Þórir Dan Jonsson, fisheries scientist

Tel +354 8202032

Salmon in the river Laxá á Ásum

Research on juvenile, 14.-16. July 2022eries

Photographer: Auður Ingólfsdóttir

Introduction

Electrofishing was performed in seven different places on the Laxá á Ásum river from July 14-16th. Attached at the back of the report is a map where the fishing spots (1-7) are marked. Six electrofishing spots were in the same areas as in the years 2019-2021, but the seventh location (below Krók (Hook)) is an ancient fishing spot that is believed to hold badly fish and therefore little effort is made to fish there. The purpose of electrofishing these sites are to check the status of juvenile salmon.

The parr survey this year was performed almost a month earlier than in previous years and unfortunately the conditions of the river for electrofishing were poor due to high water levels. The results in this report reflect those facts.

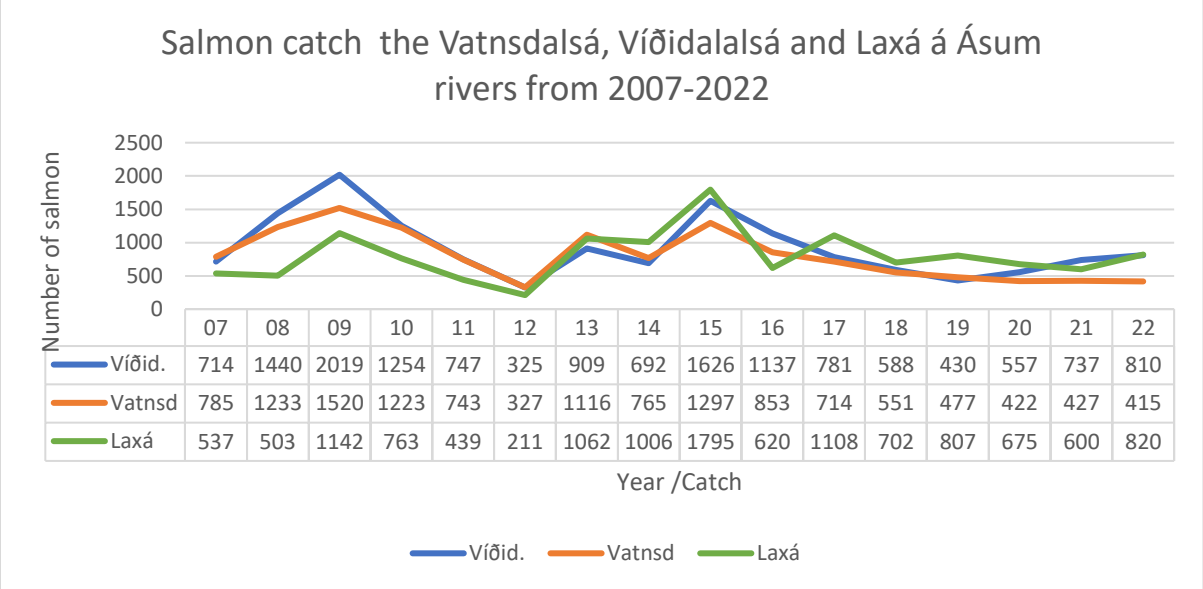
Salmon fishing 2022

In the summer of 2022, 820 salmon were caught, which is 220 salmon more than last year. It is interesting to note that the size of several salmon caught at the beginning of the season were unusually small (less than 60cm).

A more detailed analysis of the catch will not be carried out as this is done in the "Hafró" report, which is compiled from fishing books for the entire catch of 2022.

Fishing in the Laxá á Ásum, Vididalsá and Vatndalsá rivers

The catch in Laxá á Ásum and Víðidalsá is the highest it has been since 2017, while fishing in Vatnsdalsá continues to decline. Figure 1 shows the development in these three rivers.



	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22
Víðid.	714	1440	2019	1254	747	325	909	692	1626	1137	781	588	430	557	737	810
Vatnsd	785	1233	1520	1223	743	327	1116	765	1297	853	714	551	477	422	427	415
Laxá	537	503	1142	763	439	211	1062	1006	1795	620	1108	702	807	675	600	820

Figure 1: ***Fishing in the Vatnsdalsá, Víðidalalsá and Laxá á Ásum rivers from 2007-2022*****. These rivers usually fluctuate in the same rhythms, but Vatnsdalsá has started to trend downward over the last few years.**

Fishing totals were consistent amongst the Vatnsdalsá, Víðidalsá, Laxá á Ásum, and Miðfjarðará rivers from 1974 to 2003, when fishing in the Miðfjarðará river suddenly grew and outpaced the other three. In the summer of 2022, the fishing in Víðidalsá and Laxá á Ásum Rivers was better than in 2021, while meanwhile nearly 300 fewer salmon were caught in the Miðfjarðará River. As was the case in 2021, the

Miðfjarðará river had the highest catch in the entire country, with the exceptions of the East and West Rangá rivers where the catch depends solely on smolt releases.

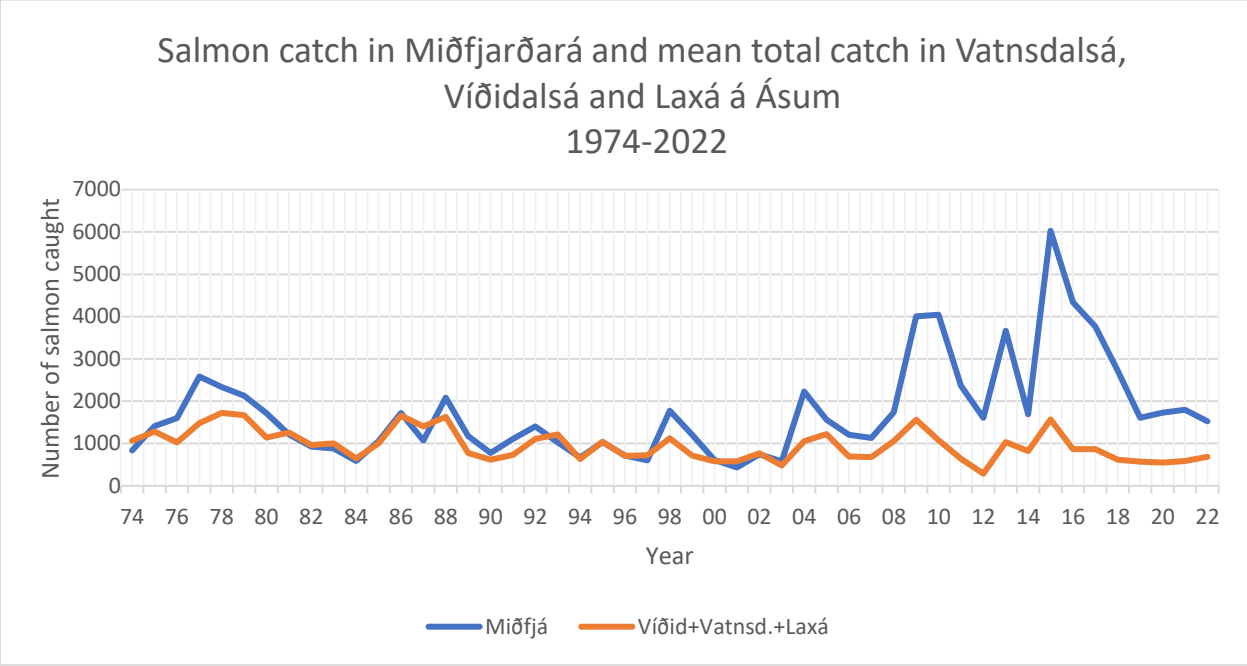


Fig 2. Salmon catch in Midfjardará and mean total catch of Laxá á Ásum, Vididalsá and Vatnsdalsá in years 1974 – 2022.

