

Kolarctic CBC – Project KO4178; Conserving our Atlantic salmon as a sustainable resource for people in the North; fisheries and conservation in the context of growing threats and a changing environment.

**Report XV. Biological features combined with the genetic stock assignment data collected from Atlantic salmon fishery at sea in Northern Norway makes it possible to understand the flexibility of salmon ecology**

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Co-funded by the  
European Union

Statsforvalteren i Troms og Finnmark PB 700, 9815 VADSØ <a href="http://www.statsforvalteren/troms-finnmark/">www.statsforvalteren/troms-finnmark/</a>  CoASal – KO4178 project	ISBN 978-82-94021-14-7 Date: 31.1.2023
<p>Report XV. Biological features combined with the genetic stock assignment data collected from Atlantic salmon fishery at sea in Northern Norway makes it possible to understand the flexibility of salmon ecology</p> <p>Niemelä<sup>1,2</sup>, E., Hassinen<sup>1,2</sup>, E., Kalske<sup>3</sup>, T.H., Høstmark<sup>3</sup>, M.S.</p> <p><sup>1)</sup> Biodiversity Unit, University of Turku; Turku, Finland  <sup>2)</sup> Firm Olli van der Meer; Oulu; Finland  <sup>3)</sup> County Governor of Troms and Finnmark; Vadsø, Norway</p>	
<p><b>Abstract</b></p> <p>Salmon of the sea-ages 1SW, 2SW, 3SW, 4SW were caught in all the municipalities in Finnmark and in Troms and Nordland counties in the research periods in 2008-2021. The proportions of 1SW fish in male salmon catches were higher in Russia in many sampling areas compared to their proportions in Norwegian catches. Differences in the sea-age distributions between municipalities in Northern Norway can be explained by the fishing method used during the fishing season and by the period of allowed fishing. Large 2SW, 3SW, 4SW salmon and previous spawners ascend into the coastal areas earliest in the summer and are covering more than 50% of the weekly catches towards the end of first week of July (week 27). The smallest salmon, 1SW fish, starts to appear in the coastal catches in week 24. The numbers of 1SW salmon increases steadily towards to the end of week 28, in the middle of July, when their proportion reach 50% of the weekly catches. After the middle of July, the proportion of 1SW salmon in the weekly catches is stable towards the end of the fishing season.</p> <p>The timing between female and male salmon in the catches indicates that females are entering into the fishery earlier than males especially in 1SW, 2SW and previous spawned salmon. Females are caught slightly earlier than males also in 3SW salmon. In female salmon catches, 2SW, 3SW and previous spawning salmon are making the majority until the end of the week 26 with appr. 90% from the total female salmon catches. From the week 27 onwards in female salmon catches the weekly proportion of 1SW female salmon is between 10-20%.</p> <p>The weekly timing of Tana originated salmon looks to be the same between the areas west of Tanafjord, in Tanafjord and east of Tanafjord. This indicates that Tana originated salmon migrates towards the River Tana approximately at the same time from west and from east following the coastal line. This migration period lasts for a total of 14 weeks. The migration period along the coast lasts for so many weeks because there are more than 30 separate river Tana salmon stocks, which all have their own temporal migration behavior. Salmon from the River Tana watershed has the same temporal migration model which can be observed at sea where all salmon stocks are combined from northern rivers and are migrating together in mixed stocks.</p> <p>Females occur in higher proportions in 1SW, 2SW and previous spawned salmon early in the migration period. Their proportions decline towards the end of summer. This phenomenon is especially obvious in 2SW salmon and previous spawners. The opposite development is observed in 4SW salmon, where males have highest proportion early in summer in the weekly catches and their occurrence is clearly declining towards the end of July.</p> <p>Based on the daily numbers of salmon in the fishery and on the cumulative catch curves (based on the numbers of salmon), we conclude that salmon from the River Neiden is the first target in the fishery in Northern Norway, out of the stocks from the rivers Altaelv, Lakselv and Tanaelv. Salmon from the River</p>	

Tana ascends somewhat later into the coastal areas. Salmon from the River Alta migrates even later on into the coastal areas. Salmon stock from the River Lakselv has the latest migratory model.

In Northern Norway, Northern Finland and North-Western Russia, smolt ages varied between 2-7 years in the material collected in the years 2008-2020. Proportions of the youngest smolt age, 3 years, is declining from East-Finmark towards West Finnmark, although there are remarkable differences between stocks. Accordingly, the proportions of five- and six-year-old smolts is slightly increasing. The dominating smolt age in all those rivers is 4-year-olds. Differences in the smolt age distributions between rivers reflect variations in the environmental conditions, like in the water temperature and nourishment. Unfavorable environmental conditions are slowing the annual growth, which in turn results in delayed smolt ages.

**Key words:**

Atlantic salmon, salmo salaris, genetics, Tana, sea salmon fishery, smolt age

**Front page photo:**

Eero Niemelä

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## 1. All Atlantic salmon sea-ages (1SW, 2SW, 3SW, 4SW and previous spawners) are occurring in the catches at sea in northern Norway

Salmon with the sea-ages 1SW, 2SW, 3SW, 4SW, were caught in all the municipalities in Finnmark and in Troms and Nordland counties in the research periods of 2008-2021. The proportions of 1SW fish in male salmon catches was higher in Russia in many sampling areas, compared to their proportions in Norwegian catches (Figure 1). In the area Tersky Bereg and Varzuga area, in South-East Kola peninsula, catches consisted mainly of 1SW fish in females and males in both the research and professional fishery. In the River Petchora the proportion of 1SW male salmon was low from all male salmon but the proportions of 2SW males and 3SW males were higher compared to their proportions in Norwegian male salmon catches. Differences in the sea-age distributions between municipalities in Northern Norway can be explained by the fishing method used during the fishing season and by the length of the legal fishing period. Also, changes in the sampling activities during summer months can explain differences in the sea-age distributions between municipalities. There are also differences in the sea-age distributions between the fishing sites in inner and outer areas of the fjords.

The proportions of previous spawned salmon in the catches was the highest in the area Tana and Gamvik, both in females and males.

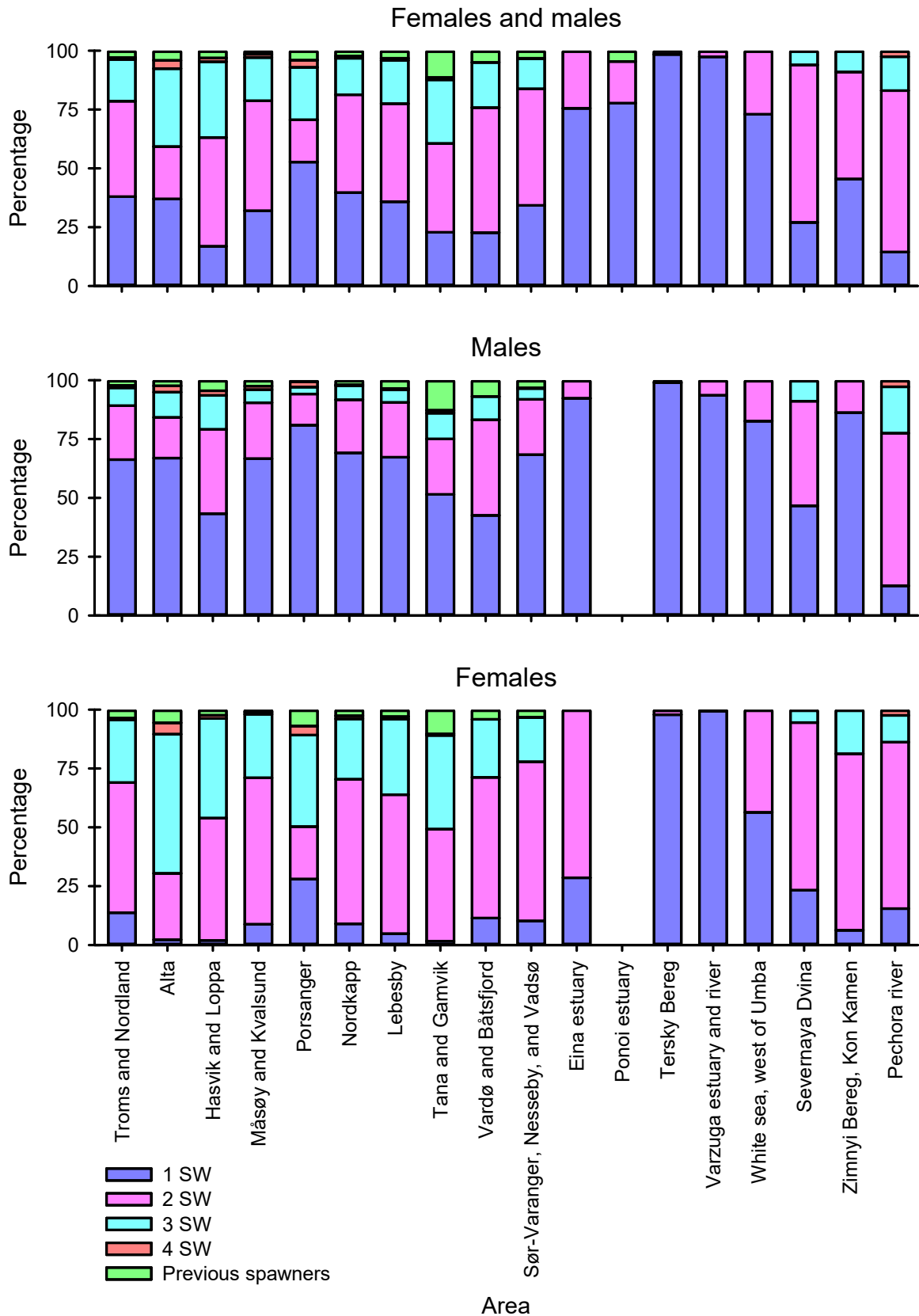


Figure 1. Sea-age distributions in the catches of female and male salmon and for both sexes between the weeks 22 and 31 in Finnmark municipalities and in Troms/Nordland counties in the years 2008-2009, 2011-2012 and 2020-2021. Sea-age distributions from Russia are mainly from White Sea area from the years 2011-2012. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

## 2. Weekly sea-age distributions of salmon at sea in the coastal fishery in Finnmark county in Norway

Large 2SW, 3SW, 4SW salmon and previous spawners are fishes that ascend into the coastal areas earliest in the summer and are covering more than 50% of the weekly catches towards the end of the first week of July (week 27) (Figure 2). In the coastal catches, the smallest salmon, 1SW, starts to appear in week 24. The numbers of 1SW salmon increases steadily towards to the end of week 28 (the middle of July), when their proportion reach 50% of the weekly catches. After the middle of July, the proportion of 1SW salmon in the weekly catches is stable towards the end of the fishing season.

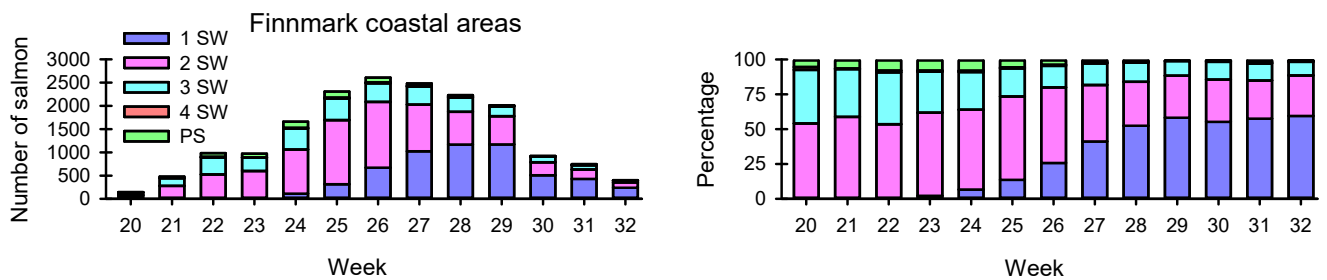


Figure 2. Weekly numbers and proportions of 1SW, 2SW, 3SW, 4SW and previous spawning salmon (PS) in the research fishery in the years 2008-2009, 2011-2012 and 2020-2021 in Northern Norway (Finnmark) including salmon stocks from Norway, Finland and Russia. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).



### 3. Weekly sea-age distributions for female and male salmon in mixed-stock fisheries in the coastal fishery in Finnmark

Female and male salmon initiate their migrations along the coastal areas in Northern Norway in the middle of May. There is, however, traditional knowledge that in the past, some salmon have been caught in late April and especially during the first half in May. These salmon have consisted of large female and male salmon. It is not known if the salmon caught in April and early May have been the whole winter in fjords or close to outer coastline. Anyway, in the past it was allowed to catch salmon in Tanafjord and in Varangerfjord in the end of the year, November and December. These “Christmas salmon” were both female and male salmon. The occurrence of salmon as bycatch in winter in northern fjords indicates that some salmon are overwintering there.

The timing between female and male salmon in the catches indicate that females enters into the fishery earlier than males, especially in 1SW, 2SW and previous spawned salmon (Figs. 3 and 4). Females are caught slightly earlier than males also in 3SW salmon. In female salmon catches 2SW, 3SW and previous spawned salmon are making the majority until the end of the week 26 with appr. 90% from the total female salmon catches (Fig. 3). From the week 27 onwards in female salmon catches the weekly proportion of 1SW female salmon is between 10-20%.

Also in male salmon catches the major sea-age groups early in the summer until the week 25 are multi-sea-winter salmon (2SW, 3SW, 4SW, previous spawner). From the week 26 onwards 1SW salmon contribute to 50% or more from the total male salmon weekly catches and is stable 75% in the weeks 27-32.

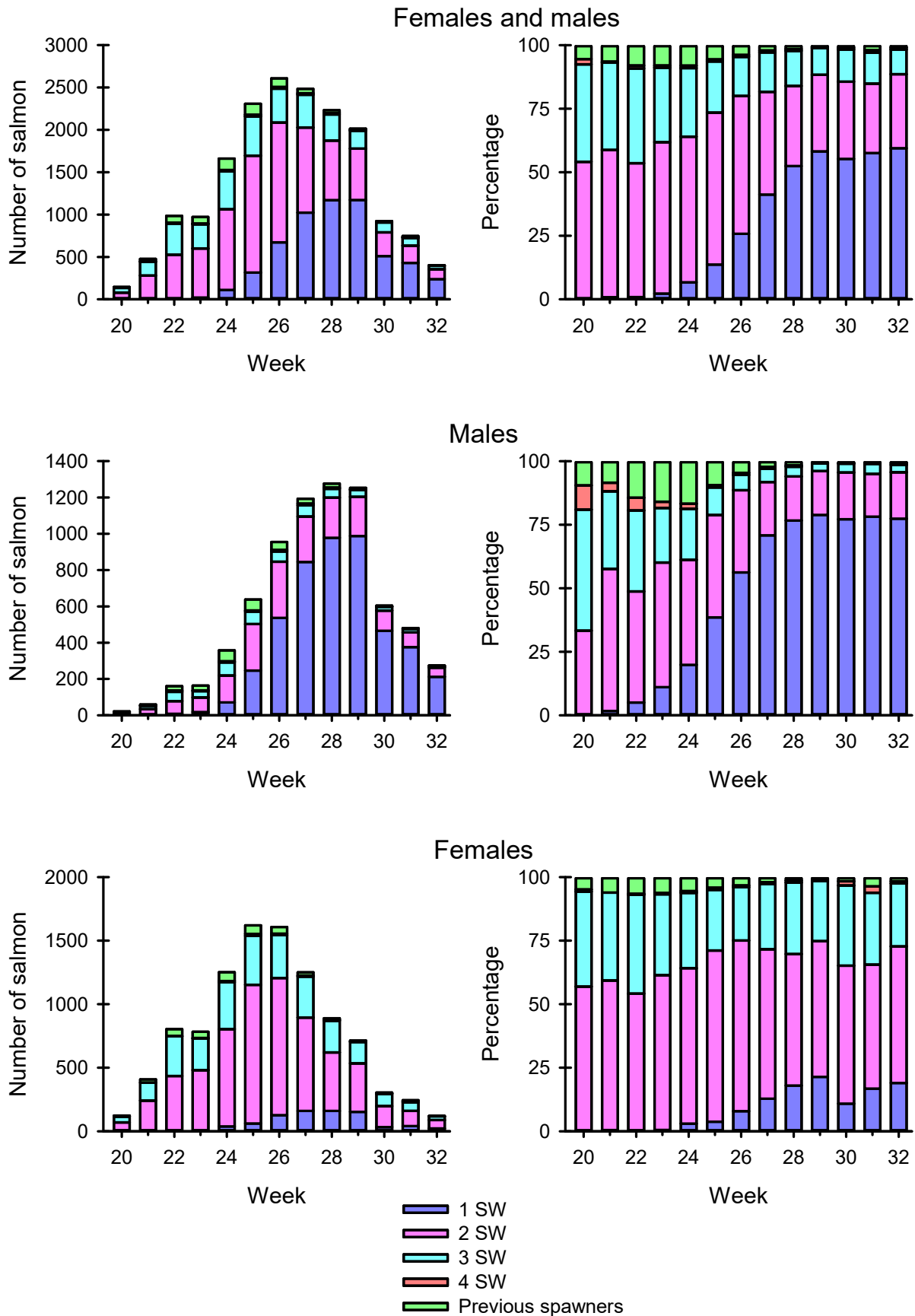


Figure 3. Weekly sea-age distributions for female and male salmon caught in the coastal fishery in Finnmark in the years 2008-2009, 2011-2012 and 2020-2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

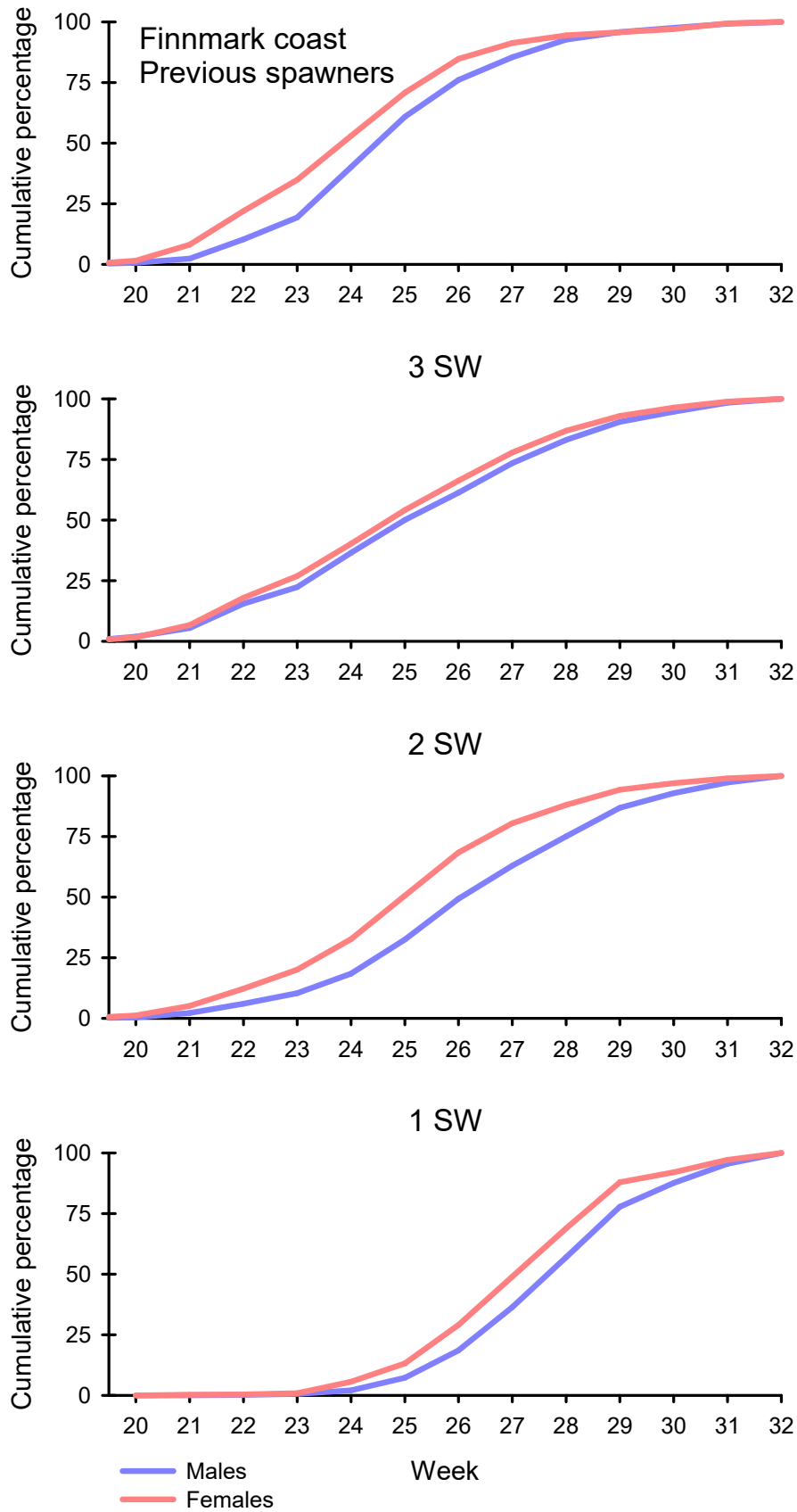


Figure 4. Cumulative percentages in 1SW, 2SW, 3SW and previous spawned salmon catches between females and males caught in the coastal fishery in Finnmark in the years 2008-2009, 2011-2012 and 2020-2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

#### 4. Weekly sea-age distributions of salmon caught at sea in the coastal research and professional sampling in Russia

Most of the salmon scale samples in Russia were from the White Sea area. Catches consisted mainly of 1SW salmon (Fig. 5). Catches peaked in the weeks 27-29 in females and males. Females were caught slightly earlier than males in 1SW fish. Salmon caught in the week 32 was from the River Pechora, indicating the migration period for autumn running stock.

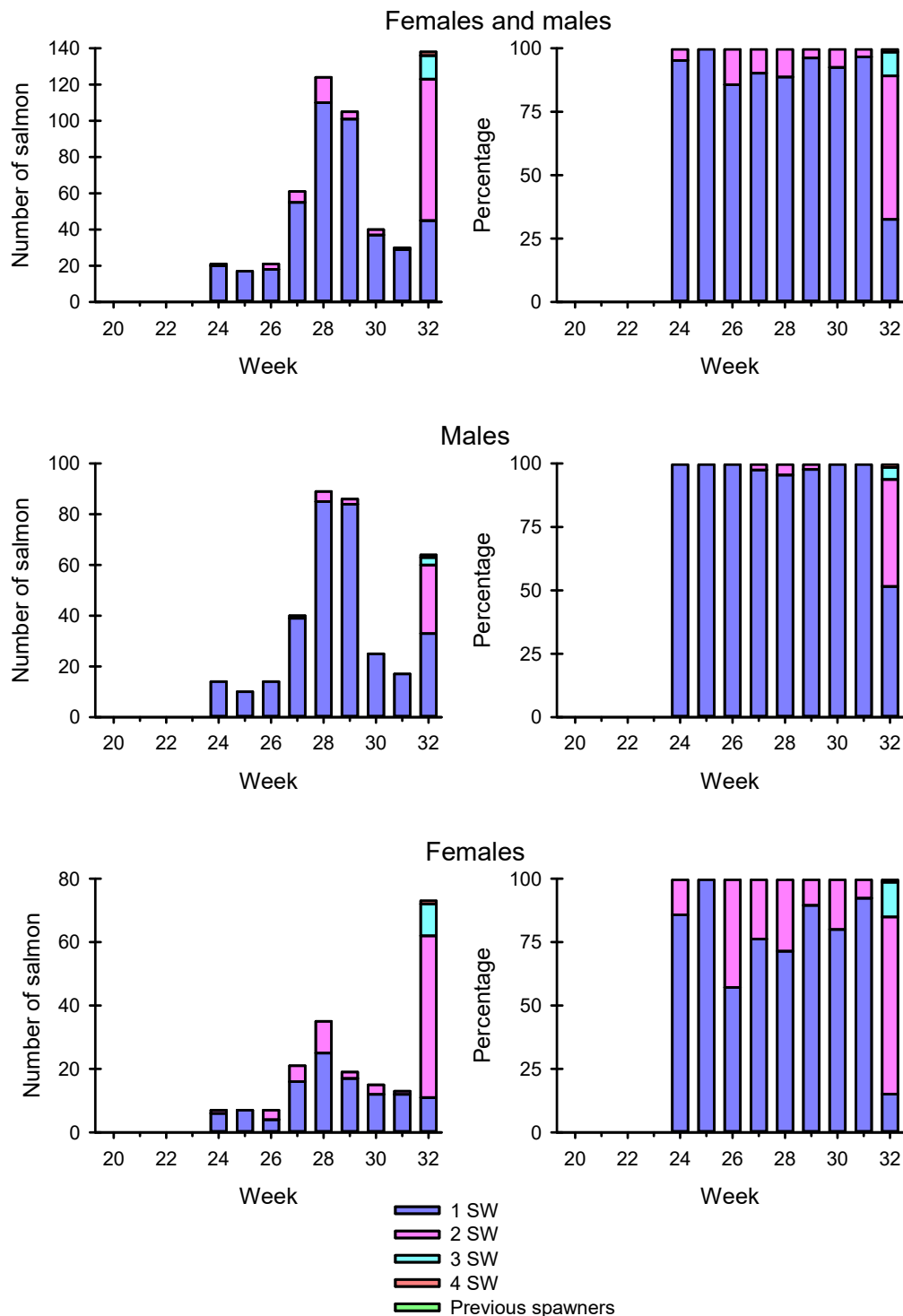


Figure 5. Weekly sea-age distributions for female and male salmon caught in the coastal fishery in Russia (North-West Kola peninsula, White Sea) and in the River Pechora in the years 2011-2012. Source: Kolarctic EU/ENPI CBC (KO 197)

## 5. Weekly sea-age distributions of River Tana originated salmon in the coastal fishery of Northern Norway (Nordland, Troms and Finnmark counties)

Salmon of 2SW, 3SW, 4SW and previous spawners from the River Tana watershed area are sea-age groups that start to ascend into the coastal areas early in the summer, from the middle of May to the week 32 in August (Fig. 6). In the coastal catches the smallest salmon, 1SW, starts to occur in the catches in the week 23 and its proportions are small until the end of the week 25. The proportion of 1SW salmon is increasing steadily towards the end of week 28, in the middle of July, when its proportion reaches appr. 70% in the weekly catches and the proportions remain stable to the end of the fishing season. The proportion of previous spawners have exceeded appr. 15% in the weeks 20-25. In week 22 the proportions of 3SW salmon have been the highest among multi-sea-winter salmon during the entire summer.

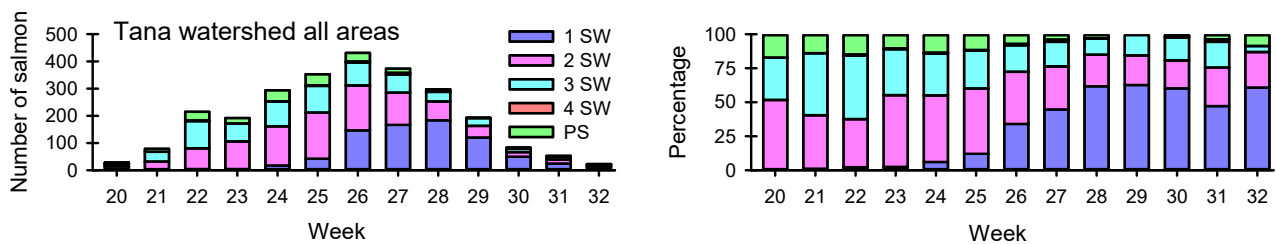


Figure 6. Weekly numbers and proportions of 1SW, 2SW, 3SW, 4SW and previous spawned salmon (PS) originating only from the river Tana watershed in the research fishery in the years 2008-2009, 2011-2012 and 2020-2021 in Northern Norway (Nordland, Troms, Finnmark). Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

## 6. The proportions of 1SW, 2SW, 3-4SW and previous spawners originating from River Tana watershed in the municipalities of Finnmark and Troms/ Nordland counties

Salmon originating from the River Tana watershed has a wide distribution area in the Norwegian coastal areas, where it is exploited on its way back to River Tana to spawn (Fig. 6). Tana watershed originated salmon is caught in the entire coastal areas from Nordland to eastern Finnmark (Fig.7). Based on the scale sampling data, all sea-ages occurs within this large migration area. It is interesting to observe that multi-sea-winter salmon originating from the River Tana watershed presents high proportions of the catches in the westernmost, as well as in easternmost areas in Northern Norway.

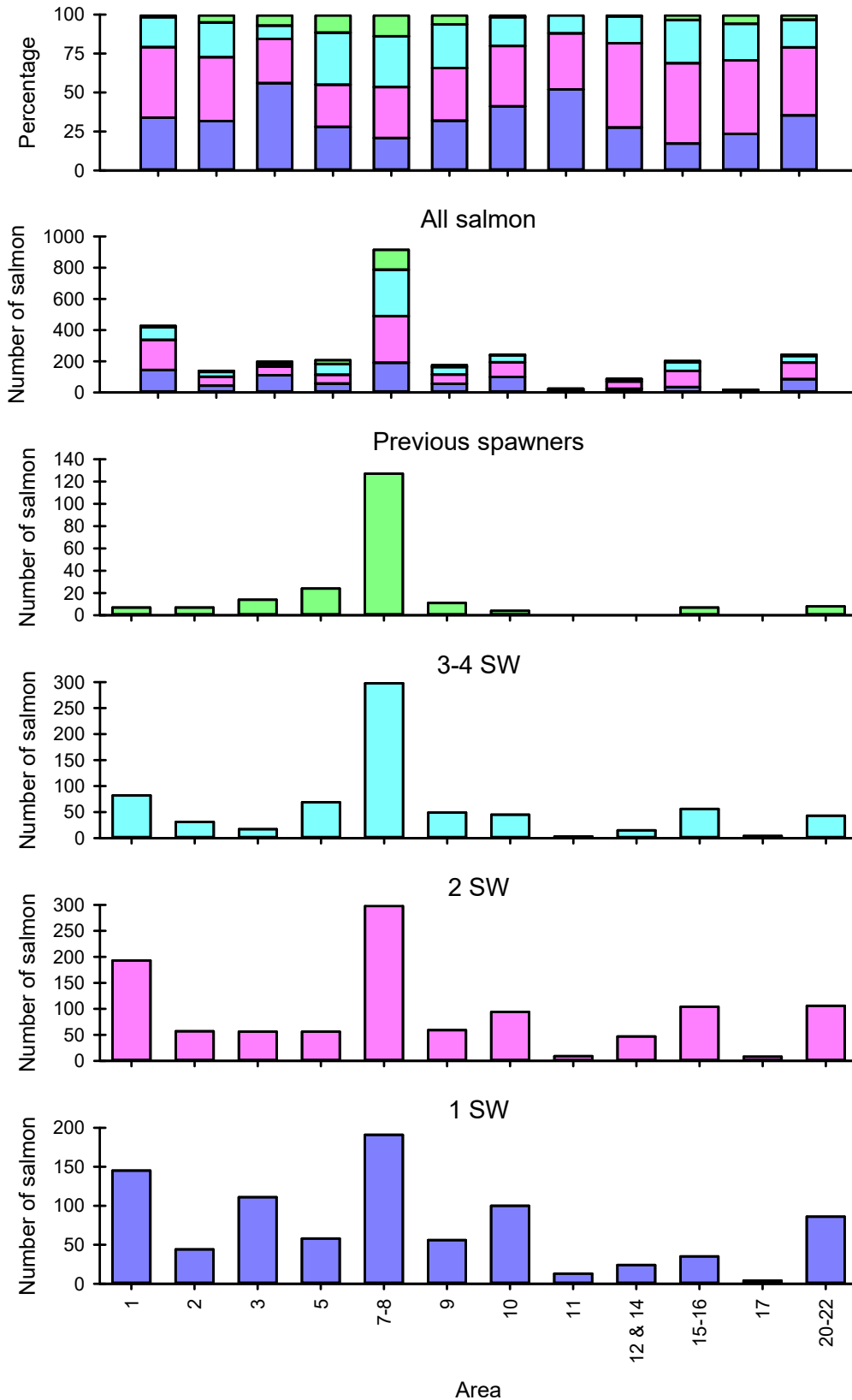


Figure 7. The occurrence and proportions of Tana watershed origin 1SW, 2SW, 3-4SW and previous spawned salmon in the sampling in northern Norway in the weeks 22-31 in the years 2008-2009, 2011-2012 and 2020-2021. Municipalities and counties are: 1 Sør-Varanger; 2 Nesseby; 3 Vadsø; 5 Vardø & Båtsfjord & Berlevåg; 7-8 Tana & Gamvik; 9 Lebesby; 10 Nordkap; 11 Porsanger; 12-14 Måsøy & Kvalsund & Hammerfest; 15-16 Loppa & Hasvik; 17 Alta; 20-22 Troms & Nordland. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

## 7. Spatio-temporal sea-age distributions of salmon originating from the River Tana watershed and catches in three geographic areas in Finnmark

The weekly timing of Tana originated salmon looks to be the same in the areas west of Tanafjord, in Tanafjord and east of Tanafjord (Fig. 8). This indicates that Tana originated salmon migrates towards the River Tana approximately at the same time from west and from east, following the coastal line. This migration period lasts for a total of 14 weeks. Migration period along the coast lasts for so many weeks because there are more than 30 separate river Tana salmon stocks, which all have their own temporal migration behavior. All salmon from the River Tana watershed has the same temporal migration model, which can be observed at sea where all salmon stocks are combined from northern rivers and migrates together in mixed stocks (see Fig. 2).

From the figure 8 and especially from the figure 9 it is easy to observe that migration weeks between sea-ages are different, but they are also overlapping. Tana river salmon with the sea-ages 3-4SW migrates first along the coast, followed by 2SW and latest 1SW salmon. Cumulative catches for 1SW, 2SW and 3-4SW salmon indicates that the timing is simultaneous between all three areas in each sea age (Fig. 9).

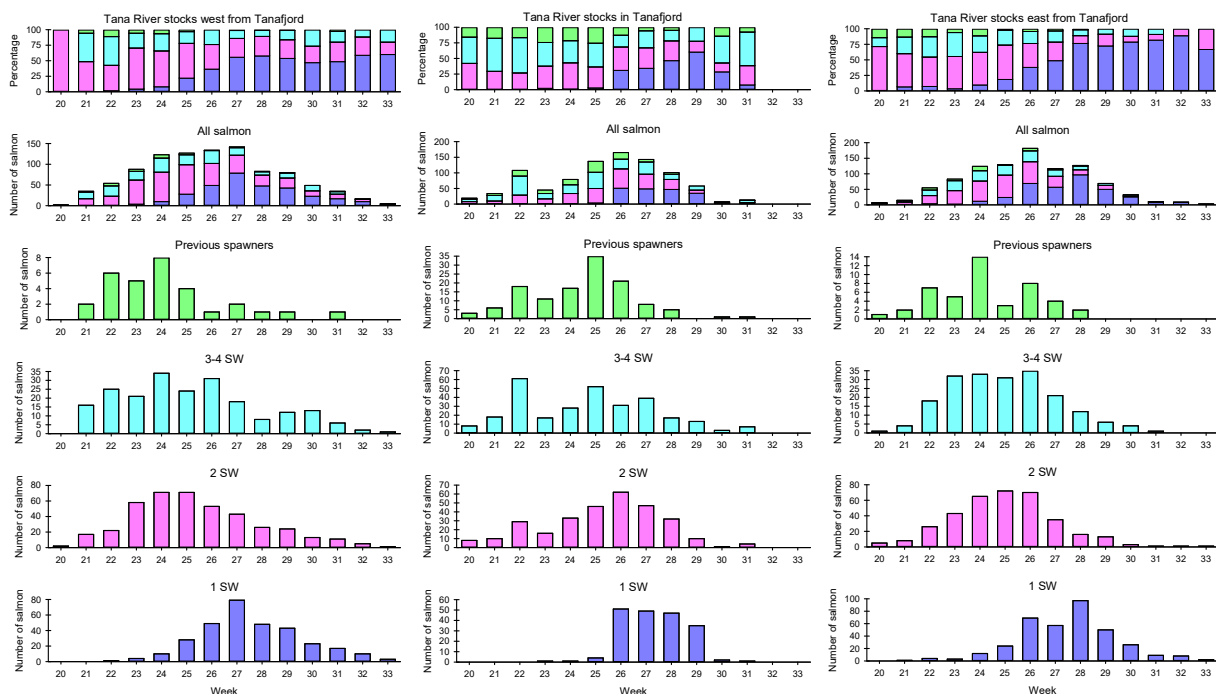


Figure 8. Weekly numbers and proportions for 1SW, 2SW, 3-4SW and previous spawned salmon originating from River Tana watershed in the catches between the areas west of Tanafjord (from Loppa to Laksefjord), Tanafjord (Tana and Gamvik) and east of Tanafjord (from Berlevåg to Sør-Varanger). Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).



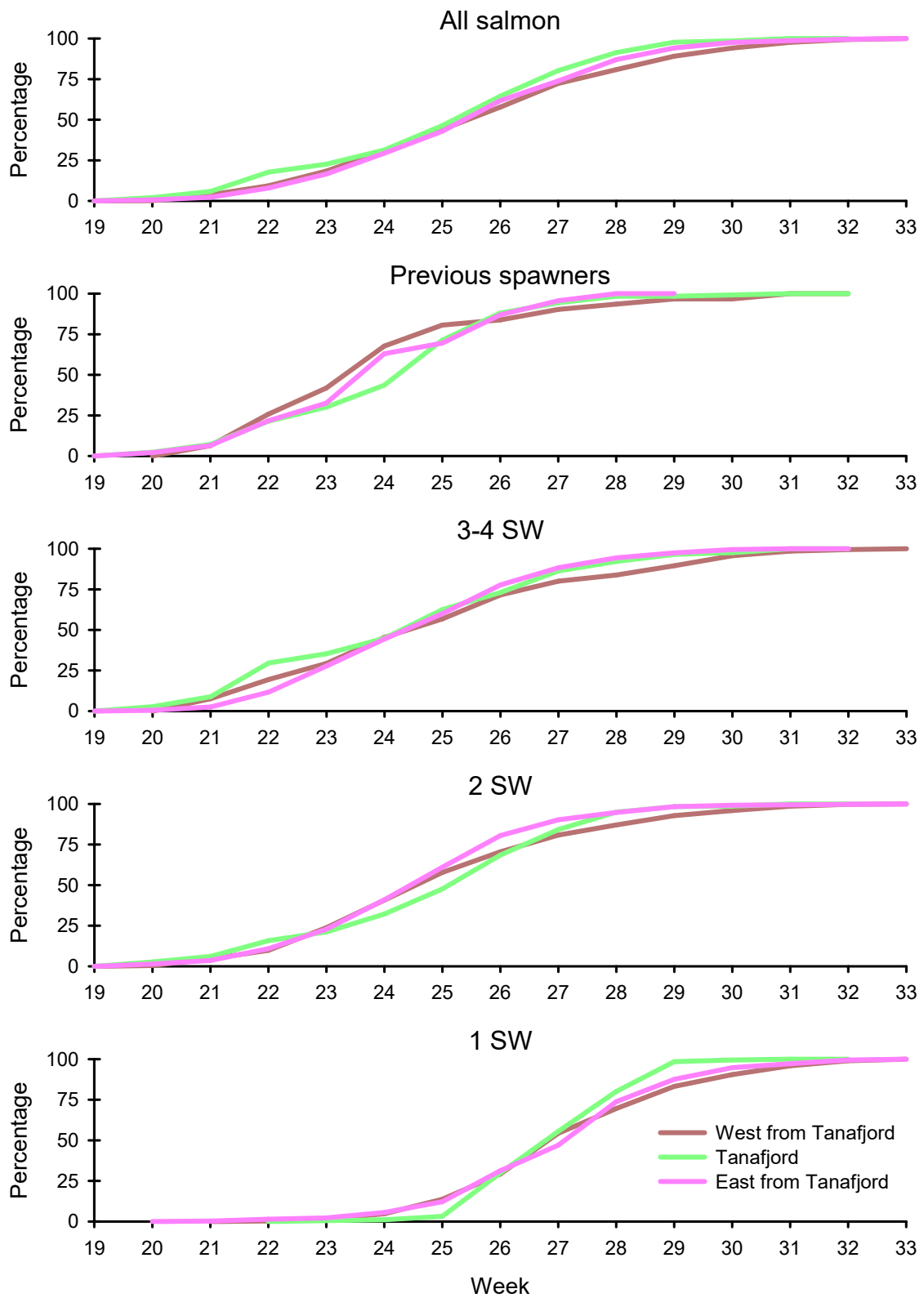


Figure 9. Cumulative catches for salmon stocks in the River Tana watershed caught in three large areas in Finnmark. Cumulative catches are based on the data in the figure 8. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

## 8. Weekly sea-age and sex distributions during the salmon migration in Finnmark

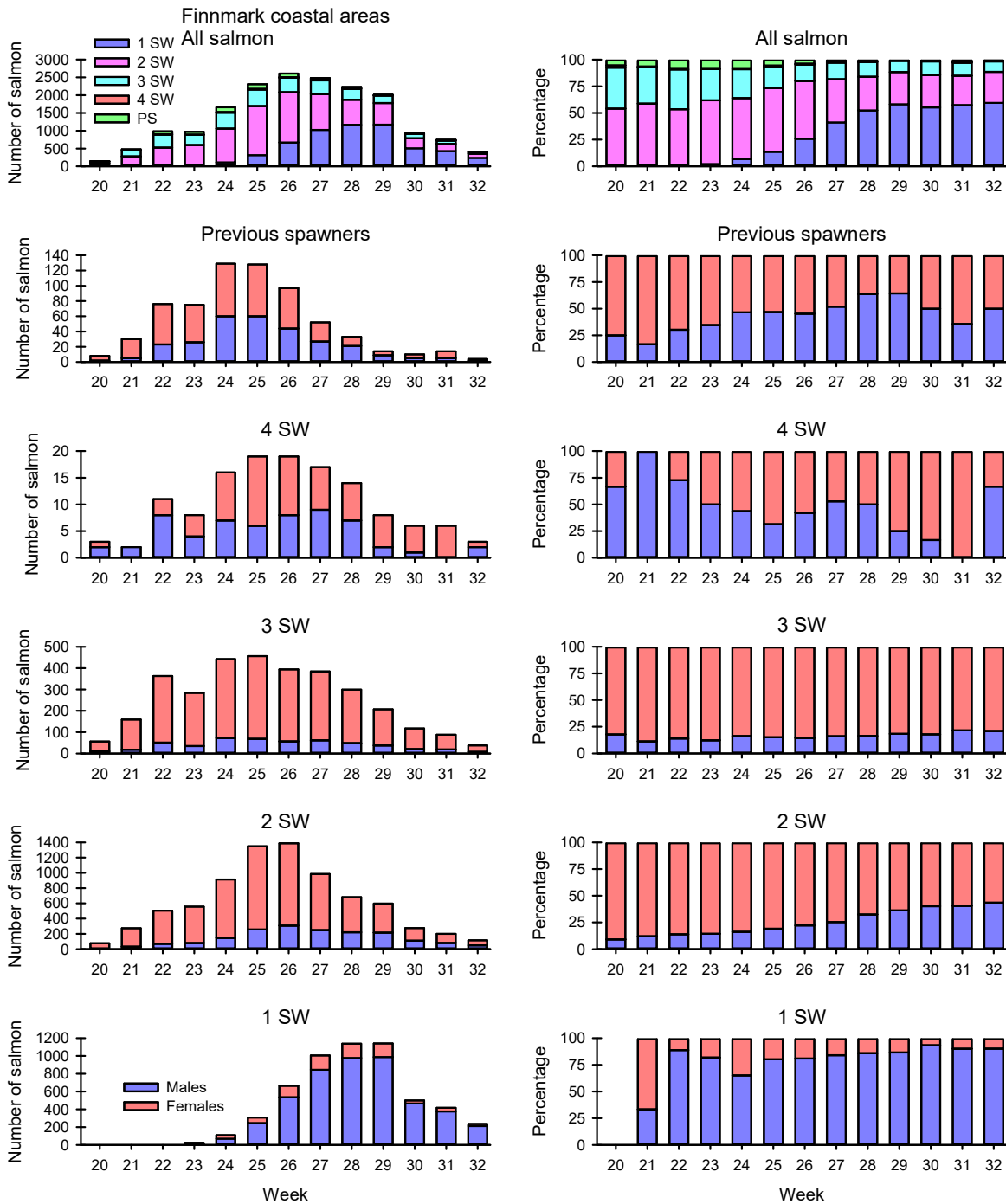


Figure 10. Weekly sea-age and sex distributions from all the salmon stocks together for 1SW, 2SW, 3SW, 4SW and previous spawned salmon caught at sea in Finnmark coastal areas in the fisheries in the years 2008-2009, 2011-2012 and 2020-2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

Females occurs in higher proportions in 1SW, 2SW and previous spawned salmon early in the migration period. Their proportions are declining towards the end of summer (Fig. 10). this phenomenon is especially obvious in 2SW salmon and previous spawners. The opposite development is observed in 4SW salmon, where males have highest proportion early in the summer in the weekly catches and their occurrence is clearly declining towards the end of July.

## 9. Sea-age and sex distributions for combined and separated salmon stocks (Local RG areas) from the River Tana watershed caught at sea in Finnmark throughout the coastal migration period

Weekly sea-age and sex distributions in the catches at sea are developing in the same way throughout the summer for the River Tana watershed stocks, for Tana mainstream stock, Karasjohka/Iesjohka stocks, Anarjohka/Karigasjohka stocks and Utsjoki/Kevojoki stocks (Figs. 11-13). Females make up the majority in sex distributions for 2SW and 3SW salmon in the weekly catches throughout the summer.

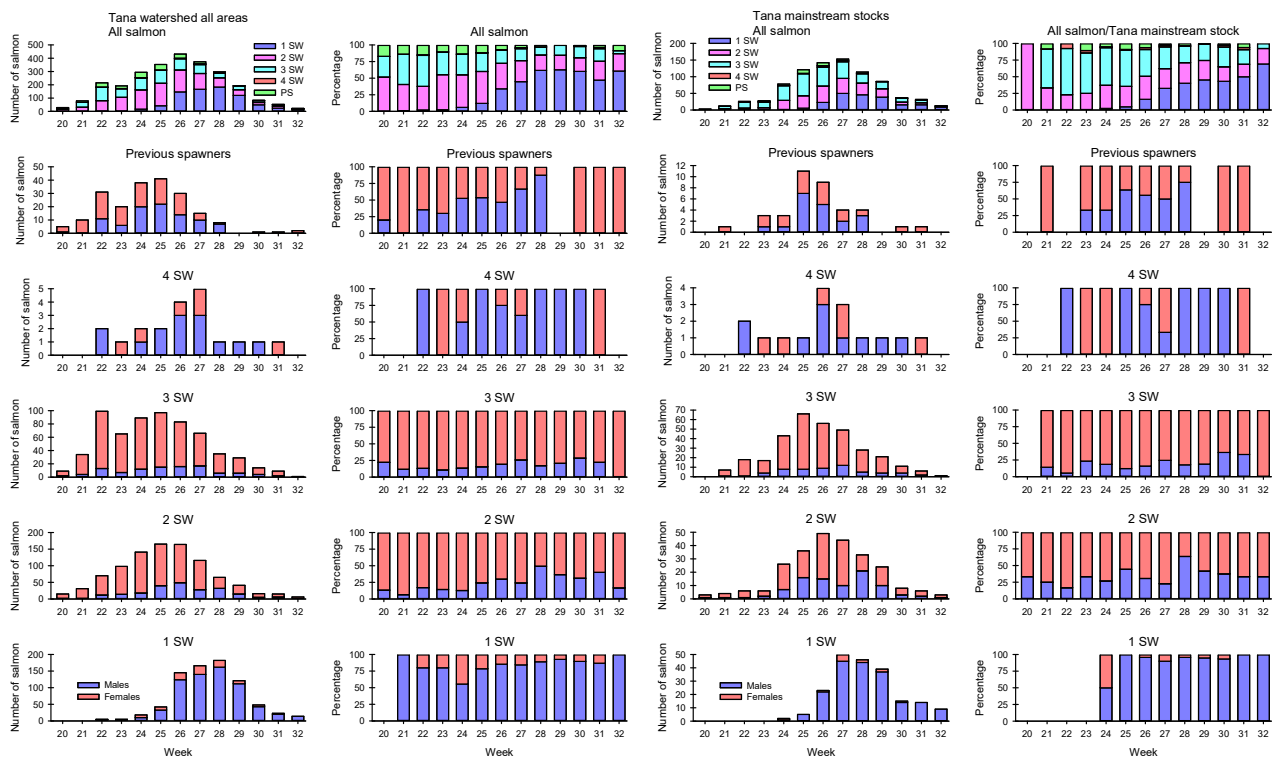


Figure 11. Weekly sea-age and sex distributions from all the salmon stocks in the river Tana watershed (figure on the left) and from the River Tana mainstream salmon stocks (figure on the right) for 1SW, 2SW, 3SW, 4SW and previous spawned salmon in the fisheries at sea in Finnmark coastal areas in the years 2008-2009, 2011-2012 and 2020-2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

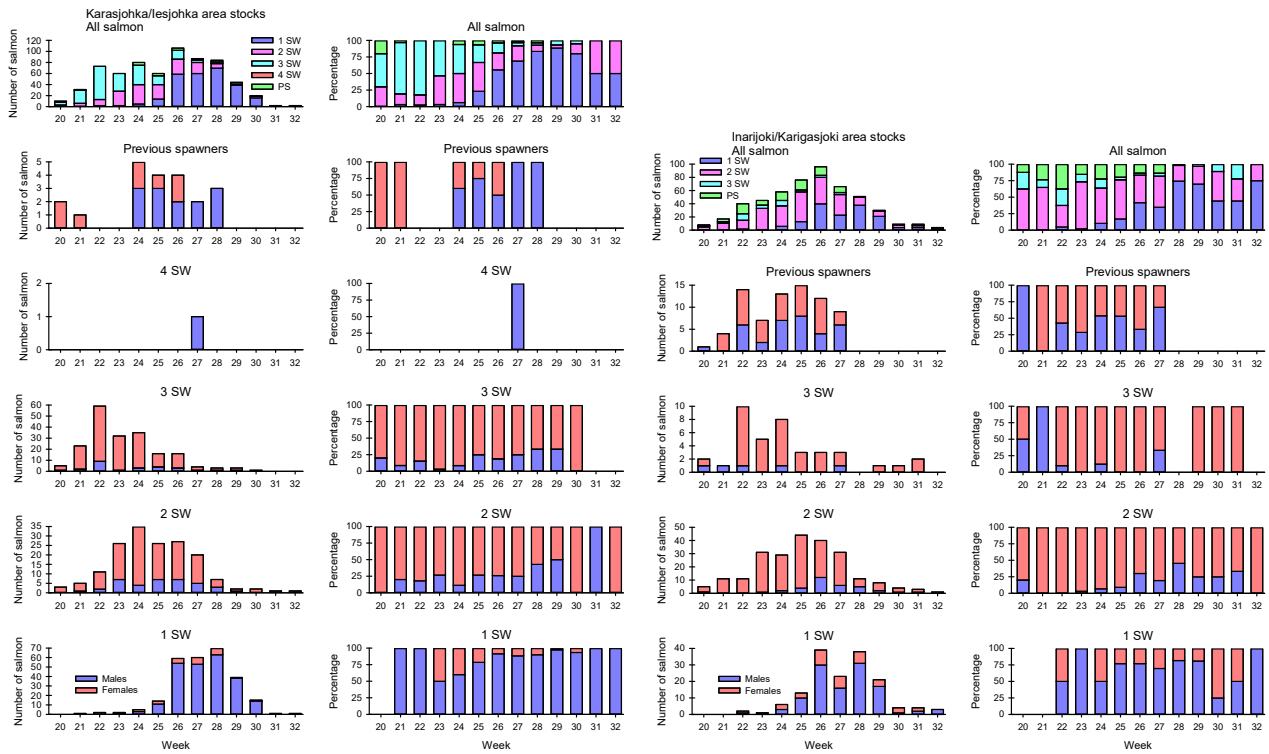


Figure 12. Weekly sea-age and sex distributions from the rivers Karasjohka/Iesjohka area salmon stocks (figure on the left) and from the rivers Inarijoki/Karigasjoki area salmon stocks (figure on the right) for 1SW, 2SW, 3SW, 4SW and previous spawner salmon in the fisheries at sea in Finnmark coastal areas in the years 2008-2009, 2011-2012 and 2020-2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

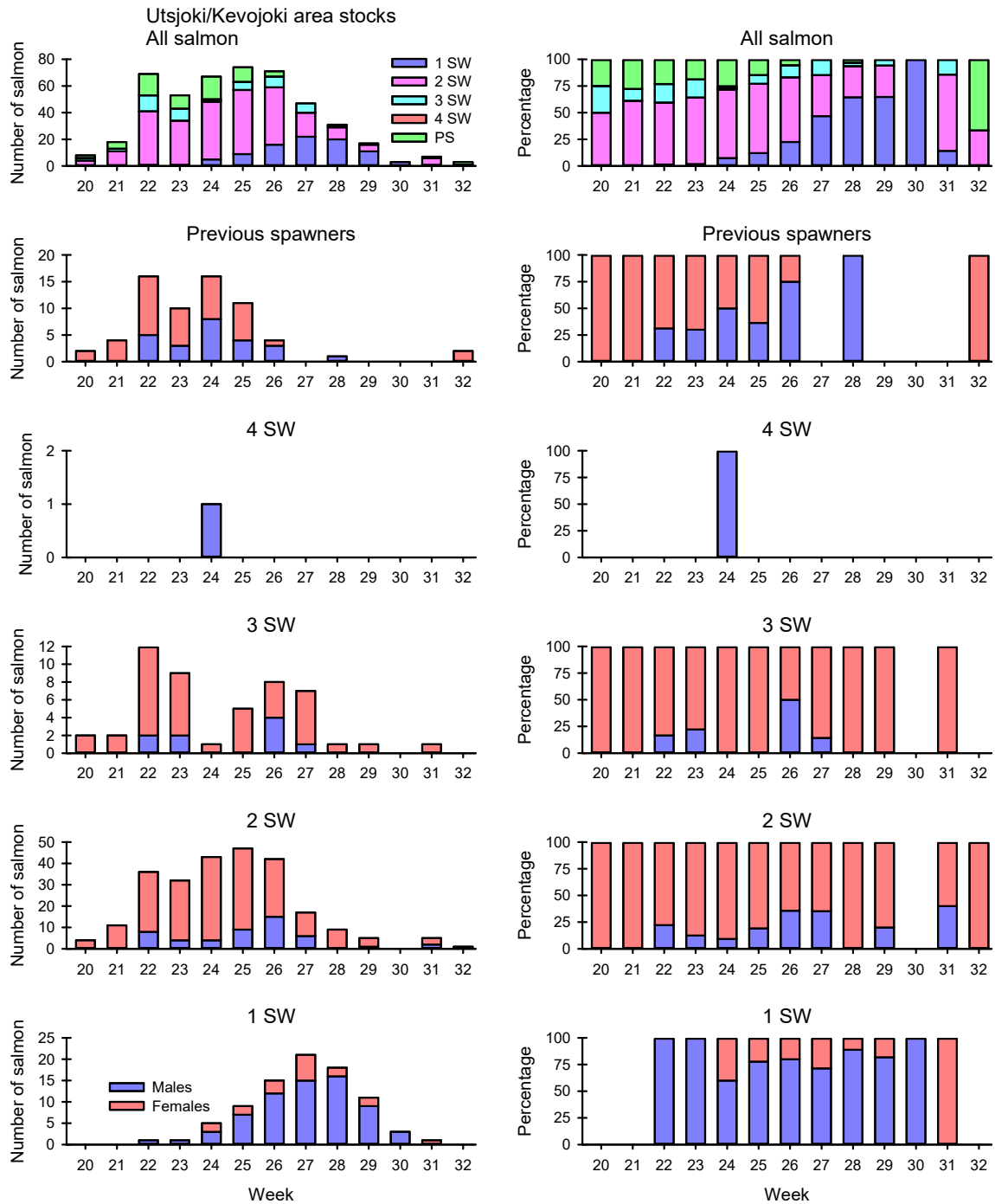


Figure 13. Weekly sea-age and sex distributions from the rivers Utsjoki/Kevojoki salmon stocks for 1SW, 2SW, 3SW, 4SW and previous spawned salmon in the fisheries at sea in Finnmark coastal areas in the years 2008-2009, 2011-2012 and 2020-2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

## 10. Sea-age and sex distributions for salmon in the rivers Reisaelv, Altaelv, Repparfjordelv, Lakselv and Neidenelv caught at sea in Finnmark throughout the coastal migration period

Also in the rivers Reisaelv, Altaelv, Repparfjordelv, Lakselv and Neidenelv weekly sea-age and sex distributions changes throughout the summer, like in the river Tana watershed (Figs. 14-16). Weekly changes are simultaneous in the sea-age and sex distributions in the River Tana watershed and in all other salmon stocks of the coastal catches in Finnmark.

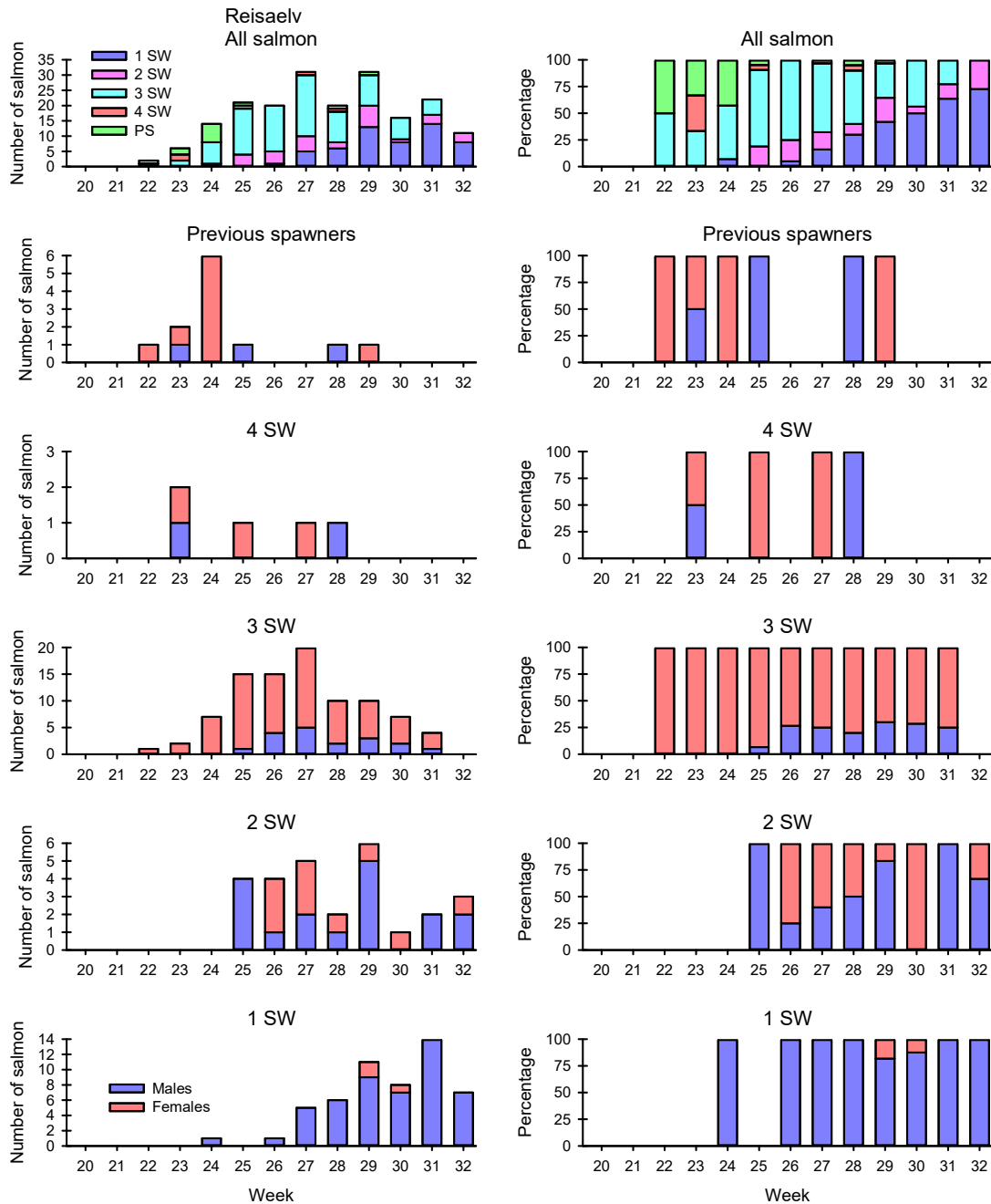


Figure 14. Weekly sea-age and sex distributions of the River Reisaelv salmon stock for 1SW, 2SW, 3SW, 4SW and previous spawner salmon in the fisheries at sea in Finnmark coastal areas in the years 2008-2009, 2011-2012 and 2020-2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

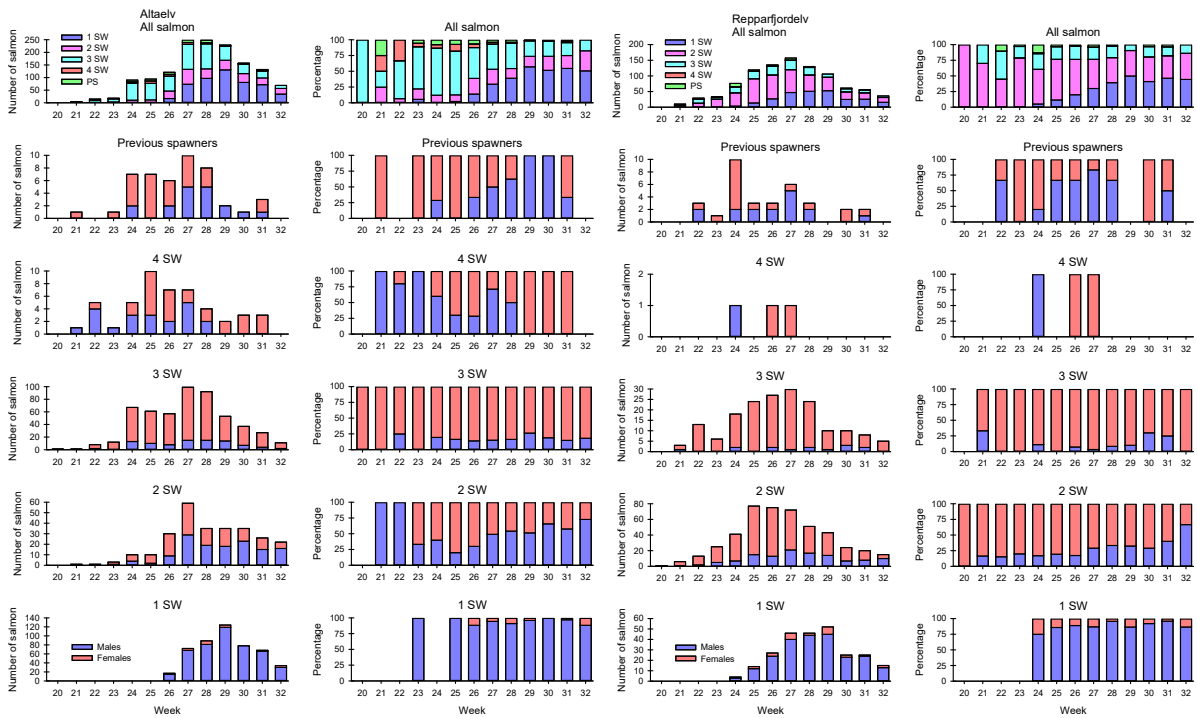


Figure 15. Weekly sea-age and sex distributions of the rivers Altaelv (figure on the left) and Repparfjordelv (figure on the right) salmon stock for 1SW, 2SW, 3SW, 4SW and previous spawner salmon in the fisheries at sea in Finnmark coastal areas in the years 2008-2009, 2011-2012 and 2020-2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

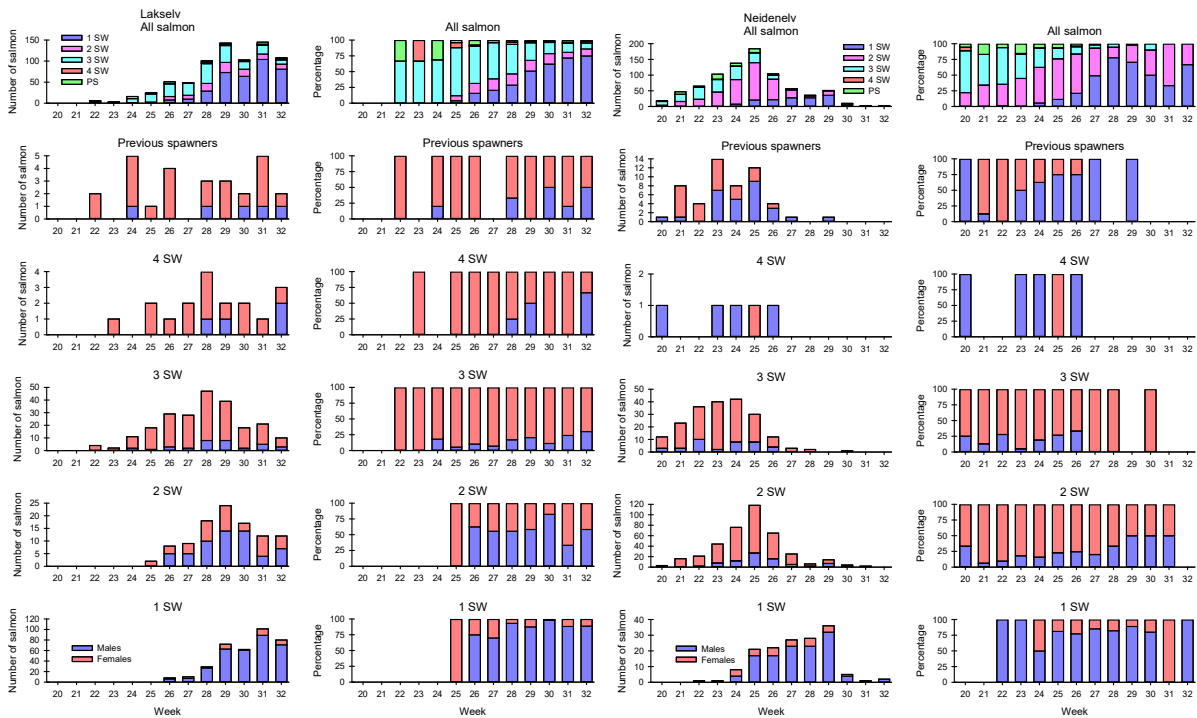


Figure 16. Weekly sea-age and sex distributions of the rivers Lakselv (Porsanger) (figure on the left) and Neidenelv (figure on the right) salmon stock for 1SW, 2SW, 3SW, 4SW and previous spawner salmon in the fisheries at sea in Finnmark coastal areas in the years 2008-2009, 2011-2012 and 2020-2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

## 11. Summary of the sex distributions in 27 salmon rivers in Finnmark for 1SW, 2SW, 3SW and previous spawning salmon

Females represent the majority of 2SW and 3SW salmon catches during the weeks 20-32 at sea, in all the salmon stocks (Fig. 17). A great majority of 1SW salmon catches are males in all salmon stocks. The proportion of males in 1SW salmon is always higher than 75% for all the stocks caught at sea in Finnmark. In the salmon stocks from the rivers Tana, Altaelv and Reisaelv males represented as much as 95% in 1SW salmon catches.

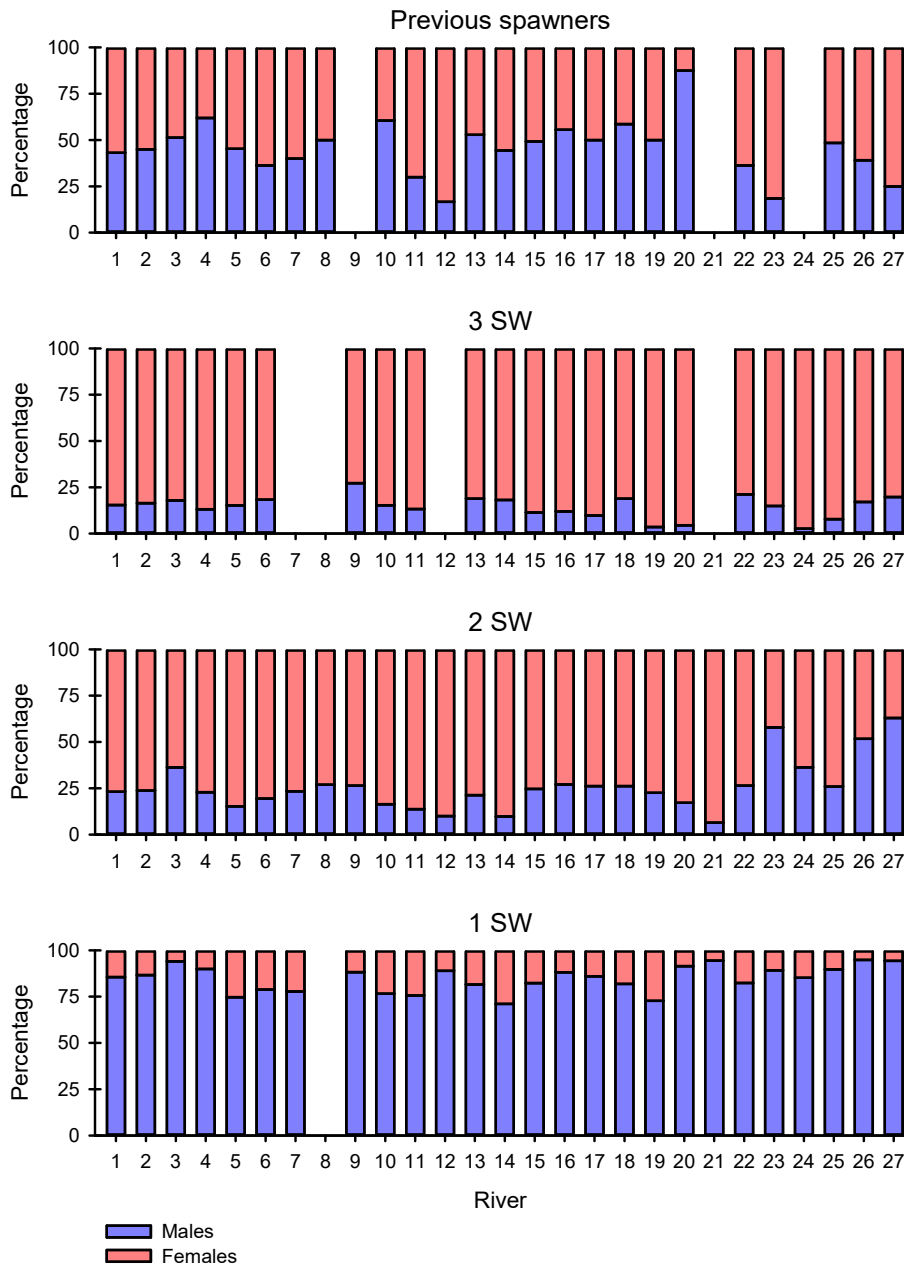


Figure 17. Sex distributions in 1SW, 2SW, 3SW and previous spawned salmon stocks caught at sea in Finnmark in the years 2008-2009, 2011-2012 and 2020-2021. Material is from the weeks 20-32. River and area number are: All salmon stocks together in the materials from Finnmark (1), Tana watershed all salmon stocks together (2), Tana mainstream (3), Karasjohka/Iesjohka (4), Inarijoki/Karigasjoki (5), Utsjoki/Kevojoki (6), Levajohka (7), Laksjohka (8), Maskejohka (9), Grense Jakobselv (10), Karpelv (11), Munkelv (12), Neidenelv (13), Vesterelv (14), Bergebyelv (15), Vestre Jakobselv (16), Skallelv/Komagelv (17), Syltefjordelv (18), Kongsfjordelv (19), Langfjordelv (20), Risfjordelv (21), Børselv (22), Lakselv (23), Stabburselv (24), Repparfjordelv (25), Altaelv (26), Reisaelv (27). Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).



## 12. Cumulative catches between females and males in 1SW, 2SW, 3SW and previous spawned salmon originating from the rivers in Finnmark

Cumulative percentage (accumulated catches) of the catches indicates how fast or slow catches are accumulating. These accumulating curves are also indicating differences in the timing of catches between sea-ages and also, between sexes in each sea-age of salmon. Figures 18-20 demonstrate the differences between sexes in the timing of 1SW, 2SW, 3SW salmon and previous spawners in salmon fishery at sea in Finnmark. Almost in all sea-ages and for each salmon stocks female salmon are accumulating in the catches before males.

