FIRUM
vitan til varandi aling

The Sea Trout Project

Annual Report 2024

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FIRUM vitan til varandi aling	# Frágreiðing
	Heiti: The Sea Trout Project – Annual Report 2024
Firum Við Áir 11 FO-430 Hvalvík Føroyar Telefon: (+298) 474747 Teldupostur: firum@firum.fo www.firum.fo	**Høvundar:** Kirstin Eliasen, Sandra L. Østerø, Jógvan F. Hansen, Ása Johannesen, Hanus Kruse, David Vazques, Teitur í Stórustovu, Tróndur T. Johannesen og Unn V. Johannesen

Status: Opin	**Firum rit nr.:** 2025-01	**Verkætlan:** Uppgáva biløgd av Havbúnaðarfelagnum
Dato: 27.02.2025	**Tal av síðum:** 24	**Ábyrgdarhavi:** Kirstin Eliasen
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Samandráttur:
Eftir áheitan frá Havbúnaðarfelagnum eru kanningar av sjósílum framdar við tí endamáli at staðfesta nær á árinum sílini fara á sjógv á fyrsta sinni, og hvussu trivnaður hjá sílum er á sjónum.
Í 2024 vórðu hesar kanningar framdar við trimum ymiskum mannagongdum: 1) PIT-merking av sílum og einari antennuskipan í Norðagøtu, 2) veiða við gørnum í Funningsfirði, Kollafirði og Fámjin, og 3) innsavnan av roðslu frá sílafiskarum kring landið.
Síðani februar 2024 hevur antennuskipanin í Norðagøtu støðugt skrásett nær merkt síl fara á sjógv, og nær tey koma niðan í ánna aftur. Tann 2. mai 2024 vórðu 145 síl merkt, og er samlaða talið av merktum sílum nú komið upp á 385. Av hesum eru 141 skrásett av antennunum, harav 91 eru farin á sjógv. Av hesum eru 23 ikki skrásett at vera komin niðan í ánna aftur. Høvuðstíðarskeiðið har síl, ið verða mett at vera smolt, fóru á sjógv, var í 2024 frá 27. mai til 9. juni. Hetta líkist ferðingarmynstrinum hjá smoltinum í Sandá í 2021, sum var seinni enn í 2019 og 2022, men fyrr enn í 2020.
Tíverri komu sera fáir brævbjálvar frá sílafiskarum í 2024 - bert 74, harav einans 24 síl vóru fingin á sjónum. Hetta avmarkaða dátugrundarlagið ávirkaði úrslitini munandi.
Veiðan við gørnum varð tikin uppaftur í 2024, og vórðu 50 síl veidd við loyvi frá Vørn. Eins og í 2021 og 2022 varð veitt eftir sílum bæði nærhendis aling og longri burturi frá aling. Í 2024 vórðu sílini nærhendis aling veidd í Funningsfirði og Kollafirði (N = 34), meðan sílini longri burturi frá aling vórðu veidd í Fámjin (N = 16). Úrslitini vístu, at sum heild var lítil munur á trivnaðinum hjá sílunum í mun til frástøðuna til aling. Hinvegin var stórur munur á lúsatølunum.

Leitiorð:
Sjósíl, *Salmo trutta*, longd, vekt, aldur, vøkstur, PIT, ferðing, antennuskipan, lús

Fyrivarni:

Tilfar og upplýsingar í hesi frágreiðing eru eftirkannað og góðskukannað við teimum avmarkingum, sum henda verkætlan ásetir. Upphavsfólk til tilfarið og upplýsingarnar ella umboð teirra eiga ikki at ábyrgast nakrar niðurstøður og avgerðir, ið eru grundaðar á tilfarið og upplýsingarnar.
Tilfar úr hesari frágreiðing kann bert endurgevast, um upprunin verður greitt tilskilaður.

Contents

Føroyskur samandráttur

Hóast ávísar áir eita Laksá og Laksará, hevur laksur (*Salmo salar*) neyvan nakrantíð verið áarfiskur í Føroyum. Hinvegin eru síl (*Salmo trutta*) at finna í nærum øllum áum, og tey eru bæði vælumtókt hjá stuttleikafiskarum og ein góður matfiskur. Kortini varð so nógv fiskað fram móti 1900-talinum, at sílastovnurin minkaði munandi (trap.fo/nattura-og-landslag/osalt-vatn/). Tí er tað av stórum týdningi at fylgja við fiskastovnum, soleiðis at neyðug tiltøk kunnu setast í verk áðrenn støðan gerst ov álvarsom.

Í Føroyum hevur alivinnan stóran búskaparligan týdning. Tó munnu tey fægstu vænta at ein so stór vinna ikki ávirkar umhvørvið hon virkar í. Ein møgulig avleiðing kann vera ein minkandi føroyskan sjósílastovn. Orsøkin til at tað serliga eru síl sum kunnu hugsast at kenna árinini frá alivinnuni, er at sílini hoyra til laksafiskarnar. Alilaksur fær laksalús, ið er ein síkur sum einans livir á laksafiski. Tá ið talið av alilaksi veksur, veksur eisini talið av laksalús, og verður tað mett, at hetta kann hava neiligа ávirkan á villan laksafisk, t.d. síl, ið liva í nærumhvørvinum.

Laksalýs (*Lepeophtheirus salmonis*) eru krabbadjór sum skifta skal fyri at vaksa. Til tess at gerast vaksin hevur laksalúsin átta menningarstig. Tá ið hon er vaksin, ber kvennlúsin eggini í tveimum streingjum sum hanga aftur úr henni til tey klekjast.

Úr eggunum koma lúsaynglini sum skifta skal tvinnar ferðir áðrenn tey kunnu festa seg á ein fisk aftur. Í hesum tíðarskeiðinum kunnu tey spjaðast til onnur økir og til aðrar fiskar, so sum sjósíl. Tá ið lúsin hevur fest seg á fiskin, byrjar hon at liva av honum. Í fyrstani er lúsin so lítil, at hon mest livir av slipu, men so hvørt hon veksur, verður ávirkanin á fiskin størri. Við tíðini kann fiskurin fáa opin sár, og í ringasta føri kann hann doyggja.

Fyri at meta um hvussu stóra ávirkan alivinnan hevur á føroyska sjósílastovnin bað Havbúnaðarfelagið í 2018 Firum kanna hetta nærri. Hetta førdi til, at Sjósílaverkætlanin varð sett í gongd í 2019.

Høvuðsendamálini við verkætlanini eru:

1. At kanna nær smolt fara á sjógv fyrstu ferð.
2. At meta um trivnaðin hjá sílum á sjónum, serliga við atliti at lús.

Sambært kunngerð nr. 75 frá 28. juni 2016 um yvirvøku og tálming av lúsum á alifiski (Lúsakunngerðin) er alivinnan áløgd at halda lúsatølini á einum lægri støði í mai, juni og juli. Hetta fyri at verja tey síl sum fara á sjógv fyrstu ferð, tí tey verða mett at vera serliga viðkvæm fyri lús. Við hesi verkætlan fæst greiðu á um hesir mánaðir eru teir røttu fyri føroysku sjósílini.