Results of juvenile salmon studies and trends in juvenile salmon density since 2000.

The fishing this summer was performed about one month earlier than in recent years. Conditions for electrofishing were not ideal as water levels in the river were high. Due to the high current speed and greater than usual water depth in many places, higher percentage of juveniles escaped than usual. Furthermore, while the fry's had recently emerged from the gravel, they have yet to start to disperse. In this case it was a matter of luck that determined whether they would be caught or not.

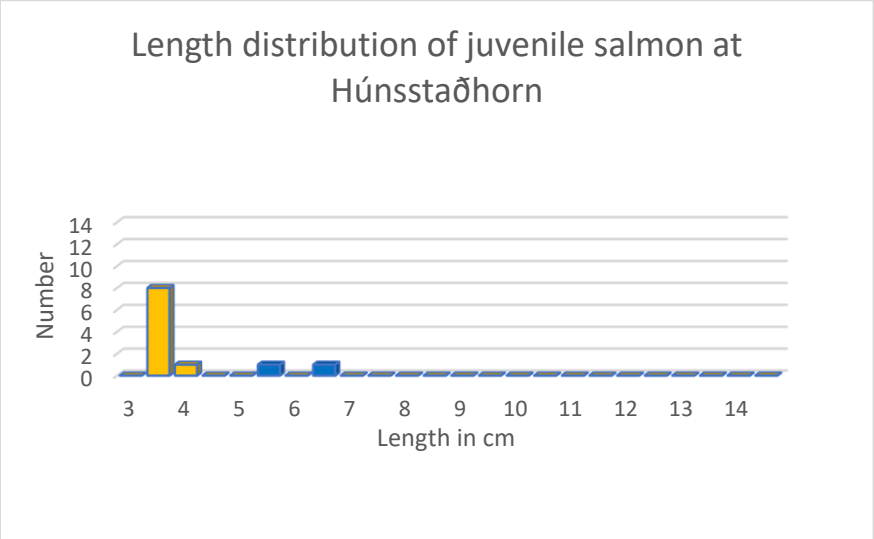
Table 1 shows the number and mean length of salmon juvenile on seven fishing spots in Laxá á Ásum

Site no.	Name	Date	Areal	Age								Sum	Density
				0+		1+		2+		3+			
			m^2	no.	m.l. (cm)	no.	m.l. (cm)	no.	m.l. (cm)	fj.	m.l. (cm)		no/100 m2
1	Húnsstaðahorn	14-juli	100	9	3.44	2	5.8					11	11
2	Holt	16-juli	30	15	3.34	6	6.47	4	8.4			25	83
5	Below Krókhyl	16-juli	45	10	3.5	2	6.65					12	27
4	Above Mánafoss	15-juli	30	3	2.97	7	5.73	1	7.6			11	37
5	50 m below Tumi	16-juli	30			4	5.73					4	13
6	Below Skotti	16-juli	45	18	3.14	8	6.27	3	8.7			29	64
7	Below Krókur	16-juli	30	2	3.1	2	5.9	4	8.2	1	11.1	9	30
	Total		310	57		31		12		1		101	33
	Number/100m2			18		10		4					

Table 1. Number and mean length of salmon juvenile on seven fishing spots in Laxá á Ásum.

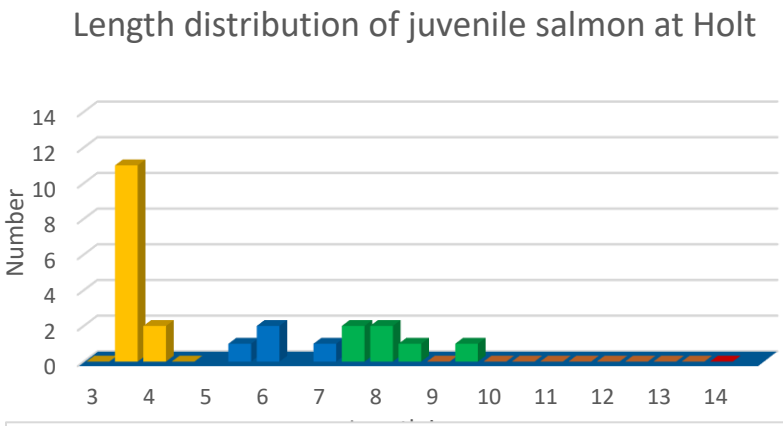
0^+ = Fry , 1^+ = one winter old parr, 2^+= two winters old parr, 3^+ = three winters old parr.

Results of the seven fishing spots:



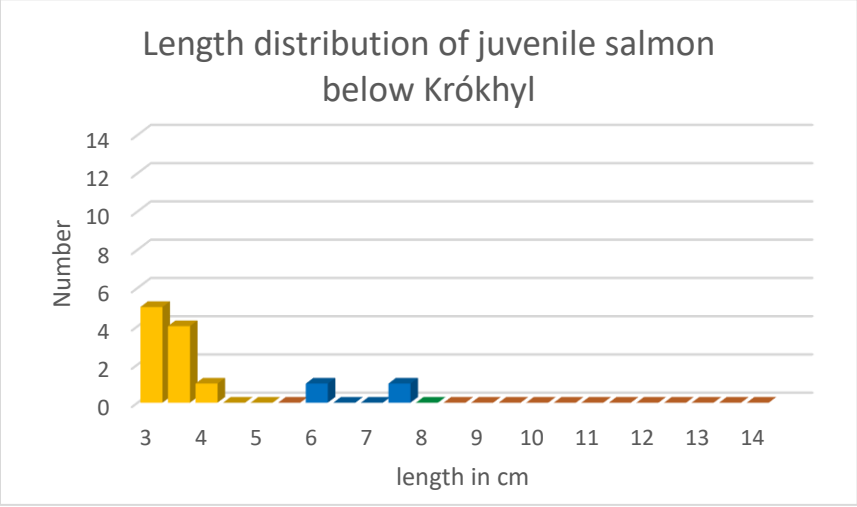
Spot 1: Húnsstaðahorn (100 m^2)

Historically this location has yielded mostly 0^+ (fry) and 1^+(parr). and this year was no exception. Here the 0^+ are larger than on other spots that were fished. The bottom consist of fine gravell and not suitable for larger parrs.

