

Genetic and geographical (Geogenetic) origin of 1SW- 4SW salmon and previous spawners caught in the years 2011 and 2012 in the Kolarctic salmon project area in Northern Norway; results when combining genetic assignments into the converted numbers of salmon from the official catch statistics in Norway

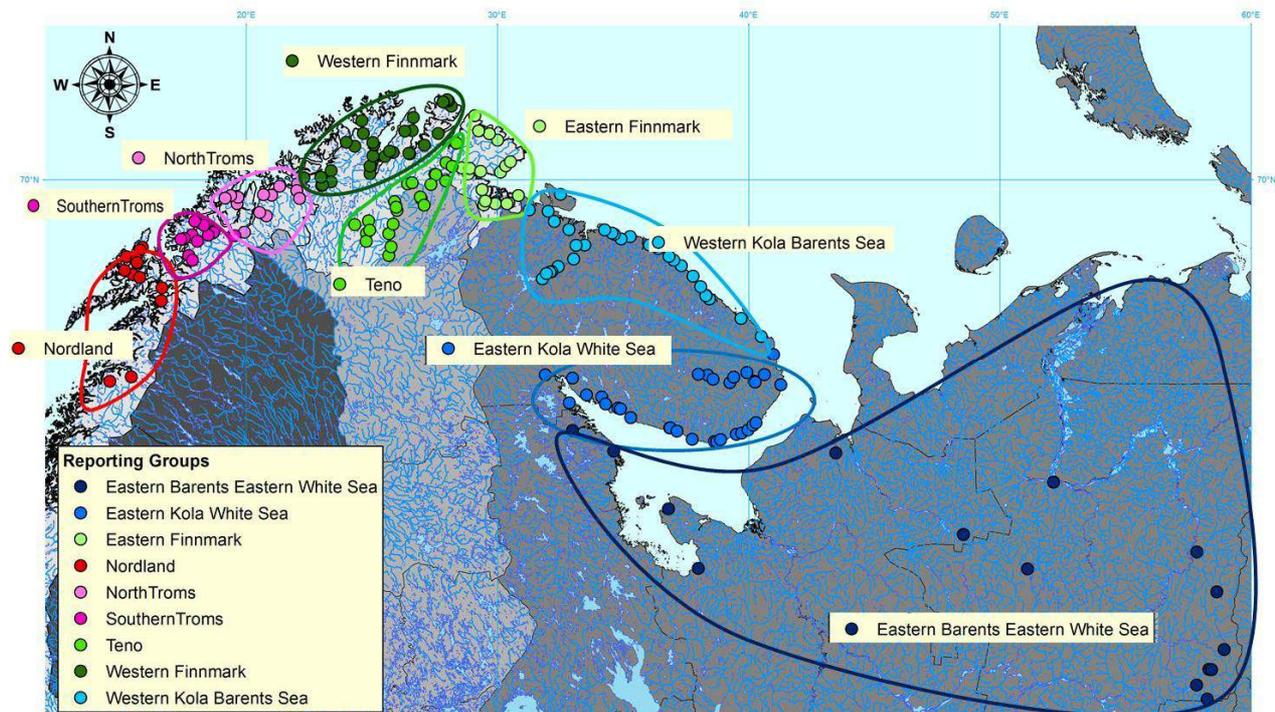
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Abstract

In the Kolarctic salmon project (KO197) detailed information was collected from the salmon catches including the biology of salmon in the large coastal area in Northern Norway between the counties Nordland and Finnmark in the years 2011 and 2012. Whereas official salmon catch statistics offer numbers and weights for three size groups of salmon (small, medium, large), we collected information on catch date, weight and sex of 19524 individual salmon. In addition river and sea age of each individual sampled salmon was determined by scale reading. Furthermore river of origin for each salmon was determined using genetic stock identification methods for 16291 samples.

Here we present results where individual information was used to convert official catch statistics (SSB, Statistics Norway) in to spatial and temporal abundance and proportions of salmon. However, instead of using specific rivers, we present results where larger geographic regions i.e. reporting groups (here after referred as Regional Groups) were used as origin of salmon. This approach was chosen as it focuses on level most crucial for current fishery management objectives.

This report is responding into the specific item mentioned in the Kolarctic project "Task 3. Combine genetic, biological and environmental information into a salmon migration model that will allow for a more precise and sustainable management. Moment 3.4. Describe the salmon catch composition in time and space based on available catch statistics and own data"

1. Introduction

SSB (Statistics Norway) is collecting annual catch data from all sea salmon fishermen. Fishermen have to fulfill daily logbooks and report their salmon catches. Salmon catches are reported in terms of numbers and weights separately for fish smaller than 3 kilos, between 3-7 kilos and above 7 kilos. During the official fishing time from June 1st to August 4th fishermen are asked to report salmon and trout catches without any information whether salmon are wild or escaped fish. The reported salmon catches include therefore both wild as well as escaped salmon.

To describe salmon ecology, to evaluate the reported salmon catch composition in relation to time and space and to describe the stock specific migration patterns in the Kolarctic salmon project collection of the basic information on the salmon catches like scales for age determination, lengths and weights, sexes and number of salmon lice was arranged. The normal SSB salmon catch data where catch is divided into three size groups is masking the ecological detailed data (sea-ages, wild or escaped salmon) behind each size groups of salmon. To understand better the diversity of salmon catches and the timing of the migrations of various sea-ages of salmon belonging into different salmon stocks it was necessary to convert the officially collected salmon catch data into the numbers and weights of salmon in 1SW (one sea-winter salmon), 2SW, 3SW, 4SW, previous spawners and in escaped salmon. These specific numbers of salmon in different sea-ages combined to the genetic information can be one of the tools for possible adaptive, knowledgebase management regime to reduce mixed stock fishery where needed to preserve declining and vulnerable stocks. Locally (here in each municipality or combination of municipalities) obtained catch samples were used to convert the official catch data into sea-age groups of wild salmon and escaped salmon and then by using modern genetic analyses to identify into which Regional Group area each salmon belongs to.

This report is responding into the specific item mentioned in the Kolarctic project "Task 3. Combine genetic, biological and environmental information into a salmon migration model that will allow for a more precise and sustainable management. Moment 3.4. Describe the salmon catch composition in time and space based on available catch statistics and own data". In this Kolarctic salmon Report VII we are presenting figures of the origin of salmon catches in the level of Regional Group areas caught in counties in Northern Norway as well as in municipalities or groups of municipalities. In addition to present data in figures we have added tables from where persons working in administration and in research can find the detailed basic information for further analysis.

2. Material and methods

Kolarctic salmon project arranged careful sampling from the salmon fishery in Northern Norway in the years 2011 and 2012 (Figure 1). Detailed information on the results covering sea-ages, origin of salmon (wild or escaped salmon) and timing of the catches of various sea-ages etc. are presented in separate reports ((Kolarctic salmon Report I, Results from the coastal and fjord salmon fishery in 2011 in Nordland, Troms and Finnmark: timing of the salmon catches, wild and escaped salmon, sea- and freshwater ages, sex distributions and other biological parameters (Niemelä et al. 2014); Report II, Results from the coastal and fjord salmon fishery in 2012 in Nordland, Troms and Finnmark: timing of the salmon catches, wild and escaped salmon, sea- and freshwater ages, sex distributions and other biological parameters (Niemelä et al 2014); Report III, Summary results from the coastal and fjord salmon fishery in the years 2011 and 2012 in Nordland, Troms, Finnmark and White Sea (Russia): timing of the salmon catches, wild and escaped salmon, sea- and freshwater ages, sex distributions and other biological parameters (Niemelä et al 2014); Report IV, Estimated numbers and weights of 1SW- 4SW salmon, previous spawners and escaped salmon in the official catch statistics in Norway in the years 2011 and 2012 for the Kolarctic salmon project area in Northern Norway; results from the converting of SSB catch data into sea-age groups (Niemelä et al 2014); Report V, Escaped salmon, its abundance and timing in the research fishery and in the reported salmon catches in Nordland, Troms and Finnmark in 2011 and 2012 (Niemelä et al 2014); Report VI, Previous spawned salmon having origin from more than 80 stocks improves the catches and widens diversity of the Atlantic salmon life history in Kolarctic salmon project area with reference to the reconditioning of kelts in the River Tana in Norway/Finland (Niemelä et al 2014)).

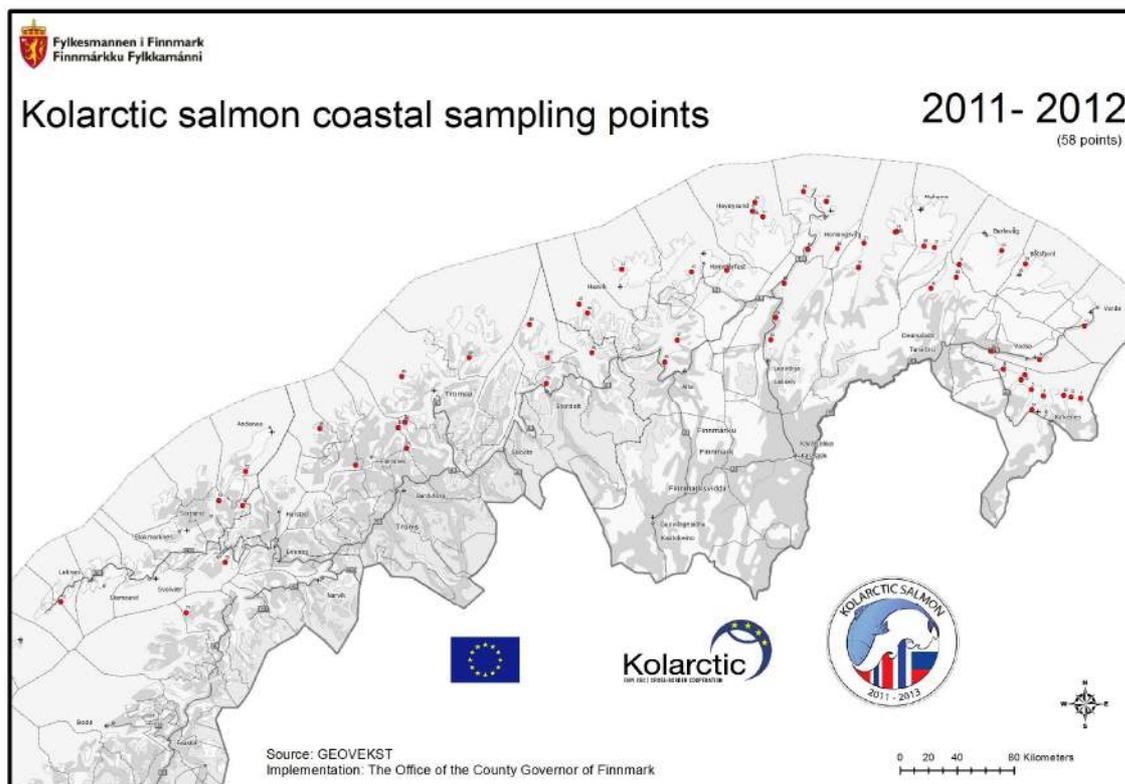


Figure 1. Salmon fishing sites (red points) at sea in the Kolarctic area in northern Norway in 2011 and 2012. Sites indicate the locations where sampling from the salmon catches took place from May to September. In the Kolarctic area there were 39 and 53 salmon fishermen in 2011 and 2012, respectively, who took samples from their catches.

Sampling from salmon fishery in 2011-2012 was taken from 19524 salmon of which 5%, 29% and 66% were caught in Nordland, Troms and Finnmark, respectively. Out of the 39 and 53 fishermen who promised to take samples over the whole season, five and nine ceased the sampling after May or in June in 2011 and 2012, respectively. In 2011, the numbers of salmon caught from May to September were 275, 2411, and 5617 in Nordland, Troms and Finnmark, respectively, and in 2012 were 754, 3183, and 7283. The total mass of salmon caught in the Kolarctic project in 2011 and 2012 was 4, 25 and 54 tons in Nordland, Troms and Finnmark, respectively.

All the fishermen were advised to take careful measurements of all their salmon catches, such as lengths and weights, and it was especially highlighted to take the scale samples from the recommended area of the fish. Fishermen were instructed to write the information on scale bags. Scales were collected from the advised area of the fish to be certain of getting the correct ageing and growth measurements when the scales were analysed and measured. Fishermen were able to identify the origin (wild/escaped) of the salmon using external and internal features, and a manual with photos of wild and escaped salmon was provided to help with the identification process. The date of the capture, fishing method, sex of the fish and number of salmon lice was also recorded on the scale bag. Fishermen sent the scale bags in envelopes within two weeks of the catch to the County Governor in Finnmark or scale bags were collected by researcher when frequently visiting the fishermen.

The data written on the scale bags was transferred into data files and the first evaluation of the accuracy of the data took place by correcting false or missing information. All scale bags were given a new number that corresponds with the number in the data file. In this phase, five scales (from only wild salmon) were put into a new numbered scale bag and were sent for genetic analysis to the University of Turku. Scale impressions for age determination, growth measurements and for analysing the origin of salmon (wild/escaped) were taken from all almost 19500 scales. Impressions on plastic plates were taken from almost all individual salmon. After the scale impressions were available, ageing and discrimination between wild and escaped salmon took place. Work was done following the ICES scale reading working group's (ICES 2011) recommendations. The final task was the internal evaluation and correction of the basic scale data during which we compared the ages of salmon to the recorded lengths and weights.

In the Kolarctic salmon project we study the migratory patterns of salmon in the coast and fjord areas of northern Norway, where the captured salmon originate from some hundreds of rivers. Determining migratory patterns includes clarifying the timing of the wild 1SW (one sea-winter salmon), 2SW, 3SW, 4SW salmon and previously spawned salmon in the catches as well as the timing of the escaped salmon in the catches. The aim was to have continuous sampling covering the entire period during the time when salmon are migrating along the coastal areas from early May to late September. In order to fulfil the goal of the Kolarctic salmon project and to have accurate documentation from the timing of different stocks in different areas and in different fisheries, the fishermen participating in this project received special permission to catch salmon outside the official fishing season. Within this project, in Nordland and Troms counties, fishermen were also allowed to use bend nets in addition to or instead of using bag nets, which is the only fishing method allowed there today. Special effort was made to include fishermen from the

outermost coastal areas, where the catch reveals more precisely the timing of the migrations in general and the migrations of different stocks specifically, than the catches in fjords do (Figure 1).

Figures 2 and 3 are illustrating spatial and temporal fishing restrictions in Kolarctic salmon project area. These regulatory measures were valid in both of the research years. Fishing methods allowed are bag nets and bend nets in Finnmark County but outside Finnmark the only method allowed is bag net. In the Kolarctic salmon project fishermen who participated to the research fishery had the possibility to use both methods. In the research project it was important to know spatial and temporal migration periods of salmon stocks also outside the official fishing time and therefore the project had special permission to catch salmon from May 1st to September. The use of bend nets in the outermost coastal areas in Finnmark is limited to c. 12 fishing days but fishermen have possibility to use the old fashioned method, bag net, a little longer period of c. 23 days. There has been development in Finnmark to use bend net instead of heavy bag net. In Nordland County salmon fishery is allowed c. six days during three last weeks in July and in Troms County c. c. eight days in July.



Photo 1. Fishermen in Nordkapp – Kamøyvær – Photo: Eero Niemelä.

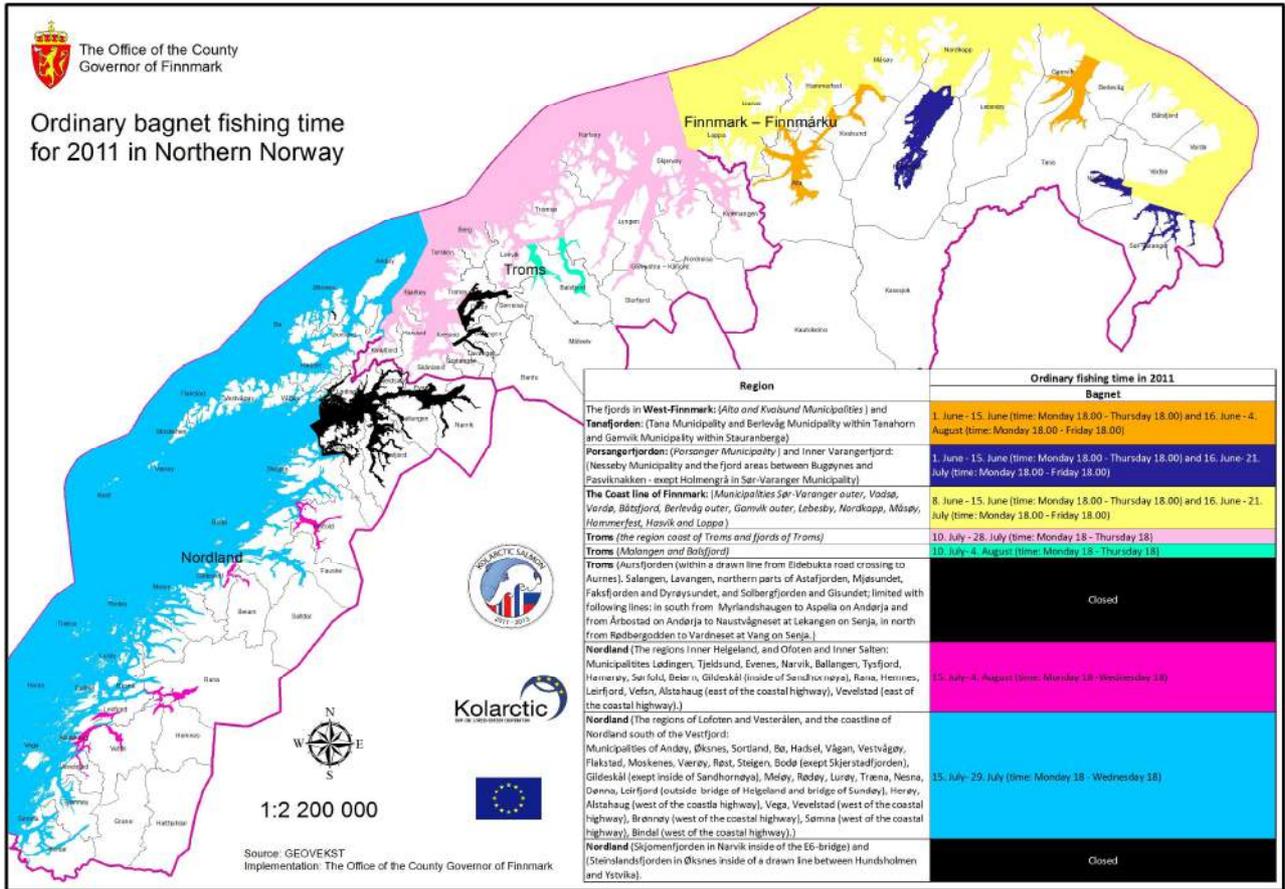


Figure 2. Official salmon fishing periods for bag net fishery in Kolarctic project area.

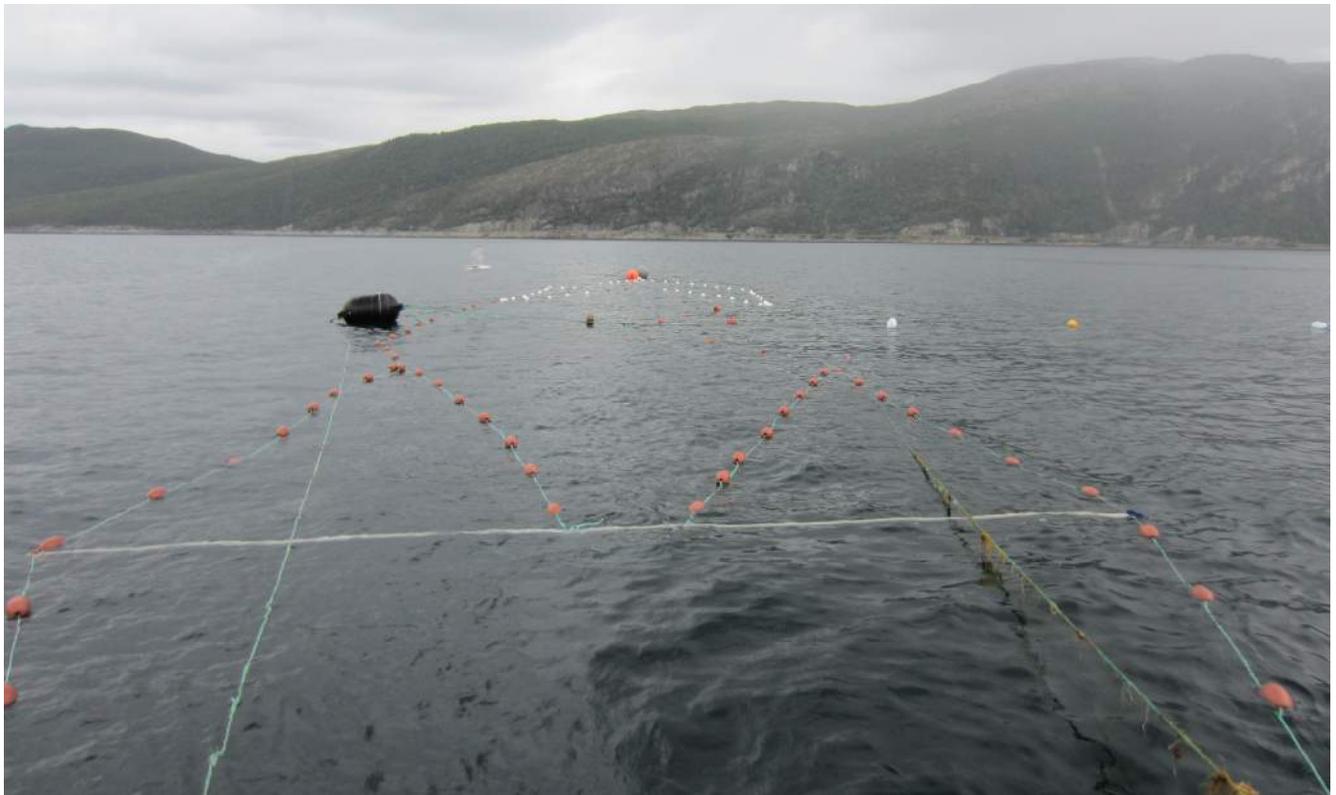


Photo 2. Bag net – “Alta type” - Photo Eero Niemelä (FGFRI).

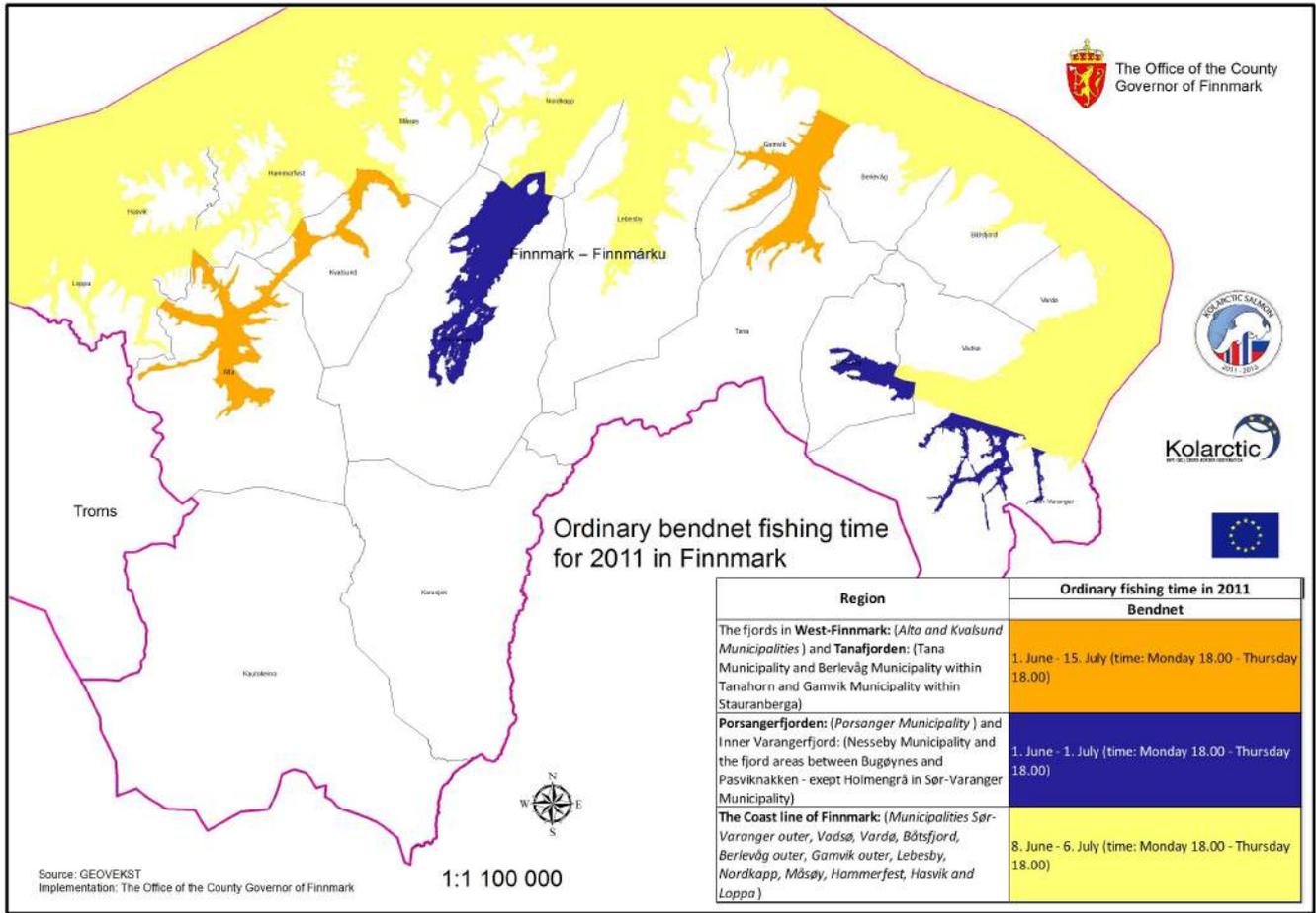


Figure 3. Official salmon fishing periods for bend net fishery in Kolarctic project area.