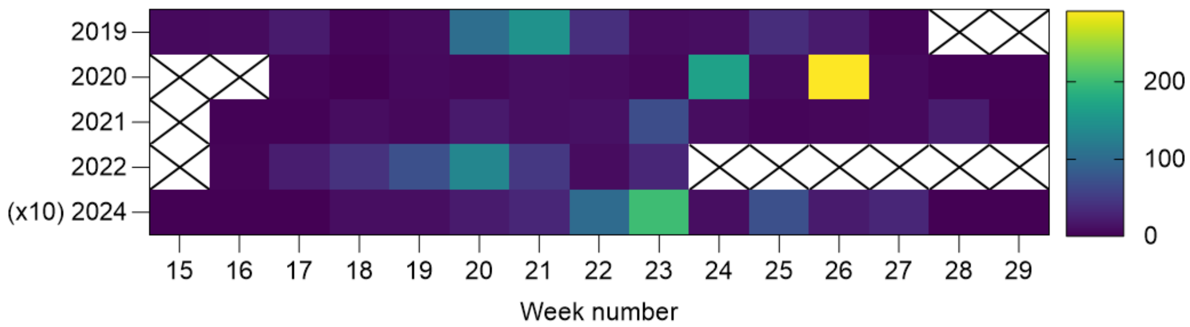
Av tí at hetta er fyrsta verkætlan av sínum slag í Føroyum, hava ymiskar mannagongdir verið royndar. Eitt nú varð ein fella sett upp í Sandá frá apríl til juli í árunum 2019-2022, og gav hon okkum tær fyrstu ábendingarnar um ferðingarmynstrið hjá sjóbúnum sílum ið fóru á sjógv fyri fyrstu ferð. Kortini hevði hendan mannagongdin sínar avmarkingar. Fellan kundi ikki standa uppi alt árið, hon virkaði ikki tá ið áin var ov stór, og hon forðaði sílum í at ferðast niðan ánna. Tí valdu vit í 2023 at leggja um og í staðin merkja síl. Hetta varð gjørt við etiskari góðkenning frá landsdjóralæknanum, soleiðis at ferðingin hjá sílunum ístaðin kundi skrásetast við einari antennuskipan.

Við undantaksloyvi frá kunngerð nr. 92 frá 26. juni 1990 um síla- og laksaveiðu flýggja út av Vørn, hava vit veitt 50 síl árliga við gørnum. Fyrstu árini varð hetta gjørt á tilvildarligum støðum kring Føroyar, men í 2022 broyttu vit mannagongdina. Nú verður helmingurin av sílunum veiddur nærhendis aling, meðan hin helmingurin verður veiddur longur burtur. Hetta fyri betur at kunna greina møguligan mun á sílum í mun til hvussu nær aling tey liva.

Síðani verkætlanin byrjaði hava sílafiskarar havt møguleika at stuðla kanningunum við at senda inn roðslu og aðra vitan um síl ið teir hava fingið. Hetta verður gjørt við serligum brævbjálvum sum eru mentir til endamálið. Umvegis sílafiskararnar er savnað nógv vitan um aldur, vøkstur og lúsastøðu hjá sjósílum.

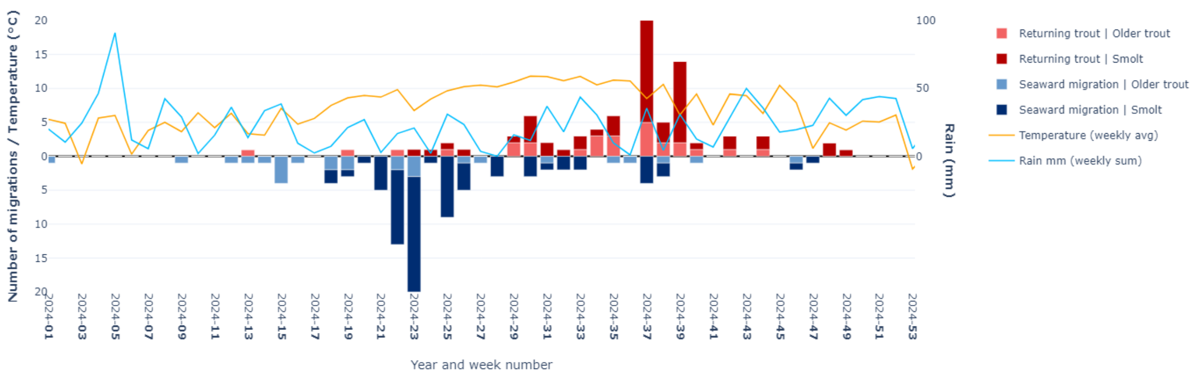
Í 2024 komu 74 brævbjálvar inn, ið tíverri er tann lægsta nøgdin higartil. Tann 2. mai vórðu 145 síl merkt í Eiðisá í Norðagøtu, og við hesum er samlaða talið av merktum sílum nú komið upp á 385. Harumframt vórðu 50 síl veidd við gørnum: seks í Funningsfirði, 28 í Kollafirði og 16 í Fámjin. Sílini í Fámjin umboða tey, ið liva longur burtur frá aling.

Á mynd 1 sæst nær flest síl eru skrásett at ferðast á sjógv fyri fyrstu ferð, bæði sambært felluni í Sandá (2019-2022) og antennunum í Eiðisá (2024). Í 2024 fóru flestu sílini á sjógv í viku 22 og 23 (27. mai til 9. juni), sum minnir mest um ferðingarmynstrið í 2021. Hetta var seinni enn í 2019 og 2022, men fyrr enn í 2020.



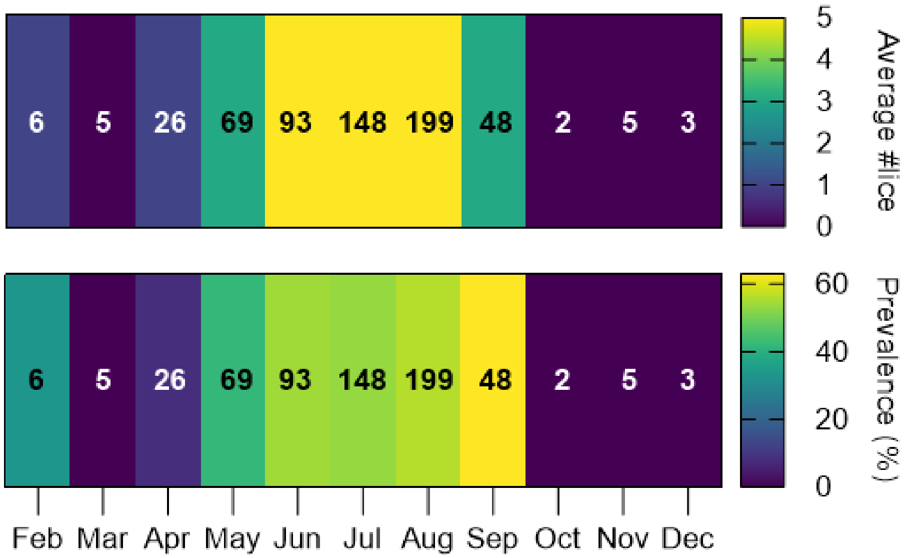
Mynd 1. Vikuligar skrásetingar av smolt ið fór á sjógv fyri fyrstu ferð. Vikurnar við krossum vísa tíðarskeið har ongar mátingar vórðu gjørdar. Fyri at gera myndina greiðari - og tí at tvær ymiskar mannagongdir eru nýttar sum ikki beinleiðis kunnu samanberast - er talið av skrásetingum í 2024 faldað við 10.