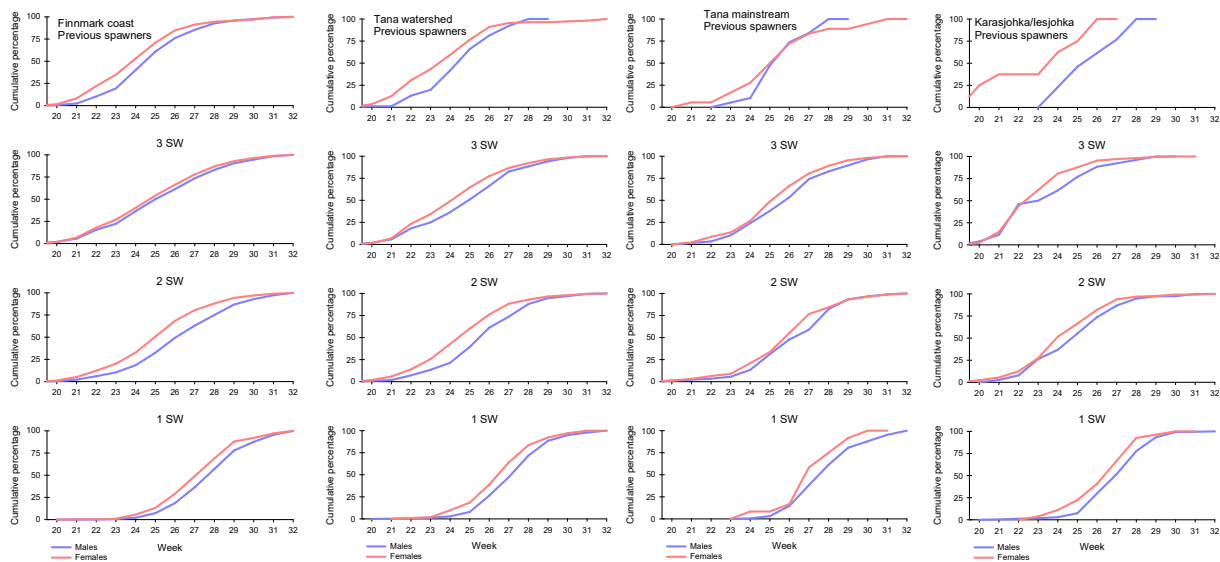


Figure 18. Cumulative catches for 1SW, 2SW, 3SW and previous spawner salmon in the coastal fishery in Finnmark for all the salmon stocks, for Tana watershed area stocks, for Tana mainstream area stocks, for Karasjohka/Iesjohka area stocks in the years 2008-2009, 2011-2012 and 2020-2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

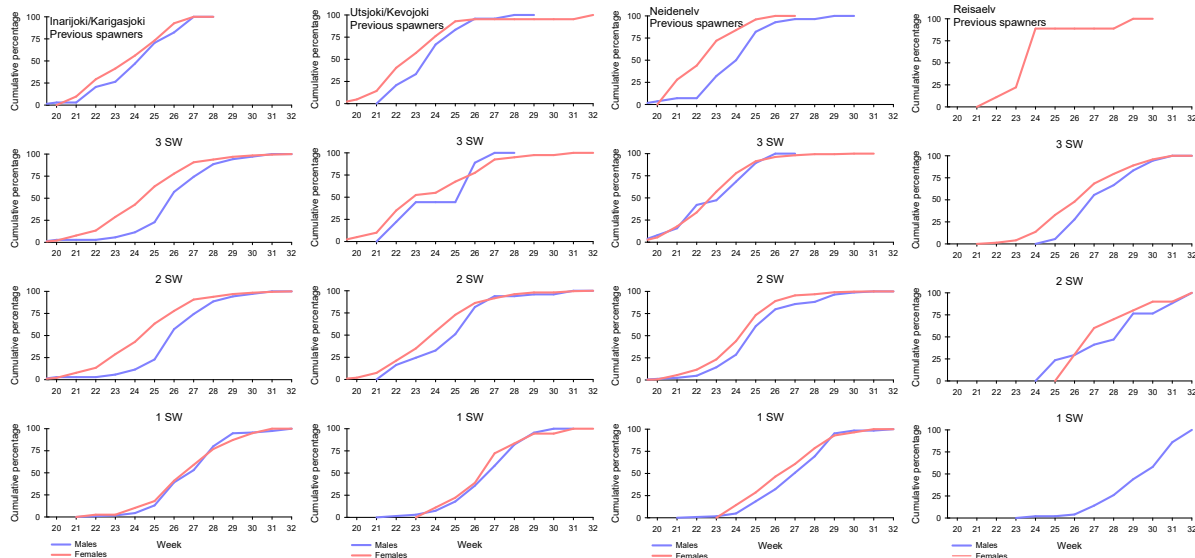


Figure 19. Cumulative catches for 1SW, 2SW, 3SW and previous spawned salmon in the coastal fishery in Finnmark for Inarijoki/Karigasjoki area stocks, for Utsjoki/Kevo area stocks, for the River Neidenelv stocks, for the River Reisaelv stocks in the years 2008-2009, 2011-2012 and 2020-2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

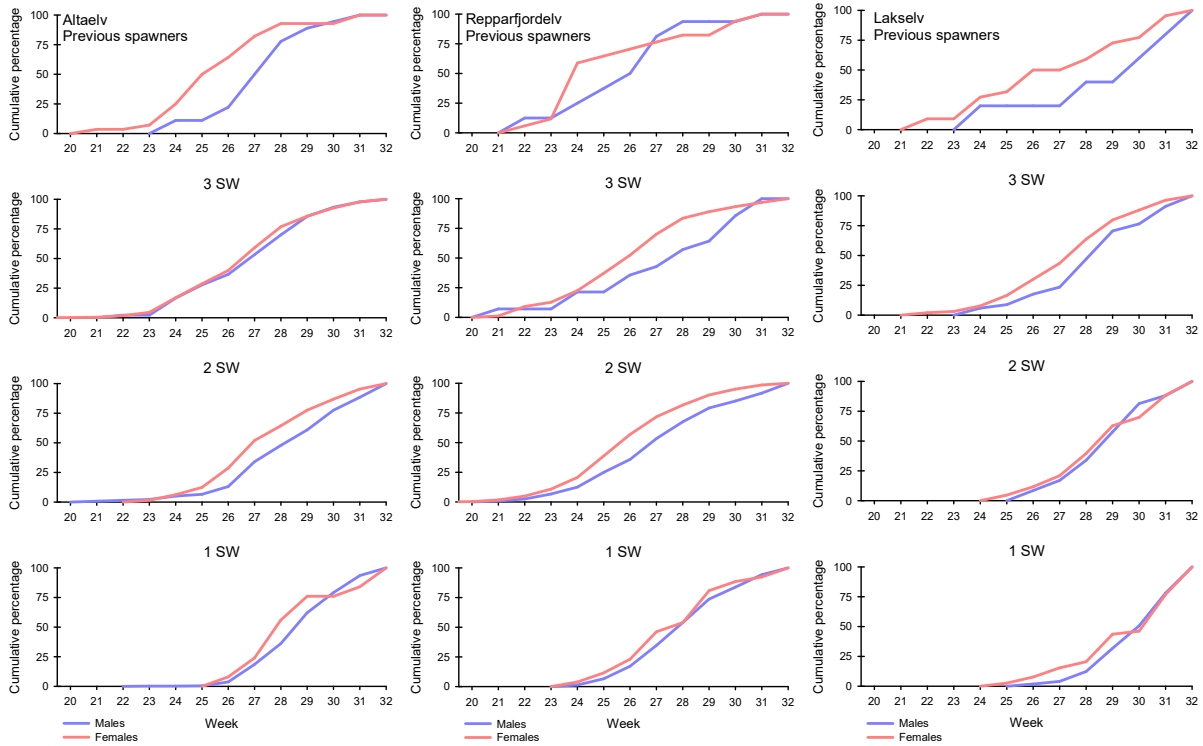


Figure 20. Cumulative catches for 1SW, 2SW, 3SW and previous spawned salmon in the coastal fishery in Finnmark for the River Alta stock, for the River Repparfjordelv stock, for the River Lakselv (Porsanger) stock in the years 2008-2009, 2011-2012 and 2020-2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

### 13. Sea-age distributions for the group of river stocks belonging to Regional RG areas and Local RG areas

Based on the genetical analysis from juvenile salmon in the rivers in Kolarctic area it was possible to identify the origin of adult salmon caught at sea. Origin was a particular river including one genetic salmon stock or restricted smaller geographic region including more than one salmon stock or larger geographic region including large number of salmon stocks. Regional group of salmon rivers (salmon stocks) including large numbers of salmon stocks is Regional RG area which has seven (7) geographical areas (Fig. 21). The second group, including smaller numbers of salmon stocks is Local RG area which has 26 geographical areas (Fig. 22). Using these two regional groups of salmon rivers (salmon stocks) it is practical to illustrate differences for example in sea-age distributions, sex distributions etc. between these areas.

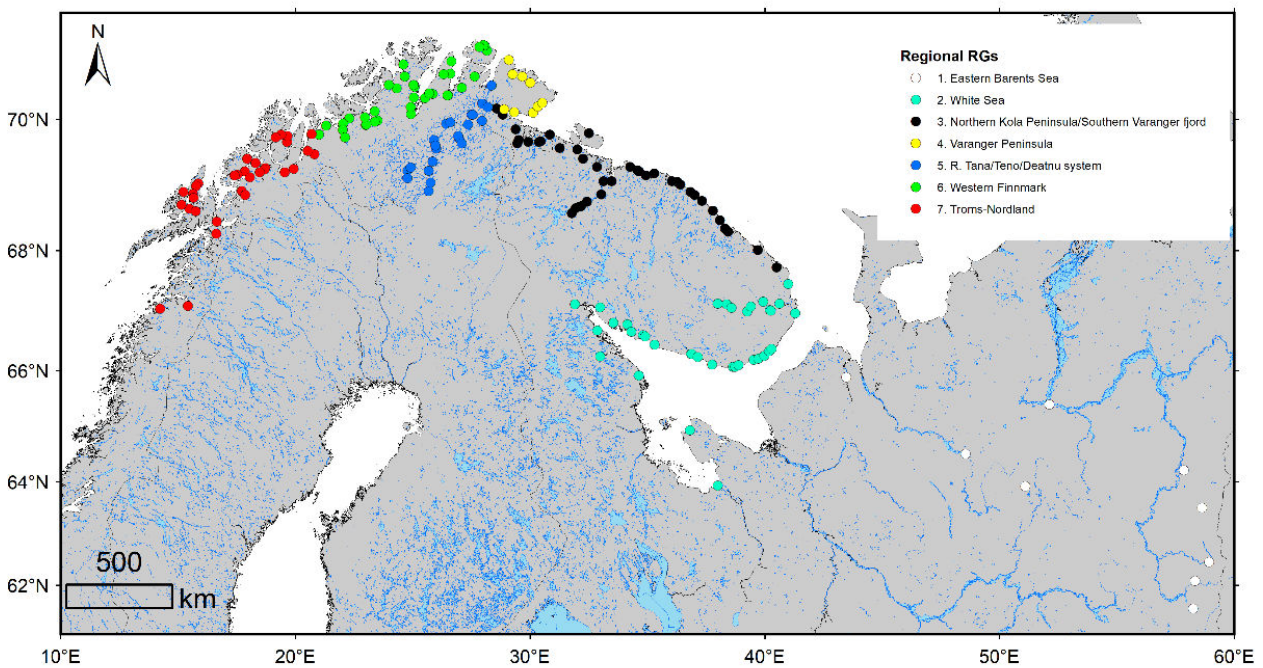


Figure 21. Salmon stocks in North Norway, in Finland and in Russia belongs to seven Regional RG groups. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

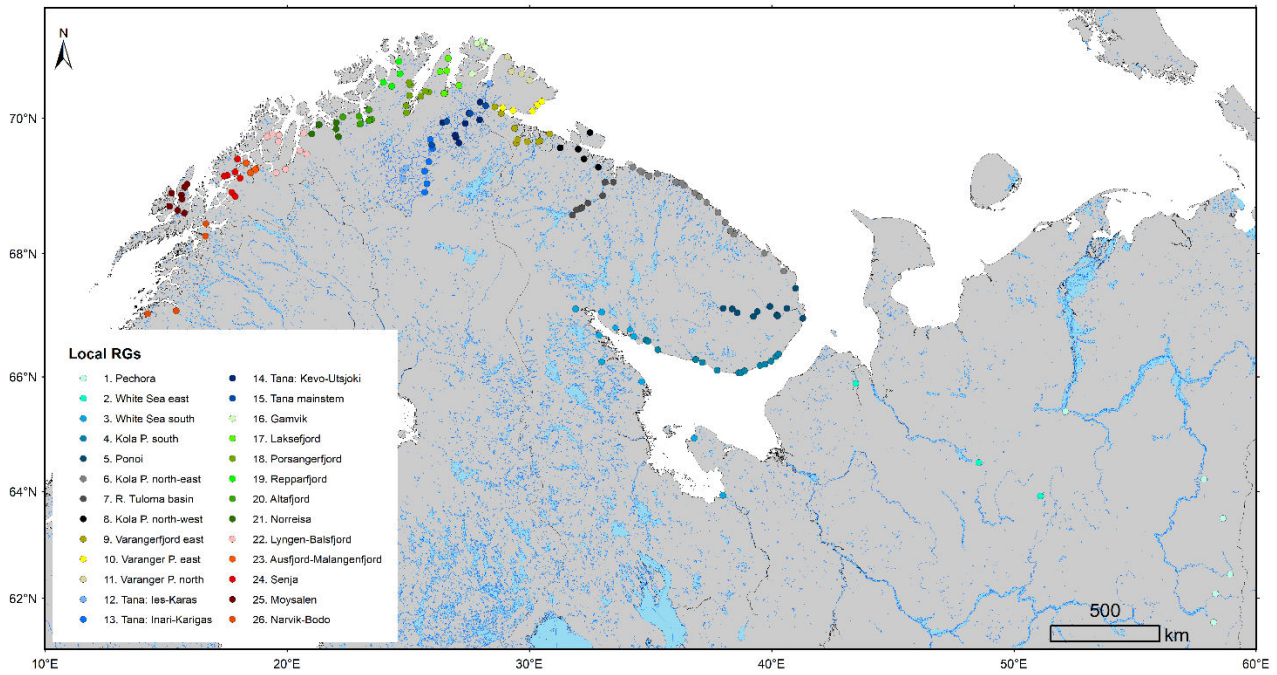


Figure 22. Salmon stocks in Northern Norway, Finland and Russia belongs to 26 Local RG groups. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

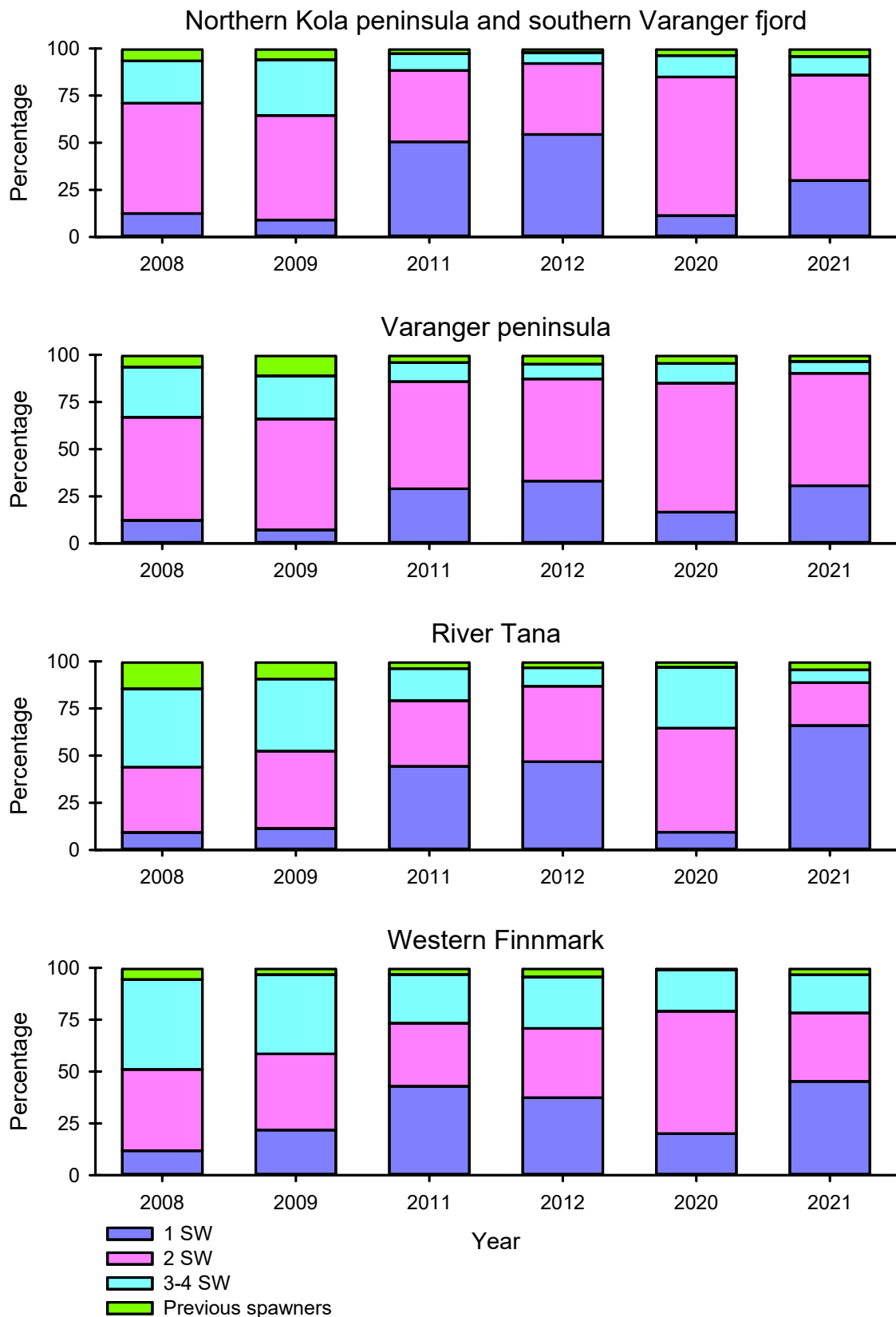


Figure 23. Annual sea-age distributions in the rivers belongs to four Regional RG areas in Finnmark and in North-West Russia. Material covers the weeks 22-31 and is from the fishery in Nordland, Troms and Finnmark. River Tana includes all the salmon stocks from the River Tana watershed. In the year 2021 salmon fishing was prohibited in Tanafjord and in a large coastal area around it. Therefore Tana watershed originated salmon is caught outside that area. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

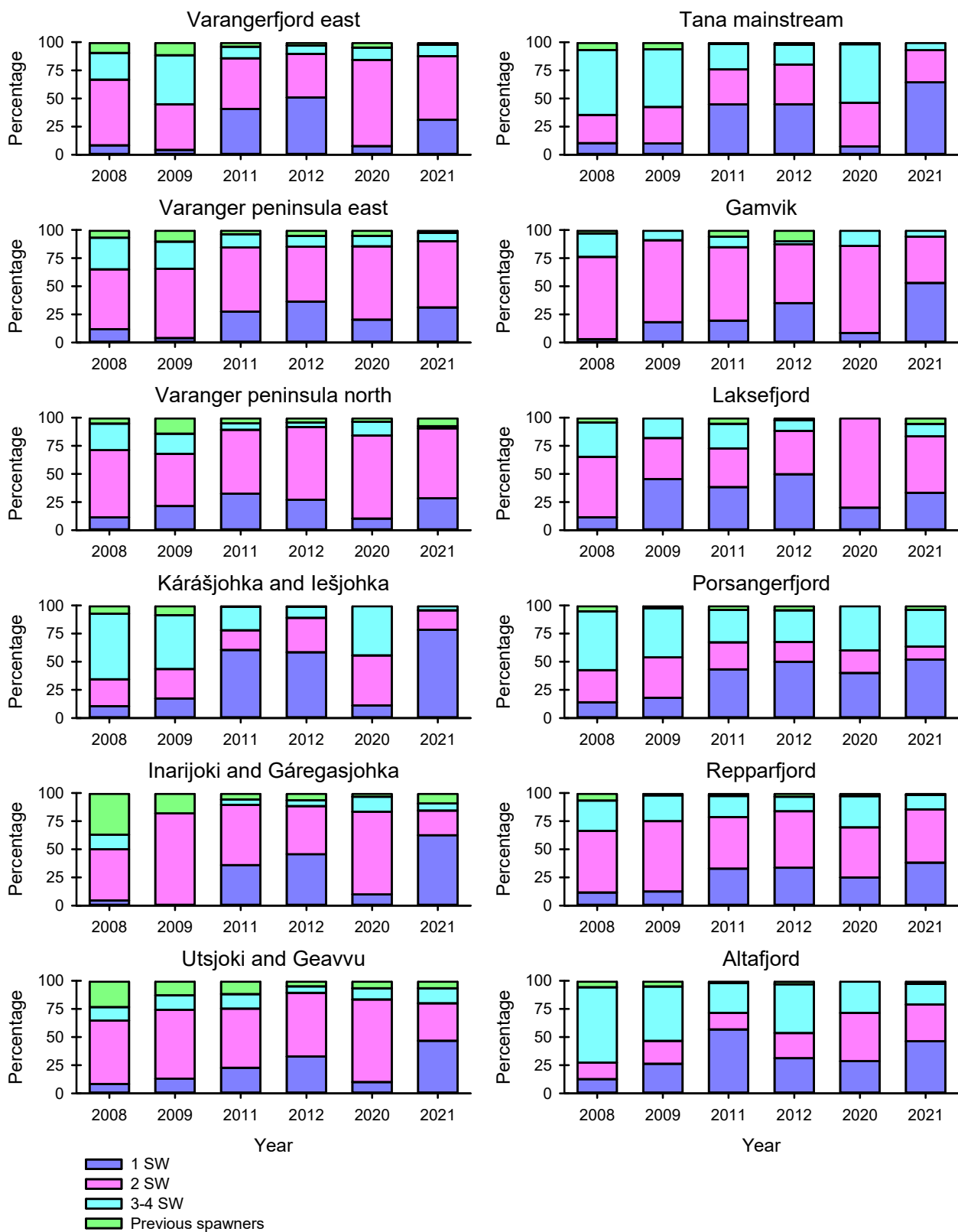


Figure 24. Annual sea-age distributions in the rivers belongs to twelve Local RG areas in Finnmark. Material covers the weeks 22-31 and is from the fishery in Nordland, Troms and Finnmark. In the year 2021 salmon fishing was prohibited in Tanafjord and in a large coastal area around it. Therefore Tana watershed origin salmon is caught outside that area. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

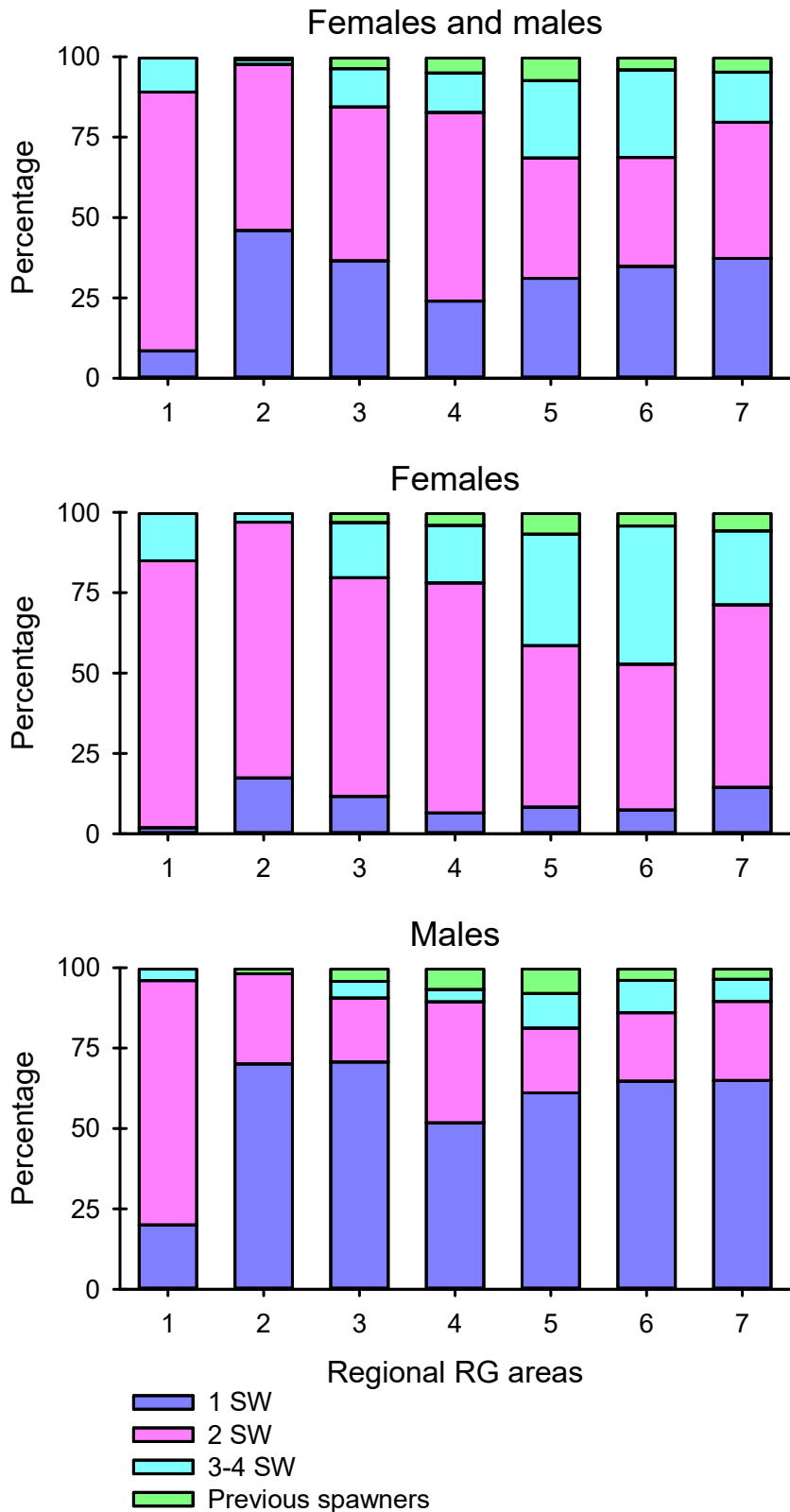


Figure 25. Sea-age distributions for females, males and sexes combined in the rivers belongs to seven Regional RG areas in Troms/Nordland and Finnmark counties and in North-Western Russia. Material covers the weeks 22-31 and is from the fishery in Nordland, Troms and Finnmark in the years 2008, 2009, 2011, 2012, 2020 and 2021. River Tana includes all the salmon stocks from the River Tana watershed. Regional RG areas are: East Barents Sea (1), White Sea (2), Northern Kola Peninsula/Southern Varangerfjord (3), Varanger Peninsula (4), Tana river (5), Western Finnmark (6), Troms/Nordland (7). In the year 2021 salmon fishing was prohibited in Tanafjord and in a large coastal area around it. Therefore Tana watershed origin salmon is caught outside that area. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

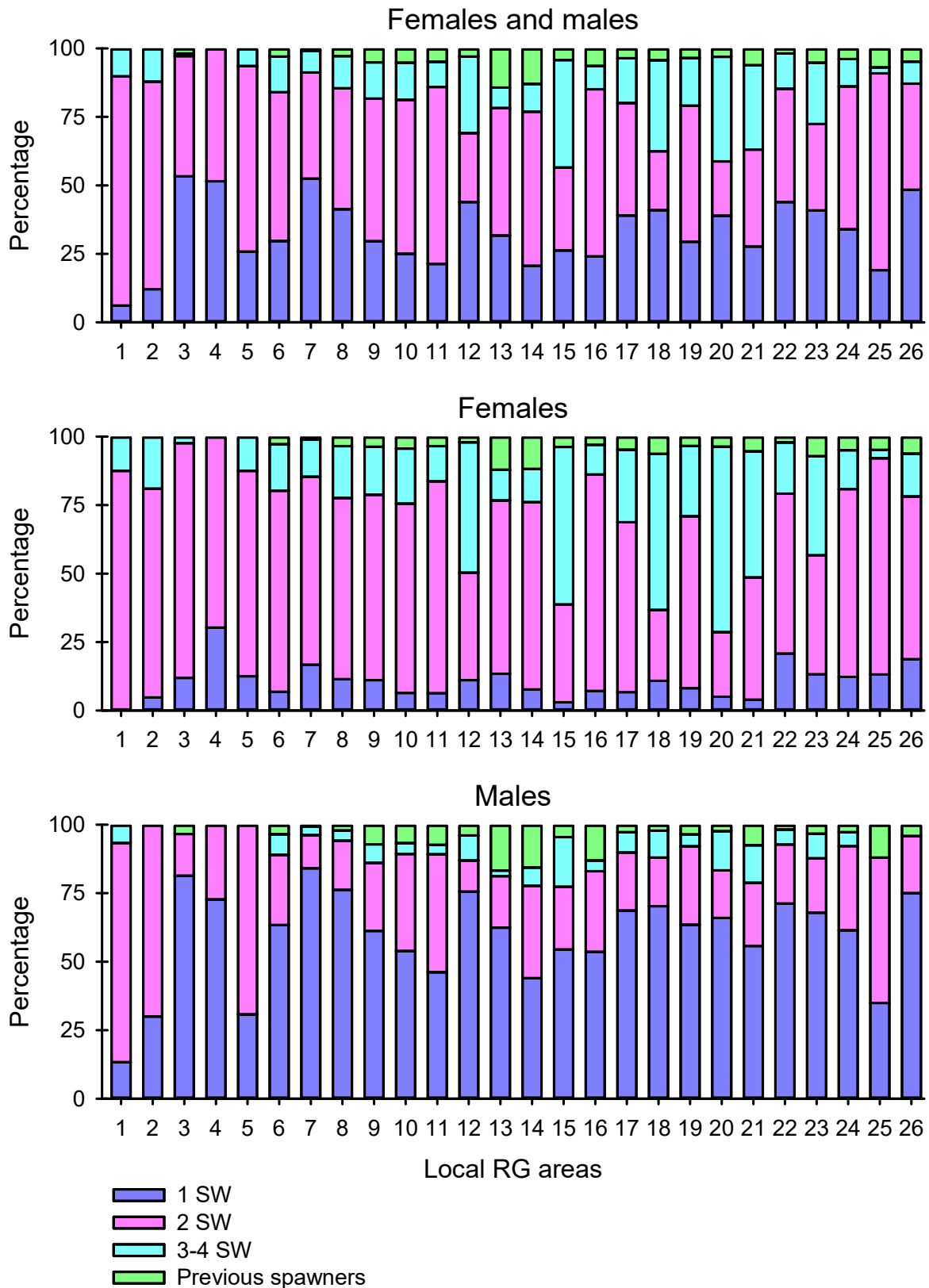


Figure 26. Sea-age distributions for females, males and sexes combined in the rivers belonging into 26 Local RG areas in Finnmark, Troms, Nordland and North-West Russia. Local RG areas are in the figure 22 where the numbers of local RG areas are corresponding to the numbers in the figure 26. Material covers the weeks 22-31 and is from the fishery in Nordland, Troms and Finnmark in the years 2008, 2009, 2011, 2012, 2020 and 2021. In the year 2021 salmon fishing was prohibited in Tanaffjord and in a large coastal area around it. Therefore Tana watershed origin salmon is caught outside that area. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).



## 14. Weekly numbers and proportions of 1SW, 2SW, 3SW, 4SW and previous spawning salmon in the coastal catches in Finnmark originating from northern rivers

Figures 27-31 presents the weekly timing of salmon in all the sea-ages at sea in Finnmark. Migrations are taking place in the same sea-age order for all the salmon stocks, whereas 3SW and 2SW migrates early in the summer in the fishery and 1SW migrates last. There is clear overlapping in the migration timing after week 24 in all stocks between the sea-ages. Figures 27-31 presents the timing of salmon at sea for the most important salmon rivers between Stabburselv and Grense Jakobselv in Finnmark.

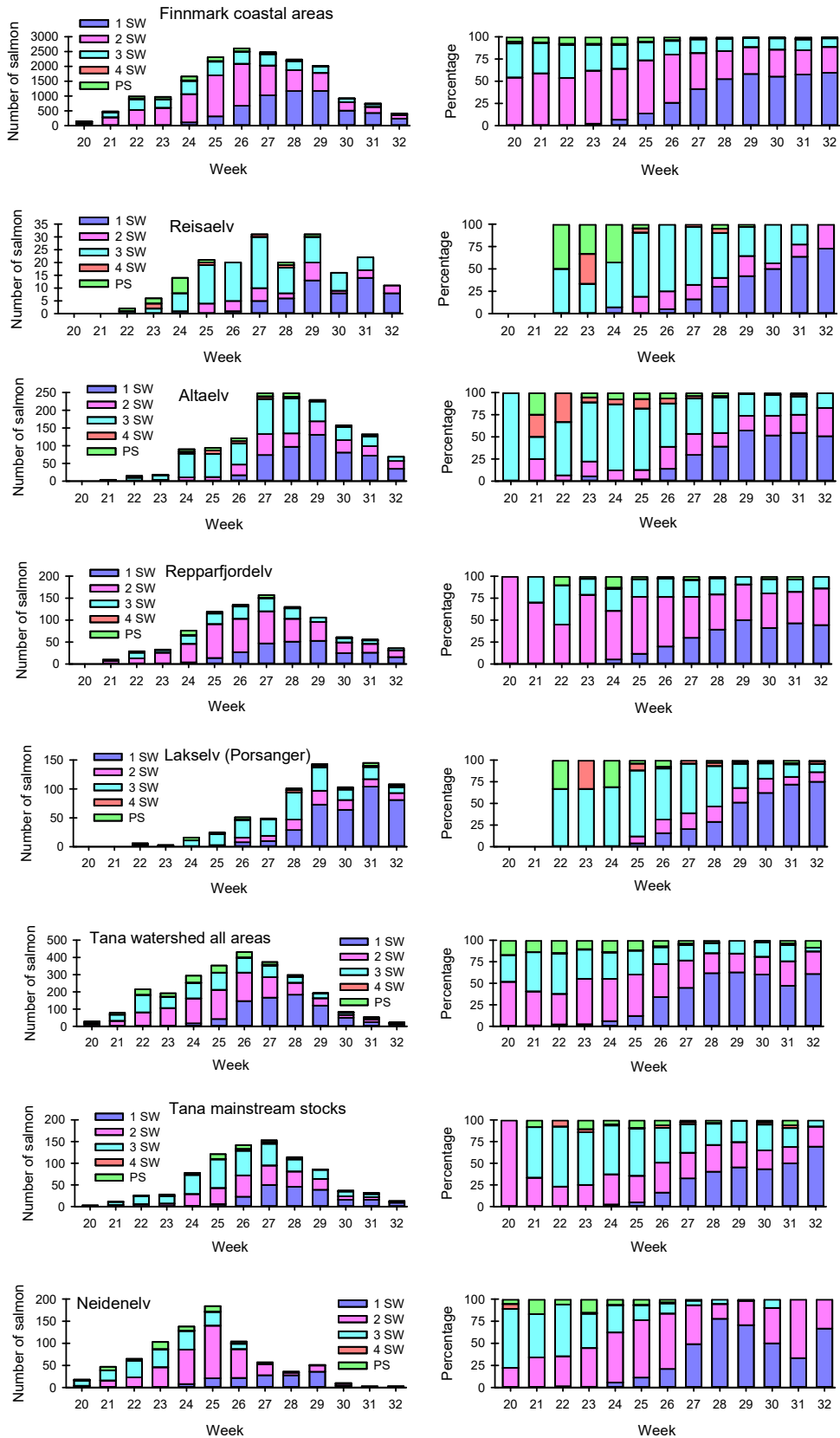


Figure 27. Weekly numbers and proportions of salmon in all sea-ages in Finnmark County all salmon stocks included (figure on the top) and in other salmon rivers in Finnmark. Material is combined from the years 2008, 2009, 2011, 2012, 2010 and 2021 and is collected from the coastal fishery in Finnmark. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

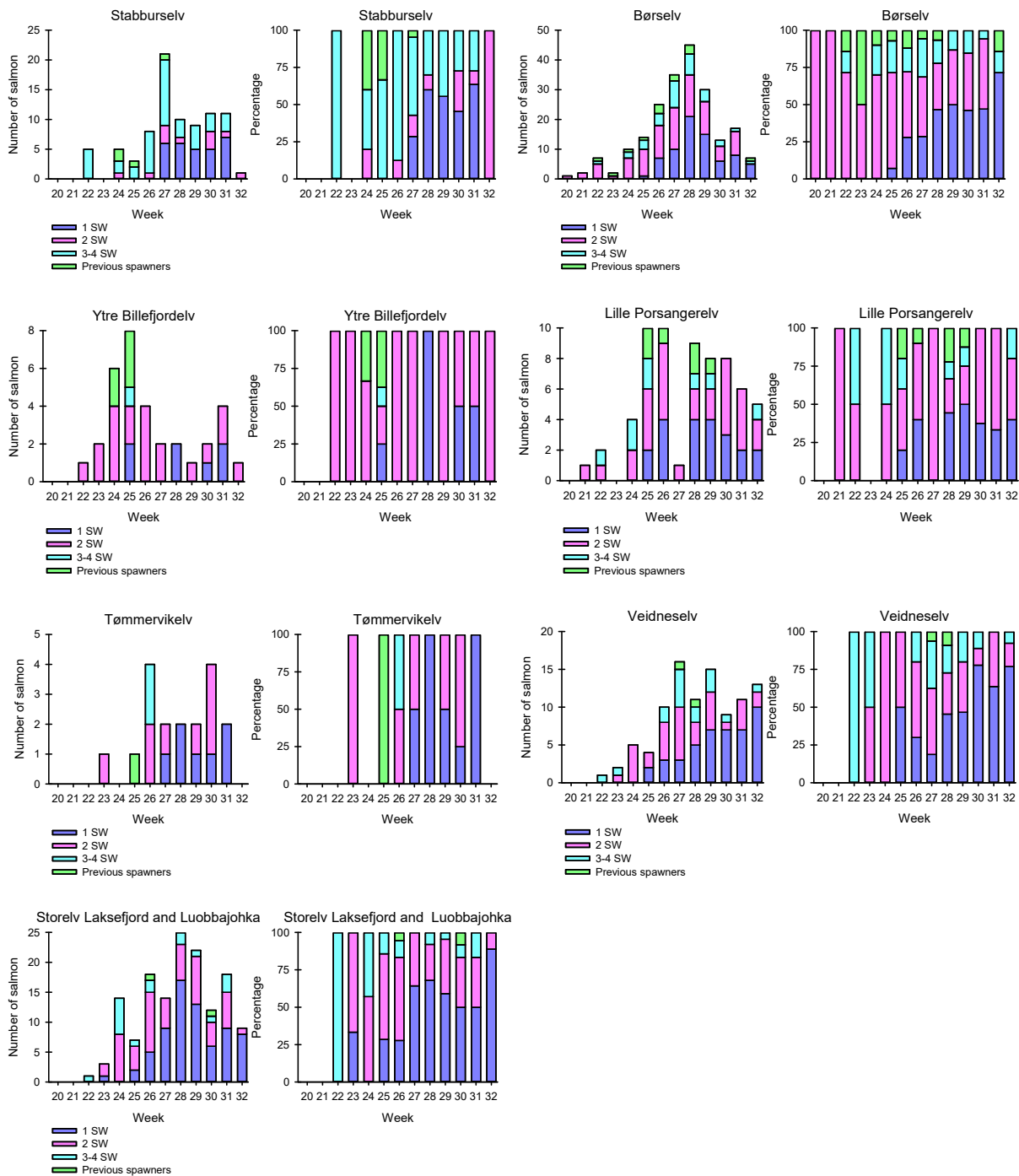


Figure 28. Weekly numbers and proportions of salmon in all sea-ages in the rivers in Finnmark County. Material is combined from the years 2008, 2009, 2011, 2012, 2010 and 2021 and is collected from the coastal fishery in Finnmark. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

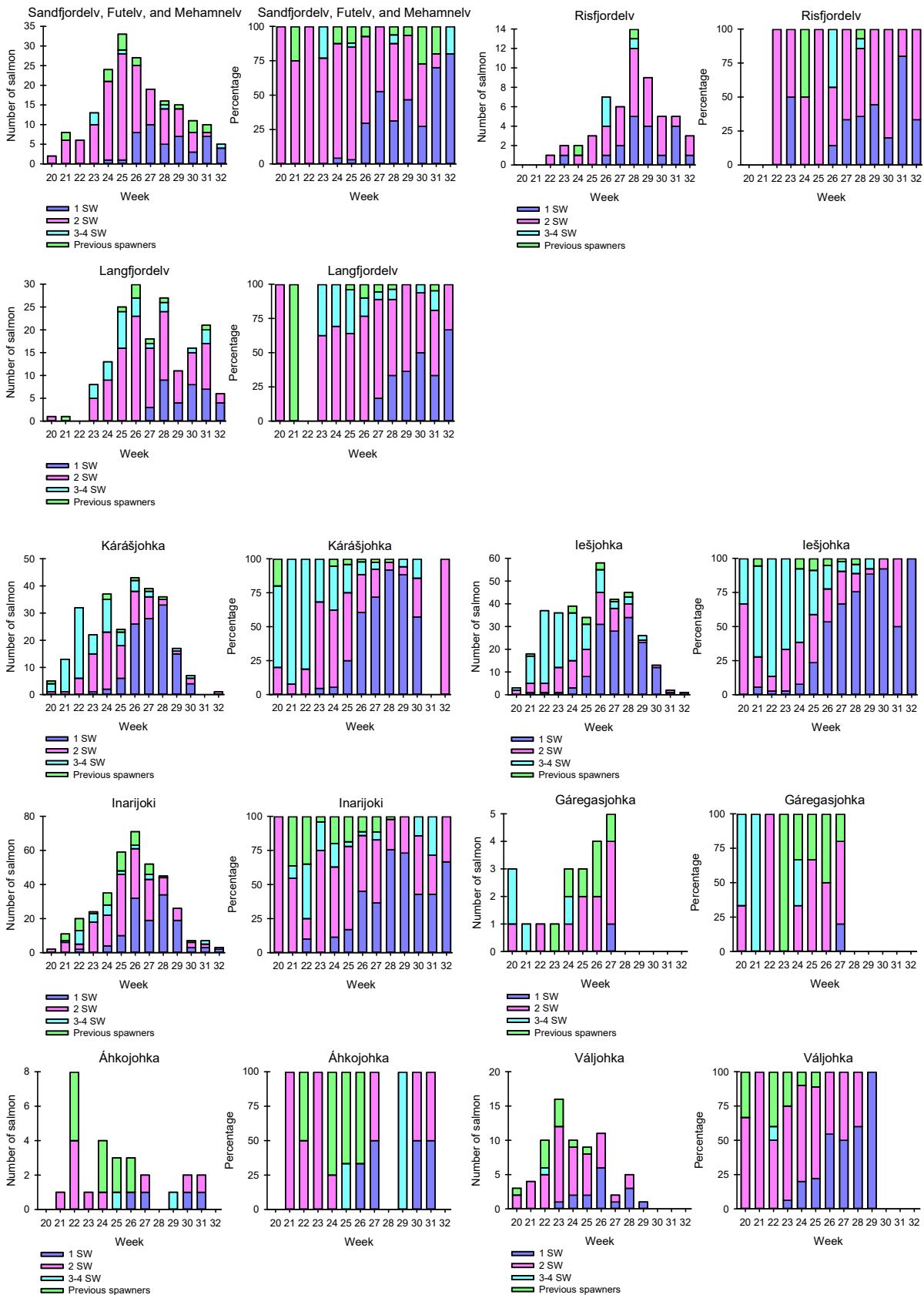


Figure 29. Weekly numbers and proportions of salmon in all sea-ages in the rivers in Finnmark County. Material is combined from the years 2008, 2009, 2011, 2012, 2010 and 2021 and is collected from the coastal fishery in Finnmark. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

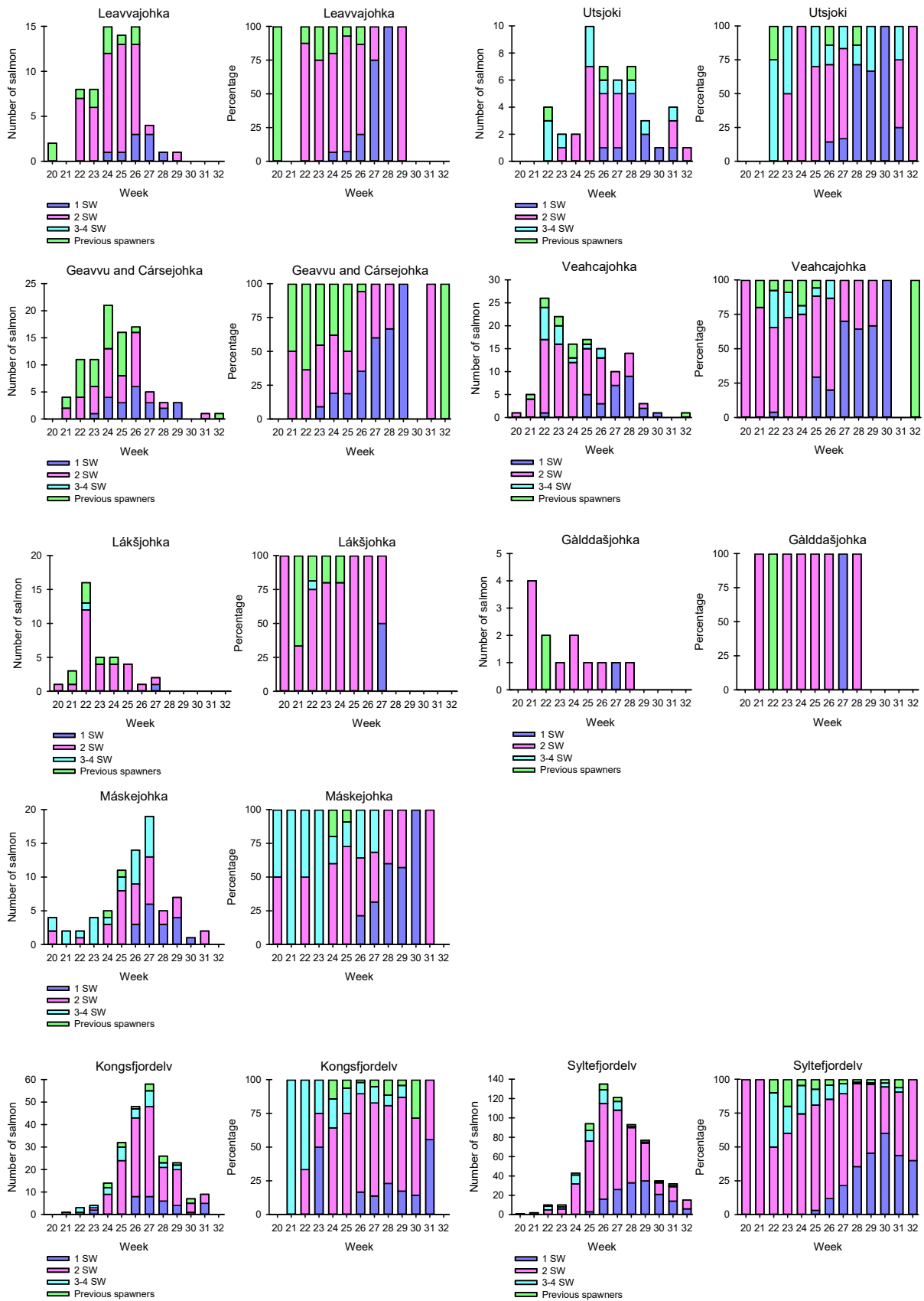


Figure 30. Weekly numbers and proportions of salmon in all sea-ages in the rivers in Finnmark County. Material is combined from the years 2008, 2009, 2011, 2012, 2010 and 2021 and is collected from the coastal fishery in Finnmark. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

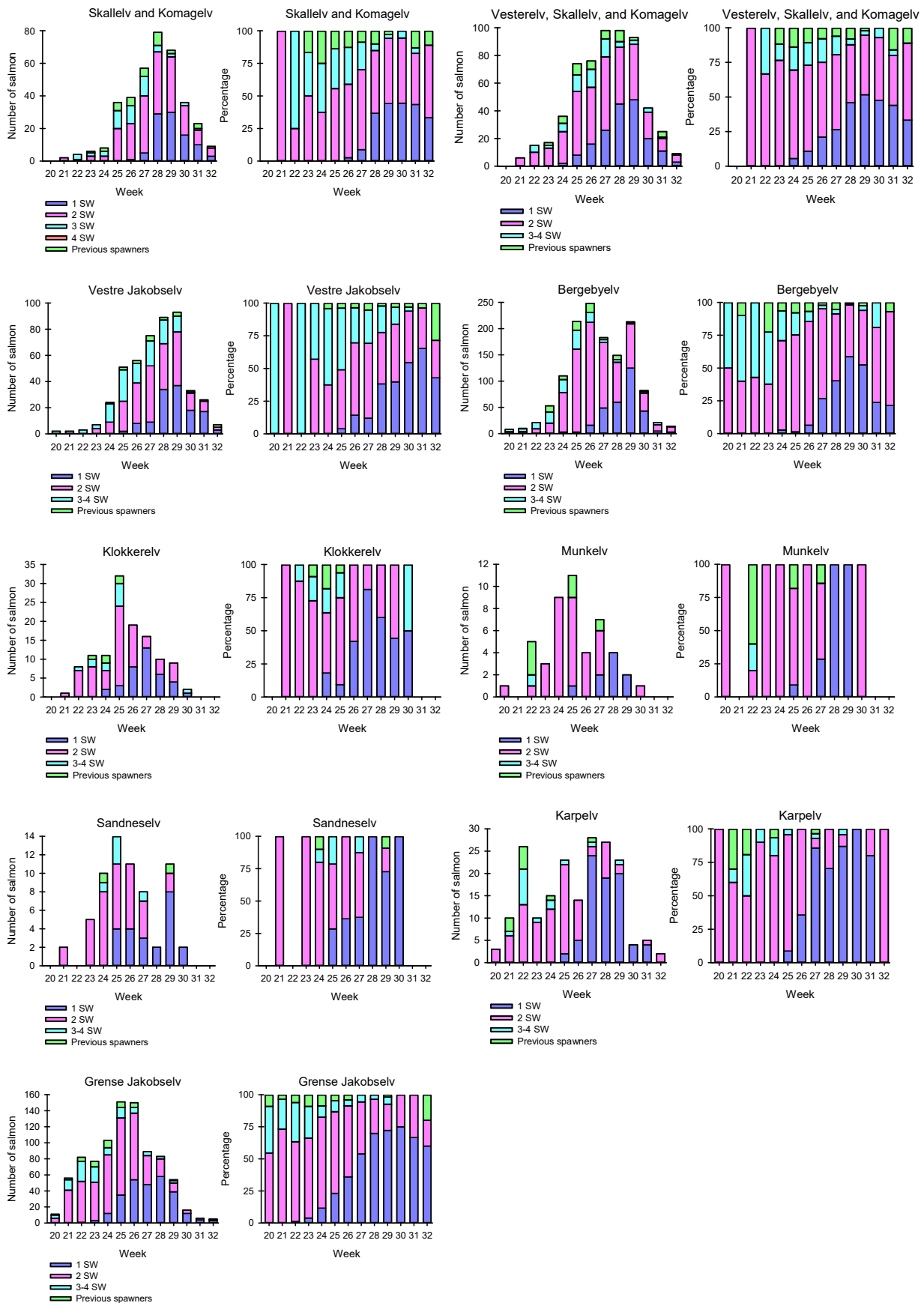


Figure 31. Weekly numbers and proportions of salmon in all sea-ages in the rivers in Finnmark County. Material is combined from the years 2008, 2009, 2011, 2012, 2010 and 2021 and is collected from the coastal fishery in Finnmark. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

## 15. Differences in the timing of salmon catches between the important stocks from the rivers Tana watershed, Alta, Lakselv and Neiden along the coastal areas in Northern Norway

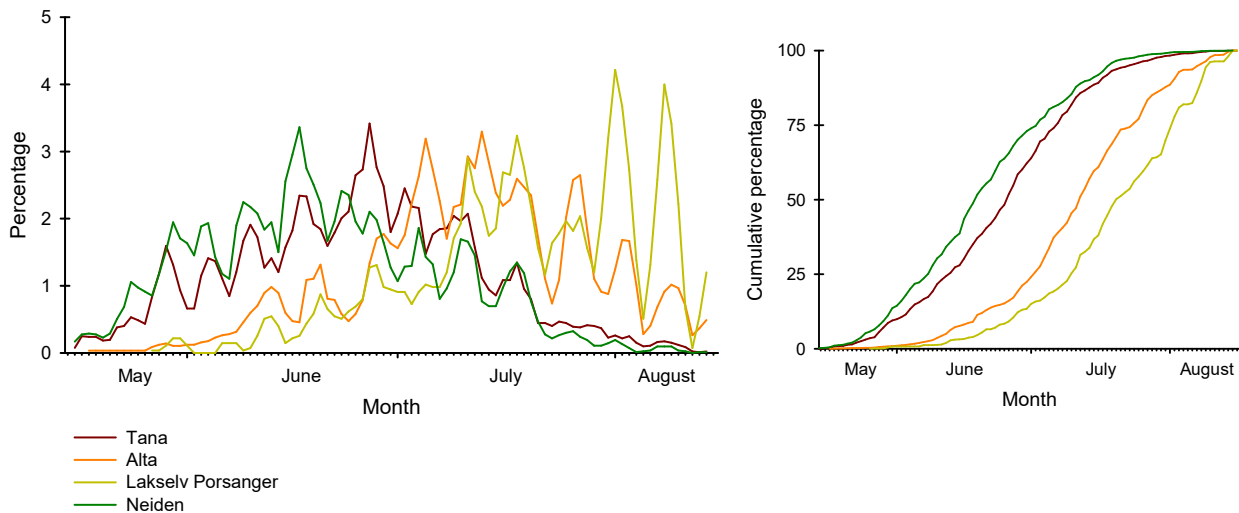


Figure 32. Daily catches (figure on the left) and cumulative catches (figure on the right) from salmon stocks (sea ages 1SW, 2SW, 3-4SW and previous spawner combined) belonging into the rivers Alta, Lakselv, Tana watershed and Neiden. Salmon was caught at sea in Finnmark, Troms and Nordland in the years 2008, 2009, 2011, 2012, 2020 ja 2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

Based on the daily numbers of salmon in the fishery and on the cumulative catch curves (based on the numbers of salmon) we can conclude that salmon from the River Neiden is the first target in the fishery in Northern Norway, out of these four salmon stocks (Fig. 32). Salmon from the River Tana ascends somewhat later into the coastal areas. Salmon from the River Alta migrates clearly later into the coastal areas. Salmon stock from the River Lakselv has the latest migratory model compared to the migration models mentioned above. Spatial and temporal salmon fishing regulations can have some affect into the daily catches and their accumulation.

## 16. Differences in the catch timing in Northern Norway (collected from Nordland, Troms, Finnmark) for salmon originating from the rivers in Finnmark, Troms and Nordland in Norway and from Finland and from Russia

Figure 33 is indicating the large variation in the migration periods at sea between 33 rivers in Northern Norway, Finland and Russia. These figures highlights that there are numerous salmon stocks migrating more or less simultaneously and are targets for coastal mix-stock fishery. There are, however, clear differences in the median dates of capture between some rivers. Median dates of capture in the rivers Skallelv/Komagelv and Vestre Jakobselv are clearly later than in their neighboring rivers like in Bergebyelv, Nyelv/Vesterelv and in Syltefjordelv (Fig. 34). Rivers in each Local RG area are genetically closer to each other than to the rivers in neighboring Local RG areas and that may affect the simultaneous migrations (Fig. 35).



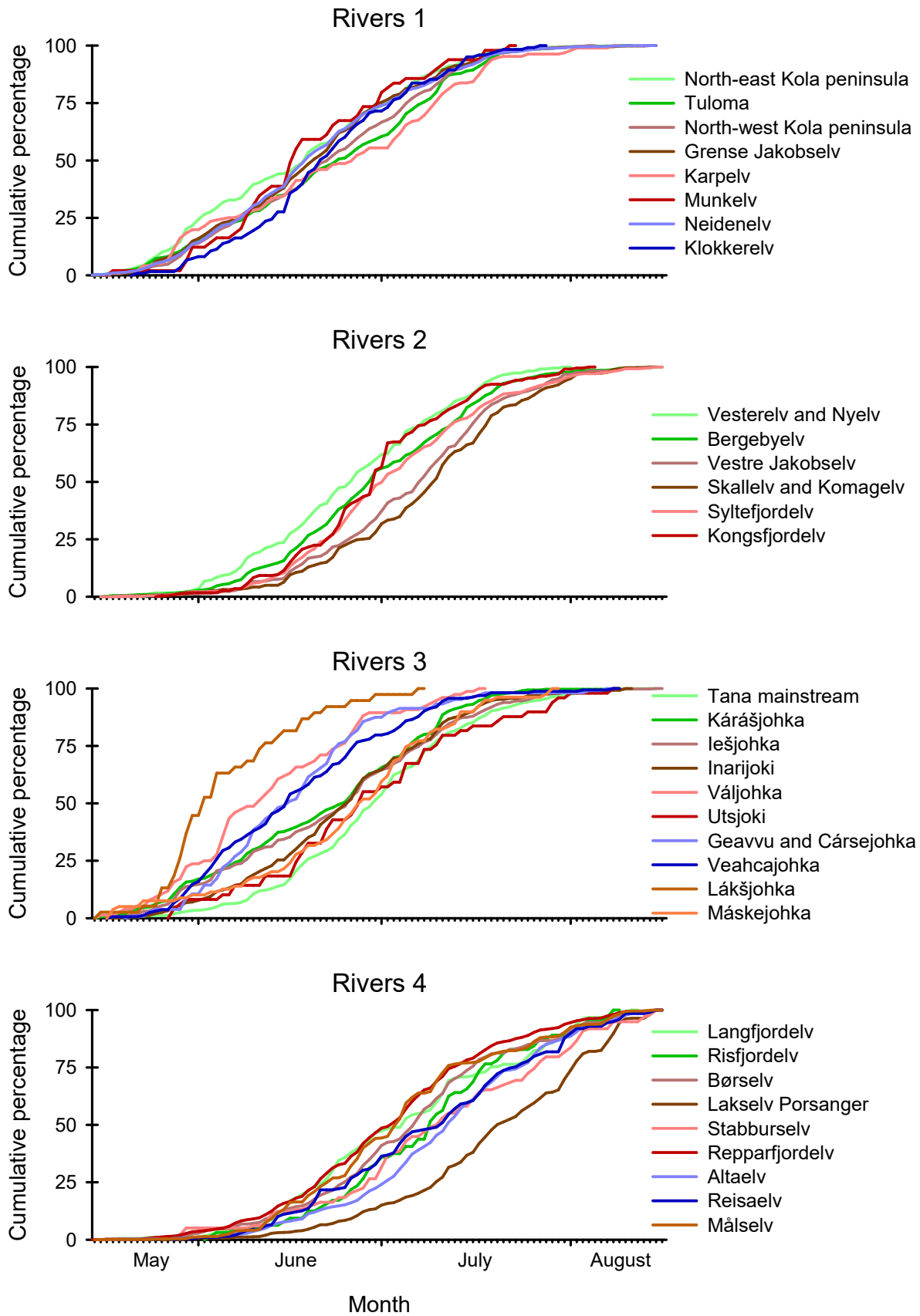


Figure 33. Cumulative catches for salmon stocks (sea ages 1SW, 2SW, 3-4SW and previous spawners combined) belonging to four large geographical areas between North-East Kola Peninsula in Russia and the River Målselv in Troms county. Salmon was caught at sea between May 15<sup>th</sup> and August 15<sup>th</sup> in Finnmark, Troms and Nordland in the years 2008, 2009, 2011, 2012, 2020 ja 2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

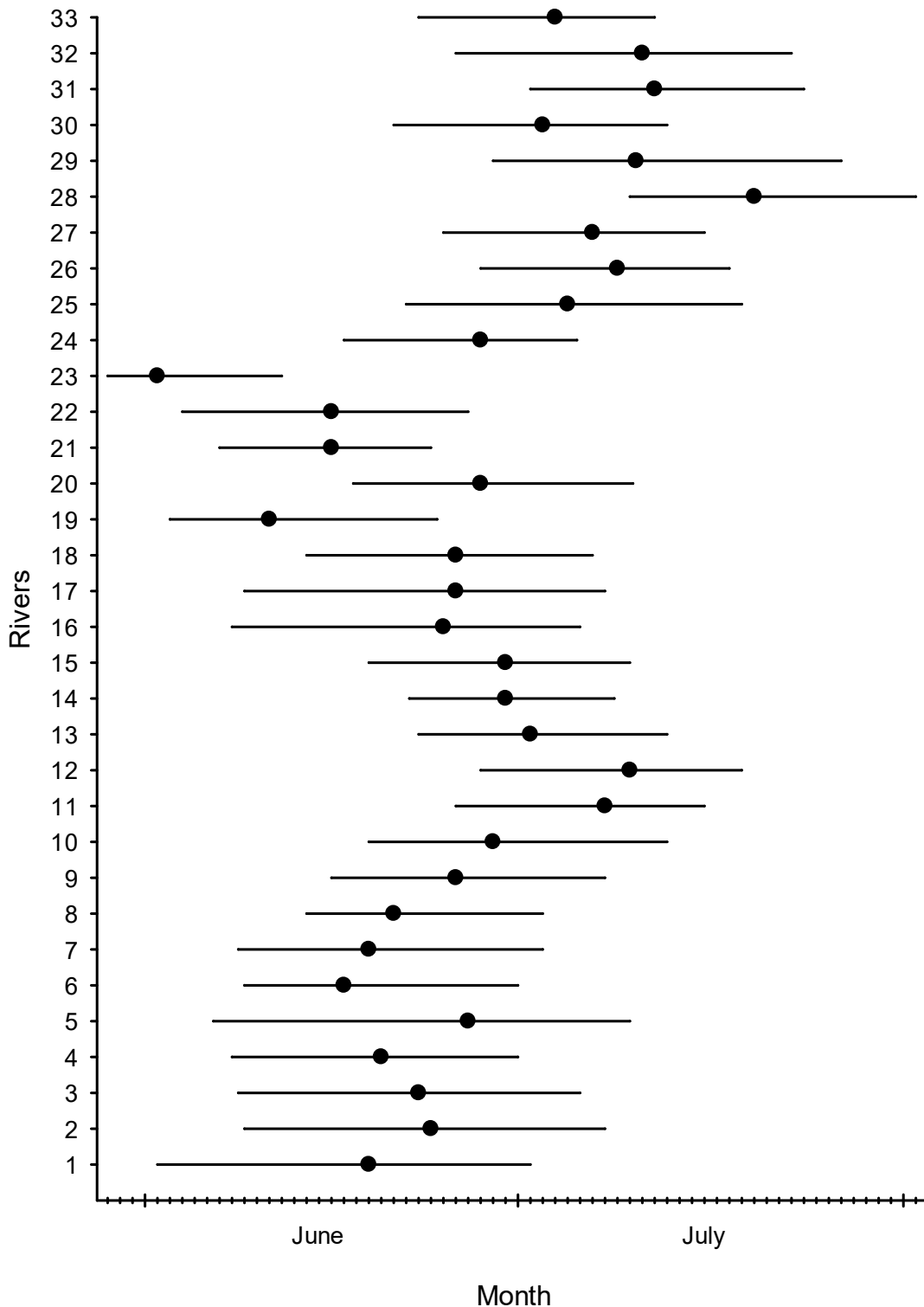


Figure 34. Median dates of capture with lower and upper quartiles for salmon stocks presented in the figure 33. Rivers are: North-East Kola peninsula (1), Tuloma (2), North West Kola peninsula (3), Grense Jakobselv (4), Karpelv (5), Munkelv (6), Neiden (7), Klokkerelv (8), Vesterelv+Nyelv (9), Bergebyelv (10), Vestre Jakobselv (11), Skallelv+Komagelv (12), Syltefjordelv (13), Kongsfjordelv (14), Tana mainstream (15), Karasjohka (16), Iesjohka (17), Inarjoki (18), Valjohka (19), Utsjoki (20), Kevo+Tsarsejoki (21), Vetsijoki (22), Laksjohka (23), Maskejohka (24), Langfjordelv (25), Risfjordelv (26), Børselv (27), Lakselv Porsanger (28), Stabburselv (29), Repparfjordelv (30), Alta (31), Reisaelv (32), Målselv (33). Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

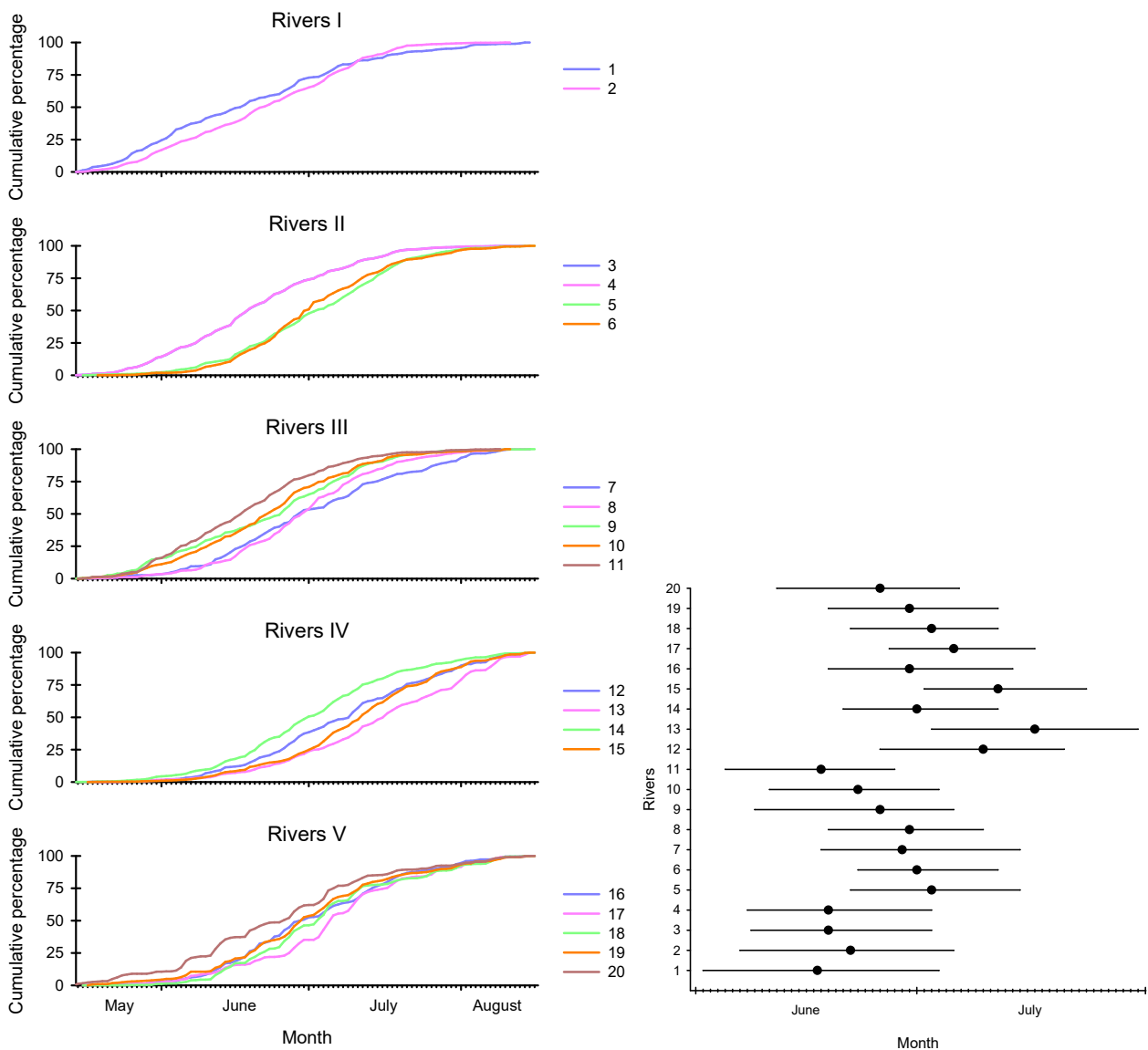


Figure 35. Cumulative catches and median dates of captures with lower and upper quartiles for salmon stocks belonging to Local RG areas in the counties Finnmark, Troms and Nordland. Cumulative catches (figure on the left) and median date of capture (figure on the right) are based on the material collected in the years 2008-2009, 2011-2012, 2020-2021 at sea between May 15<sup>th</sup> and August 15<sup>th</sup> in Finnmark, Troms and Nordland. Rivers are: **Rivers I**; Pechora, White Sea east and south, Kola peninsula south (1), From Ponoï to Tuloma basin area stocks (2), **Rivers II**; Varangerfjord east area stocks (3), Neiden area stock (4), Varanger peninsula east area stocks (5), Varanger peninsula north area stocks (6), **Rivers III**; Gamvik area stocks (7), Tana mainstream area stocks (8), Karasjohka and Iesjohka areas stocks (9), Inarijoki and Karigasjoki area stocks (10), Utsjoki and Kevojoki areas stocks (11), **Rivers IV**; Laksefjord area stocks (12), Porsanger area stocks (13), Repparfjord area stocks (14), Altafjord area stocks (15), **Rivers V**; Norreisa area stocks (16), Lyngen and Balsfjord areas stocks (17), Ausfjord and Malangenfjord areas stocks (18), Senja area stocks (19), Møysalen, Narvik and Bodø areas stocks (20). Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

17. Daily development in the numbers and proportions of 1SW, 2SW, 3-4SW and previous spawned salmon in the coastal fisheries in Northern Norway (Finnmark, Troms and Nordland catch data combined) for salmon stocks in the River Tana watershed and Neidenelv

Daily numbers and proportions of 1SW, 2SW, 3-4SW and previous spawners in the catches in Northern Norway clearly indicates the overlapping migration periods for small, medium and large salmon in the River Tana mainstream and in its tributaries and, in the River Neidenelv salmon stocks (Figs. 36-40). Especially figure 41 where all the salmon stocks from the rivers Tana and Neiden are combined presents ideally differences in the timing of salmon in all sea-ages. Previous spawners are migrating together with 2SW and 3SW salmon along the coastal shore areas of Northern Norway.