Photo 3. Bend net. Only allowed in use in Finnmark County. Photo Eero Niemelä (FGFRI).

SSB (Statistics Norway) offered daily catch data for the years 2011 and 2012. In this daily catch data is information on the numbers and weights of salmon for the size groups of <3 kg, 3-7 kg and >7 kg salmon. Daily catch data is combined in this report to weekly catch data for each size group of salmon. In the case of unclear (unknown) or missing information in the fishing time the catch data is not included in the analyses when converting official catch data into the catches of 1SW, 2SW, 3SW, 4SW, previous spawner and escaped salmon. The number of salmon with unclear catch date was rather low. Official catch data is available only for that time when the salmon fishery is allowed. Official fishing time is varying between and even within municipalities and counties and therefore we can produce data from the origin of salmon (here in the Regional Group areas) for the limited time during the entire migration periods of salmon along the coastal areas of Northern Norway. Detailed information on the converting process of official catch data into the numbers and weights of various sea-age groups are presented in the separate Kolarctic salmon project Report IV (Niemelä *et al* 2014).

Catches are for the following areas in this report: Nordland (salmon districts Helgeland, Lofoten, Salten are combined), South Troms (municipalities Harstad, Tromsø, Kvæfjord, Skånland, Bjarkøy, Ibestad, Gratangen, Lavangen, Salangen, Målselv, Sørreisa, Dyrøy, Tranøy, Torsken, Berg, Lenvik, Balsfjord are combined), North Troms (municipalities Karlsøy, Lyngen, Storfjord, Kåfjord, Skjervøy, Nordreisa, Kvæangen are combined), Loppa-Hasvik (combined), Alta, Hammerfest-Nordkapp-Kvalsund-Måsøy (combined), Porsanger, Lebesby, Tana, Gamvik-Båtsfjord-Berlevåg-Vardø (combined), Vadsø-Nesseby (combined), Sør-Varanger. Catches in some municipalities had to be combined to the neighboring municipality due to too few fishermen in one municipality.



Photo 4. Fisherman Leif Ingilæ, Bugøynes. Photo Eero Niemelä.

3. Genetics

Genetic stock identification (GSI) allows assessment of origin of the stocks being harvested and during the last decade it has become an indispensable and powerful tool to understand fishery dynamics, especially of salmonid fishes (e.g. Oregon Salmon Commission 2008, Beacham et al. 2008, Hess et al. 2011).

Genetic stock identification takes advantage of the genetic differences among salmon from different rivers and works by estimating the most likely stock of origin where a specific multilocus genotype of unknown individual appears. For this, tailored and powerful statistical methods are available. However, the feasibility of applying genetic stock identification depends also on the relative genetic distinctiveness of stocks and adequate baseline data capturing the genetic structure and diversity of all the potential stocks in the mixture. In addition, number of markers applied plays a major role in successful stock identification.

Details of the genetic structure of the salmon of the Barents region and their stock identification procedure are described in Vähä et al (2014). Below we shortly describe the baseline data and potential for successful stock identification of fishery samples.

For this report, more than 14 000 samples for genetic analysis were collected from 201 sampling locations within 185 rivers along the Norwegian and Russian northern coasts between 14°E and 60°E (Figure 4). Samples represented 155 river level reporting groups i.e. in some cases tributaries were not treated as separate units.

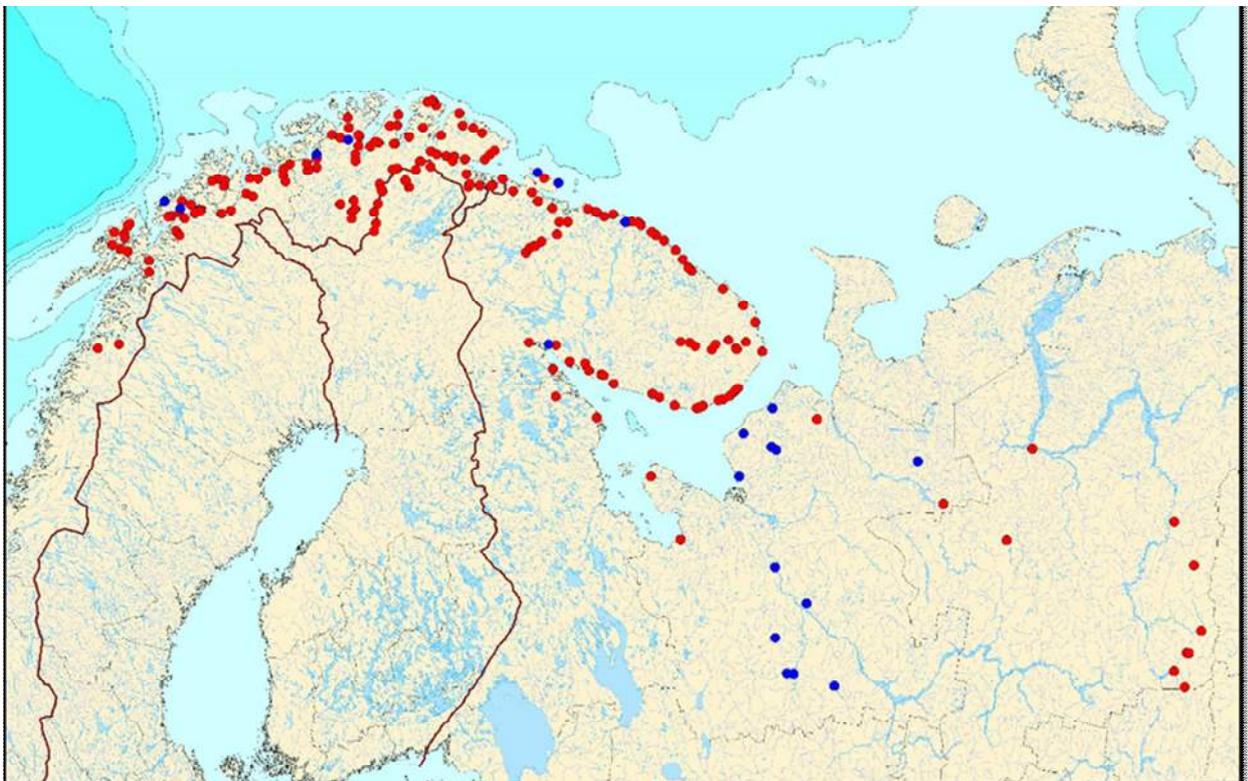


Figure 4. Map showing the baseline river samples. Red dots represent river samples included in the final baseline, blue dots represent samples not included for various reasons (see text).



Photo 5. Researcher Eero Niemelä – electrofishing in River Laggo. Photo: Eevaliisa Kivilahti

Both baseline and fishery samples were screened for 31 microsatellite markers displaying from minimum of 6 to maximum of 44 alleles per locus. In total, 660 and 673 alleles were observed in the baseline and coastal samples, respectively.

Baseline samples were tested for family structure as sampling of families rather than populations may bias the relative allele frequency estimates which will have a negative effect on the genetic stock identification. The analyses of kinship in the samples collected demonstrated that full siblings were present in most samples, but also that the proportion varied greatly, with some samples having no full siblings, and other samples containing up to 68% (Storelva Båtsfjord). On average, the baseline samples contained 16% full siblings. Sib-ships were eliminated by exclusion leaving total of 12860 individuals in the baseline data.

The various analyses conducted on this dataset have demonstrated large variations in genetic differentiation and diversity within the Kolarctic region. On average, the F_{ST} between populations was 0.055. As a whole, this is relatively high compared to studies of Atlantic salmon in other regions, where F_{ST} values in the range 0.01 – 0.04 have often been reported for Atlantic salmon (Griffiths et al. 2010). However, this was partly due to very wide geographical coverage of the samples (figure 4). Genetic structure analyses and self-assignment tests provided evidence to construct genetically similar groups of salmon rivers i.e. regional reporting groups. Based on results we constructed 9 regional groups (Figure 5). At these smaller regions, average pairwise F_{ST} among salmon rivers within the region was 0.038. Eastern Barents and White Sea rivers and Teno river system displayed high divergence (F_{ST} 0.080 and 0.069, respectively) while genetic divergence of populations within other regions was lower (0.020-0.042).

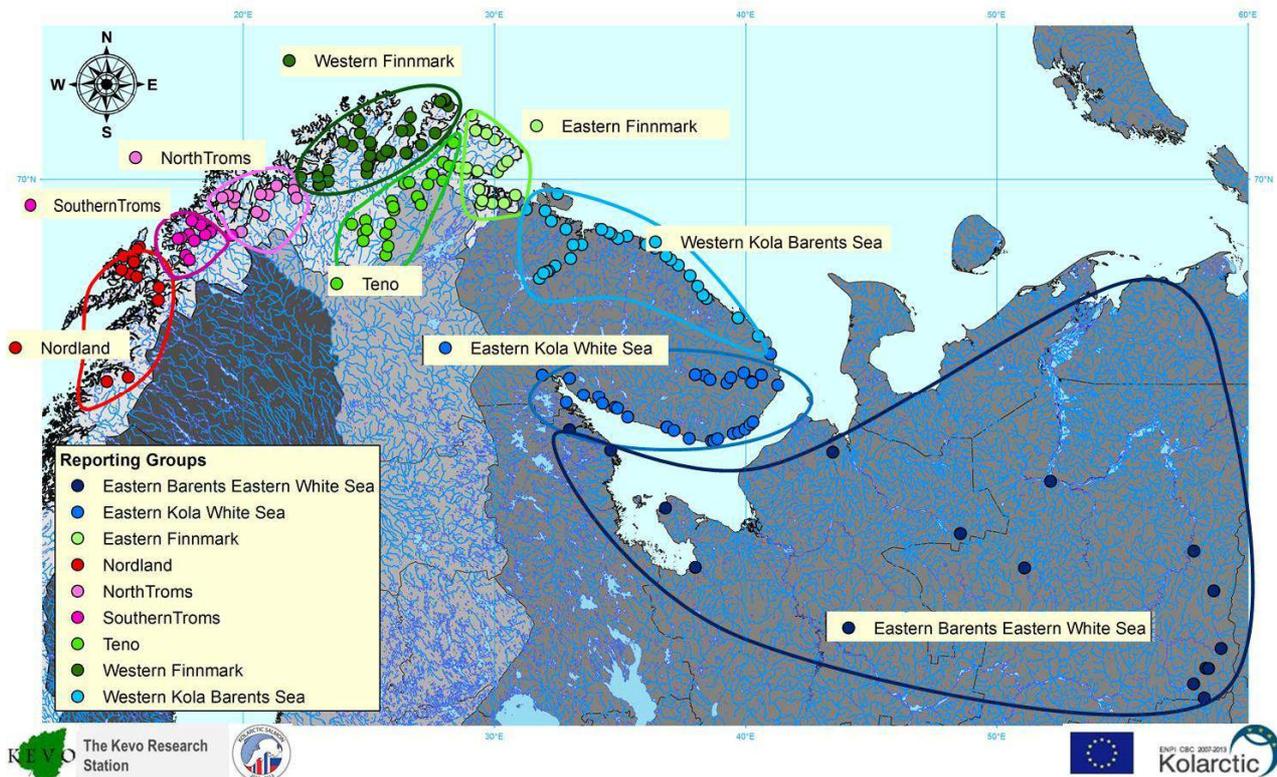


Figure 5. Genetic reporting group areas (later referred into regional groups) for salmon caught in Kolarctic salmon project in Northern Norway (Map – UTU-Kevo)

Similarly to genetic divergence, power tests of genetic stock identification using test samples from the baseline data revealed large differences among rivers and regions. In general, levels of genetic divergence was reflected in the power tests of genetic stock identification – salmon from the highly diverged populations were identified with higher success than those from low divergence populations.

On average, 69% of samples assigned to rivers were correct, but varied between 0% and 100%. Highest correct assignments were observed for rivers in the Eastern Barents and White Sea and Teno River system salmon stocks (90%), while lowest were observed for the Troms and Nordland stocks (54%). Despite salmon from the largest river stocks were generally well identified, genetic stock identification does not allow for all salmon to be successfully assigned to their river of origin. Accepting reduction in the number of assigned samples by 25%, proportion of correct assignments at the river level could be increased to mean of 89%. However, rather than reducing number of assigned samples we chose to assign samples to larger geographical areas, regional groups as shown in figure 5.

Power tests showed that 90%-98% of samples assigned to Russian, Eastern Finnmark and Teno/Tana River system reporting groups were correct (Figure 6). Only slightly lower assignment success was obtained for the samples from rivers in Finnmark county; 87%. Northern and southern Troms reporting groups were most problematic showing 68% and 58% correct assignments, but when combined 80% of Troms salmon were correct. Nordland had correct assignment rate of 72%. Largest miss-assignments were between

Western Finnmark and Northern Troms (WF to NT 5%, NT to WF 22%) followed by Nordland and southern Troms (N to ST 20%, ST to N 4%).

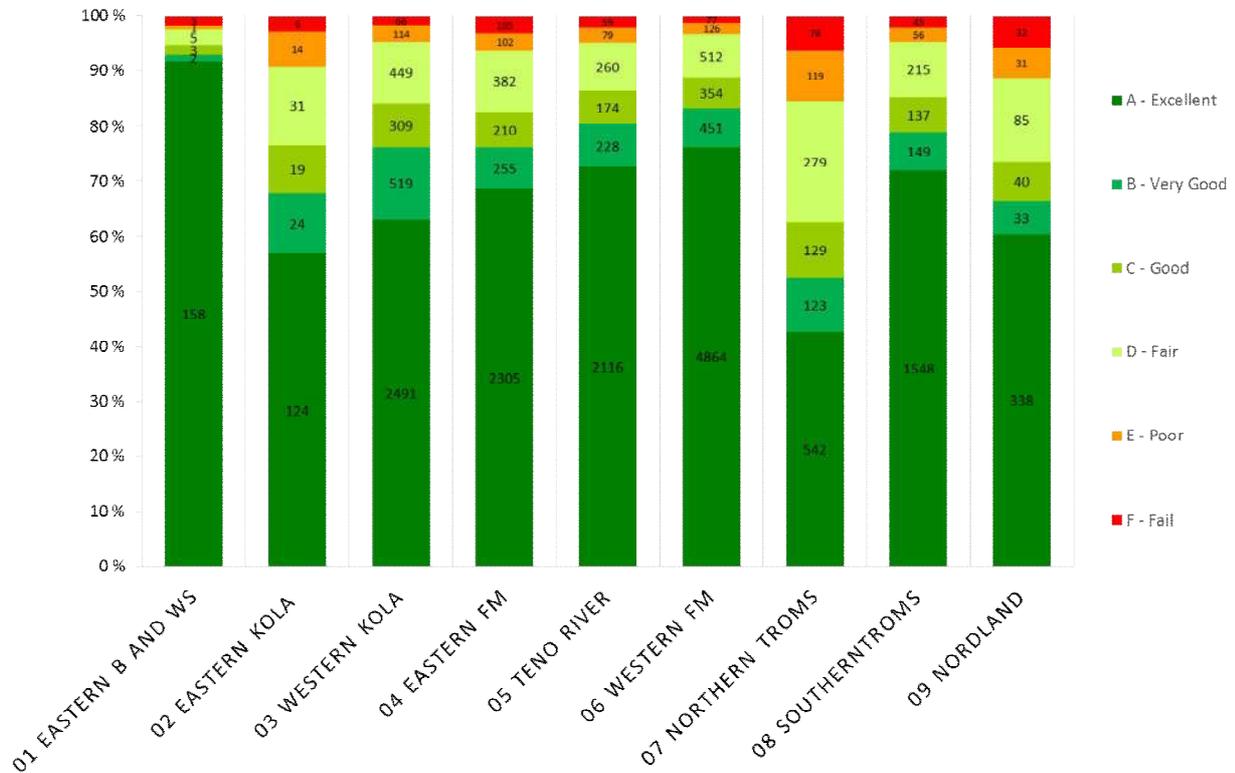


Figure 6. Proportions and numbers of samples assigned to reporting groups classified in 6 categories representing reliability of assignment.

It should be noted that while power tests provide an overview on how reliable an estimate is generally expected, exact proportions of correct as well as miss-assignments will depend on real fishery samples, stock composition and their relative proportions. In power tests equal proportions of samples from rivers were used albeit analysed with real mixture samples.

Table I. Altogether, 16291 fishery catch samples from 58 fishermen were divided into 24 analysis regions and two time periods within sampling year period 1 (May-June), period 2 (July-August).

Region name	Year Period	2011		2012		TOTAL
		1	2	1	2	
1 - Sør-Varanger - East		296	96	407	117	916
2 - Sør-Varanger - West		666	567	555	652	2440
3 - Nesseby - Fjord		152	146	164	234	696
4 - Vadsø		135	249	181	276	841
5 - Vardø				47	81	128
6 - Båtsfjord-Berlevåg		51	91	105	87	334
7 - Tana		90	51	78	179	398
8 - Gamvik		80	6	6	13	105
9 - Lebesby		133	253	129	552	1067
10 - Nordkapp – Outer		122	85	236	197	640
11 - Nordkapp – Inner		178	230	117	432	957
12 – Porsanger		15	8	26	327	376
13 – Måsøy		9	46	154	122	331
14 - Kvalsund-Hammerfest		85	73	38	59	255
15 – Hasvik		108	45	123	31	307
16 – Loppa		84	126	139	234	583
17 – Alta		45	255	123	202	625
18 - N.-Troms – Inner		191	287	238	423	1139
19 - N.-Troms – Outer				86	144	230
20 - S.-Troms – North out		81	86	168	115	450
21 - S.-Troms – Middle out		297	169	172	158	796
22 - S.-Troms – Middle in		314	483	482	628	1907
23 - Nordland - North		59	63	109	44	275
24 - Nordland - South		37	35	296	127	495
TOTAL		3228	3450	4179	5434	16291

Genetic stock identification estimates for the regional groups were generated using cBayes (Neaves et al 2005). Five independent chains of 100K iterations were run beginning with different starting conditions. Individual population estimates were first calculated and then summed into reporting (regional) groups. In this report we have chosen to apply 0.5 probability of belonging to reporting group as a cut-off value to exclude ambiguous and potentially miss-assigned samples. Applying 0.5 cut-off value filtered out 5.2% (854) of fishery catch samples.

4. Results and discussion

4.1 Richness of salmon stocks in Regional Group areas

Kolarctic salmon research fishery in Finnmark, Troms and Nordland covered almost the entire migratory window of wild salmon from the beginning of May to the early September (Figure 7). In the first week in May there were already c. 40 salmon stocks available to be caught in Finnmark, which indicates that at least some stocks belonging to each Regional Group area had initiated migrations towards their rivers of origin already earlier in April (Figure 8). Data in the figures 7 and 8 includes all salmon caught in the outer coastal areas as well as in inner part of fjords giving an overview of the high diversity of stocks available. The numbers of salmon stocks increased in the catches throughout May and June peaking in numbers of stocks in the week 25 in Nordland, in the week 26 in Troms and in the weeks 27 and 28 in Finnmark (Figure 8). During the weeks with highest abundance of stocks their numbers were in Nordland, Troms and Finnmark 35, 65 and 90, respectively. During the official fishing time the numbers of stocks were much lower in Nordland in the weeks 28-30 being c. 15 stocks. In Troms during the official fishing time in the weeks 28-30 the number of salmon stocks in the catches were 30-50. In Finnmark where the official fishing time covers the weeks 23-31 the numbers of salmon stocks were 60-90. Figures 7 and 8 are giving a very generalized overview of the diversity of salmon stocks belonging into nine Regional Group areas.

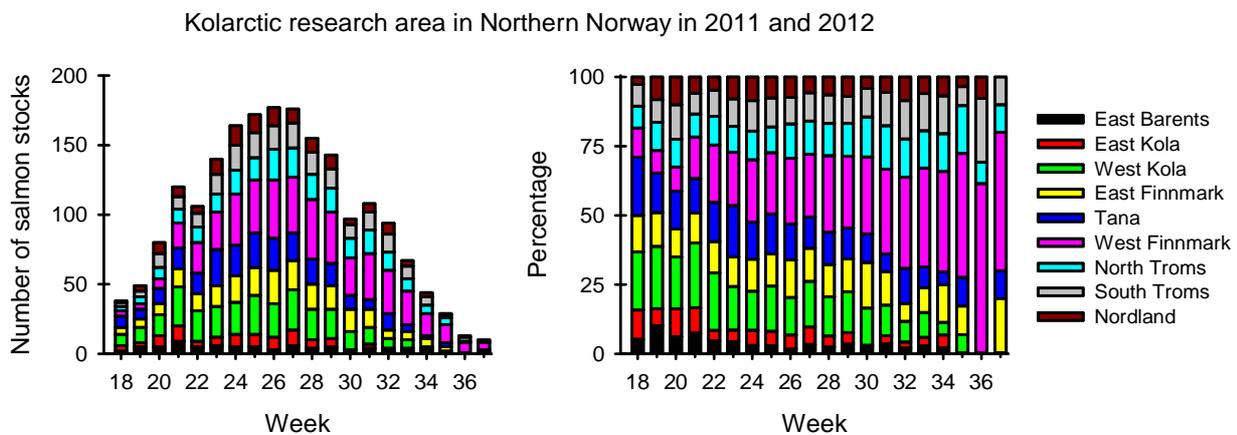


Figure 7. Numbers and proportions of stocks belonging into nine Regional Group areas in Kolarctic salmon research fishery between May and September in Northern Norway (Nordland, Troms and Finnmark combined). Only salmon stocks with the assignment accuracy of excellent, very good, good and fair are included into the material.

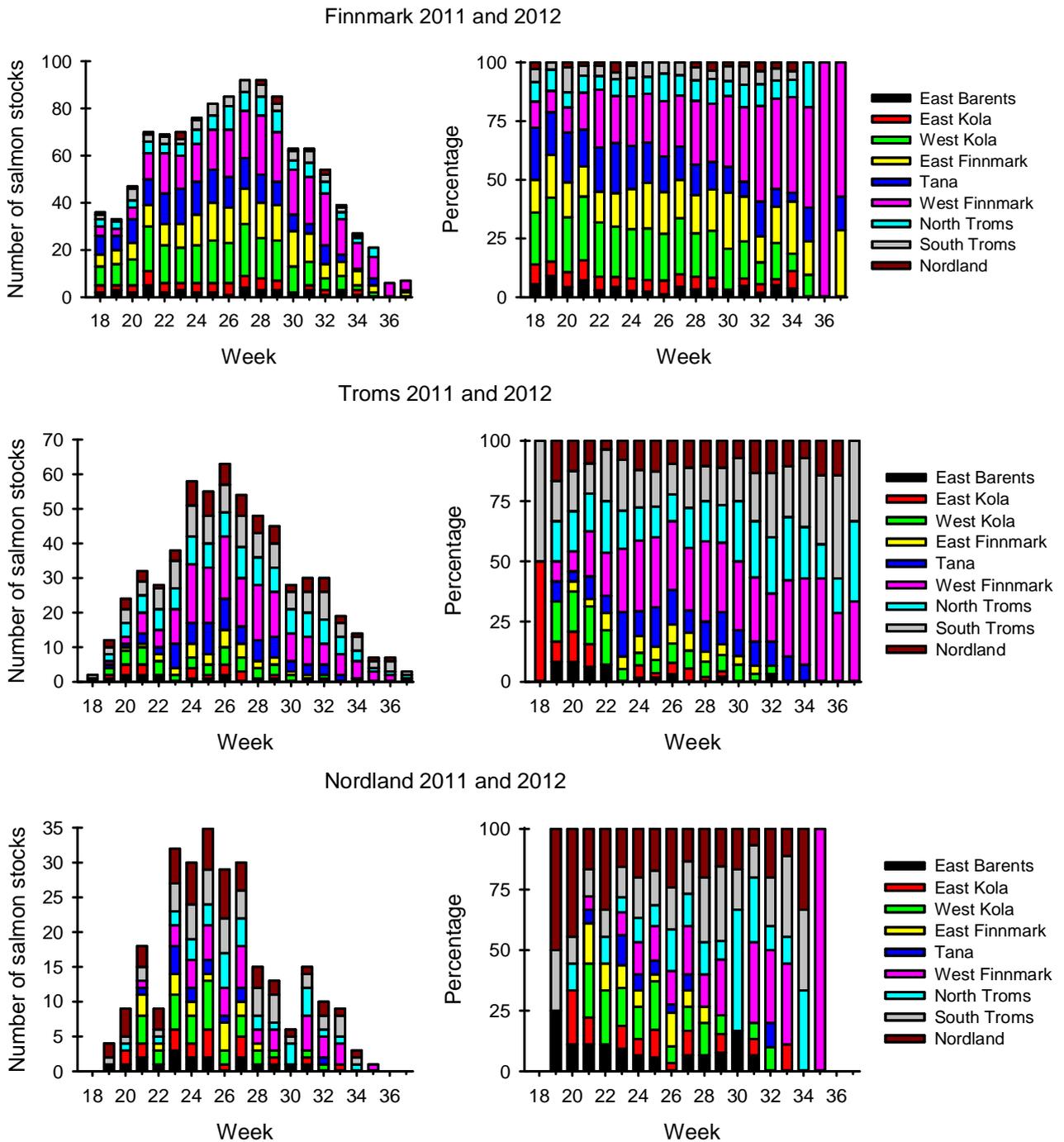


Figure 8. Numbers and proportions of stocks belonging into nine Regional Group areas in Kolarctic salmon research fishery between May and September for the counties Finnmark, Troms and Nordland material from the years 2011 and 2012 combined. Only salmon stocks with the assignment accuracy of excellent, very good, good and fair are included into the material.