Tá ið vit hyggja at ferðingini hjá øllum sílum í 2024 (Mynd 2), bæði smoltum og eldri sílum, sæst, at tey eldru sílini fóru á sjógv fyrr enn tey yngru. Eins og í Sandá byrjaðu yngru sílini ikki at ferðast á sjógv fyrr enn lufthitin var komin upp á eitt vist, uml. 8°C, og ferðingin hjá øllum sílunum var í stóran mun knýtt at avfalli, helst tí at áin tá var størri. Í mun til felluna í Sandá kunnu vit nú eisini síggja, nær ferðingin niðan aftur í ánna hendir. Flestu yngru sílini ferðaðust niðan aftur í ánna í vikunum 37 til 39 (9.-29. september) tá ið lufthitin aftur var fallandi. Ferðingin niðan aftur hjá teimum eldru sílunum var meira javnt býtt, men ábendingar vóru um at hon bæði byrjaði og endaði nakað fyrr enn hjá teimum yngru sílunum. Av tí at summi síl allatíðina verða skrásett av báðum antennunum, settu vit sum treyt, at ein ferðing á sjógv bert verður skrásett um sílið er á sjónum í minst tríggjar dagar, og at ein ferðing niðan aftur í ánna bert verður skrásett um sílið í minsta lagi steðgar seks tímar uppi í ánni.



Mynd 2. Vikuligar skrásetingar av ferðingini hjá merktum sílum í Eiðisá í 2024. Bláu og reyðu stabbarnir vísa ávikavist ferðingar á sjógv og niðan aftur í ánna, meðan ljósu og myrku stabbarnir umboða ávikavist yngru og eldri sílini. Gula kurvan vísir lufthitan, og bláa kurvan vísir avfallið.

Á mynd 3 sæst hvussu nógvar lús sílini, ið sílafiskarar hava fráboða, hava havt í miðal ymisku mánaðirnar. Samlaða myndin vísir at sílini hava flest lús um summarið - serliga í juni, juli og august. Tá ið talið av lús á alilaksi vanliga ikki er hægst um summari, bendir hetta mynstrið á at lítið avfall hesa árstíðina avmarkar møguleikarnar hjá sílunum at lúsa seg av í ferskvatni. Lutfallið av sílum við lús er eisini høgt hesar mánaðirnar, men hægst í september.

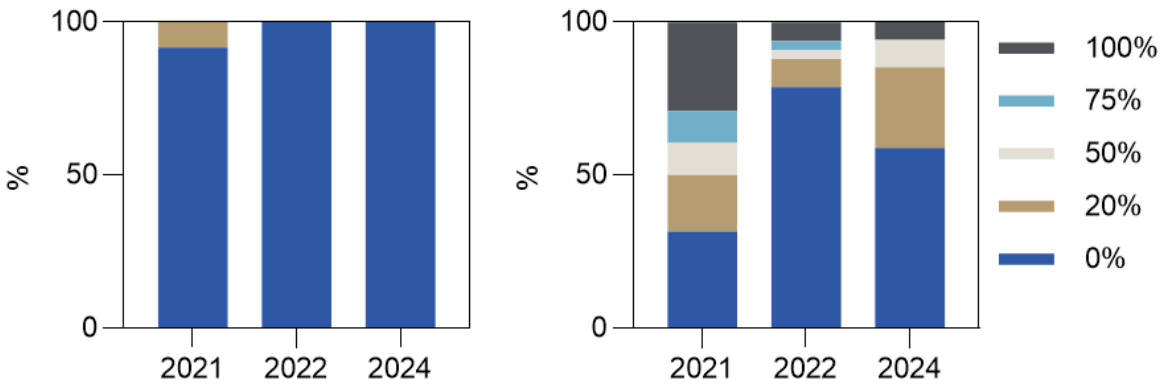


Mynd 3. Mánaðarligir munir í miðaltali av lús á sílum fráboðað av sílafiskarum (ovara) og lutfallinum av somu sílum ið hava havt lús (niðara). Tølini á myndunum vísa hvussu nógv síl tølini eru grundað á í ymisku mánaðunum.

Norðmenn fylgja væl við teirra villu laksafiskum, eisini sílunum. Fyri at meta um í hvønn mun lús ávirkar síl hava teir ment eina flokkingarskipan ið skipar sílini eftir hvussu nógvar lús tey hava per gramm kropsvekt. Hvør flokkur umboðar síl ið verða mett at hava ávís sannlíkindini fyri at doyggja orsaka av lús - ávikavist 0%, 20%, 50%, 75% og 100%.

Á mynd 4 sæst hvussu stórur partur av sílunum ið eru veidd langt burtur frá og nærhendis aling verður mettur at hoyra til teir ymisku flokkarnar. Sjónligur munur sæst millum báðar bólkarnar. Út frá flokkingarskipanini var í 2024 einki av sílunum ið liva longur burtur frá alingini mett at hava lúsatøl ið kunnu elva til felli. Hinvegin varð mett at knapt 16% av sílunum ið vórðu veidd nærhendis aling høvdu so høg lúsatøl, at tey helst fóru at doyggja orsaka av lús.

Hóast tað sýnist at vera ein munur millum 2022 og 2024 viðvíkjandi talið av sílum ið vóru mett at hava felli orsakað av lús, var hesin munur ikki hagfrøðiliga signifikantur. Hinvegin var mett fellið í 2022 og 2024 hagfrøðiliga signifikant lægri enn í 2021, samsvarandi teimum lúsatølum ið vit hava fingið frá sílafiskarum (sí Figure G í frágreiðingini).



Mynd 4. Lutfall av sílum veidd við gørnum sum livdu longur burtur frá (vinstra) og nærhendis (høgra) aling ið eru mett at hava eitt væntað felli á ávikavist 0%, 20%, 50%, 75% og 100% orsakað av lús.

Nógv er eftir at kanna, men samanumtikið benda úrslitini fyribils á, at:

1. Ferðingarvindeygað hjá smolt er í vikunum 20-26, t.e. frá miðskeiðis í mai til seinnu helvt av juni.

2. Ferðingin á sjógv verður ávirkað av bæði hita og avfalli, t.e. ferðingin tók dik á seg tá ið lufttemperaturin var komin upp um umleið 8°C og áin var stór.

3. Minni avfall um summari avmarkar møguleikan hjá sílum at lúsa seg av í áunum, og tí hava sílini fleiri lús hesa árstíðina.

4. Síl ið liva nærhendis aling hava fleiri lús enn síl ið liva longur burtur frá aling, og mett felli, orsakað av lús, er sostatt hægri hjá sílum nærhendis aling samanborið við síl ið liva longri burtur.

Introduction

Although some rivers are named Laksá and Laksará, wild Atlantic salmon (*Salmo salar*) has likely never been a spawning fish in the Faroe Islands. On the other hand, trout (*Salmo trutta*) can be found in almost all rivers and are both popular among recreational anglers and considered a good food. However, by the late 19th century, fishing pressure had increased so much that the trout population declined significantly (trap.fo/nattura-og-landslag/osalt-vatn/). Therefore, it is crucial to monitor fish stocks so that necessary measures can be implemented before the situation becomes too severe.

Aquaculture plays a vital role in the Faroese economy. However, an industry of this scale also has the potential to negatively impact the environment. One potential consequence is a decline in the Faroese sea trout population. The reason trout, in particular, are likely to be affected by the salmon farming industry is that they belong to the salmonid family. Farmed salmon are hosts to the salmon louse, a parasitic copepod that only survives on salmonids. As the number of farmed salmon increases, so does the population of salmon lice, which is proven to have a negative impact on wild salmonids, such as sea trout.

Salmon lice (*Lepeophtheirus salmonis*) are crustaceans that must molt to grow. To reach adulthood, they have eight different developmental stages. Once mature, the female louse carries its eggs in two strings attached to it until they hatch. From the eggs emerge louse larvae, which molt twice before they can attach to a fish. During this free-swimming phase, they can spread to new areas and infect other fish, such as sea trout. Once attached to a host, the louse begins feeding. Initially, it is so small that it mainly feeds on mucus, but as it grows, its impact on the fish becomes more severe. Over time, the fish may develop open wounds, and in the worst cases, it can die.

