Applecross Sea trout and salmon monitoring report 2024

to inform Loch Ainort, Caol Mor & Inner Sound EMP

for MOWI Scotland Ltd., Wester Ross Area District Salmon Fisheries Board, The Scottish Government (in place of the Skye District Salmon Fisheries Board) and The Highland Council

Peter Cunningham, December 2024 info@wrft.org.uk

Wester Ross Fisheries Trust (WRFT)
Harbour Centre, Gairloch, Ross-shire, IV21 2 BQ

www.wrft.org.uk
WRFT is a Registered Charity No. SCO50755 and a Company Limited by Guarantee SC687827

Applecross sea trout and salmon monitoring report 2024 for Loch Ainort, Caol Mor & Inner Sound EMP, 2024

Peter Cunningham, December 2024

Summary

This document presents the results of wild fish monitoring activities at Applecross during the spring and summer of 2024 as part of the Environment Management Plan [EMP] for MOWI salmon farms in Loch Ainort, Caol Mor and the Inner Sound.

Seine netting teams were assembled to sample sea trout in the mouth of the Applecross River each month from May to September 2024, except August. Twenty or more sea trout were caught using a seine net in the sea pool in June, July and September. Overall, 89 sea trout were recorded with counts of sea lice taken. All fish were returned following a period of recovery from mild sedation.

Lice counts were low on sea trout sampled in May (just one fish) and in June (35 fish) in contrast to the high counts recorded at the same times of the year in 2023.

However, lice levels were high on some fish in the July 2024 sample. We were unable to sample sea trout in August due to the high river level. In September, lice counts were low, however many of the younger sea trout had damaged dorsal fins and other sea lice damage from earlier in the year.

Reference to reported sea lice levels and on-farm biomass figures for the nearest salmon farms in the East of Skye and in Loch Kishorn can help with interpretation of potential sources of lice.

Farms in the east of Skye were mostly fallow by early spring 2024, farms in Loch Kishorn were fallow throughout the spring and early summer. Active farms in the Loch Alsh – Loch Duich area were being harvested out in early summer 2024; they may have a been a source of some of the lice on sea trout sampled at Applecross in July; one of the recently re-stocked farms in east of Skye reported quite high counts of adult female lice by end of July (of up to 0.5 adult female lice per fish).

The Applecross site has again provided useful samples of sea trout for monitoring of sea lice on wild fish in the Inner Sound area.

Primarily to find out about the status of juvenile salmon in the Applecross River, an electro-fishing survey of four sites was carried out on 5th September 2024.

Salmon fry and parr were found at all four sites (between the top of the main glen and the sea) with highest numbers (CPUE and estimated minimum densities) of both fry and parr at the two sites midway up the glen.

Few salmon fry and parr were recorded at the top site and the bottom site (near Applecross House), and they were larger for their age; indicative of lower densities and fast growth as a result of greater food availability per fish.

Results thus concur with the Scottish Government's 'category 3' conservation grading for the Applecross River, indicative of inadequate numbers of adult salmon spawning within the system to maintain optimal levels of juvenile salmon production within the area of habitat accessible to wild salmon.

1. Introduction and background

1.1 Location and rational

The Loch Ainort, Caol Mor and the Inner Sound EMP covers an area to the Isle of Skye and around the island of Scalpay (production area M-28) as shown in Figure 1.

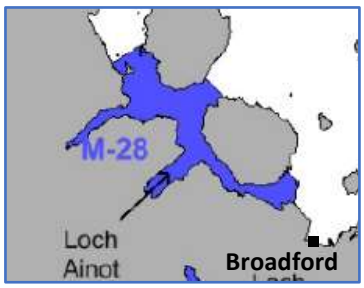


Figure 1. Location of M-28 farm salmon production area.

This area has 5 licenced salmon farms, all operated by MOWI; these are shown in Figure 2.