Figures 9 and 10 are illustrating the weekly numbers and proportions of salmon belonging into nine Regional Group areas in the research fishery. It should be noted that these figures are presenting only the data from research fishery and these numbers have not converted to the real numbers of salmon which are in SSB catch information. Figures 9 and 10 are indicating that during the period from May to August there are fish available in weekly catches belonging to almost all the Regional Group areas. The numbers of salmon in the figures 9 and 10 belonging into each Regional Group areas are highly biased and they depend on the fishing effort in the research fishery and therefore this figure is only illustrative and indicating only the high diversity in the origin of salmon.

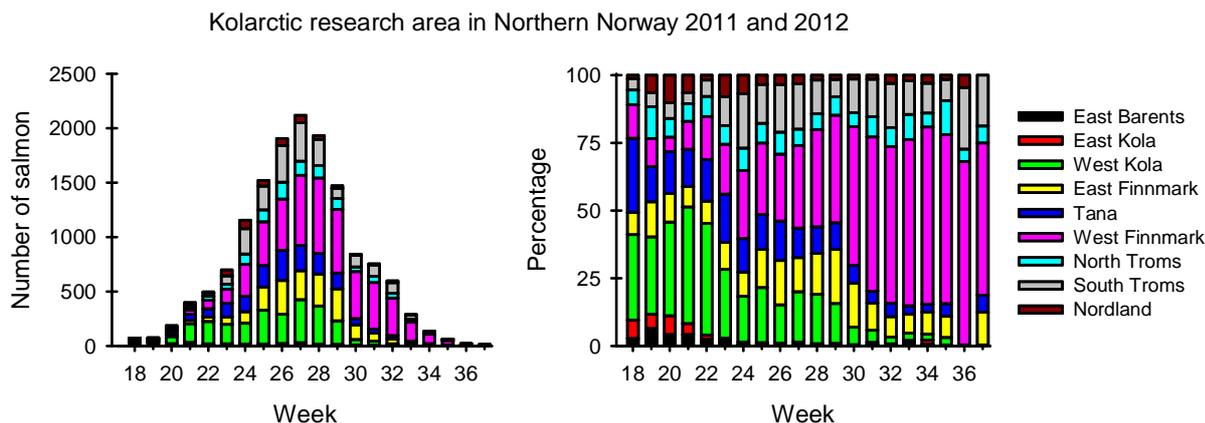
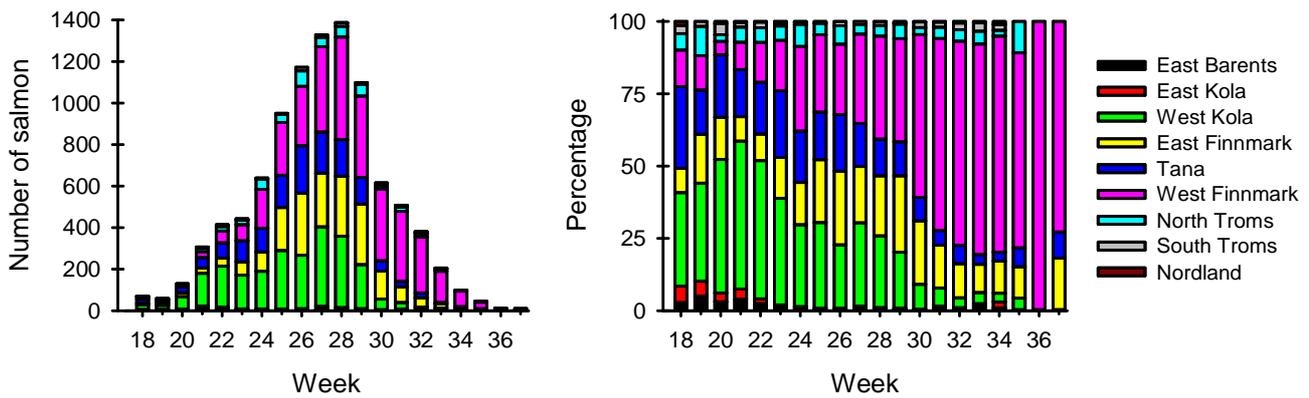
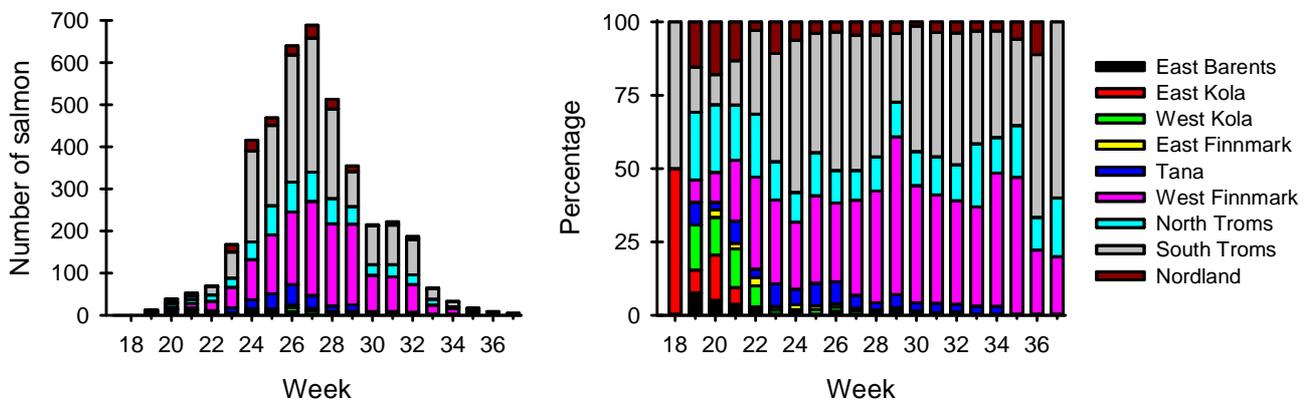


Figure 9. Numbers and proportions of salmon belonging into nine Regional Group areas in Kolarctic salmon research fishery between May and September. Only salmon with the assignment accuracy of excellent, very good, good and fair are included into the material. Note: figure includes all the weekly catches from Monday to Thursday-Friday in research fishery with both of the fishing methods bag nets and bend nets. The official fishing time is varying between counties and in Finnmark also between municipalities.

Finnmark 2011 and 2012



Troms 2011 and 2012



Nordland 2011 and 2012

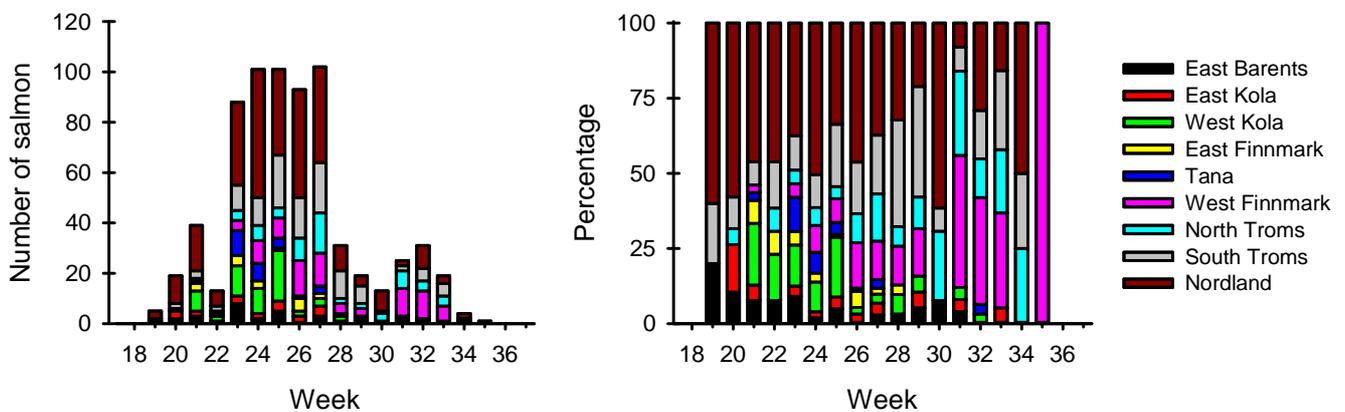


Figure 10. Numbers and proportions of salmon belonging into nine Regional Group areas in Kolarctic salmon research fishery between May and September for the counties Finnmark, Troms and Nordland material from the years 2011 and 2012 combined. Only salmon with the assignment accuracy of excellent, very good, good and fair are included into the material. Note: figure includes all the weekly catches from Monday to Thursday-Friday in research fishery with both of the fishing methods bag nets and bend nets. The official fishing time is varying between counties and in Finnmark also between municipalities.

4.2 Geographical origin of salmon caught in Nordland, Troms and Finnmark in the official salmon catches

Salmon catches especially in Troms and Finnmark counties during the official fishing time had the origin of fish from a large geographical area. In Finnmark the official fishing time is covering the period from June 1 to August 4 with many spatial and temporal differences between municipalities and therefore the origin of salmon in the catches is covering more precisely salmon stocks occurring in Kolarctic area than catches caught with much more limited fishing time in Troms County or in Nordland County where the official fishing takes place during six-eight days in three -four weeks' time in July.

Salmon rivers in Western Finnmark (including the large rivers like Altaelva, Repparfjordelva, Stabburselva, Lakselva, Børselva, Langfjordelva and tens of smaller rivers) contributed the main origin (Regional Group area West Finnmark) of official salmon catches in the whole Finnmark with c. 40% (Figure 11, Tables II and III) from the numbers and weight of salmon caught. The River Tana stocks made 17-18%, Russian stocks made 16-18% and salmon stocks from East Finnmark made 11-14% from the salmon caught in the years 2011 and 2012 in Finnmark County from the official salmon catches. Salmon stocks from Troms County made 7% from the number of fish caught in Finnmark and stocks from Nordland County have minimal affect into the catches caught in Finnmark.

Majority of salmon caught in Troms County originated from Troms rivers with 38-50% and also stocks from West Finnmark had high proportions in Troms County with 27-39%. Salmon stocks from Tana, East Finnmark and Russia did not occur often in the catches in Troms County during the official fishing time because the fishery takes place in c. 4 weeks in July when most of the eastern stocks have passed that area.

Material from Nordland in the year 2011 is too small to make clear conclusion on the origin of salmon in the catches during the official fishing time of c. 3 weeks in July. Material from the year 2012 indicated that origin of salmon caught in Nordland during the official fishing time is mainly from the rivers in Troms County and also from West Finnmark but also from Russian rivers and Nordland rivers.

Catches and percentages mentioned in the three previous paragraphs in this chapter are including salmon which has escaped from the cage culture. If escaped salmon in the catches during the official fishing time is not taken into account then we find more precise the percentage distributions of wild salmon originating from various areas (Regional Group areas) in the catches in three Northern counties in Norway. Origin of wild salmon catches was in terms of numbers, escaped salmon excluded, in the year 2011 as follows during the official fishing time:

- in Finnmark County wild salmon had Russian origin with 18 %, East Finnmark origin 12 %, Tana origin 19 %, West Finnmark origin 45 %, Troms origin 8 % and Nordland origin <1 %.

-In Troms County wild salmon had Russian origin with <1 %, East Finnmark origin <1 %, Tana origin 3 %, West Finnmark origin 47 %, Troms origin 46 % and Nordland origin 3 %.

-In Nordland County wild salmon had Russian origin with 3 %, East Finnmark origin 0 %, Tana origin 0 %, West Finnmark origin 0 %, Troms origin 44 % and Nordland origin 53 %.

The percentages were in the year 2012 as follows:

-In Finnmark County Russian origin 19 %, East Finnmark origin 15 %, Tana origin 19 %, West Finnmark origin 42 %, Troms origin 5 % and Nordland origin <1 %.

-In Troms County Russian origin 1 %, East Finnmark origin 1 %, Tana origin 2 %, West Finnmark origin 32 %, Troms origin 59 % and Nordland origin 5 %.

-In Nordland County Russian origin 20%, East Finnmark origin 0 %, Tana origin 0 %, West Finnmark origin 30 %, Troms origin 37 % and Nordland origin 13 %.

When combining materials from the two years it is possible to make a general conclusion on the origin (Regional Group areas) of wild salmon in terms of numbers caught in three Northern counties in Norway within Kolarctic salmon project area during the official fishing time.

The percentages years 2011 and 2012 combined were as follows:

-In Finnmark County Russian origin 18 %, East Finnmark origin 13 %, Tana origin 19 %, West Finnmark origin 43 %, Troms origin 6 % and Nordland origin <1 %.

-In Troms County Russian origin 1 %, East Finnmark origin <1 %, Tana origin 2 %, West Finnmark origin 40 %, Troms origin 52 % and Nordland origin 4 %.

-In Nordland County Russian origin 7%, East Finnmark origin 0 %, Tana origin 0 %, West Finnmark origin 8 %, Troms origin 43 % and Nordland origin 42 %.

As a conclusion the origin of wild salmon caught in terms of numbers was in the entire Kolarctic salmon project area combining results from two research years as follows during the official fishing time:

-Russian origin 16 %, East Finnmark origin 11 %, Tana origin 16 %, West Finnmark origin 42 %, Troms origin 14 % and Nordland origin 1 %.

Wild salmon catches are also indicated in term of weights and the percentages years 2011 and 2012 combined were as follows during the official fishing time:

-In Finnmark County Russian origin 14 %, East Finnmark origin 11 %, Tana origin 17 %, West Finnmark origin 51 %, Troms origin 7 % and Nordland origin <1 %.

-In Troms County Russian origin <1 %, East Finnmark origin <1 %, Tana origin 2 %, West Finnmark origin 45 %, Troms origin 48 % and Nordland origin 4 %.

-In Nordland County Russian origin 5%, East Finnmark origin 0 %, Tana origin 0 %, West Finnmark origin 11 %, Troms origin 42 % and Nordland origin 42 %.

As a conclusion the origin of wild salmon caught in terms of weight was in the entire Kolarctic salmon project area combining results from two research years as follows during the official fishing time:

-Russian origin 12 %, East Finnmark origin 10 %, Tana origin 15 %, West Finnmark origin 50 %, Troms origin 12 % and Nordland origin 1 %.

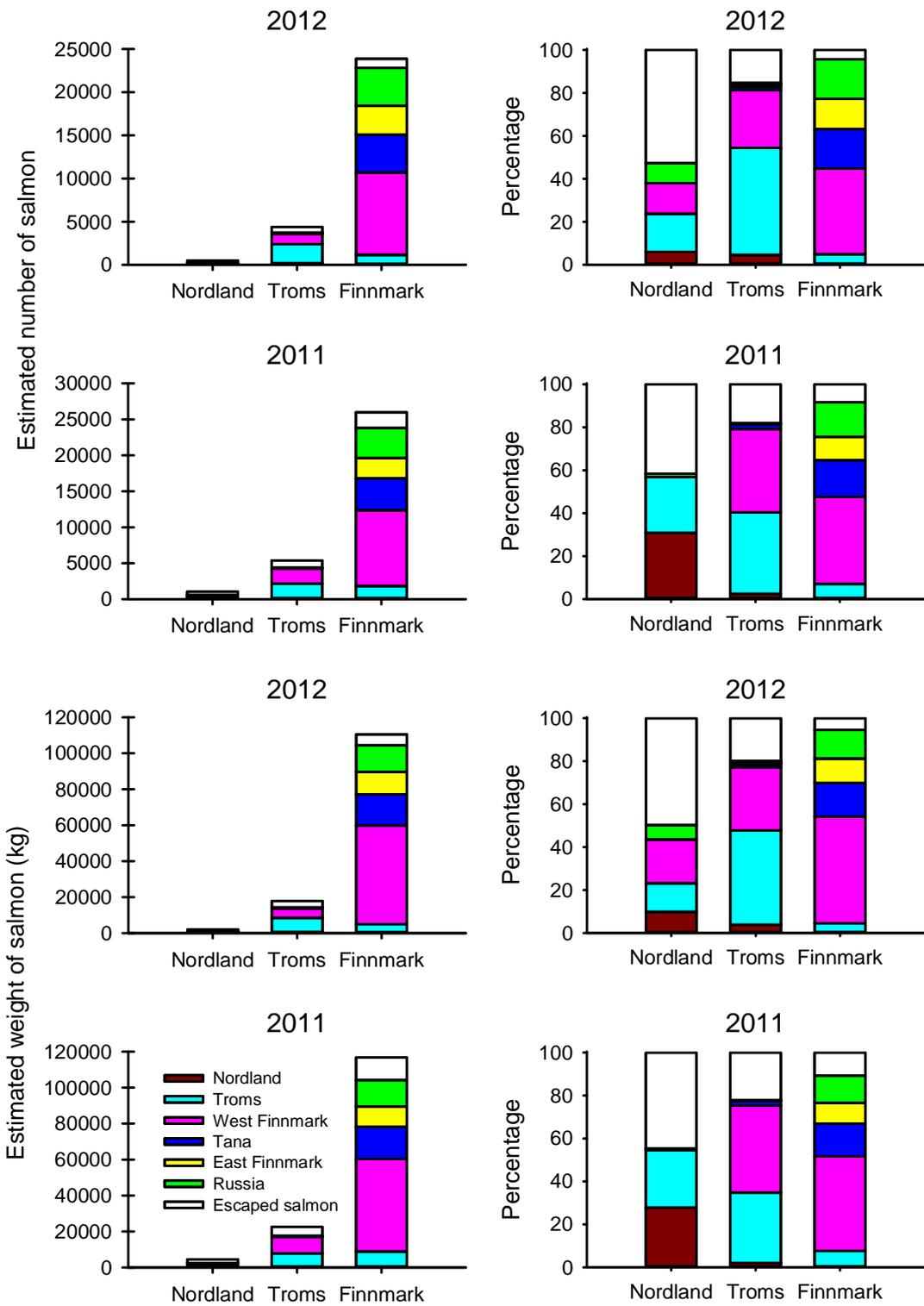


Figure 11. Numbers and weights of wild and escaped salmon caught in the years 2011 and 2012 in Kolarctic salmon project area during the official fishing time. Wild salmon catch caught in the counties Nordland, Troms and Finnmark is divided into six areas (Regional Group areas) based on the genetic origin of salmon. Catch data is the official reported salmon catches (SSB) and it has been converted into sea-age groups of 1-4SW salmon, previous spawners and escaped salmon.

Table II. Numbers and percentages (in parenthesis) of wild and escaped salmon caught in the years 2011 and 2012 in Kolarctic salmon project area. Wild salmon catch caught in the counties Finnmark, Troms and Nordland is divided into six areas based on the genetic origin of salmon (Regional Group areas). Catch data is the official reported salmon catches (SSB) and it has been converted into sea-age groups of 1-4SW salmon, previous spawners and escaped salmon. This is table for the figure 11.

Regional group	Year 2011			Year 2012		
	Finnmark	Troms	Nordland	Finnmark	Troms	Nordland
Russia	4194 (16)	20 (<1)	16 (2)	4404 (18)	41 (1)	45 (9)
East Finnmark	2820 (11)	7 (<1)		3343 (14)	32 (<1)	
Tana	4428 (17)	122 (2)		4392 (18)	68 (2)	
West Finnmark	10541 (41)	2089 (39)		9516 (40)	1187 (27)	69 (14)
Troms	1813 (7)	2050 (38)	268 (26)	1141 (7)	2196 (50)	86 (18)
Nordland	22 (<1)	131 (2)	319 (31)	26 (<1)	200 (5)	29 (6)
Escaped fish	2161 (8)	977 (18)	431 (41)	1038 (4)	674 (15)	255 (53)

Table III. Weights and percentages (in parenthesis) of wild and escaped salmon caught in the years 2011 and 2012 in Kolarctic salmon project area. Wild salmon catch caught in the counties Finnmark, Troms and Nordland is divided into six areas based on the genetic origin of salmon (Regional Group areas). Catch data is the official reported salmon catches (SSB) and it has been converted into sea-age groups of 1-4SW salmon, previous spawners and escaped salmon. This is table for the figure 11.

Regional group	Year 2011			Year 2012		
	Finnmark	Troms	Nordland	Finnmark	Troms	Nordland
Russia	14764 (13)	82 (<1)	34 (<1)	14831 (13)	145 (<1)	130 (7)
East Finnmark	11251 (10)	9 (<1)		12520 (11)	108 (<1)	
Tana	17812 (15)	481 (2)		17257 (16)	258 (1)	
West Finnmark	51425 (43)	9147 (41)		54837 (50)	5249 (29)	393 (20)
Troms	8843 (8)	7389 (33)	1214 (27)	4883 (4)	7841 (44)	257 (13)
Nordland	93 (<1)	465 (2)	1257 (28)	111 (<1)	678 (4)	189 (10)
Escaped fish	12552 (11)	5006 (22)	2017 (45)	5964 (5)	3546 (20)	960 (50)

4.3 Origin of salmon caught in municipalities in North Norway

The highest wild salmon catch according official catch statistics was caught in Sør-Varanger municipality area in the years 2011 and 2012 which slightly exceeded catches in Alta municipality and in the area of the combined municipalities Hammerfest, Kvalsund, Måsøy, Nordkapp (Figures 12 and 13). Proportions of wild salmon originating from nine Regional Group areas had remarkable differences in the catches between the municipalities in the years 2011 and 2012. Russian origin salmon made c. 65% from the catches in both years in Sør-Varanger municipality (Tables IV, V, VI, VII). Also the Regional Group Tana salmon made high proportion in the municipality Tana in Tanafjord with c. 80%. Salmon originating from each Regional Group areas was caught widely in the outermost coastal areas as well as in inner areas of the fjords. Large rivers in West Finnmark (Altaelva, Repparfjordelva, Stabburselva, Lakselva, Børselva, Langfjordelva) and tens of smaller rivers there are supporting high proportions of West Finnmark stocks in the wild salmon catches in almost all municipalities in western Finnmark. Salmon stocks in numerous rivers in northern Kola Peninsula in Russia are important resources which are supporting salmon fishery in eastern Finnmark and especially in Sør-Varanger municipality. Salmon catches caught in the municipalities Vadsø-Nesseby have large proportion from the area in East Finnmark Regional Group. Numerous salmon stocks in the River Tana are also supporting largely the fishery especially in Tanafjord and also in neighboring Gamvik and Berlevåg municipalities. The proportions of escaped salmon increased in the catches towards north.

Figures 14 and 15 and tables VIII-XI are presenting the weights of salmon in the official catch reports belonging into the Regional Group areas.



Photo 6. Fisherman Kjell Ole Jenssen in Gjesvær, Nordkapp. Photo Eero Niemelä

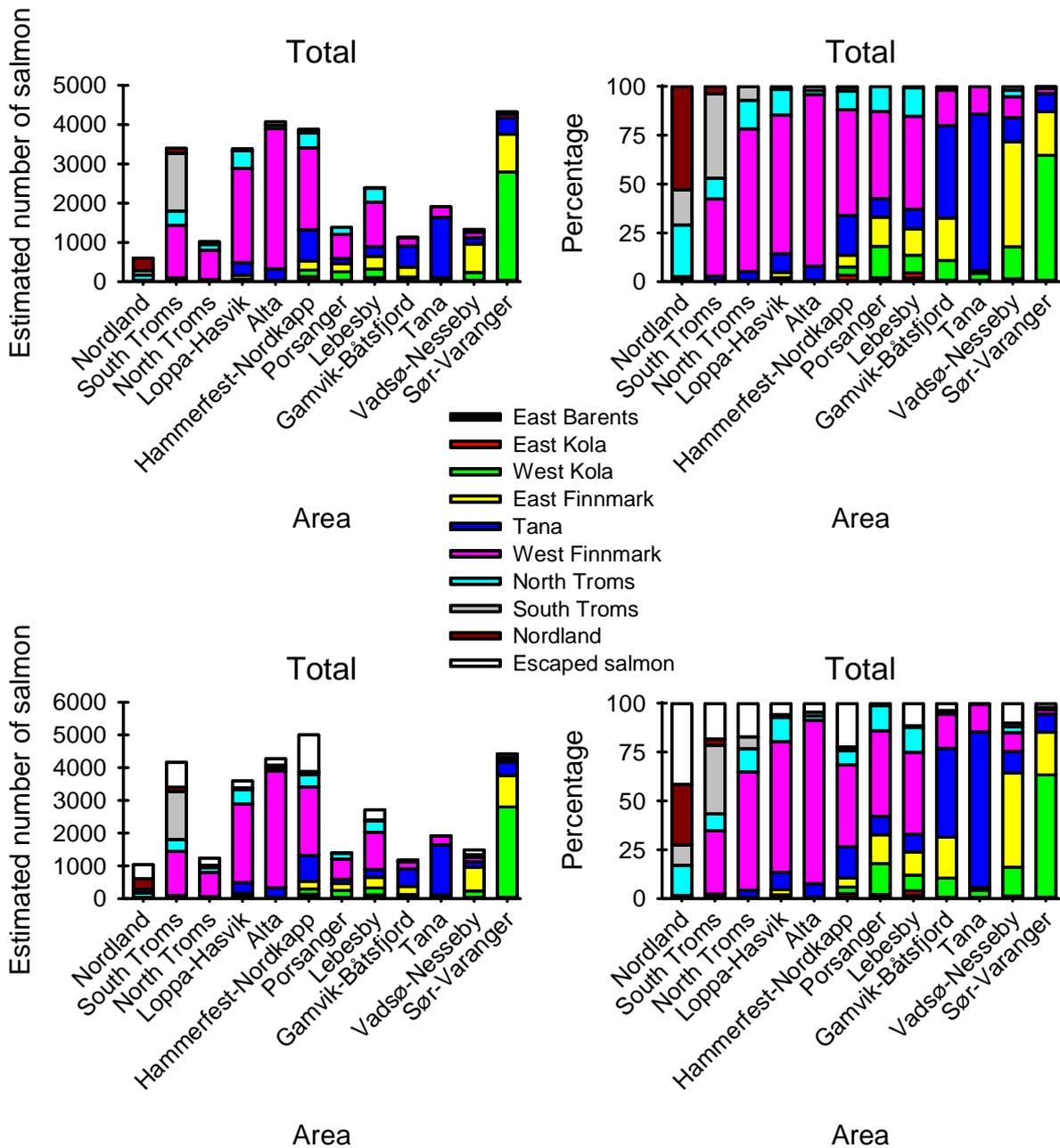


Figure 12. Numbers of wild (figure above), wild and escaped salmon (figure below) caught in the year 2011 in Kolarctic salmon project in municipalities in Finnmark and in South and North Troms and in Nordland. Wild salmon catch caught in the counties Nordland, Troms and in municipalities or in combinations of municipalities in Finnmark is divided into nine Reporting Group areas based on the genetic origin of salmon. Catch data is the official reported salmon catches (SSB) and it has been converted into sea-age groups of 1-4SW salmon, previous spawners and escaped salmon.