To determine the extent to which the Faroese aquaculture industry affects the local sea trout population, the Faroese Fish Farmers Association commissioned Firum in 2018 to investigate this issue. This led to the launch of the Sea Trout Project in 2019. The project's main objectives are:

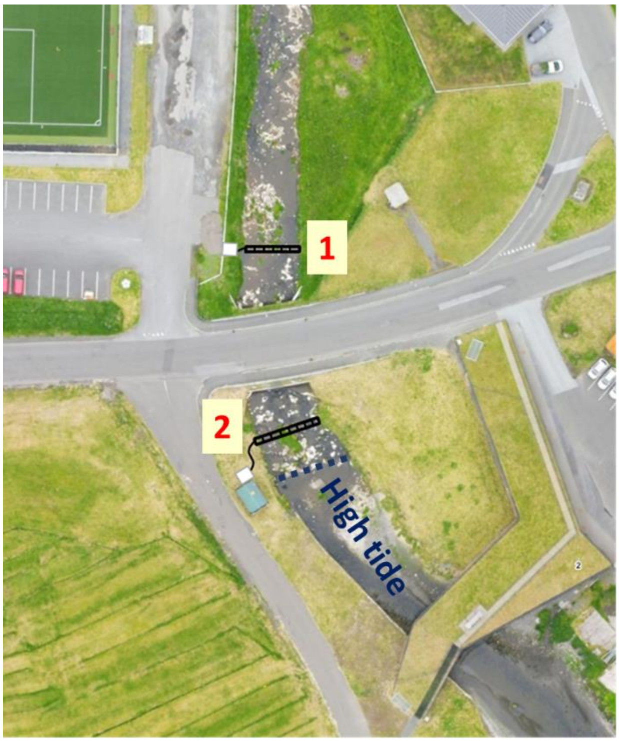
1. *To study when smolts migrate to the ocean for the first time.*
2. *To assess their condition at sea, particularly regarding sea lice infestation.*

According to Regulation No. 75 of June 28, 2016, on monitoring and controlling lice in farmed fish, the industry is required to maintain lower lice levels on farmed fish during May, June, and July. This measure is intended to protect juvenile trout as they enter the ocean for the first time, a stage when they are most vulnerable to lice. This project aims to determine whether these designated months are indeed the most critical for Faroese sea trout and to assess the overall impact of lice on trout at sea.

Project 1: Smolt migration to sea

Material and methods

Two Litz cord antennas, each connected to an IS1001 Standalone Reader (Biomark Inc.), are installed in the river Eiðisá (62.198N, 006.744W), which flows through the village of Norðagøtu. Positioned approximately 30 meters apart, the antennas monitor tagged trout as they pass through the system. By utilizing two antennas, it is possible to determine the direction of the trout's movement. Placing one antenna as close to the river mouth as possible, while still in freshwater, enables precise tracking of both seaward migration and return timing (Picture 1).



Picture 1. The two antennas span the Eiðisá river, both positioned in freshwater. However, Antenna 2 is located near a steep slope (indicated by the dotted line), which marks the boundary of high tides.

The river Eiðisá was selected for tagging trout because it flows into a fjord with active salmon farming. Year-to-year variations in return timing and return rates may thus also indicate differences in sea lice infestation levels on farmed salmon within the fjord.

The antennas were installed in November 2023. However, due to testing of the energy supply, data registration may have occasional gaps up until February 2024.

Trout were caught on June 1 and 2 2023 and May 2 2024 approximately 50 meters upstream of Antenna 1. To minimize unnecessary electrofishing of larger specimens, tagging was conducted in May and June, after the main spring seaward migration of older trout and before the spawning period. To reduce potential mortality associated with tagging, only fish larger than 100 mm were tagged. In 2024, a total of 145 fish were tagged, bringing the overall number to 385 when including those tagged in 2023.

All fish were anesthetized using Benzocaine (Tjaldurs Apotek, Tórshavn), measured for total length (mm) and weight (g), and scale samples were collected for potential future age determination. Fish meeting the size threshold were implanted with a PIT tag (APT12 PL 12.5 mm, 134.2 kHz ISO FDX-B preloaded tag, Biomark Inc.) into the peritoneal cavity using an MK25 PIT tag implanter (Biomark Inc.). Immediately after tagging, each fish's ID number was recorded using a handheld reader and stored.

Following tagging, the fish were held in live wells until they fully recovered, after which they were released back into the habitat unit where they were captured.

Results

On average, the trout tagged in 2024 weighed 42.8 g (range: 8-265 g), measured 156 mm in length (range: 98-300 mm), and had a condition factor (Fulton's *K*) of 1.00 (range: 0.59-1.28). Most of the tagged trout (approximately 96%) were under 200 mm in length, suggesting that they were predominantly juveniles (Figure 1).

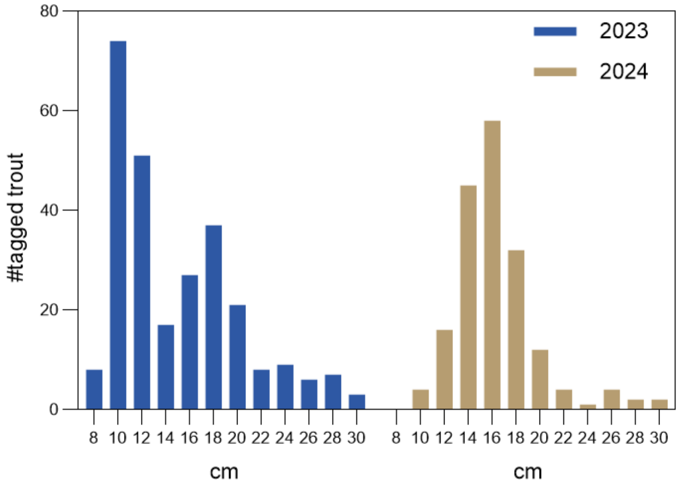


Figure 1. Length distribution of trout tagged in 2023 and 2024.

A total of 730 scales from sea trout caught at sea, either by anglers or with gillnets, have been analysed. Of these, approximately 97% migrated to sea for the first time at either two or three years of age. Scale analysis reveals a significant difference in length-at-age depending on the duration spent in freshwater before migration (t-test, $p < 0.0005$). Specifically, larger individuals tend to migrate to sea at a younger age. As shown in Figure 2, this length difference between the two cohorts persists significantly at each age until five years old. At age two, trout that migrate to sea average 16.6 cm in length, whereas those that remain in freshwater for an additional year measure only 13.1 cm on average (Figure 2).

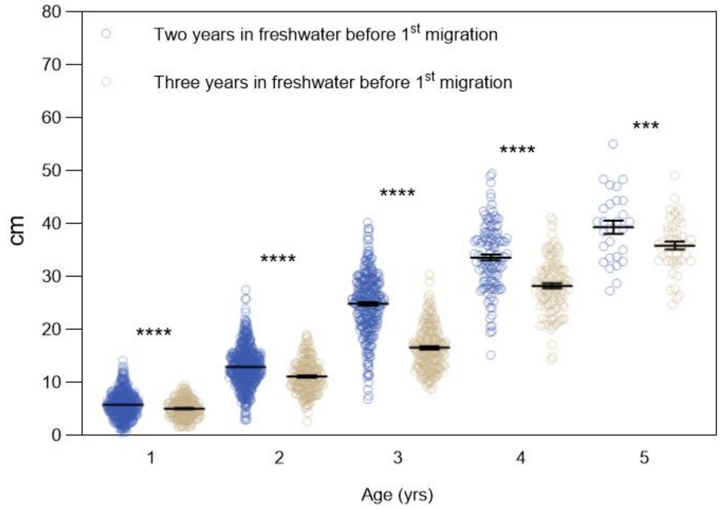


Figure 2. Length-at-age of sea trout migrating to sea after two years (blue) and three years (brown) in freshwater. Black horizontal lines indicate the mean, while black vertical bars represent the standard error. Asterisks denote significant differences: **** ($p < 0.0001$) and *** ($p < 0.001$) (t-test).

