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Annual report – the sea trout project

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Frágreiðing

Heiti

Annual report – the sea trout project

Høvundar

Kirstin Eliasen, Unn V. Johannesen, Símeon Petersen and Kim S. G. Bergkvist

Status	Frágreiðing nr.	Slag av verkætlan
Opin	2021-01	Uppgáva fyri Havbúnaðarfelagið

Dato	Ábyrgdarhavi
27.02.21	Kirstin Eliasen

Tal av síðum	Góðkent
12	

Samandráttur
Eftir áheitan frá Havbúnaðarfelagnum eru kanningar av sjósílum framdar við tí fyri eyga, at kanna nær á árinum tey fara á sjógv á fyrsta sinni, og hvussu trivnaðurin hjá teimum er á sjónum.
Úrslitini frá 2019 og 2020 vísa, at munur er millum árini viðvíkjandi nær á árinum sjósílini fara á sjógv á fyrsta sinni, umframt at aldurin á sjósílunum, tá ið tey fara á sjógv fyrstu fer, áhaldandi sæst aftur í støddini hjá teimum.
Sjósílini høvdu flest lýs í juni/juli, og tá ið flest sjósíl høvdu lýs, høvdu 78% av teimum lús.
Munur millum árini sæst eisini aftur í vøkstur tað fyrsta árið á sjónum og í hvat tey høvdu etið.

Leitorð
Sjósíl, longd, vekt, aldur, vøkstur, magainnihald

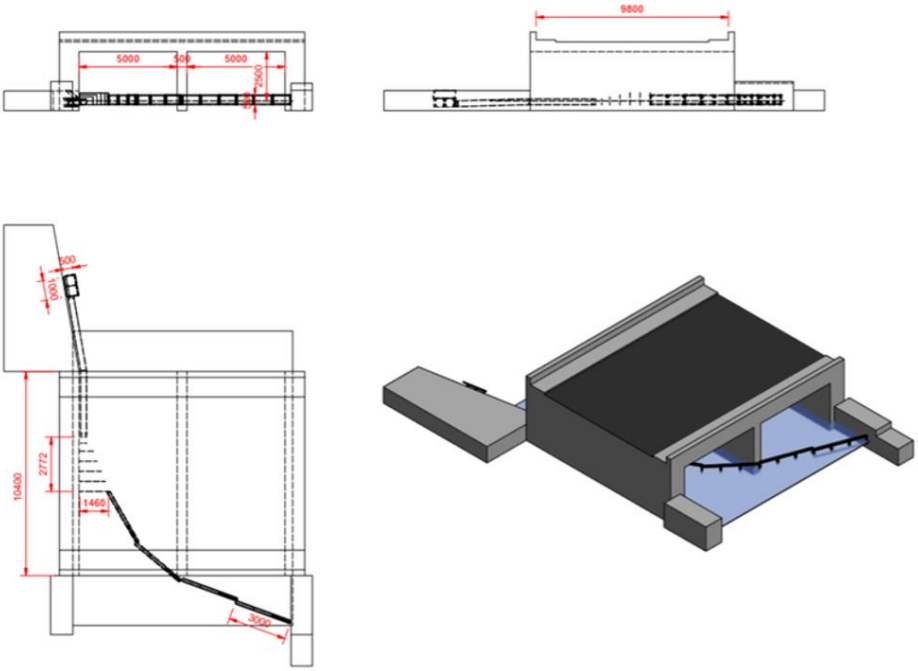
The sea trout project

The aim of the project is 1) to gain knowledge on when and under what circumstances the juvenile sea trout migrates to sea, and 2) to examine annual variations in the condition of adult sea trout at sea.

Project 1: Smolt migration to sea

Material and methods

A trap (Picture 1) was mounted in the river Sandá on the 23rd of April 2020 and demounted again on July 17th 2020, i.e., two weeks later than in 2019. The trap has the height of 50 cm, covers the total width of the river, and leads the downstream travelling trout into a sampling box. The trap was visited on a daily basis, where the sea trout caught were sampled, the water temperature measured, and the trap cleansed to avoid clogging. After sedation, the sampled sea trout were weighed to the nearest 0.1 g and length measured to the nearest 0.1 cm. Scale was sampled from each fish and stored for potential later age and growth determination. After full recovery from the anaesthetics, the sea trout were released downstream.



Picture 1. The sea trout trap in Sandá.