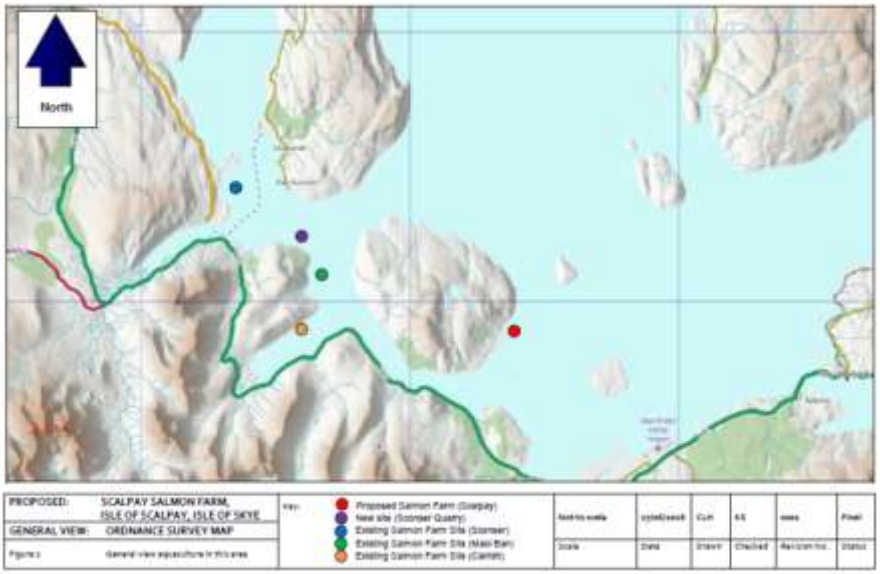


Figure 2, locations of MOWI salmon farms within the area covered by the Loch Ainort, Caol Mor and the Inner Sound. This map is taken from the EMP document.

Following development of the MOWI Scalpay farm, it was agreed that in addition to wild fish monitoring of sites by the Isle of Skye, wild fish should be monitored at Applecross on the mainland.

This was following projections from the sea lice dispersal model submitted by MOWI, in support of the planning application for the Scalpay salmon farm, that the waters around Applecross would be an area where infective stage sea lice could be expected to be present in highest densities within the sea (Figure 3).

This current report describes activities carried out to monitor wild fish at Applecross in 2024.

Figure 3. Reproduced from Figure 1 from Gillibrand (2019) Modelling the Dispersal of Sea Lice Larvae from Scalpay Salmon Farm. MOWI Scotland Ltd. Note the location of the modelled sea lice 'hotspot', just 5km to the west of Applecross, shown thus: ■ **A**.

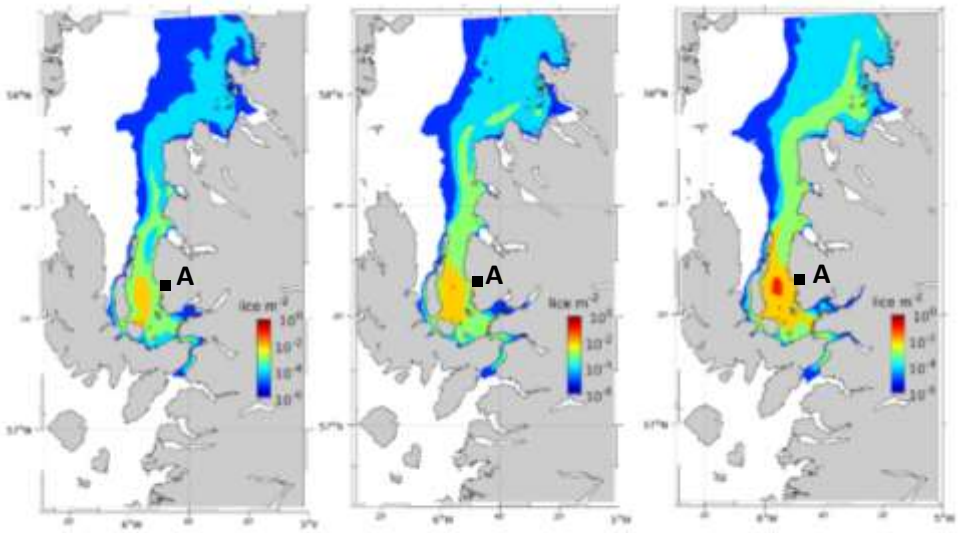


Figure 1. Predicted mean lice density (lice m^{-2}) for April – June from Simulation 1 (Scalpay only) with average adult female lice count of 0.2 (left), 0.5 (middle) and 1.0 (right). Note that the colour scale is logarithmic, indicating orders of magnitude of density, with a highest value of 1 copepodid per m^2.