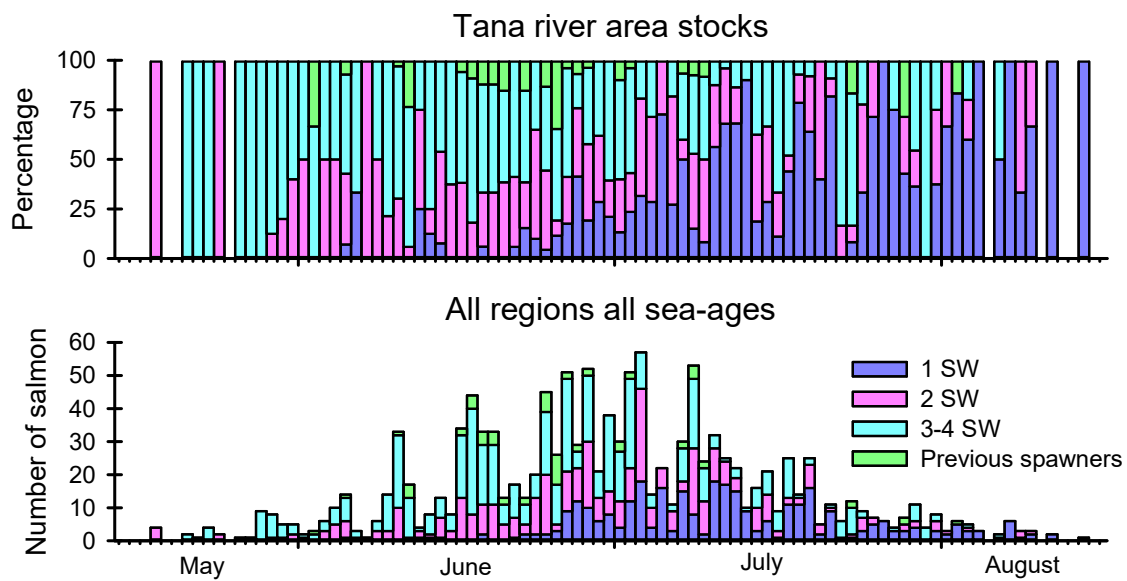


Figure 36. Daily catches of the River Tana mainstream area salmon stocks in Northern Norway in the years 2008-2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

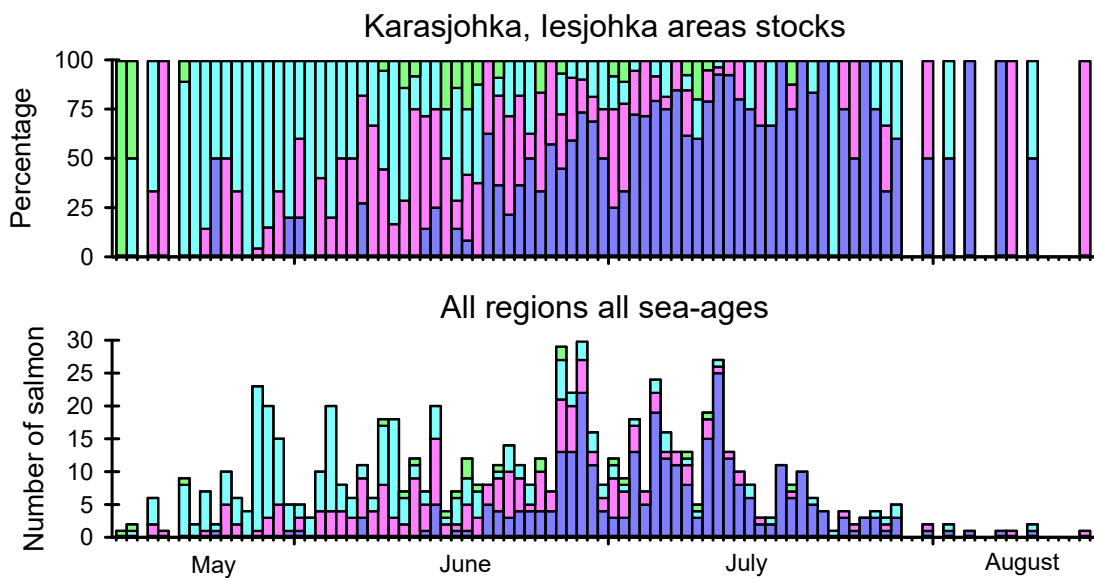


Figure 37. Daily catches of the rivers Karasjohka/lesjohka area salmon stocks in Northern Norway in the years 2008-2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

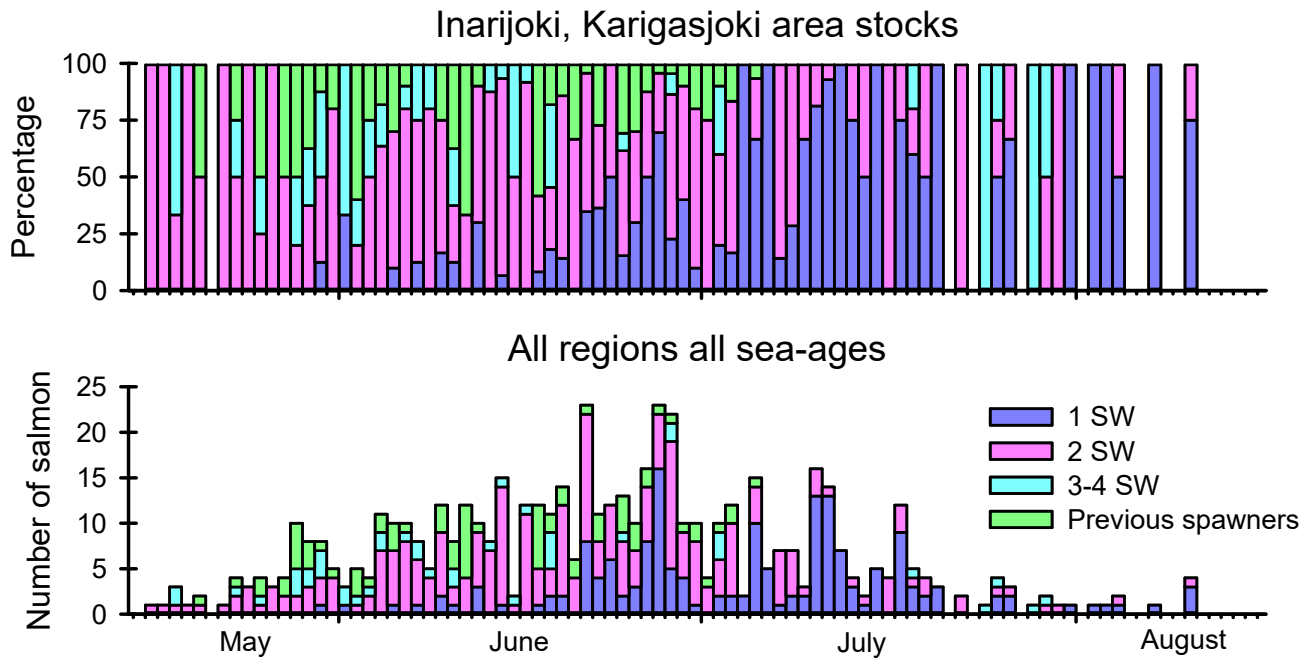


Figure 38. Daily catches of the rivers Inarijoki/Karigasjoki area salmon stocks in Northern Norway in the years 2008-2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

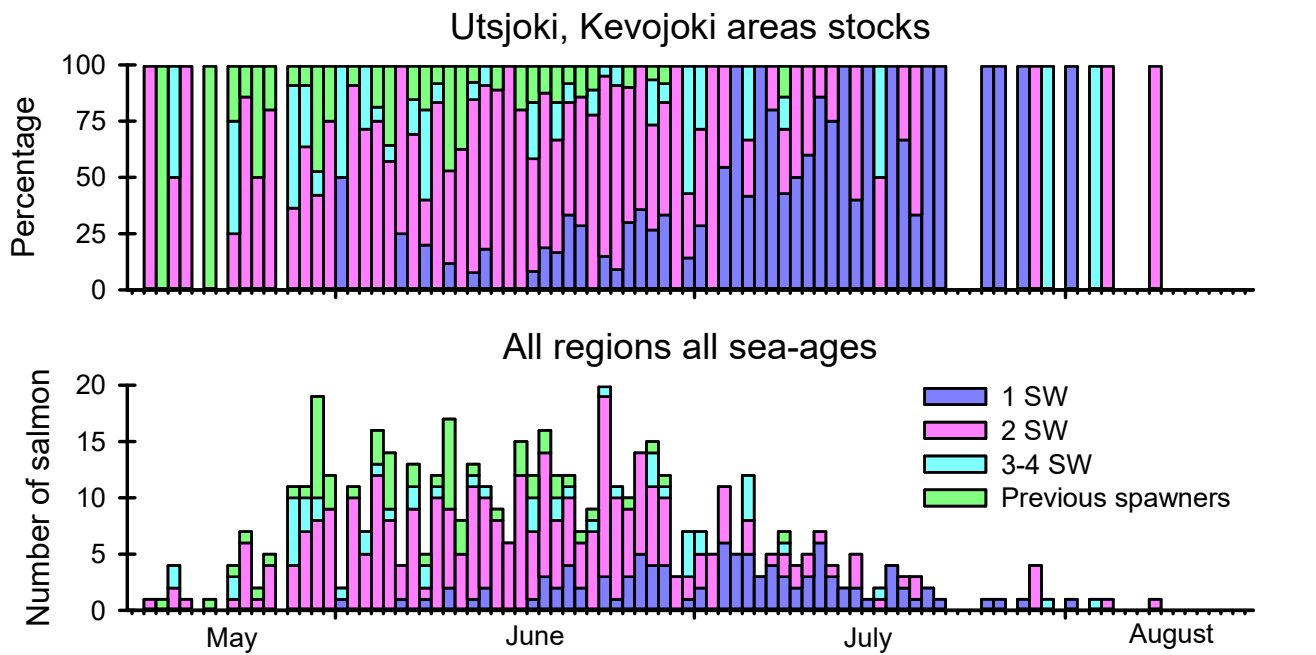


Figure 39. Daily catches of the rives Utsjoki/Kevo area salmon stocks in Northern Norway in the years 2008-2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

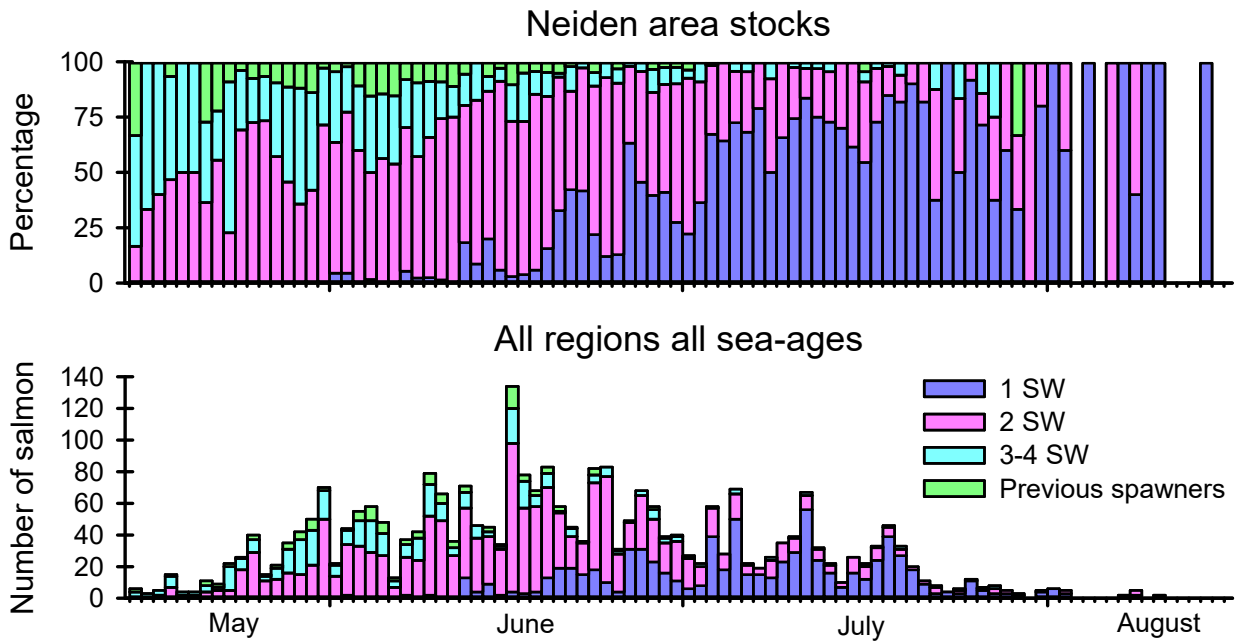


Figure 40. Daily catches of the River Neiden area salmon stocks in Northern Norway in the years 2008-2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

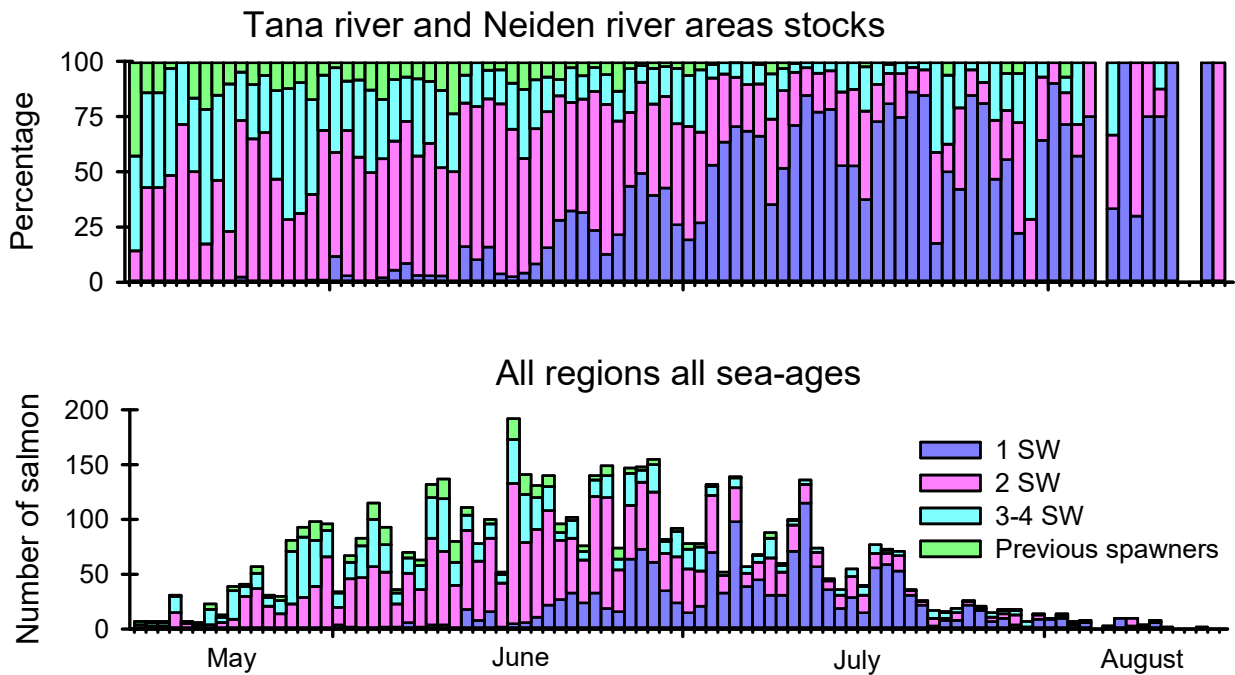


Figure 41. Daily catches of the rivers Tana and Neiden area salmon stocks at sea in Northern Norway in the years 2008-2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

## 18. Bag net and bend net catches in the years 2020 and 2021 in research fishery in Finnmark

Bag nets has been used at sea in Norway since the middle of 1800's, bend nets since the middle of 1960's and especially from the beginning of 1970's. 2021 was the last year when bend nets were allowed to use for salmon fishing. Bend nets are more selective in catching larger salmon than bag nets because of the larger mesh sizes used in bend nets. Figures 42 and 43 demonstrate this selective fishery in the week 26 especially in the year 2020 in Varangerfjord and in the year 2021 in Altafjord. From 2022 and forward, bag net fishery will most probably target 1SW salmon more effectively, because fishers who previously used bend nets now have to use bag nets with smaller mesh size.

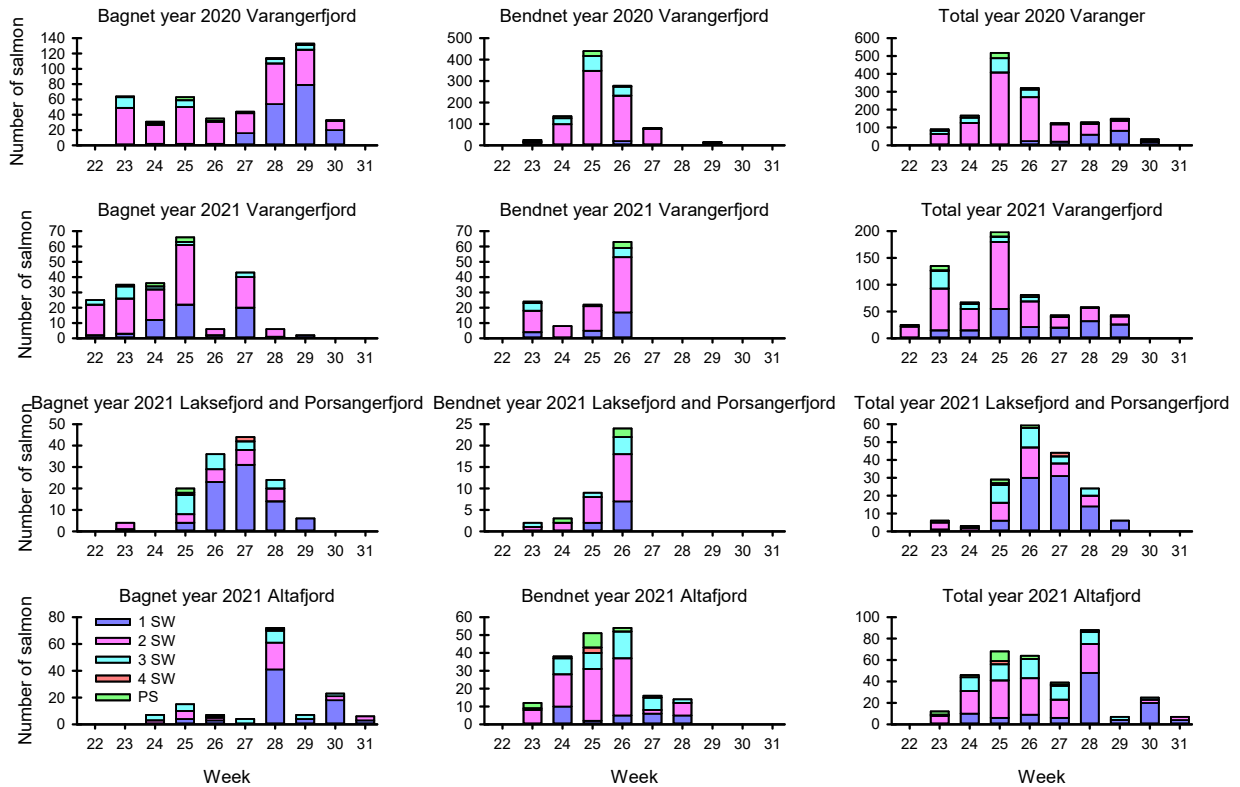


Figure 42. Weekly catches in bag net and bend net fisheries in Varangerfjord, Laksefjord & Porsangerfjord and in Altafjord in the years 2020 and 2021. Source: Kolarctic EU/ENI CBC (KO 4178).

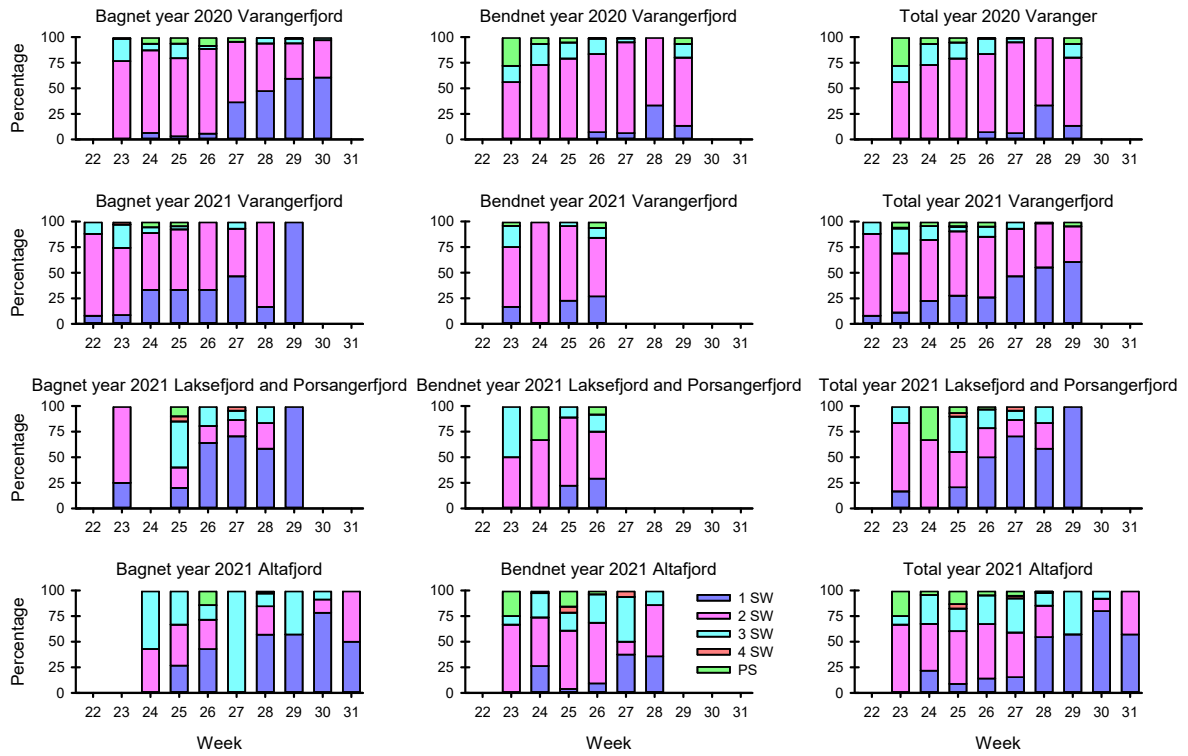


Figure 43. Sea-age distributions in the weekly catches in bag net and bend net fisheries in Varangerfjord, Laksefjord & Porsangerfjord and in Altafjord in the years 2020 and 2021. Source: Kolarctic EU/ENI CBC (KO 4178).



## 19. Selective fishing between bag nets and bend nets

In Finnmark, there are mainly two fishing methods that has been used for salmon fishing at sea: The old-fashioned bag net and the more modern bend net. Bend net fishing lasted from 1960's to 2021, while bag net fishing started in the middle of 1800's and it is still allowed today.

Selective salmon fishing in net fishing means to target the larger fish over smaller fish or females over males. Some net fishing methods are more selective than another net fishing methods. This kind of selective fishing at sea can in long-term result in an undesirable structure in the spawning stocks. The selection of the size of salmon is understandable because the mesh sizes in the bag nets are throughout the summer usually close to the minimum of 58 mm from knot to knot but the fishermen seem to use bend nets with different mesh sizes during the season, intentionally to increase the yield. Early in the season when large salmon are migrating along the coast, some fishers preferred to use mesh sizes larger than 70 mm from knot to knot but, usually used mesh sizes between 62-68 mm in bend nets. In July, however, when 1SW salmon are migrating in large amounts along the coasts, bend net fishery targeted more into the largest 1SW salmon than bag net fishery with smaller mesh sizes. Bag net fishery in July with smaller mesh sizes in nets also catches small sized 1SW female salmon. Fishermen preferred bend nets because they were easier to install and operate in the fishery actions. Therefore, the numbers of bend nets in Finnmark exceeded bag nets.

Figures 44-50 illustrates the size selection of salmon between the fishing methods bag net and bend net. In Finnmark, Nordland and Troms (in the years 2011 and 2012), bend nets selected a little larger 1SW salmon than bag nets (Figs. 49, 50). This was true especially in June in Finnmark when the data from both sexes were combined. Bend net fishing targeted more to multi-sea-winter salmon (2SW, 3SW, 4SW, previous spawners) than bag net fishery because of larger mesh sizes in bend net (Fig. 43).

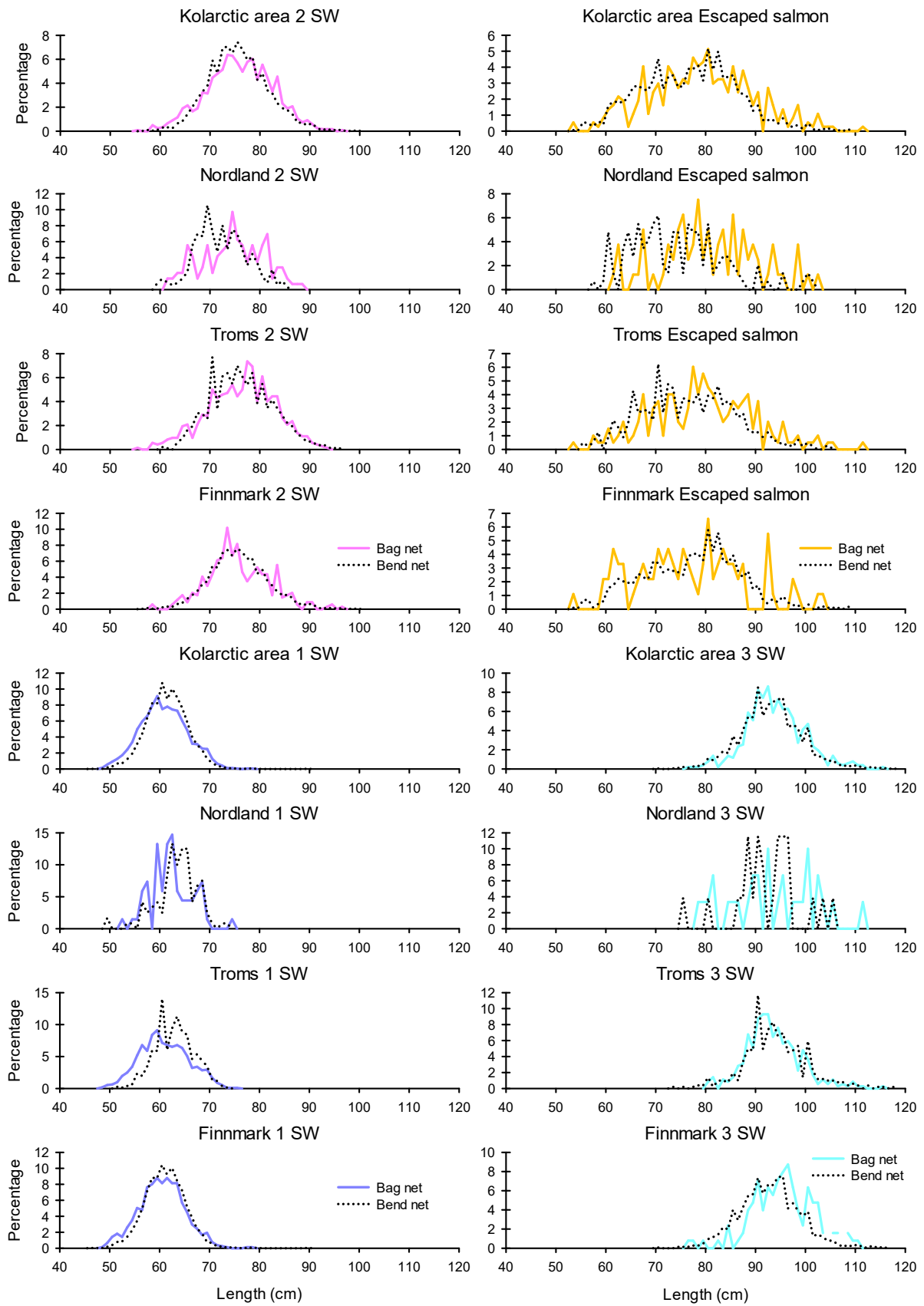


Figure 44. Length distributions for 1SW, 2SW, 3SW salmon and escaped salmon caught in the summer with bag nets and bend nets in the counties Finnmark, Troms and Nordland in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

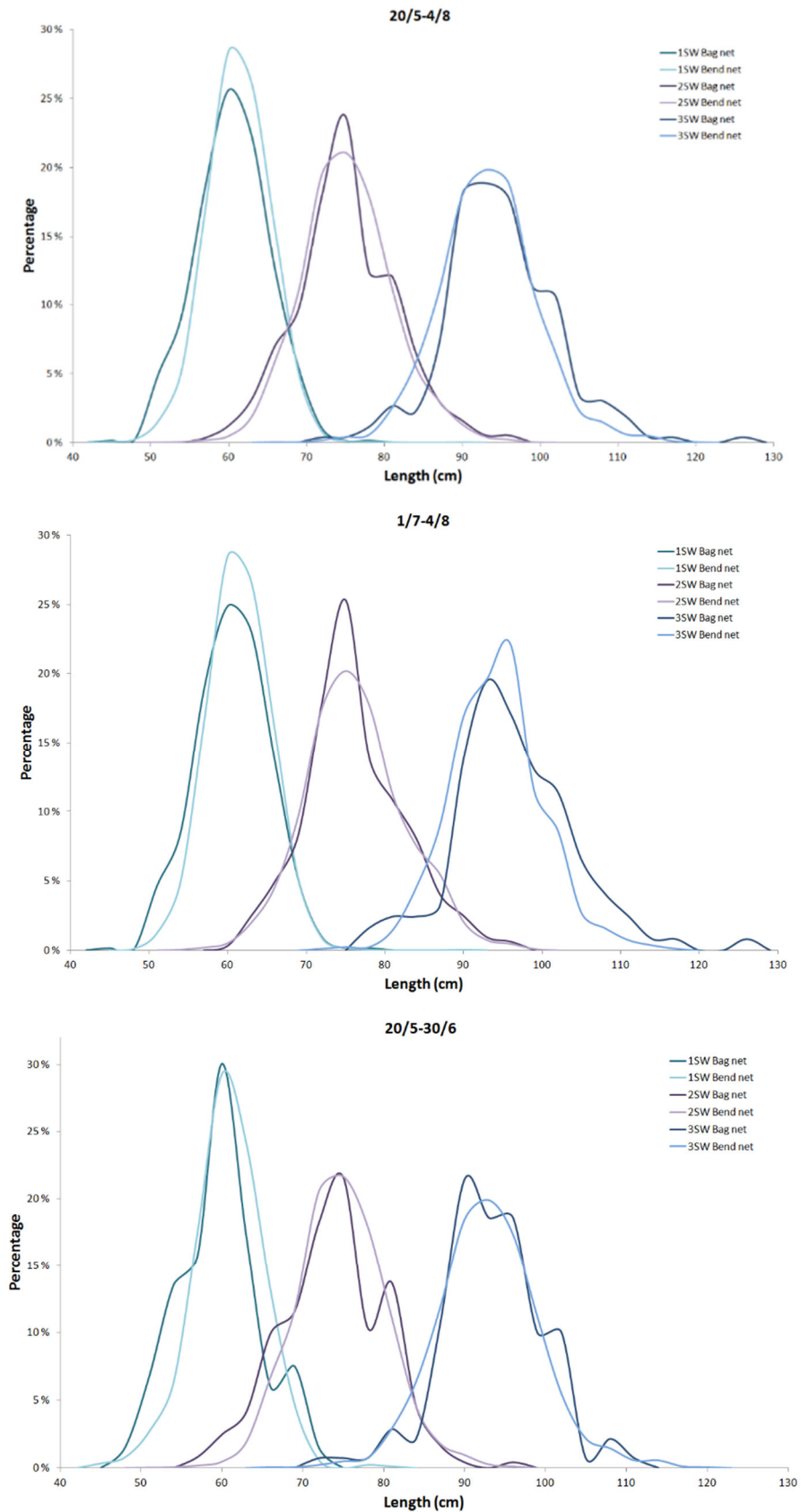


Figure 45. Length distributions for 1SW, 2SW and 3SW salmon caught in June, July and during the whole summer with bag nets and bend nets in Finnmark in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

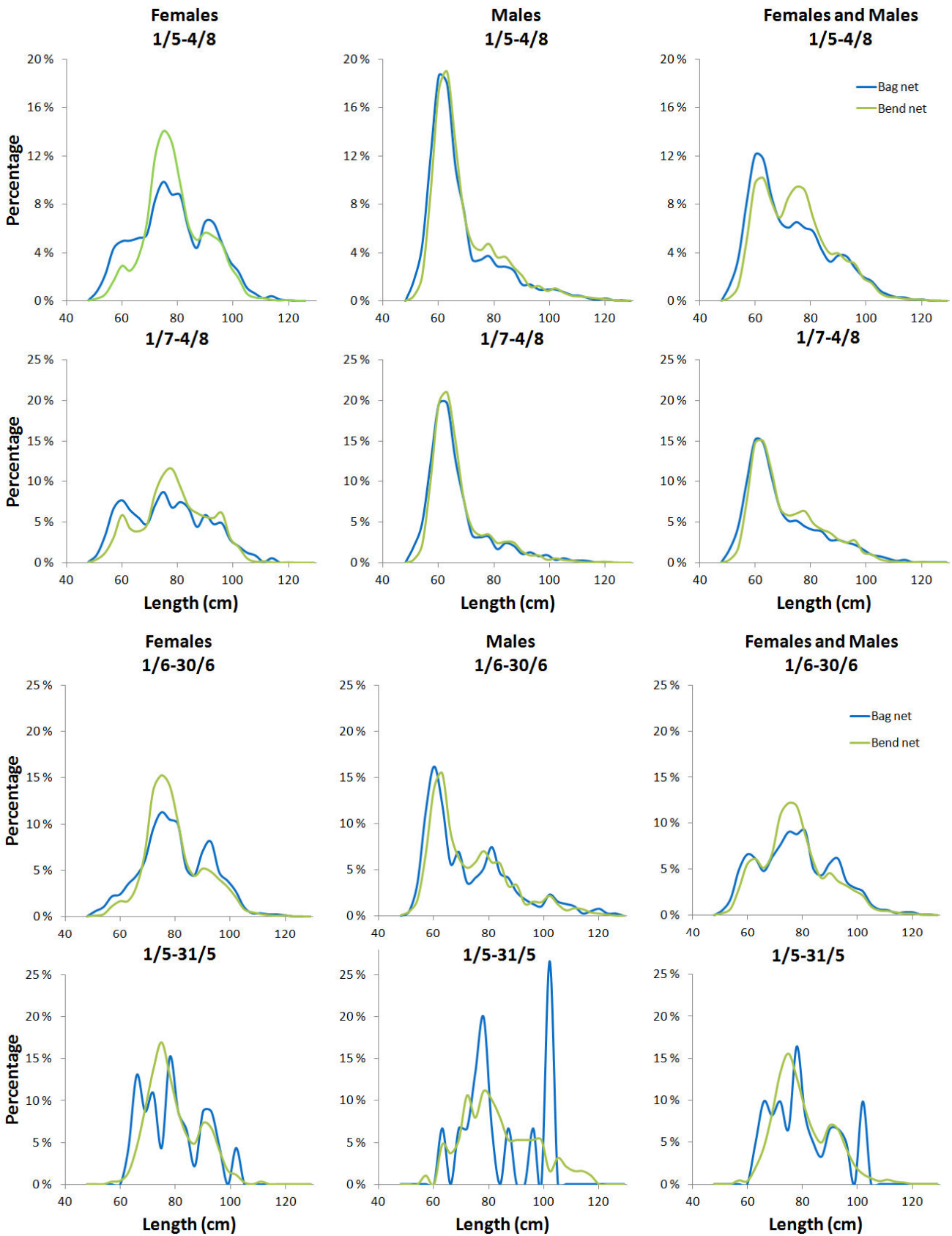


Figure 46. Length distributions for female and male salmon (wild and escaped salmon combined) between bag nets and bend nets during summer months (May, June, July) in the Kolarctic area (Finnmark, Troms, Nordland) in Norway in 2011 - 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

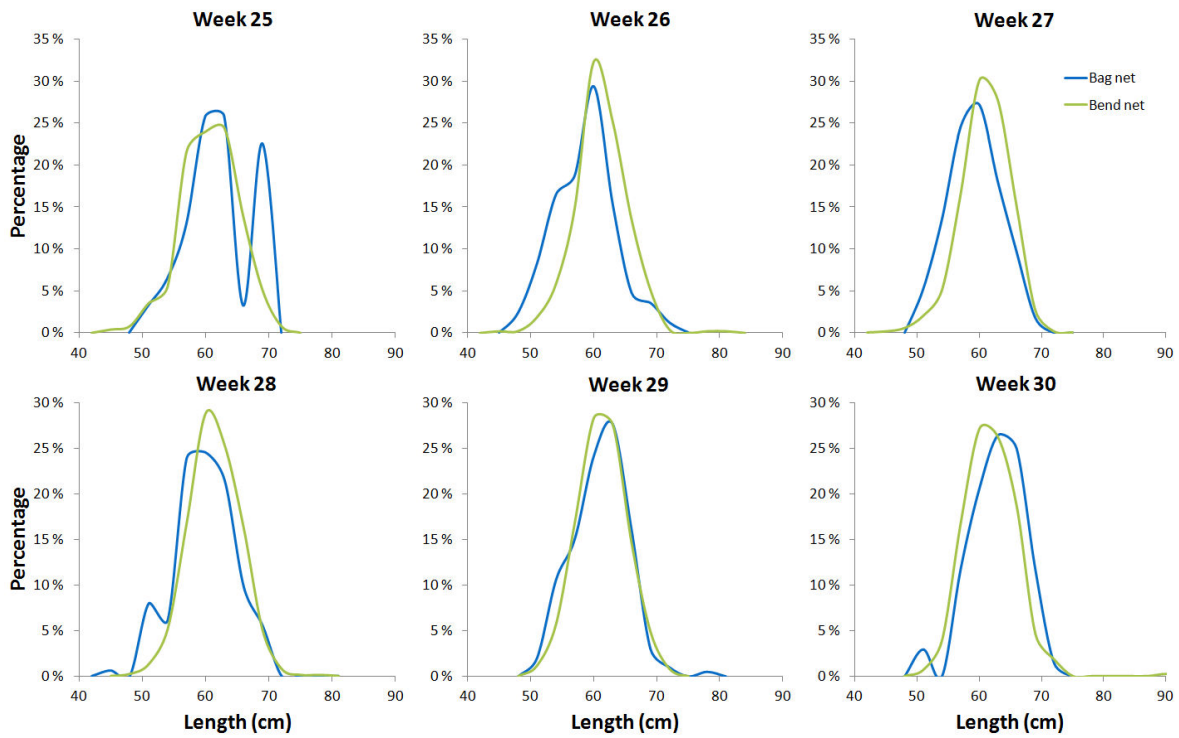


Figure 47. Weekly percentage length distributions for 1SW salmon caught with bag nets and bend nets during their migration in Finnmark in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

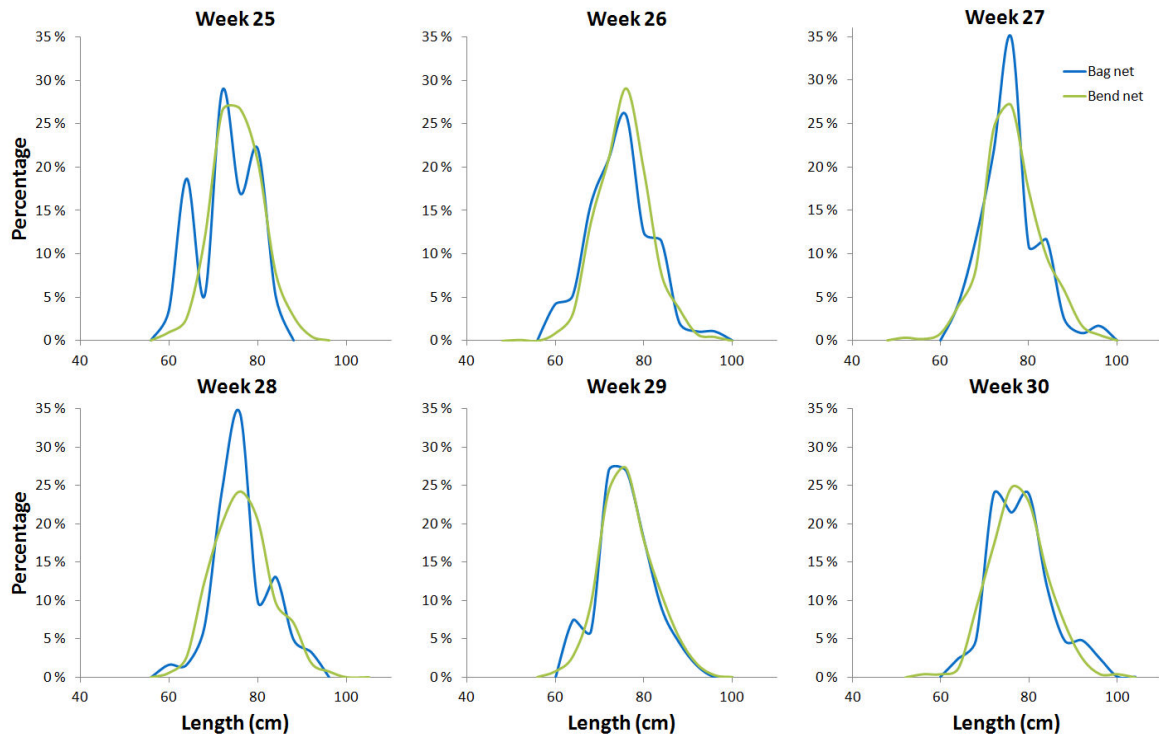


Figure 48. Weekly percentage length distributions for 2SW salmon caught with bag nets and bend nets during their migration in Finnmark in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

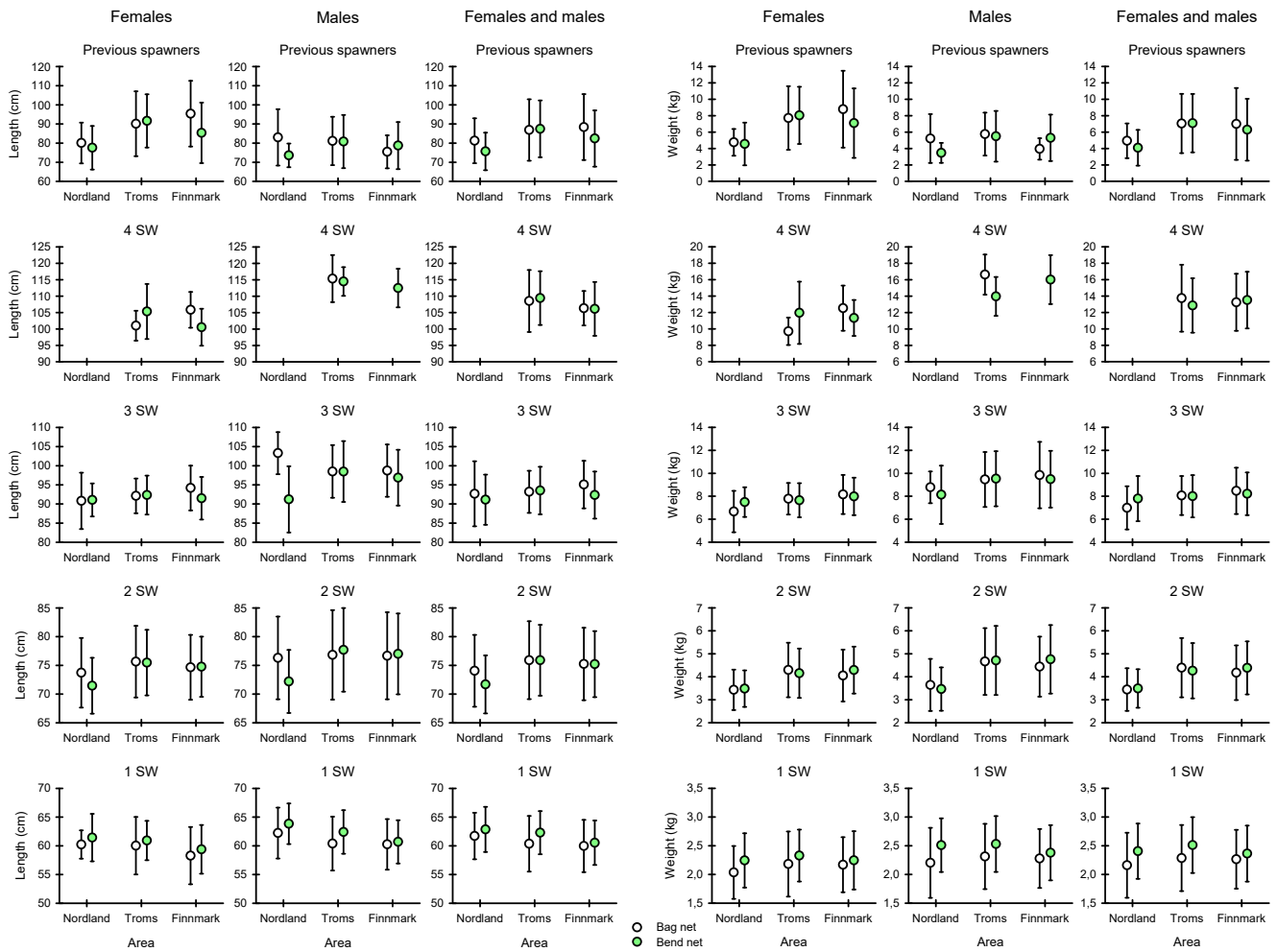


Figure 49. Mean lengths and weights of wild 1SW, 2SW, 3SW, 4SW salmon and previous spawners in bag net and bend net fishing in northern Norway (Finnmark, Troms, Nordland) between June 1<sup>st</sup> and August 4<sup>th</sup> in the years 2011-2012. Source: Kolarctic EU/ENPI CBC (KO 197).

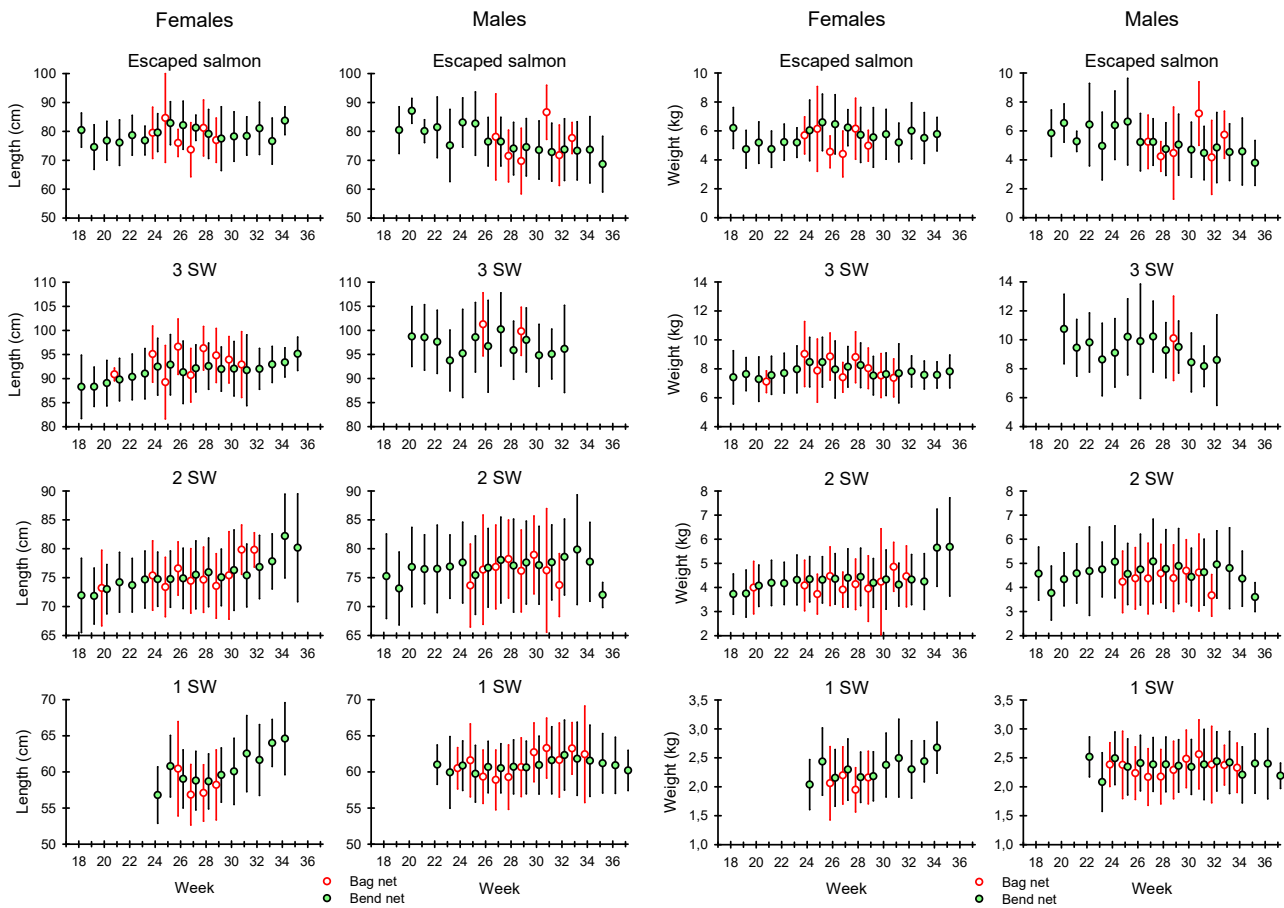


Figure 50. Mean weekly lengths (SD) and weights (SD) of wild 1SW, 2SW, 3SW salmon and escaped salmon caught with bag nets and bend nets in Finnmark combining the material from the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

20. Sea-age distributions in salmon catches for female, male and sexes combined at sea in Northern Norway in the years 2008-2009, 2011-2012; salmon belonging into nine (9) regional RG areas

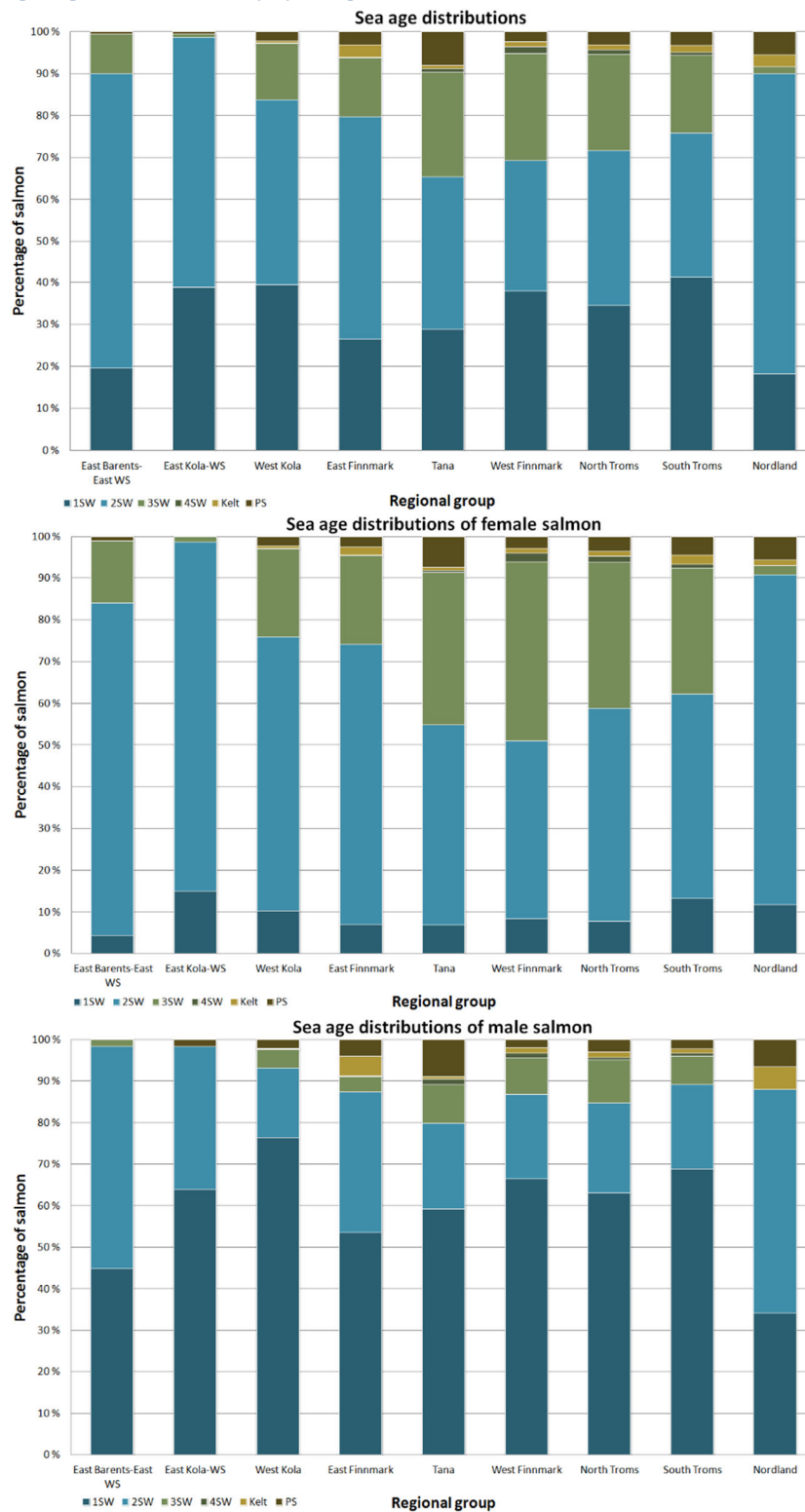


Figure 51. Proportions of salmon sea-age groups (1SW, 2SW, 3SW, 4SW, previous spawner and kelt) originating from nine (9) geographical regions (Regional group) in the research fishing catches in Finnmark, Troms and Nordland. Sea age distributions are presented for male and female salmon and sexes combined (figure on the top). Research fishing took place in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).



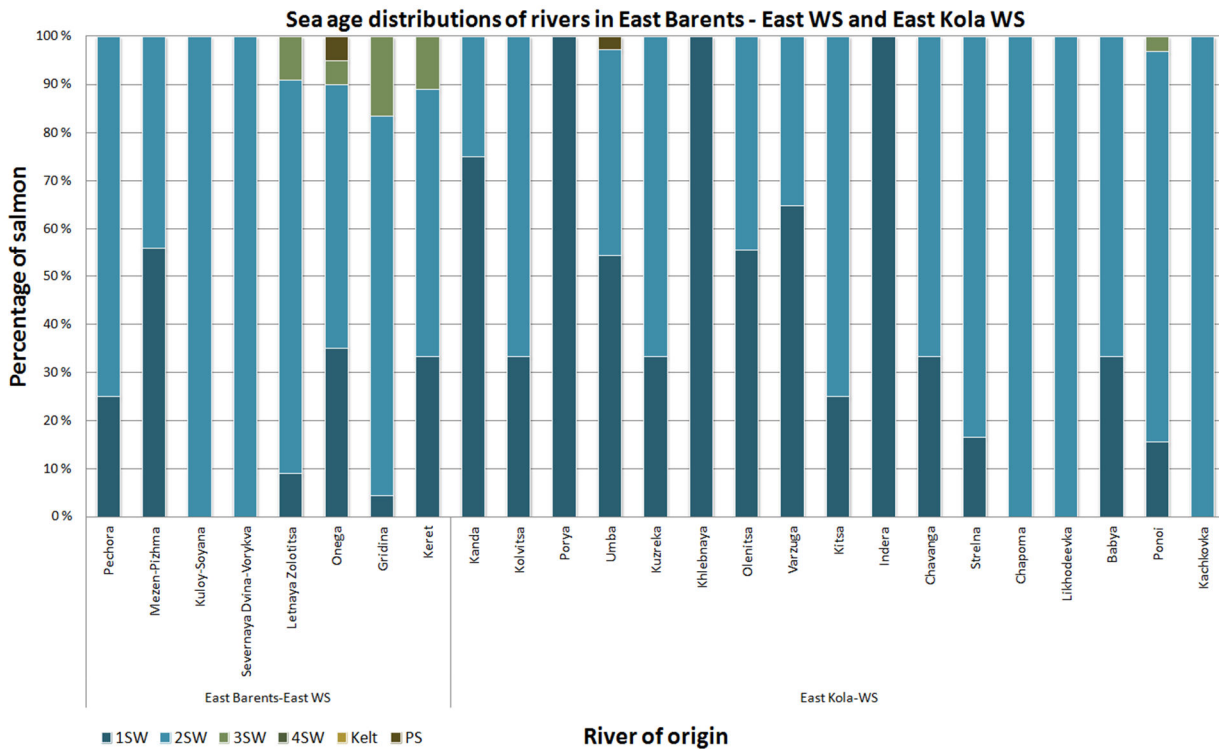


Figure 52. Salmon which were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012 originated from 26 rivers with the sea-ages 1SW, 2SW, 3SW, 4SW, previous spawners and kelt in East Barents, East White Sea and East Kola White Sea regions (RG). Source: Kolarctic EU/ENPI CBC (KO 197).

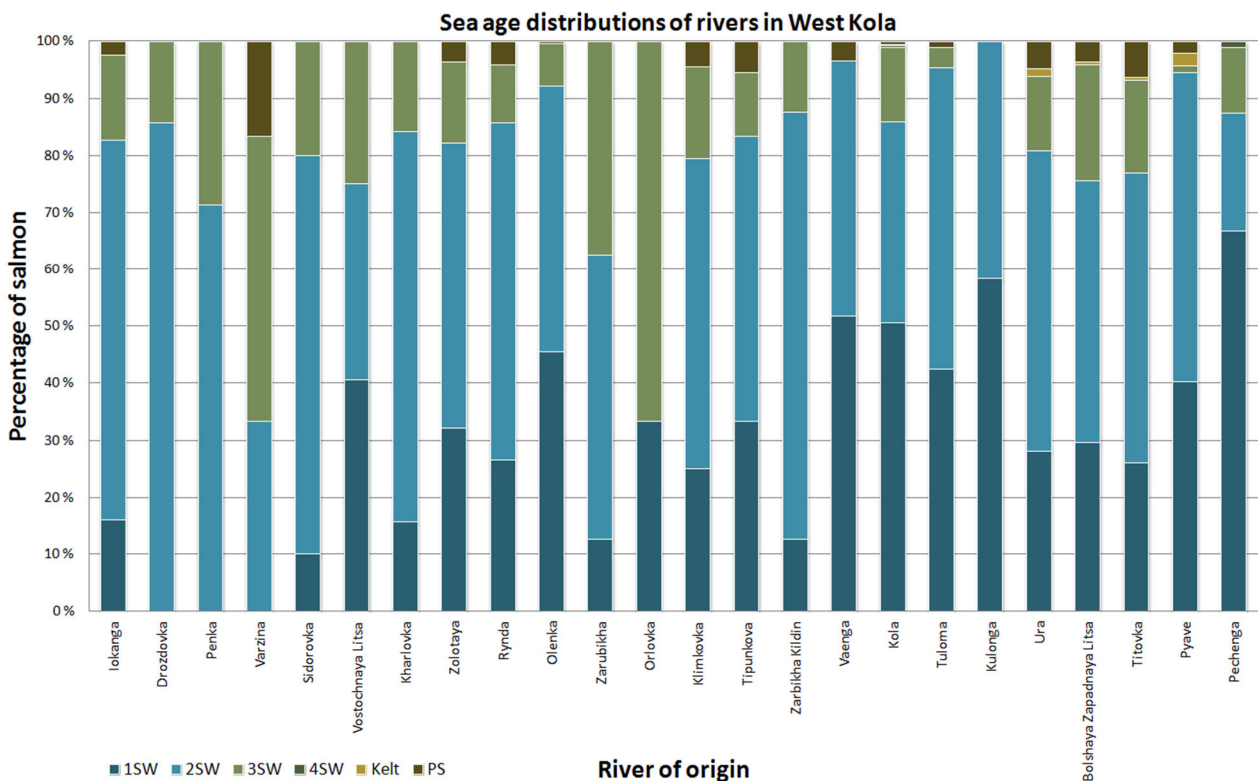


Figure 53. Salmon which were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012 originated 24 with the sea-ages 1SW, 2SW, 3SW, 4SW, previous spawners and kelt in West Kola region (RG). Source: Kolarctic EU/ENPI CBC (KO 197).

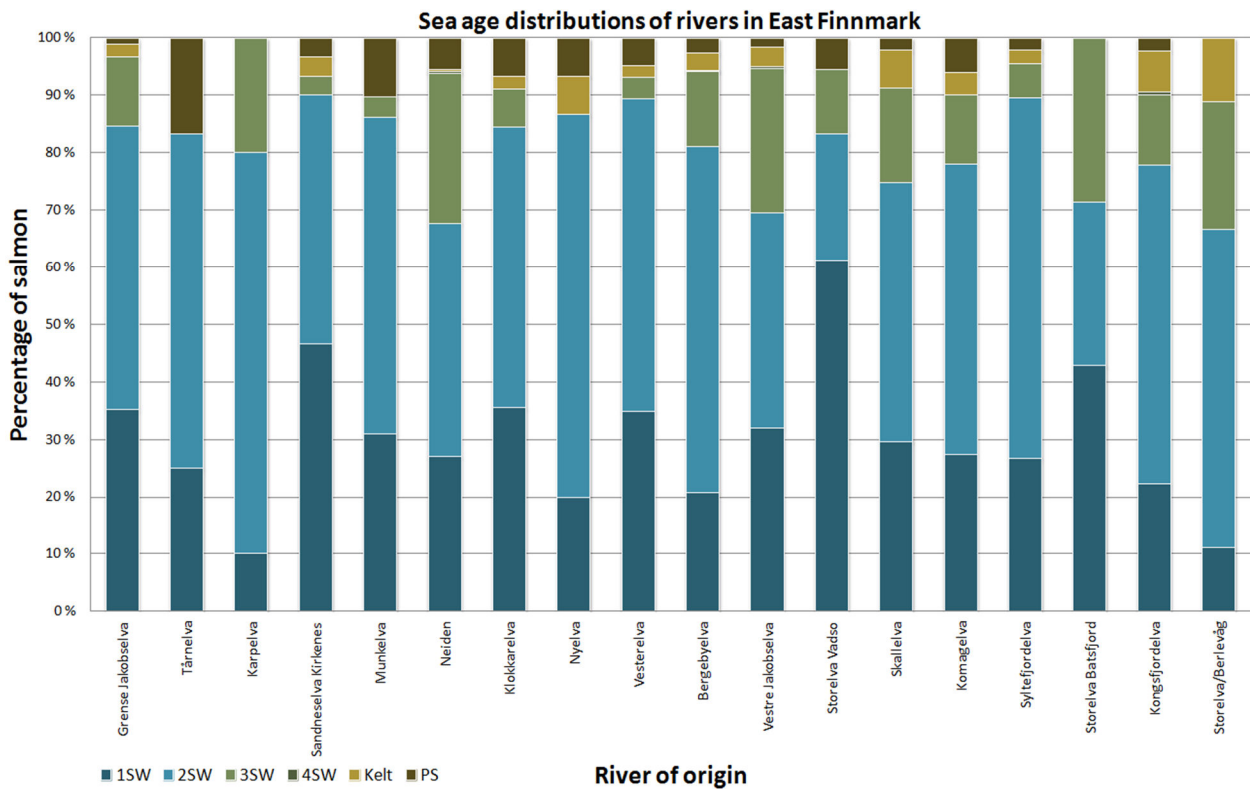


Figure 54. Salmon which were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012 originated from 18 rivers with the sea-ages 1SW, 2SW, 3SW, 4SW, previous spawners and kelt in the East Finnmark region (RG). Source: Kolarctic EU/ENPI CBC (KO 197).

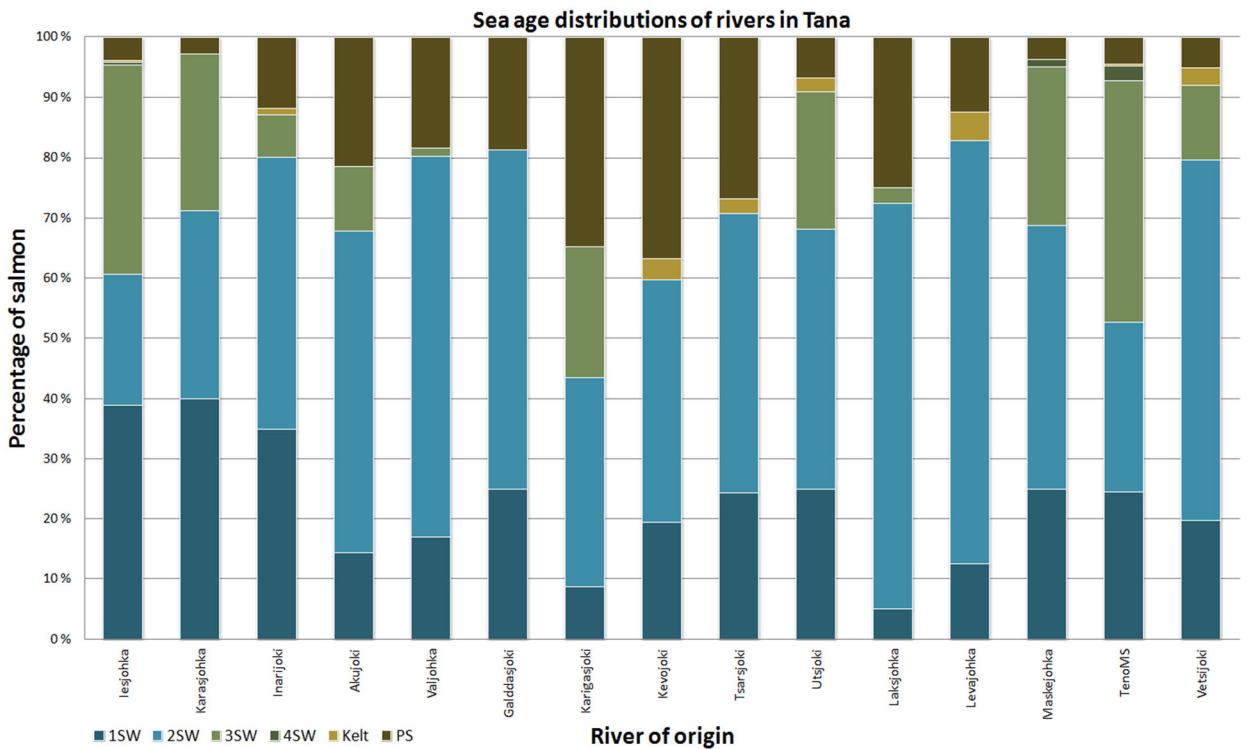


Figure 55. Salmon which were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012 originated from 15 rivers with the sea-ages 1SW, 2SW, 3SW, 4SW, previous spawner and kelt in the River Tana regions (RG). Source: Kolarctic EU/ENPI CBC (KO 197).

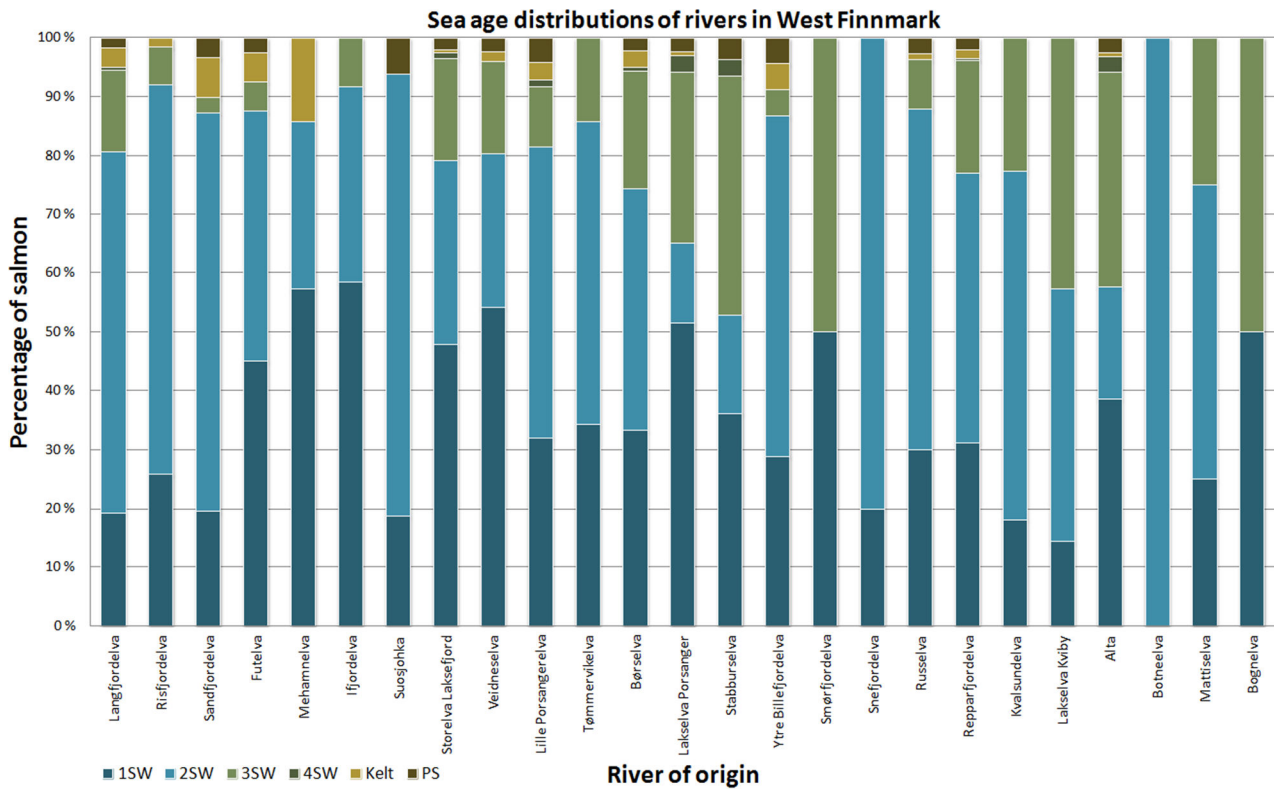


Figure 56. Salmon which were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012 originated from 25 rivers with the sea-ages 1SW, 2SW, 3SW, 4SW, previous spawners and kelt in West Finnmark regions (RG). Source: Kolarctic EU/ENPI CBC (KO 197).

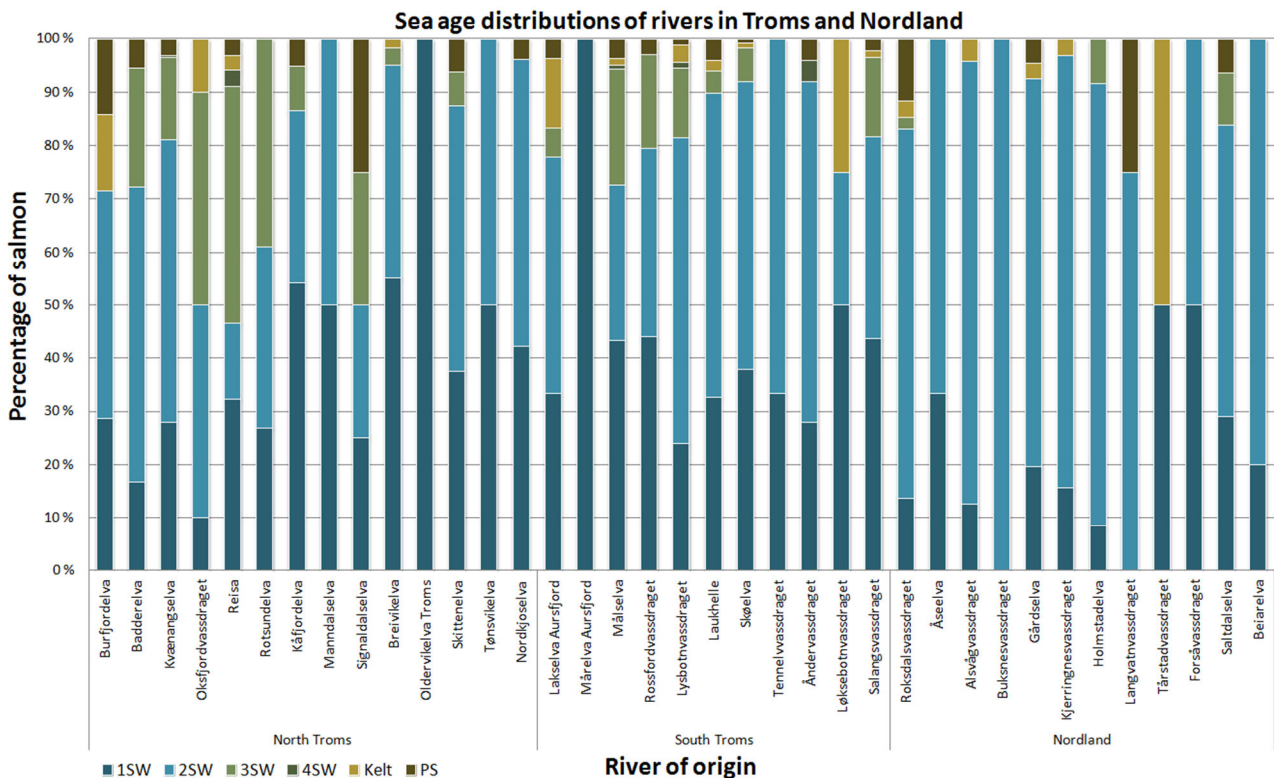


Figure 57. Salmon which were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012 originated from 37 rivers with the sea-ages 1SW, 2SW, 3SW, 4SW, previous spawners and kelt in North Troms, South Troms and Nordland regions (RG). Source: Kolarctic EU/ENPI CBC (KO 197).