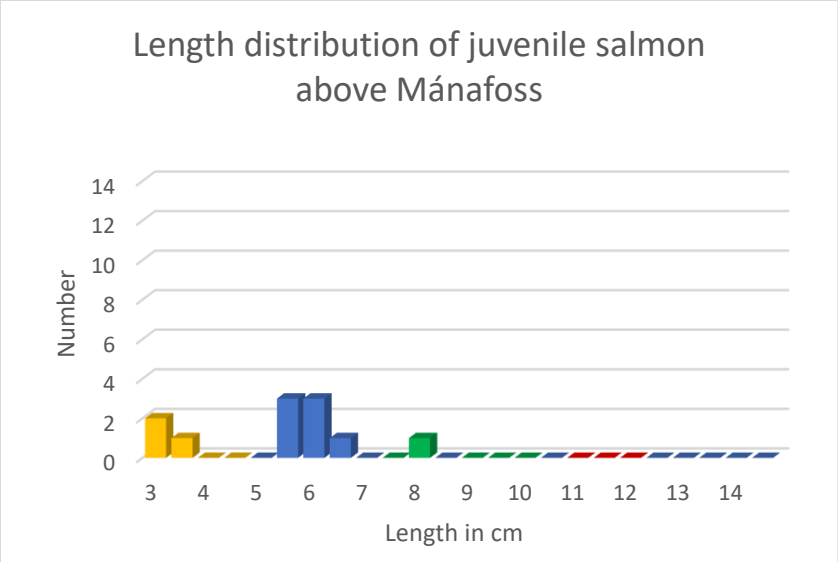


Spot 2. Holt (30 m^2)

The area is shallow and pebbled with occasional rock. Fair current despite the high volume of water. As before, there were relatively large amounts of 0^+ , 1^+ and 2^+ juveniles One male parr (8.5 cm) was sexually mature.

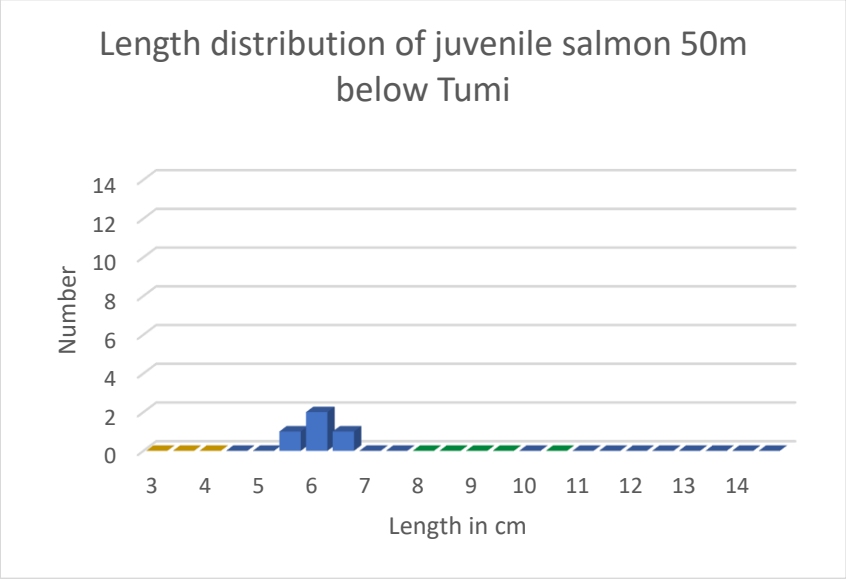


Spot 3. Below Krókhyl. (45 m^2)
The bottom is fine and somewhat overgrown, and there are small sections with coarse gravel. As in previous electrofishing, almost exclusively 0^+ and 1^+ juveniles were caught in this area. In 2021, the density of 0^+ was high and the density of 1^+ was much higher than in 2020. In 2020, the same cohort (i.e. 0^+) was strong. Only two 1^+ and no 2^+ parrs where caught, and it is clear that there are not many parrs from the previously mentioned large cohorts that remain here.

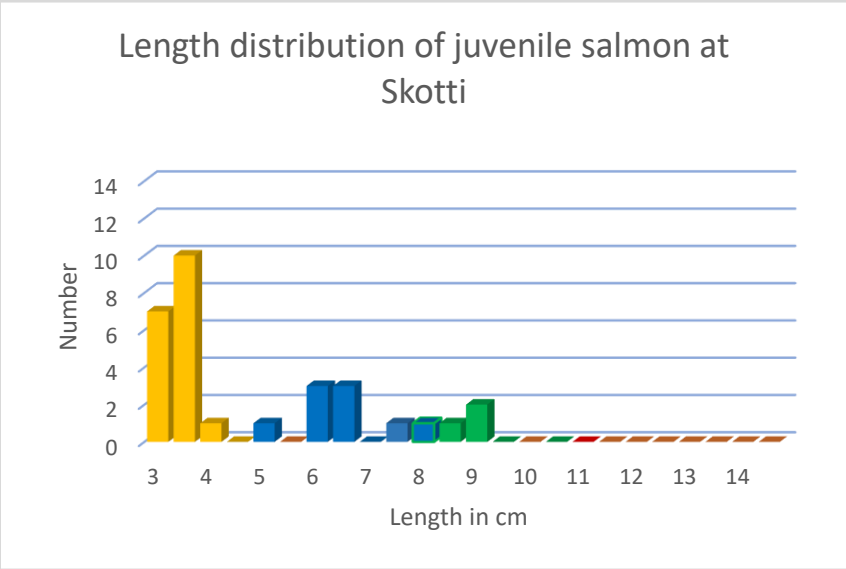


Spot 4: Above Mánafoss. (30 m^2)

Here, the bottom is ideal for large parrs, rough and rocky. A lot of slush and the bottom is slippery. The current is strong and it is difficult to fish. There were few fry's (0^+), but a lot of one-winter-old (1^+) parrs like in 2021.

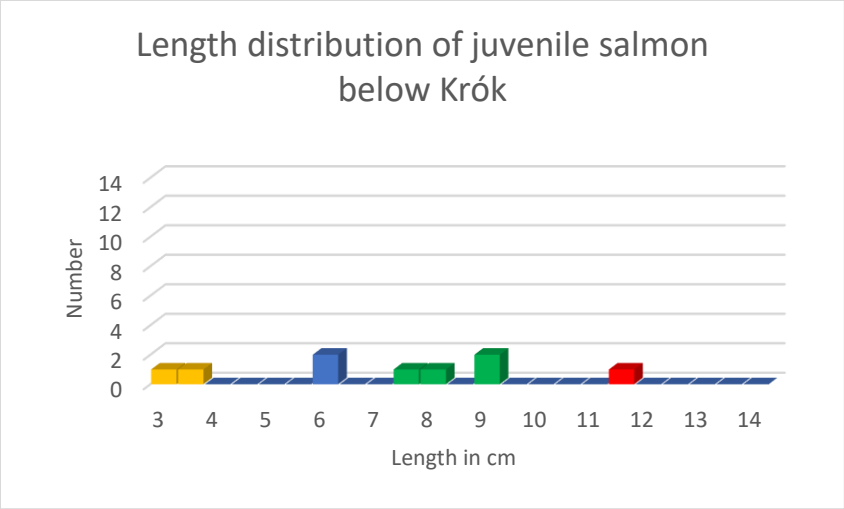


Spot 5. 50 meters below Tumi. (30 m^2)
The bottom is rather fine with the occasional larger rocks. Only four 1^+ parrs were caught. Although no fry's were caught this time, it does not necessarily mean that salmon have not spawned nearby- they were simply not at the electrofishing site.