1.2 Monitoring lice infestation on wild salmonids for Loch Ainort, Caol Mor and the Inner Sound EMP

The EMP states that 'The key element of the monitoring strategy will be a programme of wild fish monitoring to measure levels of sea lice infection pressure on wild salmonids in coastal waters. The monitoring programme should be designed to detect the potential effect (if any) of aquaculture on the local wild fisheries within a zone of 30 kilometres from the Management Area.'

'Given the relative lack of knowledge of the distribution of migrating salmon smolts in coastal waters, it is recognised that the monitoring programme should be designed with the focus on the sampling of juvenile sea trout as a surrogate means of assessing sea lice infestation pressure.'

There are four wild fish monitoring sites for wild fish for the purposes of informing the Loch Ainort, Caol Mor and the Inner Sound EMP. These are listed in Table 1.

Table 1 Monitoring sites for wild fish within the Loch Ainort, Caol Mor and the Inner Sound EMP area.

Freshwater Catchment	Marine Loch	Trust area
River Sligachan	Loch Slapin	S&LRT
River Snizort	Loch Snizort	S&LRT
River Strath Mor	Loch Sligachan	S&LRT
Applecross River	Inner Sound	Wester Ross FT

In 2022, for the purposes of informing the EMP, MOWI commissioned WRFT to sample sea trout in the Applecross River to gain data to complement that collected by Skye and Lochalsh River Trust by the Isle of Skye. In 2024, WRFT sampled sea trout in the Applecross estuary in May, June, July and September and carried out a juvenile fish survey of sites in the Applecross River using electro-fishing equipment in September.

2. Monitoring sea trout at Applecross

2.1 Previous wild fish monitoring at Applecross

In 2022, the WRFT sea trout monitoring team visited on four occasions to sample sea trout for the EMP. Altogether, only 16 trout were recorded from which sea lice data was obtained. Only two of these were caught using the seine net in the sea or in sea pools of the river; the other 14 were caught from the sea pools using rod and line by anglers using a small size 12 teal and blue fly with crimped barb. A report was prepared (Cunningham, 2022a) in which the challenges of obtaining sea trout samples in 2022 are discussed and results are presented.

In 2023, the WRFT sweep netting team organised five visits to Applecross to sample sea trout, catching sea trout on four out of five occasions in the sea pool of the Applecross River, with a total of 140 sea trout caught.

Table 2: Sea trout monitoring days at Applecross in 2023

Visit	Date	Methods used	Number of trout processed
#1	25th May 2023	Seine net sea pool of river	42
#2	21st June 2023	Seine net sea pool of river	30
#3	19th July 2023	Seine net sea pool of river	33
#4	16th August 2023	Seine net sea pool of river	36
#5	27th September 2023	Seine net sea pool of river	0

In 2023, lice levels were very high on sea trout of over 200mm sampled in May (average 138 lice per fish; 0.43 lice per gram of fish) and high in June (average 34 lice per fish; 0.27 lice per gram of fish). Lice levels were much lower on most fish in samples taken in July and August 2023 (averages of 0.09 and 0.07 lice per gram of fish respectively). All the lice recorded in May 2023, and nearly all recorded in June were small chalimus stage lice, indicative of recent attachment.

2.2 Monitoring of wild fish at Applecross in 2024

The WRFT sea trout sampling team organised four visits to Applecross in 2024, following the same method that had been successful in 2023. Each visit again focussed on using a seine net, and a sampling team which included experienced snorkellers to man-handle the lead line of the seine net over the riverbed of the sea pool where there were many stones that snagged the net and would otherwise made netting ineffective.