21. Sex ratios of salmon belonging to nine (9) regional groups (RG) in the catches (1SW, 2SW, 3SW, 4SW and previous spawned salmon) in the coastal fishery of Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012

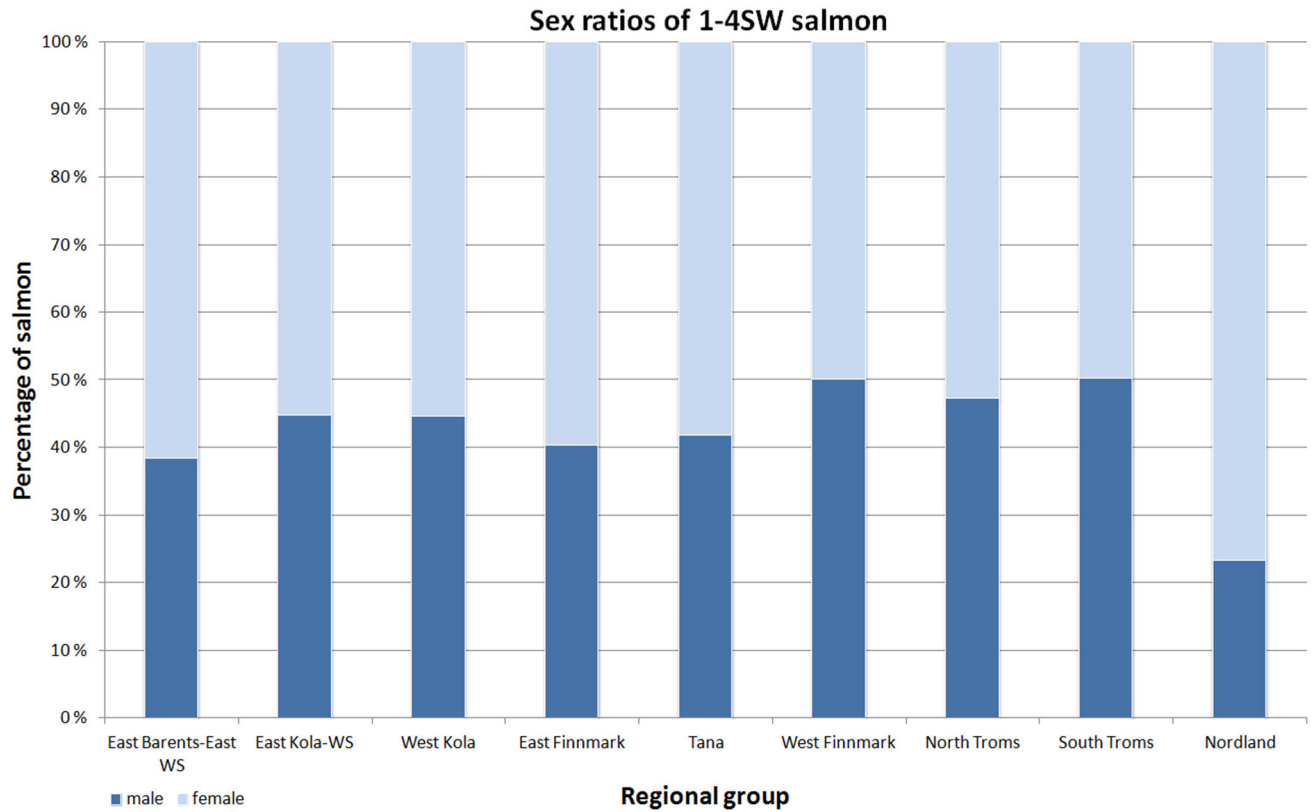


Figure 58. Sex ratios of salmon (all sea-ages combined) belonging to nine regional groups (RG) and caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarectic EU/ENPI CBC (KO 197).

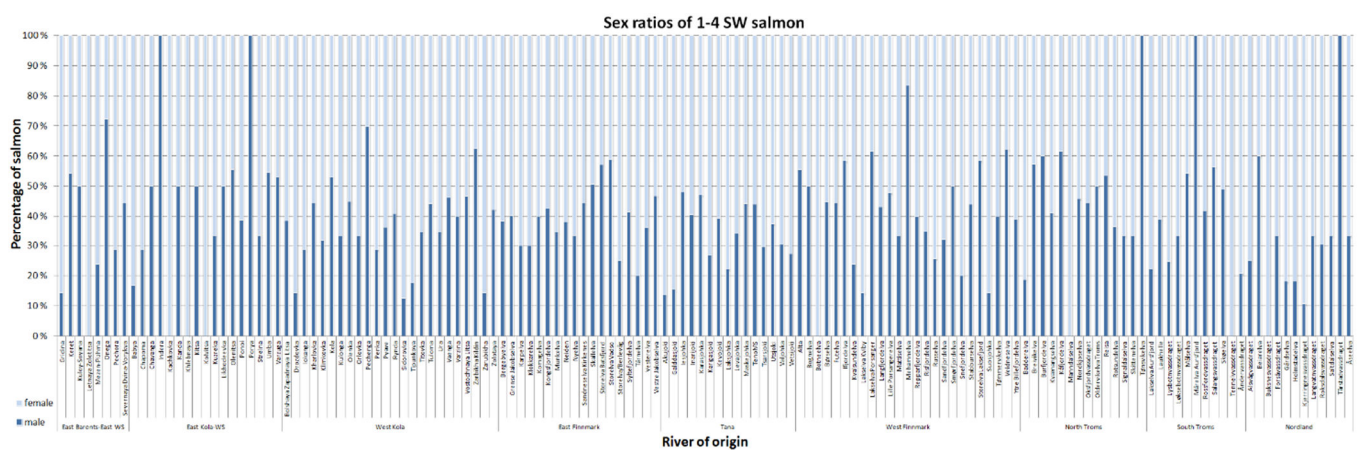


Figure 59. Sex ratios of salmon (all sea-ages combined) belonging into rivers within nine regional groups (RG). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarectic EU/ENPI CBC (KO 197).

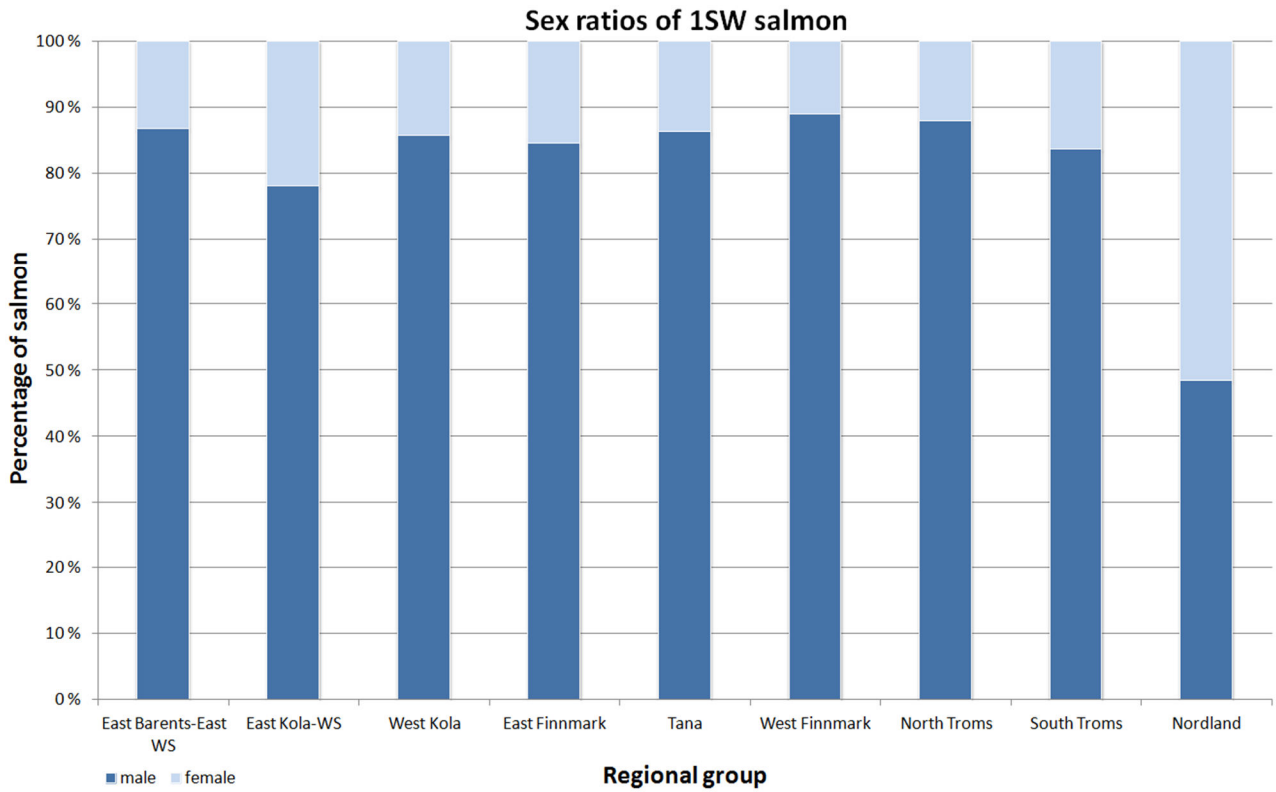


Figure 60. Sex ratios of 1SW salmon belonging into nine regional groups (RG) and caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

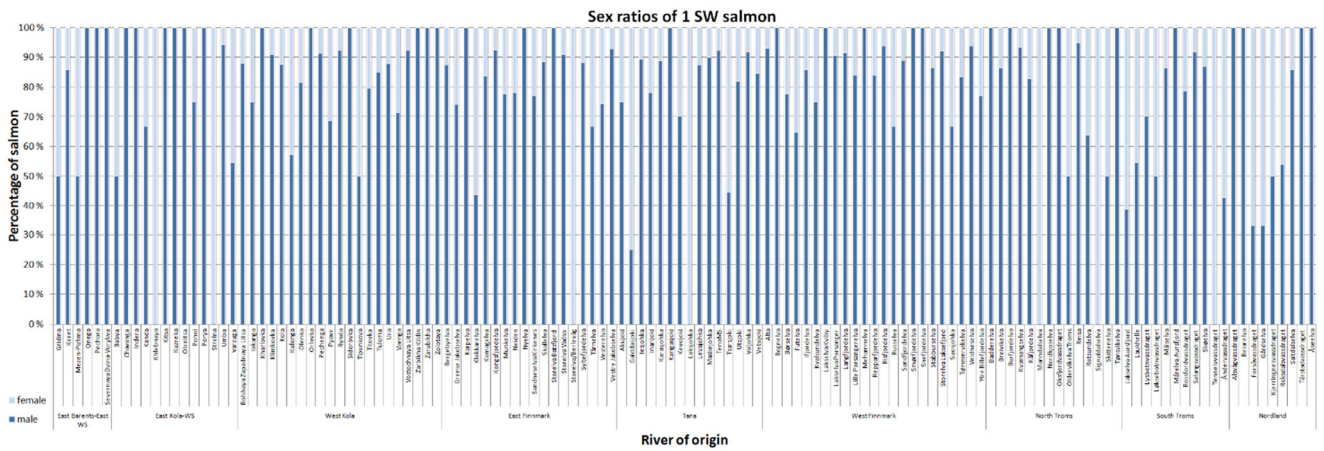


Figure 61. Sex ratios of 1SW salmon belonging into individual rivers within nine regional groups (RG). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

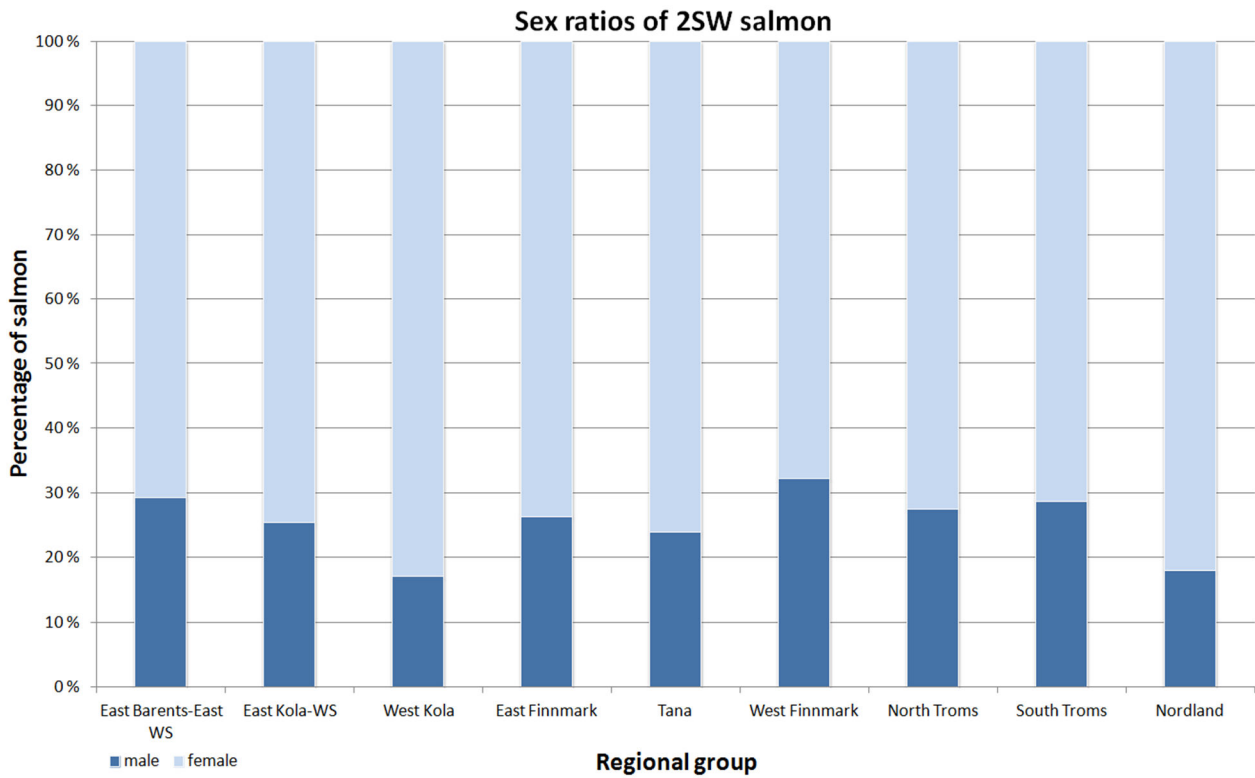


Figure 62. Sex ratios of 2SW salmon belonging to nine regional groups (RG) and caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

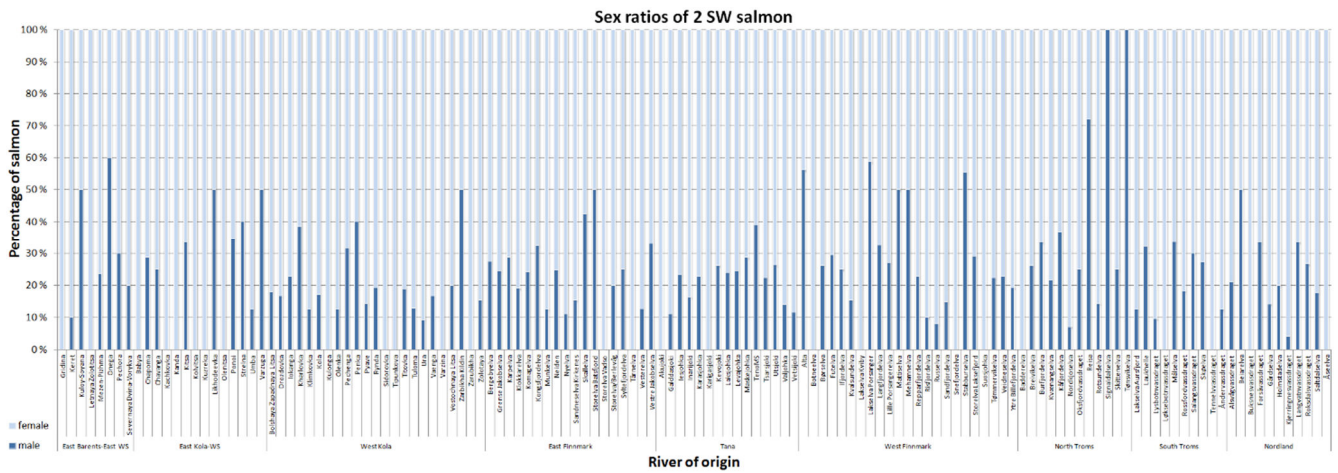


Figure 63. Sex ratios of 2SW salmon belonging to rivers within nine regional groups (RG). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

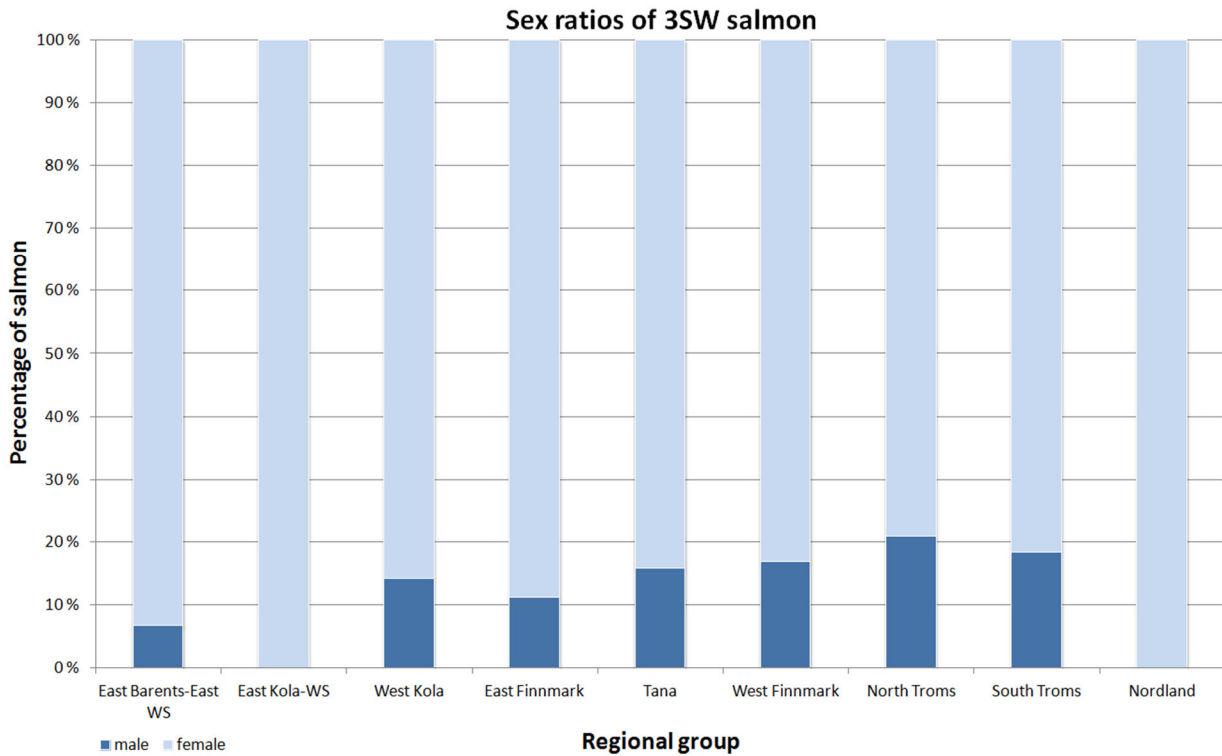


Figure 64. Sex ratios of 3SW salmon belonging to nine regional groups (RG) and caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

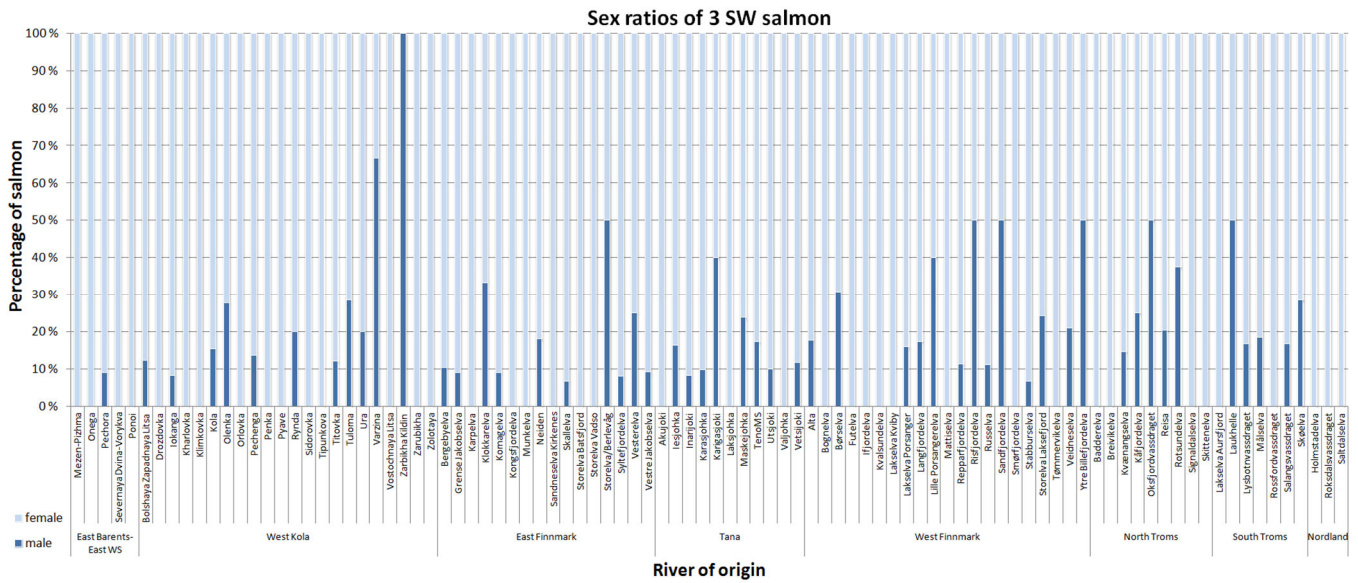


Figure 65. Sex ratios of 3SW salmon belonging to rivers within nine regional groups (RG). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

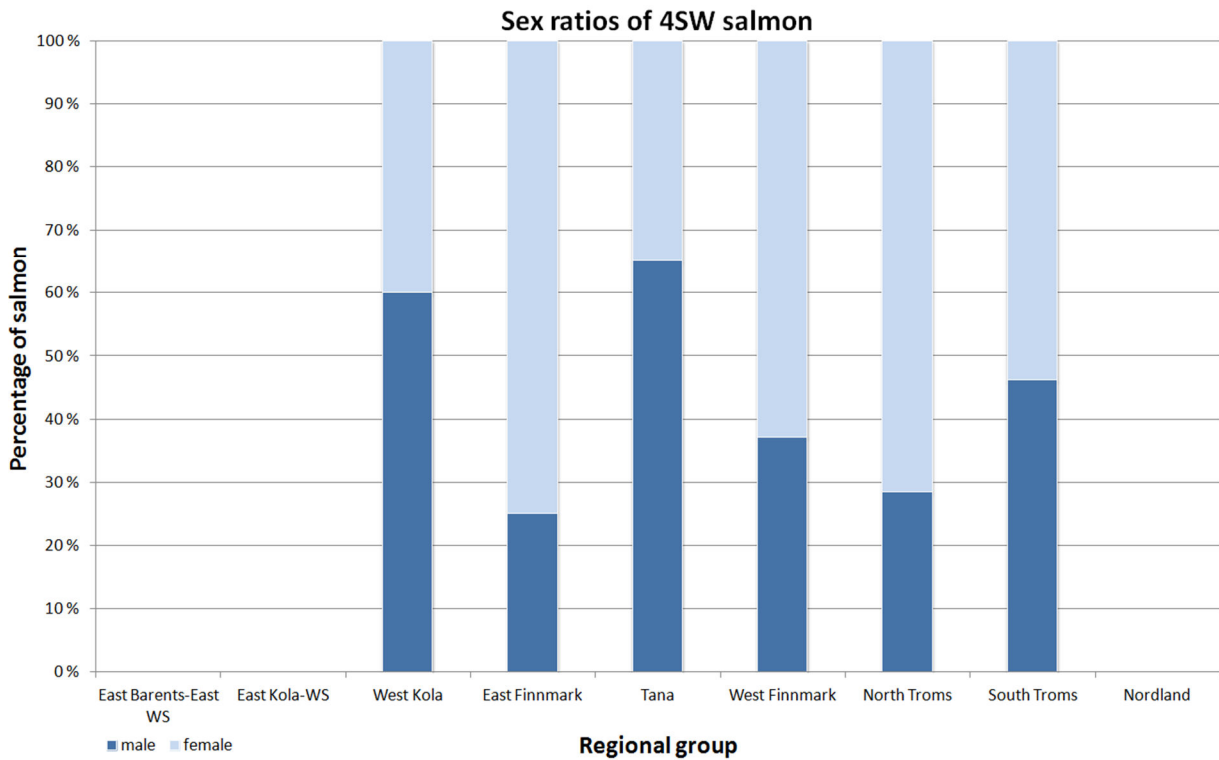


Figure 66. Sex ratios of 4SW salmon belonging to six regional groups (RG) and caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

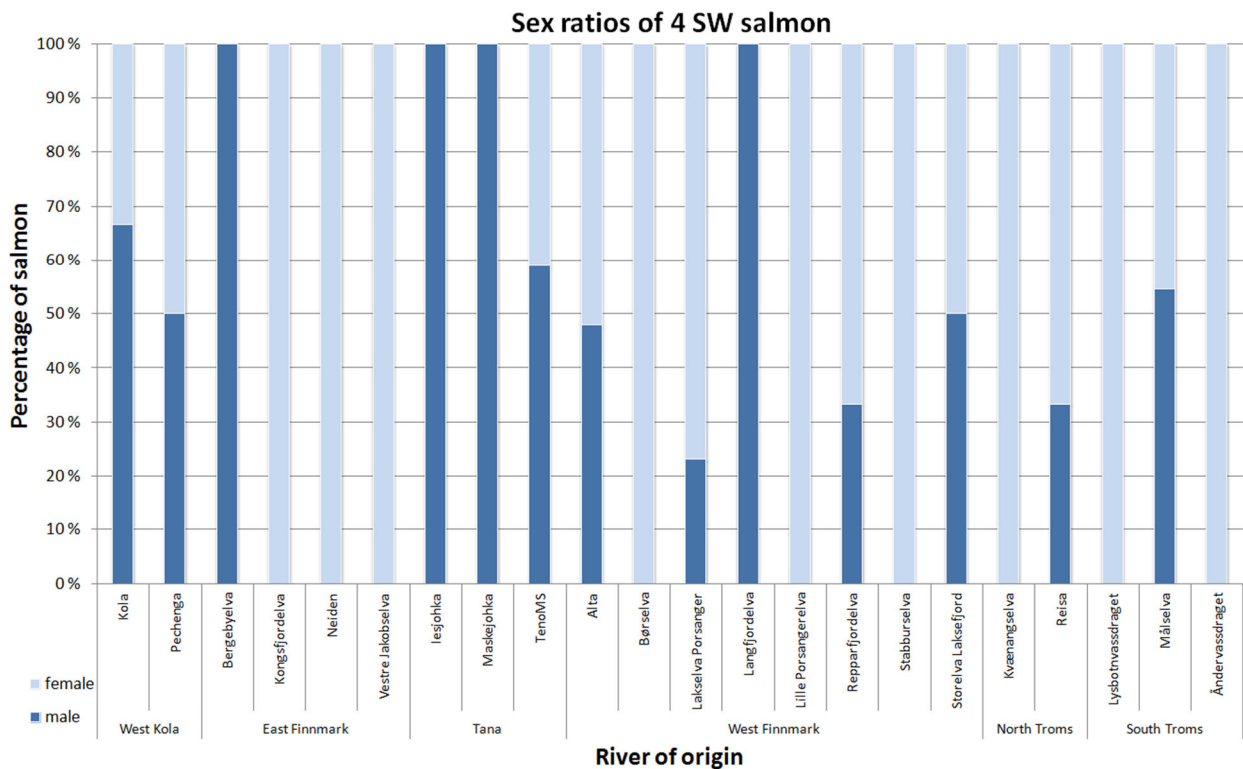


Figure 67. Sex ratios of 4SW salmon belonging to rivers within six regional groups (RG). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).



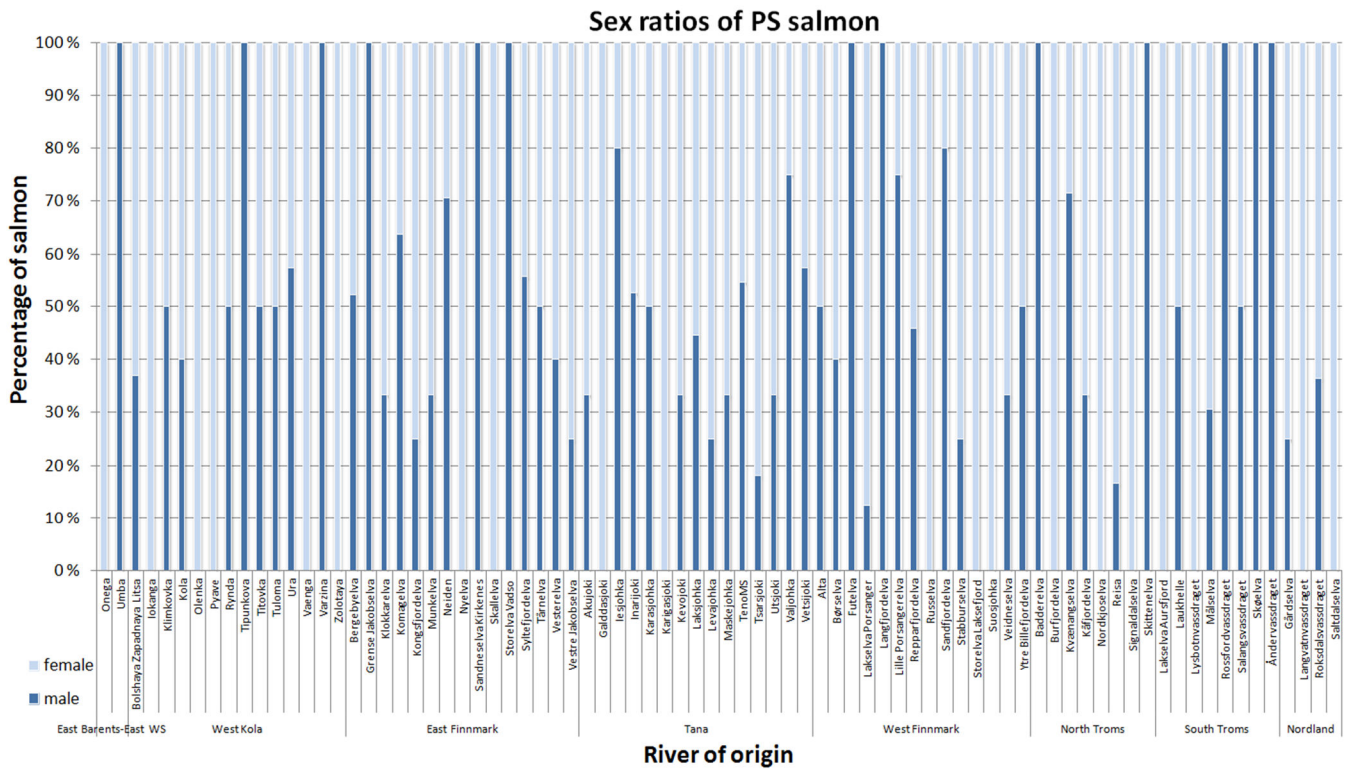


Figure 68. Sex ratios of previous spawned salmon belonging to rivers within nine regional groups (RG). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Sea age: 1S1, 1S2, 2S1, 2S2, 2S1S1, 2S1S1S1, 3S1, 3S1S1, 3S1S1S1 & 4S1. Source: Kolarctic EU/ENPI CBC (KO 197).

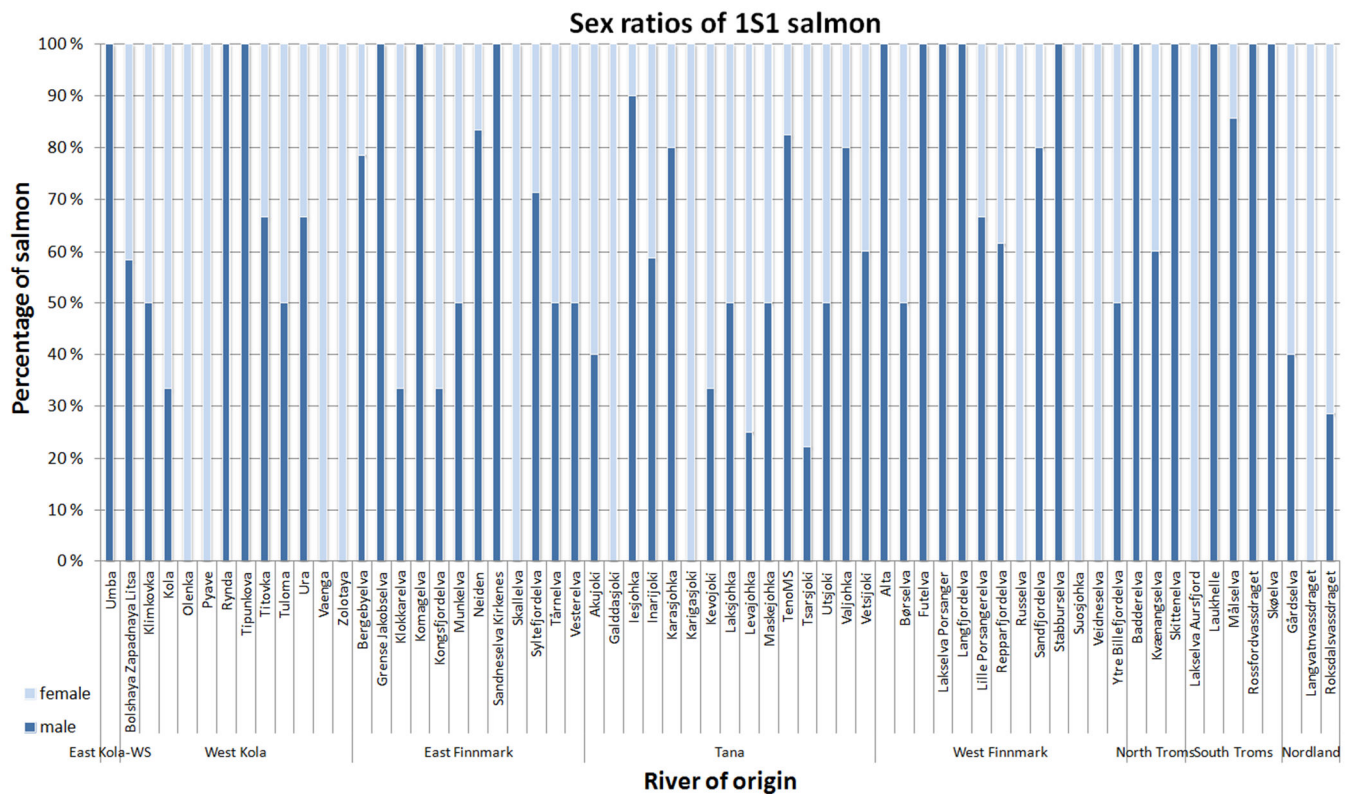


Figure 69. Sex ratios of 1S1 previous spawned salmon belonging to rivers within nine regional groups (RG). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

## 22. Smolt age distributions of salmon belonging into 41 salmon rivers in Finnmark, in seven Regional RG areas and in 26 Local RG areas in Finnmark, Troms and Nordland

In Northern Norway, Northern Finland and North-Western Russia, smolt ages varied between 2-7 years in the material collected in the years 2008-2020 (Figs.70-72). Figure 70 shows that the proportions of the youngest smolt age, 3 years, is declining from Eastern Finnmark towards Western Finnmark, although there are remarkable differences between stocks. Accordingly, the proportions of five- and six-year-old smolts are slightly increasing. The dominating smolt age in all investigated rivers is 4 years. Differences in the smolt age distributions between rivers reflect variations in the environmental conditions, like in the water temperature and nourishment. Unfavorable environmental conditions slow down the annual growth, which in turn delays smolt ages.

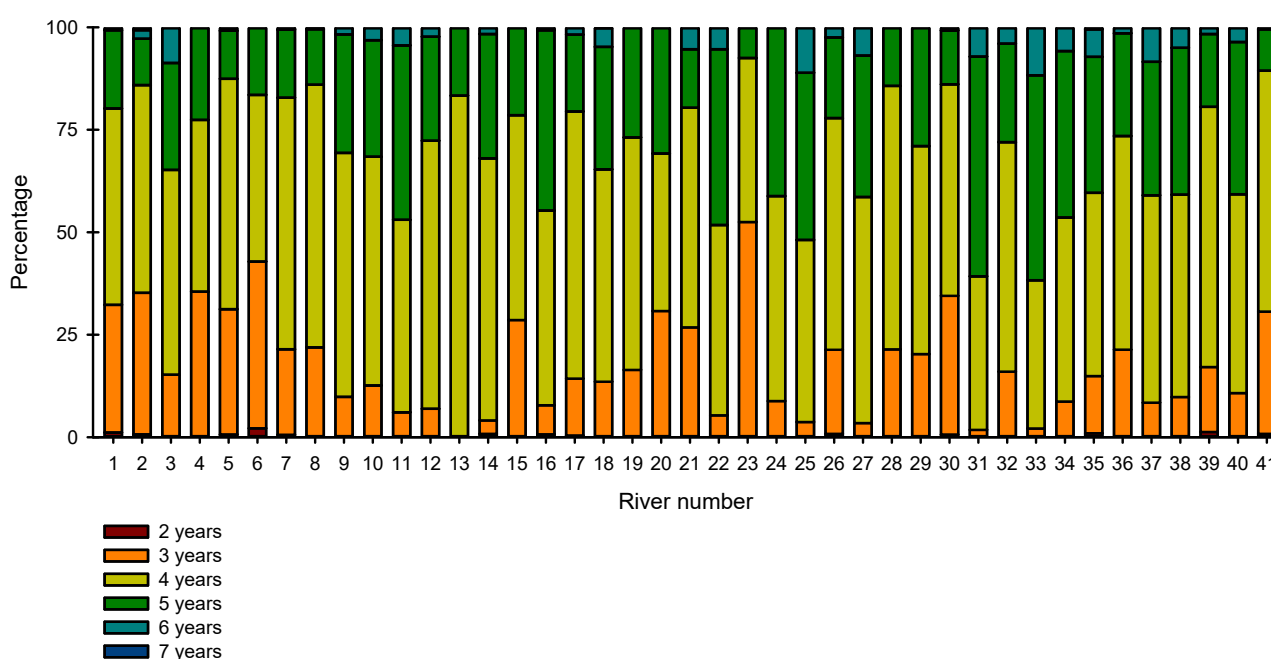


Figure 70. Smolt age distributions of salmon in 41 rivers in Finnmark. Sea-ages 1SW-4SW and sexes are combined from the salmon scale material collected in the years 2008-2009, 2011-2012 and 2020 from Finnmark, Troms and Nordland between May 15<sup>th</sup> and August 15<sup>th</sup>. Rivers are: (1) Grense Jakobselv; (2) Karpelv; (3) Sandneselv; (4) Munkelv; (5) Neidenelv; (6) Klokkerelv; (7) Vesterelv/Nyelv; (8) Beergebyelv; (9) Vestre Jakobselv; (10) Skallelv; (11) Komagelv; (12) Syltefjordelv; (13) Storelv (Båtsfjord); (14) Kongsfjordelv; (15) Stordalselv (Berlevåg); (16) Langfjordelv; (17) Karasjohka; (18) Iesjohka; (19) Inarijoki; (20) Karigasjoki; (21) Valjohka; (22) Levajohka; (23) Utsjoki mainstream; (24) Kevojoki; (25) Tsarsejoki; (26) Vetsikkojoki; (27) Laksjohka; (28) Galldasjoki; (29) Maskejohka; (30) Tana mainstream; (31) Risfjordelv; (32) Storelv/Luobbaljohka (Kunes); (33) Veidneselv; (34) Lille Porsangerelv; (35) Børselv; (36) Lakselv; (37) Stabburselv; (38) Repparfjordelv; (39) Altaelv; (40) Reisaelv; (41) Målselv Source: Kolarctic EU/ENPI CBC (KO 197). Kolarctic EU/ENI CBC (KO 4178).

Figure 71 indicates the declining proportion of 2- and 3-year-old smolts in the stocks originating from East Barents area, compared to the stocks originating from Varangerfjord rivers. Smolt ages of especially 5-year-olds are increasing from White Sea area westwards to Varanger Peninsula rivers. This change indicates that growth conditions for juvenile salmon are better in the White Sea rivers than in the rivers of Northern Norway, which have colder water and poorer nourishment.

Figure 72 presents better evidence for the environmental impact on the change of smolt ages in the river stocks along the limited northern coastal areas. Smolt ages 2- and 3-year-olds are occurring frequently and in high proportions in White Sea East rivers, in White Sea South rivers and in Kola Peninsula South rivers. 2 year old smolts occurs with 20-25% in adult salmon in White Sea East rivers and in White Sea South rivers.

The proportions of 2- and 3-year-old smolts are declining steadily in Local RG area salmon stocks from White Sea East area rivers to Varangerfjord North area salmon stocks westwards to Gamvik area salmon stocks. This decline coincides with the increase of four- and five-year-old smolt proportions. The only exceptions in this spatial and regular change of smolt age proportions takes place in the River Tana watershed. Tana watershed with its numerous tributaries is in sheltered inland areas where air and water temperatures in summer are higher than in the coastal rivers in Northern Norway.

Smolt ages in Local RG areas west from Gamvik towards the rivers in Northern Nordland are decreasing, and the proportions of 2 and 3 year smolts is increasing.

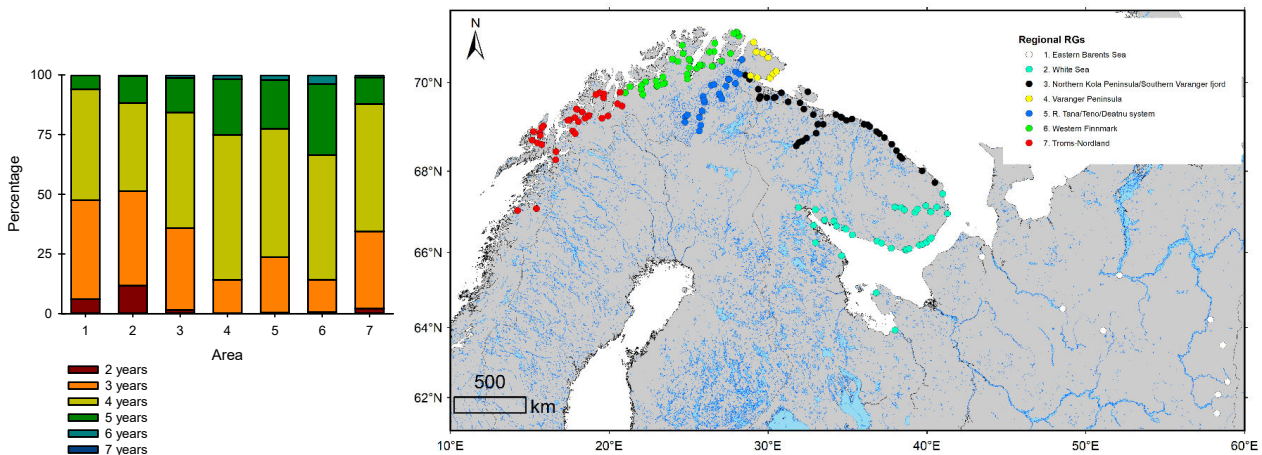


Figure 71. Smolt age distributions of salmon in seven Regional RG areas (figure on the left). Regional RG areas present seven geographical areas (figure on the right). Sea-ages 1SW-4SW and sexes are combined from the salmon scale material collected in the years 2008-2009, 2011-2012 and 2020 from Finnmark, Troms and Nordland between May 15<sup>th</sup> to August 15<sup>th</sup>. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

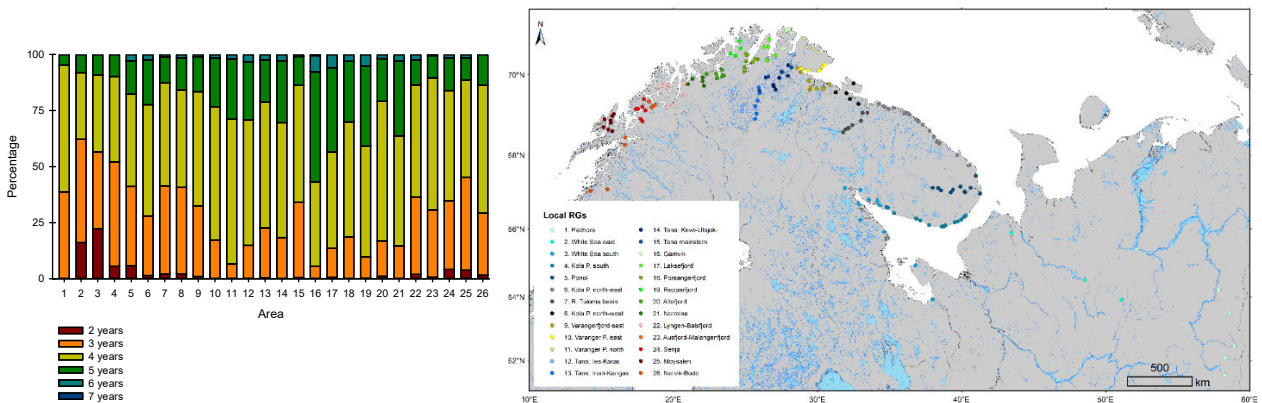


Figure 72. Smolt age distributions of salmon in seven Local RG areas (figure on the left). Local RG areas present 26 geographical areas (figure on the right). Sea-ages 1SW-4SW and sexes are combined from the salmon scale material collected in the years 2008-2009, 2011-2012 and 2020 from Finnmark, Troms and Nordland between May 15<sup>th</sup> and August 15<sup>th</sup>. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

23. Smolt age distributions of salmon belonging to nine (9) regional groups (RG) in the catches (1SW, 2SW, 3SW, 4SW and previous spawned salmon) in the coastal fishery in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012

Smolt ages within each river belonging to Regional RG areas shows remarkable differences even between neighboring rivers (Figs. 73-79).

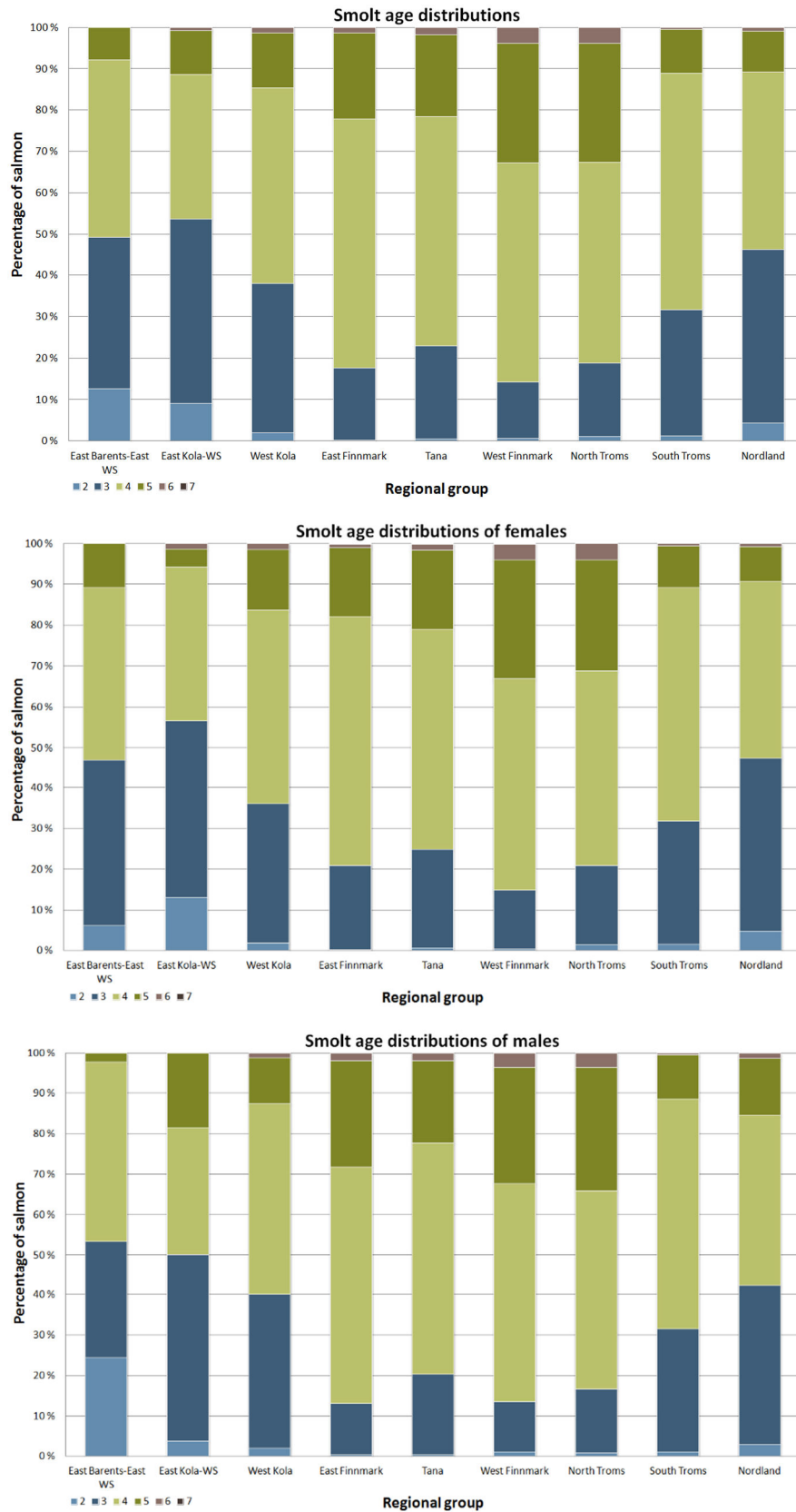


Figure 73. Proportions of salmon smolt age groups (2 years, 3 years, 4 years, 5 years, 6 years, 7 years) in the rivers belonging to nine (9) geographical regions (Regional group) in the research fishing catches in Finnmark, Troms and Nordland. Smolt age distributions are presented for male and female salmon and sexes combined (figure on the top). Research fishing took place in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

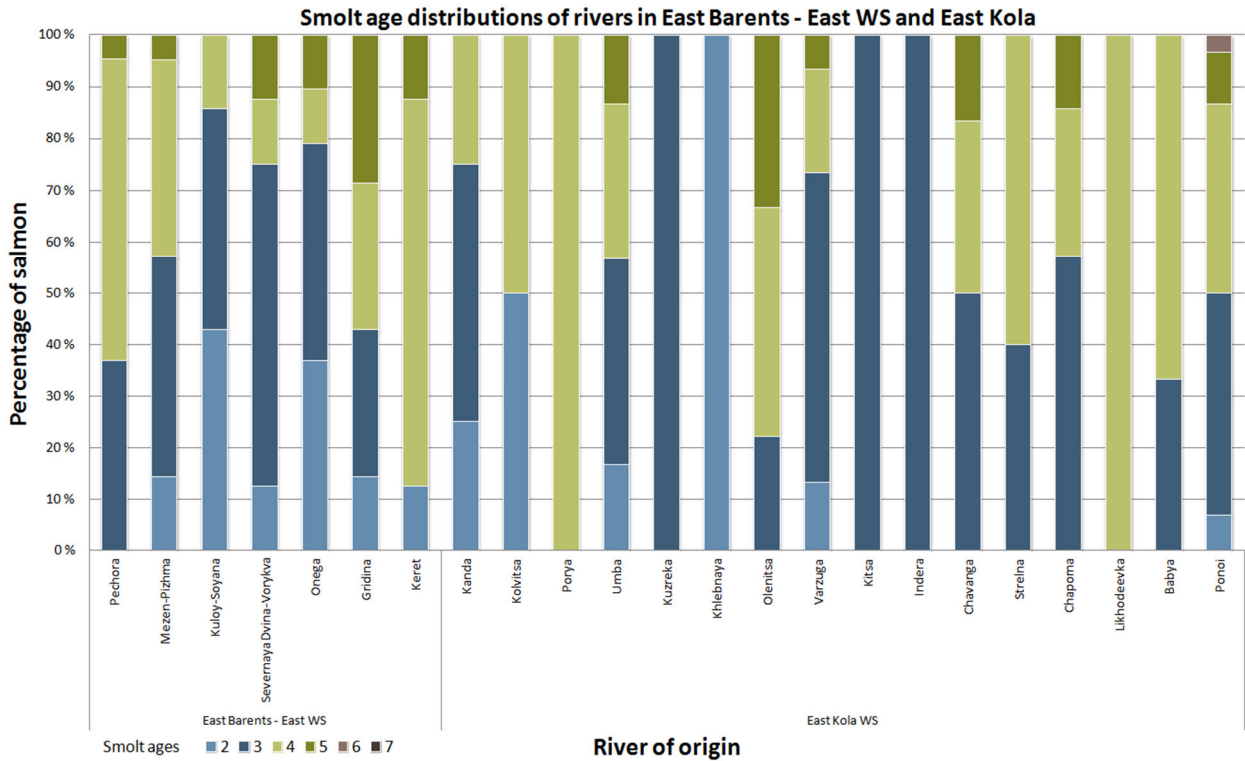


Figure 74. Smolt age distributions in the rivers belonging to two geographical groups (RG regions; East-Barents-East White Sea and East Kola White Sea). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

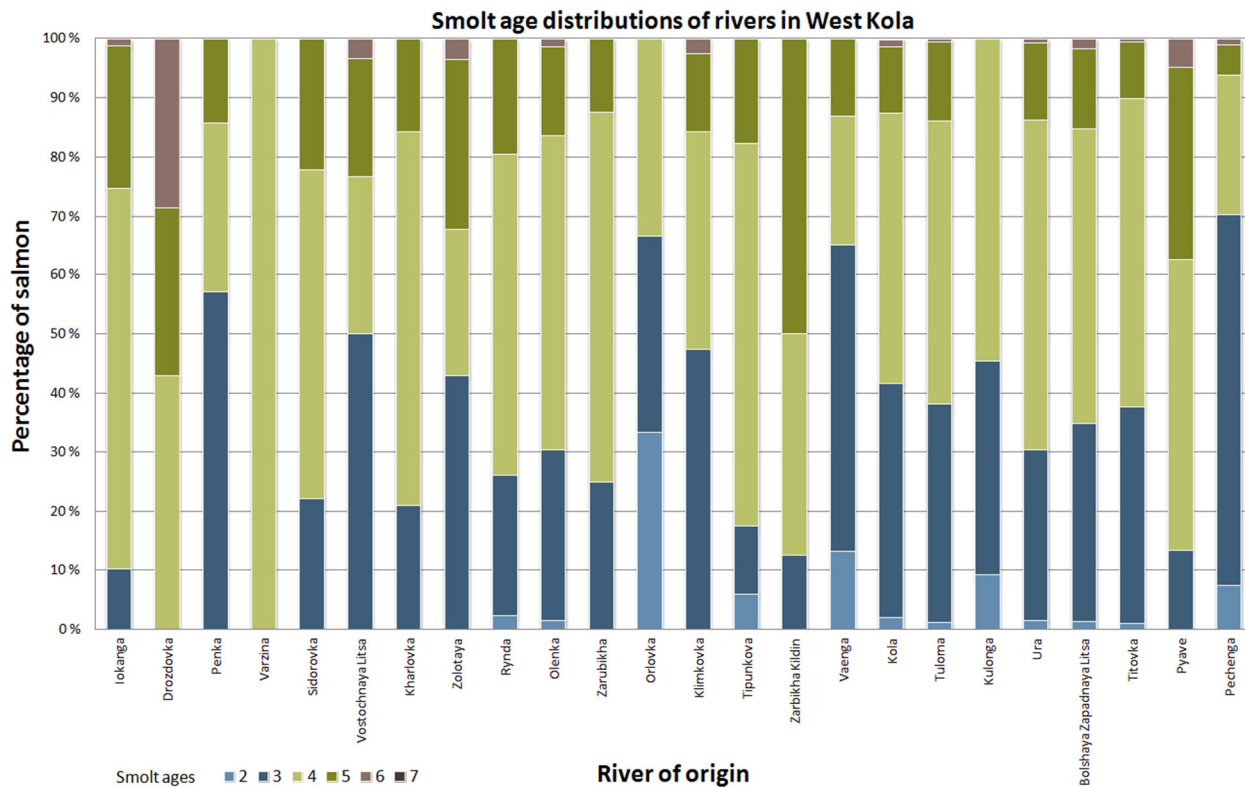


Figure 75. Smolt age distributions in the rivers belonging to one geographical group (RG region; West Kola). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

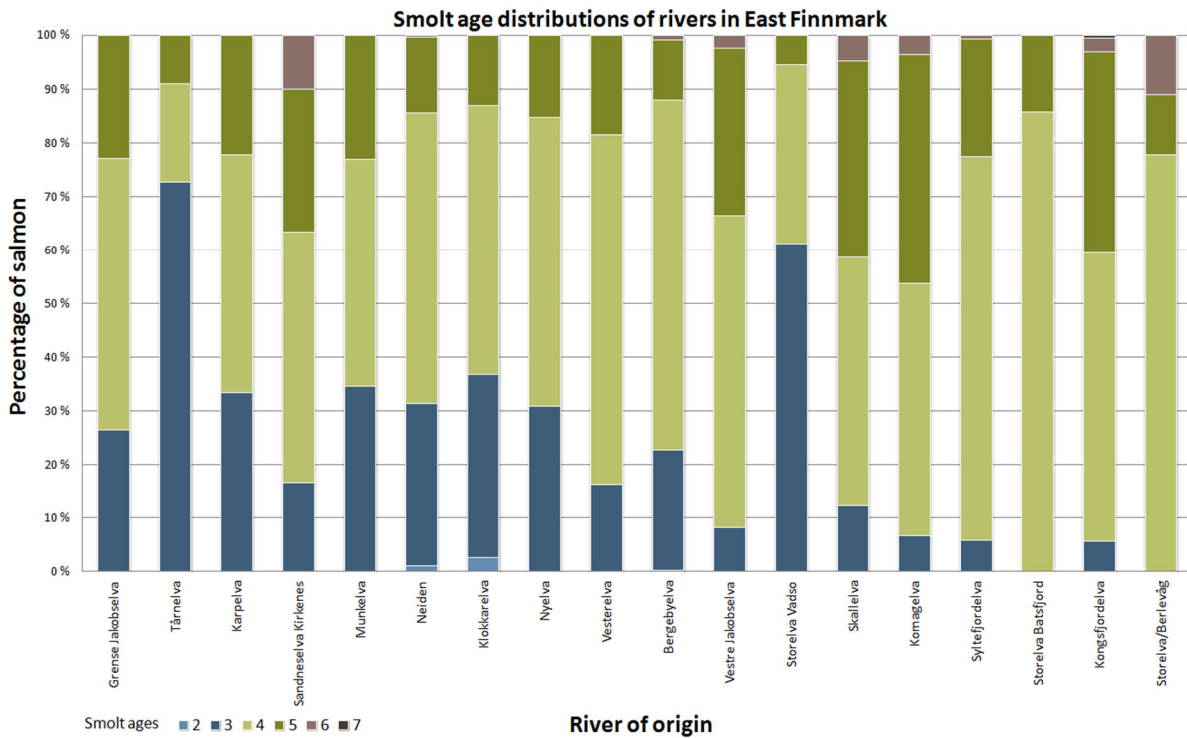


Figure 76. Smolt age distributions in the rivers belonging to one geographical group (RG region; East Finnmark). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

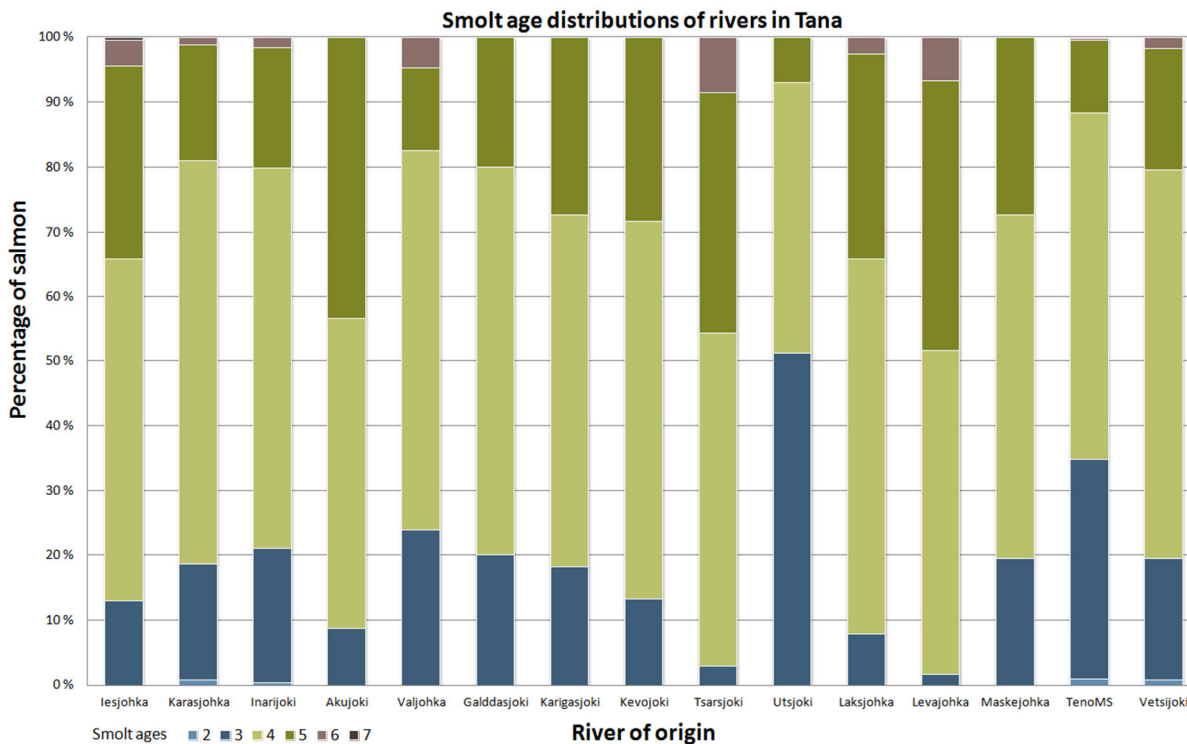


Figure 77. Smolt age distributions in the rivers belonging to one geographical group (RG region; Tana watershed). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

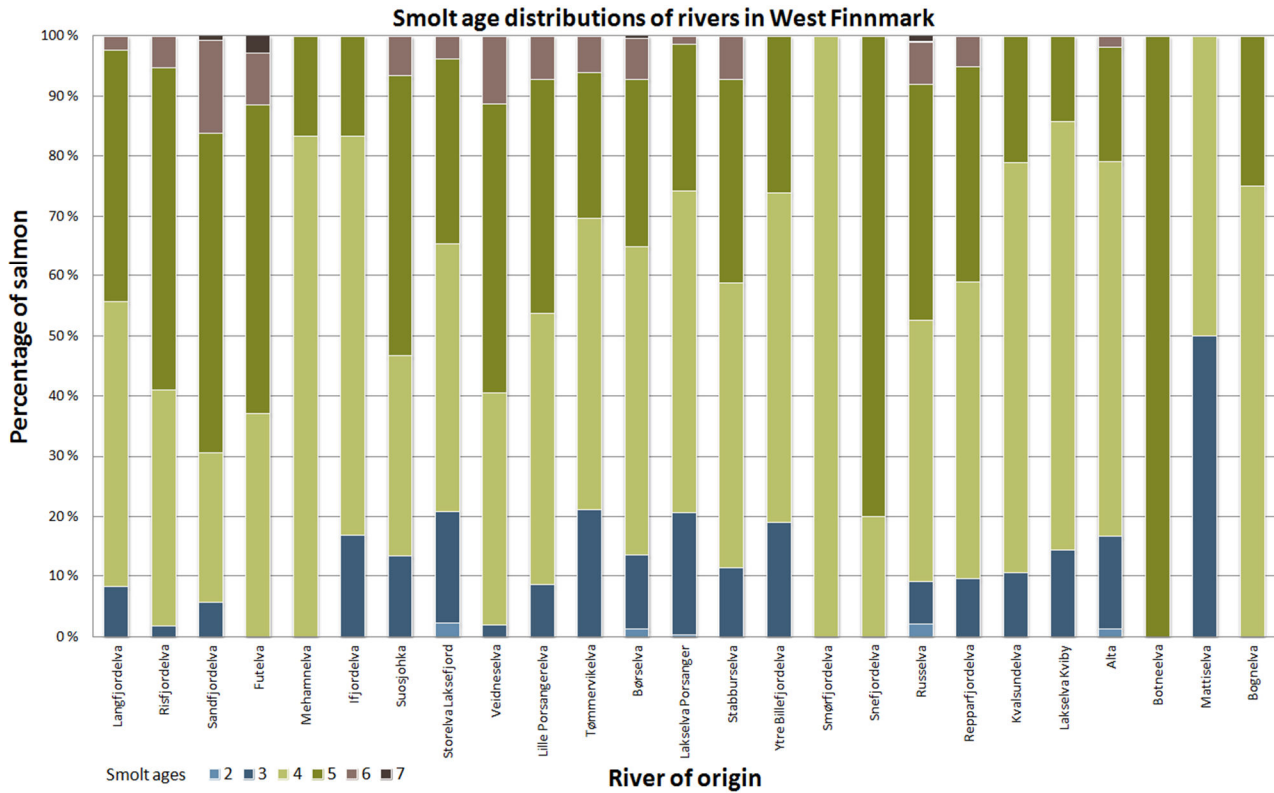


Figure 78. Smolt age distributions in the rivers belonging to one geographical group (RG region; West Finnmark). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

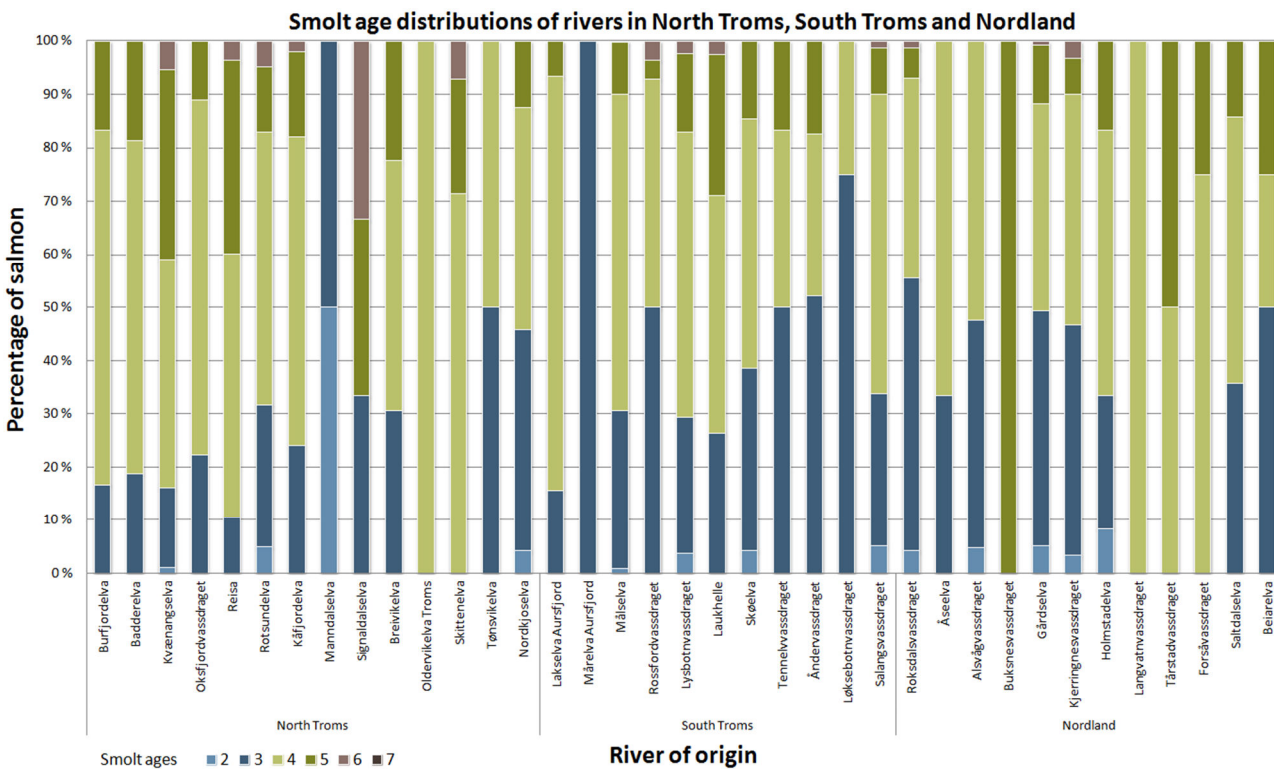


Figure 79. Smolt age distributions in the rivers belonging to three geographical groups (RG regions; North Troms, South Troms, Nordland). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).



## 24. Mean smolt ages and mean smolt lengths for salmon stocks in rivers in North Norway, North Finland and North-West Russia

Mean smolt ages are varying from approx. 2.5 years to 5 years (Fig. 80) in northern rivers which are running into the Barents Sea. The Russian rivers in Eastern Barents and in Eastern White Sea have the lowest mean smolt ages. There are wide variations in the mean smolt ages between rivers and between geographical areas. Mean smolt lengths varied from approx. 12 cm to 18 cm (Fig. 81). In the figures 82-96 mean smolt lengths are presented for the smolt ages 2-6 years in 1SW, 2SW and 3SW salmon.