Spot 6: 50 meters below Skotti (45 m^2)

As last year, fishing was done 50 meters below the rock garden and there was no fishing done in the lowest rock at Skotti, where the biggest juveniles have been caught. The bottom is gritty and with the occasional rock. Cohorts from spawning in 2019 and 2020 (now 1^+ and 2^+) are quite noticeable here.



Spot 7. Below Krók. (30 m²)

Krókur is an ancient fishing spot that is little experienced today, and people were curious to check the condition of the juveniles in the area. The bottom structure is similar to above Mánafoss. Two fry's (0⁺) were caught and larger juveniles were prominent. Salmon have spawned nearby and larger parrs thrive here.

The above pictures show length distribution on spots 1-7. Spots 1-3 are on the lower part of the river while spots 4-7 are on the upper part Yellow = 0⁺, Blue = 1+, Green = 2⁺, Red = 3⁺

Table 2 shows the development of the measured juvenile density in Laxá á Ásum river since the year 2000. This development is shown graphically in figure 4. (spot 7. Below Krókur is excluded)

Year	No of parr per 100m2			
Age	**0+**	**1+**	**2+**	**3+**
2000	2	4	2	
2001	9	6	5	
2002	2	4	3	1
2003	8	7	1	
2004	9	9	3	
2005	20	5	2	
2006	14	13	3	
2007	30	11	7	1
2008	32	9	4	1
2009	14	16	9	1
2010	64	13	10	
2011	41	13	7	1
2012	16	10	4	1
2013	9	19	10	6
2014	33	10	6	1
2015	36	13	4	3
2016	63	20	13	
2017				
2018	43	19	6	4
2018	43	19	6	4
2019	44	26	12	
2020	86	33	5	3
2021	73	30	8	2
2022	18	10	3	

Table 2. Measured juvenile density in the Laxá á Ásum river since 2000. Data missing from 2017.

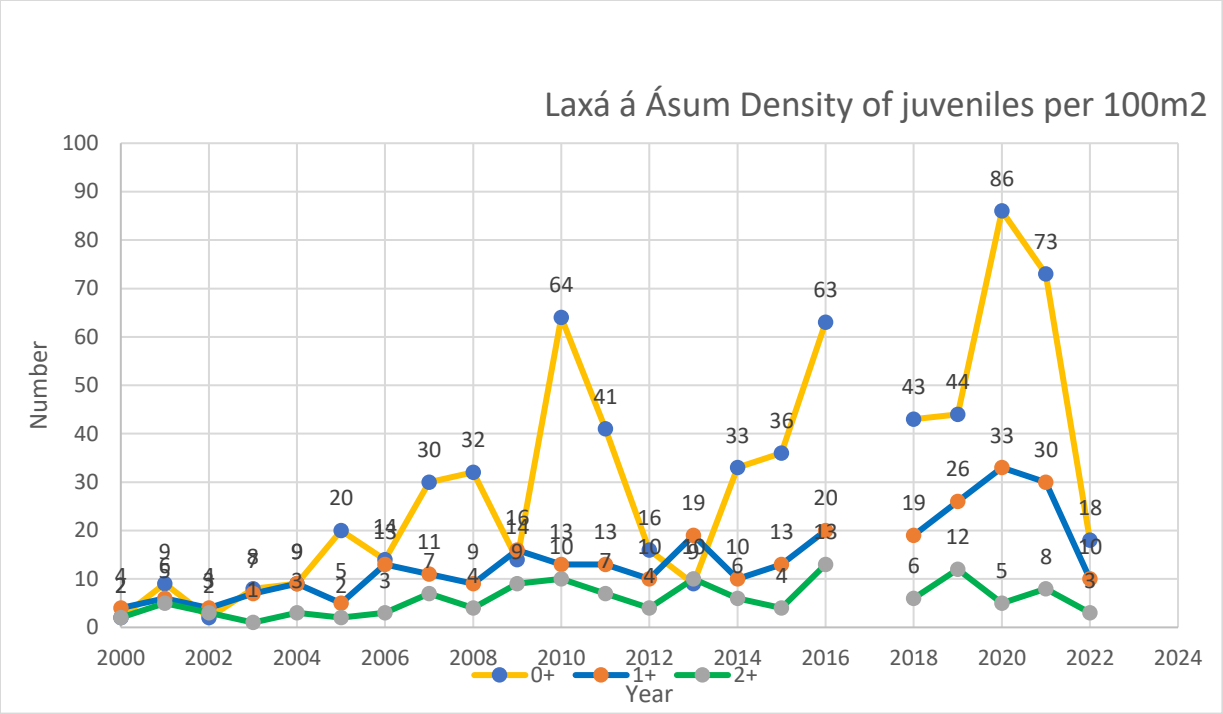


Photo 4. Progression in the density of juveniles in Laxá á Ásum river in years 2000-2022 (excluding the year 2017).

Relationship between juvenile size and population density

As the average length of juveniles varies between locations on the Laxá á Ásum, I have looked specifically at the average length of juveniles at Holt between the years 2012-2022. Holt was chosen because it has been consistently fished and there the sample size is fairly large especially for 0^+ and 1^+ juveniles and the average sizes for them have a relatively small margin of error.

Table 3 shows the relationship between density and average length of juveniles in 2012 to 2022.

		Site Holt				
Year(Date)	**Density**	**Mean length.**	**Density**	**Mean length**	**Density**	**Mean length**
	0+	**0+**	**1+**	**1+**	**2+**	**2+**
2012-13-agu	19	4.4	17	6.8	2	7.9
2013-11-agu	26	3.9	38	5.8	14	7.1
2014-14-sep	68	4.1	12	6.9	3	12.4
2015-11-agu	100	3.7	15	6	10	7.4
2016-19-jul	48	3.5	33	5.9	18	9.3
2018-22-agu	55	3.7	22	6.2	11	7.1
2019-8-agu	40	3.8	40	5.8	10	9.2
2020--4-agu	180	3.9	12.5	6.2	7.5	8.3
2021-12-agu	144	3.7	78	5.9	19	8.4
2022-16-jul	50	3.3	20	6.5	13	8.4

Table 3: Density/100 m^2 and average size of juveniles in Holt

Fishing in 2014 was conducted on September 14, while during the years 2016 and 2022 it was conducted in mid-July. These years are omitted in the next figure, which shows the relationship between density and average length of juveniles at Holt caught in the month of August.