Results

As in 2019, there were days in 2020 (22nd to 25th of May and four hours on the 16th of July) when the precipitation levels led to a rise in water levels too high for the trap, and these days sea trout probably escaped. Nevertheless, a total of 622 fish were sampled, i.e., 619 sea trout and 3 brown trout. Similar to 2019, the seaward migration of sea trout was observed to occur concurrent with occasions of high precipitation (Fig. 1). However, the major bulks of sea trout occurred considerably later in 2020 compared to 2019, i.e., the major bulks in 2019 were in the weeks 17, 20 and 21, while they were in the weeks 24 and 26 in 2020 (Fig. 1). The number of migrating sea trout continued to decrease after the major event in week 26, and after two weeks with no samplings (despite an occurrence of much precipitation), the trap was demounted. On average the sea trout sampled from Sandá in 2020 weighed 81.5 g (max 730 g; min 13 g) and were 19.6 cm in length (max 46.7 cm; min 8.1 cm).

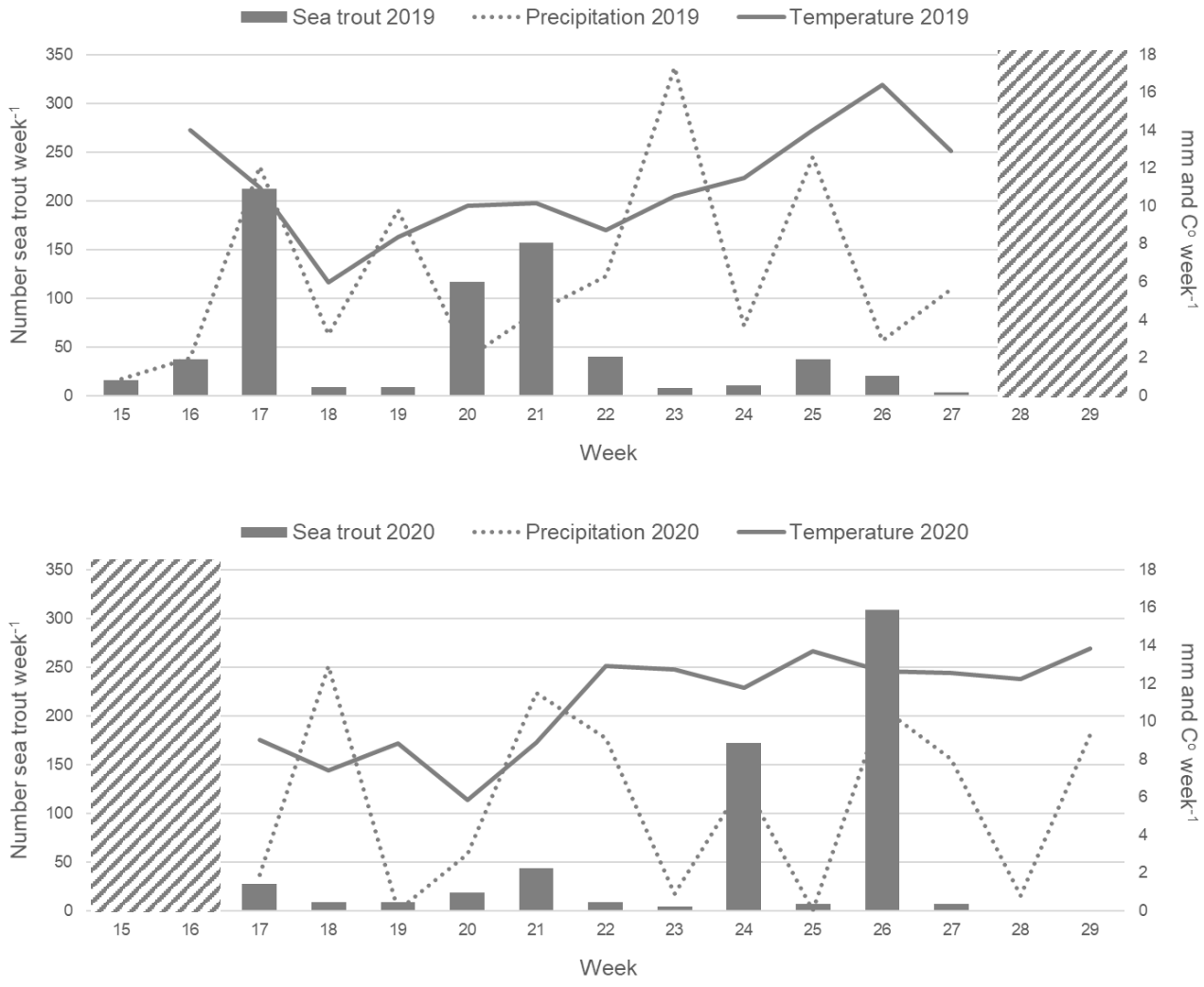


Figure 1. Number of sea trout sampled in the trap (bars), total precipitation (mm, dotted line) and average temperature (C°, solid line) per week in 2019 (upper) and 2020 (lower). Scratched area represents no sampling. Precipitation data: www.dmi.dk.