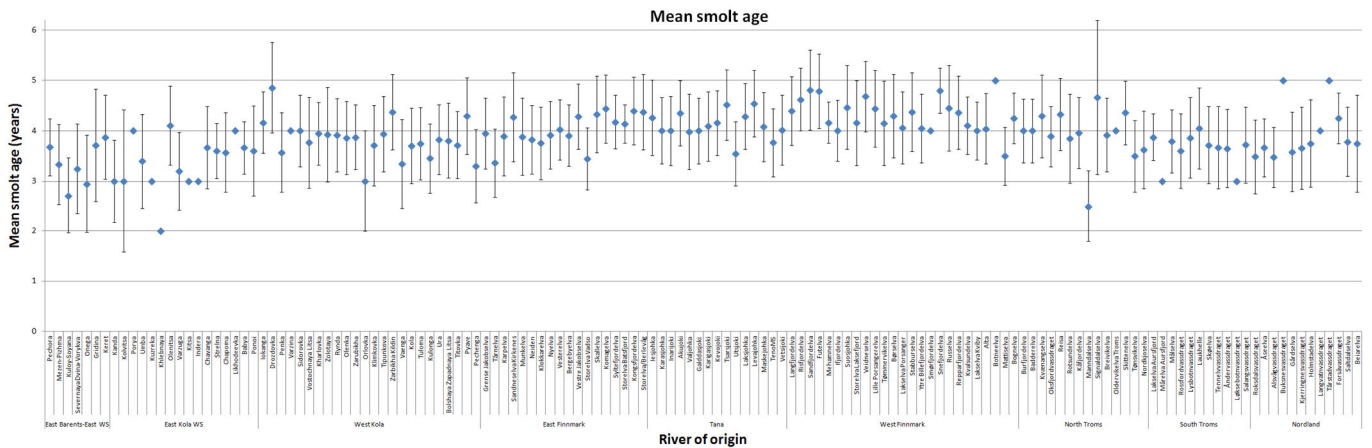


Figure 80. Mean smolt ages (SD) in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

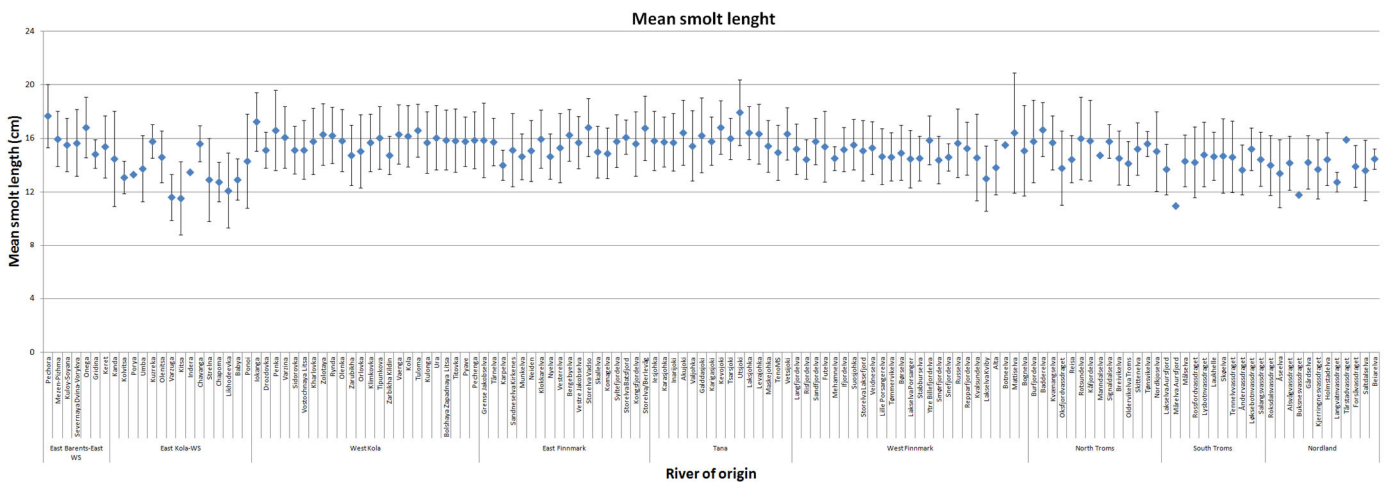


Figure 81. Mean smolt lengths (SD) in the rivers belonging to nine geographical groups (RG regions). Smolt lengths are back-calculated from salmon scales using Fraser-Lee method. Salmon were caught at sea in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

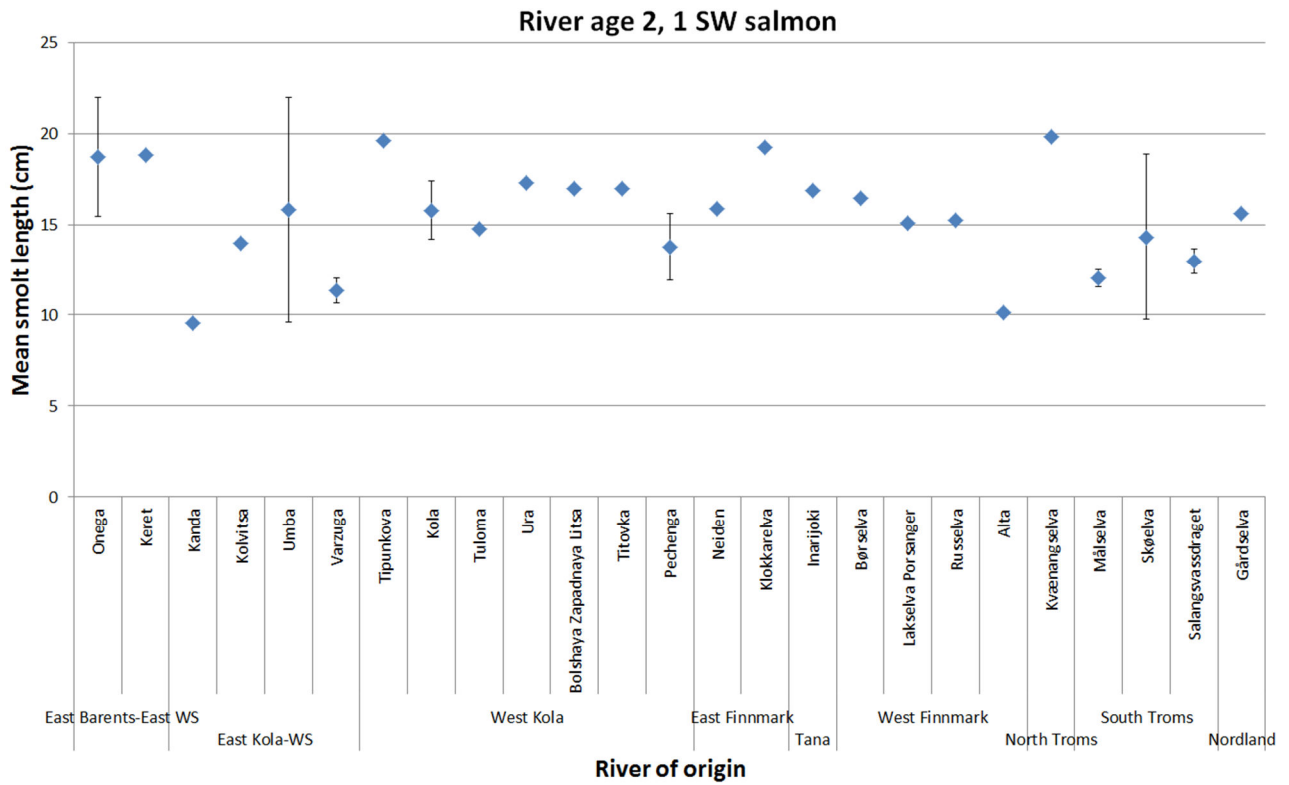


Figure 82. Mean smolt lengths (SD) for 2-year-old smolt in 1SW salmon in the rivers belonging to nine geographical groups (RG regions). Smolt lengths are back-calculated from salmon scales using Fraser-Lee method. Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

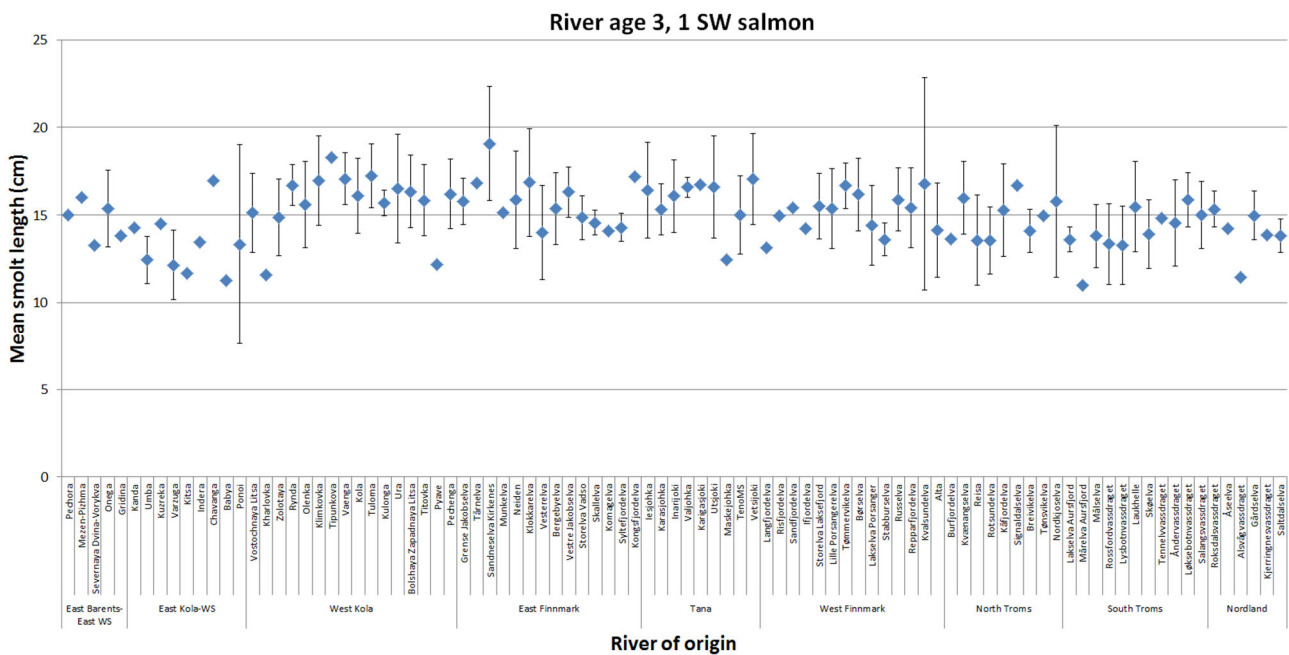


Figure 83. Mean smolt lengths (SD) for 3-year-old smolt in 1SW salmon in the rivers belonging to nine geographical groups (RG regions). Smolt lengths are back-calculated from salmon scales using Fraser-Lee method. Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

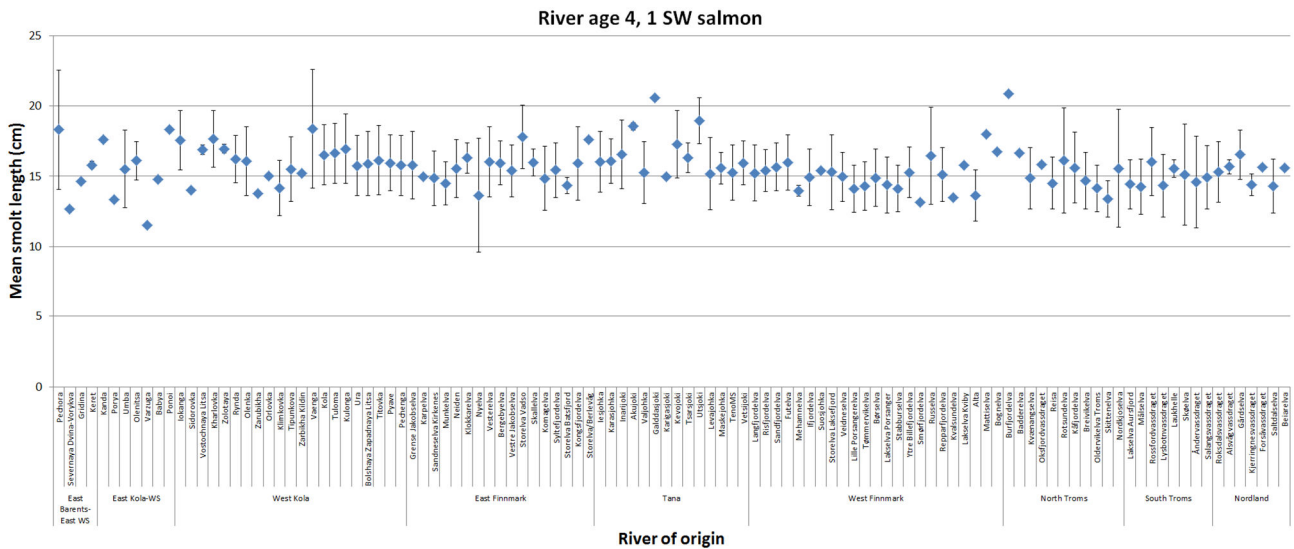


Figure 84. Mean smolt lengths (SD) for 4-year-old smolt in 1SW salmon in the rivers belonging to nine geographical groups (RG regions). Smolt lengths are back-calculated from salmon scales using Fraser-Lee method. Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

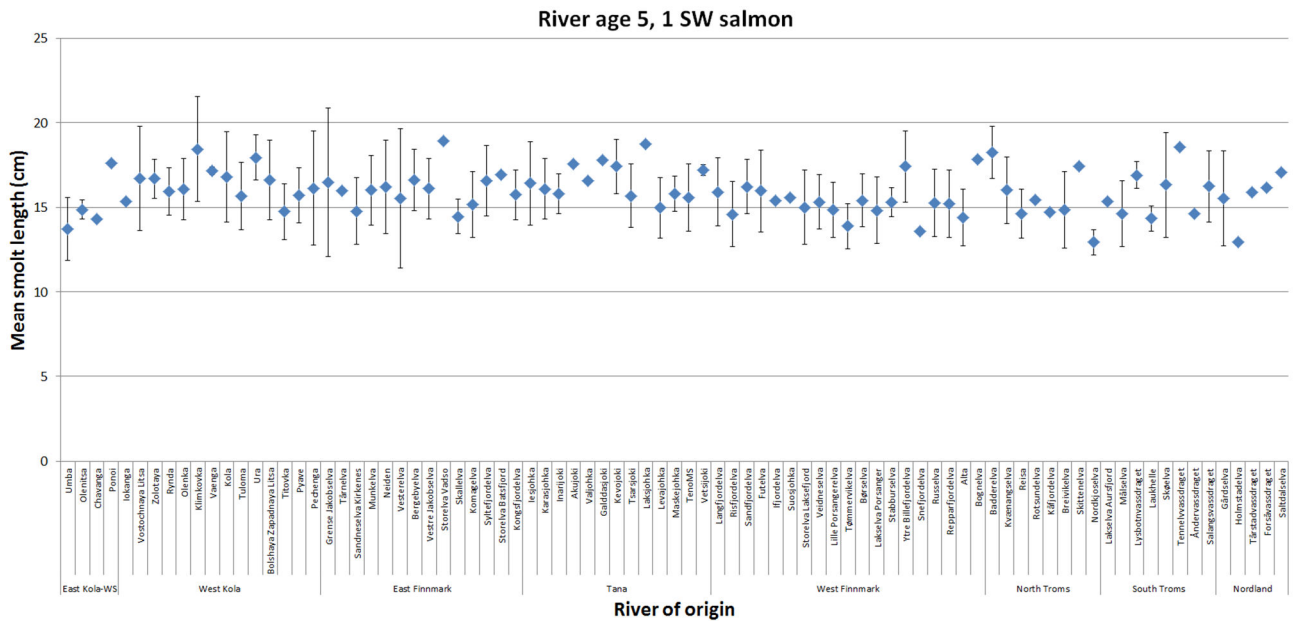


Figure 85. Mean smolt lengths (SD) for 5-year-old smolt in 1SW salmon in the rivers belonging to eight geographical groups (RG regions). Smolt lengths are back-calculated from salmon scales using Fraser-Lee method. Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

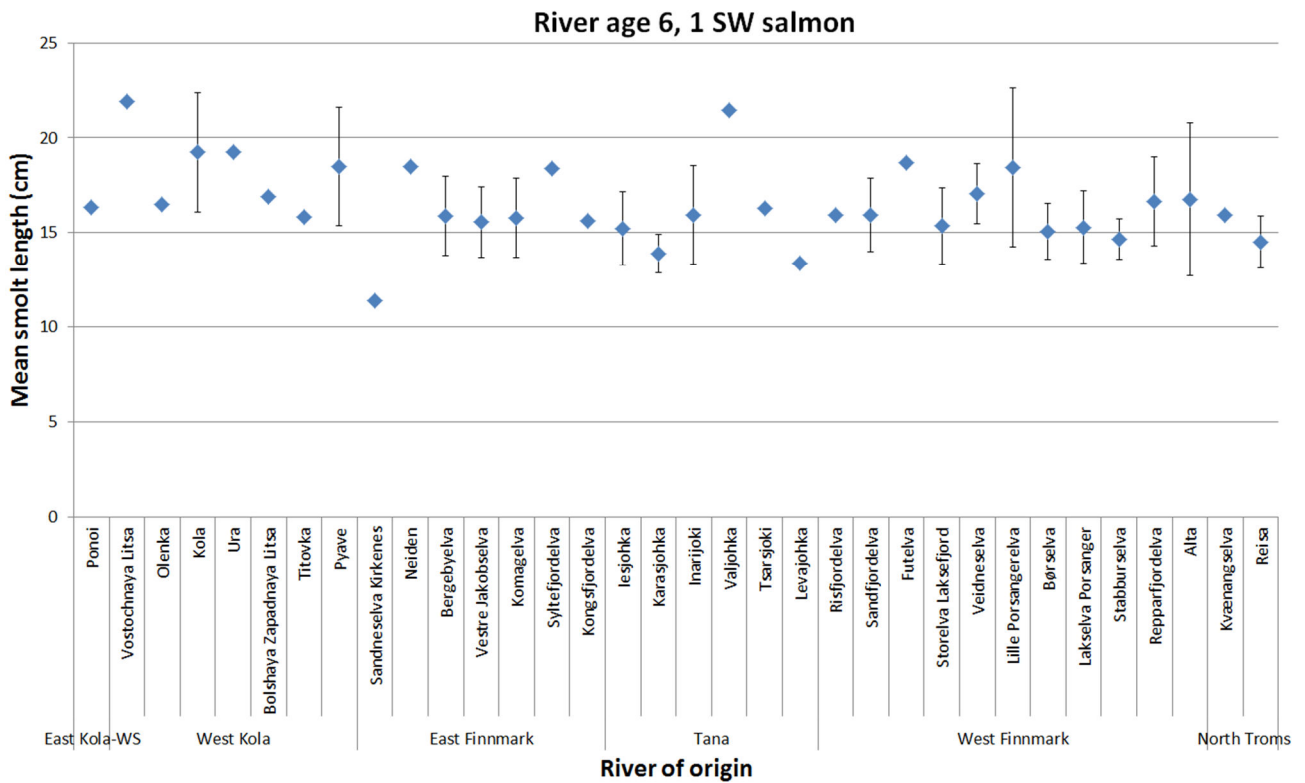


Figure 86. Mean smolt lengths (SD) for 6-year-old smolt in 1SW salmon in the rivers belonging to six geographical groups (RG regions). Smolt lengths are back-calculated from salmon scales using Fraser-Lee method. Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

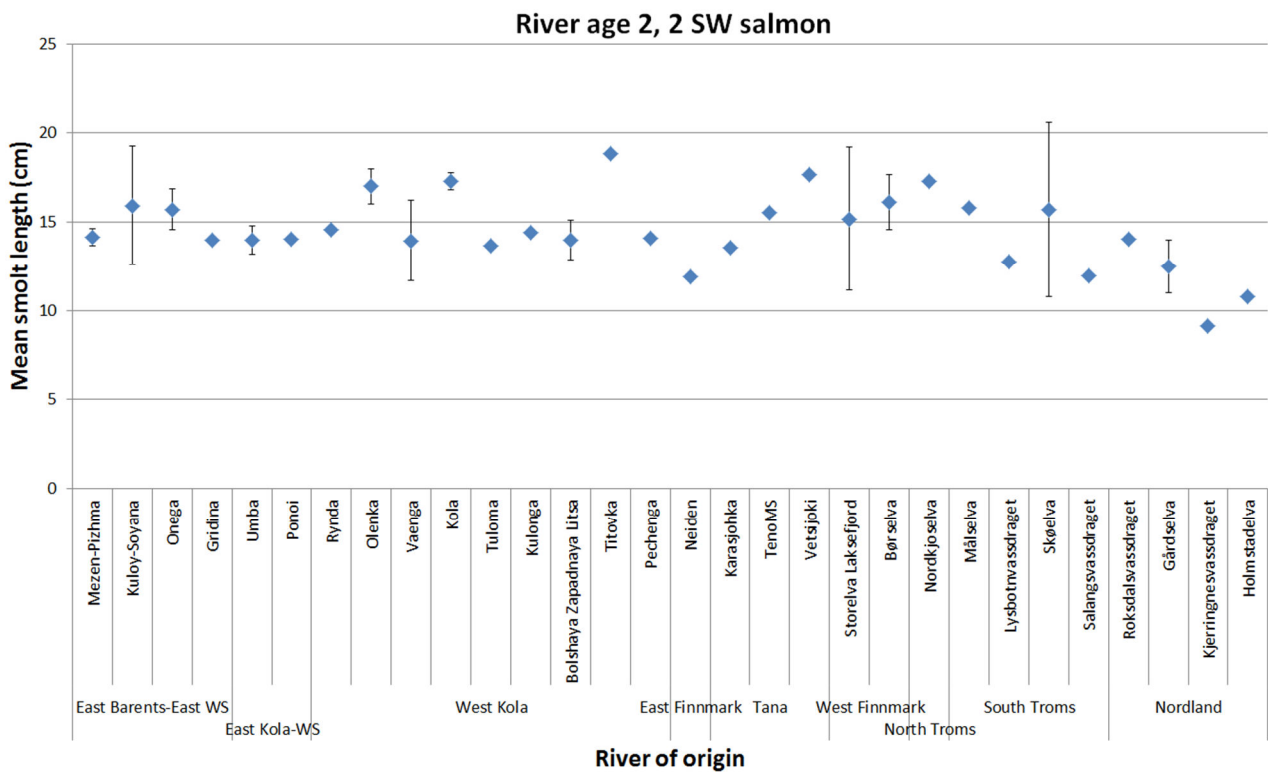


Figure 87. Mean smolt lengths (SD) for 2-year-old smolt in 2SW salmon in the rivers belonging to nine geographical groups (RG regions). Smolt lengths are back-calculated from salmon scales using Fraser-Lee method. Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

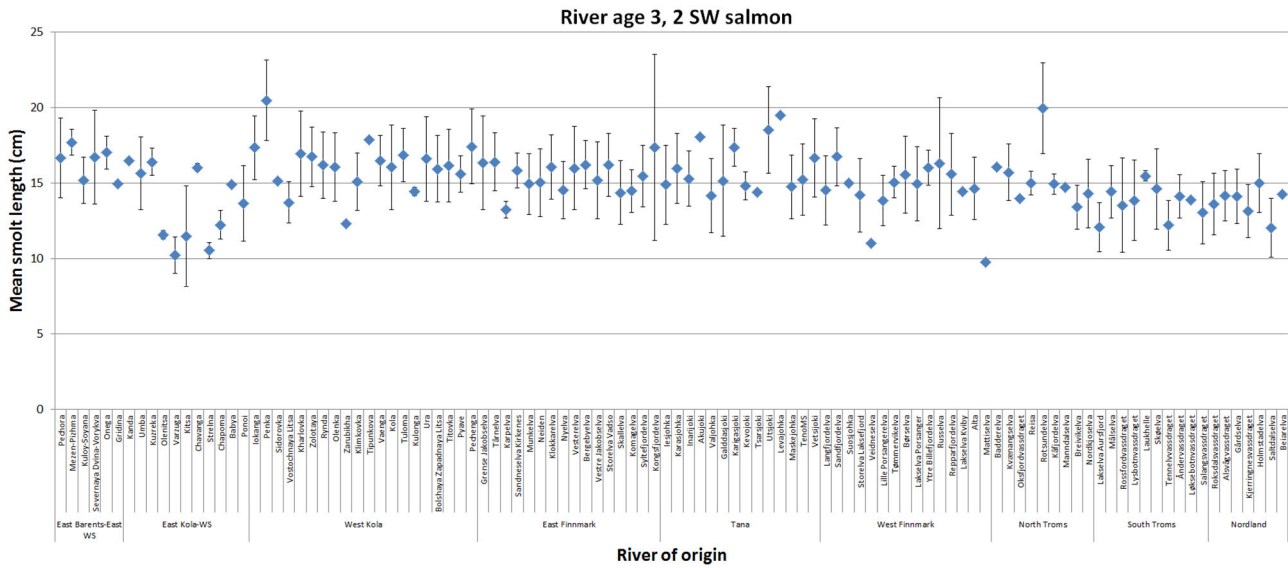


Figure 88. Mean smolt lengths (SD) for 3-year-old smolt in 2SW salmon in the rivers belonging into nine geographical groups (RG regions). Smolt lengths are back-calculated from salmon scales using Fraser-Lee method. Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

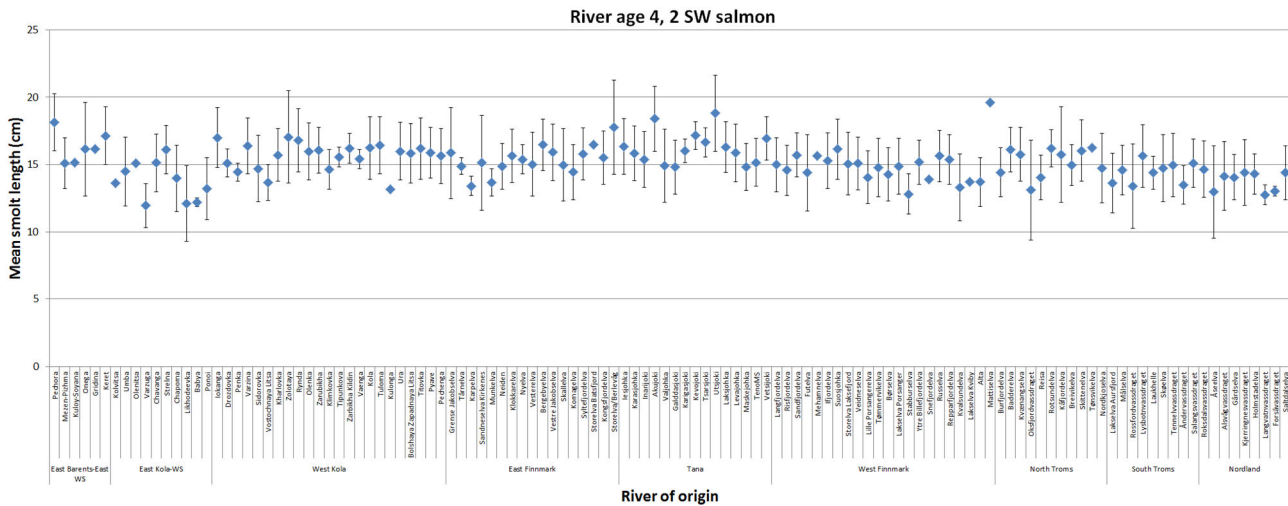


Figure 89. Mean smolt lengths (SD) for 4-year-old smolt in 2SW salmon in the rivers belonging to nine geographical groups (RG regions). Smolt lengths are back-calculated from salmon scales using Fraser-Lee method. Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

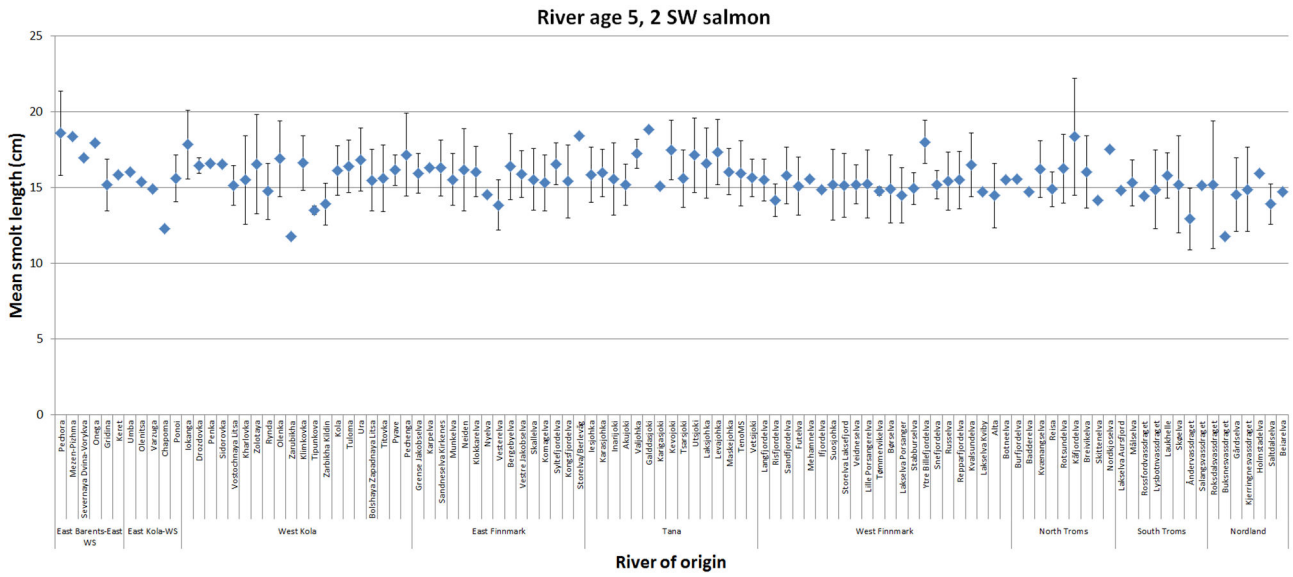


Figure 90. Mean smolt lengths (SD) for 5-year-old smolt in 2SW salmon in the rivers belonging to nine geographical groups (RG regions). Smolt lengths are back-calculated from salmon scales using Fraser-Lee method. Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

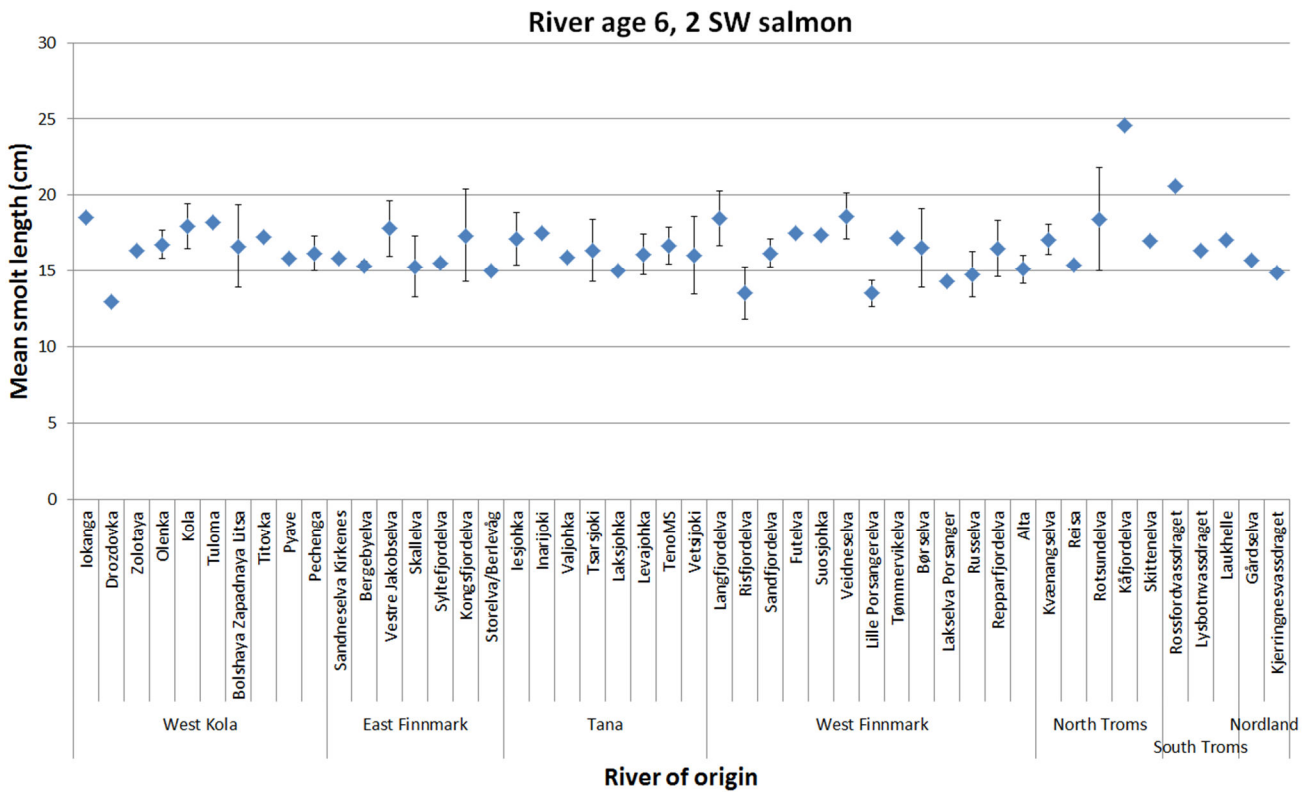


Figure 91. Mean smolt lengths (SD) for 6-year-old smolt in 2SW salmon in the rivers belonging into seven geographical groups (RG regions). Smolt lengths are back-calculated from salmon scales using Fraser-Lee method. Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

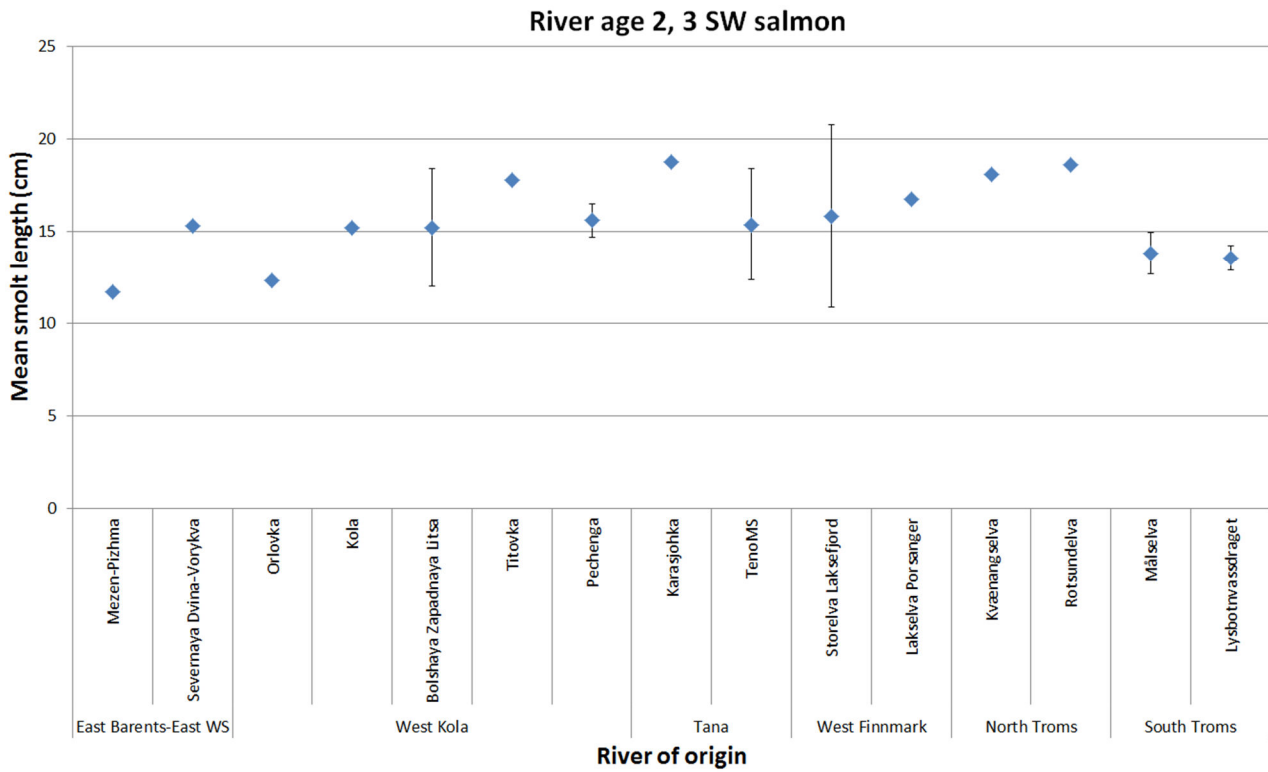


Figure 92. Mean smolt lengths (SD) for 2-year-old smolt in 3SW salmon in the rivers belonging to six geographical groups (RG regions). Smolt lengths are back-calculated from salmon scales using Fraser-Lee method. Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

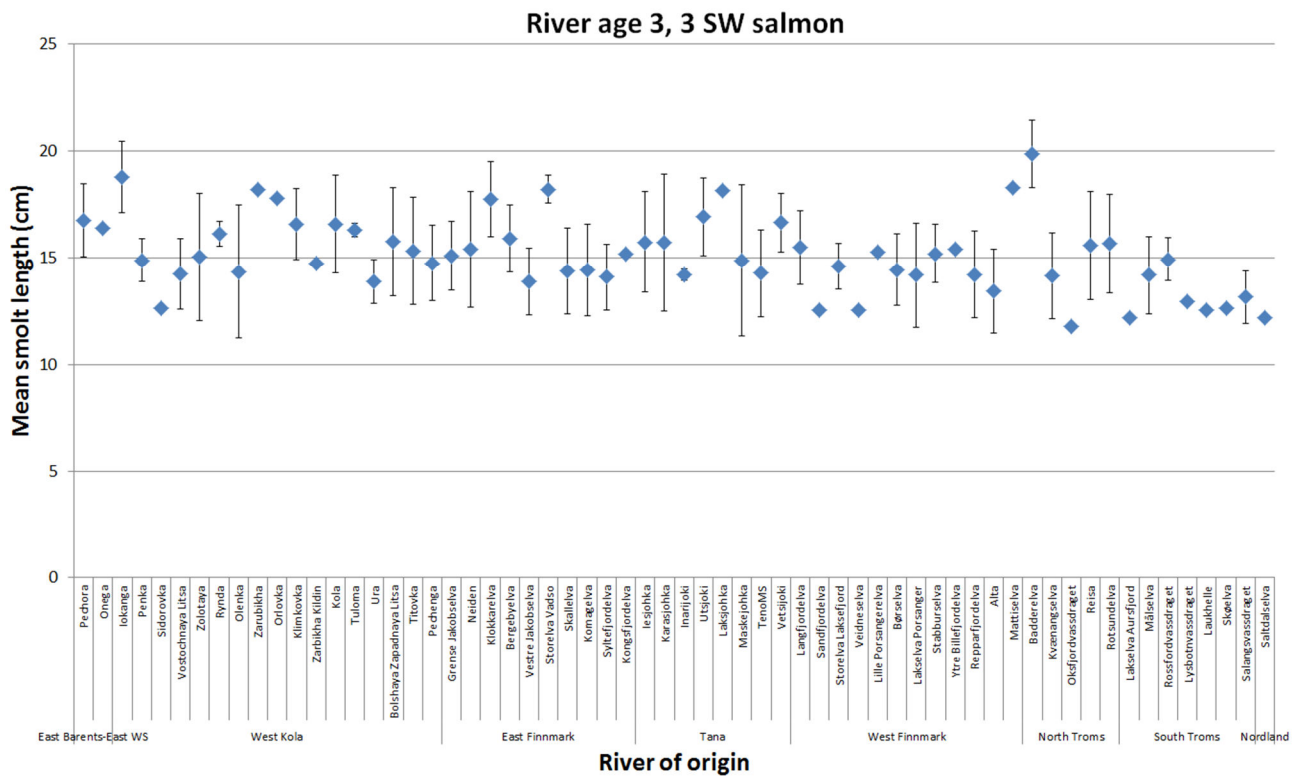


Figure 93. Mean smolt lengths (SD) for 3-year-old smolt in 3SW salmon in the rivers belonging to eight geographical groups (RG regions). Smolt lengths are back-calculated from salmon scales using Fraser-Lee method. Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

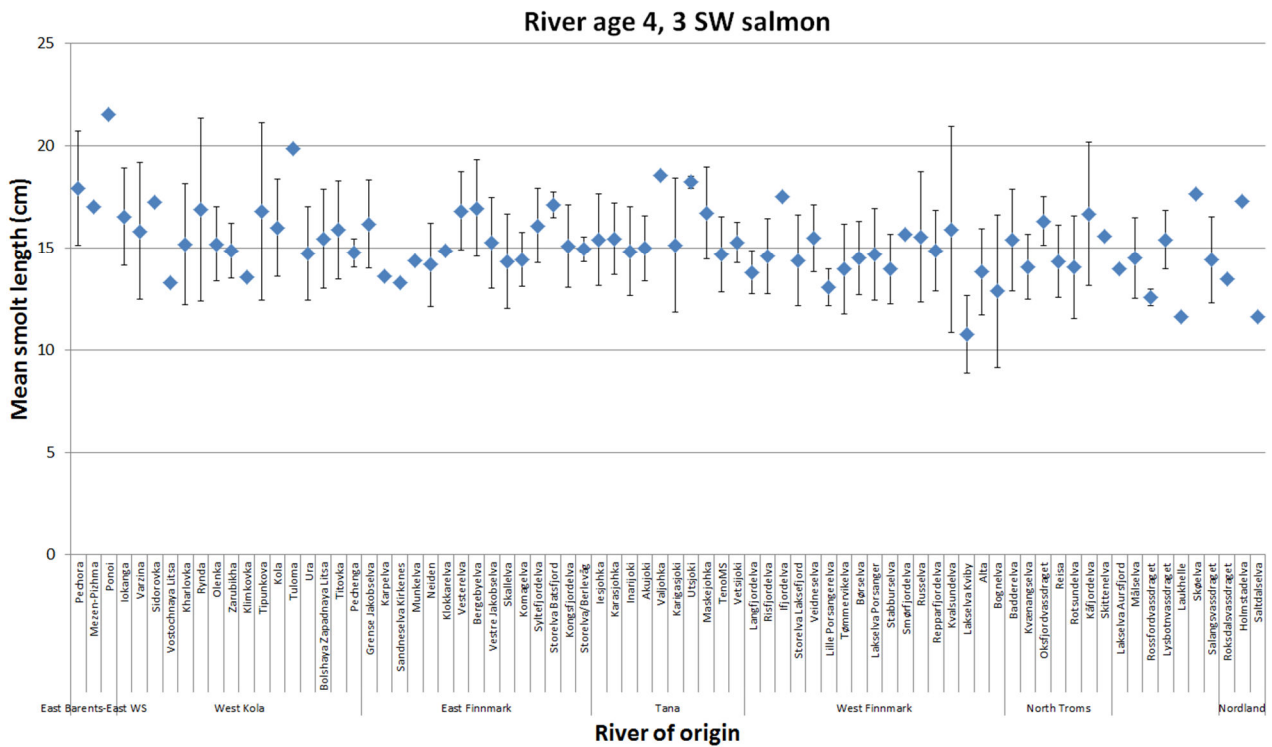


Figure 94. Mean smolt lengths (SD) for 4-year-old smolt in 3SW salmon in the rivers belonging to seven geographical groups (RG regions). Smolt lengths are back-calculated from salmon scales using Fraser-Lee method. Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

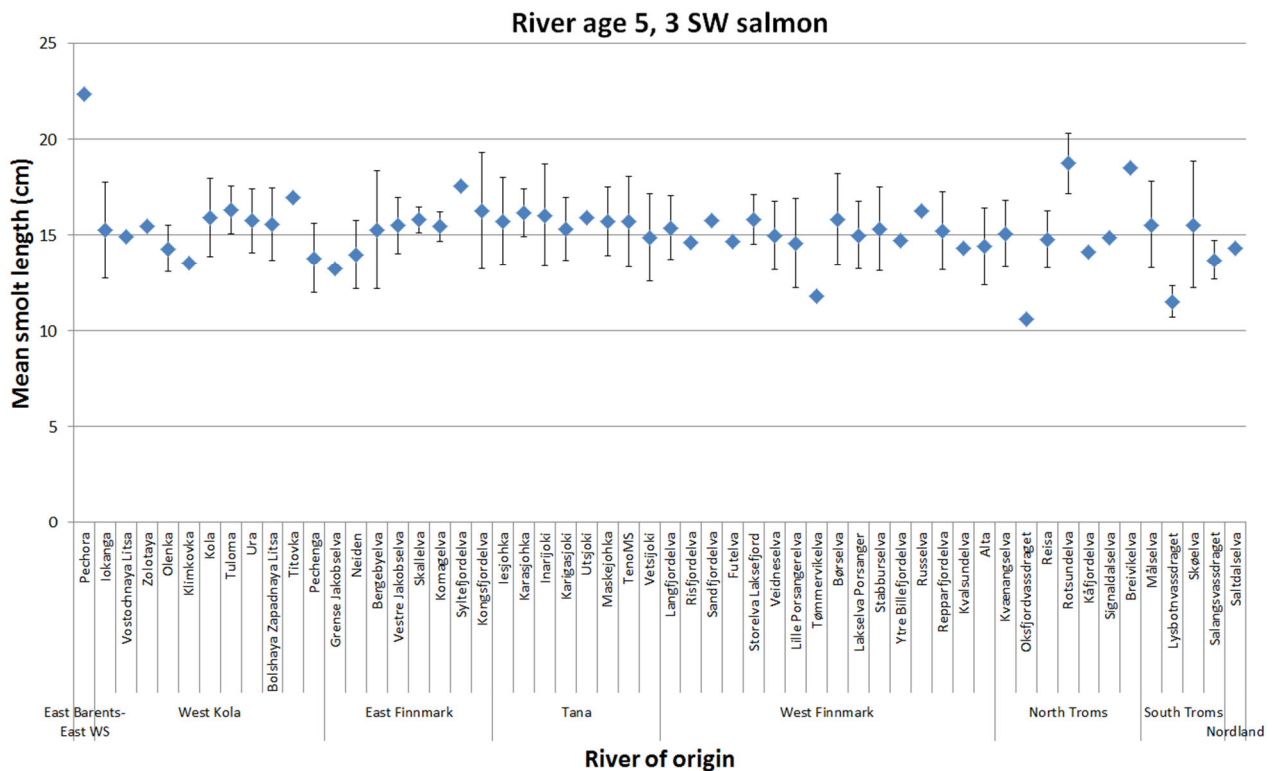


Figure 95. Mean smolt lengths (SD) for 5-year-old smolt in 3SW salmon in the rivers belonging to eight geographical groups (RG regions). Smolt lengths are back-calculated from salmon scales using Fraser-Lee method. Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).



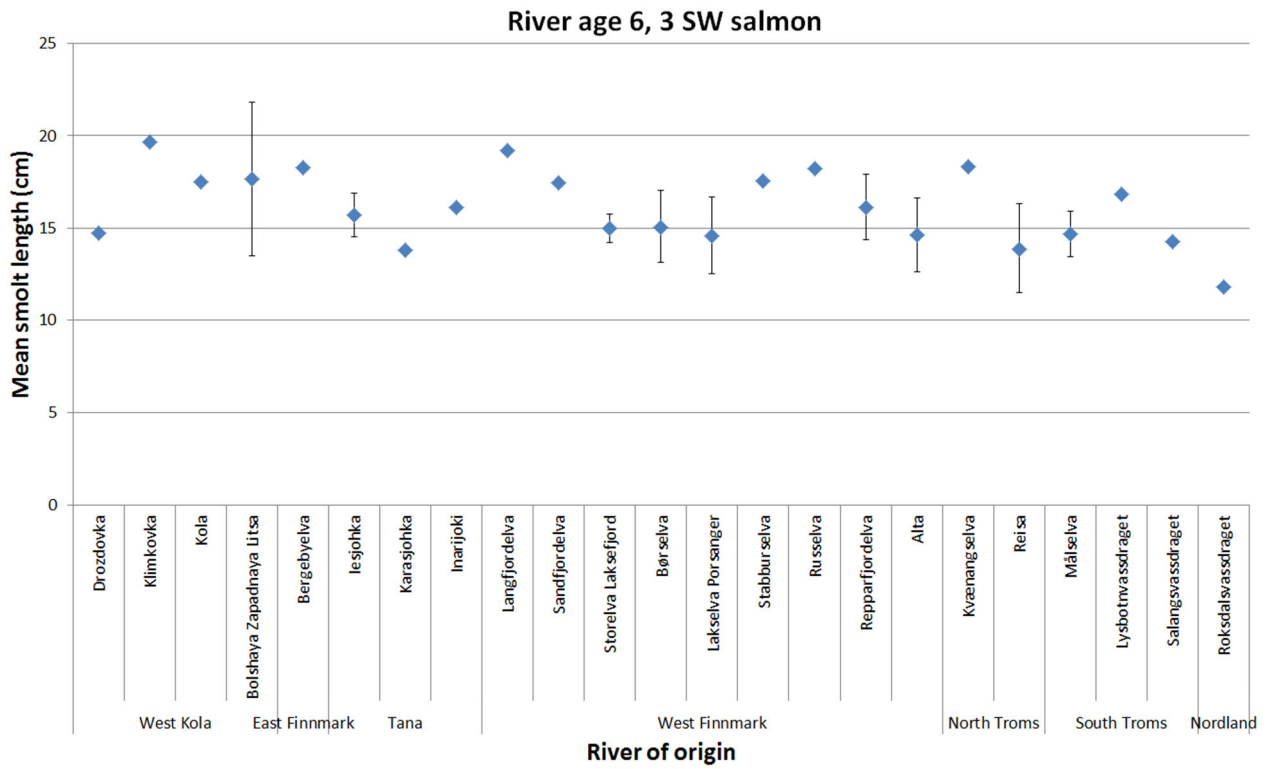


Figure 96. Mean smolt lengths (SD) for 6-year-old smolt in 3SW salmon in the rivers belonging to eight geographical groups (RG regions). Smolt lengths are back-calculated from salmon scales using Fraser-Lee method. Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

25. Mean annual and weekly lengths and weights of female and male 1SW, 2SW, 3SW and 4SW salmon in the rivers Alta, Repparfjordelv and Tana mainstream, caught at sea in Northern Norway

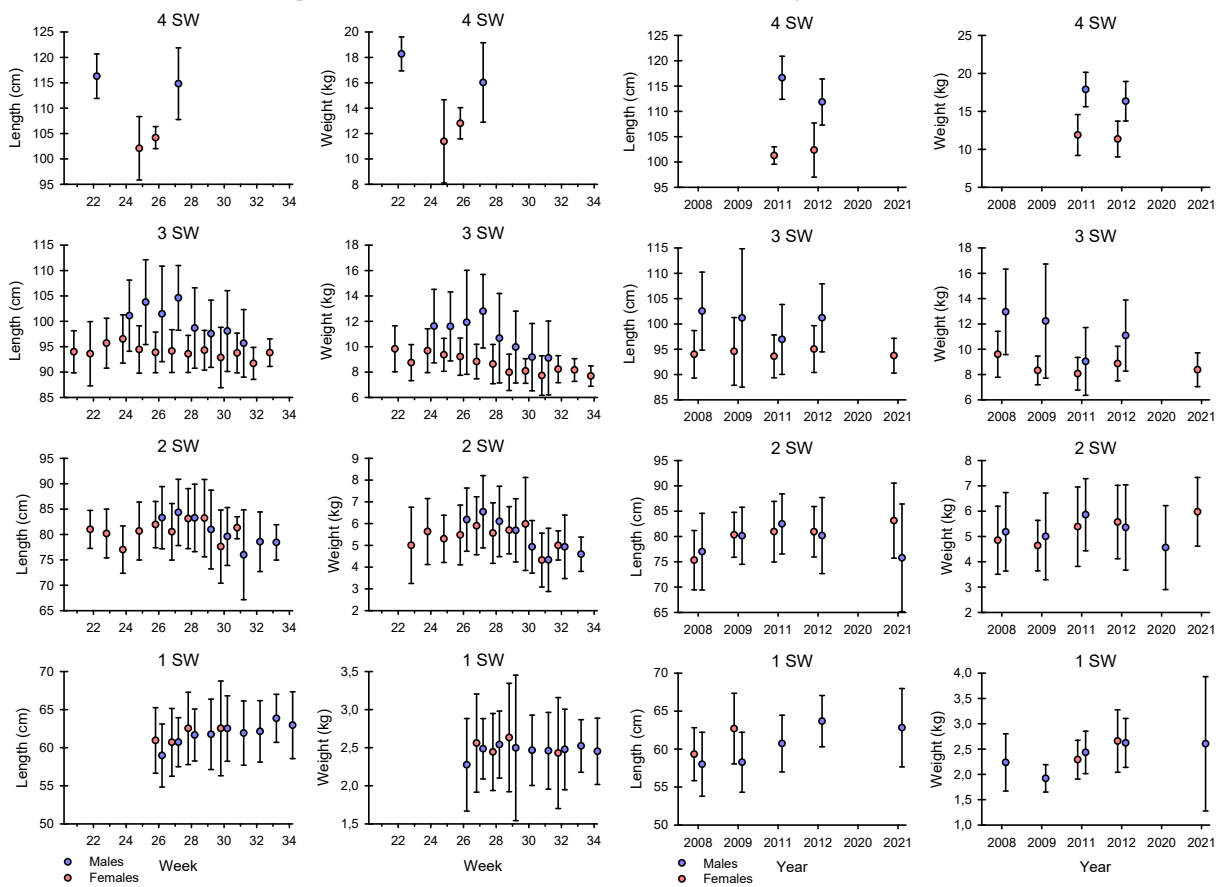


Figure 97. Weekly and annual mean lengths and weights (SD) of the River Alta salmon stocks caught in the coastal fishery in Northern Norway (Finnmark, Troms, Nordland) in the years 2008-2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

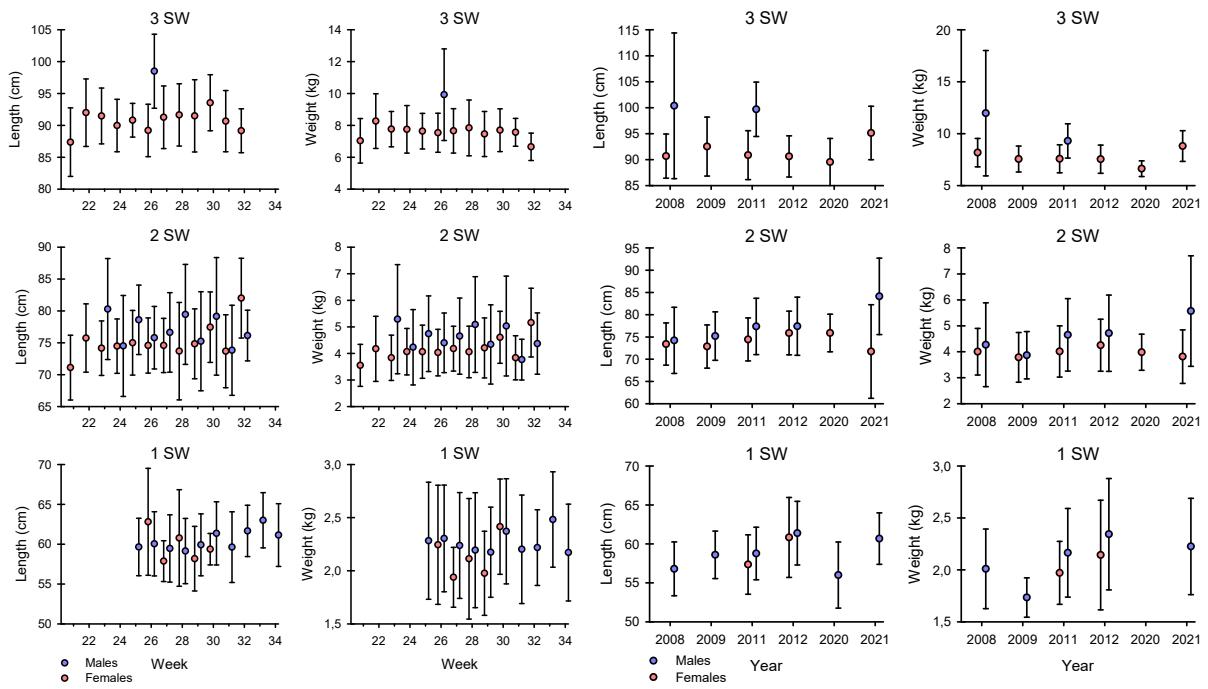


Figure 98. Weekly and annual mean lengths and weights (SD) of the River Repparfjordelv salmon stocks caught in the coastal fishery in Northern Norway (Finmark, Troms, Nordland) in the years 2008-2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

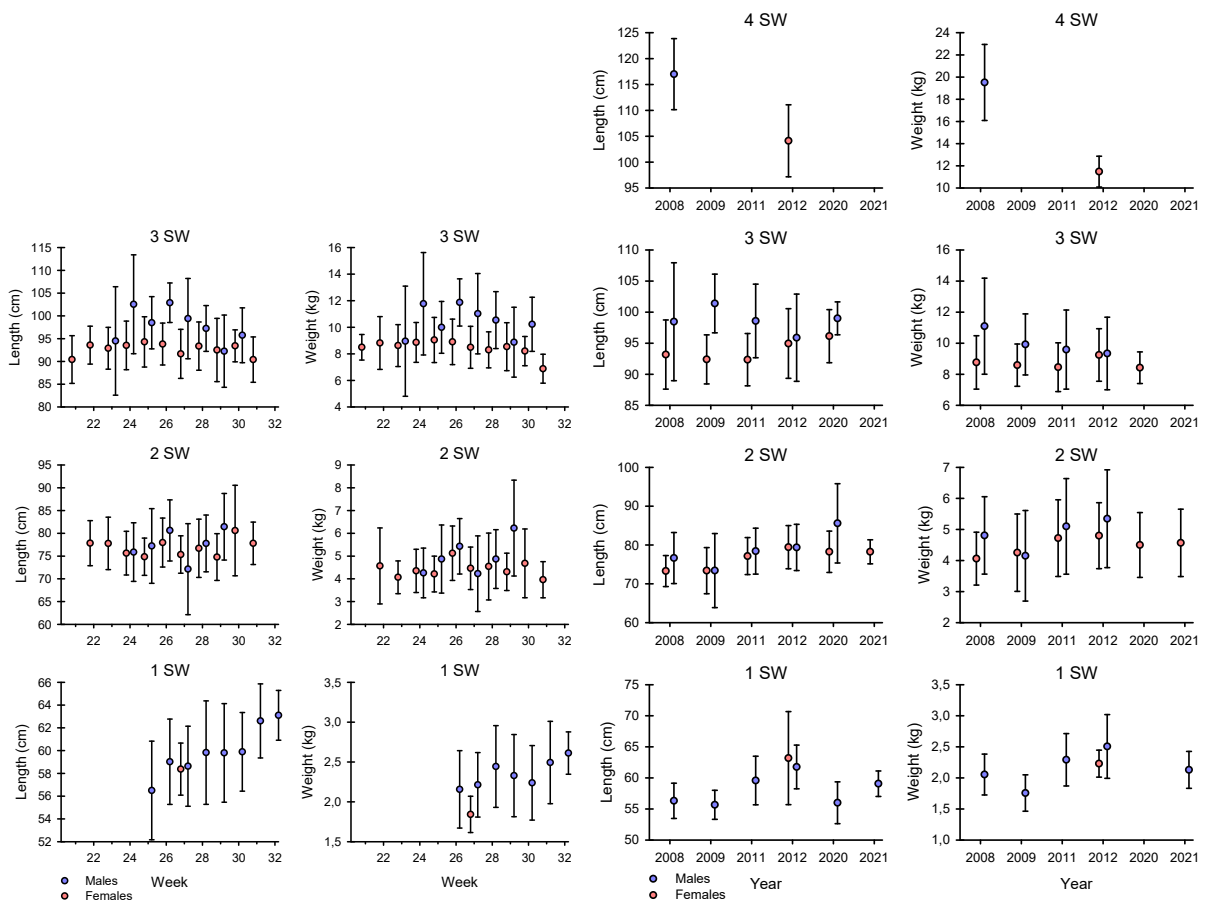


Figure 99. Weekly and annual mean lengths and weights (SD) of the River Tana mainstream salmon stocks caught in the coastal fishery in Northern Norway (Finmark, Troms, Nordland) in the years 2008-2021. Source: Kolarctic EU/ENPI CBC (KO 197), Kolarctic EU/ENI CBC (KO 4178).

## 26. Mean lengths of 1SW, 2SW and 3SW female and male salmon and sexes combined

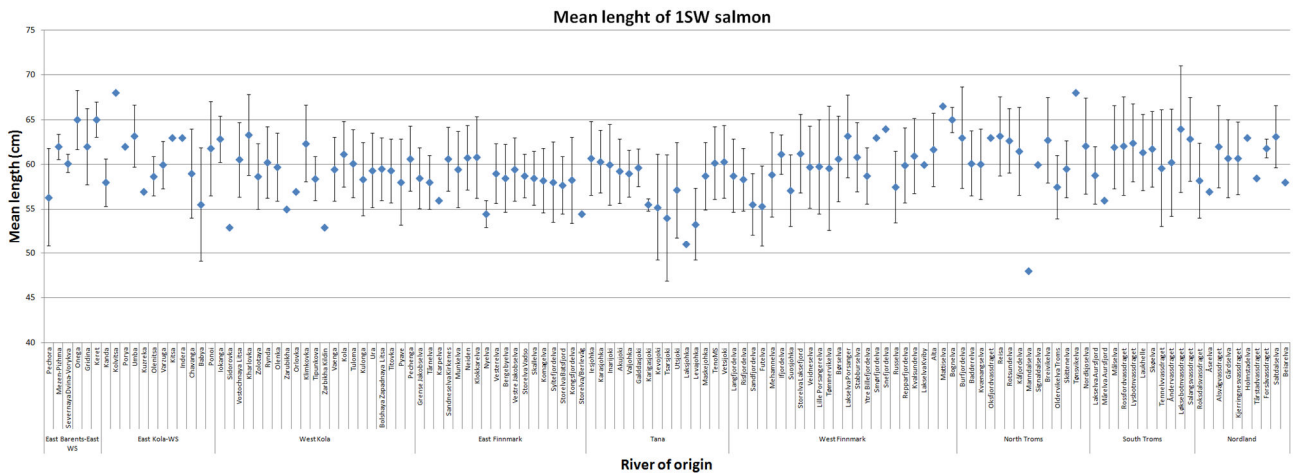


Figure 100. Mean lengths (SD) of 1SW salmon females and males combined in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

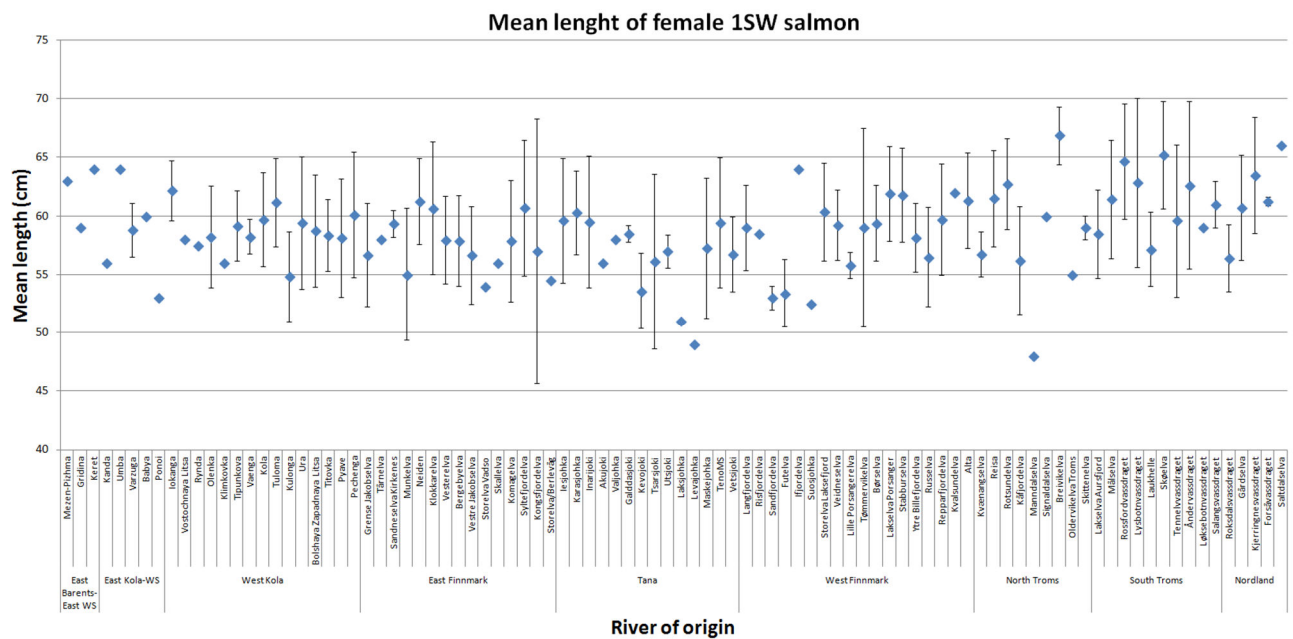


Figure 101. Mean lengths (SD) of 1SW female salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

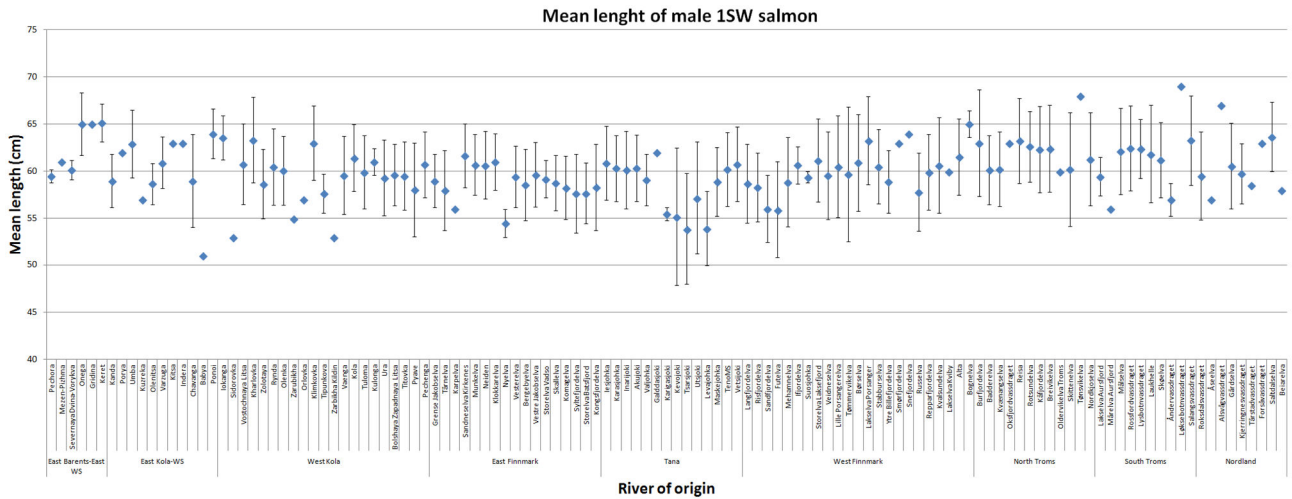


Figure 102. Mean lengths (SD) of 1SW male salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

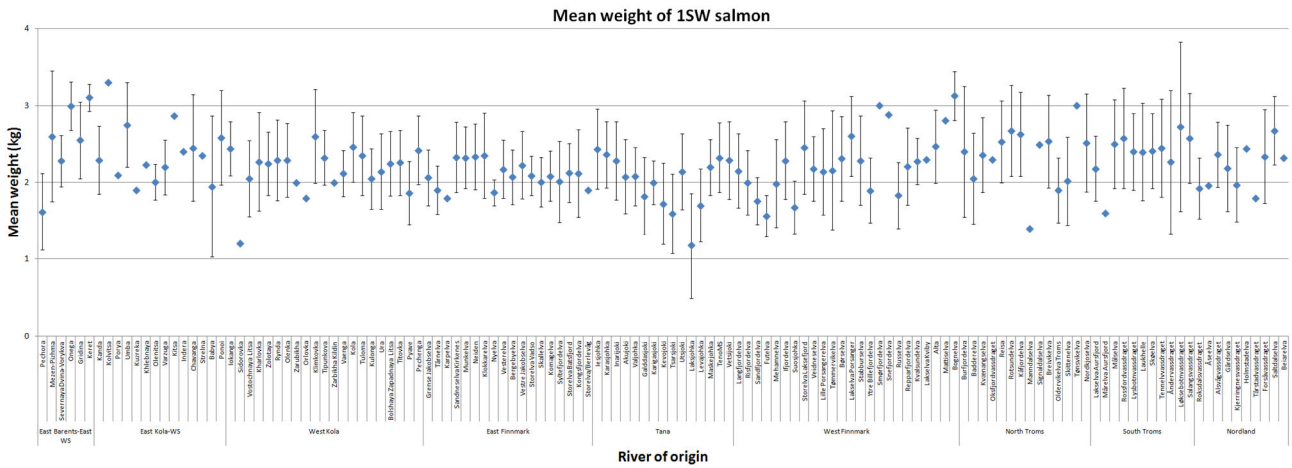


Figure 103. Mean weights (SD) of 1SW female salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

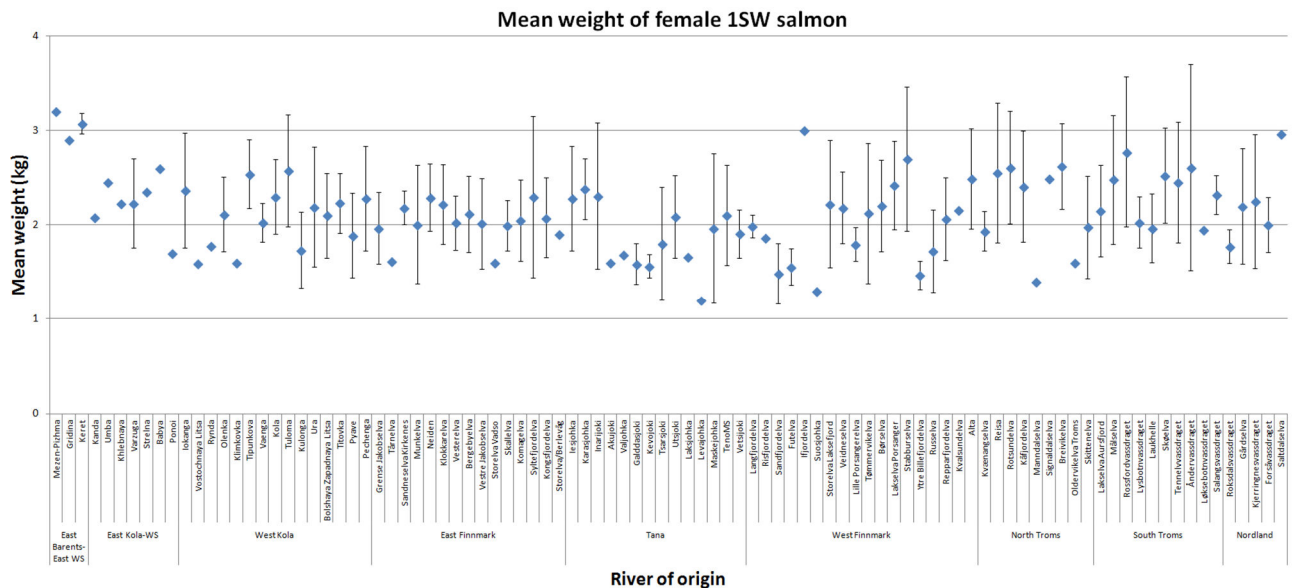


Figure 104. Mean weights (SD) of 1SW female salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

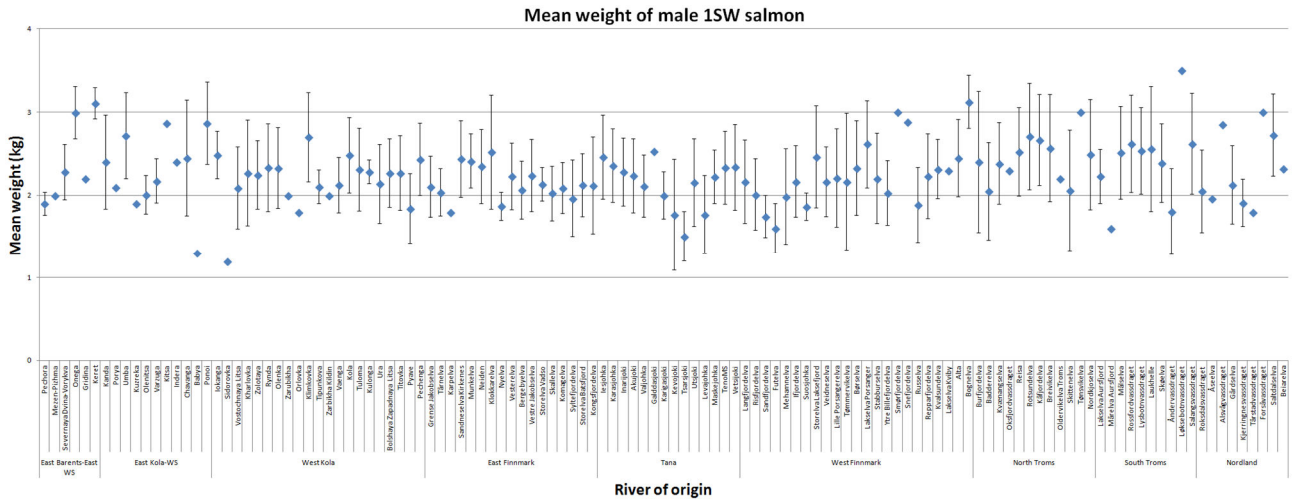


Figure 105. Mean weights (SD) of 1SW male salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

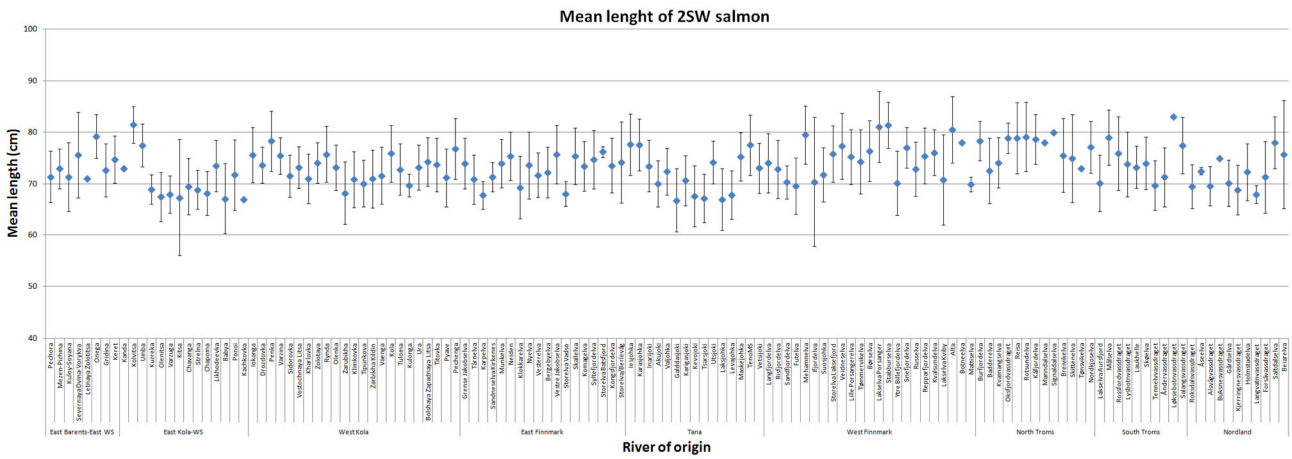


Figure 106. Mean lengths (SD) of 2SW salmon females and males combined in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