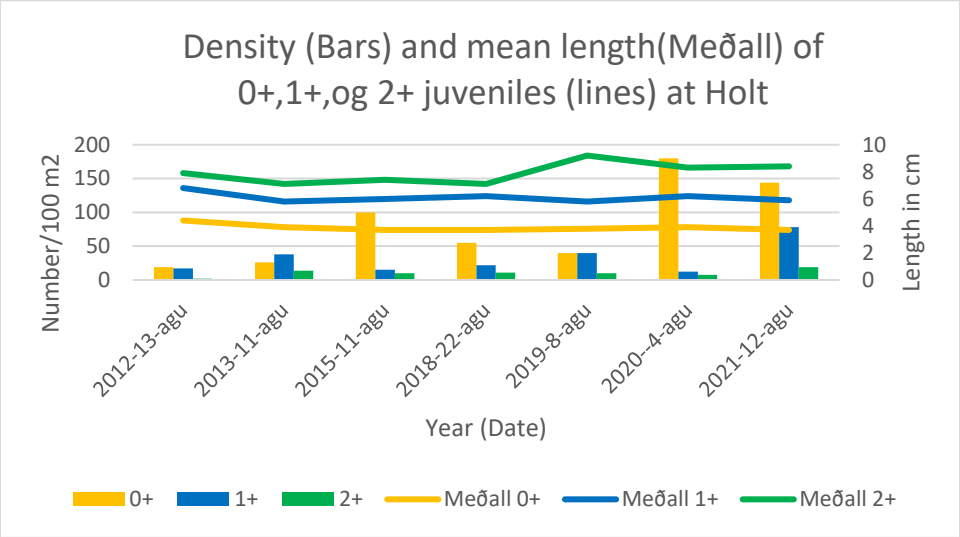
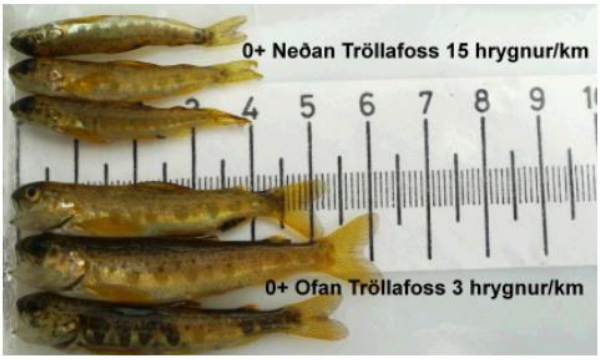


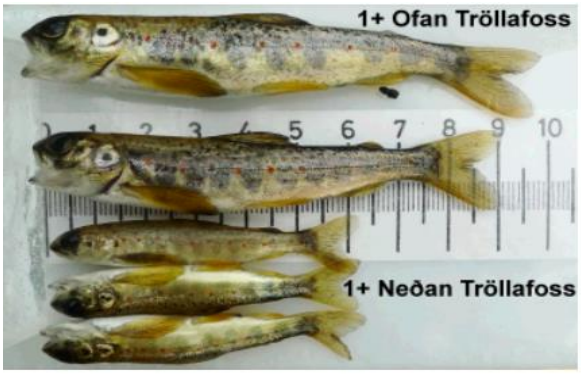
Figure 5: Relationship between density and average length of juveniles caught at Holt in August in the period 2012 to 2021. The bars represent the number of juveniles/100 m2, while the lines show the average lengths of 0^+, 1^+ and 2^+ juveniles.

The number of juveniles in Laxá á Ásum is more than enough, which is best seen in the fact that there is always a similar growth for the 0^+ and 1^+ juveniles, regardless of population density. It can be inferred that because the population is so high, food supply limits the growth of the juveniles and they are therefore always about same size.

It can be mentioned that in Leirvogsá river (near Reykjavik) salmon have been brought up above unpassable waterfall "Tröllafoss" and the spawning stock in the non-fishable part is about 2-3 females/km. In 2019, I and Jón Kristjánsson (fisheries scientist) caught juveniles in Leirvogsá at the end of July and in the middle of August. The average length of 0+ fry´s in the fishing section was 3.7 to 4 cm, but 5.4 cm above Tröllafoss. 1+ are about 5.5 cm at site Hrafnhólar on the fish-accessible part, but 8.5-9 cm above Tröllafoss. The attached pictures are taken from Jón Kristjánsson's report (Leirvogsá Rannsókn á seiðabúskap 2019) and show the difference in size between the two sites. (Neðan Tröllafoss = Below Tröllafoss, Ofan Tröllafoss = Above Tröllafoss)



Mynd 6. Laxaseiði ofan og neðan við Tröllafoss. Hrygningarstofninn neðan fossins er a.m.k. fimm sinnum stærri en fyrir ofan. Stærðarmunurinn stafar af þéttleikaháðum vexti.



Mynd 7. Eins árs seiði fyrir ofan og neðan Tröllafoss. Þyngdarmunurinn er fimmfaldur

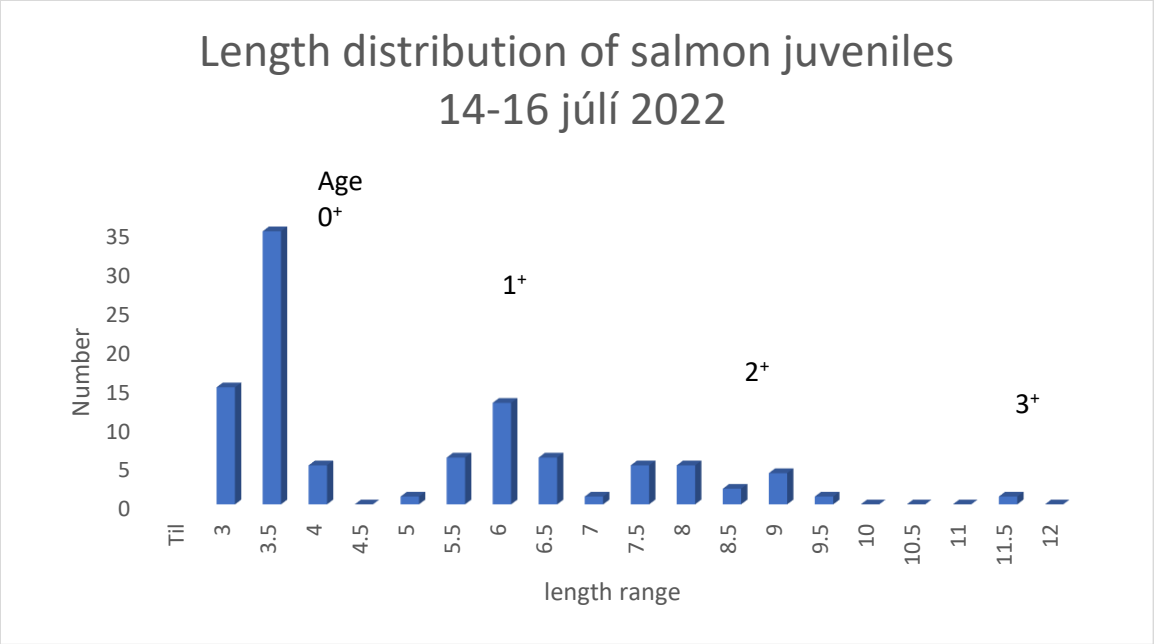


Photo 8. Length distribution of salmon spawn at fishing spots 1-7

The cohort structure is quite typical. Youngest juveniles (fry's) made up the majority of the catch, and the number decreasing as age increased. Two- and three-winters old juveniles are those that will smoltify next spring as three- and four-winters-old. Because the site was fished approximately one month earlier than in previous years, the juveniles are about half to 1 cm smaller than in previous years. In studies conducted in the middle of July (e.g. from 1989 conducted by Tumi Tómasson and 2016 conducted by Jón Kristjánsson) the juveniles are the same size as they are now.