Table IV. Numbers and percentages (in parenthesis) of wild salmon and escaped salmon caught in the year 2011 in Kolarctic salmon project area. Wild salmon catch caught in the counties Finnmark, Troms and Nordland is divided into 10 areas based on the genetic origin of salmon. Catch data is the official reported salmon catches (SSB) and it has been converted into sea-age groups of 1-4SW salmon, previous spawners and escaped salmon. Hammerfest includes Kvalsund, Måsøy and Nordkapp; Gamvik includes Berlevåg, Båtsfjord and Vardø; Vadsø includes Nesseby. This is table for the figure 12.

Regional group	Fishing areas											
	Nordland	South Troms	North Troms	Loppa-Hasvik	Alta	Hammerfest	Porsanger	Lebesby	Gamvik	Tana	Vadsø	Sør-Varanger
East Barents	15 (2)			3 (<1)		23 (<1)	17 (1)	48 (2)			6 (<1)	9 (<1)
East Kola				27 (<1)		107 (2)	11 (<1)	61 (2)	9 (<1)		13 (<1)	23 (<1)
West Kola		19 (<1)		39 (1)	10 (<1)	164 (3)	222 (16)	215 (8)	114 (10)	82 (4)	219 (15)	2764 (63)
East Finnmark		7 (<1)		93 (3)	10 (<1)	232 (5)	206 (15)	322 (12)	247 (21)	28 (1)	717 (48)	961 (22)
Tana		69 (2)	52 (4)	321 (9)	303 (7)	794 (16)	131 (9)	240 (9)	535 (45)	1527 (80)	165 (11)	409 (9)
West Finnmark		1342 (32)	747 (60)	2400 (67)	3569 (84)	2091 (42)	615 (44)	1138 (42)	206 (17)	272 (14)	142 (10)	104 (2)
North Troms	159 (15)	362 (9)	148 (12)	447 (12)	89 (2)	371 (7)	179 (13)	349 (13)	15 (1)		44 (3)	36 (<1)
South Troms	108 (10)	1465 (35)	73 (6)	50 (1)	89 (2)	78 (2)		17 (<1)	6 (<1)		25 (2)	11 (<1)
Nordland	319 (30)	131 (3)					17 (<1)				1 (<1)	2 (<1)
Escaped fish	431 (41)	763 (18)	213 (17)	210 (5)	195 (4)	1119 (22)	17 (1)	314 (11)	44 (3)	8 (<1)	153 (10)	96 (2)

Table V. Percentages of wild salmon caught in the year 2011 in Kolarctic salmon project area. Wild salmon catch caught in the counties Finnmark, Troms and Nordland is divided into 9 areas based on the genetic origin of salmon (escaped salmon excluded). Catch data is the official reported salmon catches (SSB) and it has been converted into sea-age groups of 1-4SW salmon and previous spawners. Hammerfest includes Kvalsund, Måsøy and Nordkapp; Gamvik includes Berlevåg, Båtsfjord and Vardø; Vadsø includes Nesseby. This is table for the figure 12.

Regional group	Fishing areas											
	Nordland	South Troms	North Troms	Loppa-Hasvik	Alta	Hammerfest	Por-sanger	Lebesby	Gamvik	Tana	Vadsø	Sør-Varanger
East Barents	3			<1		<1	1	2			<1	<1
East Kola				<1		3	<1	3	<1		<1	<1
West Kola		<1		1	<1	4	16	9	10	4	16	64
East Finnmark		<1		3	<1	6	15	13	22	1	54	22
Tana		2	5	9	7	20	10	10	47	80	12	9
West Finnmark		39	73	71	88	54	44	48	18	14	11	2
North Troms	26	11	15	13	2	10	13	15	1		3	<1
South Troms	18	43	7	2	2	2		<1	<1		2	<1
Nordland	53	4				<1					<1	<1

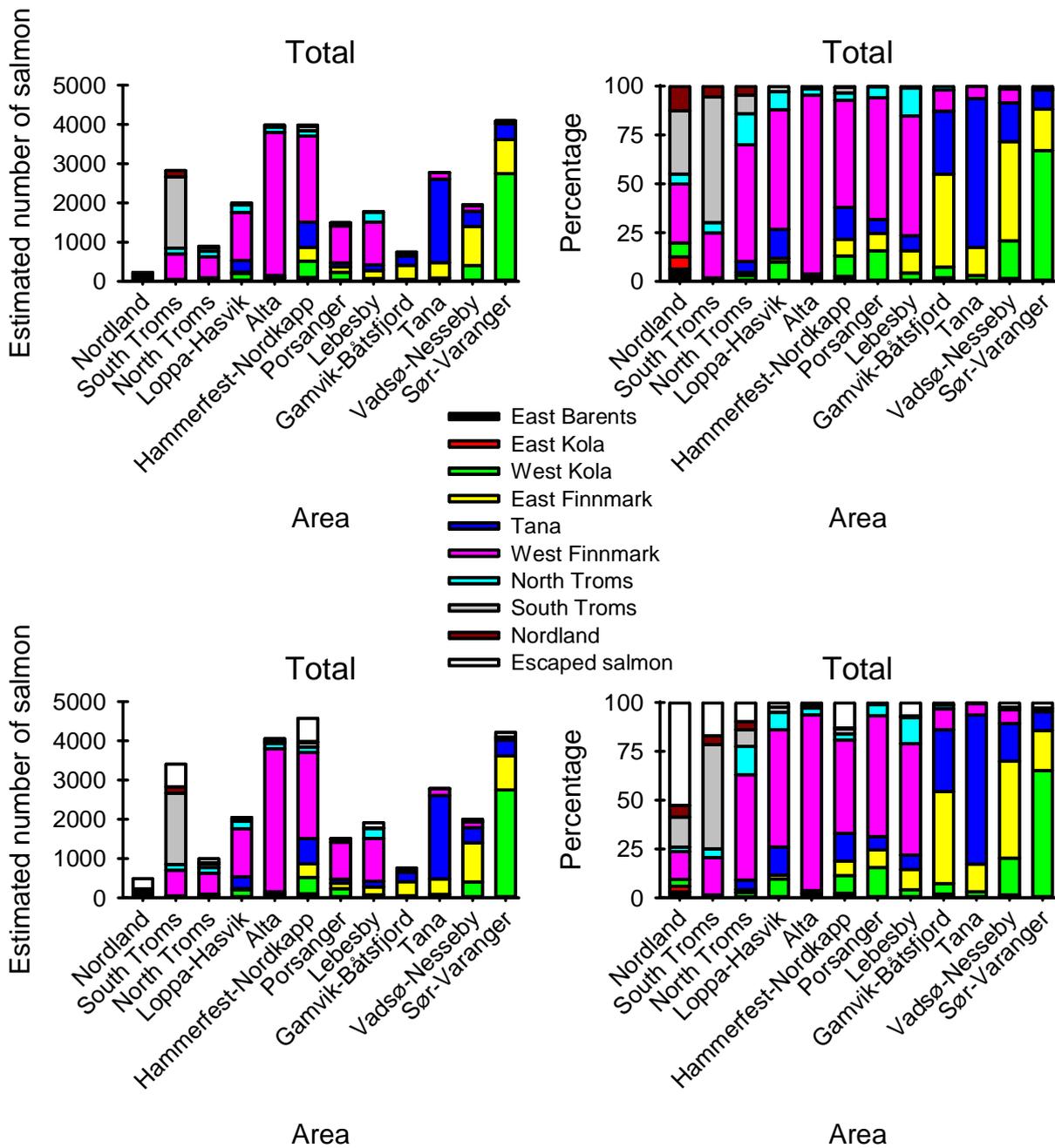


Figure 13. Numbers of wild (figure above), wild and escaped salmon (figure below) caught in the year 2012 in Kolarctic salmon project in municipalities in Finnmark and in South and North Troms and in Nordland. Wild salmon catch caught in the counties Nordland, Troms and in municipalities or in combinations of municipalities in Finnmark is divided into nine reporting groups based on the genetic origin of salmon. Catch data is the official reported salmon catches (SSB) and it has been converted into sea-age groups of 1-4SW salmon, previous spawners and escaped salmon.

Table VI. Numbers and percentages (in parenthesis) of wild salmon and escaped salmon caught in the year 2012 in Kolarctic salmon project area. Wild salmon catch caught in the counties Finnmark, Troms and Nordland is divided into 10 areas based on the genetic origin of salmon. Catch data is the official reported salmon catches (SSB) and it has been converted into sea-age groups of 1-4SW salmon and previous spawners. Hammerfest includes Kvalsund, Måsøy and Nordkapp; Gamvik includes Berlevåg, Båtsfjord and Vardø; Vadsø includes Nesseby. This is table for the figure 13.

Regional group	Fishing areas											
	Nordland	South Troms	North Troms	Loppa-Hasvik	Alta	Hammerfest	Por-sanger	Lebesby	Gamvik	Tana	Vadsø	Sør-Varanger
East Barents	15 (3)		2 (<1)	11 (11)		53 (1)	3 (<1)		6 (<1)		18 (<1)	
East Kola	14 (3)	13 (<1)			14 (<1)	51 (1)			9 (1)		13 (<1)	26 (<1)
West Kola	17 (3)	2 (<1)	25 (2)	187 (9)	67 (2)	417 (9)	231 (15)	77 (4)	40 (5)	84 (3)	374 (19)	2718 (65)
East Finnmark		18 (<1)	14 (1)	39 (2)	15 (<1)	340 (7)	135 (9)	201 (11)	356 (47)	396 (14)	991 (50)	866 (21)
Tana		19 (<1)	49 (5)	296 (14)	54 (1)	645 (14)	105 (7)	139 (7)	240 (32)	2124 (76)	388 (19)	398 (9)
West Finnmark	69 (14)	650 (19)	536 (54)	1227 (60)	3649 (90)	2190 (48)	936 (62)	1093 (57)	81 (11)	166 (6)	137 (7)	32 (<1)
North Troms	12 (2)	150 (4)	143 (14)	184 (9)	133 (3)	143 (3)	84 (6)	255 (13)	15 (2)	6 (<1)	28 (1)	47 (1)
South Troms	74 (15)	1816 (53)	85 (9)	56 (3)	50 (1)	113 (2)	5 (<1)					3 (<1)
Nordland	29 (6)	158 (5)	41 (4)			26 (<1)						
Escaped fish	255 (53)	577 (17)	97 (10)	46 (2)	68 (2)	594 (13)	12 (<1)	132 (7)	9 (1)	8 (<1)	47 (2)	119 (3)

Table VII. Percentages of wild salmon caught in the year 2012 in Kolarctic salmon project area. Wild salmon catch caught in the counties Finnmark, Troms and Nordland is divided into 9 areas based on the genetic origin of salmon (escaped salmon excluded). Catch data is the official reported salmon catches (SSB) and it has been converted into sea-age groups of 1-4SW salmon and previous spawners. Hammerfest includes Kvalsund, Måsøy and Nordkapp; Gamvik includes Berlevåg, Båtsfjord and Vardø; Vadsø includes Nesseby. This is table for the figure 13.

Regional group	Fishing areas											
	Nord-land	South Troms	North Troms	Loppa-Hasvik	Alta	Hammerfest	Por-sanger	Lebesby	Gamvik	Tana	Vadsø	Sør-Varanger
East Barents	6		<1	<1		1			<1		<1	
East Kola	6	<1			<1	1			1		<1	<1
West Kola	7	<1	3	9	2	10		4	5	3	19	66
East Finnmark		<1	2	2	<1	8		11	48	14	51	21
Tana		<1	5	15	1	16		8	32	76	20	10
West Finnmark	30	23	59	61	91	55		61	11	6	7	<1
North Troms	5	5	16	9	3	4		14	2	<1	<1	1
South Troms	32	64	10	3	1	3		<1				<1
Nordland	13	6	5			<1						

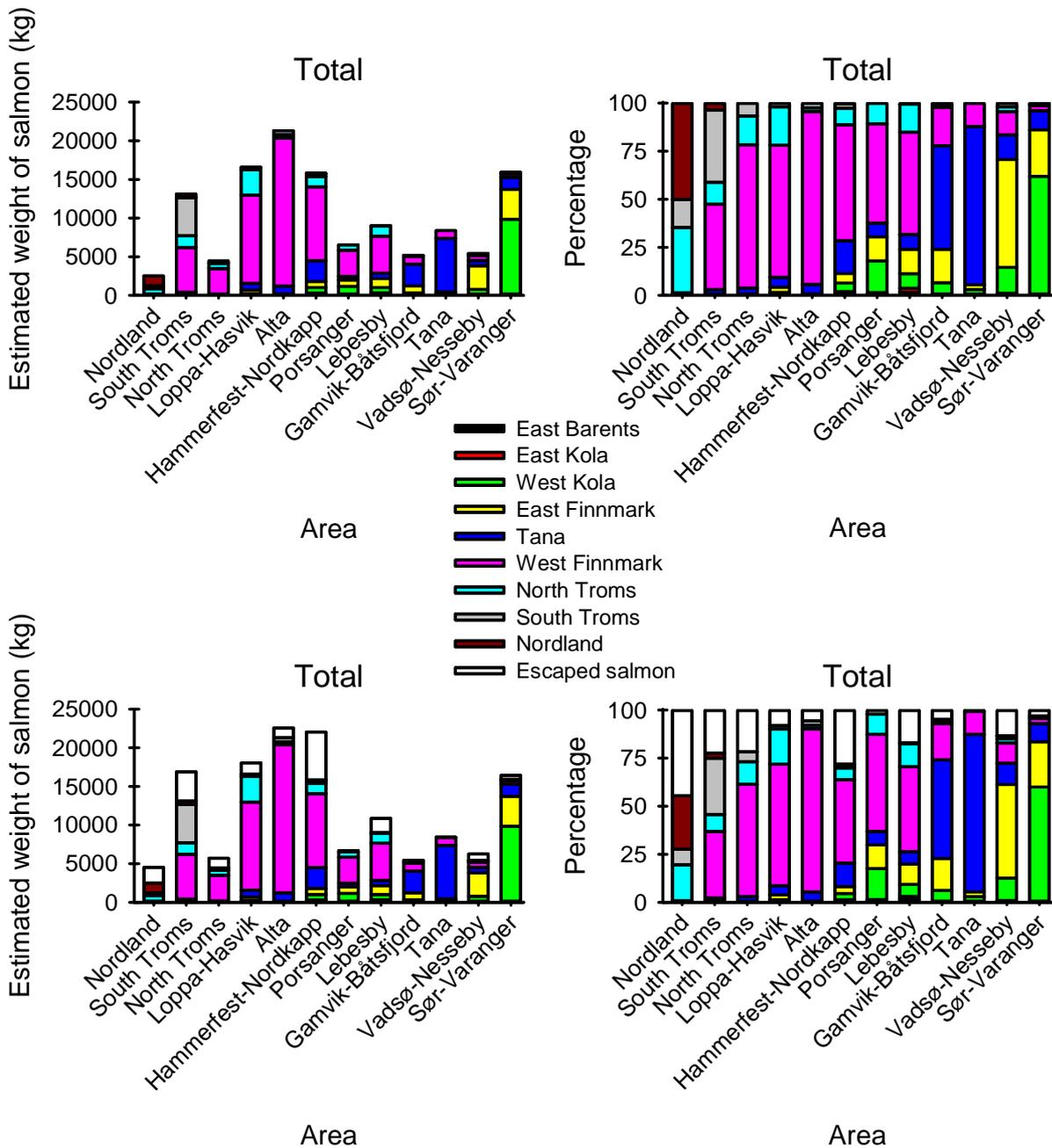


Figure 14. Weight of wild (figure above), wild and escaped salmon (figure below) caught in the year 2011 in Kolarctic salmon project in municipalities in Finnmark and in South and North Troms and in Nordland. Wild salmon catch caught in the counties Nordland, Troms and in municipalities or in combinations of municipalities in Finnmark is divided into nine reporting groups based on the genetic origin of salmon. Catch data is the official reported salmon catches (SSB) and it has been converted into sea-age groups of 1-4SW salmon, previous spawners and escaped salmon.

Table VIII. Weights and percentages (in parenthesis) of wild salmon and escaped salmon caught in the year 2011 in Kolarctic salmon project area. Wild salmon catch caught in the counties Finnmark, Troms and Nordland is divided into 10 areas based on the genetic origin of salmon. Catch data is the official reported salmon catches (SSB) and it has been converted into sea-age groups of 1-4SW salmon and previous spawners. Hammerfest includes Kvalsund, Måsøy and Nordkapp; Gamvik includes Berlevåg, Båtsfjord and Vardø; Vadsø includes Nesseby. This is table for the figure 14.

Regional group	Fishing areas											
	Nordland	South Troms	North Troms	Loppa-Hasvik	Alta	Hammerfest	Por-sanger	Lebesby	Gamvik	Tana	Vadsø	Sør-Varanger
East Barents	34 (<1)			24 (<1)		69 (<1)	54 (<1)	161 (1)			22 (<1)	36 (<1)
East Kola				78 (<1)		247 (1)	43 (<1)	176 (2)	25 (<1)		39 (<1)	69 (<1)
West Kola		82 (<1)		154 (<1)	43 (<1)	701 (3)	1079 (16)	681 (6)	314 (6)	258 (3)	731 (12)	9749 (59)
East Finnmark		9 (<1)		446 (2)	40 (<1)	782 (4)	819 (12)	1144 (11)	903 (17)	206 (2)	3046 (49)	3862 (24)
Tana		312 (2)	169 (3)	867 (5)	1135 (5)	2695 (12)	468 (7)	693 (6)	2784 (51)	6908 (81)	692 (11)	1567 (10)
West Finnmark		5818 (34)	3328 (58)	11386 (63)	19157 (84)	9551 (43)	3369 (50)	4795 (44)	1037 (19)	1021 (12)	655 (10)	451 (3)
North Troms	851 (18)	1493 (9)	669 (12)	3317 (18)	402 (2)	1353 (6)	699 (10)	1316 (12)	86 (2)		135 (2)	137 (<1)
South Troms	362 (8)	4931 (29)	295 (5)	317 (2)	528 (2)	346 (2)		47 (<1)	21 (<1)		97 (2)	33 (<1)
Nordland	1257 (27)	465 (3)					80 (<1)				6 (<1)	6 (<1)
Escaped fish	2017 (45)	3771 (22)	1235 (22)	1451 (8)	1246 (6)	6204 (28)	145 (2)	1842 (17)	265 (5)	48 (<1)	836 (13)	512 (3)

Table IX. Percentages from the weight of wild salmon caught in the year 2011 in Kolarctic salmon project area. Wild salmon catch caught in the counties Finnmark, Troms and Nordland is divided into 9 areas based on the genetic origin of salmon (escaped salmon excluded). Catch data is the official reported salmon catches (SSB) and it has been converted into sea-age groups of 1-4SW salmon and previous spawners. Hammerfest includes Kvalsund, Måsøy and Nordkapp; Gamvik includes Berlevåg, Båtsfjord and Vardø; Vadsø includes Nesseby. This is table for the figure 14.

Regional group	Fishing areas											
	Nord-land	South Troms	North Troms	Loppa-Hasvik	Alta	Hammerfest	Por-sanger	Lebesby	Gamvik	Tana	Vadsø	Sør-Varanger
East Barents	1			<1		<1	<1	2			<1	<1
East Kola				<1		2	<1	2	<1		<1	<1
West Kola		<1		1	<1	4		8	6	3	13	61
East Finnmark		<1		3	<1	5		13	17	2	56	24
Tana		2	4	5	5	17	7	8	54	82	13	10
West Finnmark		44	75	69	90	60	52	53	20	12	12	3
North Troms	34	11	15	20	2	9		15	2		3	<1
South Troms	14	38	7	2	2	2		<1	<1		2	<1
Nordland	50	4				<1					<1	<1

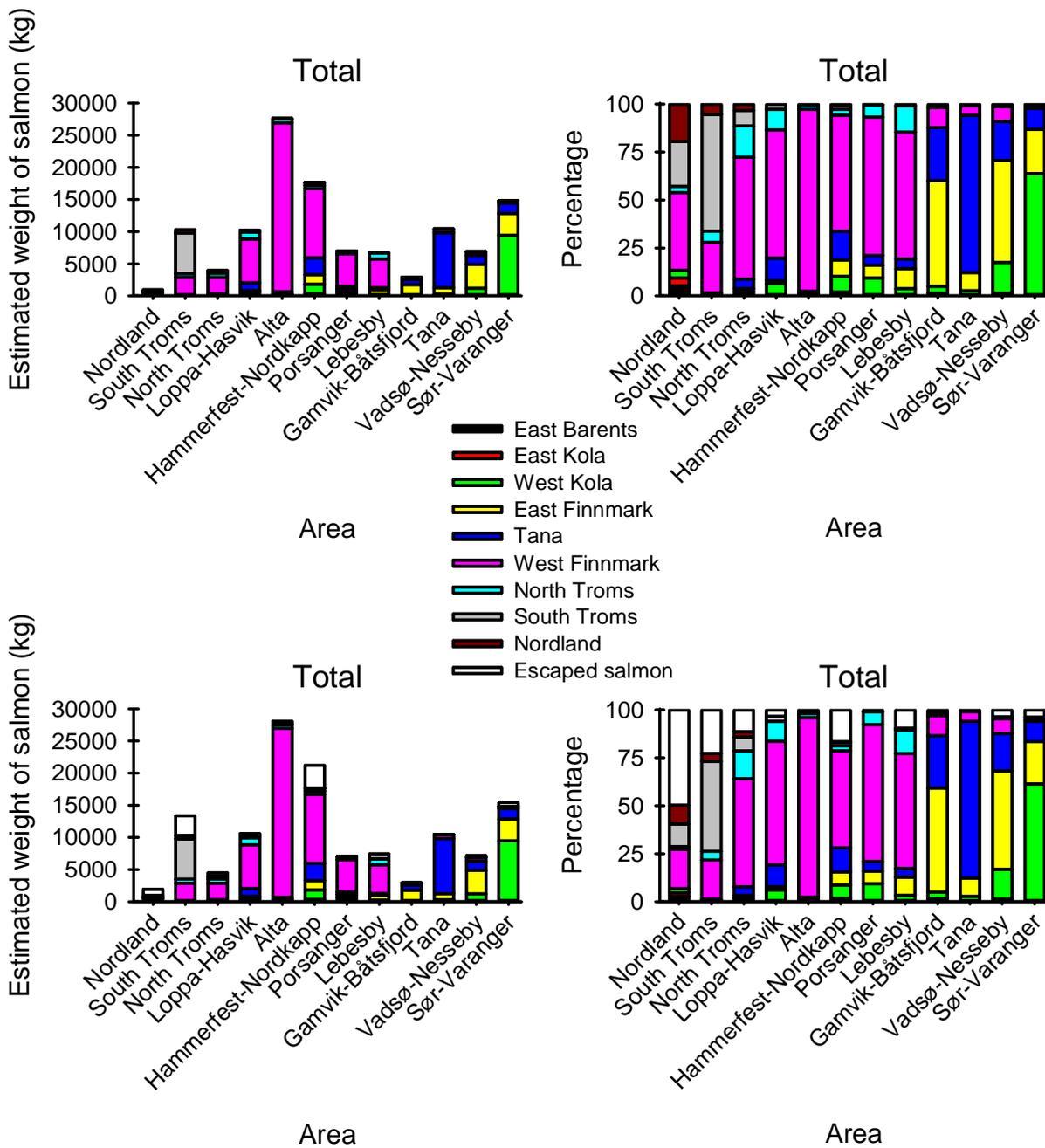


Figure 15. Weight of wild (figure above), wild and escaped salmon (figure below) caught in the year 2012 in Kolarctic salmon project in municipalities in Finnmark and in South and North Troms and in Nordland. Wild salmon catch caught in the counties Nordland, Troms and in municipalities or in combinations of municipalities in Finnmark is divided into nine reporting groups based on the genetic origin of salmon. Catch data is the official reported salmon catches (SSB) and it has been converted into sea-age groups of 1-4SW salmon, previous spawners and escaped salmon.

Table X. Weights and percentages (in parenthesis) of wild salmon and escaped salmon caught in the year 2012 in Kolarctic salmon project area. Wild salmon catch caught in the counties Finnmark, Troms and Nordland is divided into 10 areas based on the genetic origin of salmon. Catch data is the official reported salmon catches (SSB) and it has been converted into sea-age groups of 1-4SW salmon and previous spawners. Hammerfest includes Kvalsund, Måsøy and Nordkapp; Gamvik includes Berlevåg, Båtsfjord and Vardø; Vadsø includes Nesseby. This is table for the figure 15.