Since the trout tagged in 2023 were tagged approximately eight months before the antennas became operational, migration data from that year is unavailable. As scale analysis of the tagged fish is still pending, threshold lengths were established based on the findings presented earlier to identify trout that had not previously migrated to sea: 13.1 cm for trout tagged in 2023 and 20 cm for those tagged in 2024. Using these criteria, in 2024 a total of 50 smolts were recorded to migrate to sea for the first time, including 10 tagged in 2023 and 40 tagged in 2024.

From 2019 to 2022, a trap was installed in the Sandá River (61.999N; 006.781W) from April to July, capturing most seaward-migrating trout during that period. As shown in Figure 3, the majority of smolts migrated to sea in the weeks 22 and 23 in 2024 (May 27 to June 9), a pattern similar to that in the trap in 2021, but earlier than in 2020 and later than in 2019 and 2022.

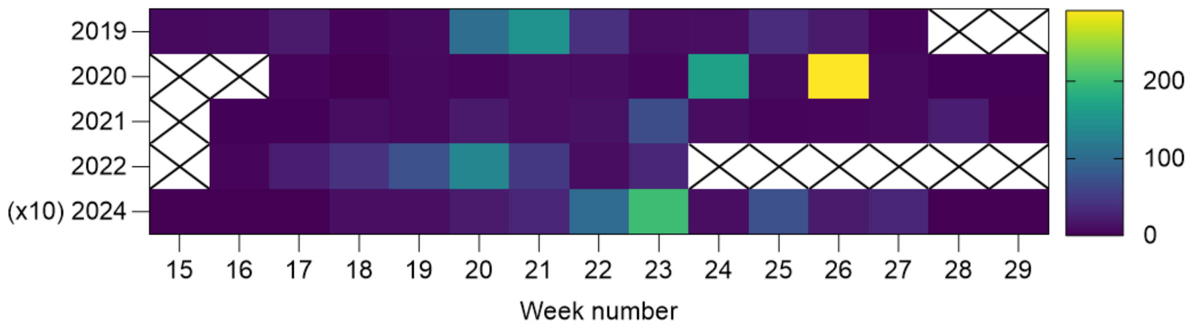


Figure 3. Weekly registrations of trout smolts in the trap (2019–2022) and by the antennas (2024). Crossed areas indicate periods without sampling. Since trout numbers recorded by the two methods are not directly comparable, the number of smolts migrating in 2024 has been scaled up by a factor of 10 for visualisation purposes.

Of the 385 tagged trout, 141 have been detected by the antennas, with 91 recorded by both, indicating migration between freshwater and the sea. 23 trout have yet to return from the sea.

When looking at the movement patterns of all sea trout in 2024, both smolts and older individuals, it is evident that the older trout started migrating to the sea earlier than the younger ones. Similar to observations in Sandá, the younger trout did not begin their migration to the ocean until the air temperature had passed a certain threshold, around 8°C, and the movement of all trout was largely influenced by precipitation, likely because the river flow increased during these periods.

Unlike the monitoring trap in Sandá, we can now also observe when the trout return to the river. Most of the younger trout migrated back upstream between weeks 37 and 39

(September 9–29), coinciding with a decrease in air temperature. The upstream migration of the older trout was more evenly distributed, but indications suggest that it both started and ended slightly earlier than for the younger trout (Figure 4).

Since some trout were continuously detected by both antennas, we set the condition that a migration to the ocean would only be recorded if the fish remained at sea for at least three days, and a return migration would only be registered if the fish stayed in the river for at least six hours.

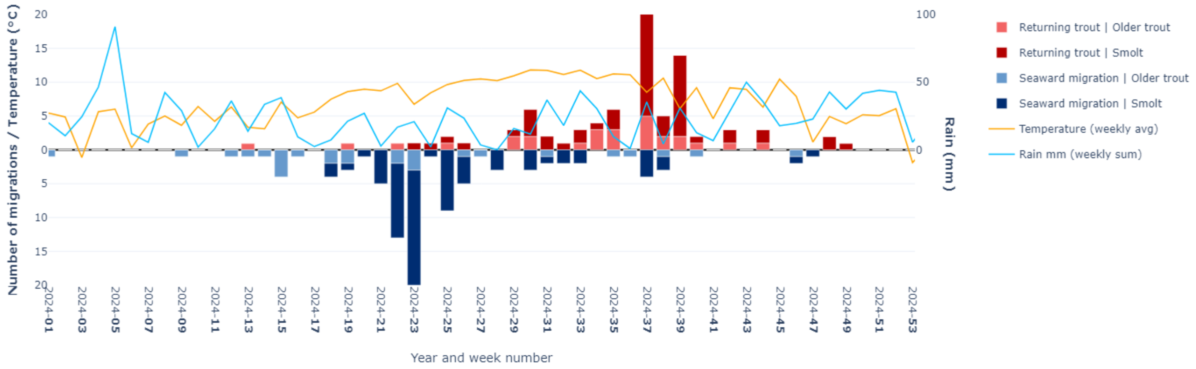


Figure 4. Weekly recordings of the migration of tagged sea trout in Eiðisá in 2024. The blue and red bars represent migrations to the ocean and returns to the river, respectively, while the light and dark bars indicate younger and older trout, respectively. The yellow curve shows air temperature, and the blue curve represents precipitation. Temperature and rain data: www.vedur.fo

Project 2: The condition of sea trout at sea

Material and methods

Sea trout caught at sea were sampled using two methods: (1) gillnets measuring 5 meters in width, 2 meters in height, and with a 20 mm mesh size, and (2) scales and additional information donated by anglers. Anglers provide details such as the trout's length, weight, and sea lice count using specially designed envelopes (Picture 2) and, in return, participate in an annual prize draw for 10,000 DKR.

Picture 2. Envelopes designed for anglers to donate sea trout scale samples and additional data. Inspired by: www.nina.no/Portals/NINA/Bilder%20og%20dokumenter/PDF-er%20nye%202021/brosjyre%20fremstadvassdraget%20norsk%20web.pdf?ver=__YivZLE5aFL9Zfs7q2dFQ%3d%3d

In addition to the prize incentive, anglers were encouraged to donate scale samples and other data on caught trout through Facebook advertisements. Free sampling envelopes were also made available in stores selling fishing supplies throughout the Faroe Islands. As a new initiative, anglers who contributed scale samples received the results of the scale analysis via SMS sent to the phone number provided on the envelope.

Gillnets were deployed at approximately a 90° angle to the shoreline and checked at least once every 30 minutes. To minimize the influence of salinity on sea lice counts, the nets were set in waters with salinity levels greater than 32‰, measured using a YSI Pro30. After sampling, the fish were euthanized with an overdose of Benzocaine (Tjaldurs Apotek, Tórshavn) and transported to shore for analysis.

On land, sea lice were counted and categorized into the following groups: (1) adult female *L. salmonis*, (2) adult male and preadult *L. salmonis*, (3) *Caligus elongatus*, and (4) chalimus. For species identification using PCR analysis, chalimus were collected and preserved in ethanol. The sea trout were weighed to the nearest 0.1 g and their length measured to the nearest 0.1 cm. Scales were sampled from each fish and stored for subsequent age and growth analysis. Finally, the fish were gutted, and stomach contents were examined.