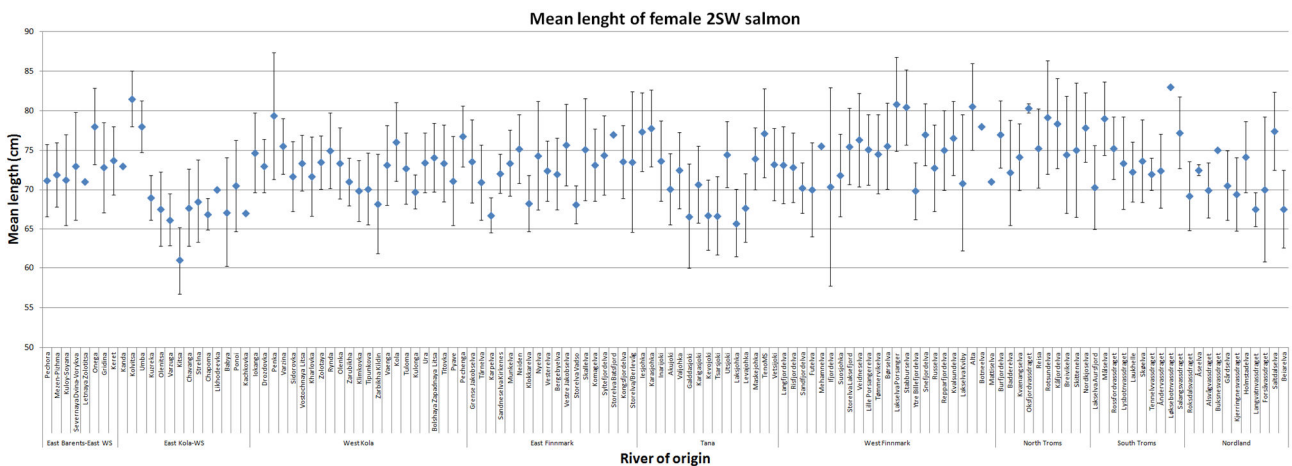


Figure 107. Mean lengths (SD) of 2SW female salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

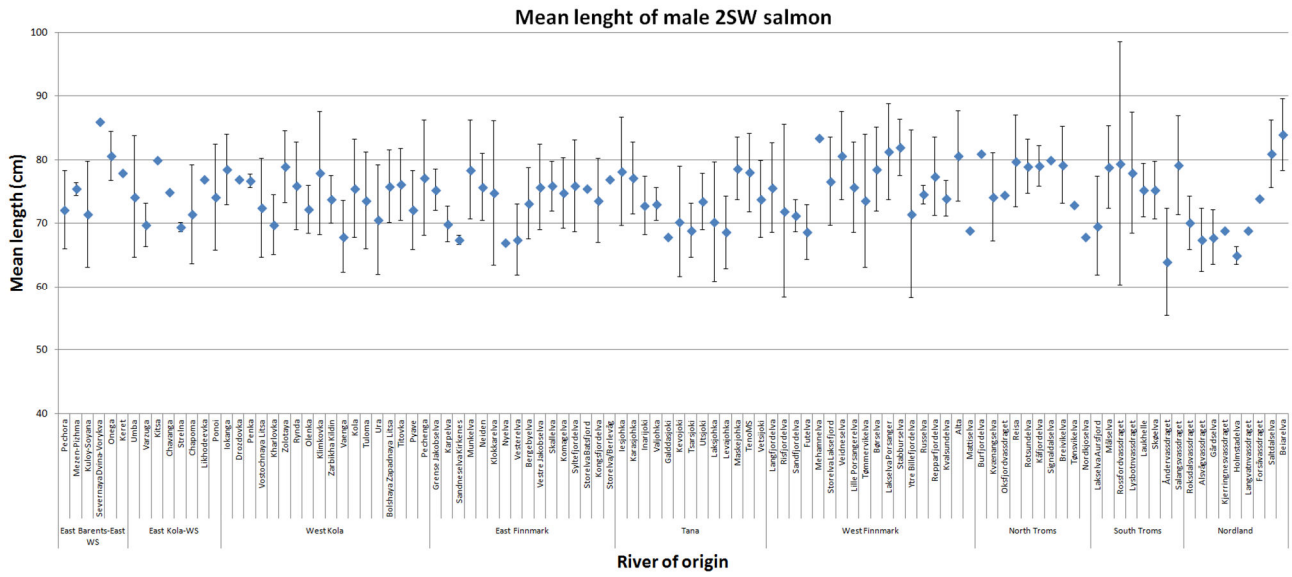


Figure 108. Mean lengths (SD) of 2SW male salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

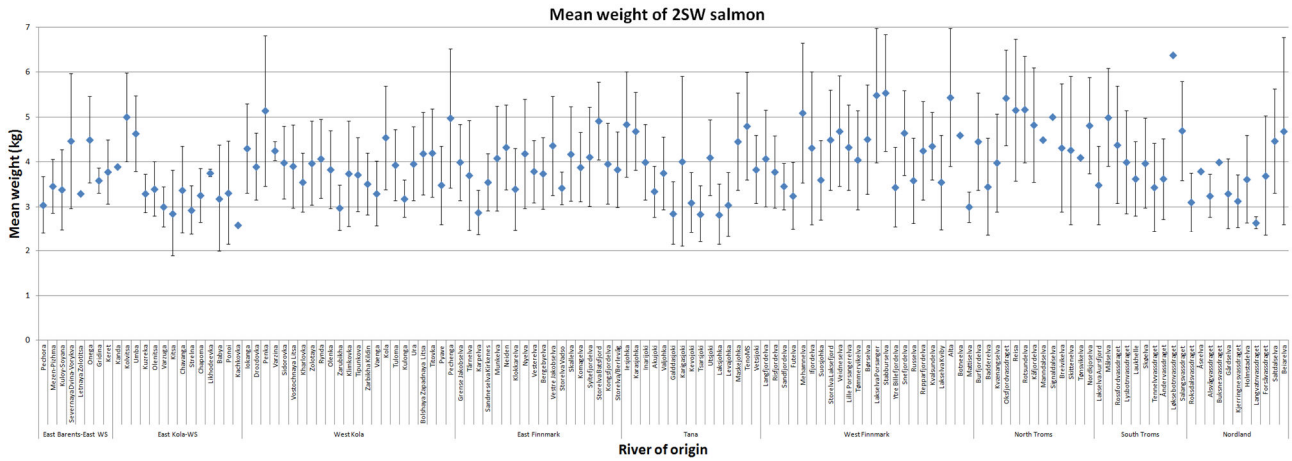


Figure 109. Mean weights (SD) of 2SW salmon females and males combined in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

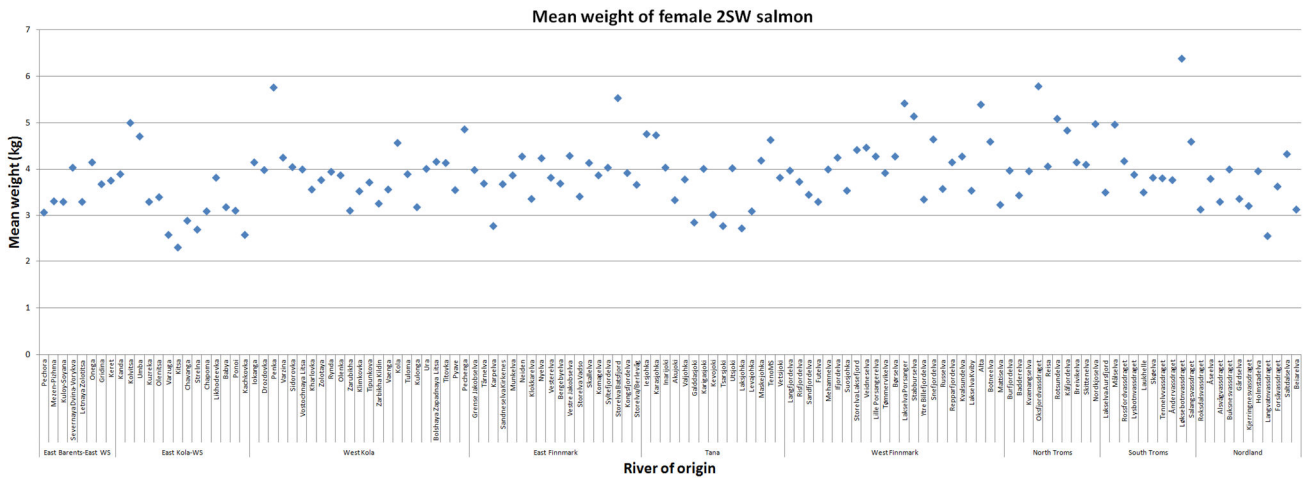


Figure 110. Mean weights (SD) of 2SW female salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

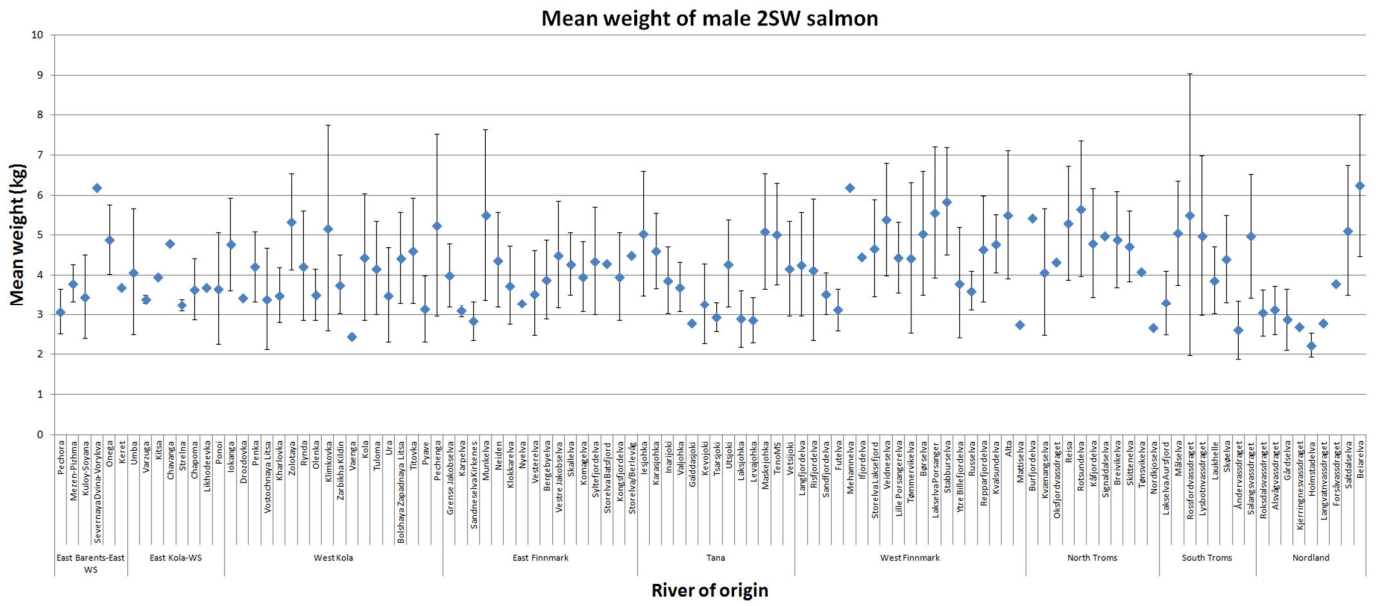


Figure 111. Mean weights (SD) of 2SW male salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

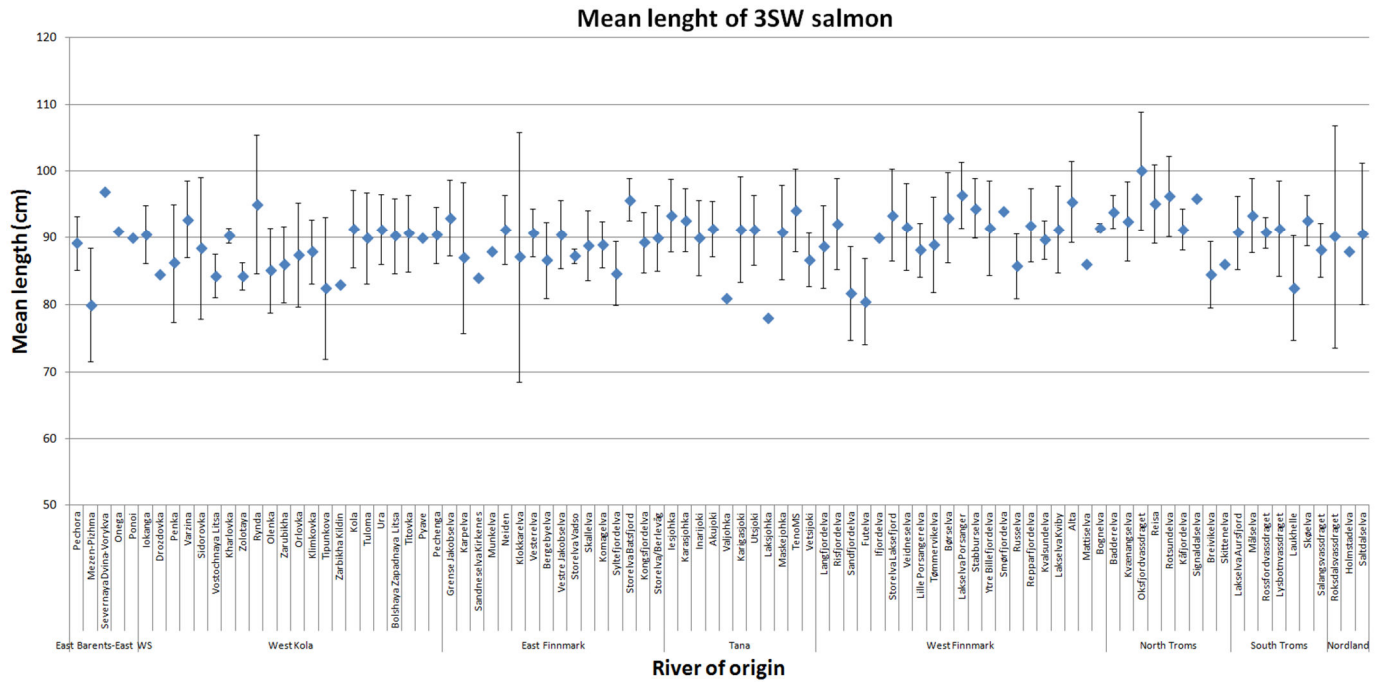


Figure 112. Mean lengths (SD) of 3SW salmon females and males combined in the rivers belonging to eight geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).



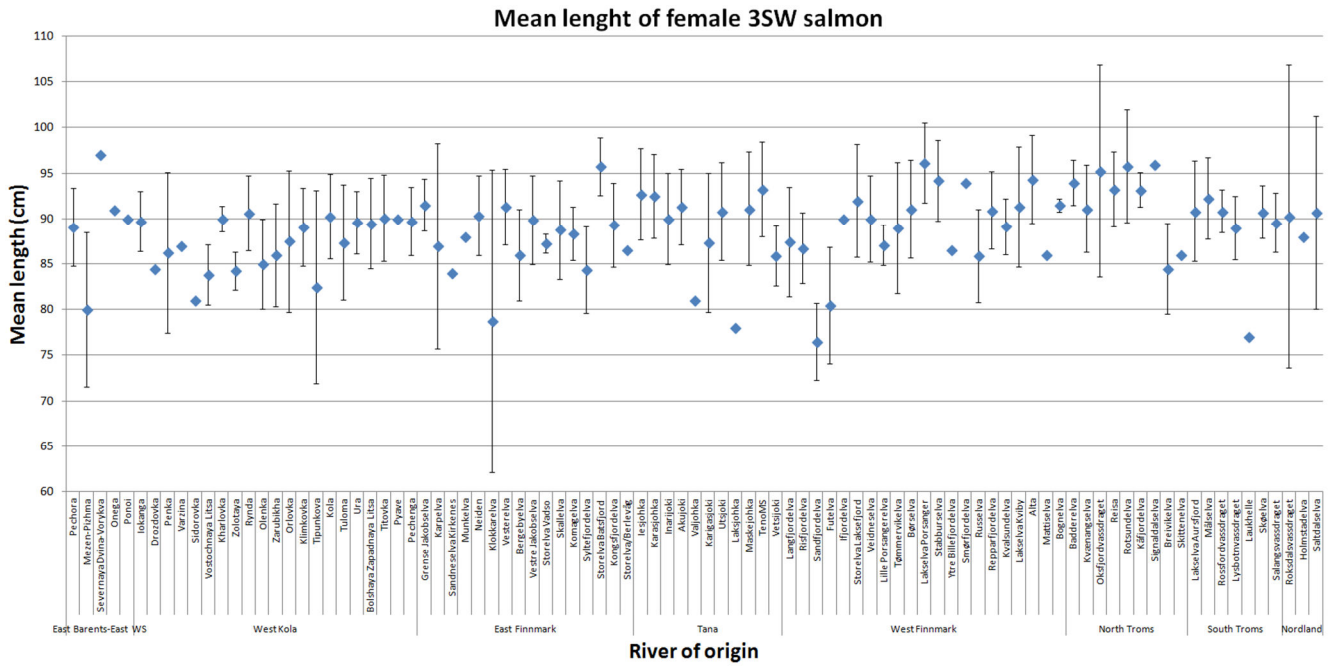


Figure 113. Mean lengths (SD) of 3SW female salmon in the rivers belonging to eight geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

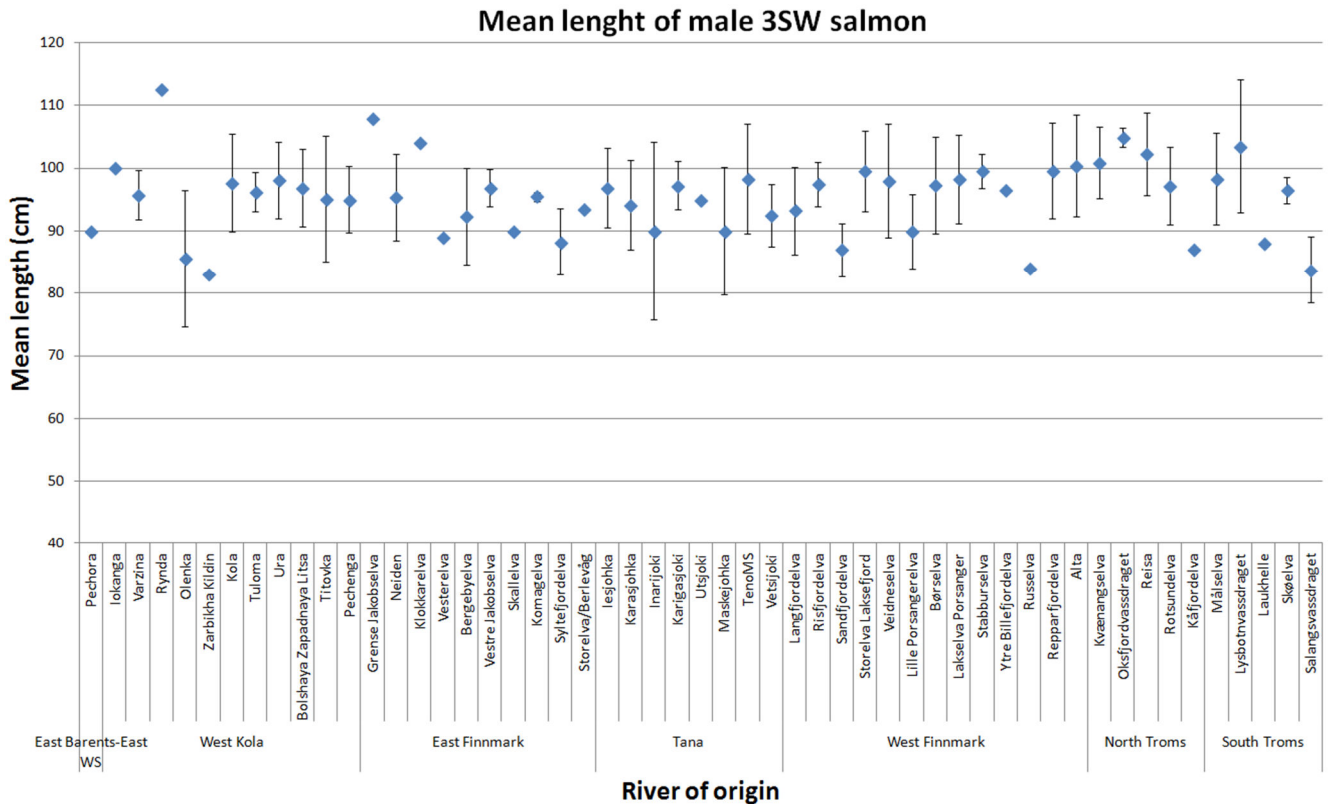


Figure 114. Mean lengths (SD) of 3SW male salmon in the rivers belonging to seven geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

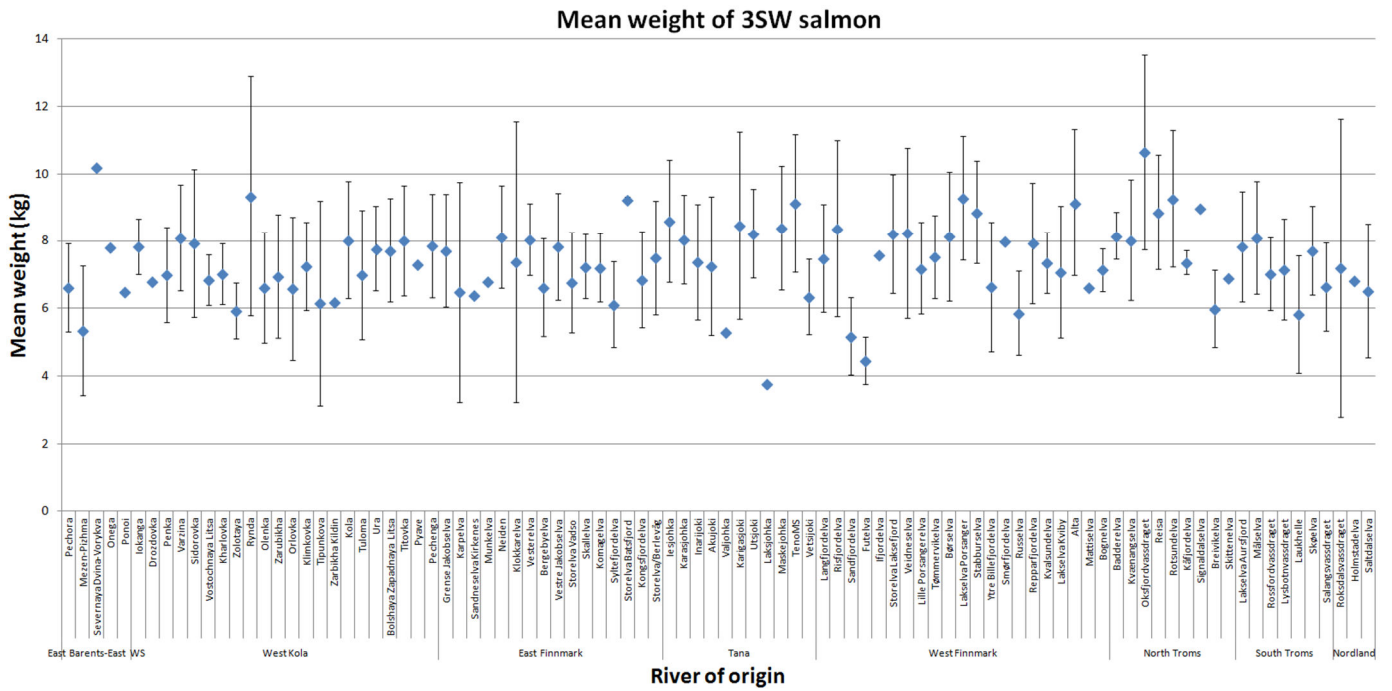


Figure 115. Mean weights (SD) of 3SW salmon females and males combined in the rivers belonging to eight geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

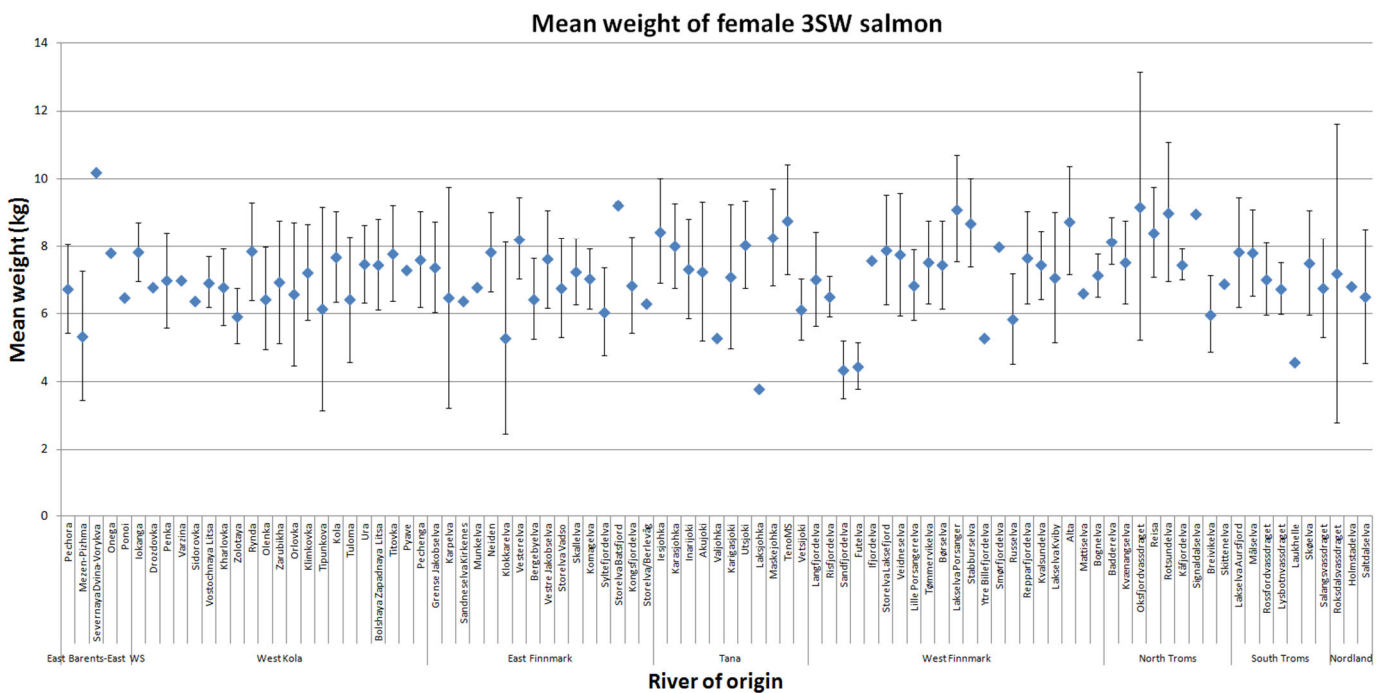


Figure 116. Mean weights (SD) of 3SW female salmon in the rivers belonging to eight geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

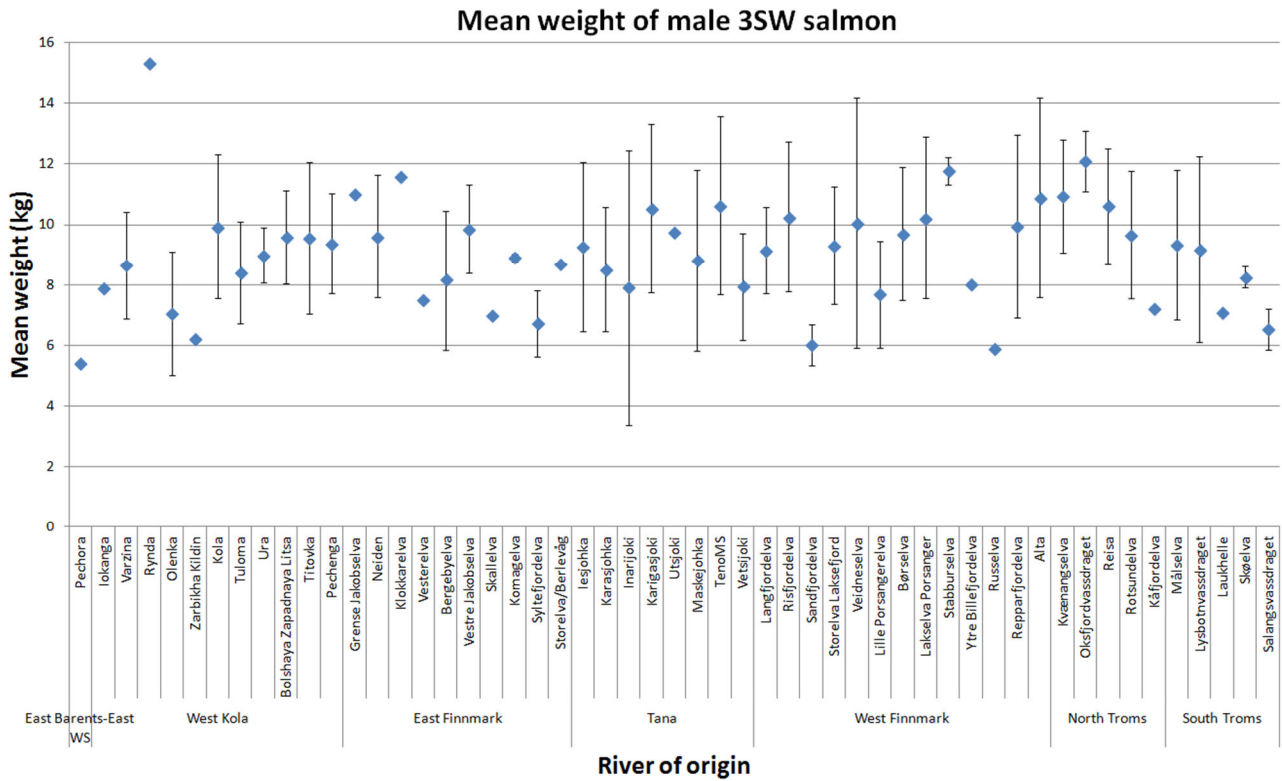


Figure 117. Mean weights (SD) of 3SW male salmon in the rivers belonging to seven geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

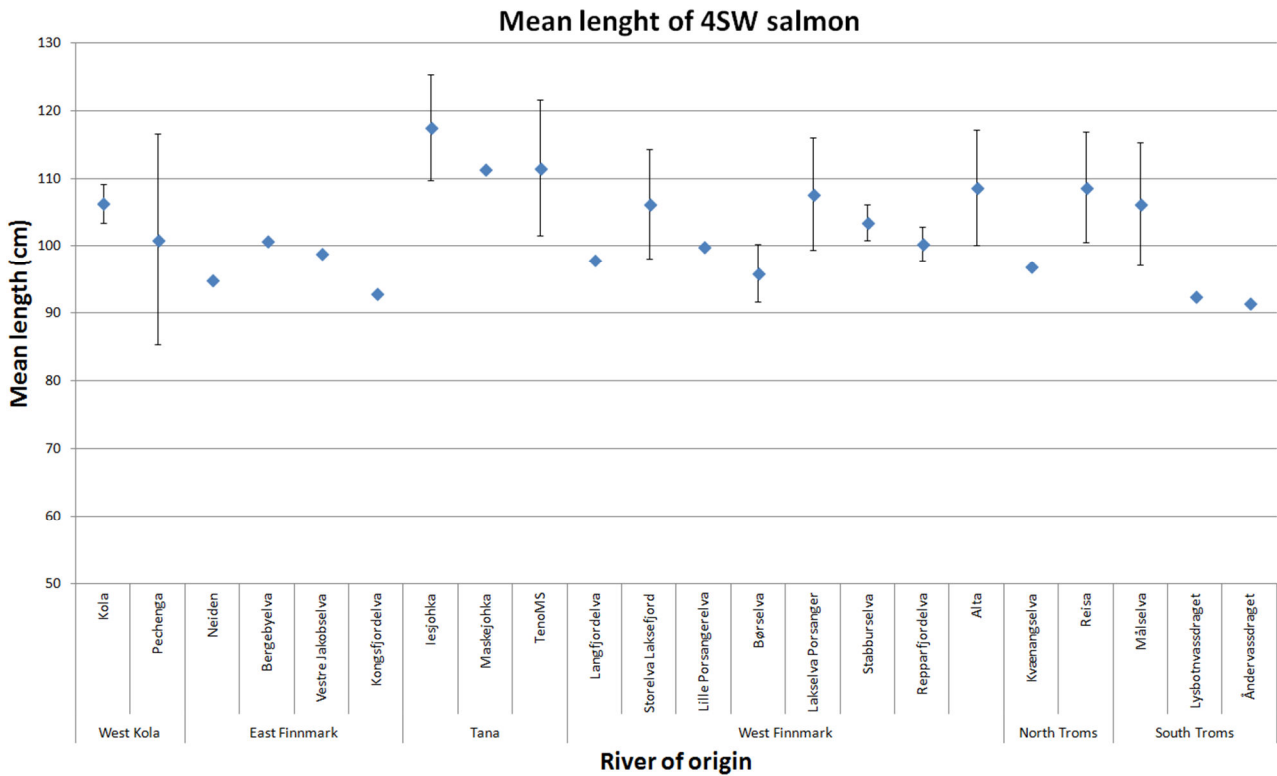


Figure 118. Mean lengths (SD) of 4SW salmon females and males combined in the rivers belonging to six geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

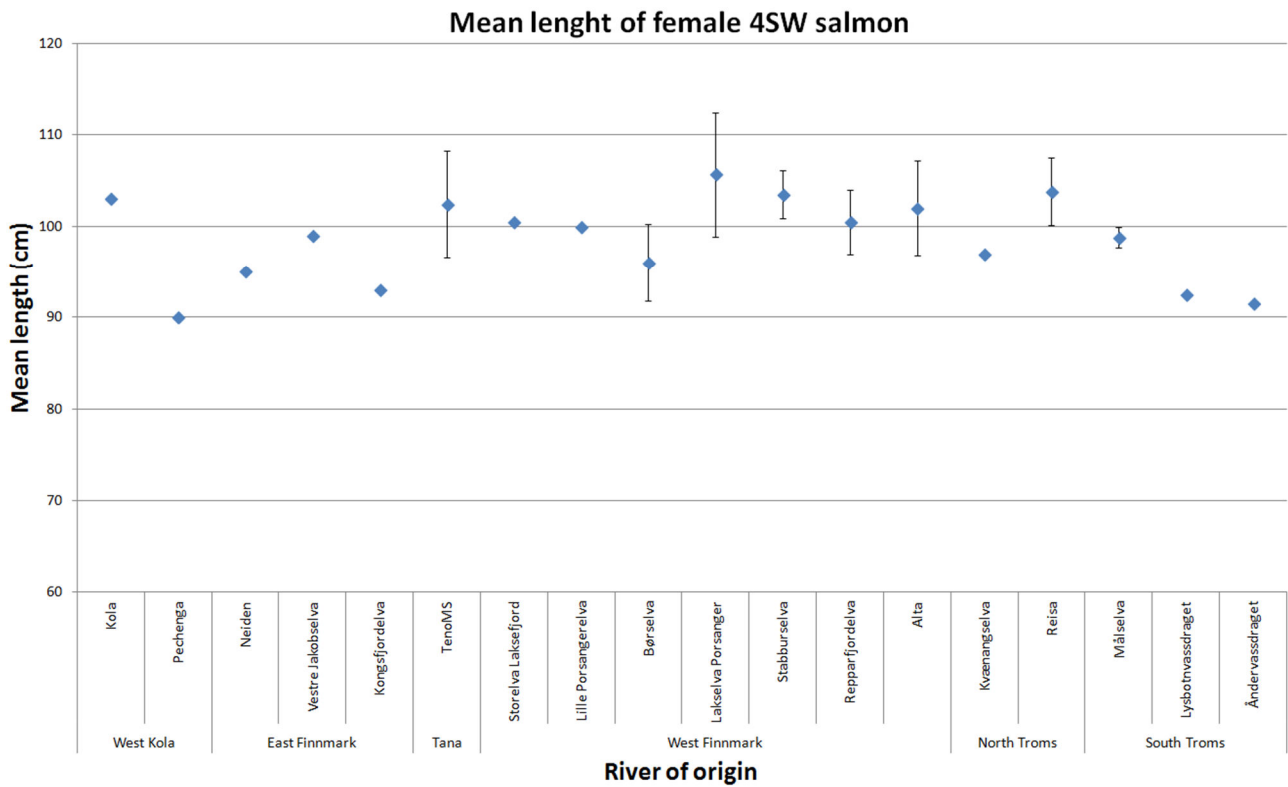


Figure 119. Mean lengths (SD) of 4SW female salmon in the rivers belonging to six geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

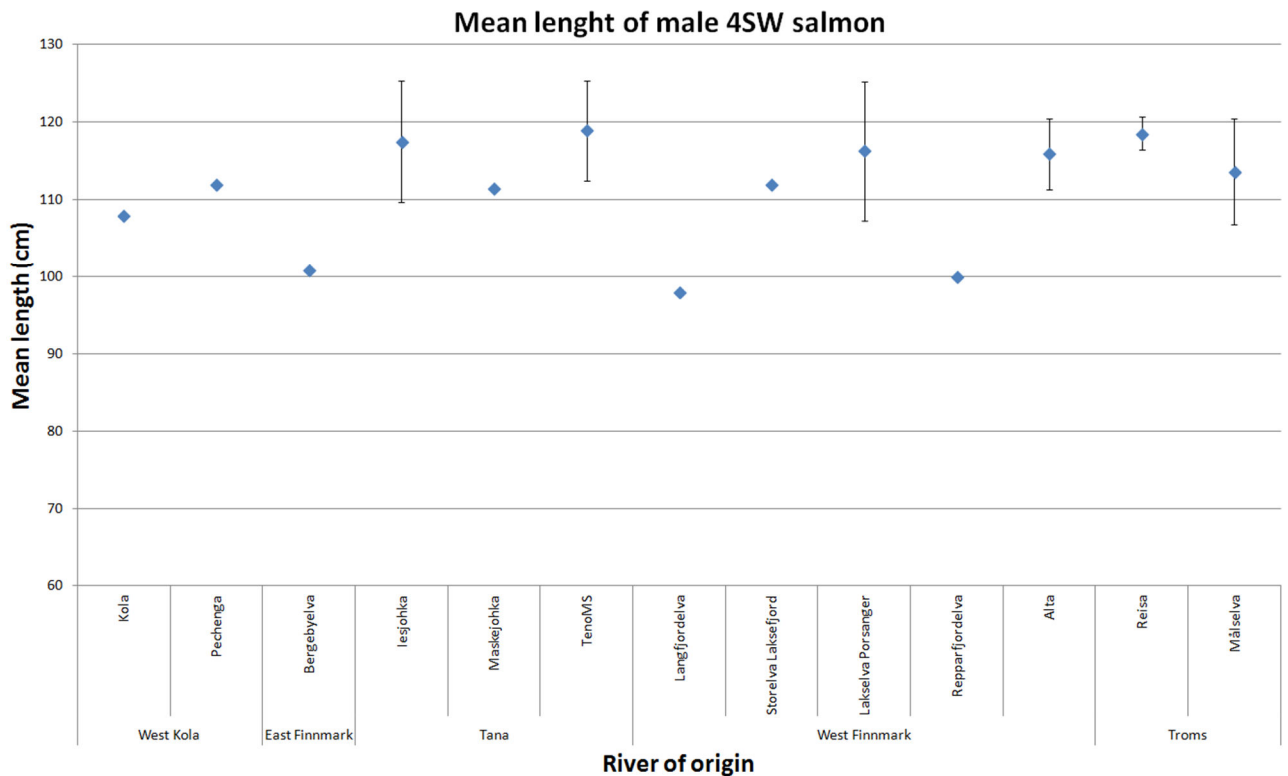


Figure 120. Mean lengths (SD) of 4SW male salmon in the rivers belonging to six geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

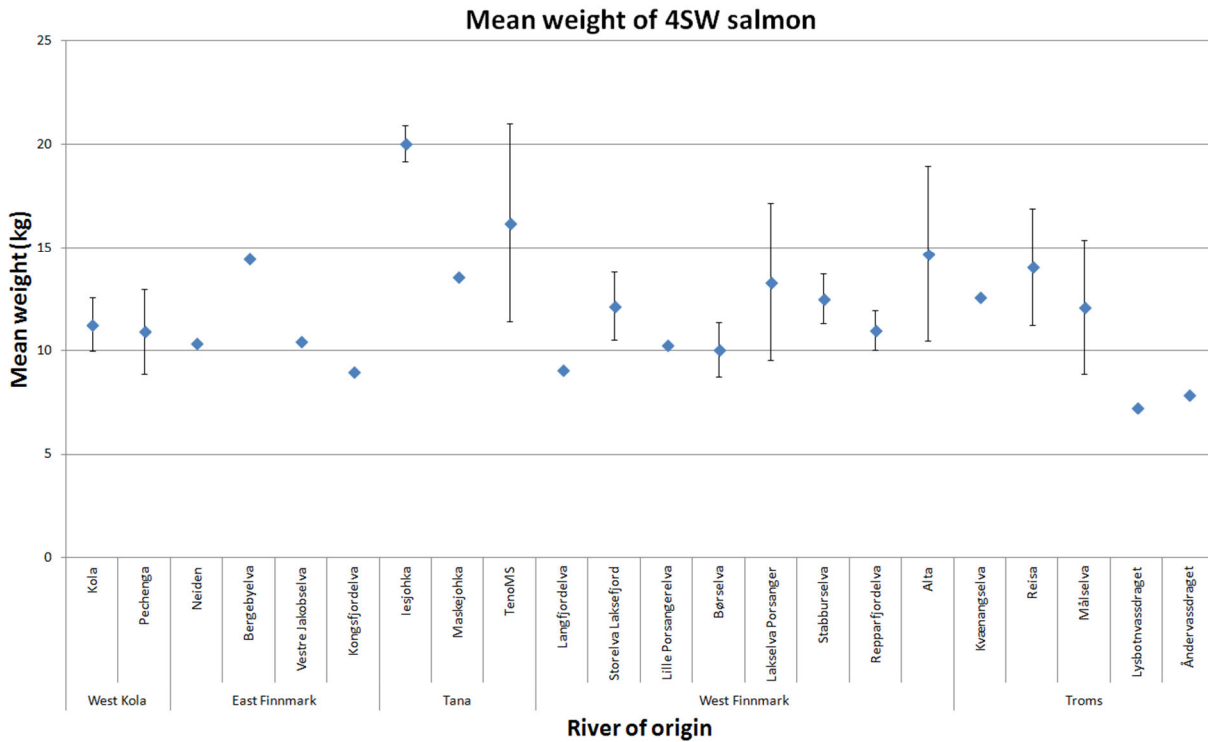


Figure 121. Mean weights (SD) of 4SW salmon females and males combined in the rivers belonging to five geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

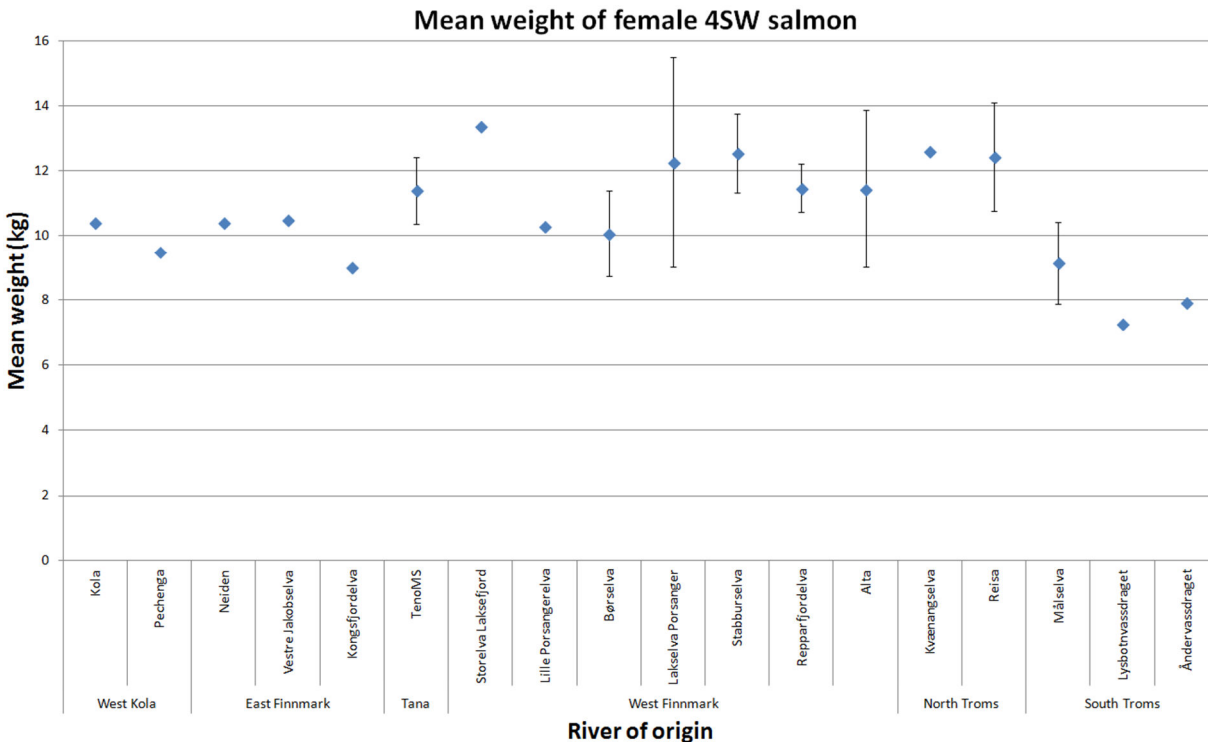


Figure 122. Mean weights (SD) of 4SW female salmon in the rivers belonging to six geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

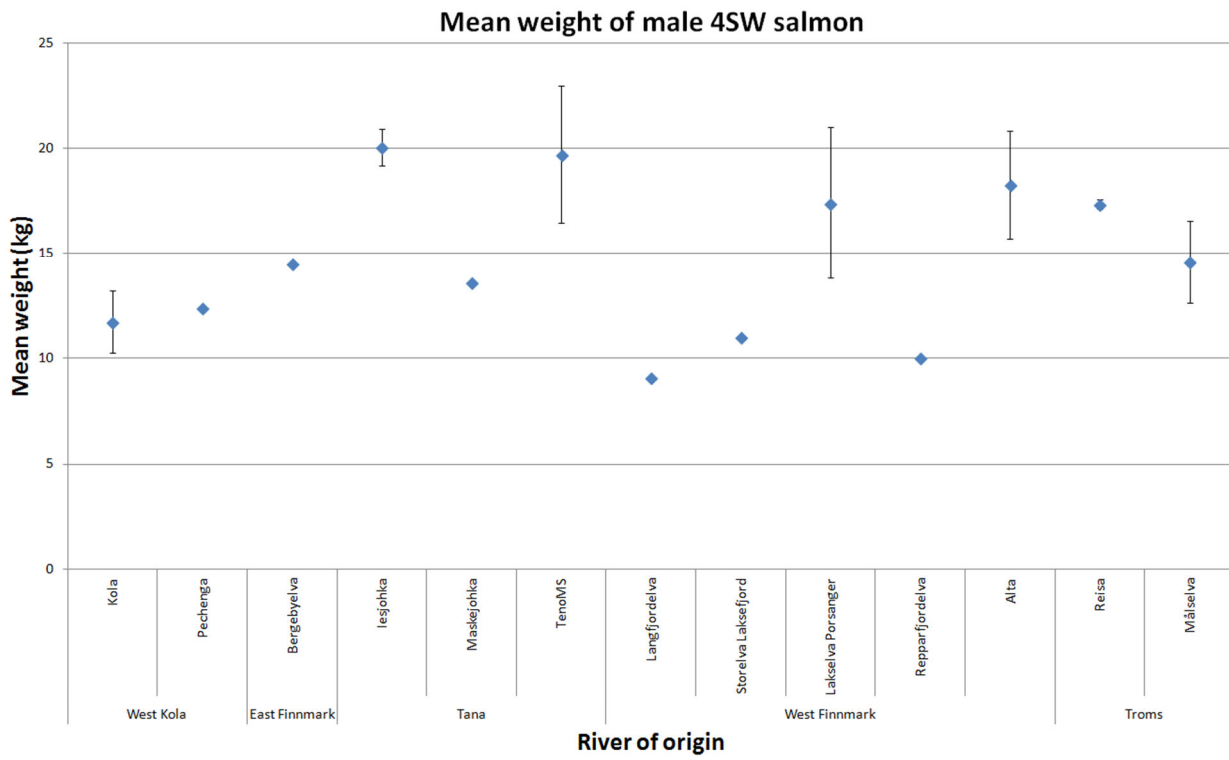


Figure 123. Mean weights (SD) of 4SW male salmon in the rivers belonging to five geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

## 27. Mean back-calculated lengths (cm) and growth rates (cm) measured from 1SW, 2SW and 3SW salmon scales to the end of each growth phase during the sea life of salmon

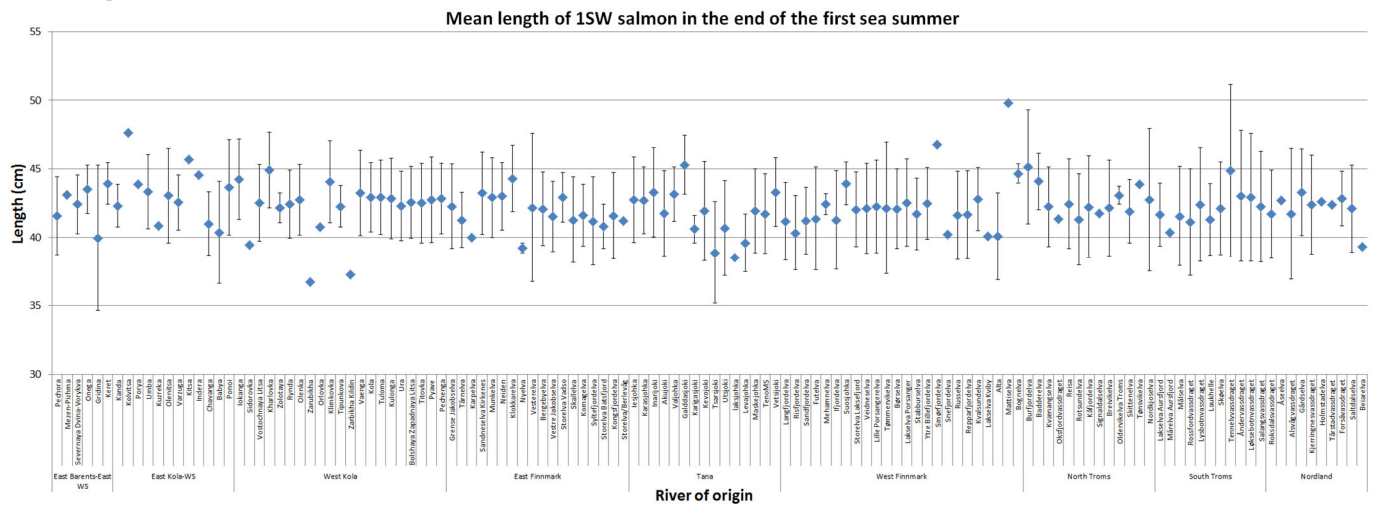


Figure 124. Mean back-calculated lengths (SD) of 1SW salmon to the end of the first summer at sea for salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

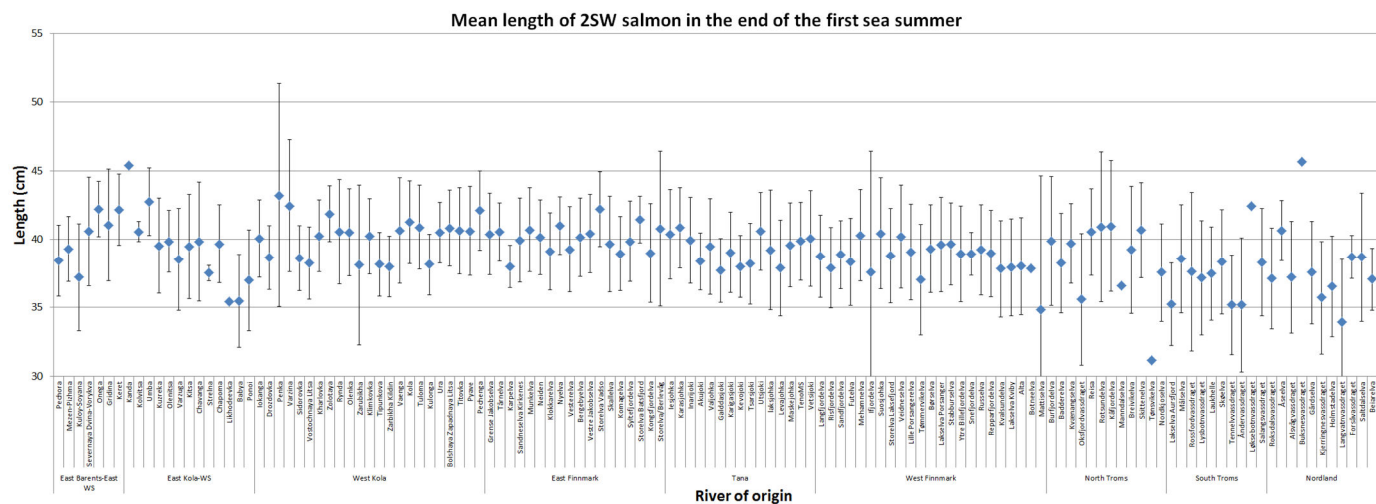


Figure 125. Mean back-calculated lengths (SD) of 2SW salmon to the end of the first summer at sea for salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

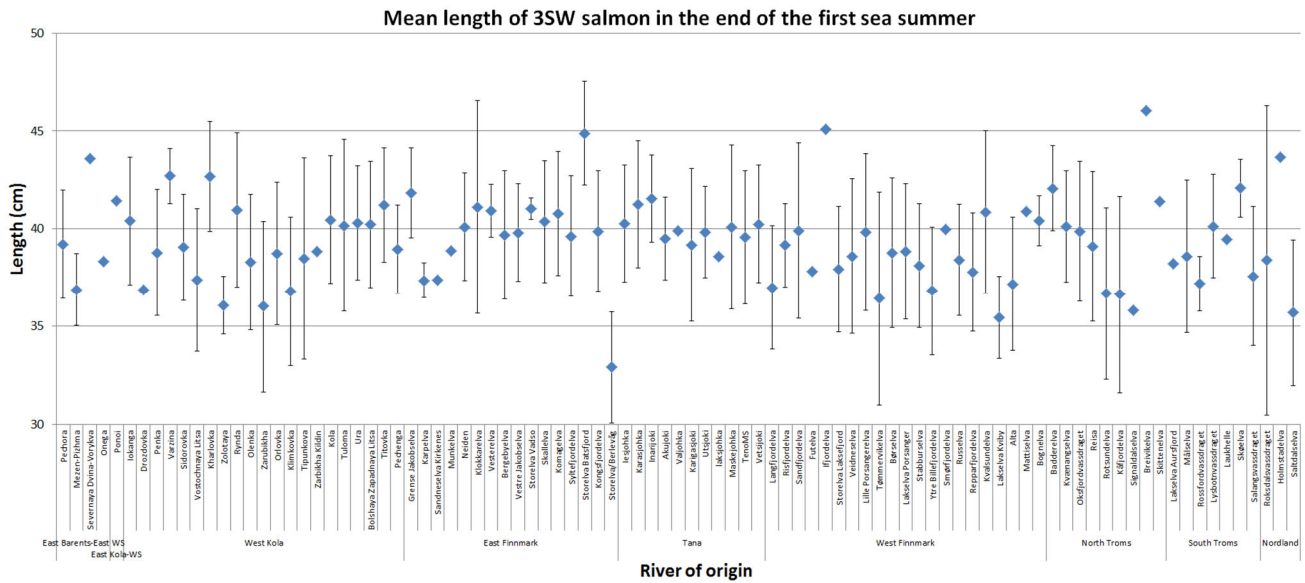


Figure 126. Mean back-calculated lengths (SD) of 3SW salmon to the end of the first summer at sea for salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

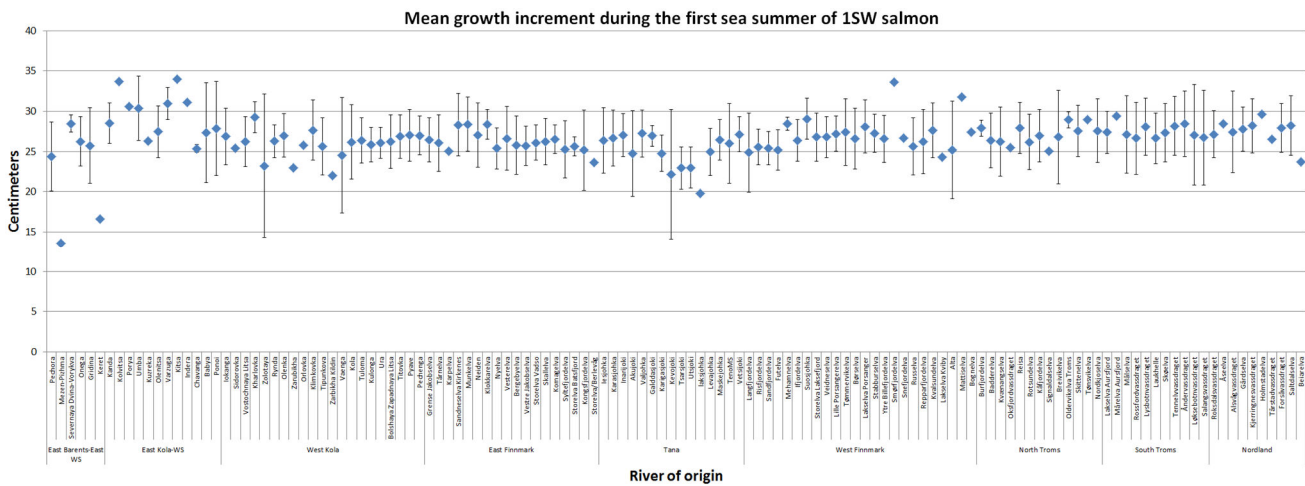


Figure 127. Mean growth increment (cm, SD) of 1SW salmon during the first sea summer for salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).



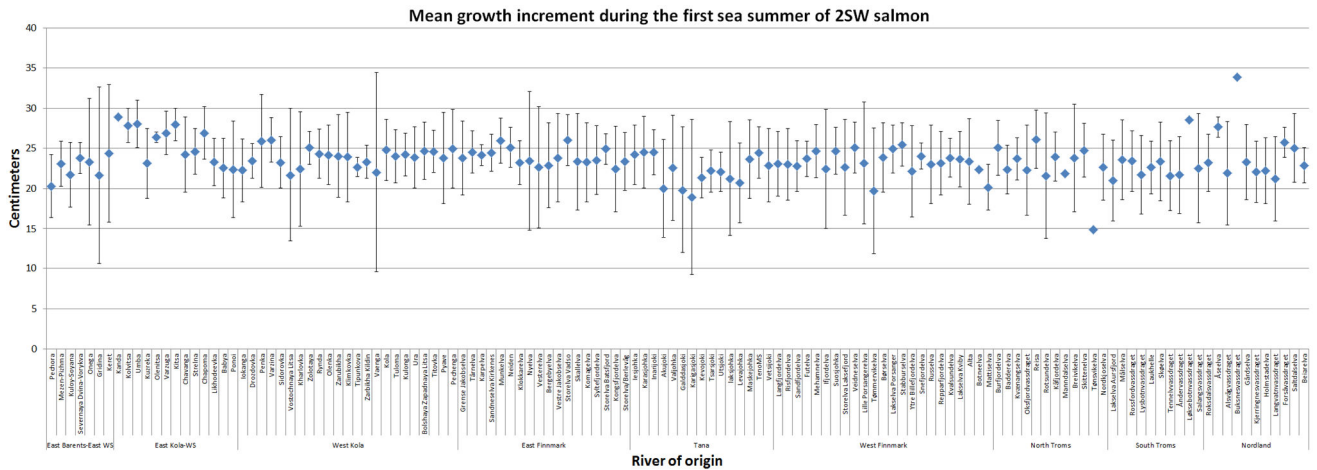


Figure 128. Mean growth increment (cm, SD) of 2SW salmon during the first sea summer for salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

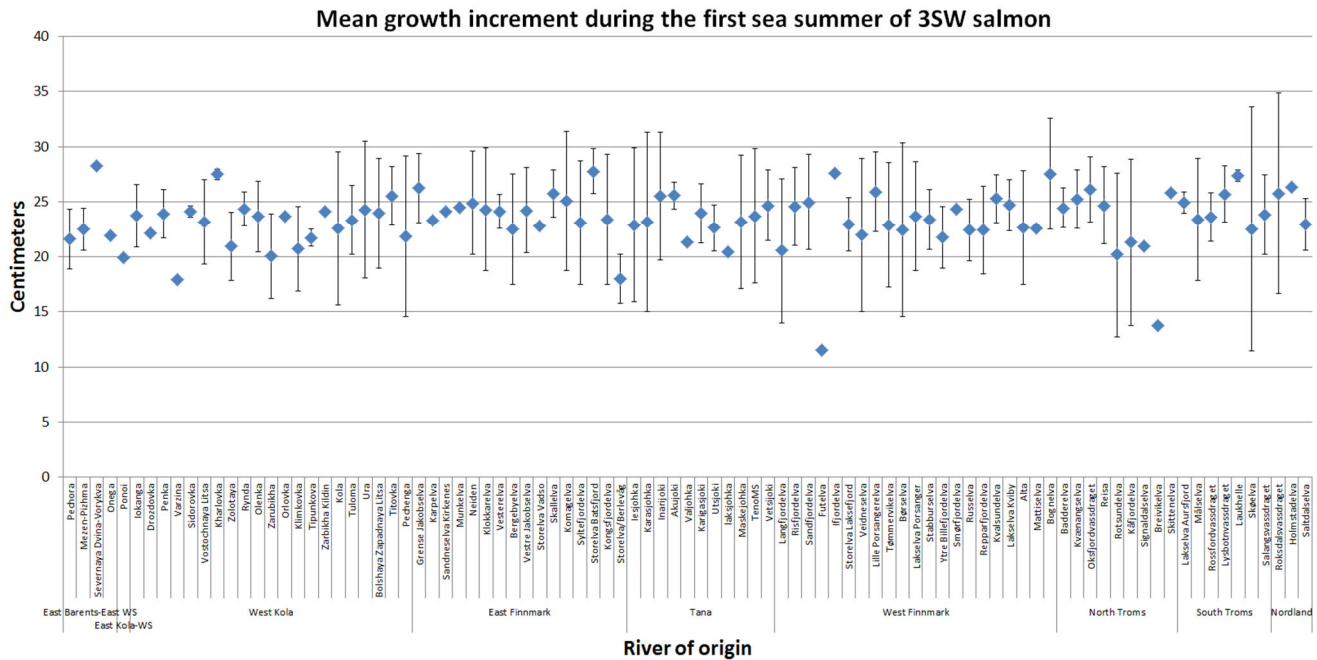


Figure 129. Mean growth increment (cm, SD) of 3SW salmon during the first sea summer for salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

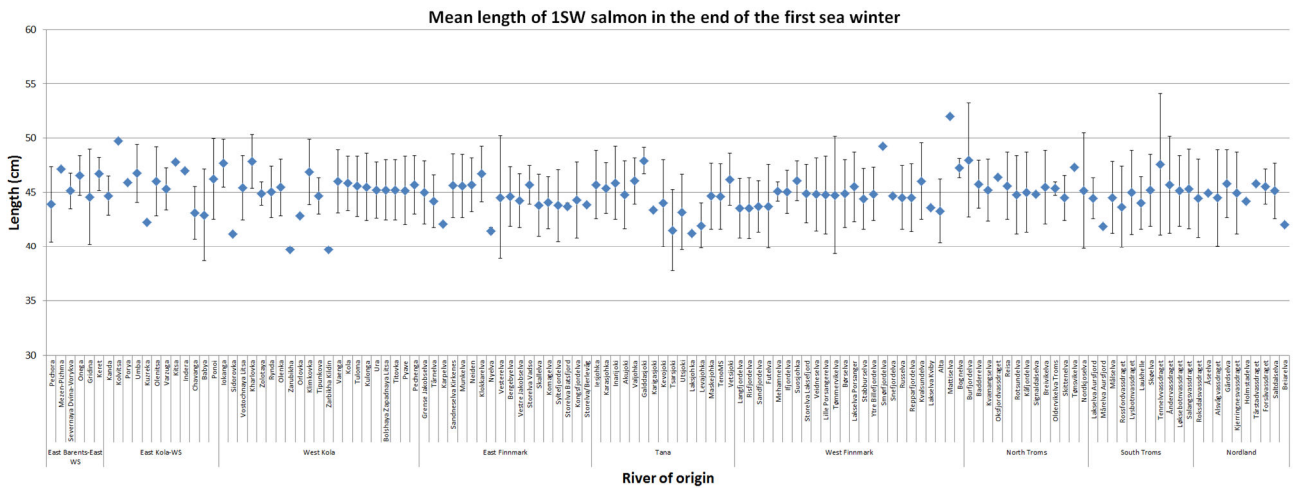


Figure 130. Mean back-calculated lengths (SD) of 1SW salmon to the end of the first winter at sea for salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

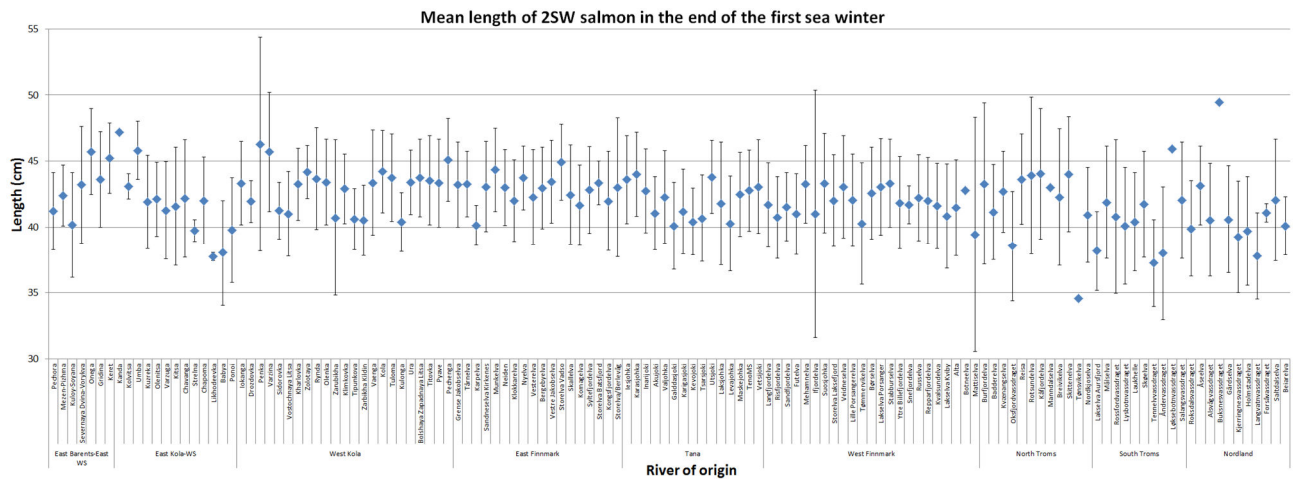


Figure 131. Mean back-calculated lengths (SD) of 2SW salmon to the end of the first winter at sea for salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

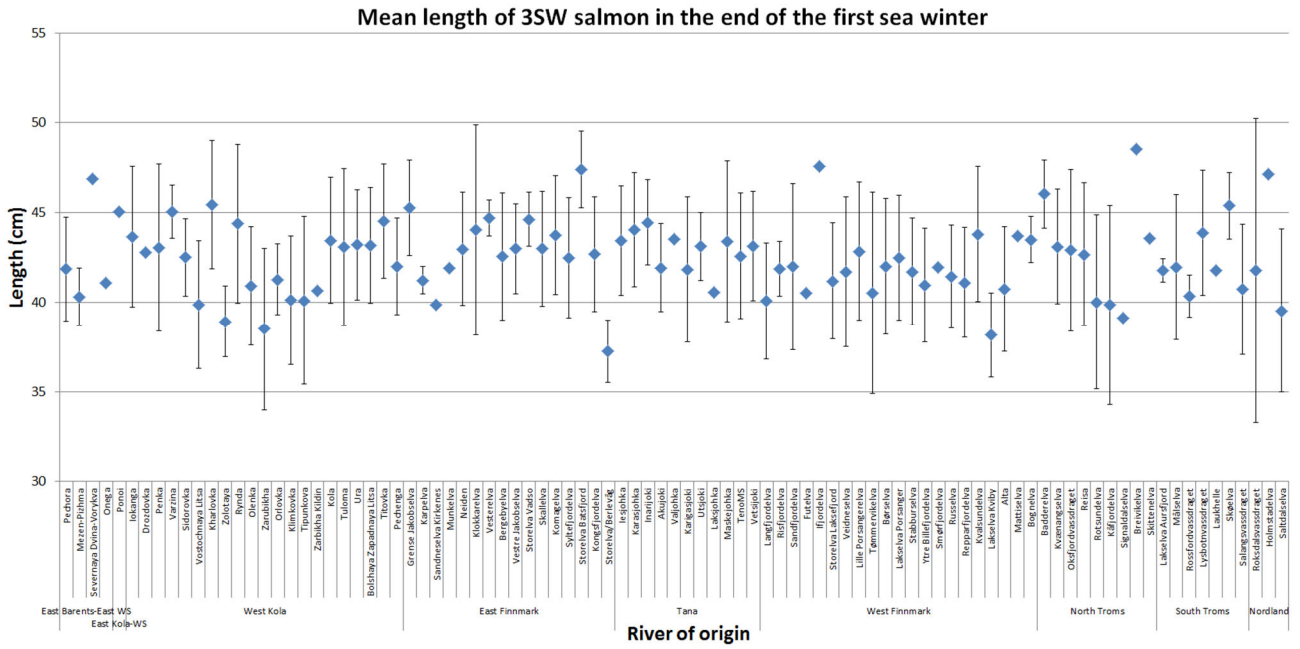


Figure 132. Mean back-calculated lengths (SD) of 3SW salmon to the end of the first winter at sea for salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

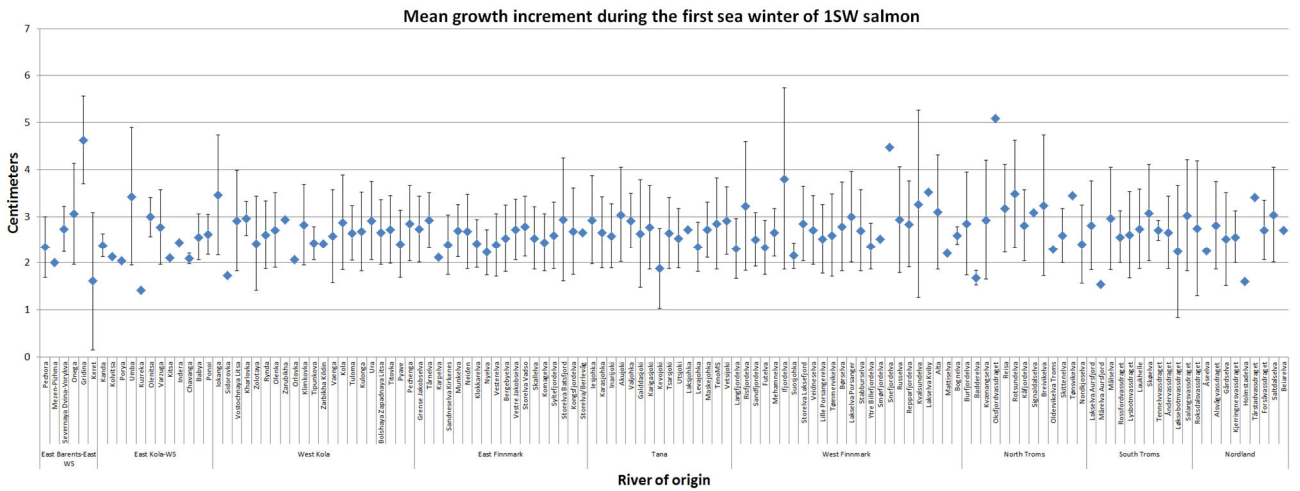


Figure 133. Mean growth increment (cm, SD) of 1SW salmon during the first winter at sea for salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

