families, while game birds are important for the general population. The birds harvested and eggs collected are used primarily to feed the family. It is also common to give some harvested birds to relatives and friends.

Our study also showed that there is a need for an adequate management system for local biological resources, as almost all residents are acutely dissatisfied with the existing regulations. The Arctic residents highly value the importance of subsistence, including bird hunting, and their interests should be accounted for.



Caveats

First, during informal interviews there were anecdotal indications that some hunters harvested significantly more birds than the maximum values recorded in the questionnaire. People usually avoid talking about such episodes but during settlement surveys in the early 2000s mass bird harvesting in Chukotka was documented by several photographs shared by local residents (Figures 7-1 and 7-2). Apparently, such episodes could be still taking place: Figure 7-3 was made in 2021. At the same time, even after we tried hard to search on Internet, ask our respondents and investigate through our network, we did not find other instances of such mass killings. Although there is no reason to believe that mass killings of hundreds of waterfowl are still the norm in Chukotka, there might be underestimation of harvested bird number by anonymous questionnaires.



Figures 7-1 and 7-2. Mass harvest of geese in Chukotka in the early 2000s. Source: Personal photographs of local hunters.



Figure 7-3. Mass harvest of waterfowl in Chukotka in 2021. Source: <https://lenta.ru/news/2021/05/21/4ukotka/>.

Usher and Wenzel (1987) note that hunters who had taken too much game, as well as those who had taken nothing at all, tended not to respond to questionnaires. In the informal interviews we conducted in 2023, there were only two reports on the harvesting of molting geese. One Amguema resident, whose relatives live in Vankarem, asked me during the informal interview if I was aware that local people were setting up molting geese pens in Vankarem. I replied that I was aware of this practice in the past and that I had a long series of photographs detailing the practice. These photos had been given to us in the early 2000s by residents of another village, who declined to comment. Two photographs from this series are shown in Figures 7-4 and 7-5. I asked him if he could confirm that such methods of harvesting had taken place in recent years. He replied that he did not know about it exactly, as he had not heard about it recently. Another hunter said that his buddy had told him last year that in the village of Ryrkarpil (to the west of Vankarem on the north coast of Chukotka) he used to catch Snow Geese by setting up an ordinary fishing net on the shore. Such a net could catch 2-3 geese a day. Therefore, it was not a mass extermination, in contrast to the molting bird harvested in pens.



Figures 7-4 and 7-5. Harvesting molting Emperor Goose in Chukotka in the early 2000s. Source: Personal photographs of local hunters.

In the village of Uelkal, a local hunter told us that 2-3 years ago, two young men from the village shot more than 200 geese, brought them to the village and started distributing them to the villagers for free. However, most of the geese were in poor condition and ended up in a rubbish dump. This act angered the interviewee. For comparison, we note that in all the questionnaires we received in Uelkal, 152 geese only were recorded.

Also, we could have underestimated the number of harvested birds due to challenges to survey the most active hunters. Active bird hunters are also active fishers. They spend a lot of time in tundra, often have their "balok" (bunkhouse) far away from a settlement. Hence, it is difficult to survey these hunter at their homes. The best one can hope for is a family member, usually a woman, at home. Since the questions in the questionnaire refer to the family (household) as a whole, it is less important who answer. However, responses about bird species caught by non-hunting persons tended to be less accurate. For example, there were cases where a woman answered: "Last spring my husband brought home 5 ducks from the hunt, but he had already plucked them, so I can't say what kind of ducks they were". If male hunters went hunting as a group, they might eat some birds on the spot without taking them home. Therefore, we believe that a door-to-door survey of hunters may lead to some underestimation of the results, as more active hunters are harder to find at home. To reduce this error, an attempt could be made to carry out the survey in winter, for example in March-April, but this would involve additional logistical problems.

The second criticism concerns the work of the interviewers. Although we paid a lot of attention to their selection and training, the questionnaires collected by one of the interviewers had to be rejected. In order to minimize this type of risk, it might be recommended to hire more interviewers in the future.

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Appendix: The questionnaire

Questions about bird hunting and bird egg collection in Chukotka
The questionnaire is anonymous and does not need to be signed. The answers to the questionnaire will be used for research purposes only.

To begin, please provide some information about your family:

❓ How many people are in your family (those who live permanently in Chukotka)?
___ people.

Are you native residents or old residents of Chukotka? (Please underline one of the answers)

All members of the family were born in Chukotka.

Some family members were born in Chukotka and some came from other places.

The whole family came to Chukotka, some ___ years ago.

Does your family belong to the Indigenous peoples of the North? (Please underline one of the answers)

The whole family belongs to the Indigenous peoples of the North.