In 2024, gillnet sampling was conducted from June 27 to July 9, consistent with the sampling period in previous years. Due to an outbreak of infectious salmon anemia (ISA) at one salmon farming site on the southernmost island with a high biomass, and the absence or low numbers of fish at other farming locations in the area during this time, sampling near these farms was not conducted. Instead, sampling was redirected to more northerly locations: Funningsfjørður near farming site A-71 (N = 6) and Kollafjørður near farming sites A-05, A-

80, and A-81 (N = 28). Sea trout living further away from salmon farms continued to be sampled in Fámjin on the southernmost island (N = 16) (Figure 5).

Figure 5. Locations of gillnet sampling sites: Fámjin (2021, 2022, and 2024 - blue star), Froðba (2021 - yellow star), Vágur (2022 - red star), Funningsfjørður (2024 - purple star), and Kollafjørður (2024 - green star).

Results

Scale samples and other data from sea trout caught at sea using gillnets or by anglers have now been collected from a total of 937 specimens (Table 2). In 2024, only 74 sample envelopes were received from anglers. Of these, nine were from trout caught in 2023, and 41 were from trout caught in freshwater in 2024, leaving just 24 specimens representing sea-caught trout by anglers in 2024.

Table 2. Number of sea trout caught at sea by anglers and gillnets from 2019 to 2024.

	Anglers	Gillnets	Total
2019	145	32	177
2020	127	46	173
2021	121	50	171
2022	142	61	203
2023	87	52	139
2024	24	50	74
Total	646	291	**937**

Similar to previous years, sampling in 2024 was seasonally uneven, with all specimens collected between June and September. When grouped by length, the smallest sea trout (<20 cm) first appear in May and are absent after September (Figure 6).

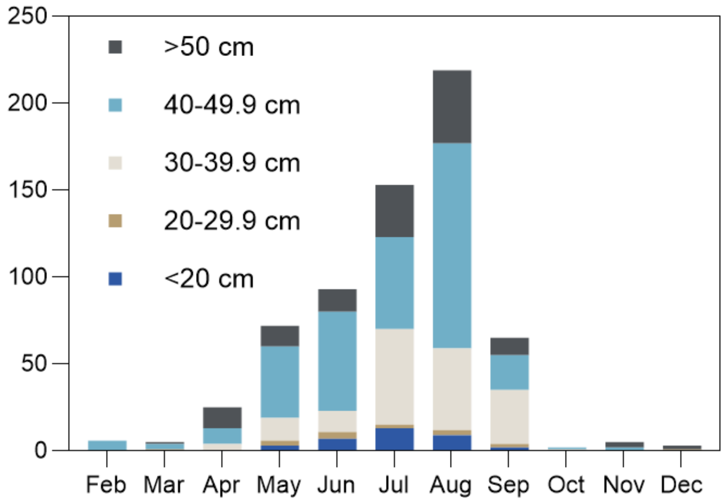


Figure 6. Number of sea trout caught at sea by anglers from 2019 to 2024, categorized by length groups.

In 2024, sea trout caught at sea (by anglers and with gillnets) had an average weight of 452 g (range: 74-1755 g) and an average length of 36.3 cm (range: 19–56 cm). The mean condition factor (Fulton's *K*) was 0.92 (range: 0.69-1.21), indicating that the trout were in similar condition to previous years, but exhibited a relatively greater length (Figure 7).

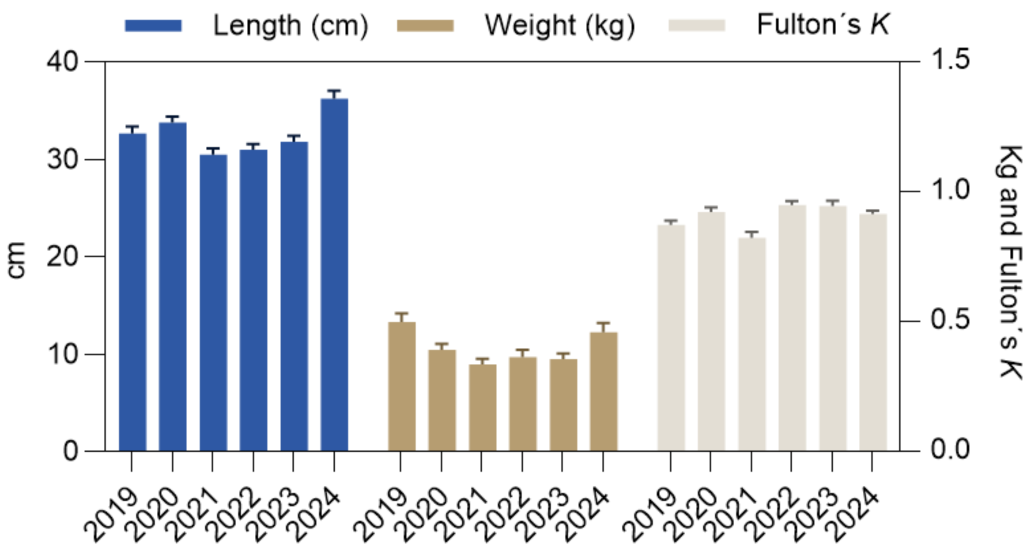


Figure 7. Average length (cm), weight (kg), and condition factor (Fulton´s *K*) of sea trout. Vertical lines indicate standard error.

The sea trout caught at sea by anglers had an average of 3.9 sea lice, with a sea lice prevalence of 48% (Figure 8). The sea lice load in 2024 did not differ significantly from previous years (ANOVA, $p > 0.05$; t-test, $p > 0.05$). However, sea lice prevalence in 2024 was comparable to that in 2021 and 2023, but lower than in 2019, 2020, and 2022 (Fisher's exact test, $p < 0.5$).

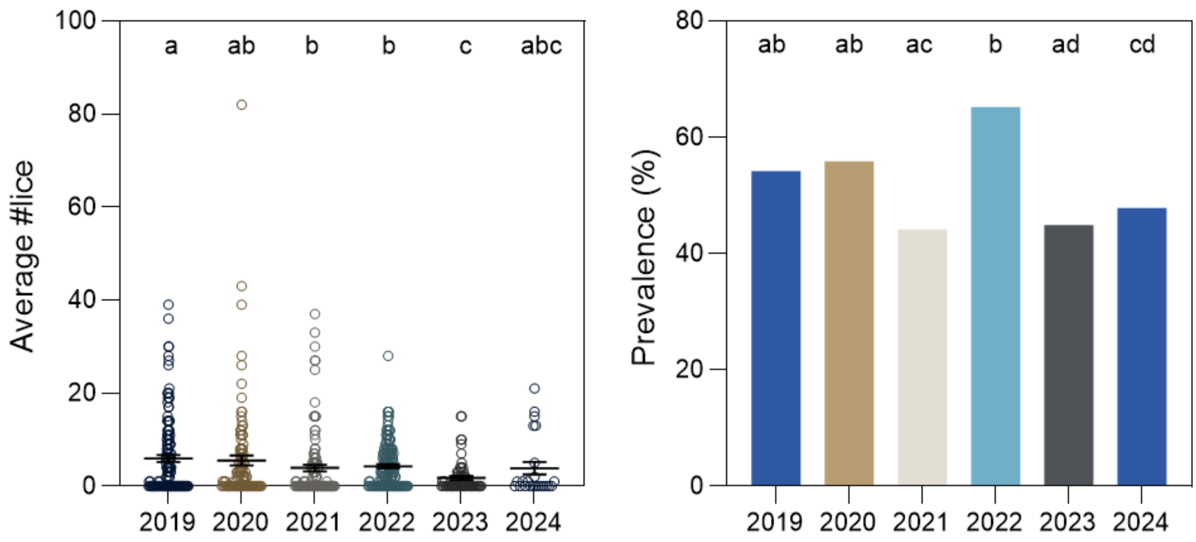


Figure 8. Annual variations in the average number of sea lice per fish (left) and the prevalence of sea lice on sea trout caught at sea by anglers (right). Vertical bars represent standard error. Different letters indicate statistically significant differences (t-test, $p < 0.05$). Sea trout examined by trained Firum staff were excluded from the analysis.