Regional group	Fishing areas											
	Nord-land	South Troms	North Troms	Loppa-Hasvik	Alta	Hammerfest	Por-sanger	Lebesby	Gamvik	Tana	Vadsø	Sør-Varanger
East Barents	52 (3)		6 (<1)	30 (<1)		152 (<1)	10 (<1)		14 (<1)		71 (<1)	
East Kola	39 (2)	57 (<1)				228 (1)			29 (<1)		32 (<1)	73 (<1)
West Kola	38 (2)	5 (<1)	75 (2)	626 (6)	325 (1)	1450 (7)	653 (9)	250 (3)	101 (3)	289 (3)	1108 (15)	9384 (61)
East Finnmark		39 (<1)	69 (2)	171 (2)	58 (<1)	1467 (7)	455 (6)	703 (9)	1607 (54)	989 (9)	3679 (51)	3386 (22)
Tana		64 (<1)	193 (4)	1209 (11)	282 (1)	2654 (13)	365 (5)	341 (5)	807 (27)	8562 (82)	1406 (20)	1627 (11)
West Finnmark	393 (20)	2727 (20)	2521 (56)	6830 (64)	26269 (94)	10731 (51)	5056 (71)	4440 (60)	309 (10)	546 (5)	540 (8)	112 (<1)
North Troms	30 (2)	602 (5)	648 (14)	1092 (10)	589 (2)	530 (3)	461 (7)	918 (12)	48 (2)	72 (<1)	85 (1)	209 (1)
South Troms	227 (12)	6269 (47)	320 (7)	276 (3)	134 (<1)	368 (2)	17 (<1)	63 (<1)				12 (<1)
Nordland	189 (10)	546 (4)	131 (3)			110 (<1)						
Escaped fish	960 (50)	3038 (23)	507 (11)	359 (3)	397 (1)	3527 (17)	60 (<1)	716 (10)	40 (1)	19 (<1)	255 (4)	588 (4)

Table XI. Percentages from the weight of wild salmon caught in the year 2012 in Kolarctic salmon project area. Wild salmon catch caught in the counties Finnmark, Troms and Nordland is divided into 9 areas based on the genetic origin of salmon (escaped salmon excluded). Catch data is the official reported salmon catches (SSB) and it has been converted into sea-age groups of 1-4SW salmon and previous spawners. Hammerfest includes Kvalsund, Måsøy and Nordkapp; Gamvik includes Berlevåg, Båtsfjord and Vardø; Vadsø includes Nesseby. This is table for the figure 15.

Regional group	Fishing areas											
	Nord-land	South Troms	North Troms	Loppa-Hasvik	Alta	Hammerfest	Por-sanger	Lebesby	Gamvik	Tana	Vadsø	Sør-Varanger
East Barents	5		<1	<1		<1	<1		<1		<1	
East Kola	4	<1				1			1		<1	<1
West Kola	4	<1	2	6	1	8	9	4	3	3	16	63
East Finnmark		<1	2	2	<1	8	6	10	55	9	53	23
Tana		<1	5	12	1	15	5	5	28	82	20	11
West Finnmark	41	26	64	67	95	61	72	66	11	5	8	<1
North Troms	3	6	16	11	2	3	7	14	2	<1	1	1
South Troms	23	61	8	3	<1	2	<1	<1				<1
Nordland	20	5	3			<1						

4.4 Origin of 1SW, 2SW, 3-4SW salmon and previous spawners caught and reported in official catch statistics in North Norway

Most of salmon catches (SSB data) caught in Kolarctic salmon project area in Norway had the origin from the West Finnmark Regional Group area. That was true for all sea-age groups of salmon (Figure 16). The origin of the catches for 2SW and 3SW salmon was almost the same in the years 2011 and 2012 when the majority of catches originated from West Finnmark Regional Group area and especially for 2SW salmon equally abundances were between the Regional Groups Tana, East Finnmark and West Kola.

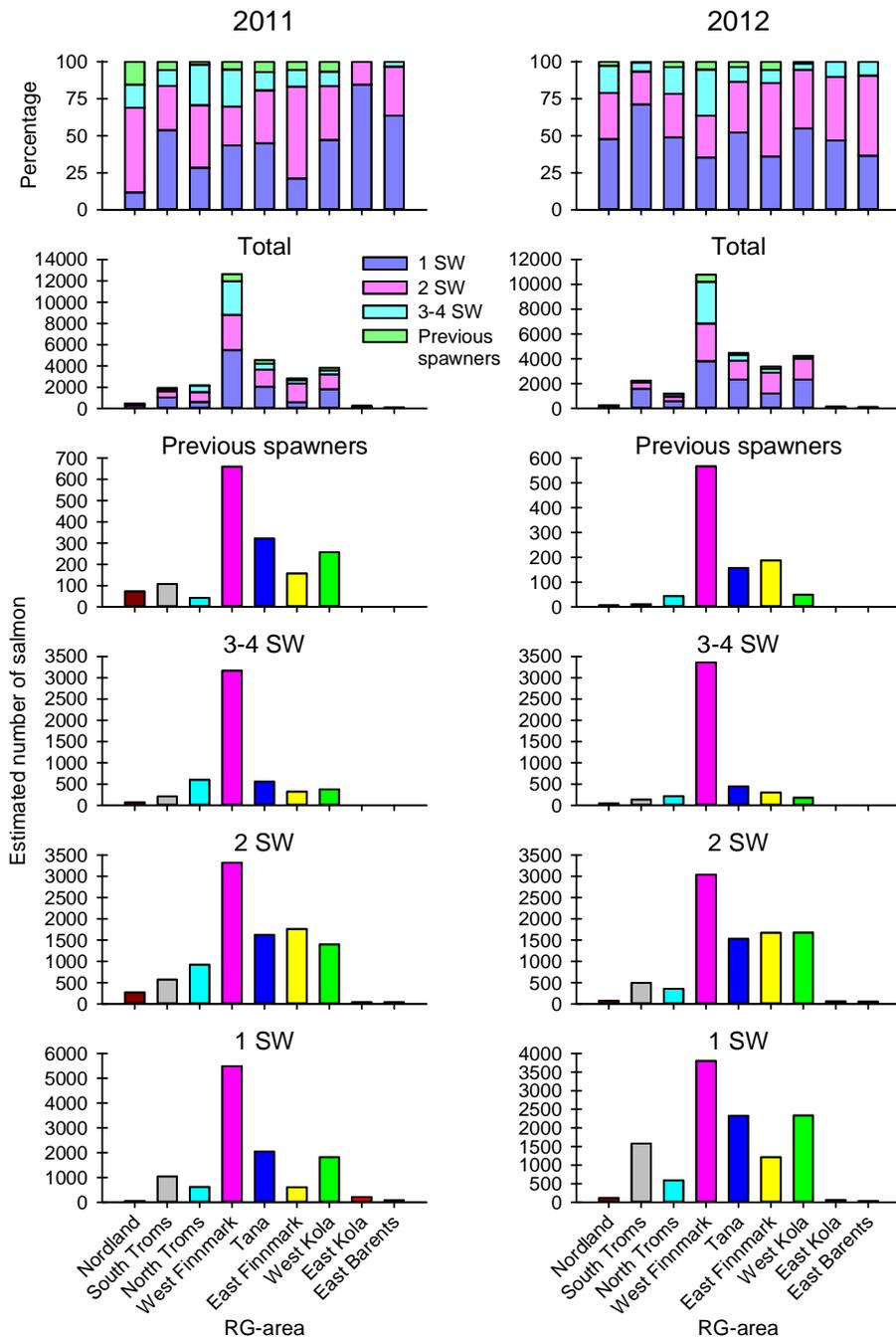


Figure 16. The origin of 1SW, 2SW, 3-4SW salmon and previous spawners from nine Regional Group (RG) areas in the catches within the Kolarctic salmon project area in Northern Norway in the years 2011 and 2012.

Figure 17 indicates the distributions of the origin for 1SW, 2SW, 3-4SW salmon and previous spawners catches in the official reported catches between nine Regional Group areas. Differences in the proportions between the two years are quite small. Regional Group West Finnmark made from the official catches in Kolarctic salmon project area in Northern Norway 31%, 34%, 71% and 55% for 1SW, 2SW, 3-4SW and previous spawners, respectively. Regional Group Tana made from the official catches in Kolarctic salmon project area in Northern Norway 19%, 17%, 9% and 15% for 1SW, 2SW, 3-4SW and previous spawners, respectively. Regional Group East Finnmark made from the official catches in Kolarctic salmon project area in Northern Norway 10%, 19%, 6% and 18% for 1SW, 2SW, 3-4SW and previous spawners, respectively and Regional Group West Kola made 19%, 19%, 4% and 5% for 1SW, 2SW, 3-4SW and previous spawners, respectively. Regional Groups East Barents and East Kola had only minimum impacts into the origin of salmon from Russia during the official fishing time.

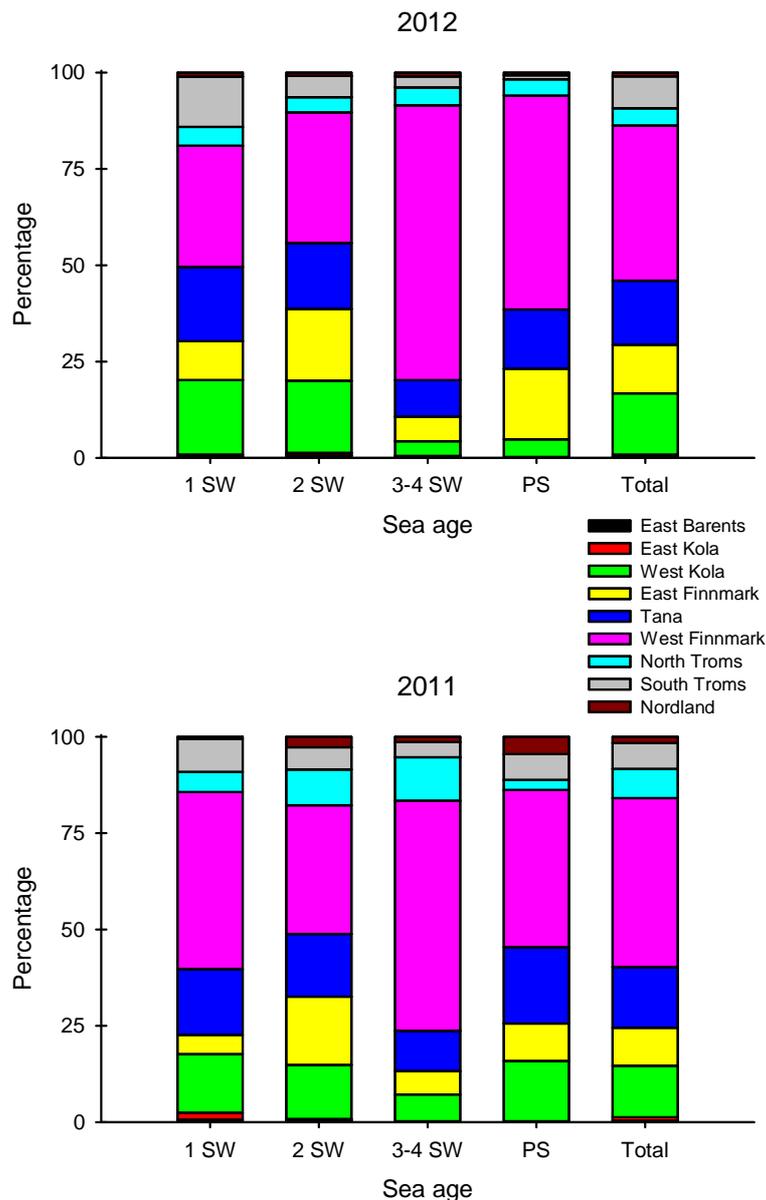


Figure 17. Proportions of salmon originating from nine regional areas within sea-age groups in Kolarctic salmon project area in the official reported catches (SSB).

Figures 18-21 are indicating abundances and proportions of salmon originating from nine Regional Group areas for 1SW, 2SW, 3-4SW salmon and previous spawner catches in each municipality from the official reported catches. Highest catches of 1SW salmon were in the year 2011 in Sør-Varanger, Alta, South Troms and in the large combined area Hammerfest, Kvalsund, Måsøy, Nordkapp. In the year 2012 high 1SW salmon catch was also in Tana municipality. Two sea-winter salmon catch was highest in both years in Sør-Varanger municipality where more than 50% of salmon had Russian origin. In all the sea-ages and in all the municipalities or larger areas salmon was originating from many Regional Group areas.



Photo 7. Fisherman Palmer Johnsen. Havøysund. Photo Eero Niemelä

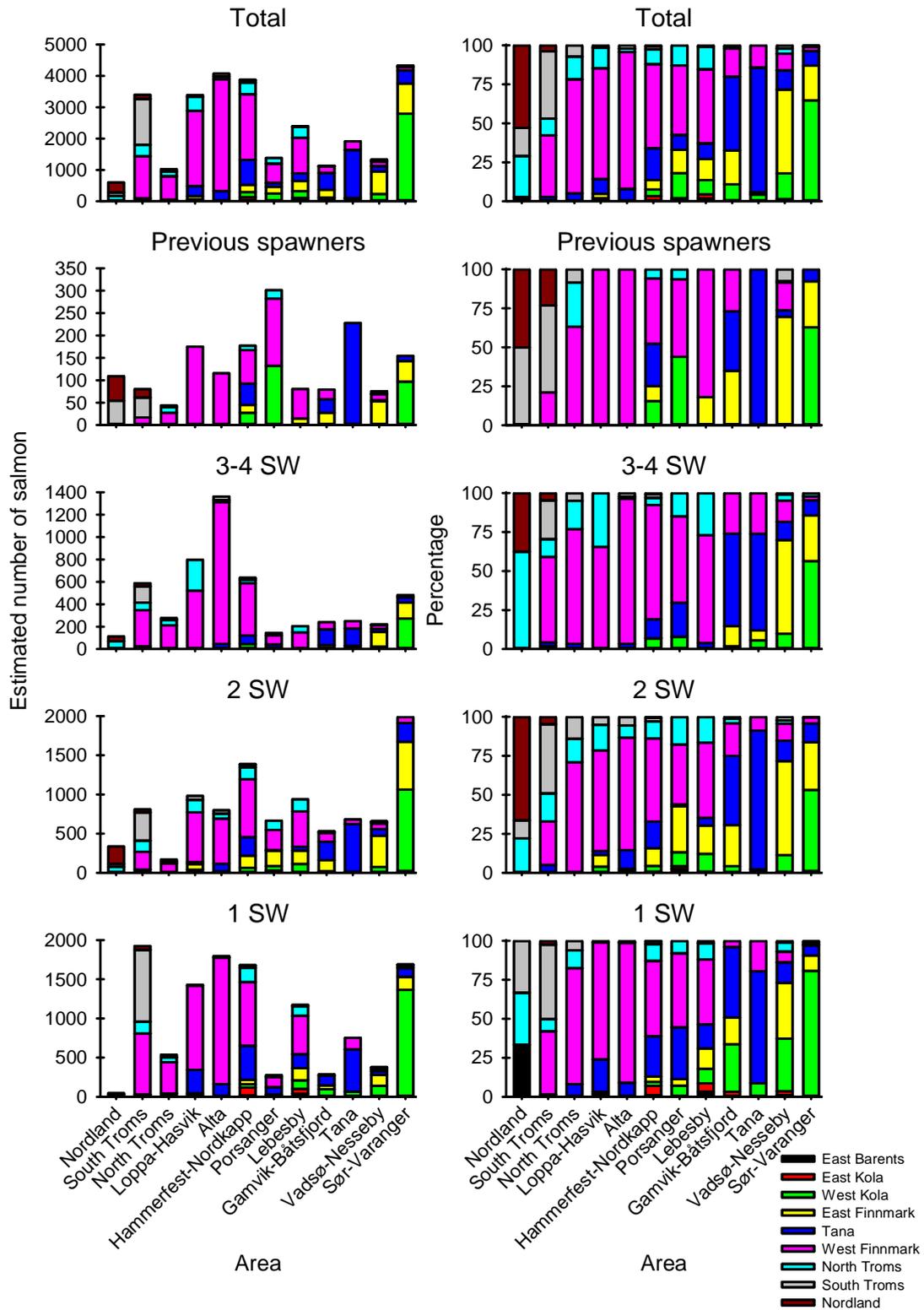


Figure 18. Numbers of wild 1SW, 2SW, 3-4SW salmon and previous spawners belonging into nine genetic Reporting Group areas caught in the year 2011 in Kolarctic salmon project in municipalities in Finnmark and in South and North Troms and in Nordland. Catch data is the official reported salmon catches (SSB) and it has been converted into sea-age groups of 1-4SW salmon and previous spawners.

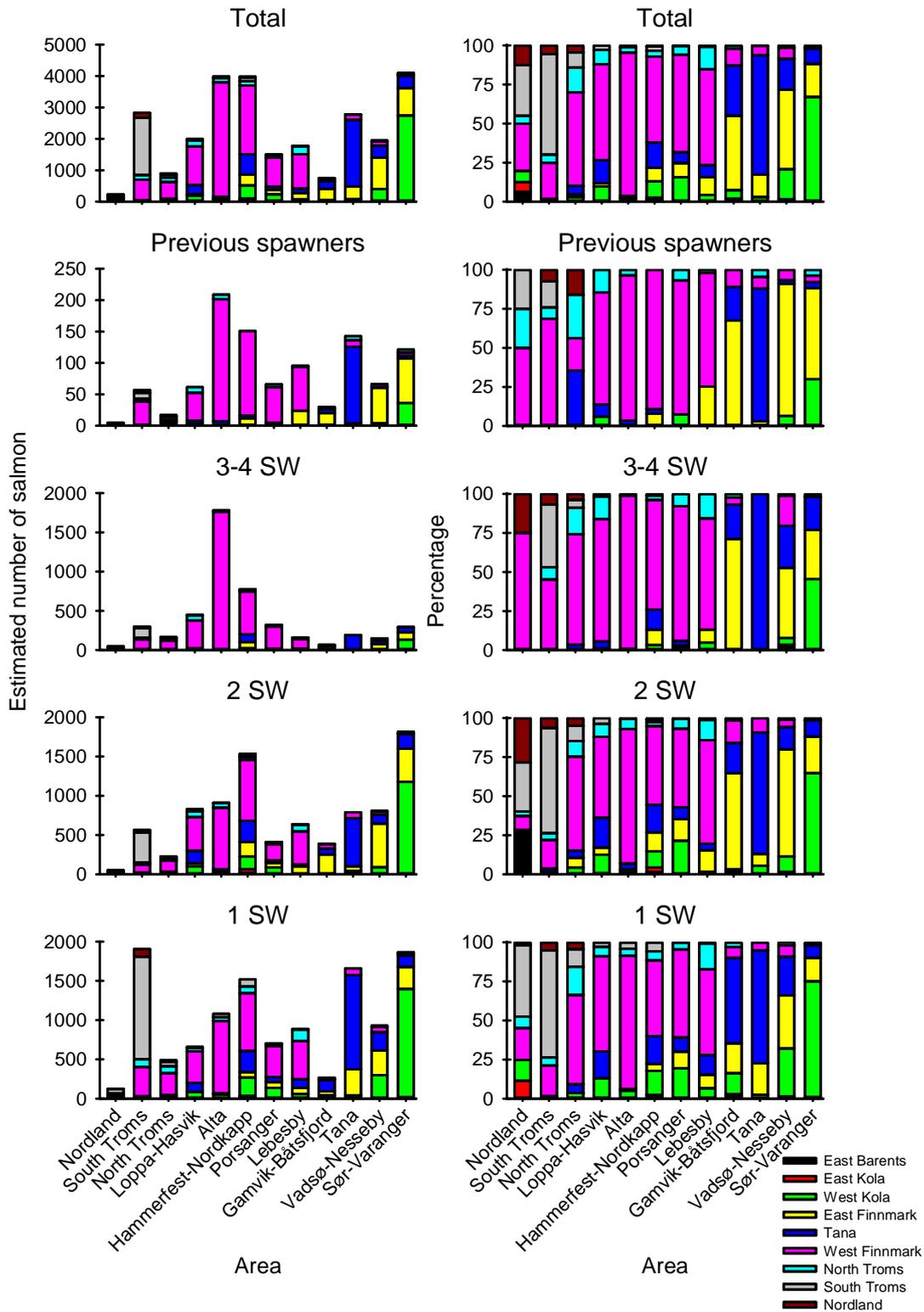


Figure 19. Numbers of wild 1SW, 2SW, 3-4SW salmon and previous spawners belonging into nine genetic Reporting Group areas caught in the year 2012 in Kolarctic salmon project in municipalities in Finnmark and in South and North Troms and in Nordland. Catch data is the official reported salmon catches (SSB) and it has been converted into sea-age groups of 1-4SW salmon and previous spawners.

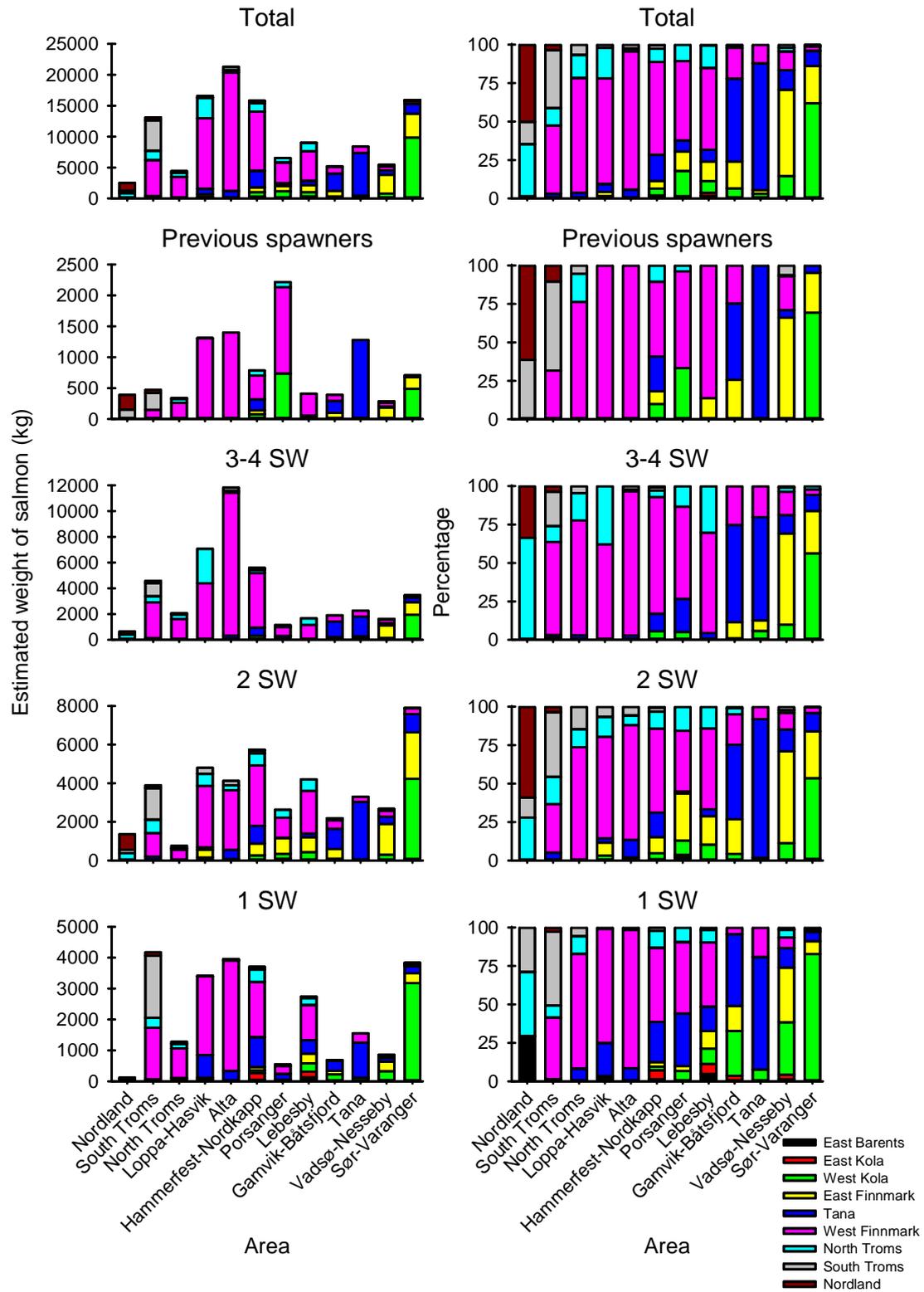


Figure 20. Weight of wild 1SW, 2SW, 3-4SW salmon and previous spawners belonging into nine genetic Reporting Group areas caught in the year 2011 in Kolarctic salmon project in municipalities in Finnmark and in South and North Troms and in Nordland. Catch data is the official reported salmon catches (SSB) and it has been converted into sea-age groups of 1-4SW salmon and previous spawners.