If the sea trout sampled in Sandá (based on the experience of others (www.gov.scot), as well as on the scale readings conducted in 2019) are divided into the categories small (<20.1 cm, likely first-time migrants) and large (>20 cm, not likely first-time migrants), we see that the main migration of small sea trout in 2019 occurred in the weeks 20 and 21, while it occurred approximately four weeks later in 2020 (Fig. 2). The window when 25% to 75% of the small sea trout (<20.1 cm) had migrated to sea ranged from the 19th to the 29th of May in 2019 and from the 10th to the 28th of June in 2020.

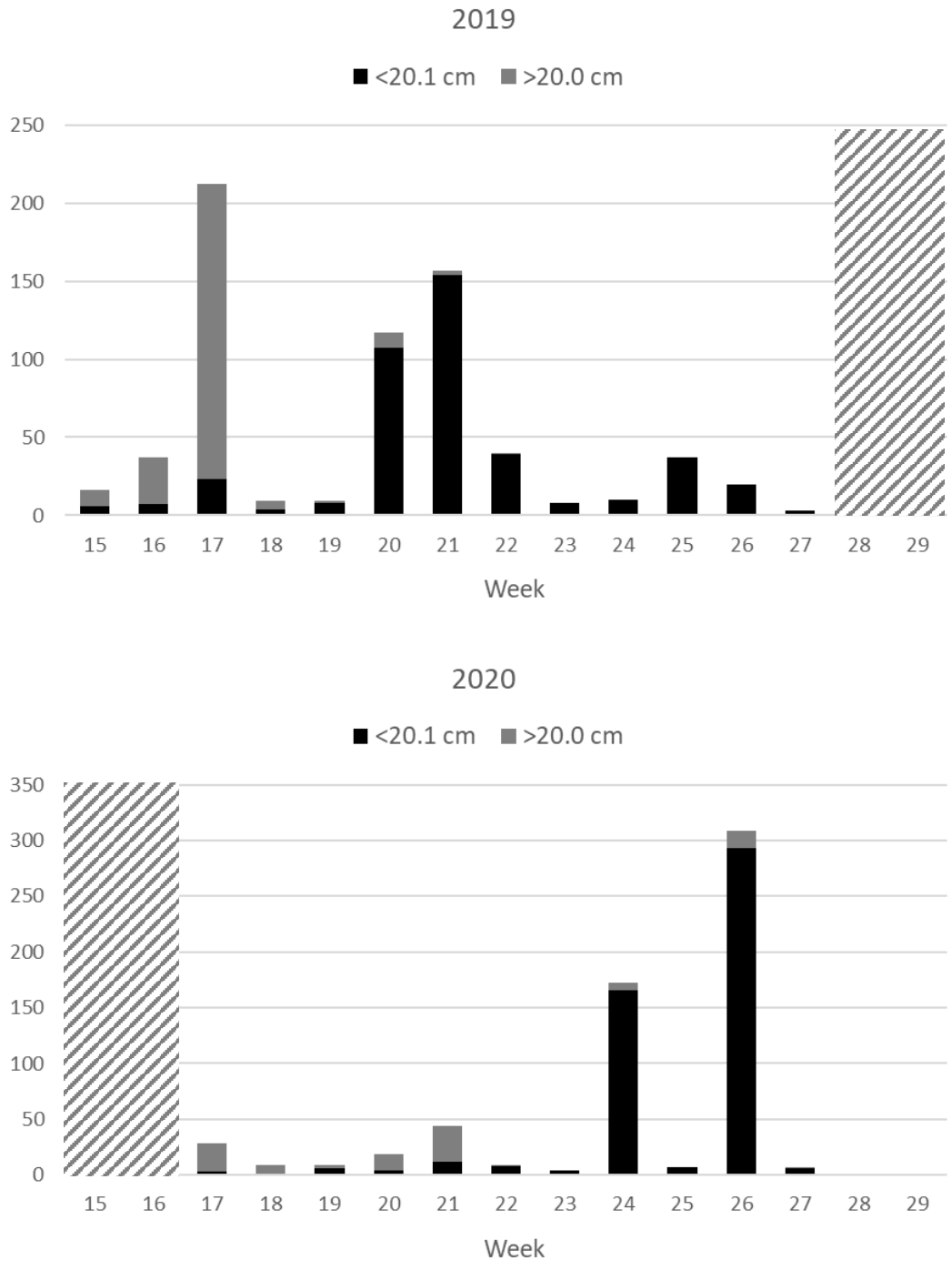
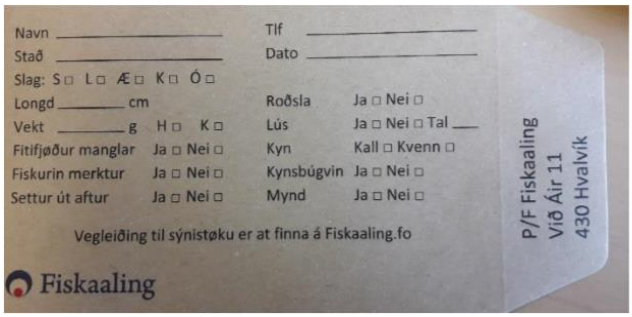