The overall trend from 2019 to 2024 shows that sea lice are most abundant on sea trout in June, July, and August, while lice prevalence peaks in September (Figure 9).

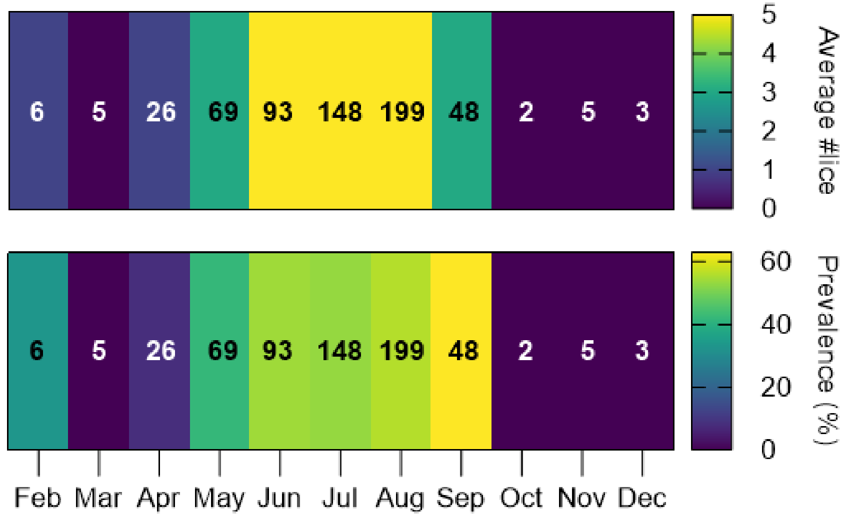


Figure 9. Annual variations in the average number of sea lice per fish (top) and the prevalence of sea lice (bottom) on sea trout caught at sea by anglers. Numbers within the heat maps represent sample size.

Based on the salmon lice index by Taranger et al. (2012), which estimates the influence of salmon farming on wild salmonid stocks, the lice load of sea trout caught at sea by anglers and weighing more than 150 g was categorized into five groups: < 0.025, 0.025–0.05, 0.05–0.10, 0.10–0.15, and > 0.15 lice per gram of sea trout. These categories correspond to 0%, 20%, 50%, 75%, and 100% expected mortality, respectively.

In 2024, the expected mortality due to sea lice was the lowest recorded to date, alongside 2023 (Figure 10). However, it is important to note that anglers reported both lice numbers and fish weight for only seven fish in 2024.

Taranger et al. (2012) also proposed a salmon lice index for sea trout smolts (< 150 g). However, since anglers have reported data for only 19 sea trout under 150 g over the six years of the project, the results for this size group are based solely on gillnet sampling.

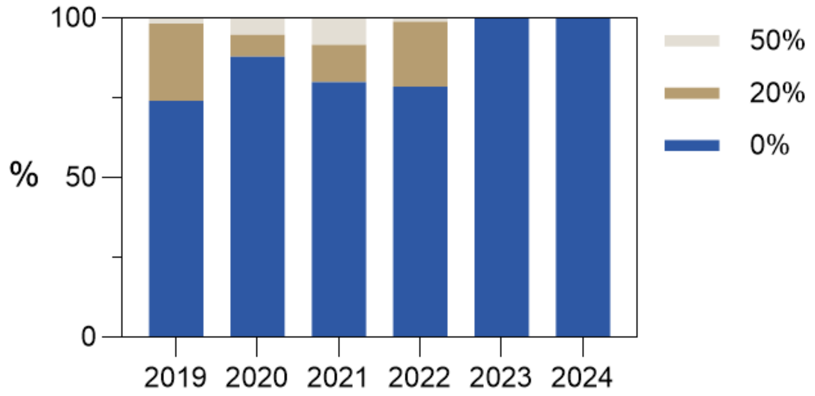


Figure 10. Proportion of sea trout (> 150 g) caught at sea by anglers, categorized by sea lice loads estimated to cause 0%, 20%, and 50% mortality.

The sea trout caught with gillnets in 2024 had an average weight of 420 g (range: 74–819 g) and an average length of 35.2 cm (range: 22.0–46.2 cm). Their average condition factor was 0.91 (range: 0.69–1.12), and they carried an average of 9.2 sea lice (range: 0–64). In all these metrics, the 2024 trout were at the upper end compared to previous years (Figure 11).

In 2024, the only significant difference between trout living near salmon farms and those from more distant areas was their sea lice load. Trout near salmon farms carried a significantly higher burden, averaging 11.6 sea lice per fish, compared to 3.7 sea lice per fish in the more distant area (t-test, $p < 0.5$) (Figure 11).