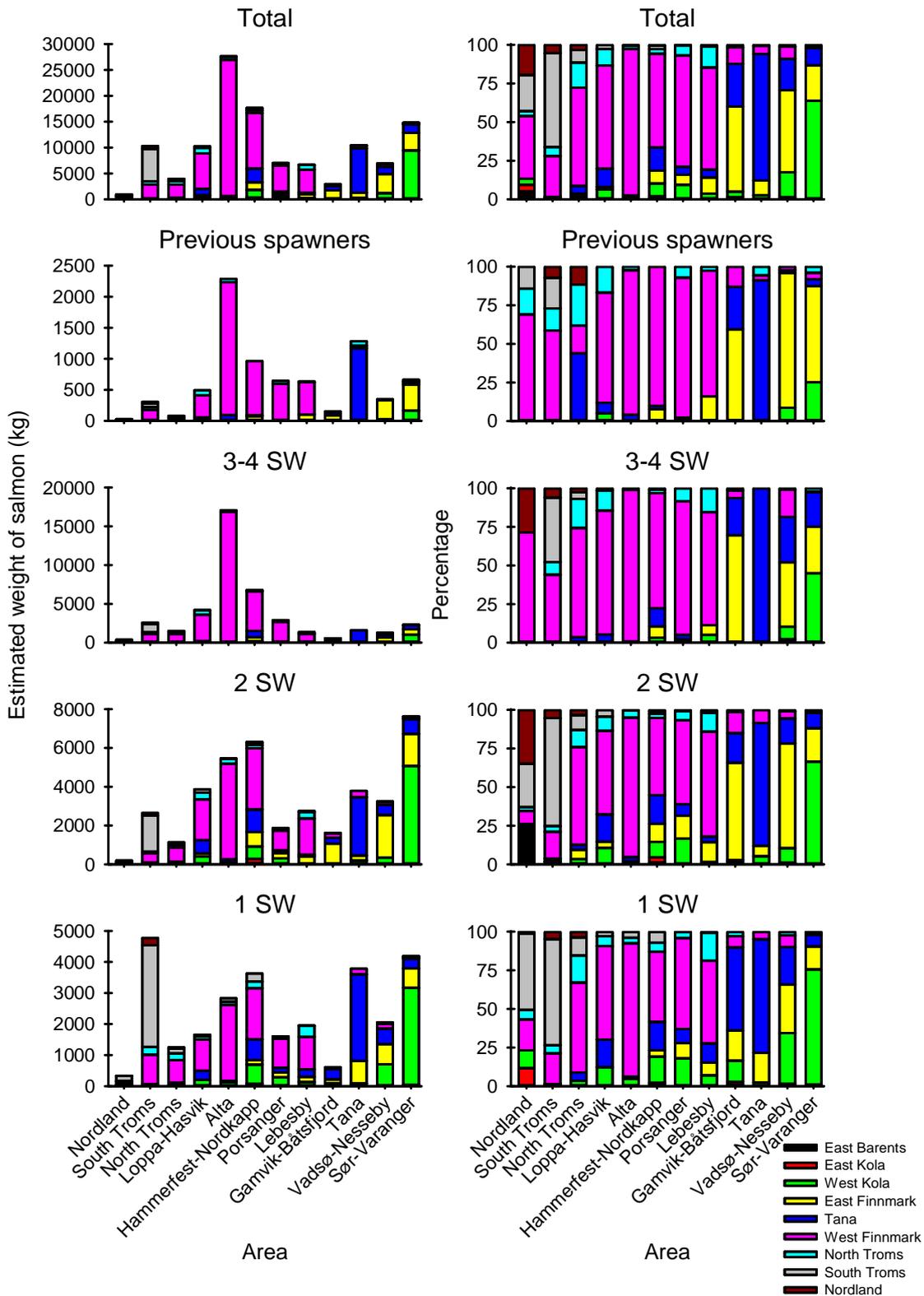


Figure 21. Weight of wild 1SW, 2SW, 3-4SW salmon and previous spawners belonging into nine genetic Reporting Group areas caught in the year 2012 in Kolarctic salmon project in municipalities in Finnmark and in South and North Troms and in Nordland. Catch data is the official reported salmon catches (SSB) and it has been converted into sea-age groups of 1-4SW salmon and previous spawners.

4.5 Spatial distribution of salmon catches originating from seven Regional Group areas and caught between 12 geographical areas in Northern Norway

The figures 22-31 and the tables XII -XXI are illustrating spatial distribution of salmon catches in terms of numbers and weights originating from Russia, East Finnmark, Tana, West Finnmark, North Troms, South Troms and Nordland in the years 2011 and 2012. Salmon stocks belonging into the same specific Regional Group areas are exploited during the official fishing time within large areas covering many municipalities and counties. The distribution of salmon catches between municipalities for each Reporting Group of salmon in both of the research years is very similar. This indicates annual similarities in the migration patterns as well as in the fishery in large scale. In some cases the highest catches are caught in that municipality or group of neighboring municipalities from where stocks are originating. This was the case for Tana stocks and high proportion of catch in Tana municipality in Tanafjord, also salmon stocks from the Reporting Group in East Finnmark were caught mainly in Vadsø-Nesseby as well as in Sør-Varanger municipalities. Most probably also Alta river stock within the West Finnmark Reporting Group area is occurring with high proportion in the catch of Alta municipality. Salmon stocks belonging into the North Troms Reporting Group area are occurring quite evenly in many municipalities in Finnmark as well as in South Troms and in Nordland.

Distributions of salmon catches between 12 geographical areas all sea-ages combined in seven Reporting Group areas indicates that salmon stocks are migrating from south to north as well as from north to south. That can be observed for example from the catches of Tana Reporting Group when those fishes are exploited in west in Troms County and in West Finnmark as well as in east in East Finnmark. This catch distribution in the orientation of migrations can clearly be observed also separately for each sea-age groups of 1SW, 2SW and 3-4SW salmon. It can be possible that some salmon belonging into certain stock or Reporting Group is not on the way for ascending into its own river and those salmon are just following shoals of mature salmon. Fishermen are recognizing those immature salmon calling them "gjellfisk" which is supporting the idea that all migratory salmon in the coastal areas are not going to ascend rivers during that year and they can be caught after they have passed that area where they should go.

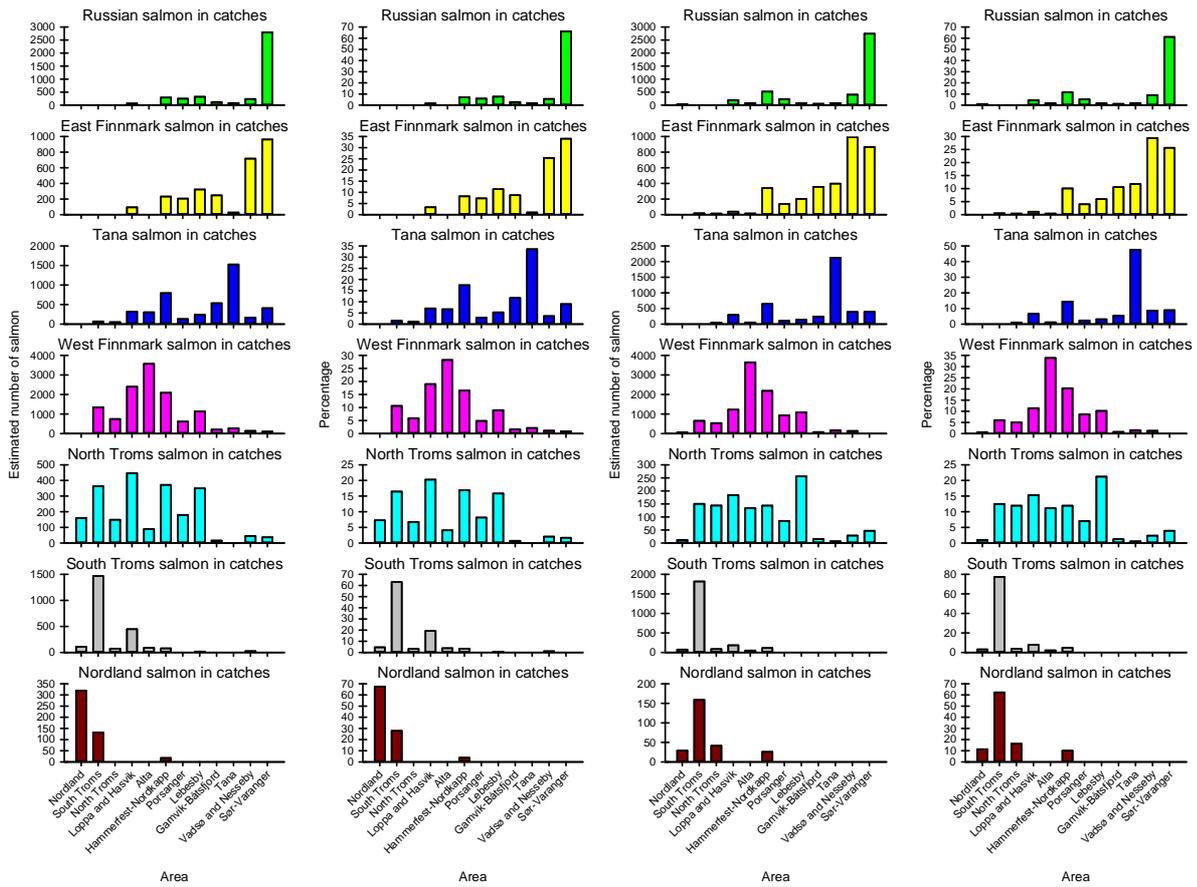


Figure 22. Exploitation in terms of numbers of salmon (all sea-ages included) from seven Regional Group areas and caught in 12 different fishing areas in the year 2011 (on the left) and in the year 2012 (on the right) during the official fishing time. In Russia salmon from three Regional Group areas are combined together. Numbers and kilos of salmon are converted to sea-age groups from SSB official catch report for each municipality.

Table XII. Percentages and total numbers of salmon all sea-age groups included in the catches in Kolarctic salmon area in the year 2011 originating from seven Regional Group areas during the official fishing time. This is table for the figure 22.

Fishing areas	Regional groups						
	Russian salmon	East Finnmark salmon	Tana salmon	West Finnmark salmon	North Troms salmon	South Troms salmon	Nordland salmon
Nordland	0,3	0	0	0	7,2	4,6	67,5
South Troms	0,4	0,2	1,5	10,6	16,4	63,0	27,8
North Troms	0	0	1,1	5,9	6,7	3,1	0
Loppa and Hasvik	1,6	3,3	7,0	19,0	20,2	19,2	0
Alta	0,2	0,3	6,6	28,2	4,0	3,8	0
Hammerfest-Nordkapp	6,9	8,2	17,4	16,5	16,8	3,3	3,7
Porsanger	5,9	7,2	2,8	4,8	8,1	0	0
Lebesby	7,6	11,4	5,2	9,0	15,8	0,7	0
Gamvik-Båtsfjord	2,9	8,7	11,7	1,6	0,7	0,2	0
Tana	1,9	0,9	33,5	2,1	0	0	0
Vadsø and Nesseby	5,6	25,3	3,6	1,1	2,0	1,1	0,2
Sør-Varanger	66,1	34,0	8,9	0,8	1,6	0,4	0,6
Number of salmon all sea-age groups in the catches	4229	2827	4550	12631	2205	2323	473

Table XIII. Percentages and total numbers of salmon all sea-age groups included in the catches in Kolarctic salmon area in the year 2012 originating from seven Regional group areas during the official fishing time. This is table for the figure 22.

Fishing areas	Regional groups						
	Russian salmon	East Finnmark salmon	Tana salmon	West Finnmark salmon	North Troms salmon	South Troms salmon	Nordland salmon
Nordland	1,0	0	0	0,6	0,9	3,1	11,3
South Troms	0,3	0,5	0,4	6,0	12,4	77,3	62,3
North Troms	0,6	0,4	1,1	4,9	11,9	3,6	16,2
Loppa and Hasvik	4,4	1,1	6,6	11,3	15,2	7,8	0
Alta	1,8	0,4	1,2	33,8	11,1	2,1	0
Hammerfest-Nordkapp	11,6	10,0	14,4	20,3	11,9	4,8	10,0
Porsanger	5,2	4,0	2,3	8,6	7,0	0,2	0
Lebesby	1,7	5,9	3,1	10,1	21,2	0,6	0
Gamvik-Båtsfjord	1,2	10,5	5,3	0,7	1,2	0	0
Tana	1,8	11,7	47,6	1,5	0,5	0	0
Vadsø and Nesseby	9,0	29,3	8,7	1,2	2,3	0	0
Sør-Varanger	61,1	25,6	8,9	0,3	3,8	0,1	0
Number of salmon all sea-age groups in the catches	4491	3376	4460	10773	1203	2347	254

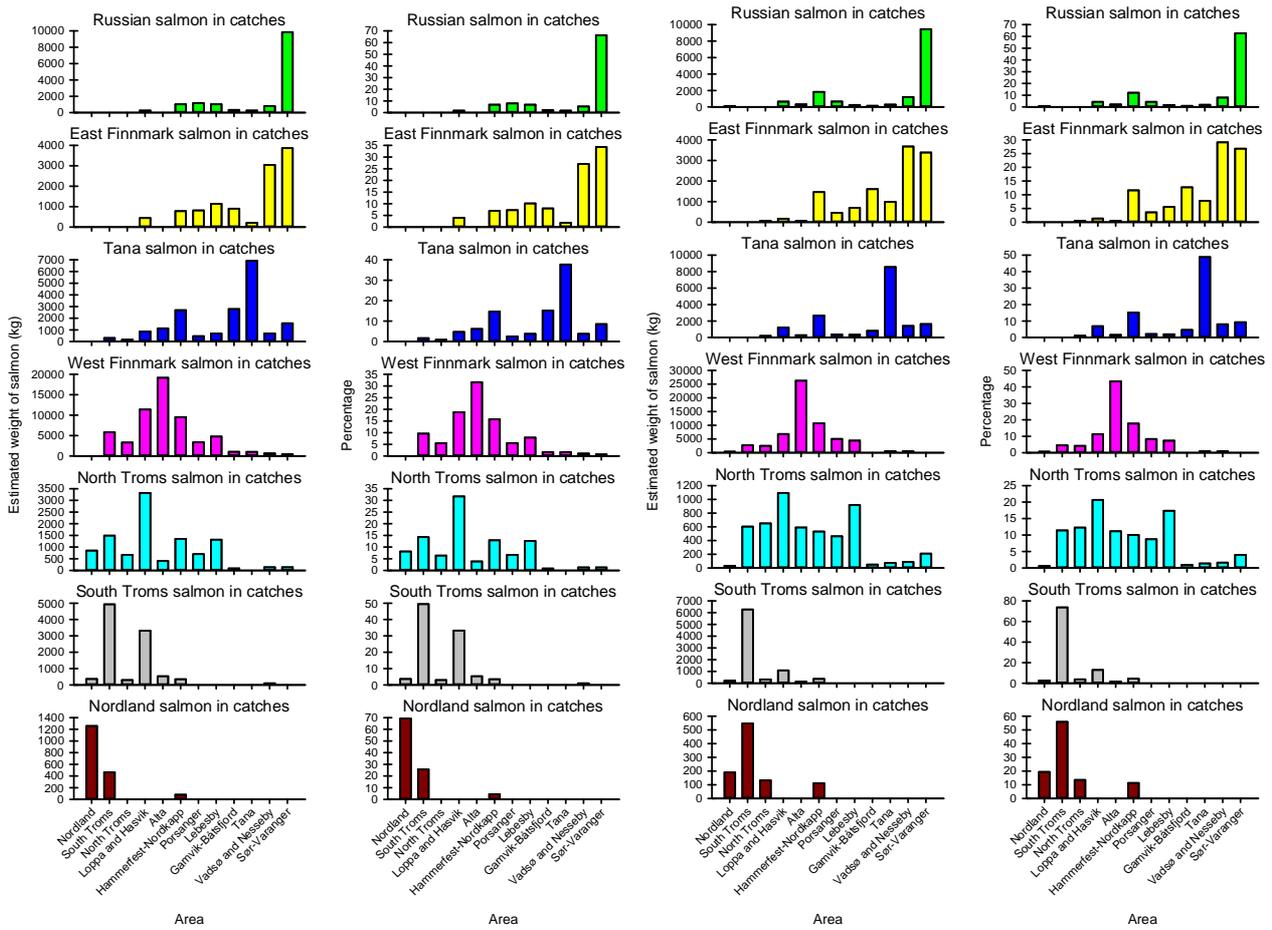


Figure 23. Exploitation in terms of weight of salmon (all sea-ages combined) from seven Regional Group areas and caught in 12 different fishing areas in the year 2011 (on the left) and in the year 2012 (on the right) during the official fishing time. In Russia salmon from three Regional Group areas are combined together. Numbers and kilos of salmon are converted to sea-age groups from SSB official catch report for each municipality.

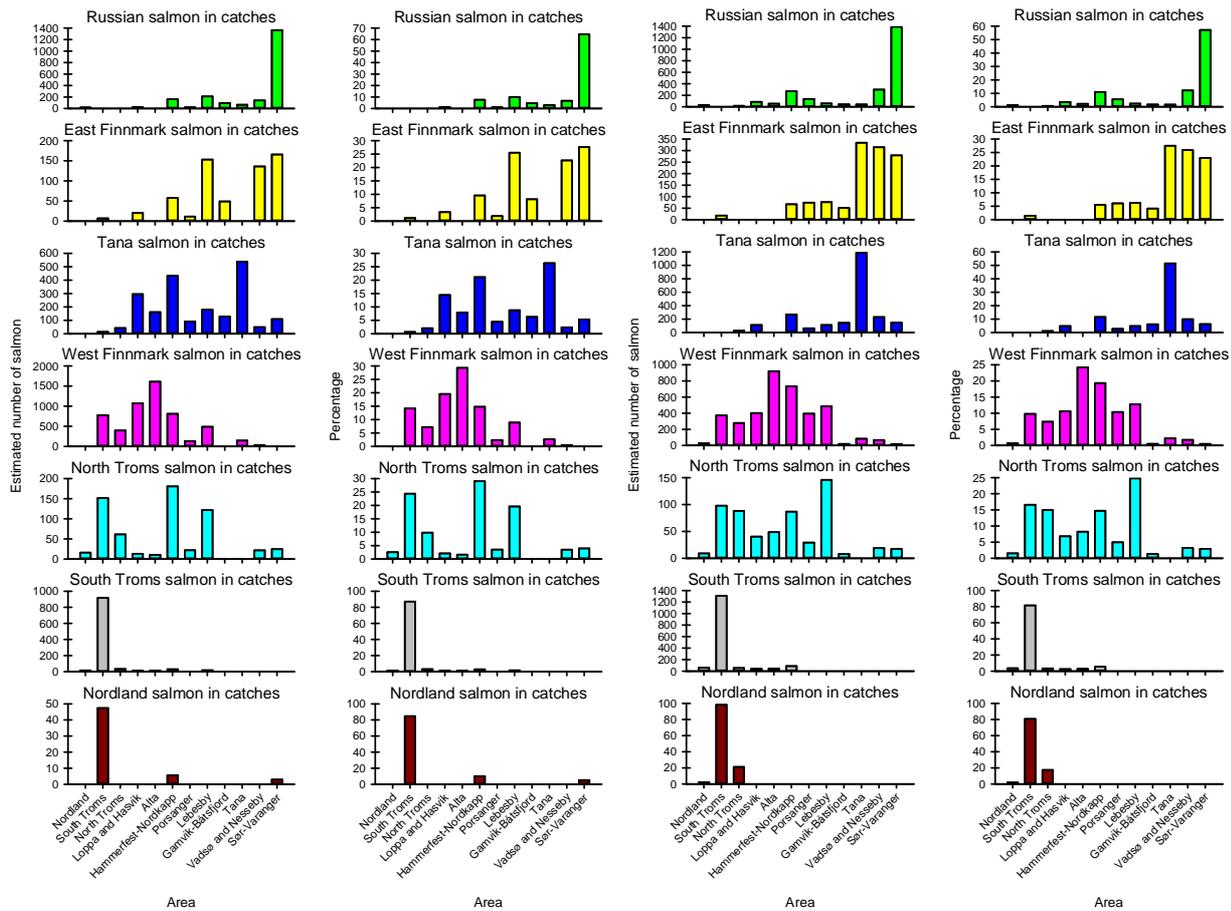


Figure 24. Exploitation in terms of numbers of 1SW (one-sea-winter) salmon originating from seven Regional Group areas and caught in 12 fishing areas in the year 2011 (on the left) and in the year 2012 (on the right) during the official fishing time. In Russia salmon from three Regional Group areas are combined together. Numbers and kilos of salmon are converted to sea-age groups from SSB official catch report for each municipality.

Table XIV. Percentages and total numbers of 1SW salmon in the catches in Kolarctic salmon area in the year 2011 originating from seven Regional Group areas during the official fishing time. This is table for the figure 24.

Fishing areas	Regional groups						
	Russian salmon	East Finnmark salmon	Tana salmon	West Finnmark salmon	North Troms salmon	South Troms salmon	Nordland salmon
Nordland	0,7	0	0	0	2,5	1,5	0
South Troms	0,4	1,1	0,6	14,1	24,3	87,1	84,7
North Troms	0	0	2,1	7,2	9,8	3,1	0
Loppa and Hasvik	1,2	3,3	14,4	19,5	2,0	1,2	0
Alta	0	0	7,9	29,3	1,6	1,3	0
Hammerfest-Nordkapp	7,6	9,5	21,1	14,7	29,0	2,8	10,0
Porsanger	0,9	1,9	4,4	2,3	3,5	0	0
Lebesby	9,9	25,5	8,7	8,9	19,5	1,6	0
Gamvik-Båtsfjord	4,5	8,1	6,2	0,2	0	0	0
Tana	3,1	0	26,3	2,6	0	0	0
Vadsø and Nesseby	6,7	22,6	2,4	0,4	3,4	0,4	0
Sør-Varanger	64,6	27,5	5,3	0,2	3,9	0,6	5,2
Number of 1SW salmon in the catches	2112	600	2044	5490	622	1050	56

Table XV. Percentages and total numbers of 1SW salmon in the catches in Kolarctic salmon area in the year 2012 originating from seven Regional Group areas during the official fishing time. This is table for the figure 24.

Fishing areas	Regional groups						
	Russian salmon	East Finnmark salmon	Tana salmon	West Finnmark salmon	North Troms salmon	South Troms salmon	Nordland salmon
Nordland	1,2	0	0	0,6	1,5	3,5	1,8
South Troms	0,2	1,4	0,2	9,7	16,5	81,5	80,7
North Troms	0,7	0,02	1,1	7,3	14,9	3,4	17,4
Loppa and Hasvik	3,5	0	4,8	10,5	6,8	2,5	0
Alta	2,2	0	0,5	24,2	8,2	2,7	0
Hammerfest-Nordkapp	11,0	5,5	11,6	19,3	14,7	5,4	0
Porsanger	5,5	6,0	2,7	10,3	4,9	0,1	0
Lebesby	2,4	6,2	4,8	12,7	24,7	0,4	0
Gamvik-Båtsfjord	1,7	4,1	6,2	0,4	1,3	0	0
Tana	1,6	27,5	51,4	2,2	0	0	0
Vadsø and Nesseby	12,2	25,9	9,9	1,7	3,1	0	0
Sør-Varanger	57,2	23,0	6,3	0,4	2,9	0,1	0
Number of 1SW salmon in the catches	2441	1214	2327	3803	589	1602	121

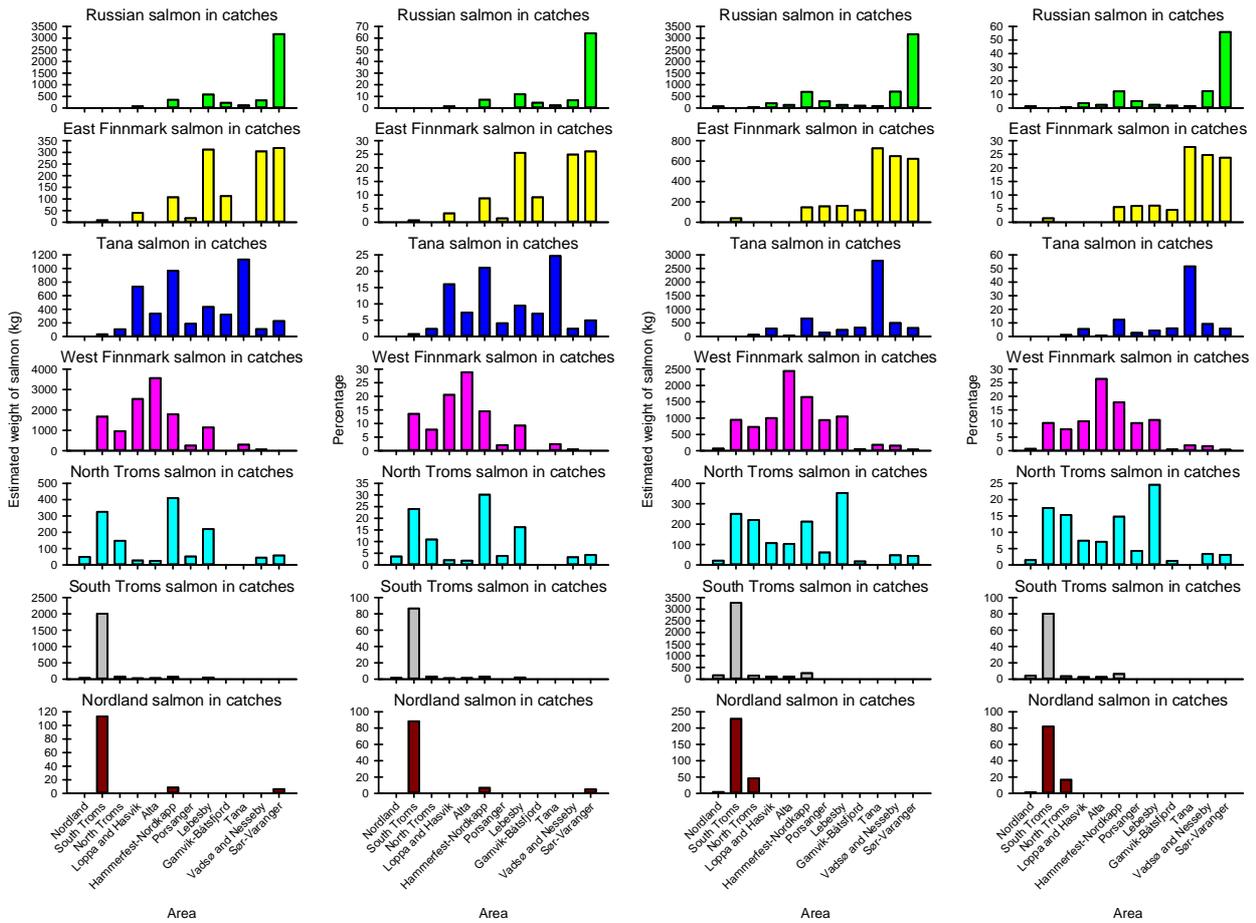


Figure 25. Exploitation in terms of weight of 1SW (one-sea-winter) salmon originating from seven Regional Group areas and caught in 12 fishing areas in the year 2011 (on the left) and in the year 2012 (on the right) during the official fishing time. In Russia salmon from three Regional Group areas are combined together.