The net used was approx. 47m x 3m of mesh size 14mm knot to knot was used with floats on top and lead weighted line on bottom.

On each occasion the minimum team size was 5 people, comprising two or more from WRFT (setting off in the morning from Gairloch) and remaining team members from the Applecross area including Applecross Trust staff.

All fish caught were transferred to a tub. Fish were lightly sedated using anaesthetic (eugenol). The length (in mm), weight (to nearest 5g) and records of the following were noted: numbers of sea lice (three categories of *Lepeophtheirus salmonis*; check for adult *Caligus elongatus*), dorsal fin damage score (0 [no damage] – 3 [over 2/3 of dorsal fin eroded away]), predator damage, and 'black spots' (*Cryptocotyle lingua*) spots per cm^2 of caudal fin. Scale samples and photos were taken. All fish were returned to the river following recovery.

Sampling days are listed in Table 2. A planned sweep for August 2024 was cancelled due to high river level.

Table 2: Sea trout monitoring days at Applecross in 2024

Visit	Date	Methods used	Number of trout processed
#1	29th May 2024	Seine net sea pool of river	1
#2	25th June 2024	Seine net sea pool of river	35
#3	24th July 2024	Seine net sea pool of river	29
#4	23rd September 2024	Seine net sea pool of river	24

2.3 Sea lice monitoring results

Results are presented in Tables 3a-3d.

Altogether 89 sea trout were processed, one fish in May, 35 fish in June, 29 fish in July and 22 fish in September.

On 29th May 2024 (Table 3a), just one trout was caught and processed; this fish carried 6 lice. Three other small sea trout were seen.

On 25th June 2024 (Table 3b), 35 sea trout were processed. These fish were from 160 to 390mm in size, a mix of post smolt sea trout and some older sea trout. Lice levels were low, most fish carried less than 10 lice. Some of the larger fish had damaged but healed dorsal fins associated with lice infestation, probably in 2023. The projected lice related mortality score was less than 5% for this sample using the Taranger et al 2014 formula.

On 24th July 2024, 29 sea trout were processed (two other trout were listed as brown trout). Lice levels were high on two of the fish, and moderate on six other fish; giving a projected lice related mortality score of 21% using the Taranger et al 2014 formula.

There was much rain in August and the river was too high to be able to sample sea trout on our planned day.

On 23rd September 2024, 21 sea trout were processed. Lice levels were low; only one fish had more than 10 lice, with a zero score for lice related mortality. However, many of the fish, mostly post-smolts (or finnock) had damaged dorsal fins associated with sea lice infestation earlier in the year. This sample also included two brown trout and a thin adult salmon (grilse) of 535 mm.

Table 3a ***Data recorded for sea trout sampled at Applecross in 2024****. All fish taken in the sea pool of the Applecross River using a seine net by WRFT team.*

Details of lice stages, dorsal fin damage, predator damage and *Cryptocotyle lingua* spots on caudal fin on sea trout sampled at Applecross in summer 2024. Including calculation for projected mortality based on method described by Taranger *et al* 2014 and adopted by Fisheries Management Scotland for analyses of Scottish Government funded sweep netting within the West of Scotland in 2022. Legend and further explanation of colour scheme can be found on next page.

Sample #1: 29th May 2024.

				Caligus	*Lepeophtheirus salmonis*																			
Sea trout no.	length (mm)	weight (g)	condition factor	total	Copepodid & Chalimus (estimate)	Pre-adult & adult	Ov. female	Total L. salmonis sea lice	*estimated lice/g fish weight	Dorsal fin damage	*Cryptocotyle ligua spots per cm2 of caudal fin*	Predator damage	Photo	scale sample?	Comments	≥13 lice/fish?	Lice/g fish weight	Range	Mortality category	Number of fish in category	Total number of fish in sample	% of sample in category	projected mortality for category %	projected mortality of fish in sample %
1	170	46	0.94	0	4	2	0	**6**	0.130	0	0	Y	Y	y	bird damaged caudal fin	No	0.130	>0.3	100%	0	1	0.00	0.00	
																		0.2-0.3	50%	0		0.00	0.00	
																		0.1-0.2	20%	1		100.00	20.00	
																		<0.1	0%	0		0.00	0.00	**20.00**
Averages	**170.00**	**46.00**	**0.94**	**0.00**	**4.00**	**2.00**	**0.00**	**6.00**	**0.13**	**0.00**	**0.00**													