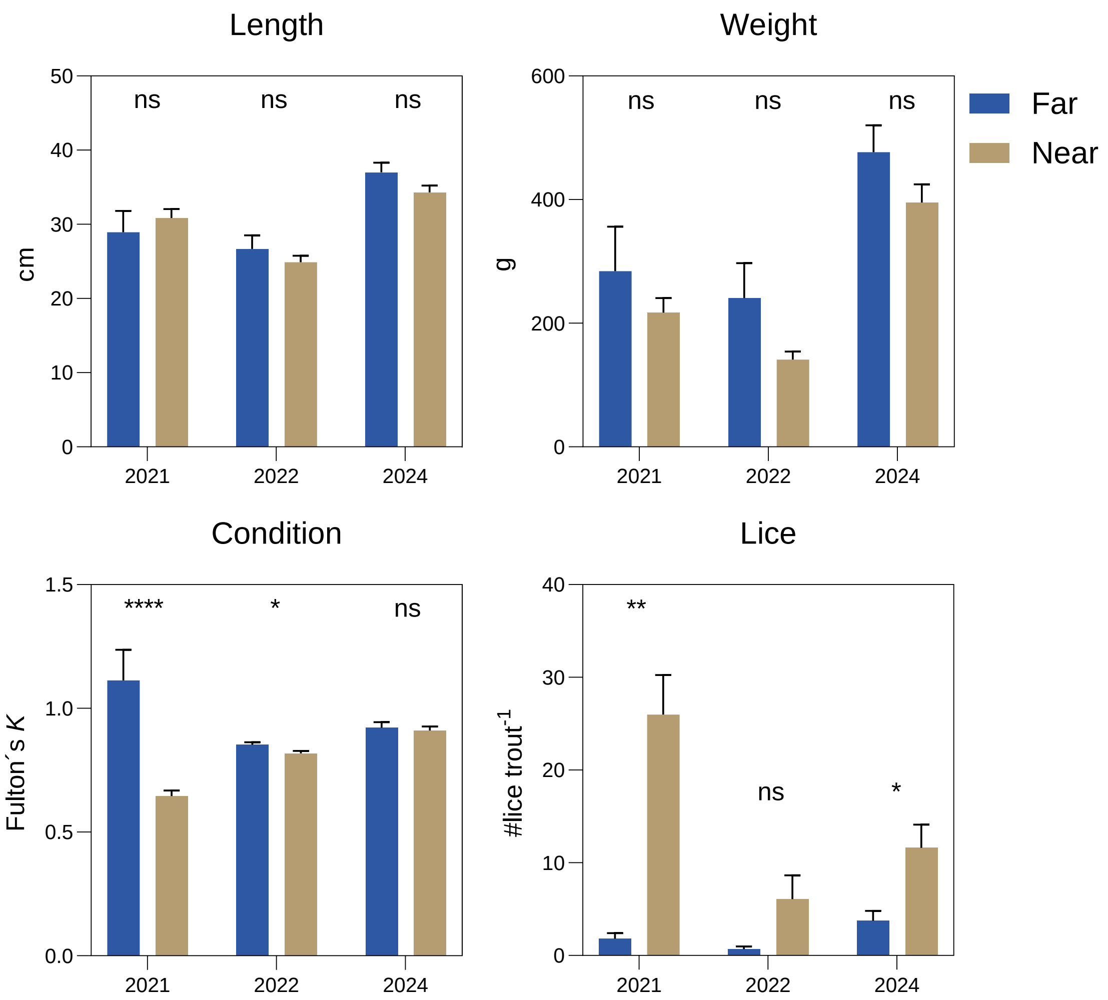


Figure 11. Average length (cm), weight (g), condition factor (Fulton's *K*), and sea lice count for sea trout caught with gillnets near and far from salmon farming. Vertical lines represent standard error, and asterisks indicate the level of statistical significance (* p < 0.05, ** p < 0.005) based on t-tests.

According to the salmon lice index by Taranger et al. (2012), which assesses the impact of salmon farming on wild salmonid stocks, trout living far from salmon farms had an estimated mortality rate of 0.4%, significantly lower than the 25.3% observed near salmon farms (t-test, $p < 0.0001$). In 2024, the estimated average mortality for sea trout residing far from farming was 0%, whereas trout living near salmon farms had an estimated average mortality of approximately 16%. Overall, sea trout caught with gillnets in 2024 had an estimated mortality rate of around 11%, marking a significant decrease from 2021 but remaining comparable to 2022 levels (ANOVA, $p < 0.0001$; t-test, $p < 0.001$) (Figure 12).

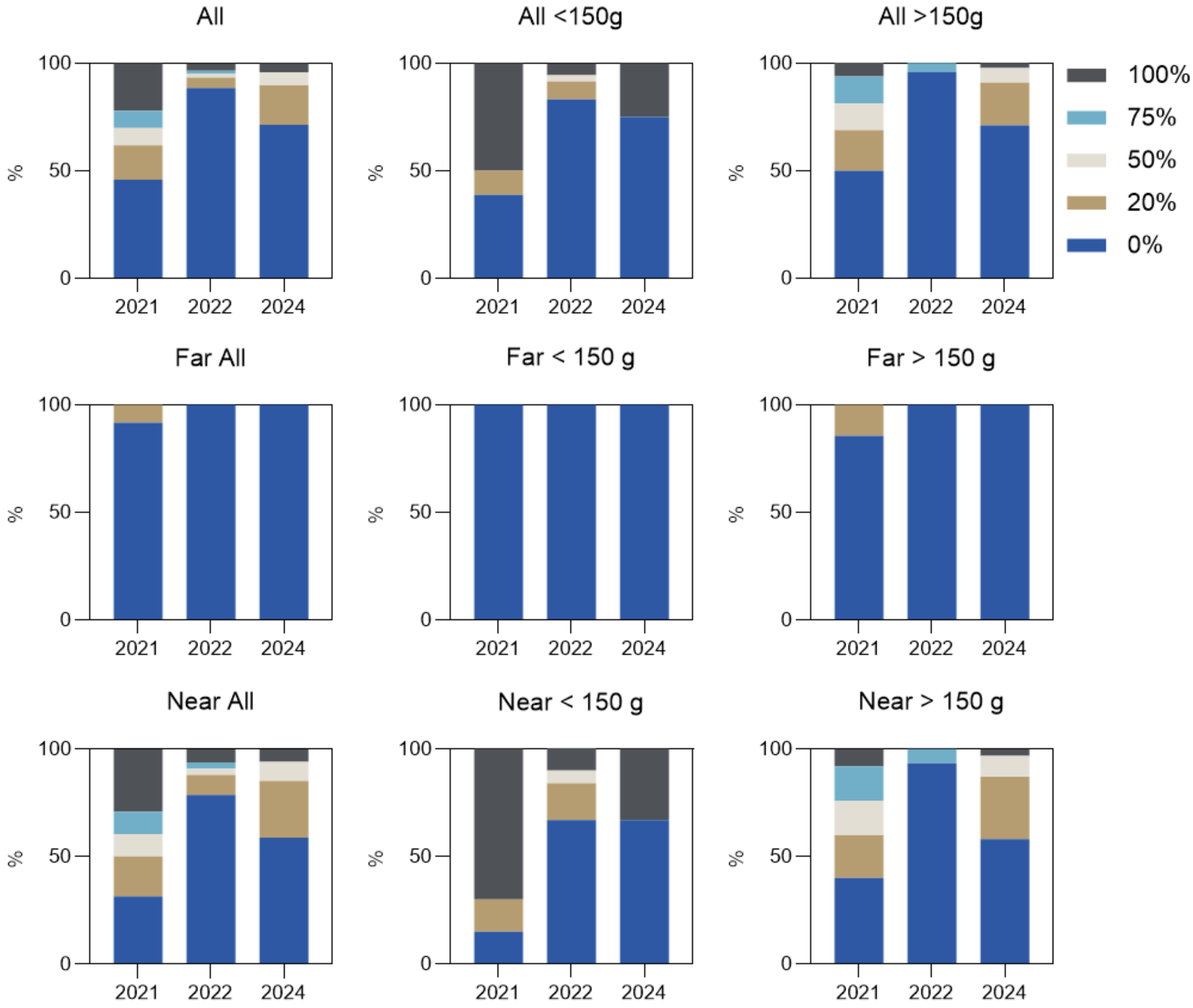


Figure 12. Proportion of sea trout caught with gillnets, categorized by lice loads estimated to result in 0%, 20%, 50%, 75%, and 100% mortality. The top row represents all examined trout, the middle row shows trout living far from salmon farming, and the bottom row displays trout living near salmon farming.

Conclusions

This study provides valuable insights into the migration behavior and health of sea trout in the Faroe Islands, particularly their interaction with the salmon farming industry. Data from traps and antennas indicate that trout migration is strongly influenced by environmental factors such as air temperature and precipitation. Younger trout delay migration until temperatures reach approximately 8°C, while older individuals tend to migrate earlier in the season. Additionally, antenna data reveal that younger trout generally return to freshwater later in the year, whereas older trout exhibit a more evenly distributed return pattern.

The research also highlights the significant impact of sea lice infestations on Faroese sea trout, particularly in areas near salmon farms. Trout residing close to farming sites consistently carried higher lice burdens than those in a more distant location, with estimated mortality rates significantly higher among trout exposed to farm-related infestations.

While current regulations require salmon farms to maintain lower lice levels during the peak migration period of smolt, this study underscores the need for ongoing evaluation of whether these measures adequately protect wild trout stocks. Expanding monitoring efforts across multiple fjords could provide a broader understanding of regional variations in trout lice loads and overall health.

The study uses the salmon lice index by Taranger et al. (2012) to estimate expected lice-induced mortality. While this method has been criticized for lacking a solid empirical basis (Eliasen et al. 2021), it remains useful for comparing different areas or groups, such as trout near and farther from salmon farms.

Balancing the economic benefits of aquaculture with the conservation of wild sea trout populations requires collaboration among researchers, policymakers, and industry stakeholders. By refining management strategies and implementing science-based solutions, it may be possible to mitigate the environmental impact of salmon farming while ensuring the long-term sustainability of both the aquaculture industry and wild trout populations in the Faroe Islands.

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