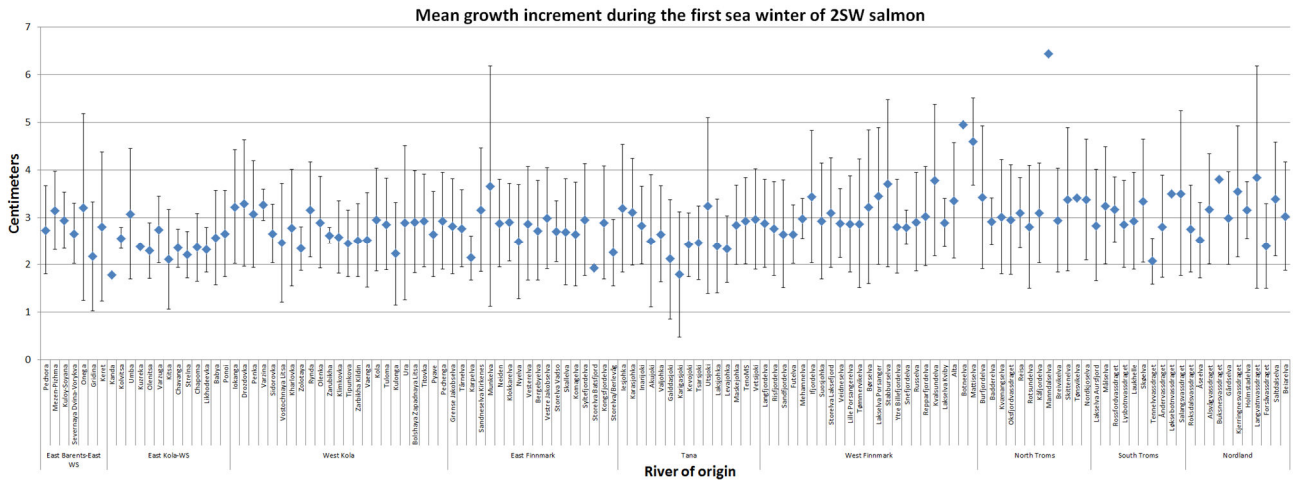


Figure 134. Mean growth increment (cm, SD) of 2SW salmon during the first winter at sea for salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

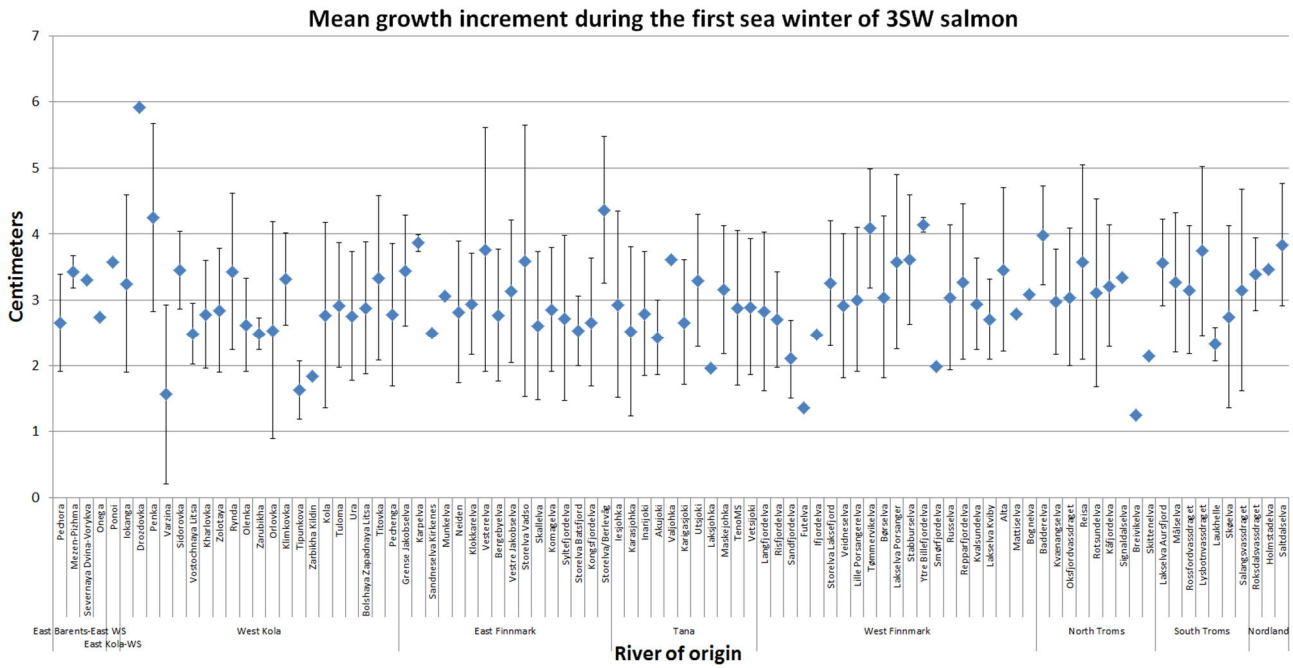


Figure 135. Mean growth increment (cm, SD) of 3SW salmon during the first winter at sea for salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

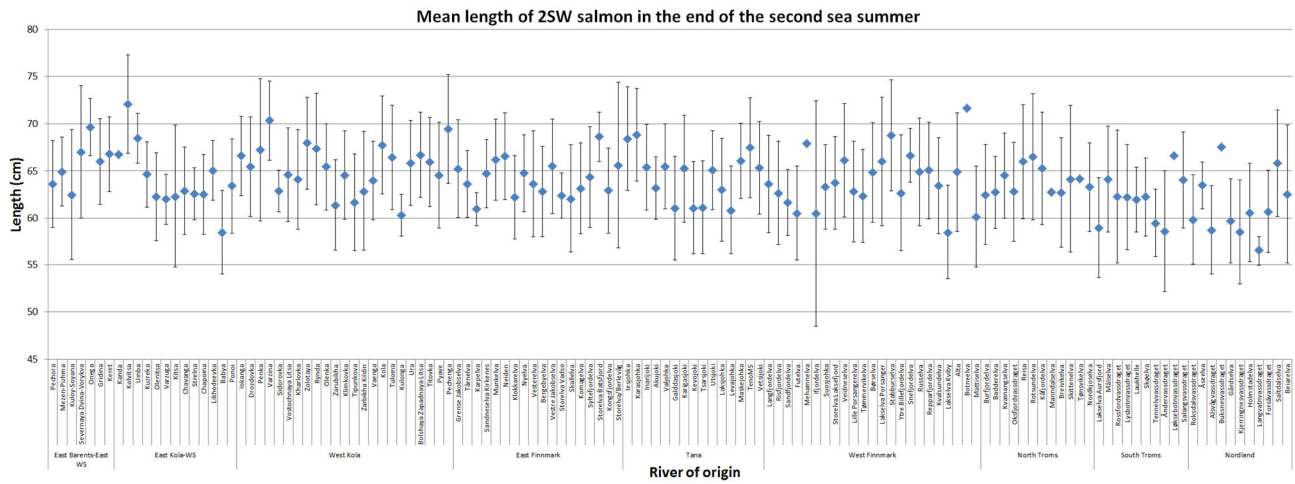


Figure 136. Mean back-calculated lengths (SD) of 2SW salmon to the end of the second summer at sea for salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

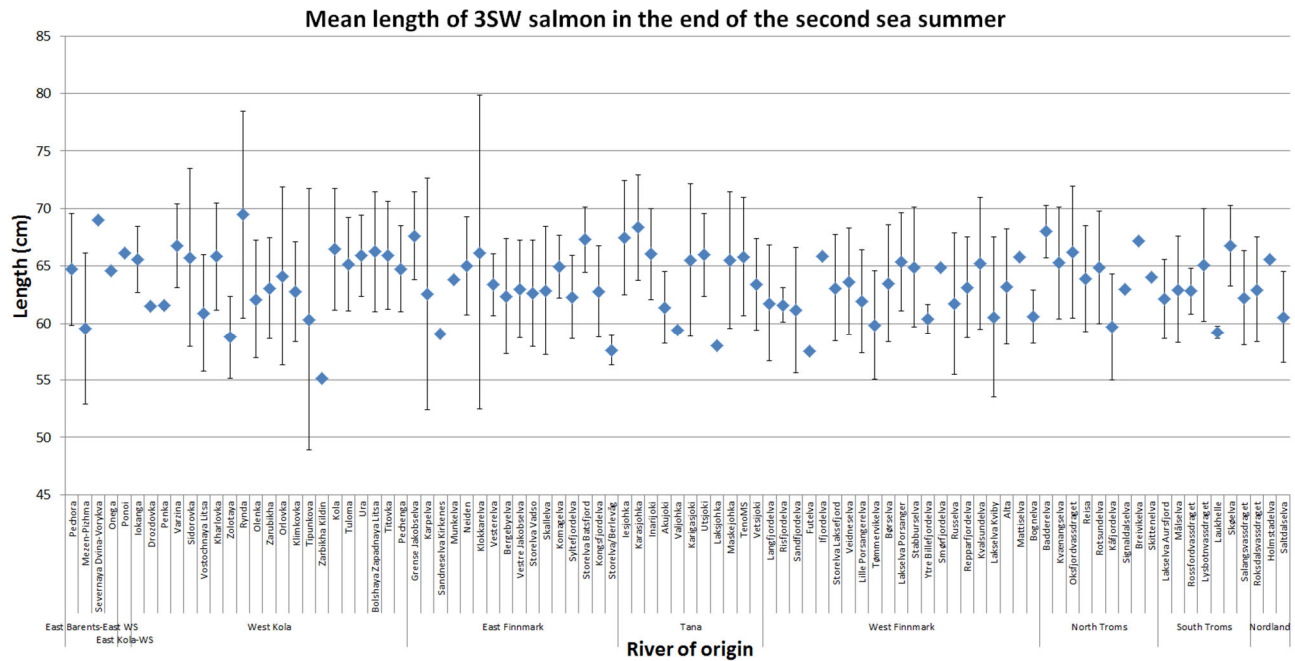


Figure 137. Mean back-calculated lengths (SD) of 3SW salmon to the end of the second summer at sea for salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

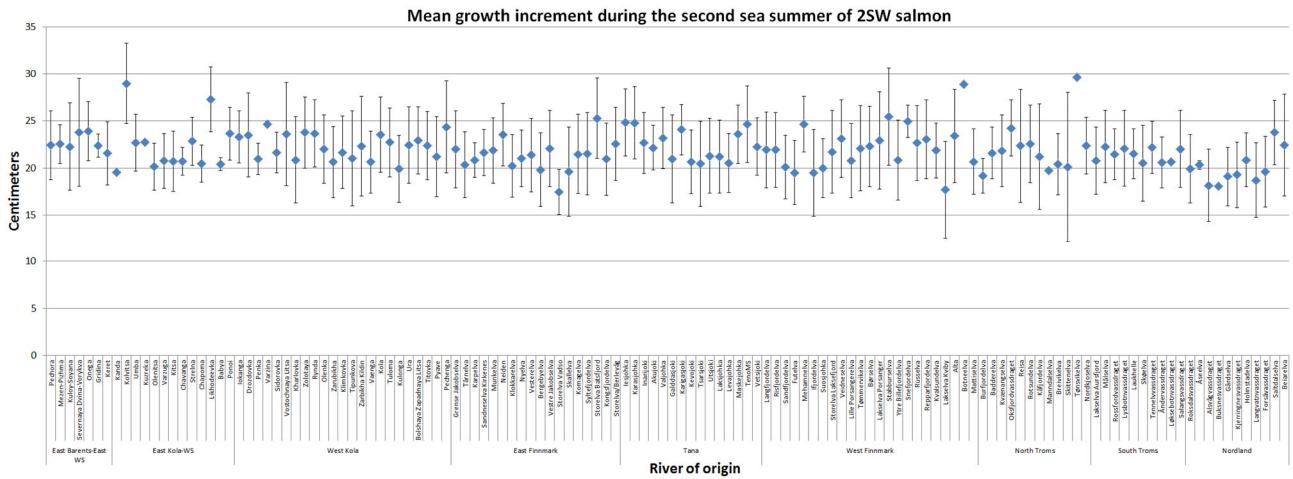


Figure 138. Mean growth increment (cm, SD) of 2SW salmon during the second summer at sea for salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

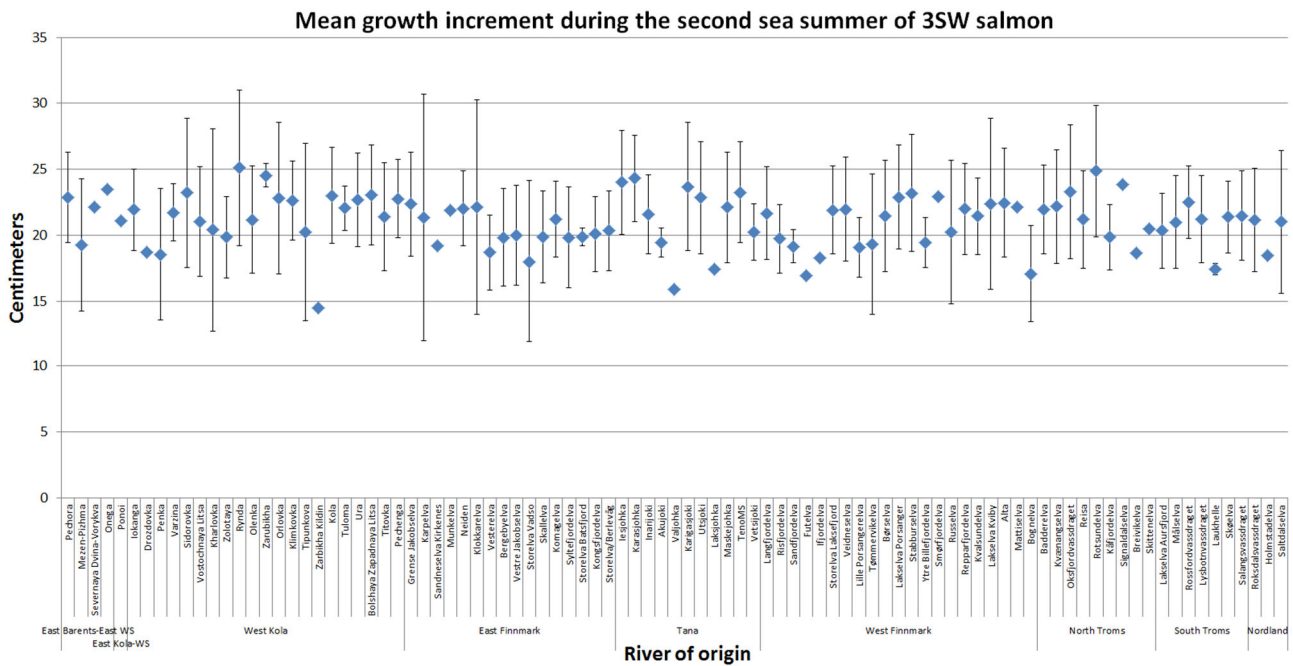


Figure 139. Mean growth increment (cm, SD) of 3SW salmon during the second summer at sea for salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

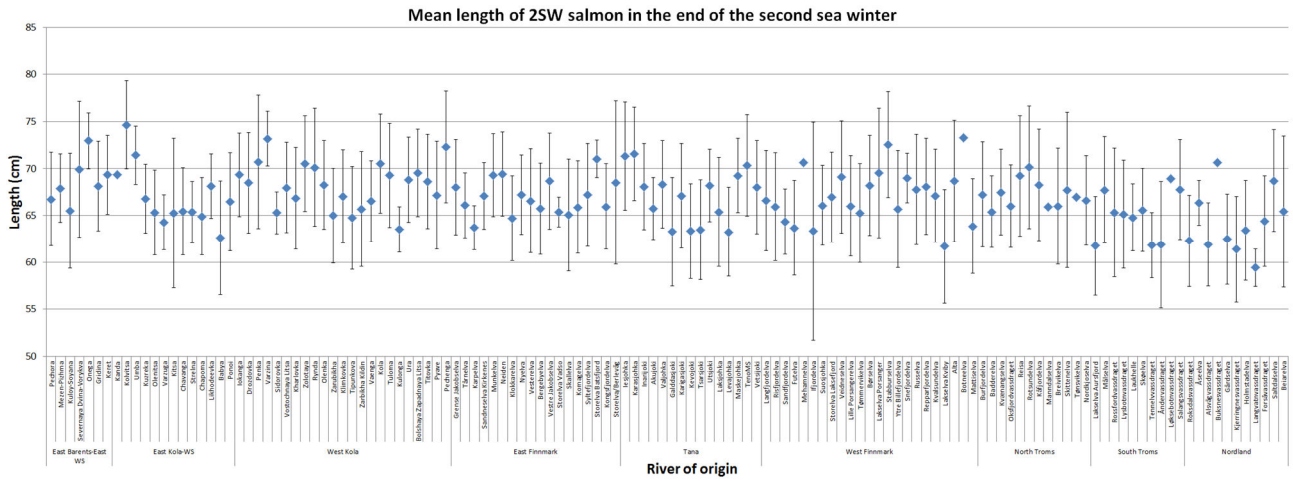


Figure 140. Mean back-calculated lengths (SD) of 2SW salmon to the end of the second winter at sea for salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

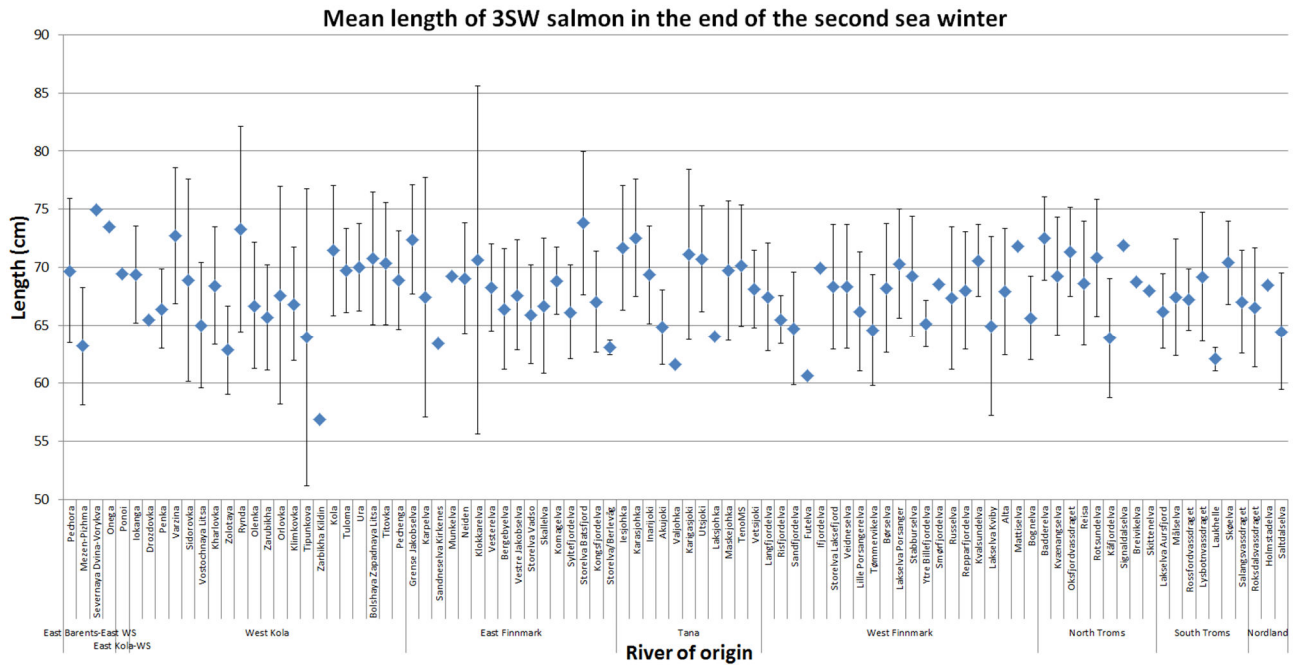


Figure 141. Mean back-calculated lengths (SD) of 3SW salmon to the end of the second winter at sea for salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

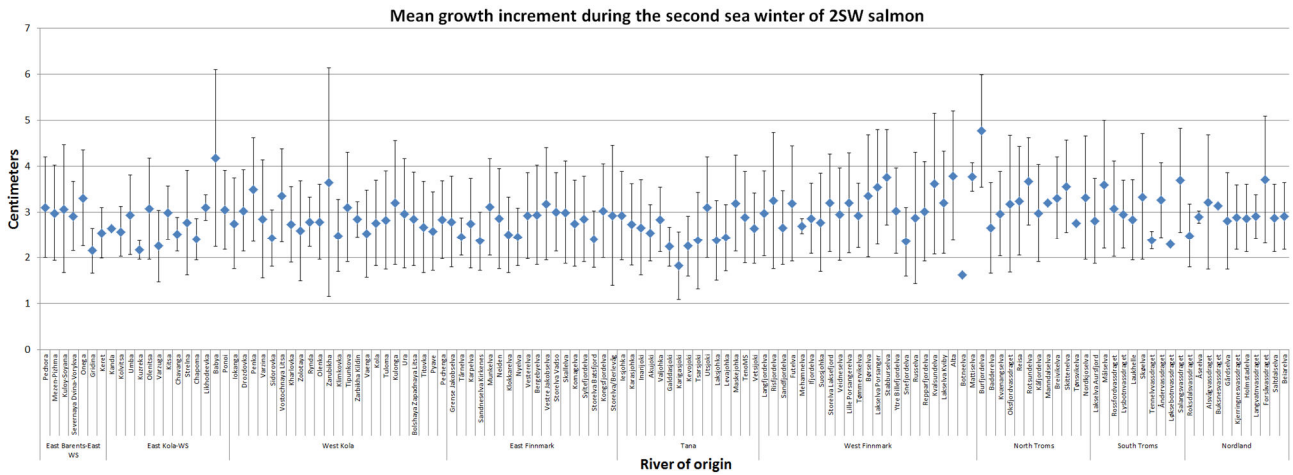


Figure 142. Mean growth increment (cm, SD) of 2SW salmon during the second winter at sea for salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

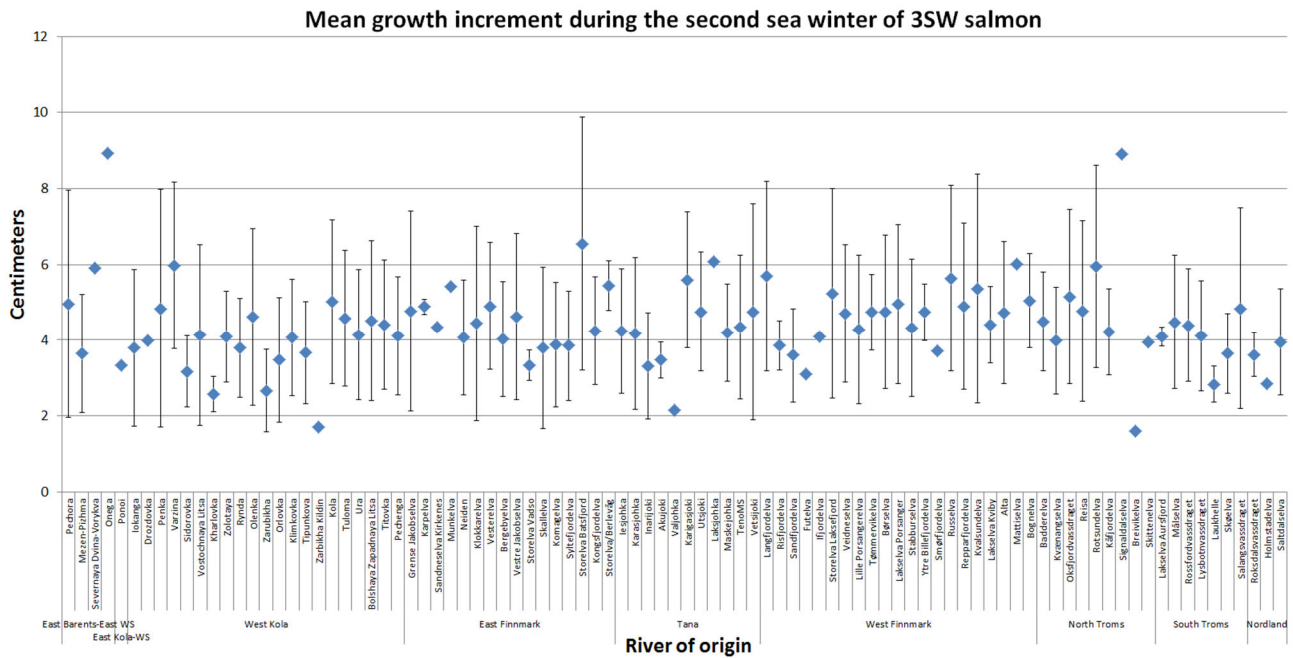


Figure 143. Mean growth increment (cm, SD) of 3SW salmon during the second winter at sea for salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).



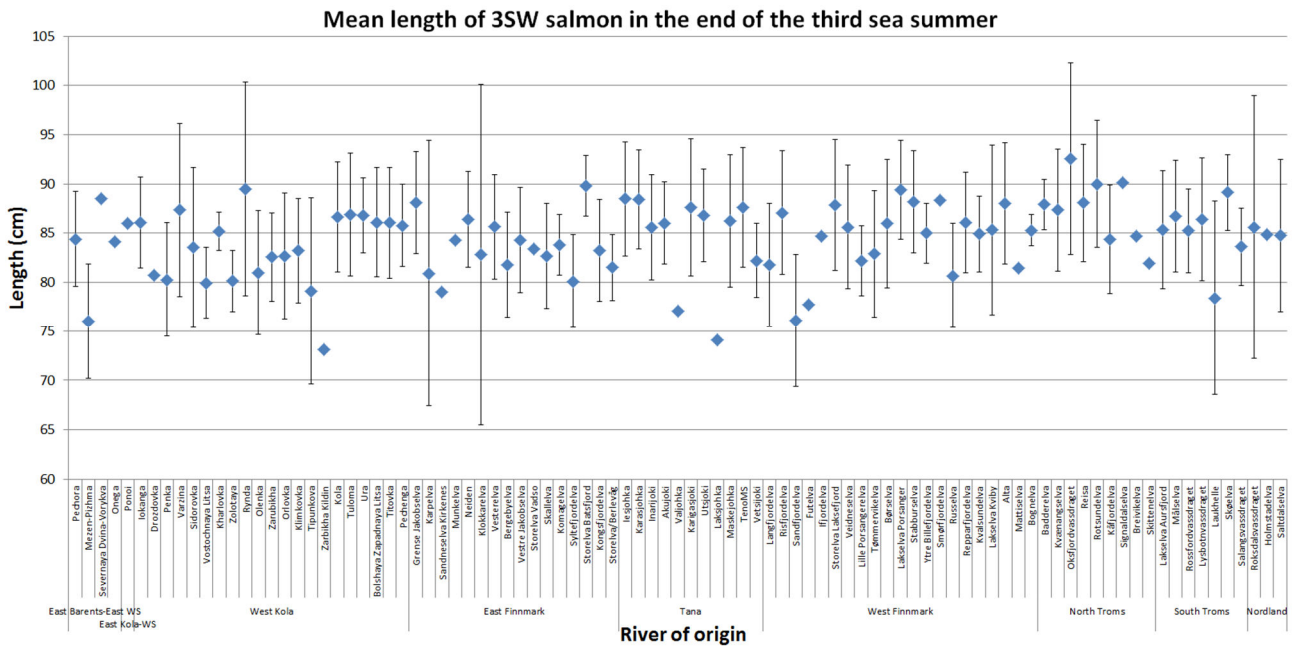


Figure 144. Mean back-calculated lengths (SD) of 3SW salmon to the end of the third summer at sea for salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

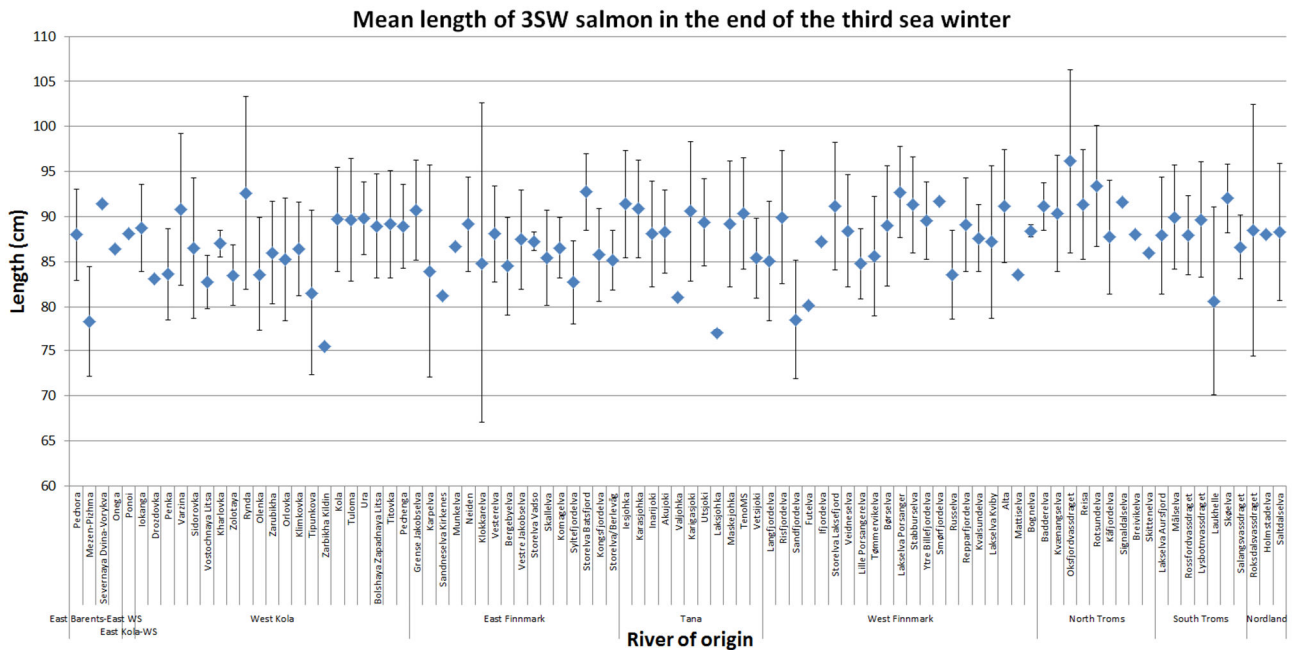


Figure 145. Mean back-calculated lengths (SD) of 3SW salmon to the end of the third winter at sea for salmon in the rivers belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

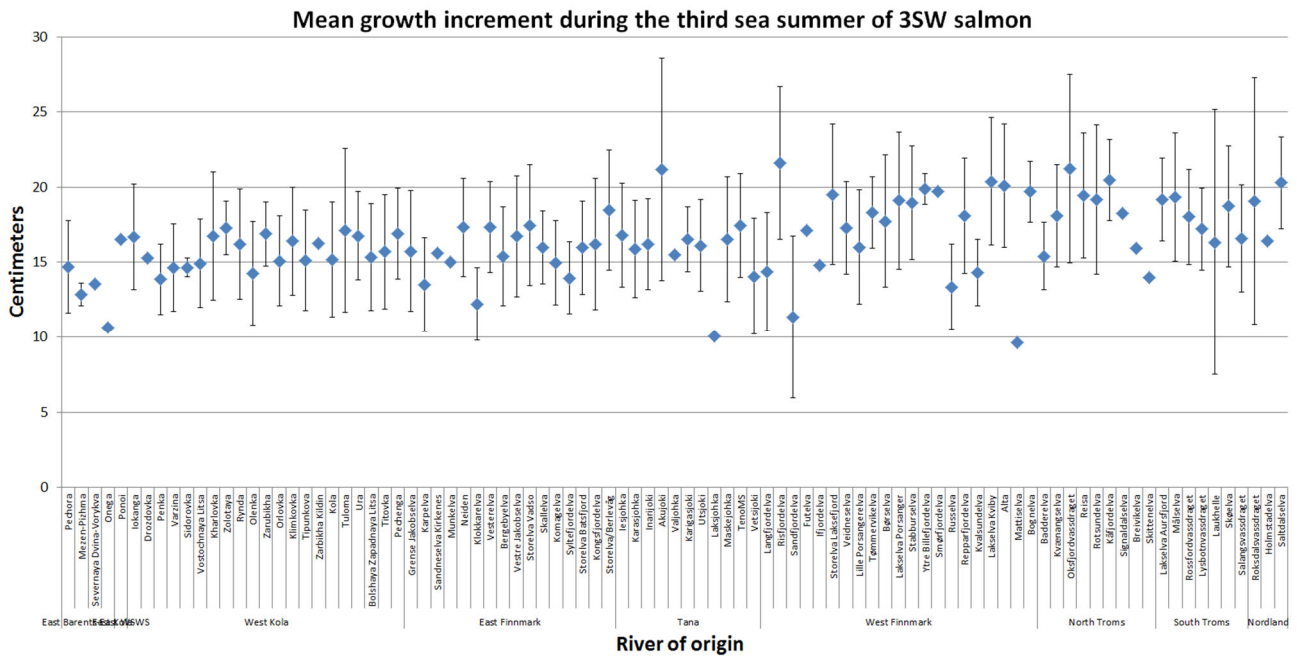


Figure 146. Mean growth increment (cm, SD) of 3SW salmon during the third summer belonging to nine geographical groups (RG regions). Salmon were caught in Finnmark, Troms and Nordland in the years 2008, 2009, 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

28. Numbers and percentages of separate salmon stocks (genetically separated stocks) belonging to nine regional groups (RG regions) in the weekly catches in the years 2011 and 2012 in Northern Norway

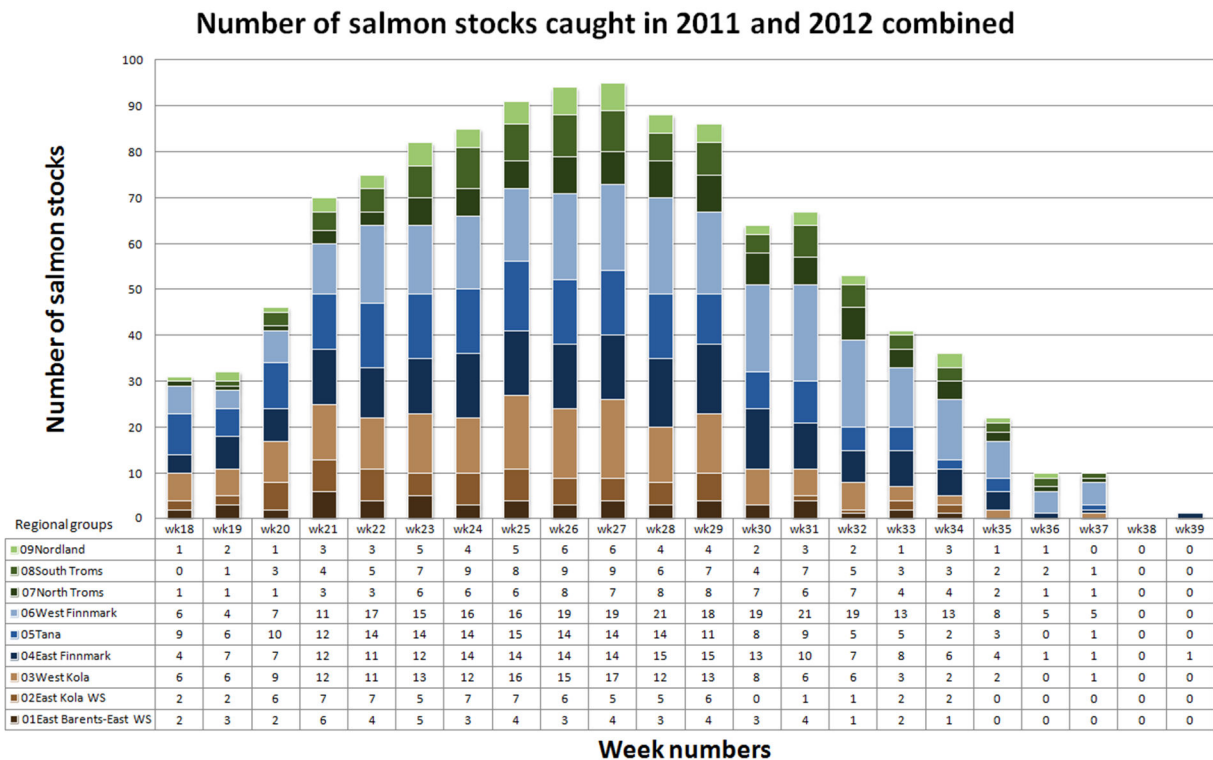
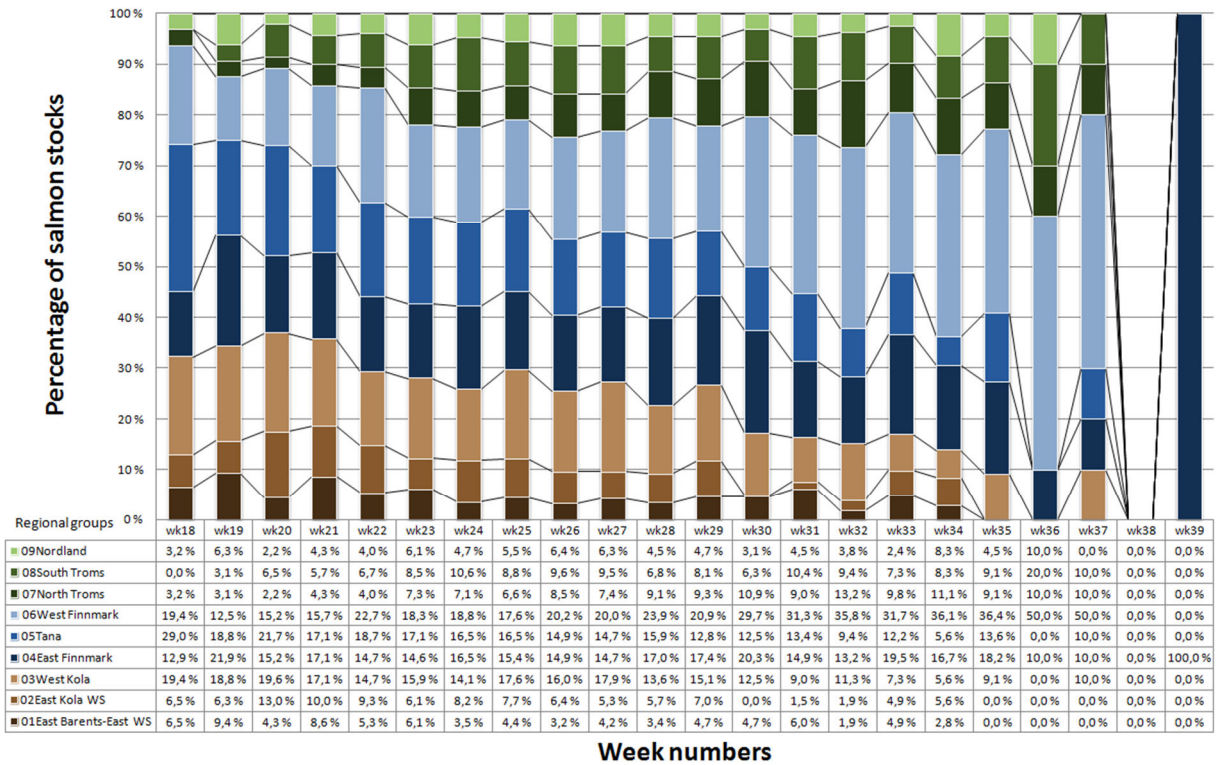


Figure 147. Weekly numbers of genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Nordland, Troms and Finnmark counties in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

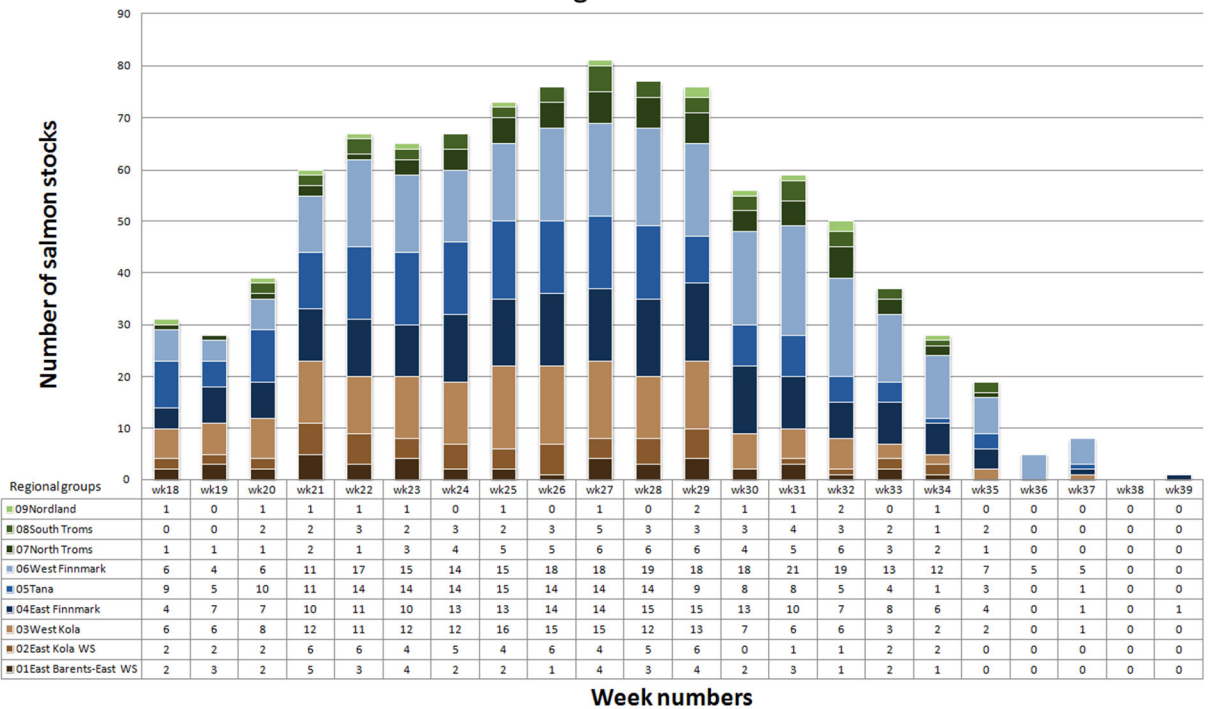
Percentage of salmon stocks caught in 2011 and 2012 combined



Week numbers

Figure 148. Weekly proportions of genetically separated salmon stocks in each of the nine regional groups (RG regions) from the total numbers of weekly salmon stocks caught in Nordland, Troms and Finnmark counties in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

Number of salmon stocks caught in Finnmark in 2011 and 2012 combined



Week numbers

Figure 149. Weekly numbers of genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Finnmark county in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

Percentage of salmon stocks caught in Finnmark in 2011 and 2012 combined

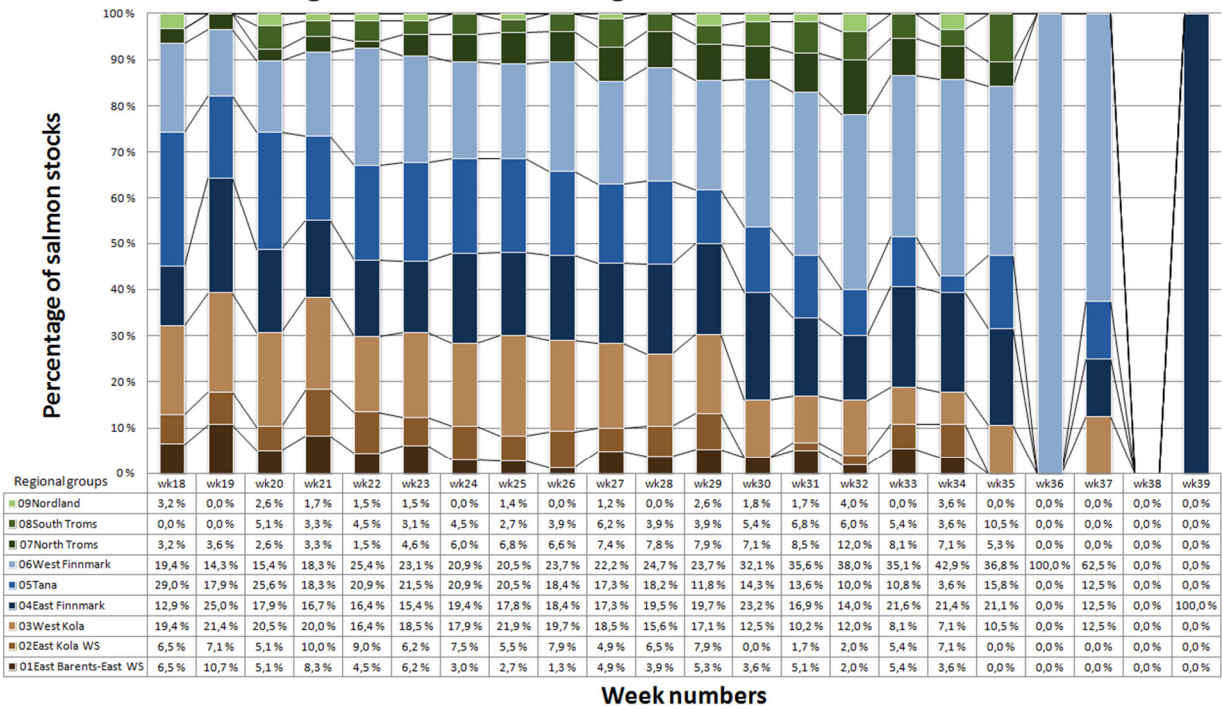


Figure 150. Weekly proportions of genetically separated salmon stocks in each of the nine regional groups (RG regions) from the total numbers of weekly salmon stocks caught in Finnmark county in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

Number of salmon stocks caught in Sør-Varanger in 2011 and 2012 combined

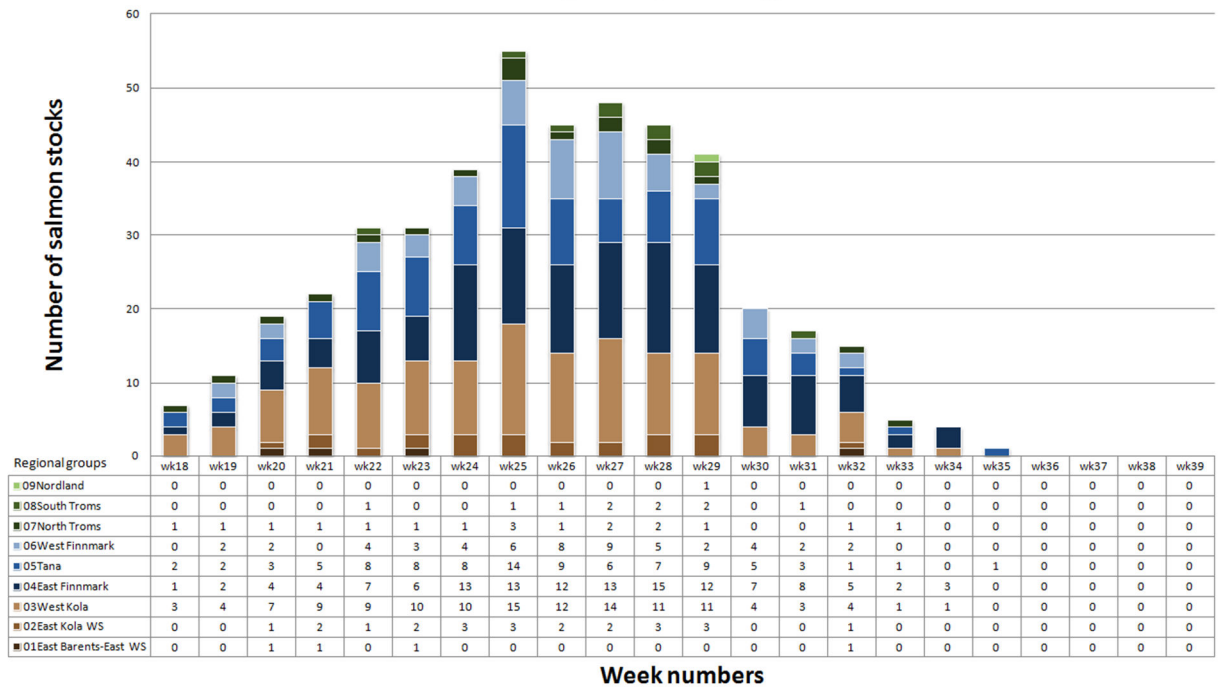


Figure 151. Weekly numbers of genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Sør-Varanger municipality in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

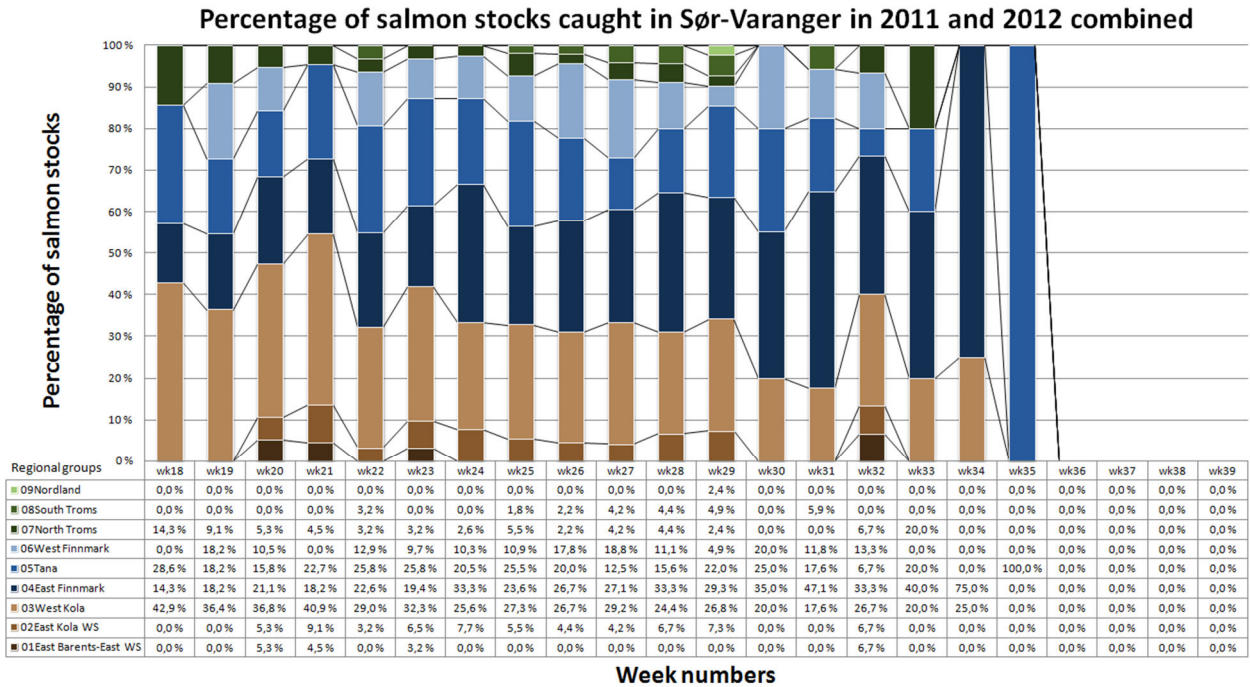


Figure 152. Weekly proportions of genetically separated salmon stocks in each of the nine regional groups (RG regions) from the total numbers of weekly salmon stocks caught in Sør-Varanger municipality in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

### Number of salmon stocks caught in Vadsø and Nesseby in 2011 and 2012 combined

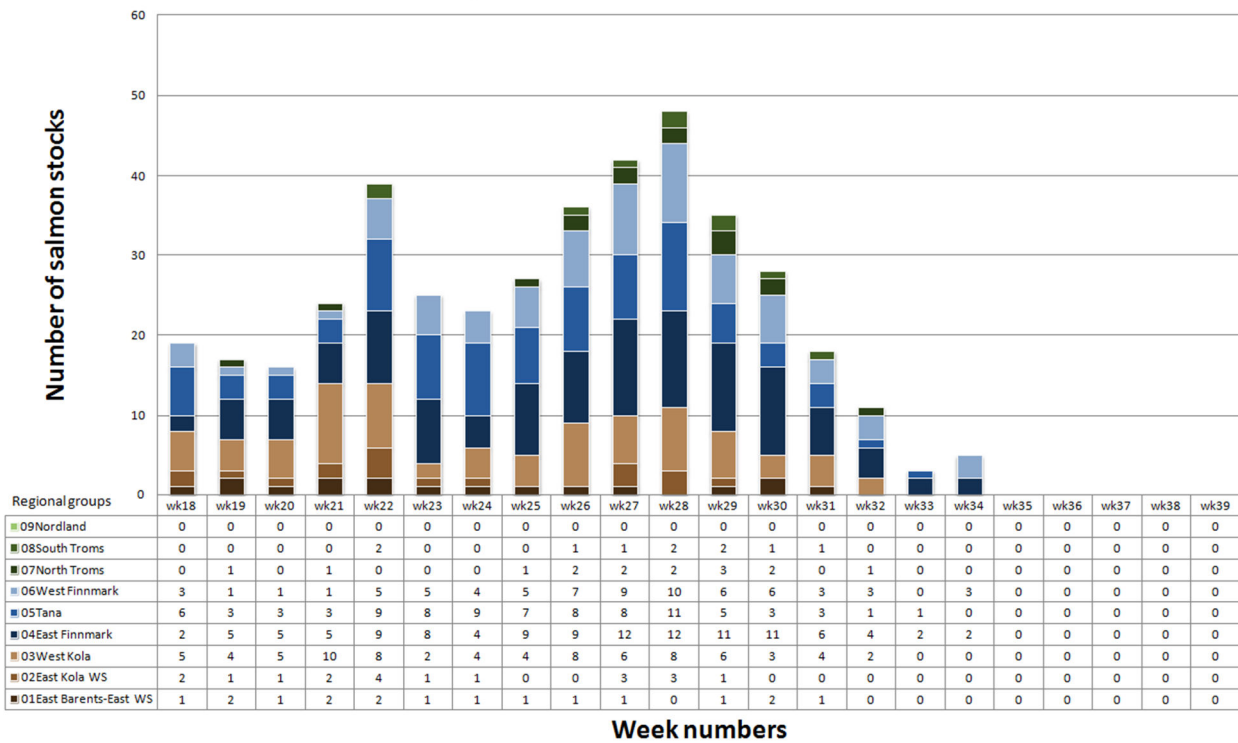


Figure 153. Weekly numbers of genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Vadsø and Nesseby municipalities in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

### Percentage of salmon stocks caught in Vadsø and Nesseby in 2011 and 2012 combined

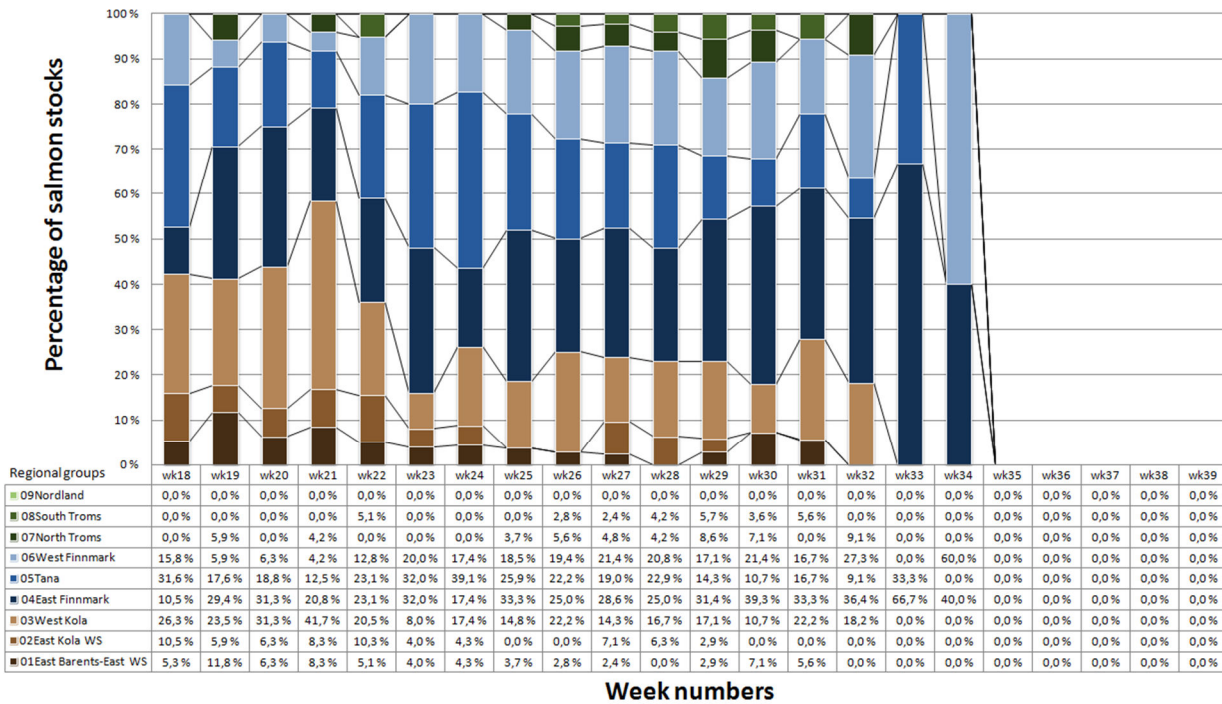


Figure 154. Weekly proportions of genetically separated salmon stocks in each of the nine regional groups (RG regions) from the total numbers of weekly salmon stocks caught in Vadsø and Nesseby municipalities in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

### Number of salmon stocks caught in Vardø, Båtsfjord, Berlevåg and Gamvik in 2011 and 2012 combined

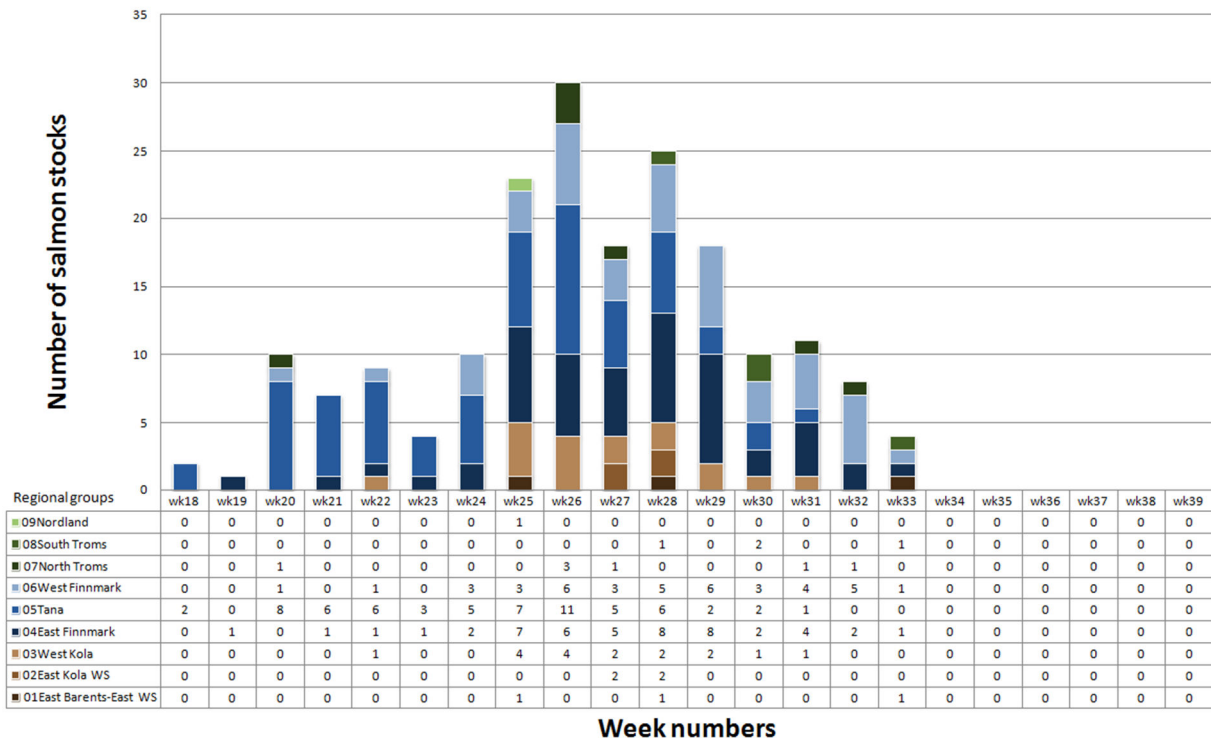


Figure 155. Weekly numbers of genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Vardø, Båtsfjord, Berlevåg and Gamvik municipalities in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

### Percentage of salmon stocks caught in Vardø, Båtsfjord, Berlevåg and Gamvik in 2011 and 2012 combined

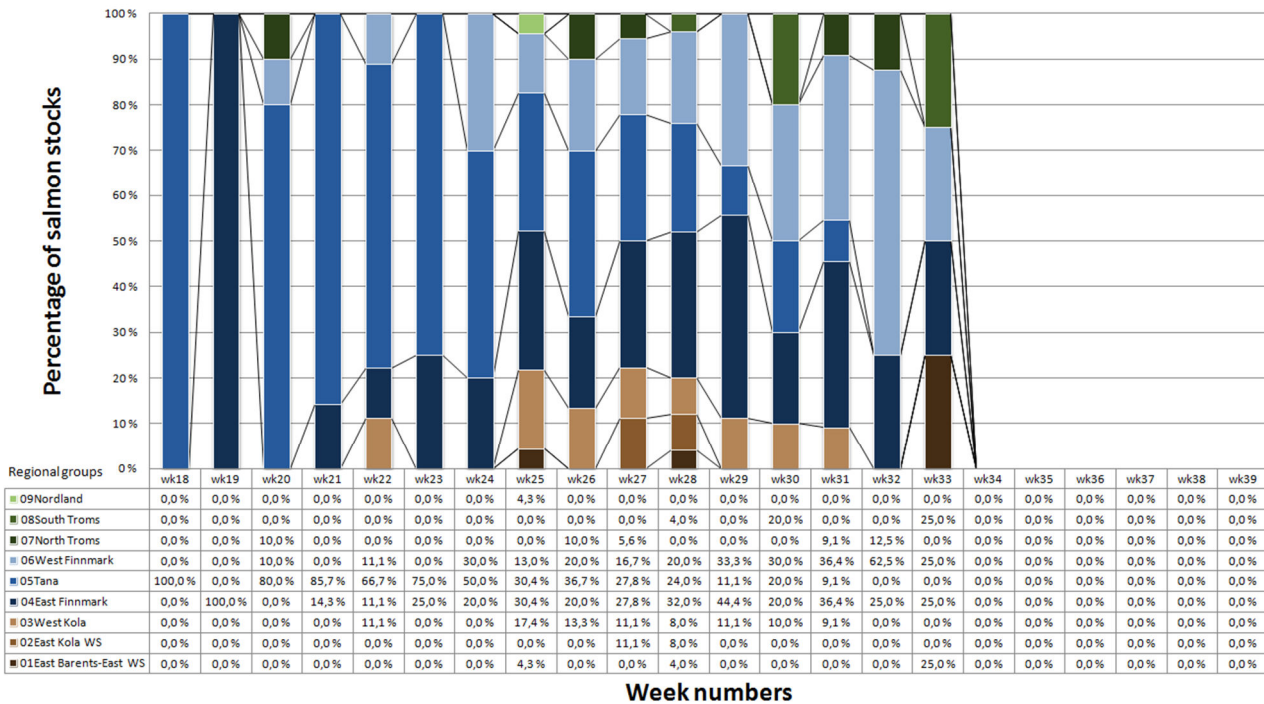


Figure 156. Weekly proportions of genetically separated salmon stocks in each of the nine regional groups (RG regions) from the total numbers of weekly salmon stocks caught in Vardø, Båtsfjord, Berlevåg and Gamvik municipalities in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

### Number of salmon stocks caught in Tana in 2011 and 2012 combined

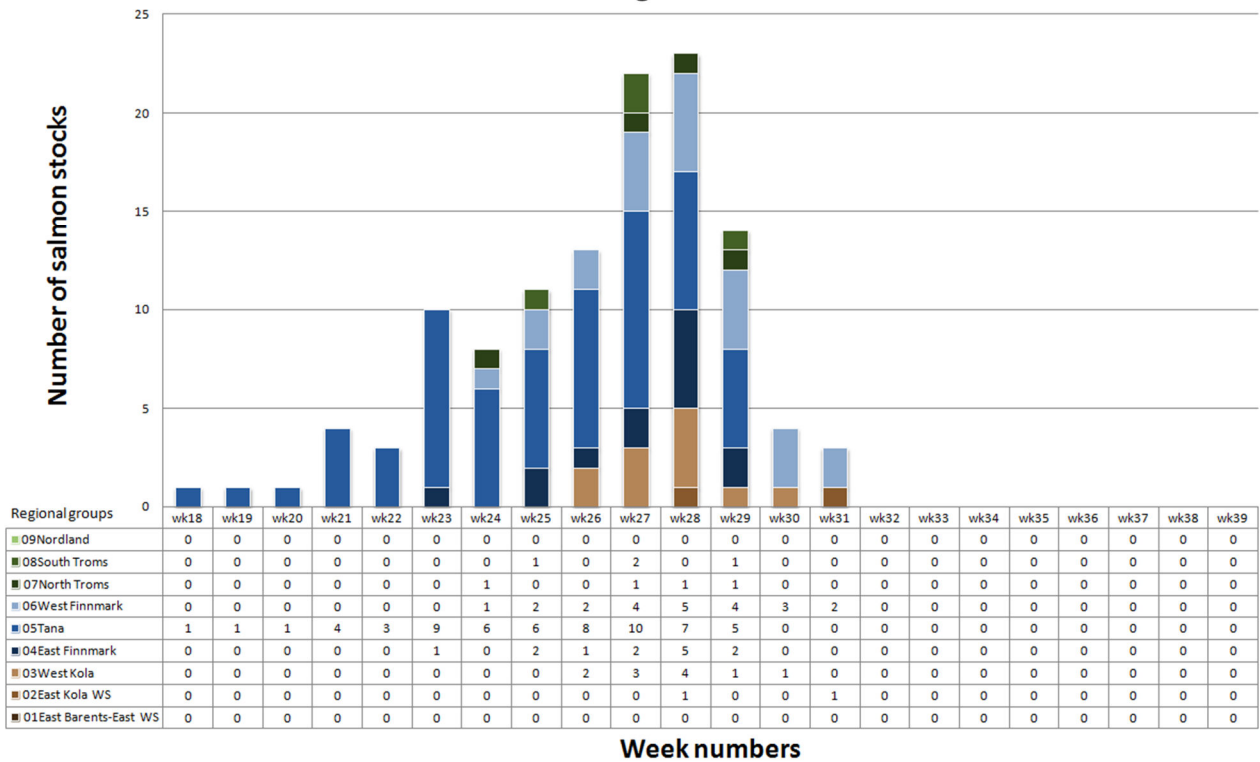


Figure 157. Weekly numbers of genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Tana municipality in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).