Fly Larvae were the main food of the juveniles that were caught in July, which is in contrast to previous studies carried out in August where their main food was freshwater snails(Radix peregra). Rock Snot (Didimo) has been common in recent years but this year it was less than usual, and that could be the reason why there are more of fly larvae now. This is in line with previous studies both in the Laxá á Ásum river and in Haffjarðará River (e.g. " „Laxá á Ásum.Rannsókn á seiðabúskap 12-14-ágúst 2012“ by Jón Kristjánsson) that where there is a lot of rock snot, there are almost exclusively freshwater snails found on rocks but no fly larvae. Larvae are the preferred food of salmon juveniles compared to freshwater snails.

Discussions.

Due to the high water level and therefore poor conditions for electrofishing, the comparison of the number of juveniles per 100 m^2 will be underestimated this year compared to previous years. In addition, fry's have not begun to disperse, which may distort the results even more. Therefore, one should be careful not to take too much notice of the population density this year compared to the last years, where conditions have been favorable and always assessed at a similar time. However, the fishing indicates that the situation is "not bad at all" and the measurements are showing that the number of one-year-old parrs is not far from average (at 1+ the average density is 13.5 parrs/100 m2).

When looking at the relationship between juvenile density and juvenile growth at Holt as well as at all the other fishing sites, it can be clear that spawning in Laxá á Ásum is exaggerated. As previously mentioned, the success of spawning in 2019 and 2020 is the best since juvenile measurements began. The big hatch classes from 2020 and 2021 are now 2^+ and 1^+. A large part of the 2^+ juveniles should enter the sea next spring (as 3^+) and enter the river as small salmon in 2024. It will be interesting to observe the salmon migration in 2024 and then 2025. But as has often been said, the survival of the juveniles depends on the availability of food which is a limiting factor when there are many juveniles. More juveniles would not smoltify until four years of age with the associated natural decline. In addition, the survival of juveniles depends on water temperature in the spring, predation, and sea conditions.

Water temperature

Water temperature was measured with a recording thermometer at two locations in Laxá á Ásum and one location in Fremri Laxá. In Laxá á Ásum, the meters were located at the ford near Holt, where there have been regular measurements for the last few years, and then one meter was added at the dam from Lake Laxárvatn. In Fremri Laxá, the meter was located at Hamrakot.

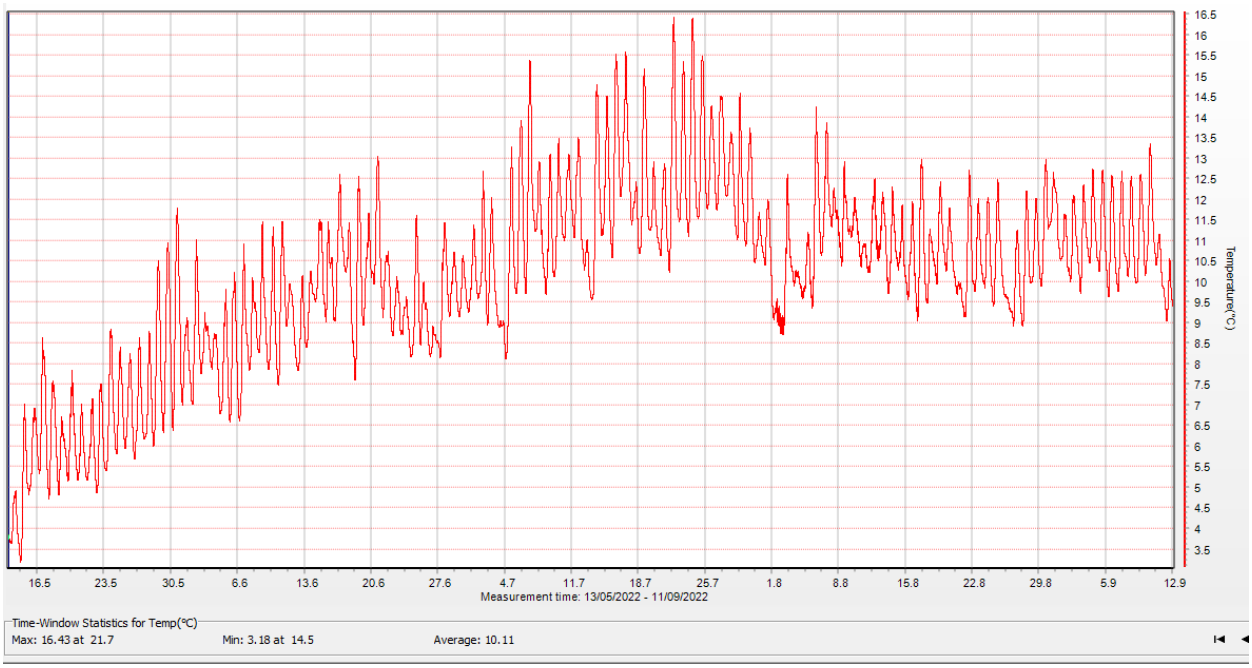


Photo 9. Water temperature in Fremri Laxá at Hamrakot 13/5 – 11/9 2022.

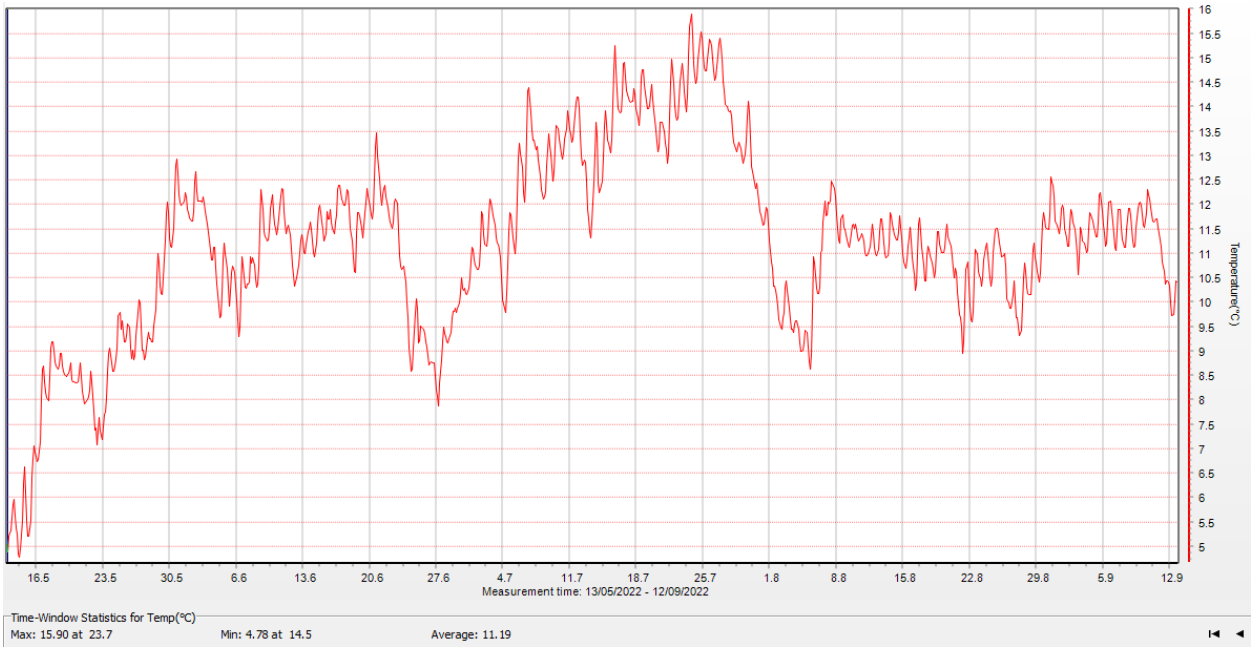


Photo 10. Water temperature at the dam at Laxá á Ásum 13/5 – 11/9 2022.