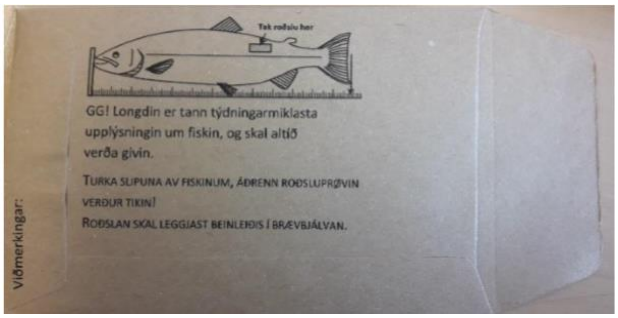
Figure 2. Weekly numbers of small (<20.1 cm, black) and large (>20 cm, grey) sea trout sampled in Sandá in 2019 (upper) and 2020 (lower). Scratched area represents no sampling.

Project 2: The condition of sea trout at sea

Material and methods

Scale and other information on sea trout caught at sea is sampled in two ways, i.e., 1) sampling by gill nets (5 m width, 2 m height and 20 mm mesh size), and 2) by anglers donating sea trout scales and information such as length, weight and sea lice counts on the sea trout they catch by using the envelopes shown below (Picture 2), and thereby participating in a yearly drawing toss for 10,000 DKR in return.





Picture 2. The envelopes developed for the anglers to donate sea trout scale and other information.

Results

Our application on changing the allowed number of sea trout to be caught at sea with gill net was met, and has increased from 30 to 50 sea trout annually. Scale and other information on sea trout caught at sea has now been sampled from 390 specimens in total (Table 1).

Table 1. Number of sea trout caught at sea by anglers and gill nets in 2019 and 2020.

Year	Anglers	Gill net	Total
2019	147	31	178
2020	166	46	212
Total	313	77	390

On average the sea trout sampled at sea in 2020 weighed 397.2 g (max 2000 g; min 45 g) and were 34.0 cm in length (max 57.0 cm; min 17.2 cm). Combined, the sampling from 2019 and 2020 is unevenly distribution, i.e., more than half of the samplings are from July and August, while none are from January and March. When the sampled sea trout were grouped into length categories, the smallest sea trout (< 20 cm) first appeared in May and disappeared in August, while sea trout larger than 45 cm disappeared in September and reappeared in December (Fig. 3).