One or more members of the family are Indigenous to the North.

No one in the family considers themselves Indigenous to the North.

Now a few questions about birds and bird hunting:

❓ Specify, please,

How many people in your family have hunted birds in the last 12 months:

total ___ people.

In what way (underline or write):

a) hunting with guns; b) traps; c) nets; d) other methods: _____

e) birds are accidentally caught in fishing nets.

How many people in your family have collected wild bird eggs in the last 12 months:

total ___ people.

In what places (underline or write):

a) at bird markets on cliffs; b) in the tundra; c) on the coast; d) on islands; e)

in other places; f) we do not collect eggs on purpose, but sometimes

accidentally find nests with eggs.

❓ Do you collect eider down, or anything else useful from birds? If yes, please explain what and for what purpose:

❓ Do you fish using nets? YES () NO (), if "yes" then:

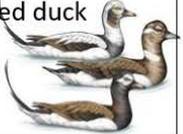
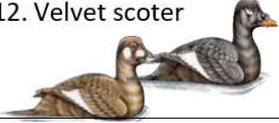
Have you ever had to get birds out of nets that were trapped in them? YES () NO ()

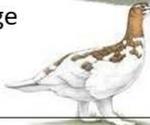
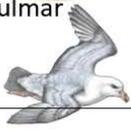
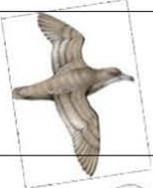
If yes, which birds and how many in the last 12 months?

What do you do with such birds (which were released from nets)?

Please look at the tables with pictures of birds.

Please note (put numbers) how many birds as well as their eggs your family members have harvested (collected) in the last year. The number of eggs can be given approximately (e.g. 10-20 eggs, etc.).

BIRD SPECIES	BIRD PRODUCTION		EGGS COLLECTE	BIRD SPECIES	BIRD PRODUCTION		EGGS COLLECTE
	SPRING AND SUMMER	AUTUMN AND WINTER			SPRING AND SUMMER	AUTUMN AND WINTER	
1. Eurasian wigeon 				13. Common eider 			
2. Mallard 				14. King eider 			
3. Northern pintail 				15. Spectacled eider 			
4. Northern shoveler 				16. Steller's eider 			
5. Teal Eurasian teal 				17. Emperor goose 			
6. Greater scaup (or Tufted duck) 				18. Swan 			
7. Goldeneye 				19. Snow goose 			
8. Harlequin duck 				20. Canada goose 			
9. Merganser 				21. Brent goose 21. Brant 			
10. Long-tailed duck 				22. Bean goose 			
11. Common scoter 				23. Greater white-fronted goose 			
12. Velvet scoter 				24. Lesser white-fronted goose 			

BIRD SPECIES	BIRD PRODUCTION		EGGS COLLECTE	BIRD SPECIES	BIRD PRODUCTION		EGGS COLLECTE
	SPRING AND SUMMER	AUTUMN AND WINTER			SPRING AND SUMMER	AUTUMN AND WINTER	
25. Crane 				37. Auklet 			
26. Partridge 				38. Black-legged kittiwake 			
27. Red-throated loon 				39. Dark-headed gull 			
28. Pacific loon 				40. Large gull 			
29. Yellow-billed loon 				41. Northern fulmar 			
30. Loon (immature (non-nesting)) 				42. Tern 			
31. Cormorant 				43. Shearwater 			
32. Murre 				44. Snowy owl 			
33. Pigeon guillemot 				45. Large wader 			
34. Tufted puffin 				46. Small wader 			
35. Horned puffin 				47. Other or unknown bird _____			
36. Grebe 							

Now, please answer a few additional questions:

❓ Have you (or anyone in your family) had to sell or buy wild-caught birds or their eggs in the last year?

BIRDS: YES () NO () ;

EGGS: YES () NO ()

We are particularly interested in the following bird species:

❓ *Common Eider, Spectacled Eider, King Eider, Steller's Eider and Emperor Goose.*

What do you think most affects the abundance of these bird species in your area?

❓ How has the number of these birds changed over the last 10 years (according to your observations)?

Please underscore a correct answer

Common eider	It's still the same	Decreased	Increased	I can't answer that
Spectacled eider	It's still the same	Decreased	Increased	I can't answer that
King eider	It's still the same	Decreased	Increased	I can't answer that
Steller's eider	It's still the same	Decreased	Increased	I can't answer that
Emperor goose	It's still the same	Decreased	Increased	I can't answer that



If you have interesting bird observations, you can post them here

THANK YOU SO MUCH FOR HELPING US WITH OUR RESEARCH!!!