Numbers and kilos of salmon are converted to sea-age groups from SSB official catch report for each municipality.

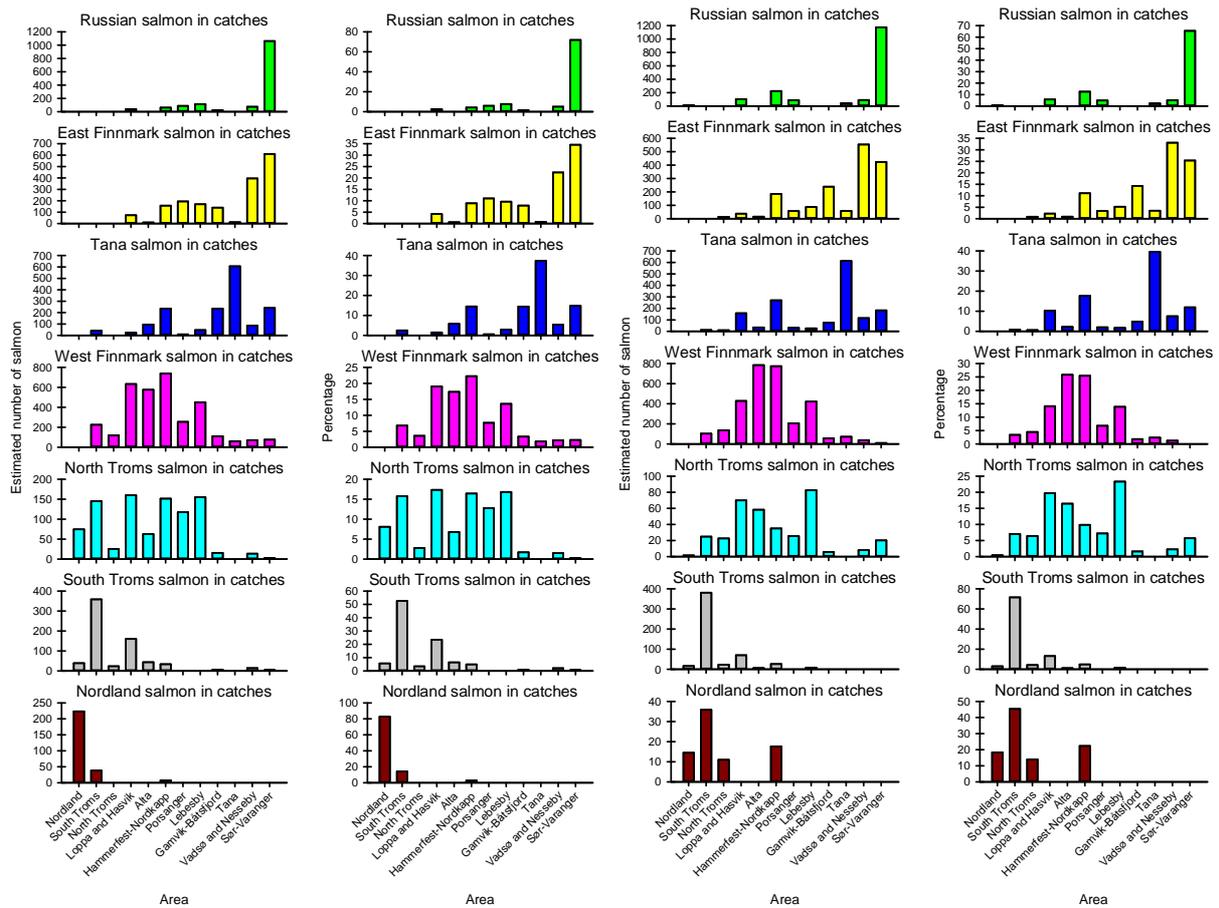


Figure 26. Exploitation in terms of numbers of 2SW (two-sea-winter) salmon originating from seven Regional Group areas and caught in 12 fishing areas in the year 2011 (on the left) and in the year 2012 (on the right) during the official fishing time. In Russia salmon from three Regional Group areas are combined together. Numbers and kilos of salmon are converted to sea-age groups from SSB official catch report for each municipality.

Table XVI. Percentages and total numbers of 2SW salmon in the catches in Kolarctic salmon area in the year 2011 originating from seven Regional Group areas during the official fishing time. This is table for the figure 26.

Fishing areas	Regional groups						
	Russian salmon	East Finnmark salmon	Tana salmon	West Finnmark salmon	North Troms salmon	South Troms salmon	Nordland salmon
Nordland	0	0	0	0	8,0	5,6	82,6
South Troms	0	0	2,5	6,7	15,7	52,5	14,1
North Troms	0	0	0	3,5	2,7	3,4	0
Loppa and Hasvik	2,6	4,1	1,5	19,0	17,3	23,4	0
Alta	0,7	0,6	5,8	17,3	6,7	6,4	0
Hammerfest-Nordkapp	4,2	8,9	14,5	22,2	16,4	4,8	2,8
Porsanger	5,9	11,0	0,5	7,6	12,7	0	0
Lebesby	7,7	9,6	2,9	13,5	16,8	0	0
Gamvik-Båtsfjord	1,5	7,9	14,4	3,3	1,6	0,9	0
Tana	0,1	0,7	37,3	1,8	0	0	0
Vadsø and Nesseby	5,0	22,4	5,3	2,1	1,4	2,0	0,3
Sør-Varanger	71,8	34,5	14,8	2,3	0,2	0,6	0
Number of 2SW salmon in the catches	1477	1763	1622	3321	922	682	270

Table XVII. Percentages and total numbers of 2SW salmon in the catches in Kolarctic salmon area in the year 2012 originating from seven Regional Group areas during the official fishing time. This is table for the figure 26.

Fishing areas	Regional groups						
	Russian salmon	East Finnmark salmon	Tana salmon	West Finnmark salmon	North Troms salmon	South Troms salmon	Nordland salmon
Nordland	0,8	0	0	0,1	0,4	3,0	18,3
South Troms	0,4	0	0,8	3,4	7,0	71,5	45,3
North Troms	0,5	0,8	0,6	4,5	6,3	4,2	13,9
Loppa and Hasvik	5,7	2,2	10,3	14,1	19,7	13,1	0
Alta	0,7	0,9	2,2	25,8	16,4	1,0	0
Hammerfest-Nordkapp	12,5	11,1	17,6	25,4	9,8	4,8	22,3
Porsanger	4,9	3,3	2,0	6,8	7,2	0,4	0
Lebesby	0,5	5,2	1,7	13,8	23,3	1,5	0
Gamvik-Båtsfjord	0,6	14,2	4,9	1,8	1,6	0	0
Tana	2,4	3,4	39,9	2,3	0	0	0
Vadsø and Nesseby	5,0	33,0	7,5	1,2	2,2	0	0
Sør-Varanger	65,5	25,3	11,9	0,3	5,7	0,2	0
Number of 2SW salmon in the catches	1796	1673	1531	3040	353	532	79

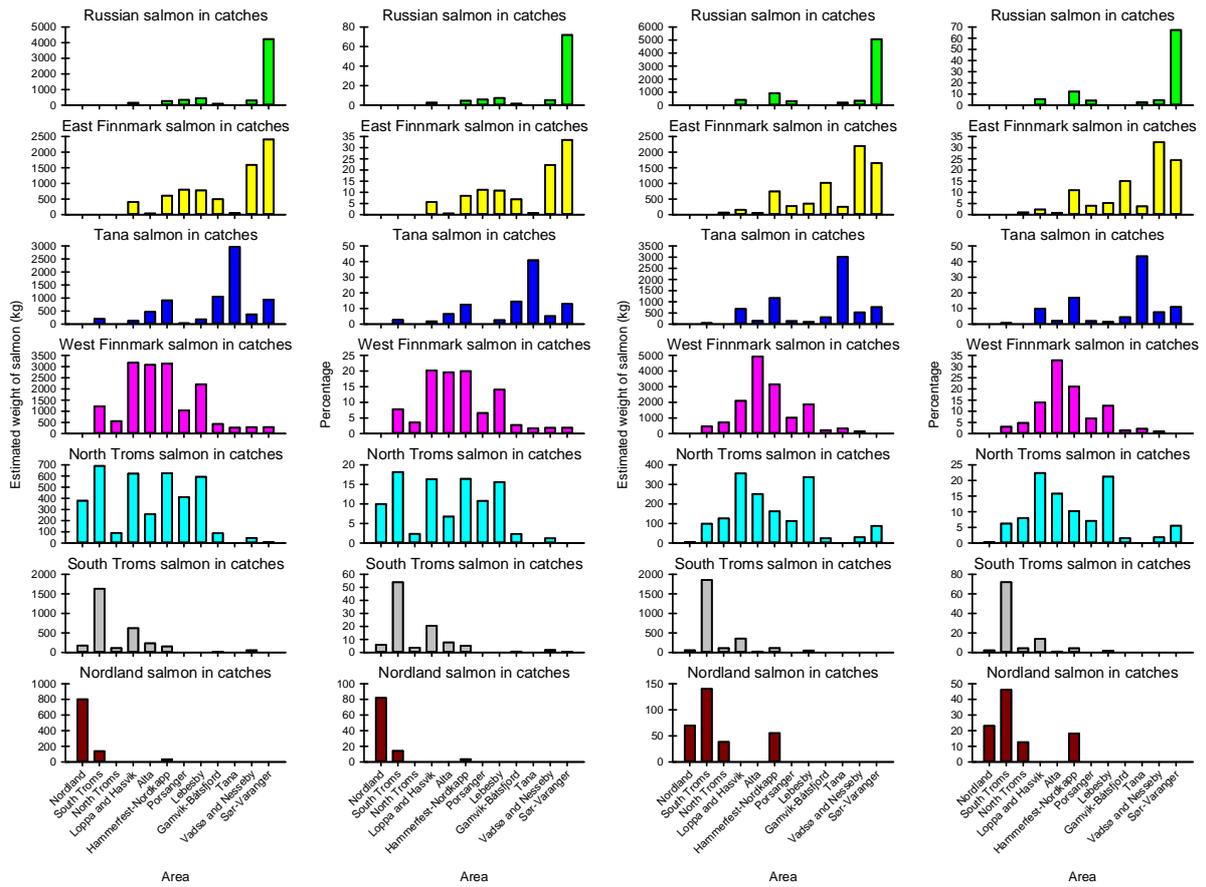


Figure 27. Exploitation in terms of weights of 2 SW (two-sea-winter) salmon originating seven Regional Group areas and caught in 12 fishing areas in the year 2011 (on the left) and in the year 2012 (on the right) during the official fishing time. In Russia salmon from three Regional Group areas are combined together. Numbers and kilos of salmon are converted to sea-age groups from SSB official catch report for each municipality.

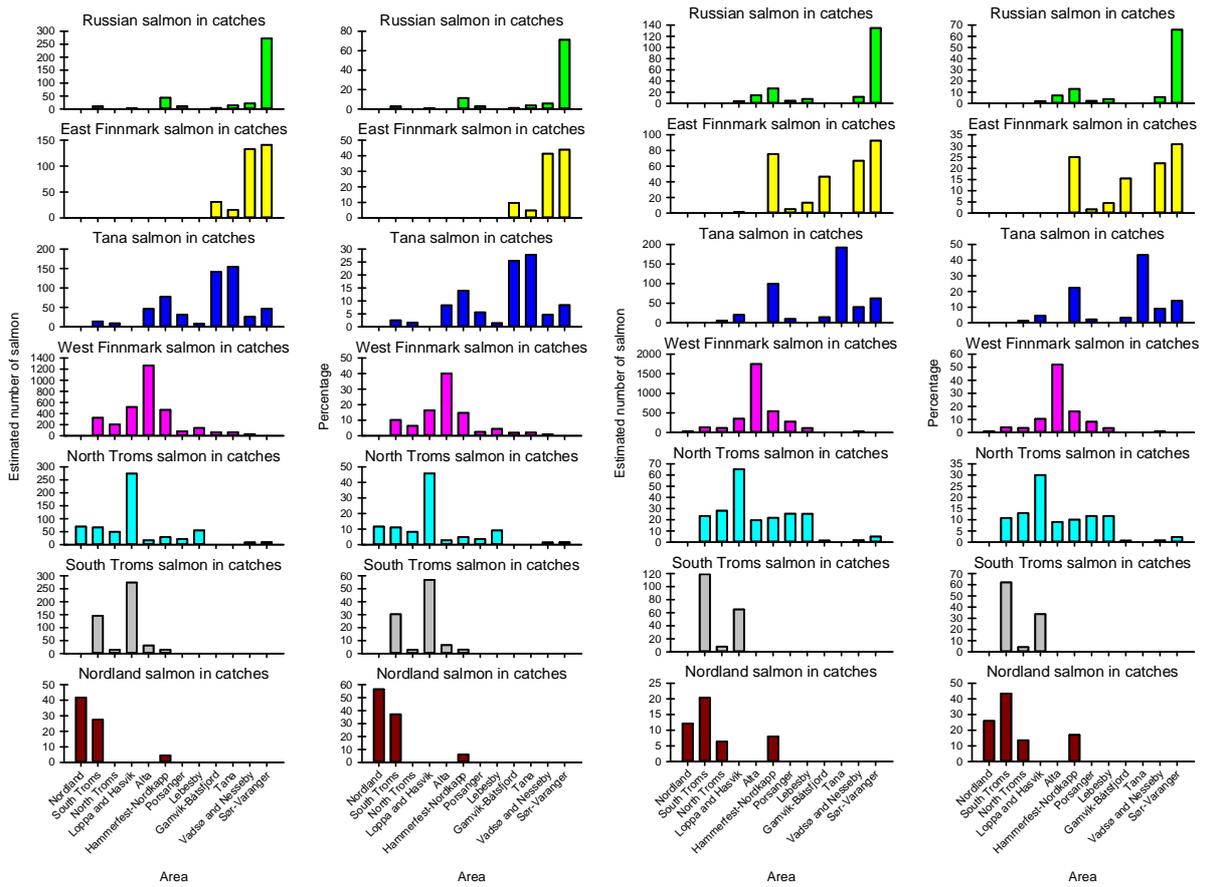


Figure 28. Exploitation in terms of numbers of 3-4SW (three and four-sea-winter) salmon originating from seven Regional Group areas and caught in 12 fishing areas in the year 2011 (on the left) and in the year 2012 (on the right) during the official fishing time. In Russia salmon from three Regional Group areas are combined together. Numbers and kilos of salmon are converted to sea-age groups from SSB official catch report for each municipality.

Table XVIII. Percentages and total numbers of 3-4SW salmon in the catches in Kolarctic salmon area in the year 2011 originating from seven Regional Group areas during the official fishing time. This is table for the figure 28.

Fishing areas	Regional groups						
	Russian salmon	East Finnmark salmon	Tana salmon	West Finnmark salmon	North Troms salmon	South Troms salmon	Nordland salmon
Nordland	0	0	0	0	11,5	0	56,4
South Troms	2,8	0	2,5	10,1	11,0	30,3	37,1
North Troms	0	0	1,6	6,4	8,2	2,8	0
Loppa and Hasvik	0,9	0,07	0,02	16,3	45,6	56,8	0
Alta	0	0	8,3	40,0	2,7	6,5	0
Hammerfest-Nordkapp	11,4	0,1	13,9	14,6	4,8	3,1	6,0
Porsanger	2,9	0	5,6	2,5	3,5	0	0
Lebesby	0	0	1,4	4,4	9,1	0	0
Gamvik-Båtsfjord	1,1	9,6	25,5	1,9	0	0	0
Tana	3,7	4,8	27,8	2,0	0	0	0
Vadsø and Nesseby	5,7	41,3	4,6	0,9	1,4	0,3	0,2
Sør-Varanger	71,2	43,9	8,3	0,3	1,6	0	0
Number of 3-4SW salmon in the catches	382	321	555	3168	599	481	73

Table IX. Percentages and total numbers of 3-4SW salmon in the catches in Kolarctic salmon area in the year 2012 originating from seven Regional Group areas during the official fishing time. This is table for the figure 28.

Fishing areas	Regional groups						
	Russian salmon	East Finnmark salmon	Tana salmon	West Finnmark salmon	North Troms salmon	South Troms salmon	Nordland salmon
Nordland	0	0	0	1,0	0	0	25,9
South Troms	0,1	0	0	4,0	10,8	62,0	43,4
North Troms	0	0	1,3	3,4	12,9	4,2	13,6
Loppa and Hasvik	2,0	0,3	4,5	10,4	30,0	33,7	0
Alta	7,0	0	0	52,0	9,0	0	0
Hammerfest-Nordkapp	13,0	25,0	22,3	16,2	10,0	0	17,0
Porsanger	2,3	1,6	2,2	8,2	11,7	0	0
Lebesby	3,9	4,4	0	3,4	11,6	0	0
Gamvik-Båtsfjord	0	15,4	3,2	0,02	0,6	0	0
Tana	0	0	43,2	0	0	0	0
Vadsø and Nesseby	5,7	22,2	9,0	0,8	0,7	0	0
Sør-Varanger	65,8	30,7	14,0	0,01	2,3	0	0
Number of 3-4SW salmon in the catches	204	301	444	3363	216	193	46

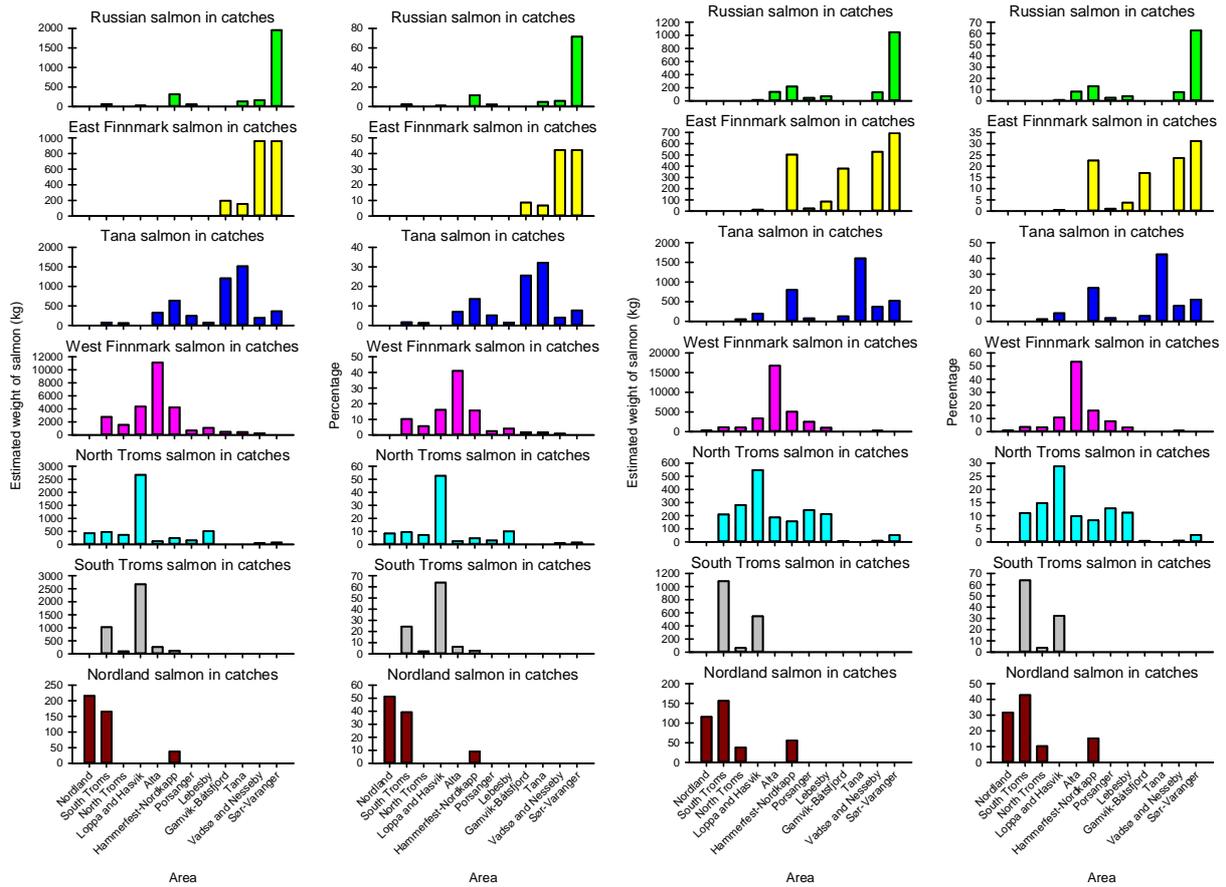


Figure 29. Exploitation in terms of weights of 3-4 SW (three and four-sea-winter) salmon originating from seven Regional Group areas and caught in 12 fishing areas in the year 2011 (on the left) and in the year 2012 (on the right) during the official fishing time. In Russia salmon from three Regional Group areas are combined together. Numbers and kilos of salmon are converted to sea-age groups from SSB official catch report for each municipality.

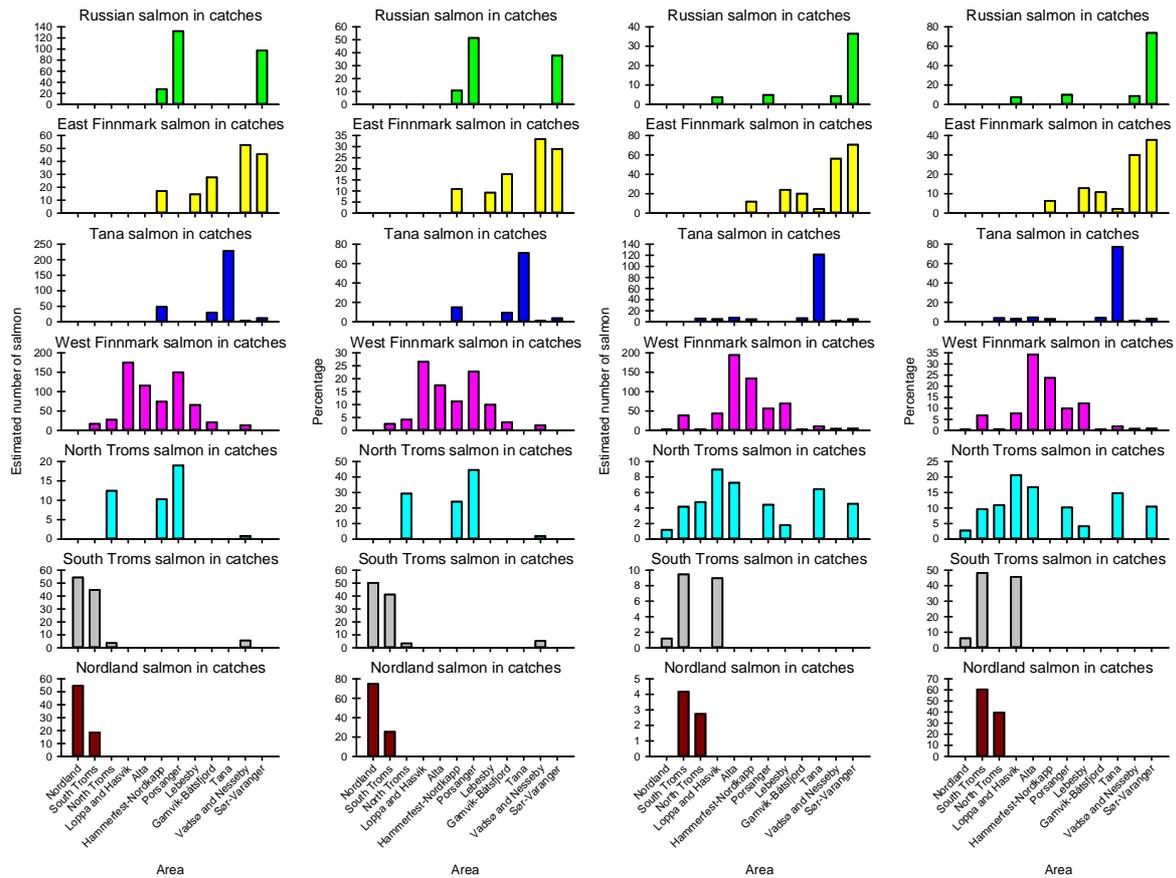


Figure 30. Exploitation in terms of numbers of previous spawners originating from seven Regional Group areas and caught in 12 fishing areas in the year 2011 (on the left) and in the year 2012 (on the right) during the official fishing time. In Russia salmon from three Regional Group areas are combined together. Numbers and kilos of salmon are converted to sea-age groups from SSB official catch report for each municipality.

Table XX. Percentages and total numbers of previous spawners in the catches in Kolarctic salmon area in the year 2011 originating from seven Regional Group areas during the official fishing time. This is table for the figure 30.

Fishing areas	Regional groups						
	Russian salmon	East Finnmark salmon	Tana salmon	West Finnmark salmon	North Troms salmon	South Troms salmon	Nordland salmon
Nordland	0	0	0	0	0	50,1	74,6
South Troms	0	0	0	2,5	0	41,2	25,3
North Troms	0	0	0	4,1	29,2	3,3	0
Loppa and Hasvik	0	0	0,01	26,5	0,1	0,04	0
Alta	0	0	0	17,5	0	0	0
Hammerfest-Nordkapp	10,7	10,8	14,9	11,2	24,1	0	0
Porsanger	51,4	0	0	22,7	44,5	0	0
Lebesby	0	9,2	0	9,9	0	0	0
Gamvik-Båtsfjord	0	17,5	9,3	3,2	0	0	0
Tana	0	0	70,9	0	0	0	0
Vadsø and Nesseby	0	33,4	0,9	2,0	1,9	5,1	0
Sør-Varanger	37,7	28,9	3,7	0	0	0	0
Number of previous spawners in the catches	257	157	321	660	42	108	73

Table XXI. Percentages and total numbers of previous spawners in the catches in Kolarctic salmon area in the year 2012 originating from seven Regional Group areas during the official fishing time. This is table for the figure 30.