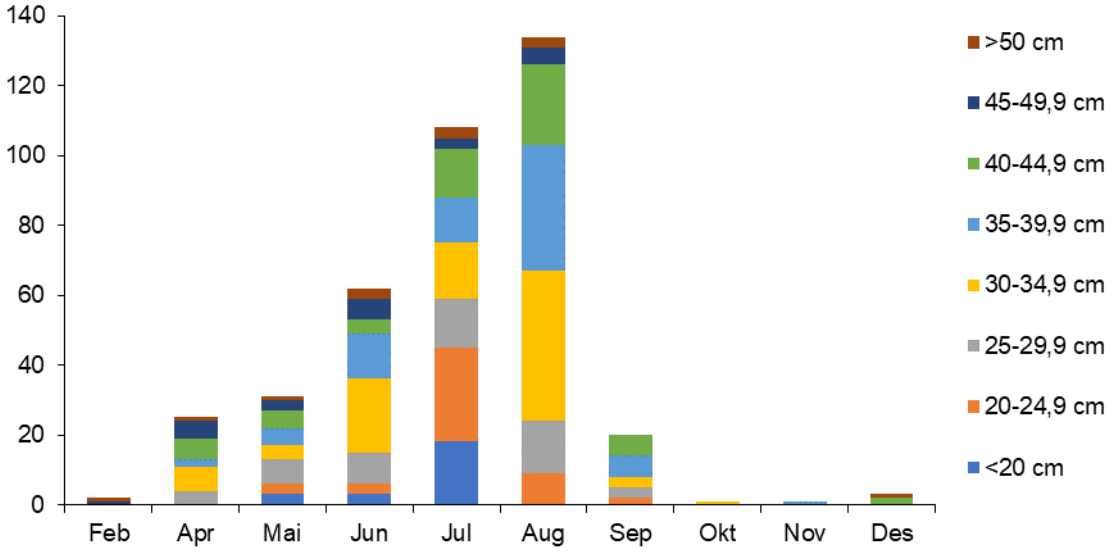


Figure 3. Monthly length distribution of sea trout caught at sea in 2019 and 2020 combined.

In 2020 the average sea trout condition factor (Fulton´s *K*) was 0.93, however, unlike in 2019, no seasonal variation was to be observed, i.e., the condition factor fluctuated between ~0.9 to ~1.0 throughout the months sampled (May to September and November) (Table 2). Overall, the average number of sea lice per sea trout was 5.0, with 0 sea lice in October and November and the highest average number and prevalence in July, i.e., 8.2 sea lice per sea trout and 69% of the sea trout having sea lice (Table 2).

Combined, the sea trout condition factor in 2019 and 2020 shows a seasonal trend, i.e., highest in July (0.98) and lowest in December (0.70) (Table 2). The same trend was observed regarding sea lice, i.e., from the sea trout having no sea lice in the period from October to February, to 7.7 sea lice per sea trout and a prevalence of 71% in July (Table 2).

Table 2. Monthly variations in Fulton´s *K* and in the number and prevalence of sea lice. Not all anglers report sea trout weight and length, nor the number of sea lice, thus the difference in number of samples (N).

2019	Fulton´s *K*				Sea lice				
Month	Average	Max	Min	N	Average	Max	Min	Prevalence (%)	N
February	0.80	0.80	0.79	2	0.0	0	0	0	1
April	0.79	1.28	0.39	21	1.8	39	0	8	26
May	0.79	0.83	0.74	9	3.0	36	0	29	21
June	0.90	1.26	0.31	30	11.5	30	0	78	32
July	0.99	1.24	0.78	11	7.1	30	0	74	46
August	1.02	1.51	0.74	20	7.9	26	0	74	34
September	0.84	0.97	0.70	11	0.2	2	0	14	14
December	0.70	0.80	0.64	3	0.0	0	0	0	3

2020	Fulton´s *K*				Sea lice				
Month	Average	Max	Min	N	Average	Max	Min	Prevalence (%)	N
May	1.04	1.15	0.92	2	1.7	8	0	22	9
June	0.91	1.20	0.56	27	0.6	15	0	7	30
July	0.97	1.44	0.68	59	8.2	100	0	69	62
August	0.88	1.44	0.37	65	4.8	43	0	59	87
September	1.01	1.27	0.80	5	1.7	6	0	50	6
October					0.0	0	0	0	1
November	0.92	0.92	0.92	1	0.0	0	0	0	1

Combined	Fulton´s *K*				Sea lice				
Month	Average	Max	Min	N	Average	Max	Min	Prevalence (%)	N
February	0.80	0.80	0.79	2	0.0	0	0	0	1
April	0.79	1.28	0.39	21	1.8	39	0	8	26
May	0.83	1.15	0.74	11	2.6	36	0	27	30
June	0.90	1.26	0.31	57	6.2	30	0	44	62
July	0.98	1.44	0.68	70	7.7	100	0	71	108
August	0.91	1.51	0.37	85	5.7	43	0	63	121
September	0.89	1.27	0.70	16	0.7	6	0	25	20
October					0.0	0	0	0	1
November	0.92	0.92	0.92	1	0.0	0	0	0	1
December	0.70	0.80	0.64	3	0.0	0	0	0	3

The scale of the 212 sea trout sampled at sea in 2020 were read, however, scale from 22 were not readable. The age distribution of the sea trout examined was 40 2-years-old, 66 3-years-old, 62 4-years-old, 18 5-years-old, three 6-years-old and one 7-years-old, which was similar to what was observed in 2019 (Fig. 4).