Explanation (for Table 3a – 3d):

Dorsal fin damage score: '1' is for up to 1/3 of fin damaged; '2' is for >1/3 an <2/3 of fin damaged; '3' is for over 2/3 of dorsal fin damaged
Estimation of projected mortality or early return to freshwater from Taranger et al 2014:

Notes:

based on the assumption that small salmonid post-smolts (<150g body weight) will suffer 100% lice-related marine mortality, or return prematurely to freshwater for sea trout in the wild if the are infected with >0.3 lice per g of fish weight.
Furthermore, the lice related marine mortality is estmated to 50%, if the infection is between 0.2 and 0.3 lice per g fish weight, 20% if the infection rate is between 0.1 and 0.2 lice per g fish weight, and finally 0% if the salmon lice infection is <0.1 g fish weight.

0.05 and 0.1 lice per g fish weight, 20% for lice infections between 0.05 and 0.01 lice per g fish weight, and finally 0% if the salmon lice infection is <0.01 lice g fish weight.

colour code

Taranger, G. L., Karlsen, Ø., Bannister, R. J., Glover, K. A., Husa,V., Karlsbakk, E., Kvamme, B. O., Boxaspen, K. K., Bjørn, P. A., Finstad, B., Madhun, A. S., Morton, H. C., and Sva˚sand, T. (2014) Risk assessment of the environmental impact of Norwegian Atlantic salmon farming. – ICES Journal of Marine Science, doi: 10.1093/icesjms/fsu132.
https://www.researchgate.net/publication/266672998_Risk_assessment_of_the_environmental_impact_of_Norwegian_Atlantic_salmon_farming

100% sea lice related mortality or early return to freshwater
>50% to 99% sea lice related mortality or early return to freshwater
>20% to 50% sea lice related mortality or early return to freshwater

Table 3b ***Data recorded for sea trout sampled at Applecross in 2024****. All fish taken in the sea pool of the Applecross River using a seine net by WRFT team.*