Fishing areas	Regional groups						
	Russian salmon	East Finnmark salmon	Tana salmon	West Finnmark salmon	North Troms salmon	South Troms salmon	Nordland salmon
Nordland	0	0	0	0,4	2,7	6,0	0
South Troms	0	0	0	6,8	9,5	48,2	60,4
North Troms	0	0	3,8	0,6	10,9	0	39,5
Loppa and Hasvik	7,4	0	3,0	7,7	20,5	45,6	0
Alta	0	0	4,6	34,3	16,6	0	0
Hammerfest-Nordkapp	0	6,3	2,9	23,6	0	0	0
Porsanger	10,0	0	0	9,9	10,1	0	0
Lebesby	0	12,8	0	12,2	4,1	0	0
Gamvik-Båtsfjord	0	10,7	4,1	0,5	0	0	0
Tana	0	2,2	77,3	1,8	14,7	0	0
Vadsø and Nesseby	8,7	29,9	1,0	0,7	0	0	0
Sør-Varanger	73,7	37,7	3,0	0,8	10,4	0	0
Number of previous spawners in the catches	49	187	157	566	43	19	7

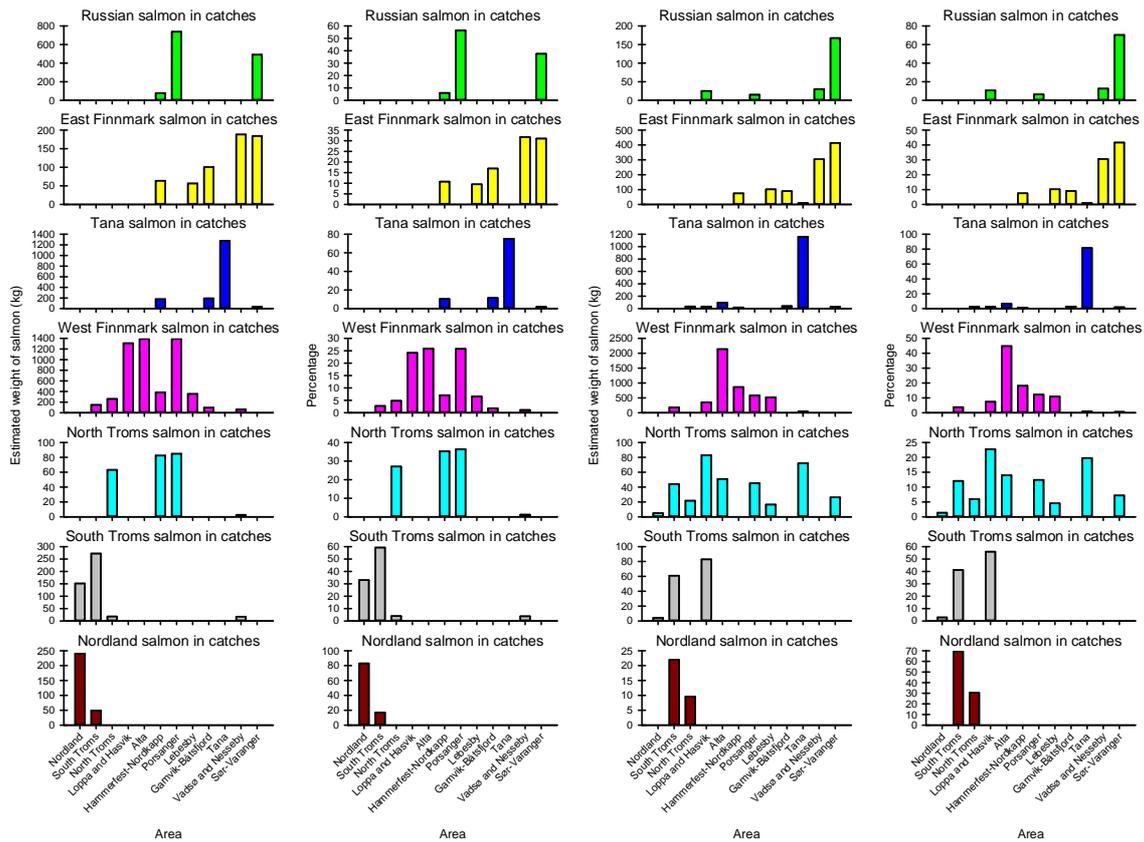


Figure 31. Exploitation in terms of weights of previous spawners originating from seven Regional Group areas and caught in 12 fishing areas in the year 2011 (on the left) and in the year 2012 (on the right) during the official fishing time. In Russia salmon from three Regional Group areas are combined together. Numbers and kilos of salmon are converted to sea-age groups from SSB official catch report for each municipality.

4.6 Official catch distribution of the River Tana salmon stocks spatially between the River Tana and the large coastal area from Nordland to East-Finnmark during the official fishing time in the years 2011 and 2012

Figures 32-35 are presenting an example on the distribution of officially reported salmon catches between the coastal and riverine fishery. Because the River Tana is representing genetically one Reporting Group area it was possible to estimate the numbers and weights of Tana salmon stocks caught at sea and in the river Tana system. Catches at sea are presented in the figures 32-35 for each municipality or groups or municipalities and for the River Tana where Finnish and Norwegian catches are combined. From the River Tana it is available the estimated numbers and weights of salmon for 1SW, 2SW, 3-4SW and previous spawners in the reported catches which makes it possible to estimate the catch distributions for all sea age groups between river fishery and sea fishery.

In the year 2011 the numbers of salmon belonging into Tana Reporting Group area were caught as follows:

- all sea-ages of salmon catch in terms of numbers **at sea 4 550** fish, catch in the **River Tana system 21 878** fish, making **17%** at sea and **83%** in the River Tana
- all sea-ages of salmon catch in terms of weight **at sea 18 293** kilos, catch in the **River Tana system 79 341** kilos, making **19%** at sea and **81%** in the River Tana
- 1SW salmon catch in terms of numbers **at sea 2 044** fish, catch in the **River Tana system 13 726** fish, making **13%** at sea and **87%** in the River Tana
- 1SW salmon catch in terms of weight **at sea 4 589** kilos, catch in the **River Tana system 24 572** kilos, making **16%** at sea and **84%** in the River Tana
- 2SW salmon catch in terms of numbers **at sea 1 622** fish, catch in the **River Tana system 3 672** fish, making **31%** at sea and **69%** in the River Tana
- 2SW salmon catch in terms of weight **at sea 7 289** kilos, catch in the **River Tana system 16 544** kilos, making **31%** at sea and **69%** in the River Tana
- 3-4SW salmon catch in terms of numbers **at sea 555**fish, catch in the **River Tana system 2 877** fish, making **16%** at sea and **84%** in the River Tana
- 3-4SW salmon catch in terms of weight **at sea 4 715** kilos, catch in the **River Tana system 27 914** kilos, making **14%** at sea and **86%** in the River Tana
- Previous spawning salmon catch in terms of numbers **at sea 321**fish, catch in the **River Tana system 1 588** fish, making **17%** at sea and **83%** in the River Tana
- Previous spawning salmon catch in terms of weight **at sea 1 698** kilos, catch in the **River Tana system 9975** kilos, making **15%** at sea and **85%** in the River Tana

In the year 2012 the numbers of salmon belonging into Tana Reporting Group area were caught as follows:

- all sea-ages of salmon catch in terms of numbers **at sea 4 460** fish, catch in the **River Tana system 33 615** fish, making **12%** at sea and **88%** in the River Tana
- all sea-ages of salmon catch in terms of weight **at sea 17 515** kilos, catch in the **River Tana system 109 853** kilos, making **14%** at sea and **86%** in the River Tana
- 1SW salmon catch in terms of numbers **at sea 2 327** fish, catch in the **River Tana system 23 764** fish, making **9%** at sea and **91%** in the River Tana
- 1SW salmon catch in terms of weight **at sea 5 396** kilos, catch in the **River Tana system 47 837** kilos, making **10%** at sea and **90%** in the River Tana
- 2SW salmon catch in terms of numbers **at sea 1 531** fish, catch in the **River Tana system 5 606** fish, making **22%** at sea and **78%** in the River Tana
- 2SW salmon catch in terms of weight **at sea 6 932** kilos, catch in the **River Tana system 24 726** kilos, making **22%** at sea and **78%** in the River Tana
- 3-4SW salmon catch in terms of numbers **at sea 444** fish, catch in the **River Tana system 2 569** fish, making **15%** at sea and **85%** in the River Tana
- 3-4SW salmon catch in terms of weight **at sea 3 761** kilos, catch in the **River Tana system 25 742** kilos, making **13%** at sea and **87%** in the River Tana
- Previous spawning salmon catch in terms of numbers **at sea 157**fish, catch in the **River Tana system 1 668** fish, making **9%** at sea and **91%** in the River Tana
- Previous spawning salmon catch in terms of weight **at sea 1 425** kilos, catch in the **River Tana system 11403** kilos, making **11%** at sea and **89%** in the River Tana

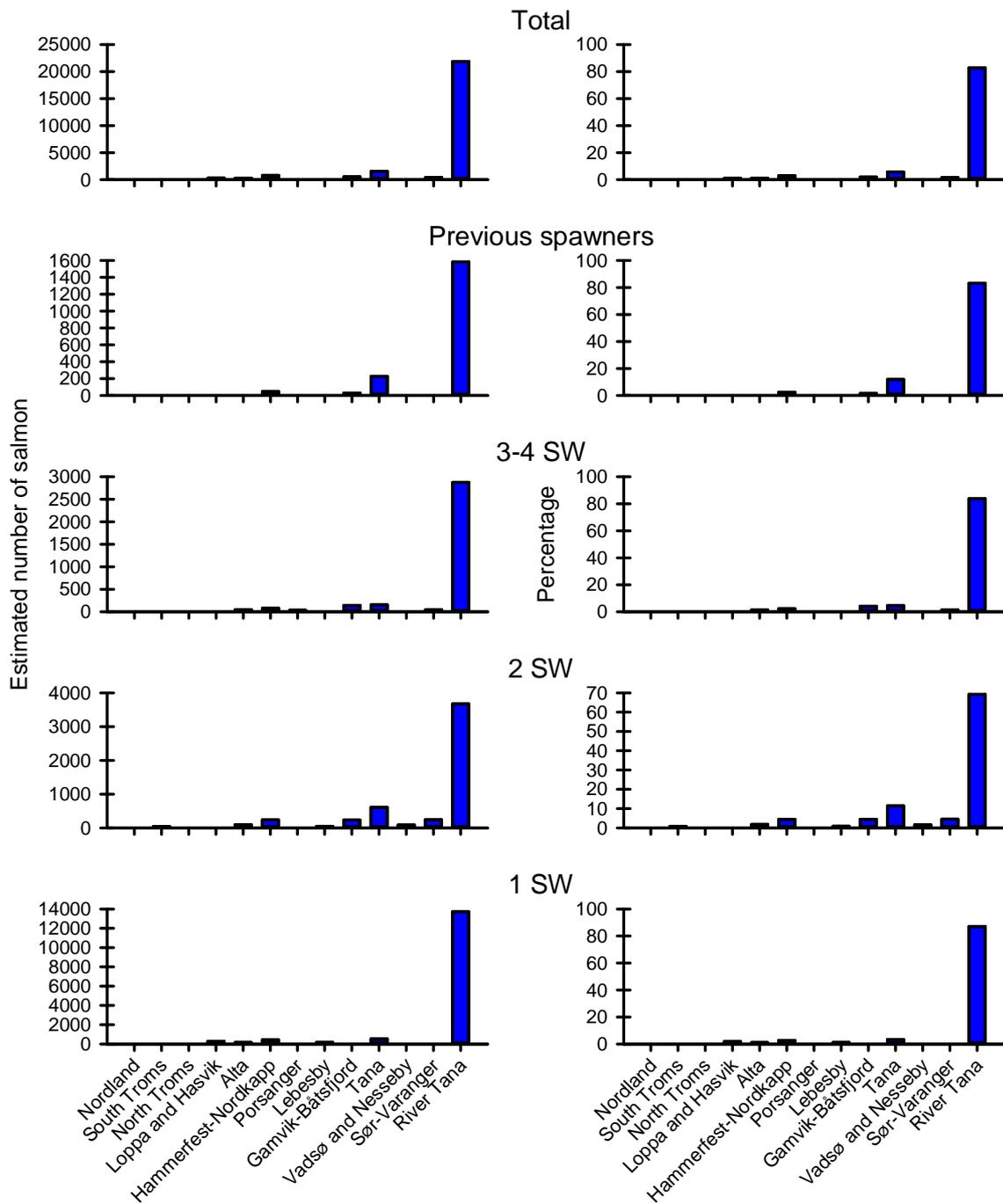


Figure 32. Catches in numbers for 1SW, 2SW, 3-4SW salmon and previous spawners originating from the Tana Regional Group area in the year 2011. Salmon catches are distributed at sea between the municipalities in North Norway and in the River Tana, where Finnish and Norwegian catches are combined.

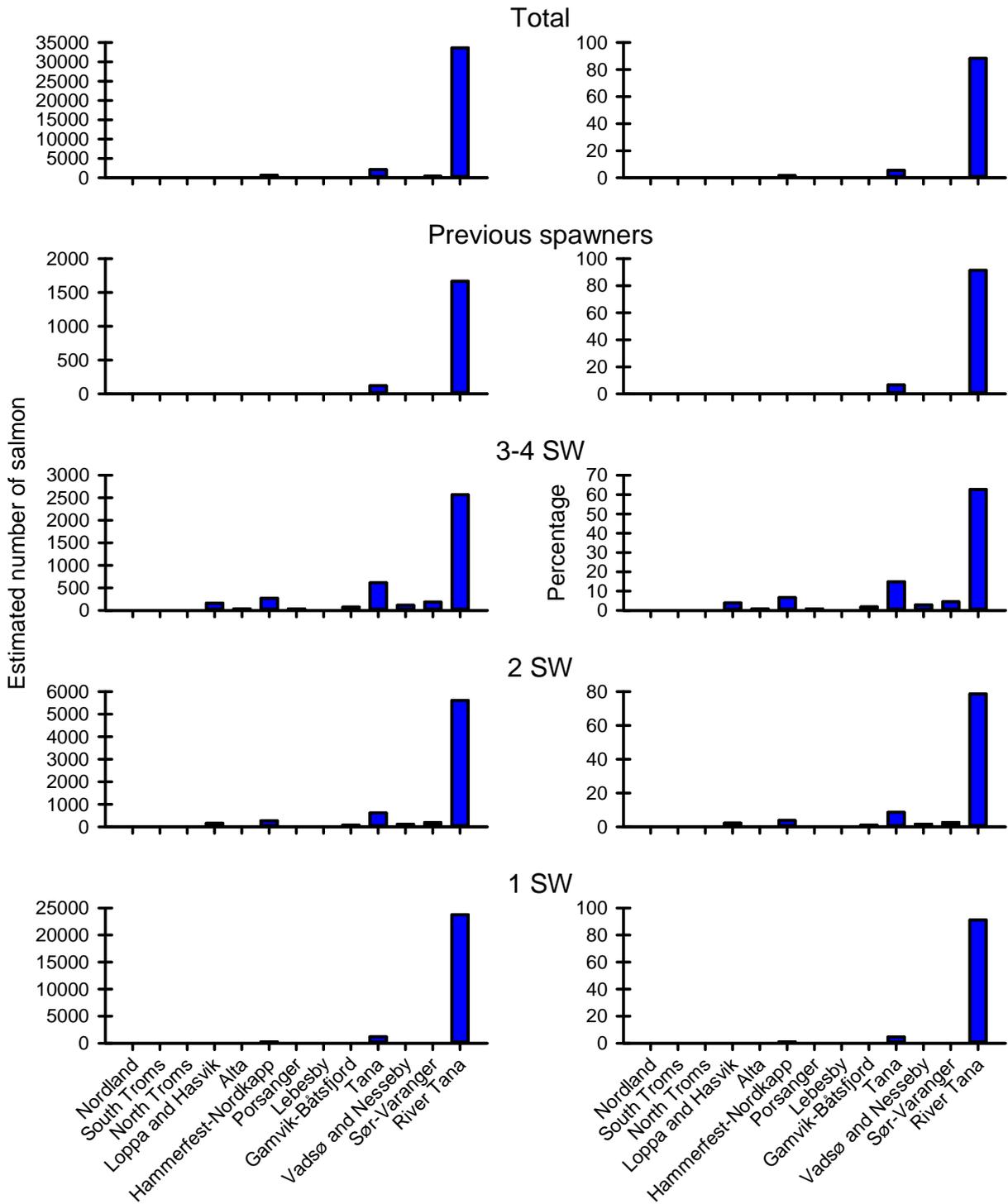


Figure 33. Catches in numbers for 1SW, 2SW, 3-4SW salmon and previous spawners originating from the Tana Regional Group area in the year 2012. Salmon catches are distributed at sea between the municipalities in North Norway and in the River Tana, where Finnish and Norwegian catches are combined.

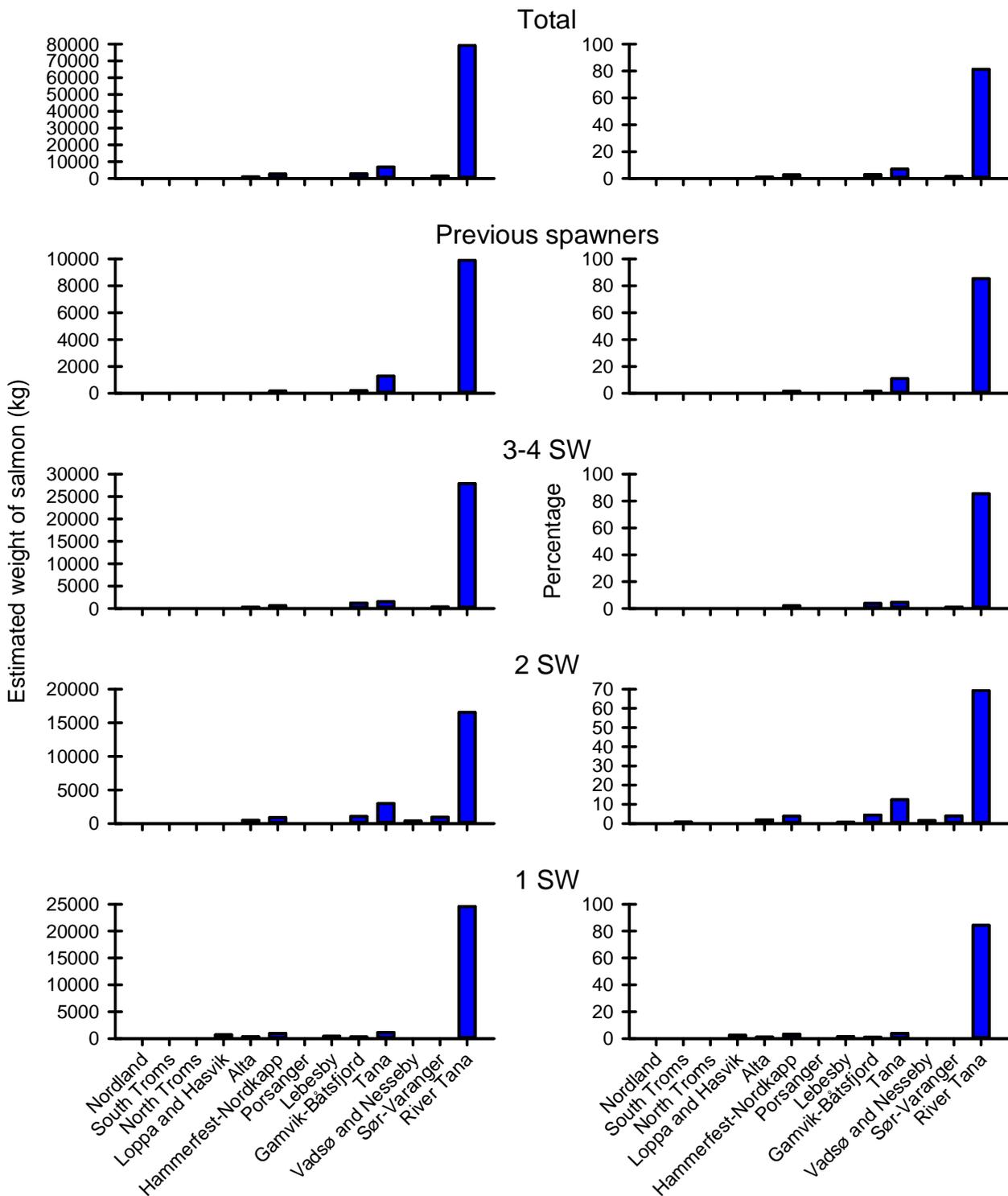


Figure 34. Catches in weight for 1SW, 2SW, 3-4SW salmon and previous spawners originating from the Tana Regional Group area in the year 2011. Salmon catches are distributed at sea between the municipalities in North Norway and in the River Tana, where Finnish and Norwegian catches are combined.

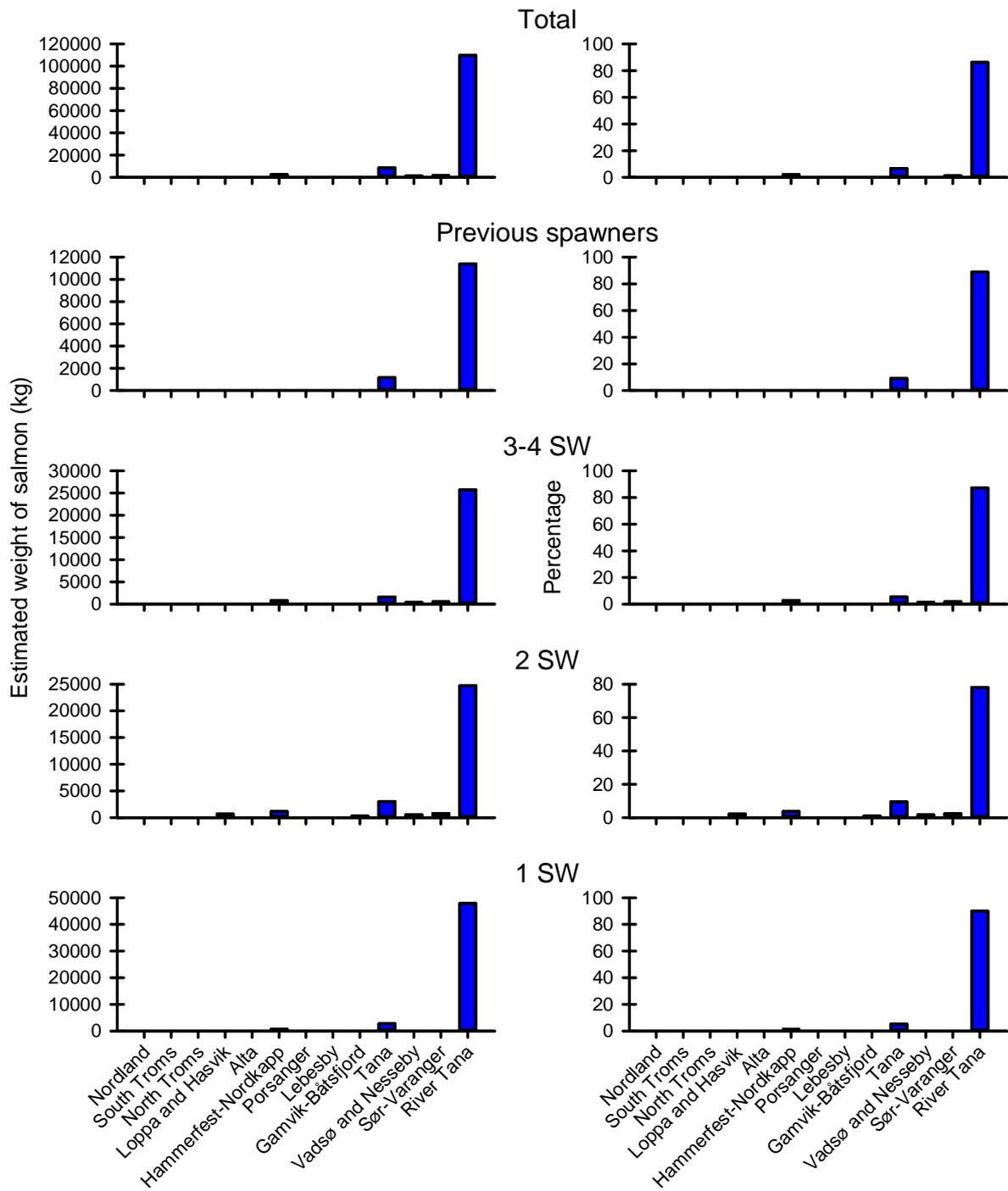


Figure 35. Catches in weight for 1SW, 2SW, 3-4SW salmon and previous spawners originating from the Tana Regional Group area in the year 2012. Salmon catches are distributed at sea between the municipalities in North Norway and in the River Tana, where Finnish and Norwegian catches are combined.

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Responsibilities in this report: FMFI organized the basic catch data covering the years 2011-2012 from SSB (Statistics Norway), FGFRI gathered the catch data from the yearly salmon catch reports, converted catch data information into sea-ages of salmon and combined the genetic data into biological catch data, made graphs and formulated text. UTU and IMR made the genetical analysis from all wild salmon, and UTU made the text for methods chapter.

NINA applied for the special research permission from the Norwegian Directorate of Nature Management for fishing outside the ordinary fishing season and had contact with fishermen in Nordland and Troms.

The Sea salmon fishers associations in Finnmark and Troms gave valuable input and contacted potential fishermen, who collected the research material.

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