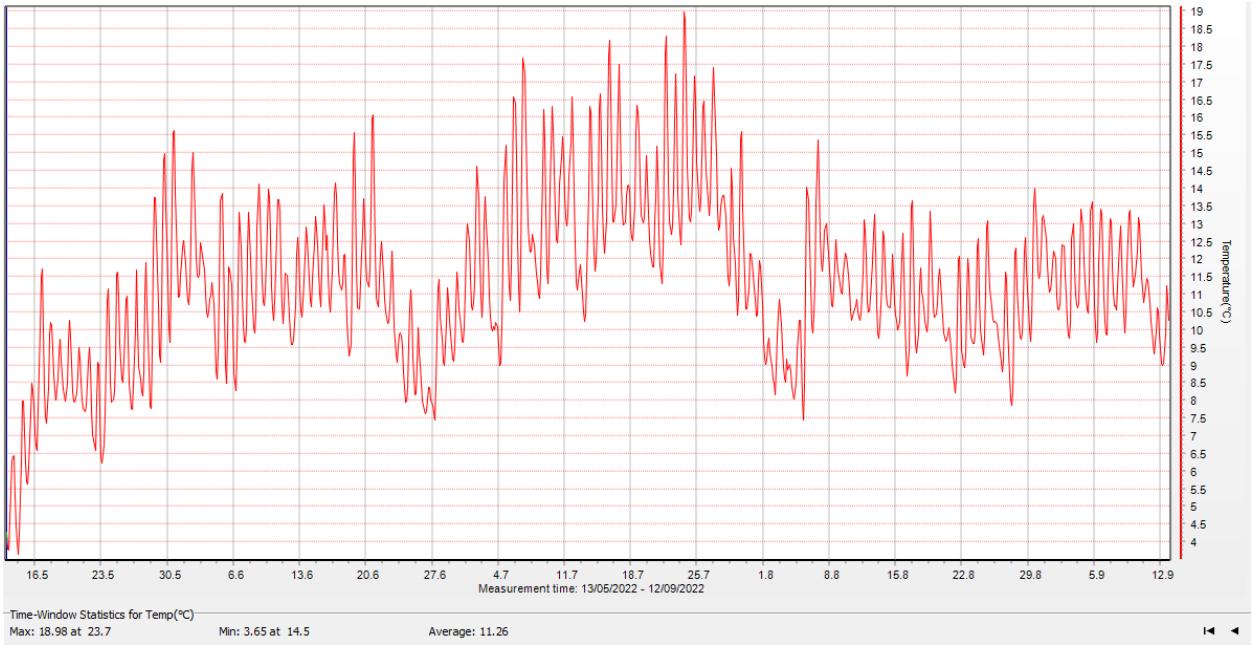


Photo 11: Water temperature at Holt in Laxá á Ásum 13/5 – 11/9 2022.

The temperature measurement images show some differences between the measurements at the dam and the other gauges. Daily temperature fluctuations are not as noticeable because there are visible effects of Laxárvatn, which moderates the effects of the sun and the nighttime cold. The average temperature over the entire measurement period is close to 11.2 degrees at Holt and the dam, but 10.1 degrees in Fremri Laxá. Spring comes later in Fremri Laxá, but the deep Svínvatn naturally takes longer to warm up than shallow Laxárvatn. At the end of May it warmed up nicely, but on June 22 it got colder and a short cold spell lasted for a week. The average water temperature this week is around 9.5 degrees.

Photo 12 shows the weekly average temperature in Laxá á Ásum measured at Holt. It shows that the weekly average water temperature is good until the little cold snap in the second part of June,another cold snap in the end of july but after that the water temperature is above the average temperature of previous years.

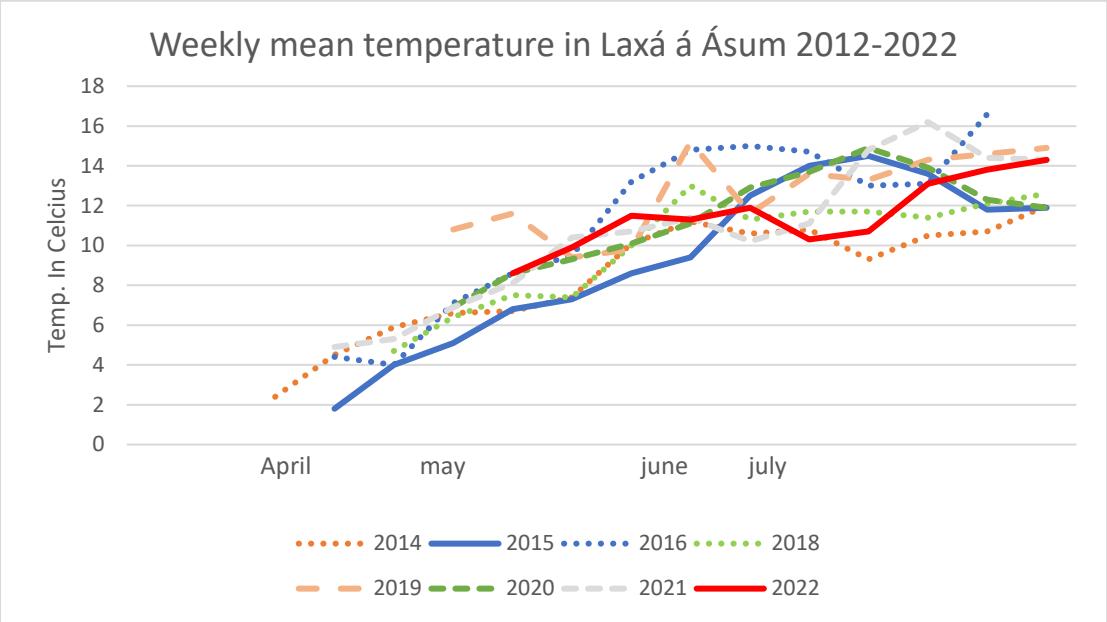


Photo 12. Average weekly temperature in the Laxá á Ásum (Holt) in the months of April to July in the years 2012, 14, 15, 16, 18, 19 20, 21 and 22. The temperature line for 2015 (cold spring) is a blue solid line while this year is represented with a red solid line.