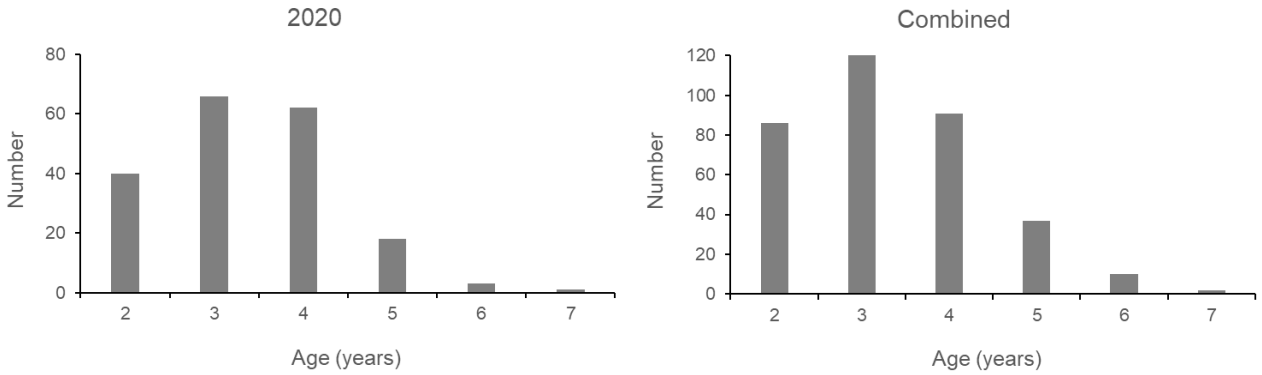


Figure 4. Age distribution of the sea trout sampled in 2020 and combined (2019 and 2020).

The sea trout sampled at sea in 2020 had spent on average of 2.12 years in freshwater before migrating to sea (Min 1 year and Max 4 years). Comparison of the length-at-age of sea trout that had spent two or three years in freshwater before migrating to sea for the first time, revealed that, with the exception of age 6, where the total number of specimens was only eight, the average length at age was significantly different between the two (t-test, $p < 0.05$, Fig. 5).

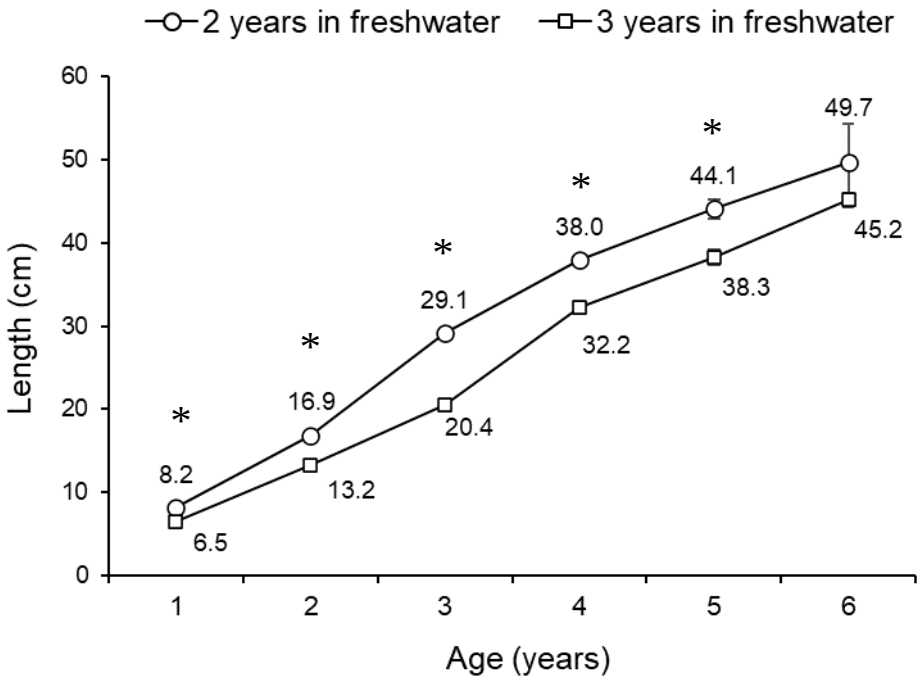


Figure 5. Length-at-age of sea trout migrating to sea after two (○) and three (□) years in freshwater. Vertical bars indicate standard error and * represents significant difference (t-test, $p < 0.5$).