Percentage of salmon stocks caught in Tana in 2011 and 2012 combined

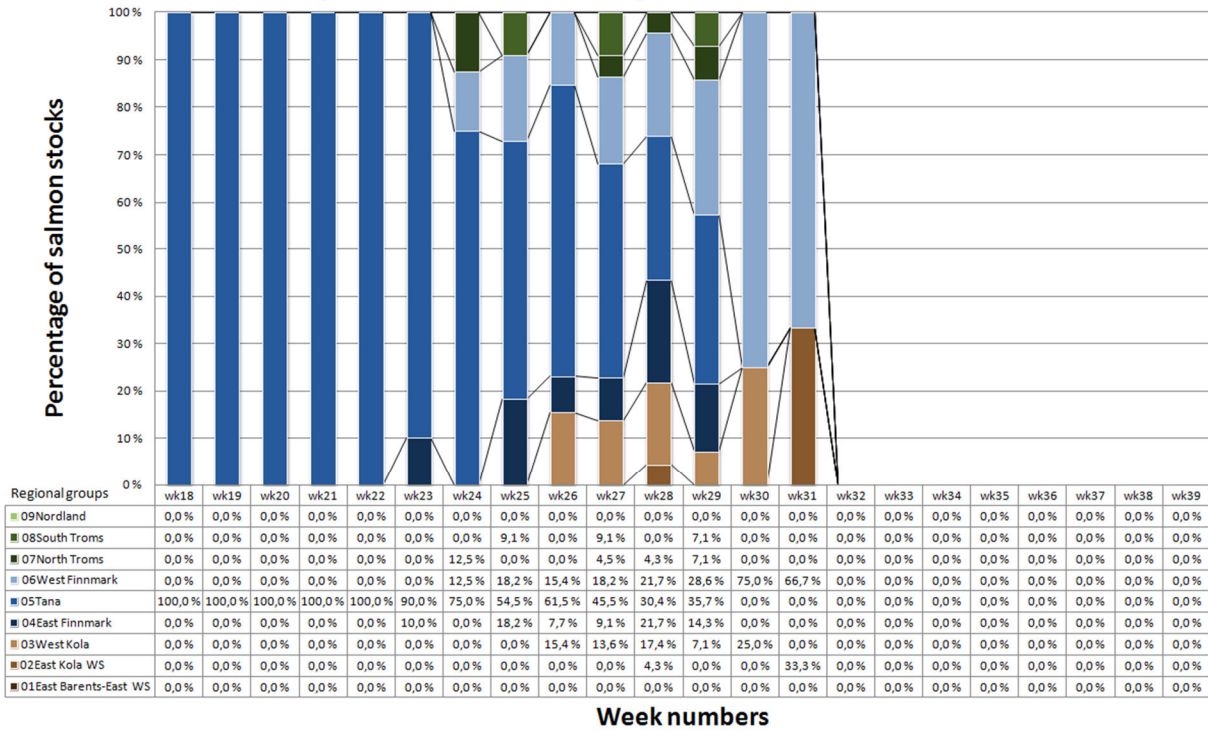


Figure 158. Weekly proportions of genetically separated salmon stocks in each of the nine regional groups (RG regions) from the total numbers of weekly salmon stocks caught in Tana municipality in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

Number of salmon stocks caught in Lebesby in 2011 and 2012 combined

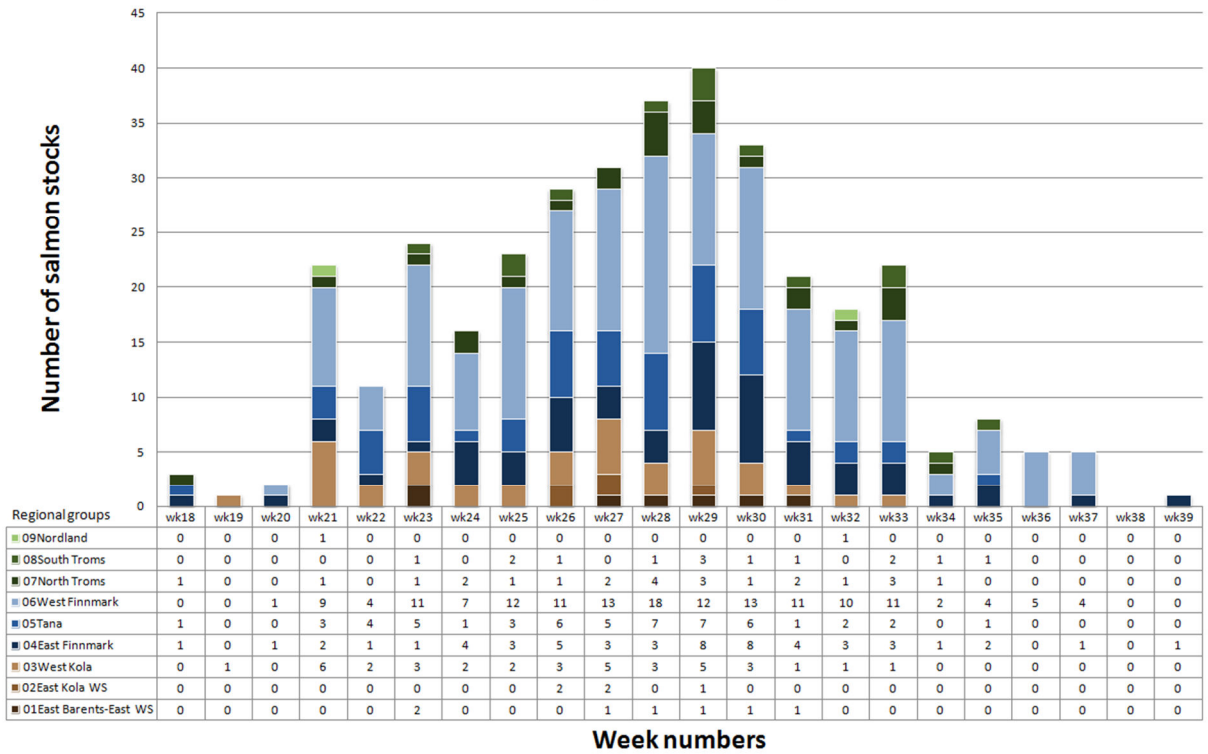


Figure 159. Weekly numbers of genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Lebesby municipality in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

Percentage of salmon stocks caught in Lebesby in 2011 and 2012 combined

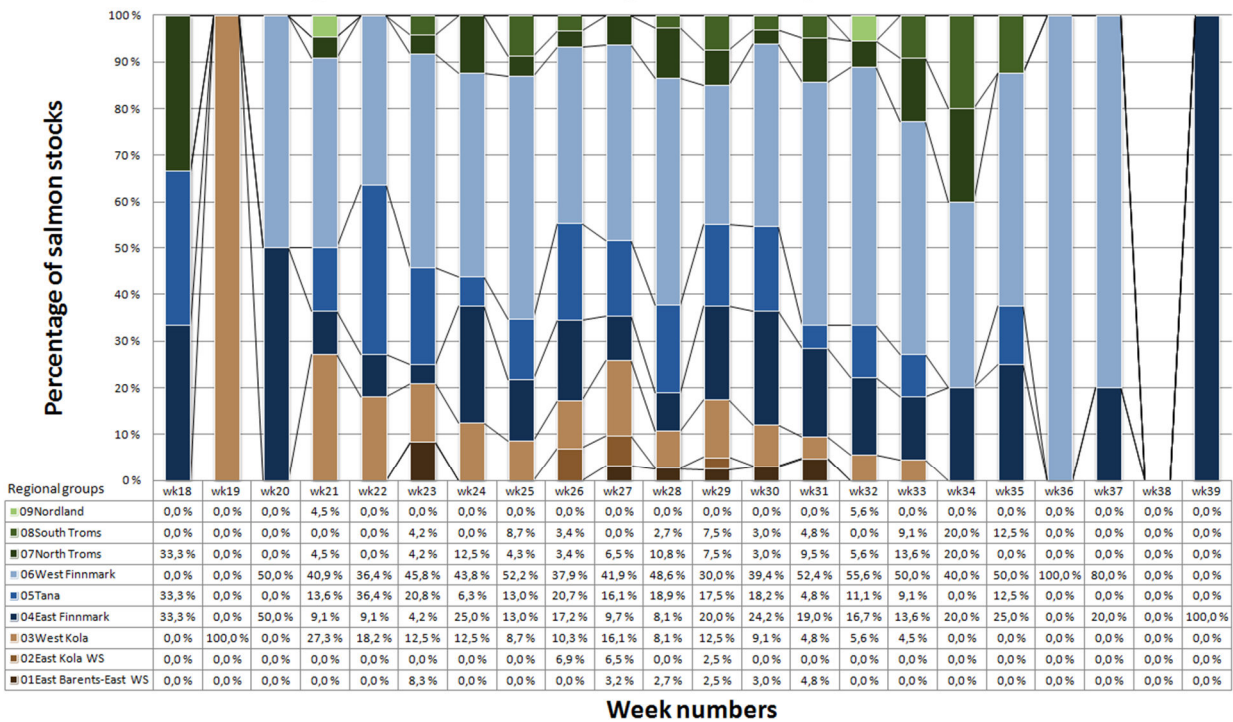


Figure 160. Weekly proportions of genetically separated salmon stocks in each of the nine regional groups (RG regions) from the total numbers of weekly salmon stocks caught in Lebesby municipality in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

Number of salmon stocks caught in Porsanger in 2011 and 2012 combined

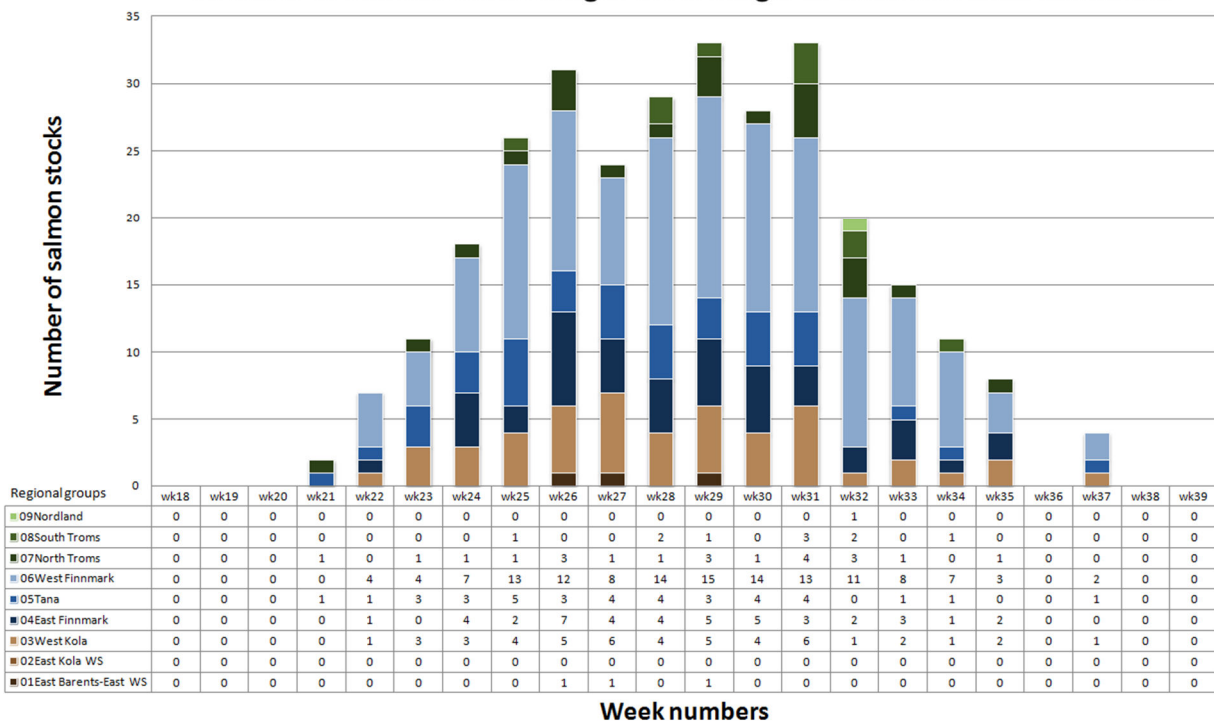


Figure 161. Weekly numbers of genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Porsanger municipality in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

Percentage of salmon stocks caught in Porsanger in 2011 and 2012 combined

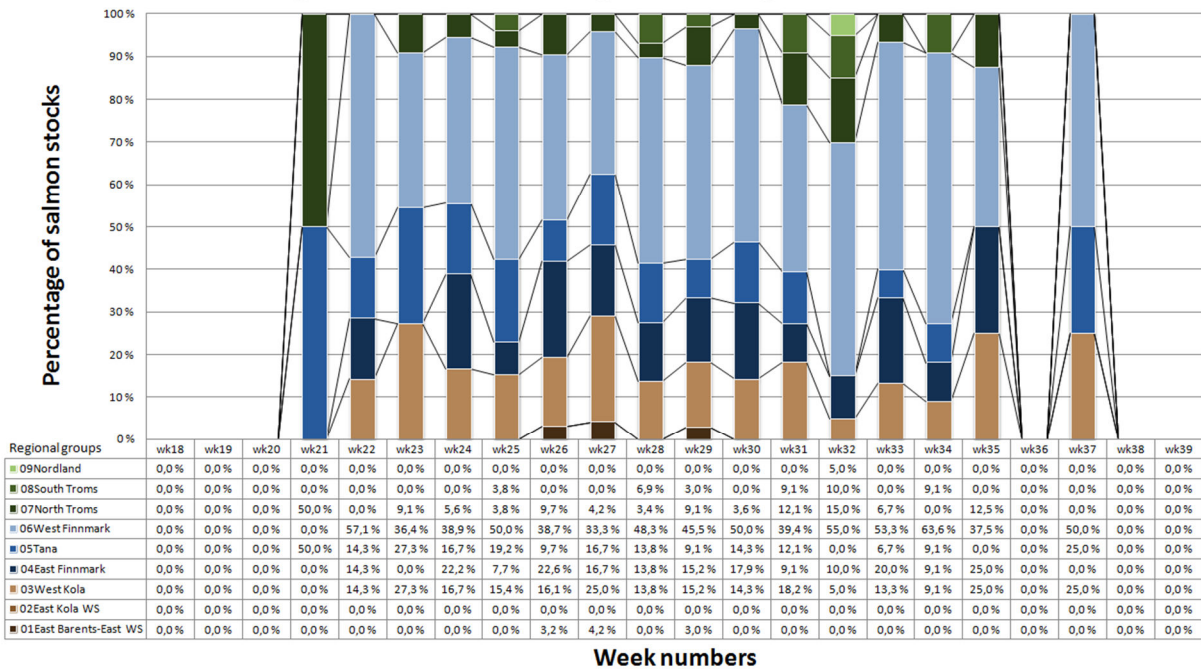


Figure 162. Weekly proportions of genetically separated salmon stocks in each of the nine regional groups (RG regions) from the total numbers of weekly salmon stocks caught in Porsanger municipality in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

Number of salmon stocks caught in Nordkapp, Måsøy, Hammerfest and Kvalsund in 2011 and 2012 combined

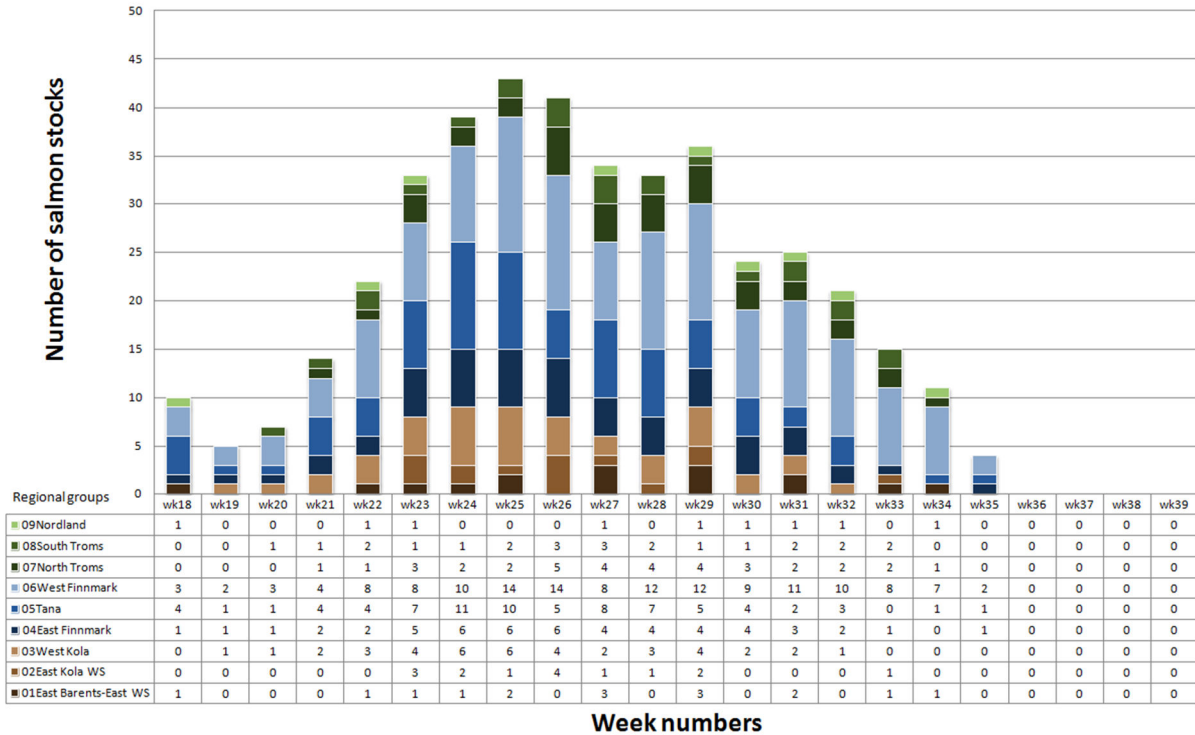


Figure 163. Weekly numbers of genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Nordkapp, Måsøy, Hammerfest and Kvalsund municipalities in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

### Percentage of salmon stocks caught in Nordkapp, Måsøy, Hammerfest and Kvalsund in 2011 and 2012 combined

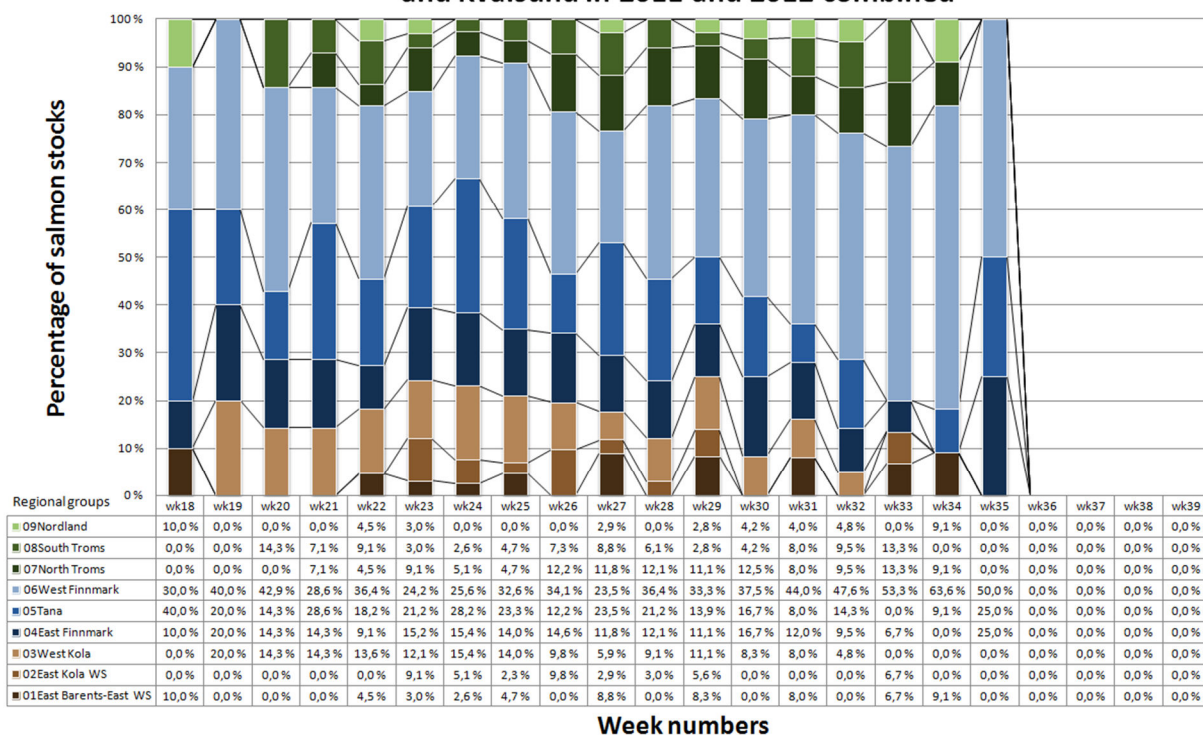


Figure 164. Weekly proportions of genetically separated salmon stocks in each of the nine regional groups (RG regions) from the total numbers of weekly salmon stocks caught in Nordkapp, Måsøy, Hammerfest and Kvalsund municipalities in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

### Number of salmon stocks caught in Hasvik and Loppa in 2011 and 2012 combined

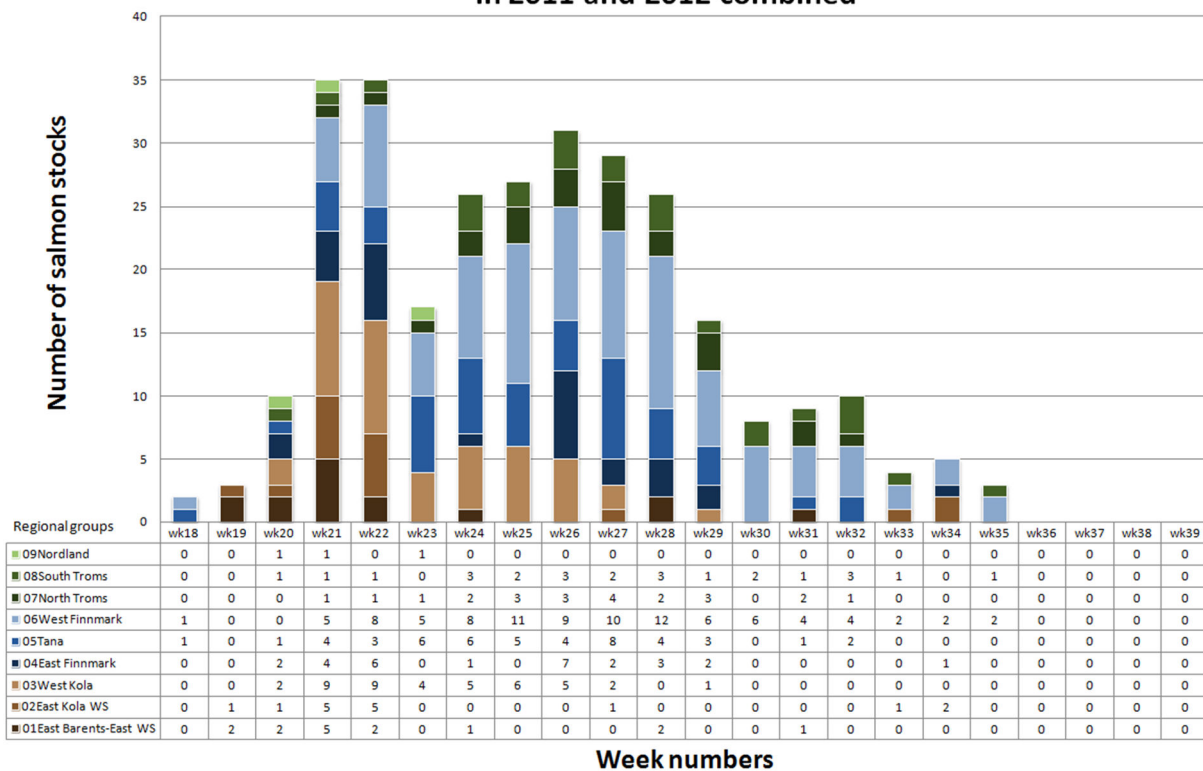


Figure 165. Weekly numbers of genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Hasvik and Loppa municipalities in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

### Percentage of salmon stocks caught in Hasvik and Loppa in 2011 and 2012 combined

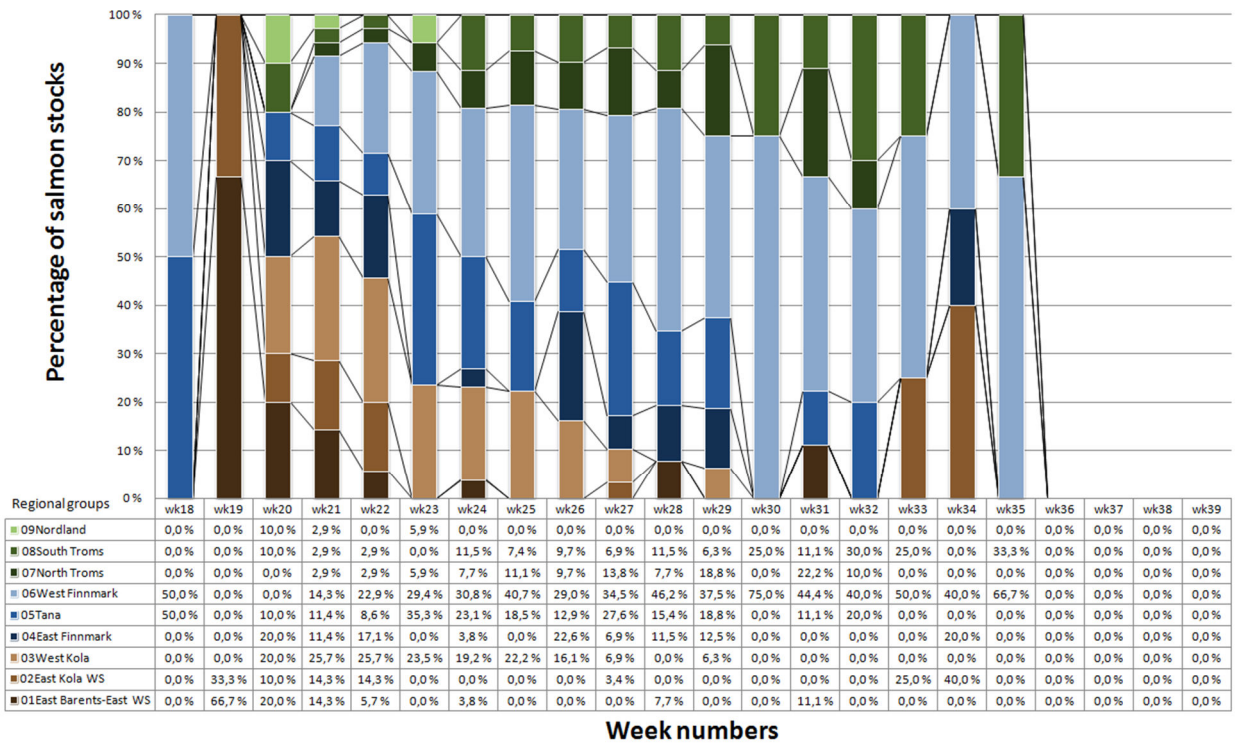


Figure 166. Weekly proportions of genetically separated salmon stocks in each of the nine regional groups (RG regions) from the total numbers of weekly salmon stocks caught in Hasvik and Loppa municipalities in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

29. Numbers and proportions of salmon individuals belonging to nine geographical groups (RG regions) in the weekly catches in the years 2011 and 2012 in North Norway

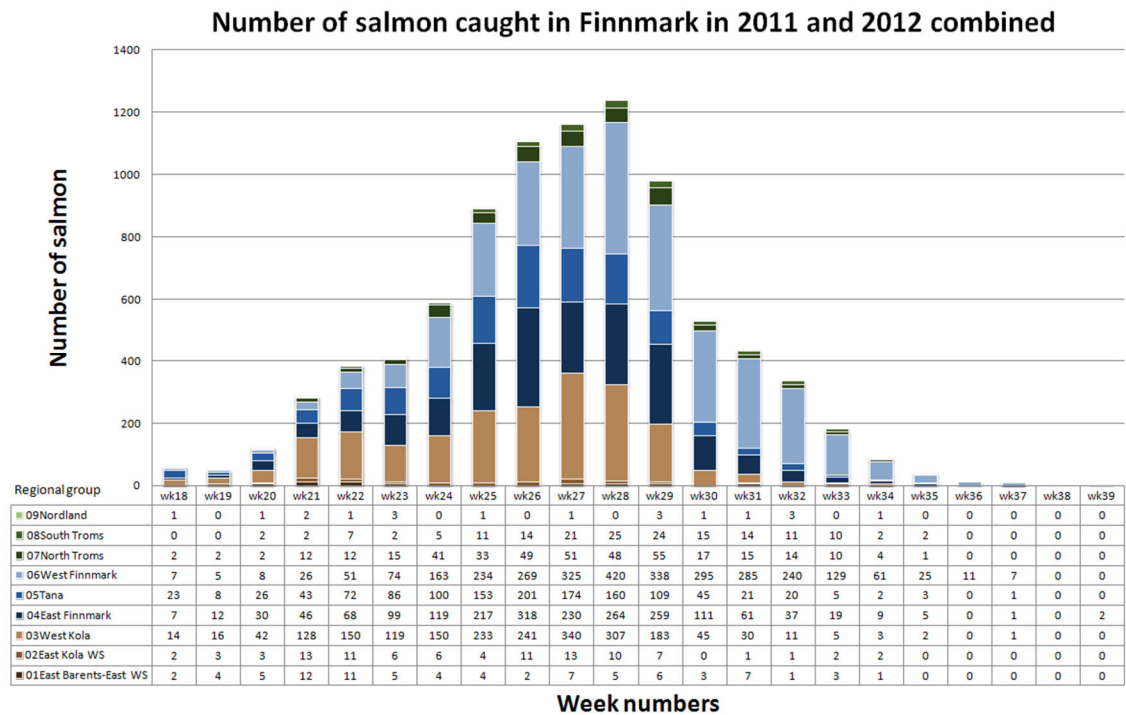


Figure 167. Weekly numbers of salmon individuals belonging to genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Finnmark county in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

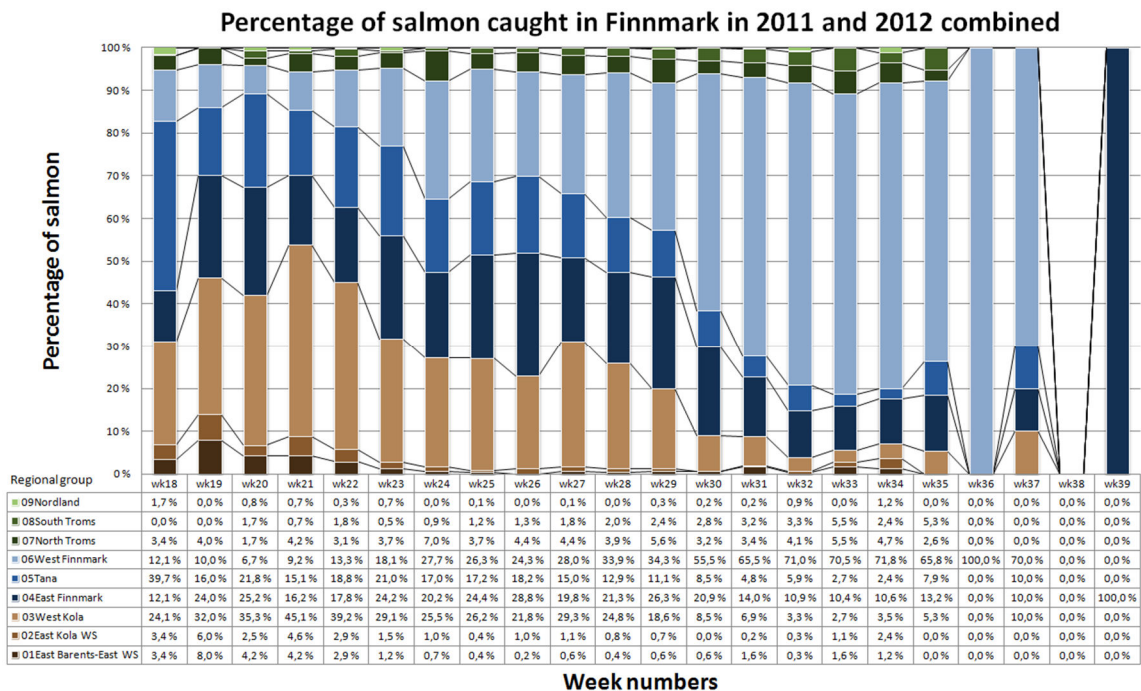


Figure 168. Weekly proportions from the numbers of salmon individuals belonging to genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Finnmark county in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

Number of salmon caught in Sør-Varanger in 2011 and 2012

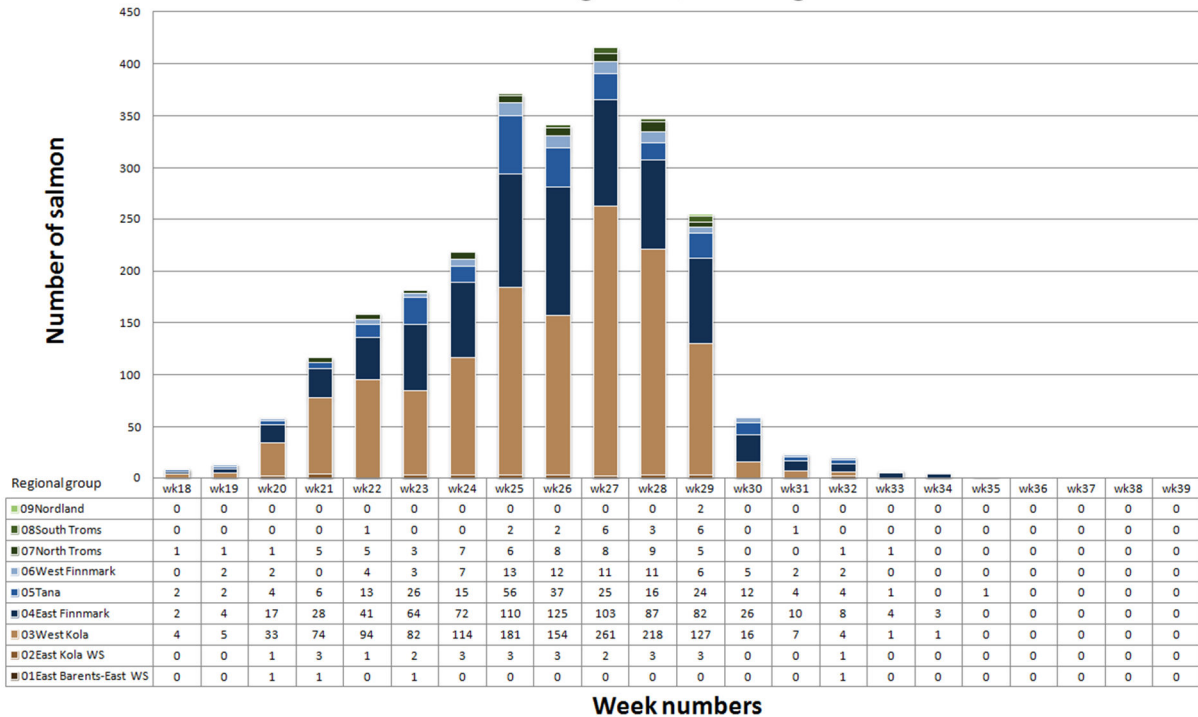


Figure 169. Weekly numbers of salmon individuals belonging to genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Sør-Varanger in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

Percentage of salmon caught in Sør-Varanger in 2011 and 2012 combined

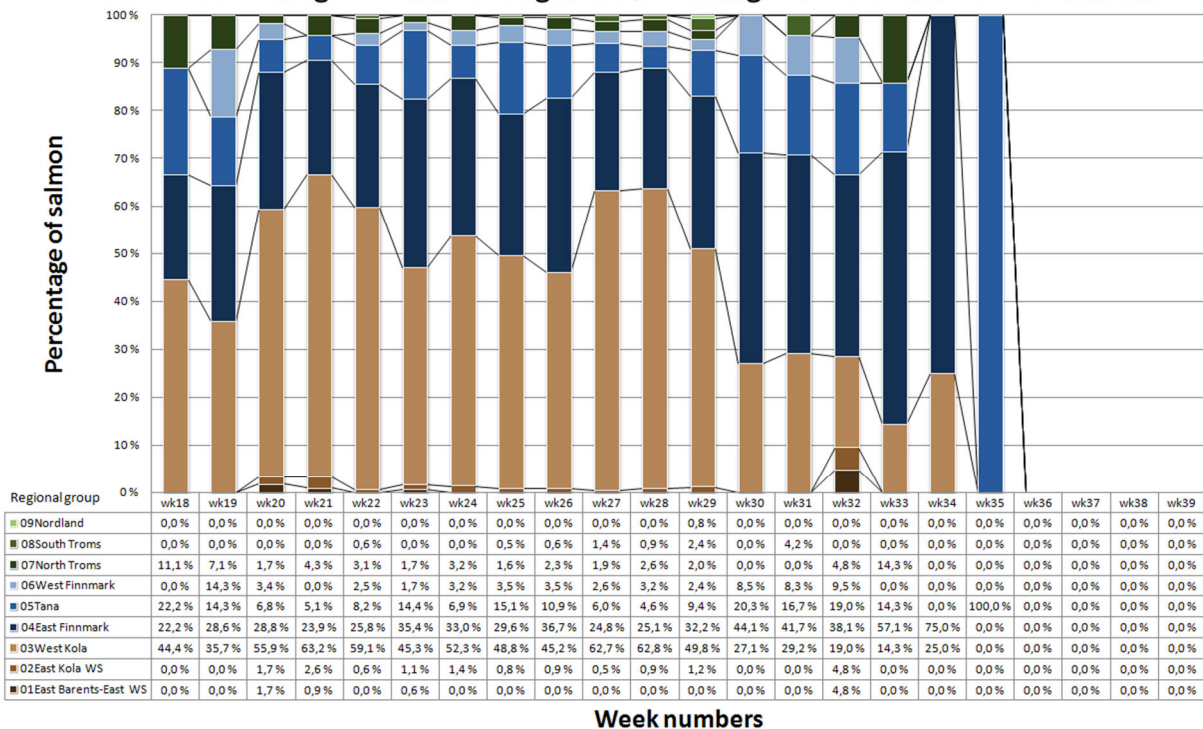


Figure 170. Weekly proportions from the numbers of salmon individuals belonging to genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Sør-Varanger municipality in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

**Number of salmon caught in Vadsø and Nesseby  
in 2011 and 2012 combined**

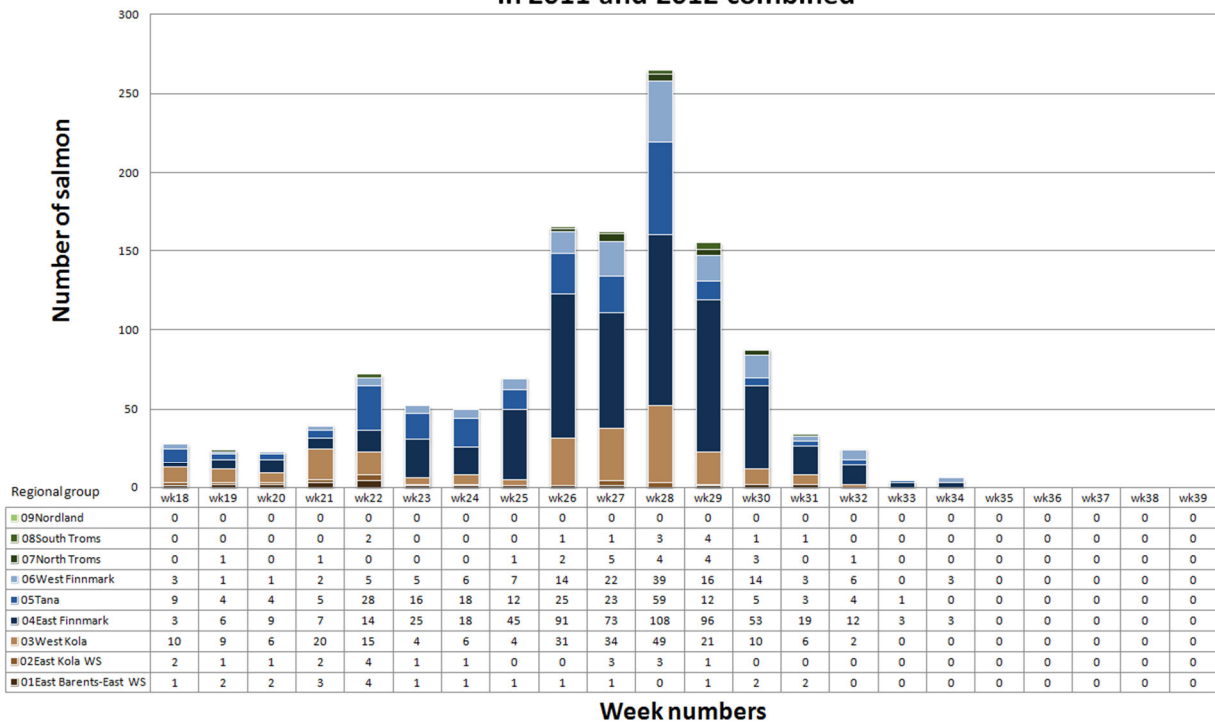


Figure 171. Weekly numbers of salmon individuals belonging to genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Vadsø and Nesseby municipalities in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

**Percentage of salmon caught in Vadsø and Nesseby  
in 2011 and 2012 combined**

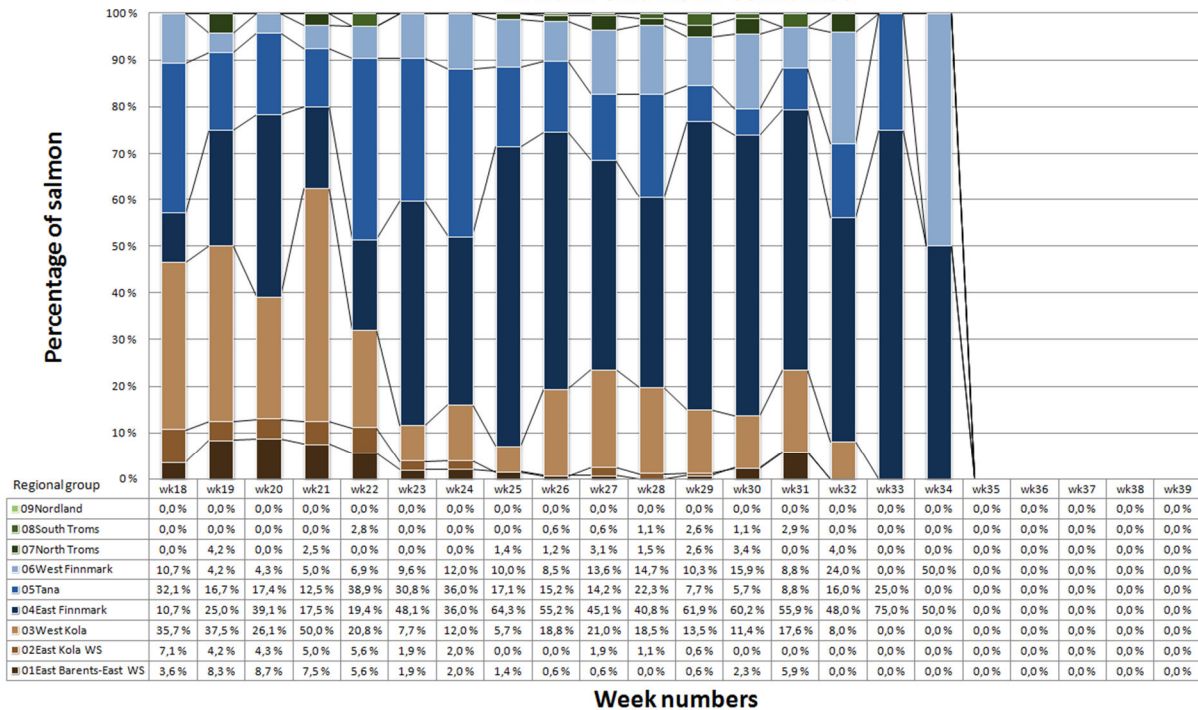


Figure 172. Weekly proportions from the numbers of salmon individuals belonging to genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Vadsø and Nesseby municipalities in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).



### Number of salmon caught in Vardø, Båtsfjord, Berlevåg and Gamvik in 2011 and 2012 combined

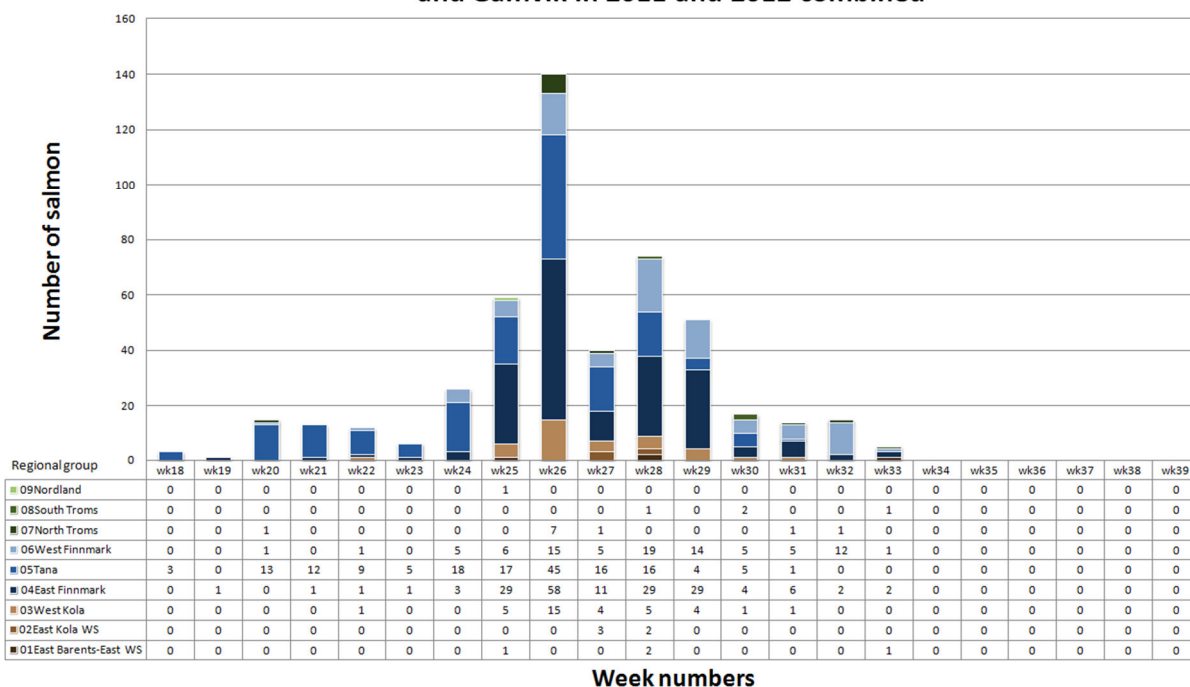


Figure 173. Weekly numbers of salmon individuals belonging to genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Vardø, Båtsfjord, Berlevåg and Gamvik municipalities in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

### Percentage of salmon caught in Vardø, Båtsfjord, Berlevåg and Gamvik in 2011 and 2012 combined

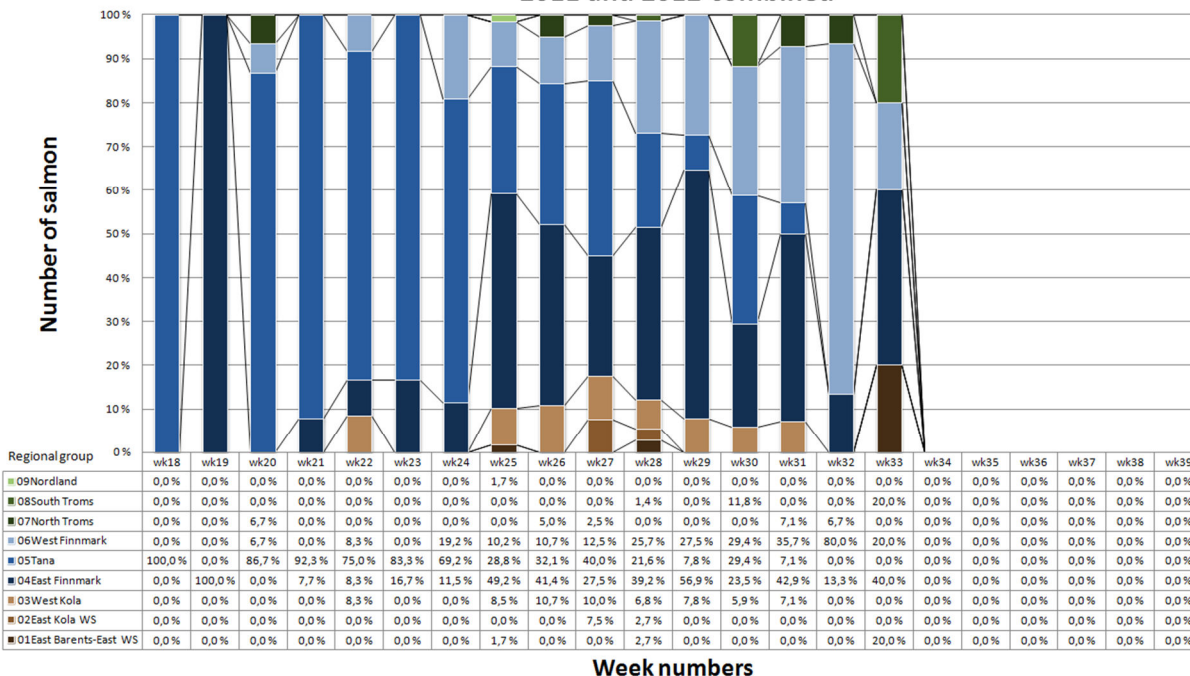
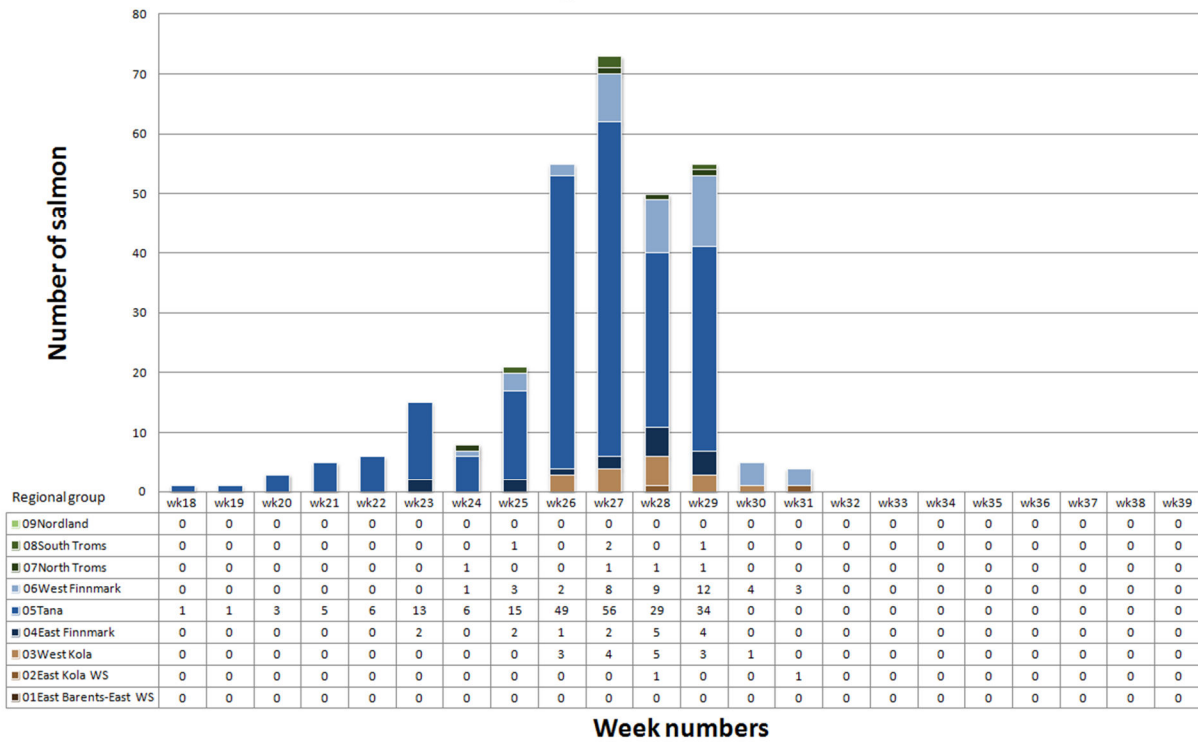


Figure 174. Weekly proportions from the numbers of salmon individuals belonging to genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Vardø, Båtsfjord, Berlevåg and Gamvik municipalities in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

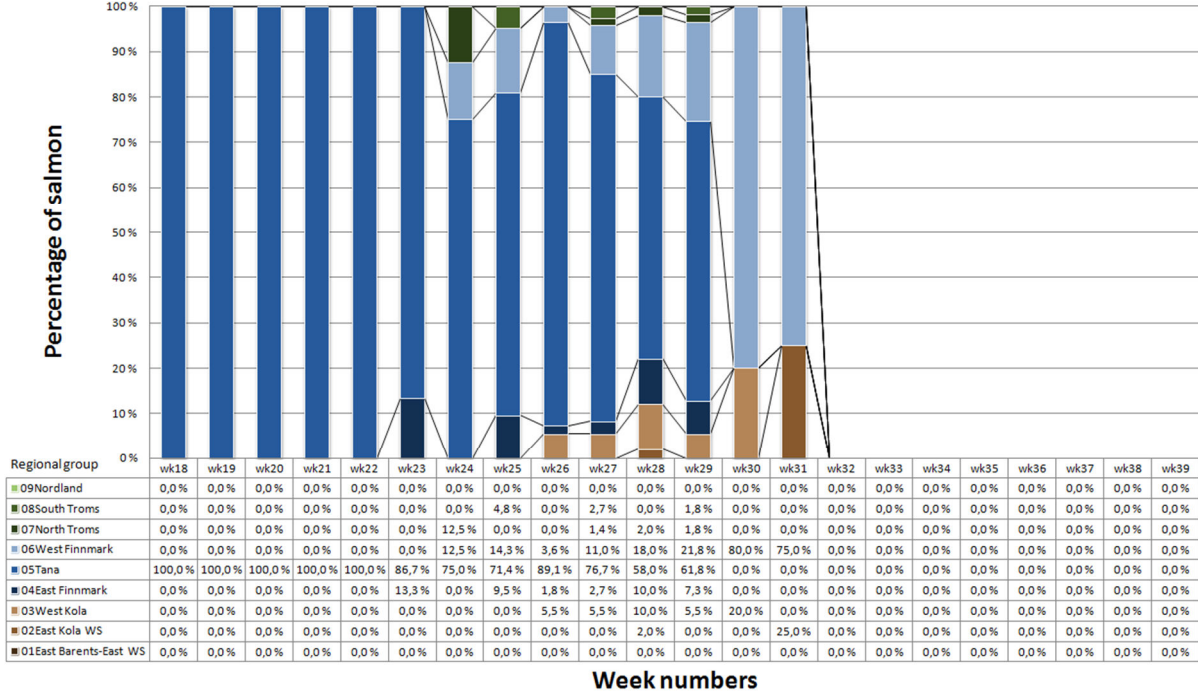
Number of salmon caught in Tana in 2011 and 2012 combined



Week numbers

Figure 175. Weekly numbers of salmon individuals belonging to genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Tana municipality in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

Percentage of salmon caught in Tana in 2011 and 2012 combined



Week numbers

Figure 176. Weekly proportions from the numbers of salmon individuals belonging to genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Tana municipality in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

Number of salmon caught in Lebesby in 2011 and 2012 combined

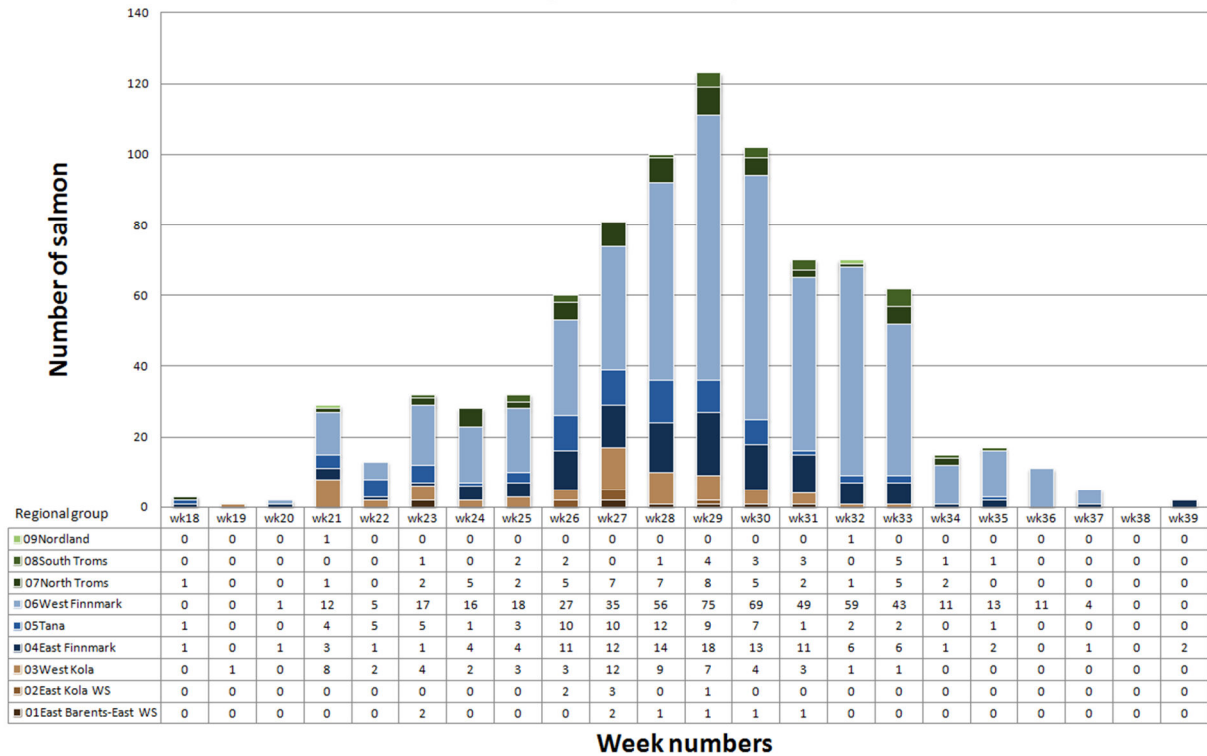


Figure 177. Weekly numbers of salmon individuals belonging to genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Lebesby municipality in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

Percentage of salmon caught in Lebesby in 2011 and 2012 combined

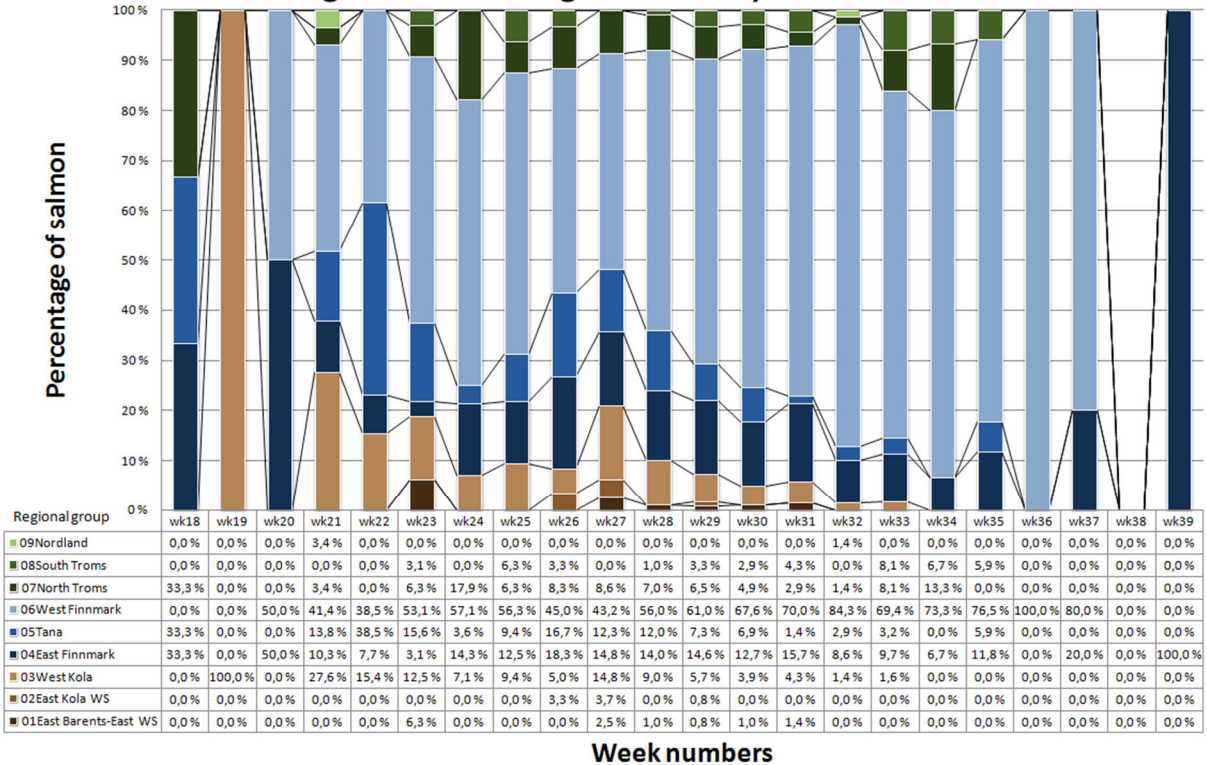


Figure 178. Weekly proportions from the numbers of salmon individuals belonging to genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Lebesby municipality in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

Number of salmon caught in Porsanger in 2011 and 2012 combined

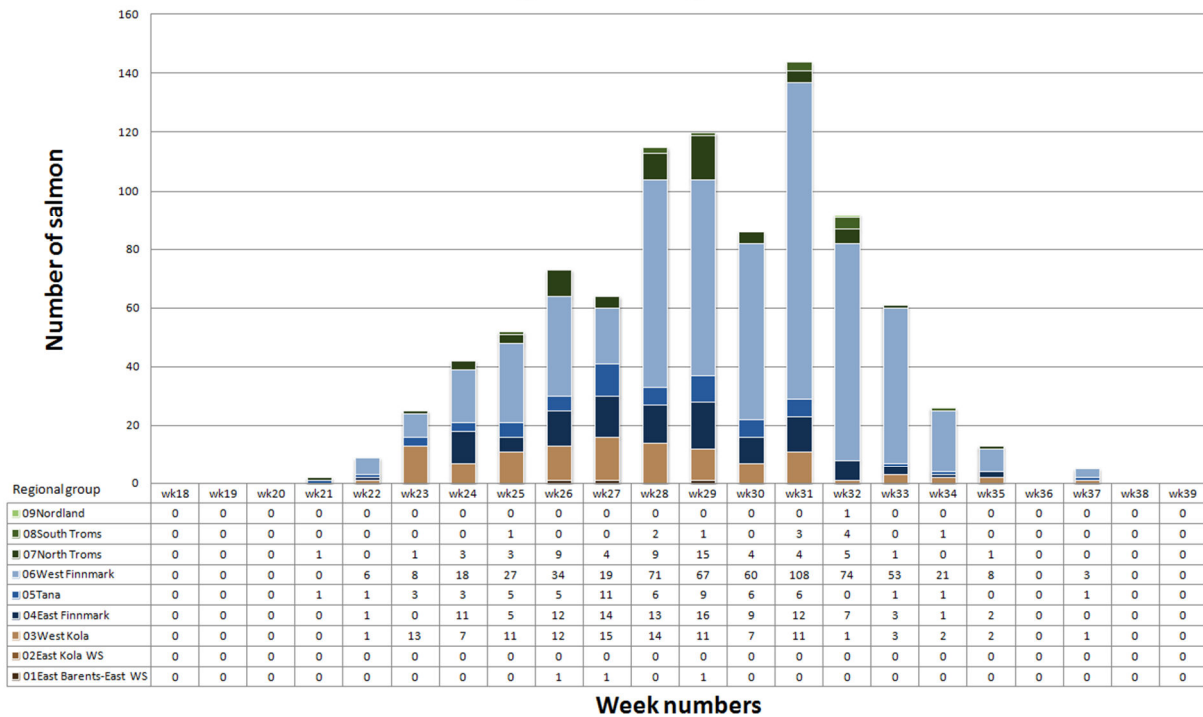


Figure 179. Weekly numbers of salmon individuals belonging to genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Porsanger municipality in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

Percentage of salmon caught in Porsanger in 2011 and 2012 combined

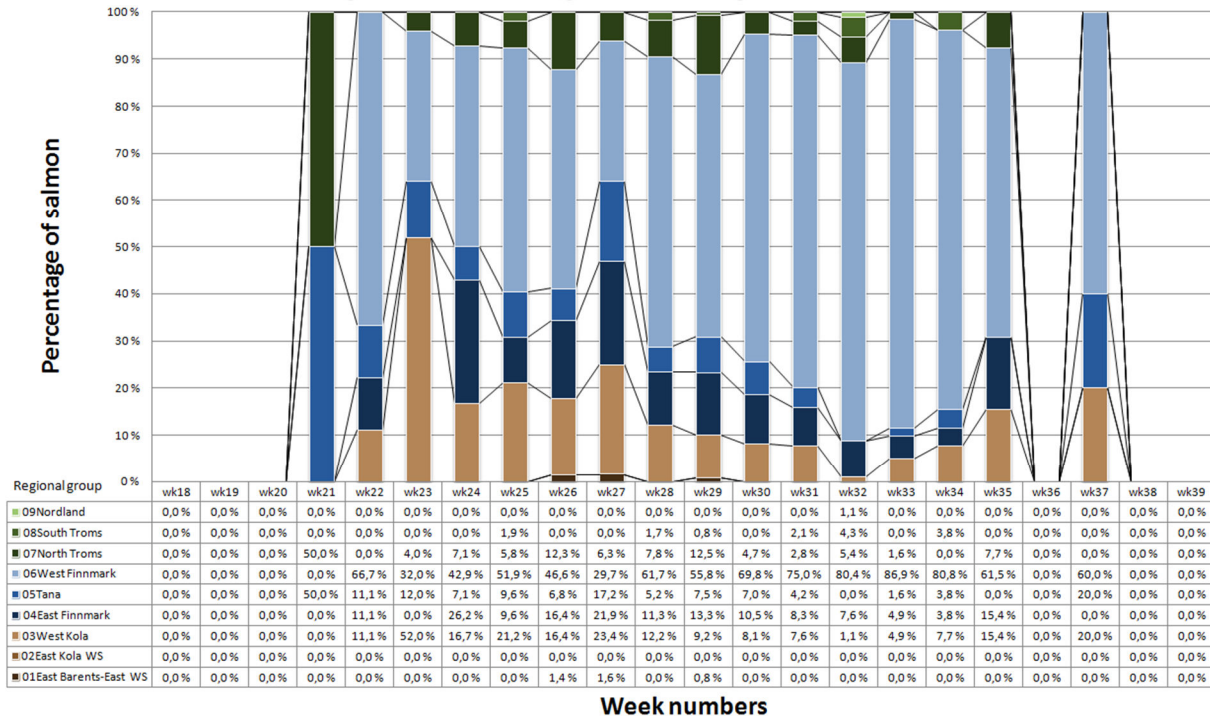
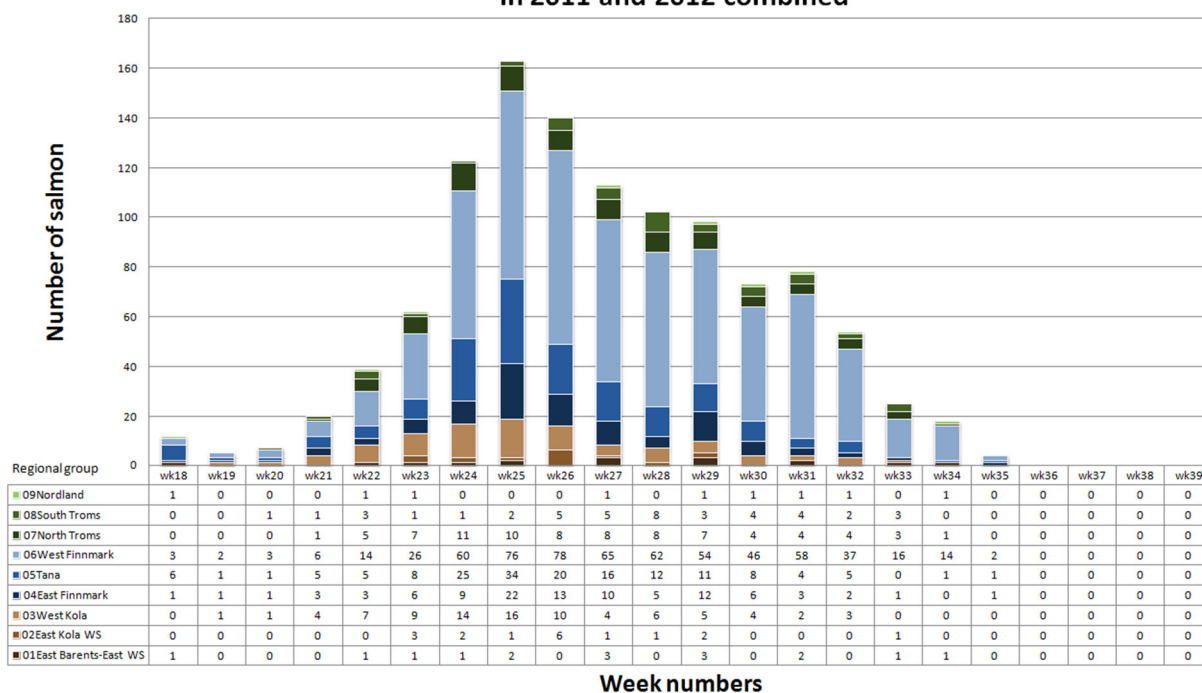


Figure 180. Weekly proportions from the numbers of salmon individuals belonging to genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Porsanger municipality in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

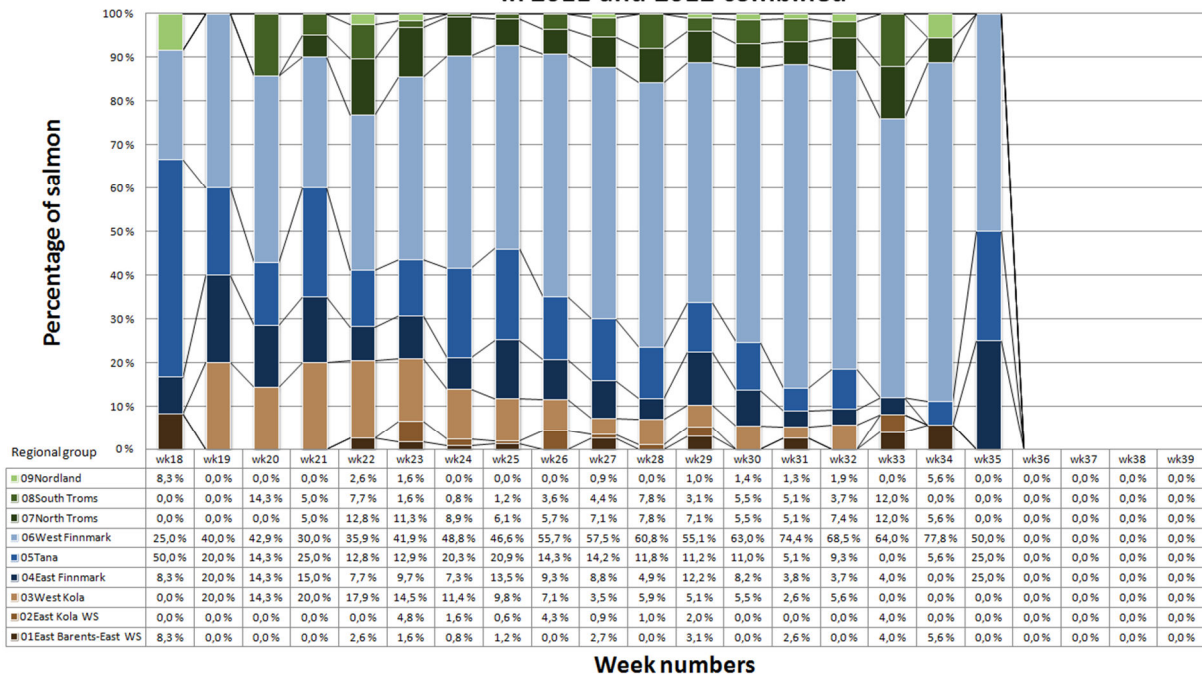
### Number of salmon caught in Nordkapp, Måsøy, Hammerfest and Kvalsund in 2011 and 2012 combined



Week numbers

Figure 181. Weekly numbers of salmon individuals belonging to genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Nordkapp, Måsøy, Hammerfest and Kvalsund municipalities in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

### Percentage of salmon caught in Nordkapp, Måsøy, Hammerfest and Kvalsund in 2011 and 2012 combined



Week numbers

Figure 182. Weekly proportions from the numbers of salmon individuals belonging to genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Nordkapp, Måsøy, Hammerfest and Kvalsund municipalities in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

Number of salmon caught in Hasvik and Loppa in 2011 and 2012 combined

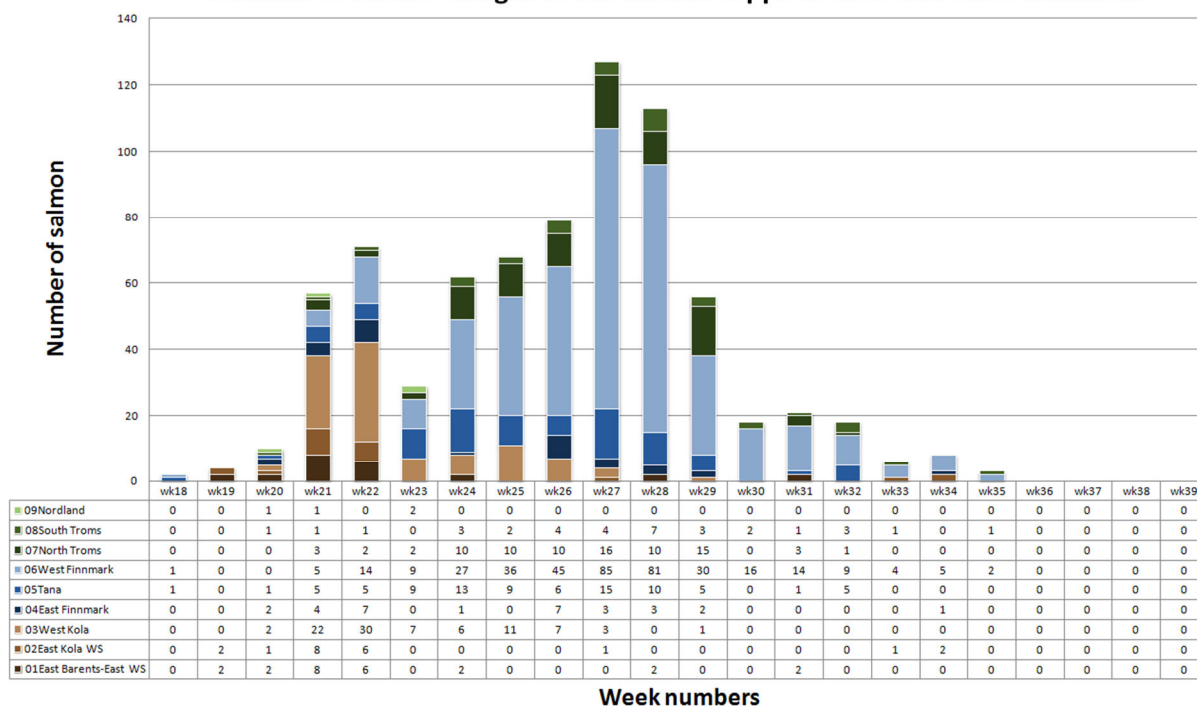


Figure 183. Weekly numbers of salmon individuals belonging to genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Hasvik and Loppa municipalities in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).

Percentage of salmon caught in Hasvik and Loppa in 2011 and 2012 combined

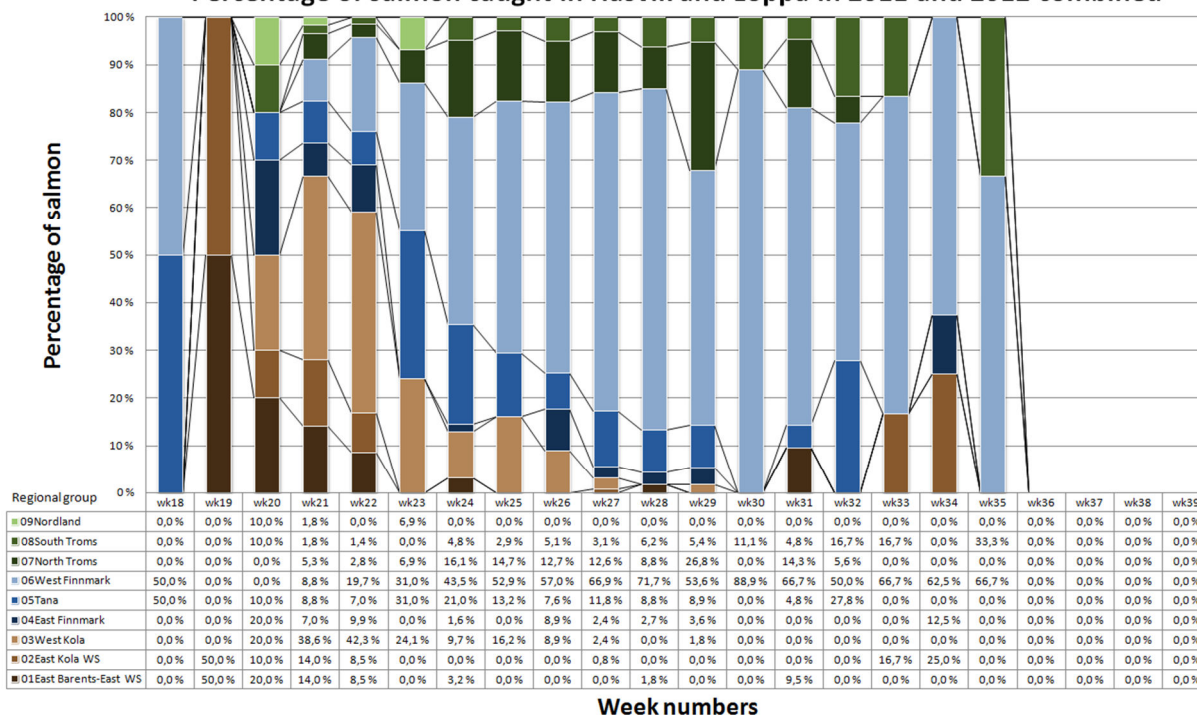


Figure 184. Weekly proportions from the numbers of salmon individuals belonging to genetically separated salmon stocks in each of the nine regional groups (RG regions) caught in Hasvik and Loppa municipalities in the years 2011 and 2012. Source: Kolarctic EU/ENPI CBC (KO 197).