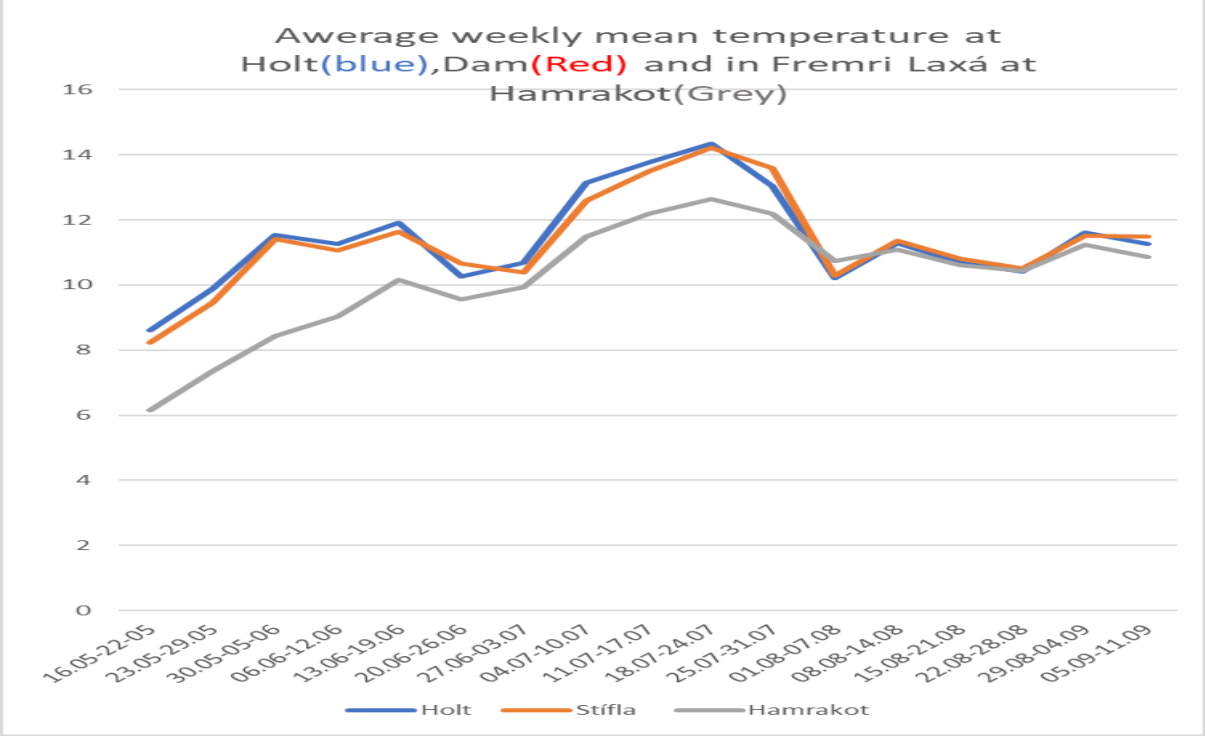


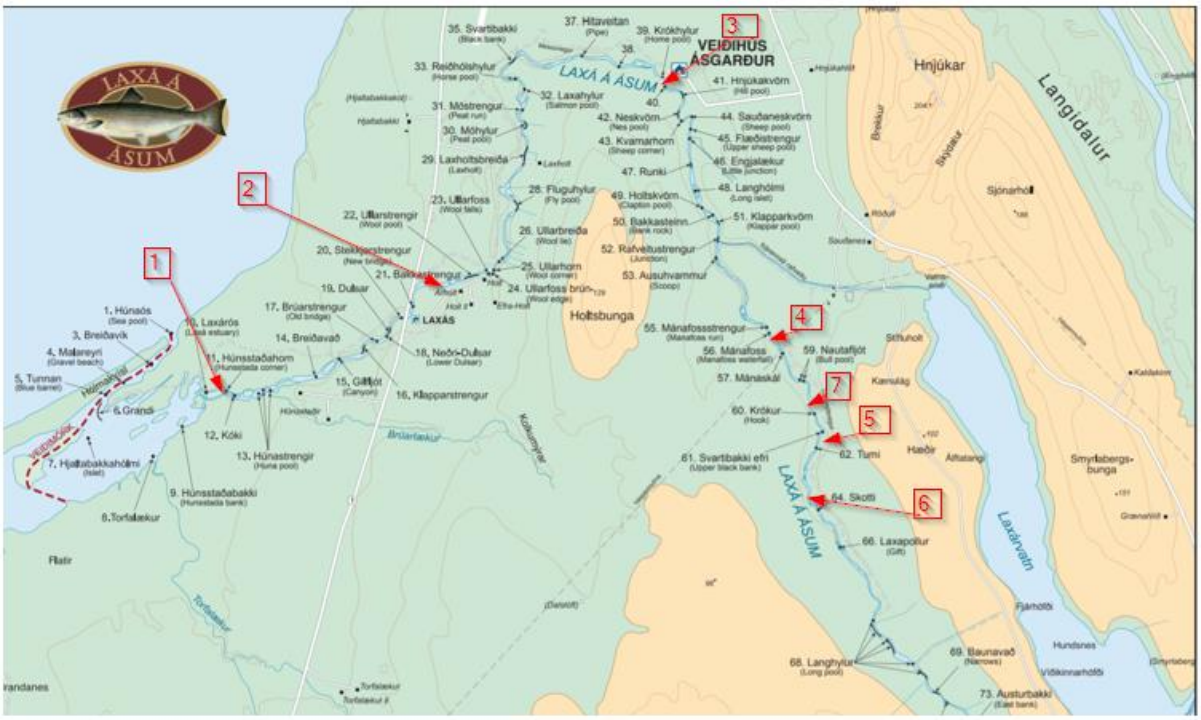
Photo 13. Average weekly mean temp.at Holt, Dam in Laxá á Ásum and Hamrakot in Fremri Laxá.

Salmon runs 2023.

Water temperatures in May and June are an important factor for smolts preparing for sea migration. Increased light and higher water temperatures need to coincide in order for the juveniles to prepare for their journey to the ocean(smoltify), and this time frame is quite short. After cold springs like 1979 and then again in 2011 and 2015 (see report for 2012 and 2015) there were poor grilse runs the following year and two sea winters salmon runs two years later. It can be deduced that the river temperature in the spring heavily influences the runs of grilse in the following year.

Temperature measurements show that the annual temperature from May 16 to June 22 follows the average of recent years, and there is reason to believe that the juveniles have smoltified normally. The cold snap that arrived on June 22 is small and, moreover, came too late to prevent normal sea migration.

Juveniles research in 2021 showed that the condition of juveniles was good and the number of 2^+ juveniles expected to go to sea as 3^+ smolts this spring was well within expected ranges. The number of smolts that went to sea last spring should not limit the salmon migration in summer 2023. These assumptions indicate that grilse runs will be decent next summer as long as the sea conditions are normal.



Map showing fishing spots on Laxá á Ásum. This map is taken from asum.is. On this map I have marked the electrofishing locations in red. The fixed fishing spots are marked from 1 to 6. The extra fishing spot below the Hook(Krókur) is marked 7.