Comparing the growth in the third year of specimens which had spent two years in freshwater before migrating to sea, showed a significant difference (Anova, Tukey's multiple comparisons test,

p < 0.05), i.e., the sea trout that was at sea for the first time in 2019 (19/20) had a significant higher growth compared to those who were at sea for the first time in 2018 (18/19) (Fig. 6).

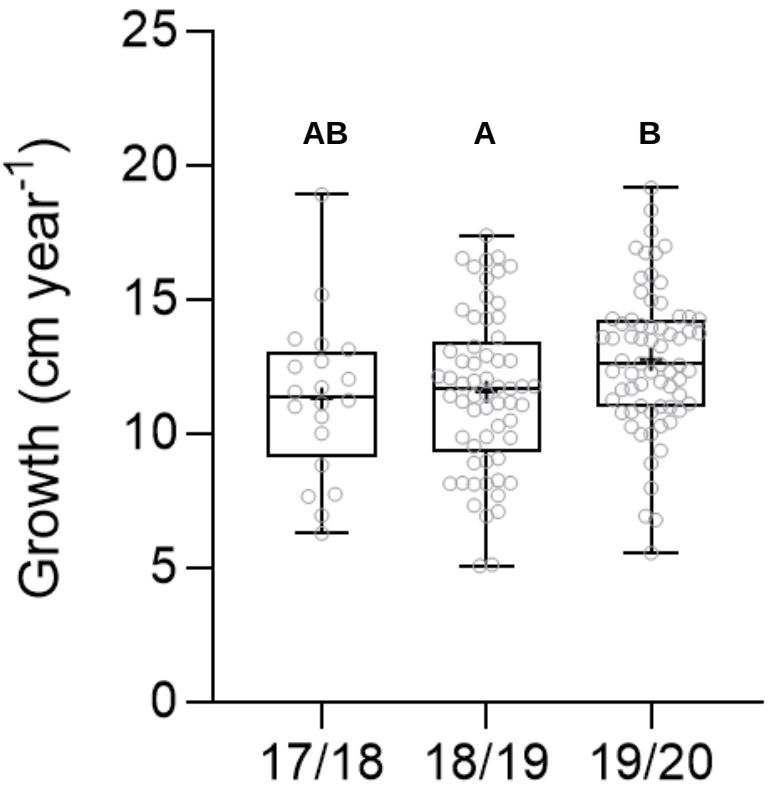
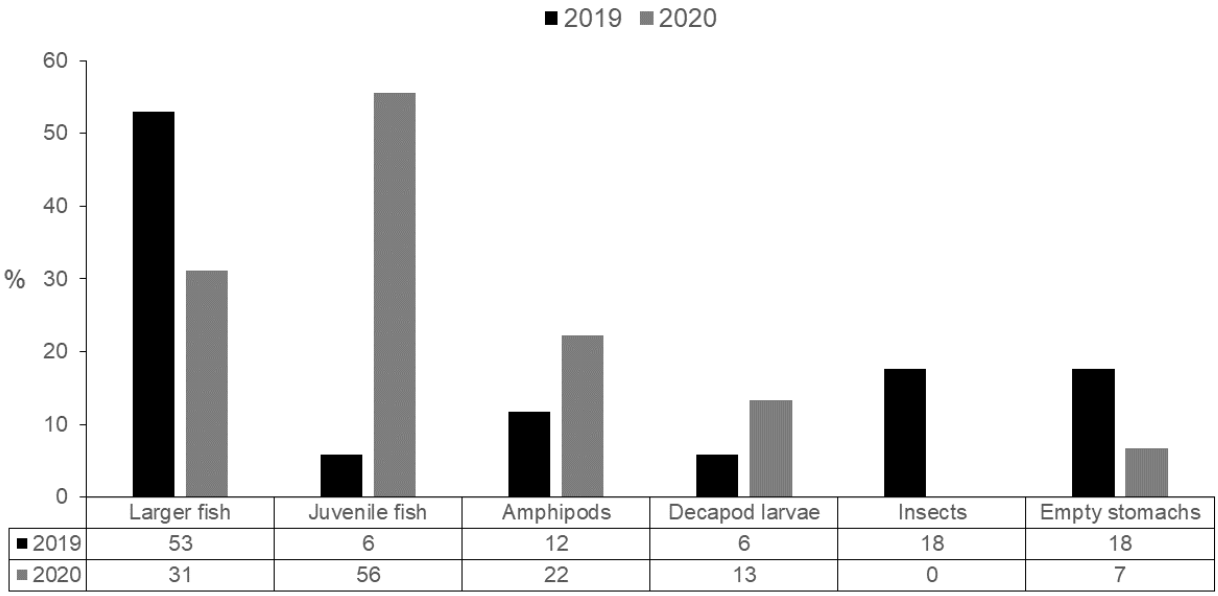


Figure 6. Annual differences in the growth in the first year at sea of 3-years-old specimens, which had spent two years in freshwater before migrating to sea. Vertical bars indicate standard deviation, + indicates the average growth and different letters indicate significant difference (Tukey's multiple comparisons test, p < 0.05).

The stomachs of the sea trout sampled with gill nets were examined, and showed an annual difference (Chi-square, p < 0.05), i.e., the majority of the sea trout sampled in 2019 had ingested larger fish such as sandeel and sprat, while the sea trout in 2020 predominantly had ingested smaller prey (Fig. 7).



	Larger fish	Juvenile fish	Amphipods	Decapod larvae	Insects	Empty stomachs
2019	53	6	12	6	18	18
2020	31	56	22	13	0	7

Figure 7. Annual differences in the stomach content of sea trout sampled with gill nets.

Concluding remarks

- As in 2019, the seaward migration was concurrent with much precipitation and subsequent increase in water discharge, however, indications were also of temperature dependent migration, i.e., the migration of first-time migrants only occurred when the water temperature had reached 10 C°. Temperature is known to regulate the rate and duration of the smoltification process (Høgåsen 1998, Byrne et al. 2004), however, the relative importance of water discharge and temperature as initiators of smolt migration has been shown to vary among years (Hembre et al. 2001).

- The migration period was approximately four weeks later in 2020 (mid- to late June) than in 2019 (mid- to late May), which is in the late category compared to other European rivers (Thorstad et al. 2016).

- The results of the length distribution of sea trout sampled at sea was in concert with the findings in the trap, i.e., the smallest sea trout (< 20 cm, most likely first-time migraters) initially appeared in May and disappeared in August, probably due to growing out of the smallest category. Furthermore, no large specimens (> 45 cm) were sampled from September to November, which might indicate a spawning period similar to that in northern Norway (Jensen and Rikardsen 2008).

- Overall, the results from 2019 and 2020 combined indicate that the condition (Fulton´s *K*) of sea trout at sea is low from December to April, but then increases and peaks in July, which is concordant with the period of high marine prey abundance in the Faroe Islands (Gaard et al. 2002).

- The same trend was observed regarding the sea lice number on the sea trout, i.e., no sea lice were found from October to February, and both the average number of sea lice per sea trout and the prevalence of sea trout with sea lice peaked in July. The abundance of salmon lice in the Faroese aquaculture is typically highest in the winter months (Kragesteen et al. 2021), and thus might the

absence of sea lice in this period indicate delousing in freshwater, while the decrease in the sea lice burden following the peak in July also can indicate premature return to freshwater as described by Thorstad et al. 2015.

- The scale readings of the sea trout sampled at sea in 2020 showed that the majority were either 3- or 4-years-old. The sea trout had spent on average 2.12 years in freshwater before seaward migration, and the oldest specimen sampled was 7-years-old.

- Comparison of the length-at-age of sea trout that had spent two or three years in freshwater before migrating to sea, revealed that the average length at age was significantly higher for the two-years-in-freshwater cohort, emphasising the enhanced growth rate at sea, as well as indicating that size might be an initiator of seaward smolt migration.

- A significantly different and higher growth rate was observed in the first year at sea in the cohort that migrated to sea in 2019 compared to the cohort that migrated in 2018.

- Annual difference was observed in the diet of the sea trout sampled with gill nets, i.e., the majority of the sea trout sampled in 2019 had ingested larger fish such as sandeel and sprat, while the sea trout in 2020 predominantly had ingested smaller prey.

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