Sample #2: 25th June 2024

				Caligus	*Lepeophtheirus salmonis*																			
Sea trout no.	length (mm)	weight (g)	condition factor	total	Copepodid & Chalimus (estimate)	Pre-adult & adult	Ov. female	Total L. salmonis sea lice	*estimated lice/g fish weight	Dorsal fin damage	*Cryptocotyle ligua* spots per cm2 of caudal fin	Predator damage	Photo	scale sample?	Comments	≥13 lice/fish ?	Lice/g fish weight	Range	Mortality category	Number of fish in category	Total number of fish in sample	% of sample in category	projected mortality for category %	projected mortality of fish in sample %
1	217	102	1.00	0	5	4	1	**10**	0.098	0.0	3	N	Y	y		No	0.098	>0.3	100%	0	38	0.00	0.00	
2	185	65	1.03	0	2	4	0	**6**	0.092	0.0	1	N	Y	y		No	0.092	0.2-0.3	50%	2		5.26	2.63	
3	182	55	0.91	0	1	3	0	**4**	0.073	0.0	1	N	Y	y	lice spot scars	No	0.073	0.1-0.2	20%	4		10.53	2.11	
4	201	81	1.00	0	3	5	4	**12**	0.148	0.0	6	N	Y	y		No	0.148	<0.1	0%	32		84.21	0.00	**4.74**
5	217	95	0.93	0	2	4	1	**7**	0.074	0.5	1	Y	Y	y	bird beak	No	0.074							
6	250	138	0.88	0	4	5	0	**9**	0.065	1.0	0	N	Y	y	deformed caudal fin stocked	No	0.065							
7	223	120	1.08	0	1	4	0	**5**	0.042	0.0	1	N	Y	y		No	0.042							
8	225	113	0.99	0	3	6	2	**11**	0.097	0.5	5	N	Y	y	lice damage	No	0.097							
9	215	95	0.96	0	3	3	1	**7**	0.074	1.0	1	N	Y	y	torn dorsal fin	No	0.074							
10	246	152	1.02	0	0	1	0	**1**	0.007	1.0	2	Y	Y	y	bird beak	No	0.007							
11	182	51	0.85	0	0	3	1	**4**	0.078	0.0	3	N	Y	y	damaged tail	No	0.078							
12	199	88	1.12	0	4	5	0	**9**	0.102	0.5	0	N	Y	y		No	0.102							
13	202	86	1.04	0	2	4	0	**6**	0.070	1.0	1	N	Y	y		No	0.070							
14	220	107	1.00	0	0	7	0	**7**	0.065	1.0	2	N	Y	y		No	0.065							
15	179	58	1.01	0	6	7	1	**14**	0.241	1.0	3	N	Y	y		Yes	0.241							
16	190	70	1.02	0	2	2	1	**5**	0.071	0.0	1	N	Y	y		No	0.071							
17	180	58	0.99	0	0	0	0	**0**	0.000	0.5	0	N	Y	y		No	0.000							
18	200	82	1.03	0	12	5	0	**17**	0.207	1.0	1	N	Y	y		Yes	0.207							
19	200	76	0.95	0	1	6	0	**7**	0.092	0.5	1	N	Y	y	slightly torn tail	No	0.092							
20	191	67	0.96	0	3	5	0	**8**	0.119	0.0	1	N	Y	y		No	0.119							
21	161	42	1.01	0	1	2	0	**3**	0.071	0.0	0	N	Y	y		No	0.071							
22	163	47	1.09	0	2	2	0	**4**	0.085	0.0	1	N	Y	y		No	0.085							
23	201	82	1.01	0	2	7	0	**9**	0.110	0.5	0	N	Y	y		No	0.110							
24	335	425	1.13	0	7	1	2	**10**	0.024	0.5	10	N	Y	y		No	0.024							
25	318	370	1.15	0	0	2	0	**2**	0.005	0.0	0	N	Y	y		No	0.005							
26	390	590	0.99	0	5	4	0	**9**	0.015	2.0	2	N	Y	y	Acanthacephalus; lice off	No	0.015							
27	320	370	1.13	0	4	6	0	**10**	0.027	2.5	2	N	Y	y		No	0.027							
28	215	93	0.94	0	4	2	0	**6**	0.065	0.5	2	N	Y	y		No	0.065							
29	285	220	0.95	0	0	12	0	**12**	0.055	2.0	2	N	Y	y		No	0.055							
30	233	117	0.92	0	1	3	1	**5**	0.043	1.0	2	N	Y	y		No	0.043							
31	190	60	0.87	0	1	1	0	**2**	0.033	0.0	2	N	Y	y	thin	No	0.033							
32	215	100	1.01	0	0	1	0	**1**	0.010	0.5	3	Y	Y	y	healed damage	No	0.010							
33	200	85	1.06	0	1	0	0	**1**	0.012	0.5	1	N	Y	y		No	0.012							
34	183	69	1.13	0	0	0	0	**0**	0.000	0.5	0	N	Y	y	scarring on back	No	0.000							
35	220	110	1.03	0	0	5	0	**5**	0.045	1.0	3	N	Y	y		No	0.045							
Averages	**220.94**	**129.69**	**1.01**	**0.00**	**2.34**	**3.74**	**0.43**	**6.51**	**0.07**	**0.60**	**1.83**													

Table 3c ***Data recorded for sea trout sampled at Applecross in 2024****. All fish taken in the sea pool of the Applecross River using a seine net by WRFT team.*

Sample #3: 24th July 2024

				Caligus	*Lepeophtheirus salmonis*																	
Sea trout no.	**length (mm)**	**weight (g)**	**condition factor**	**total**	**Copepodid & Chalimus (estimate)**	**Pre-adult & adult**	**Ov. female**	**Total L. salmonis sea lice**	***estimated lice/g fish weight**	**Dorsal fin damage**	***Cryptocotyle ligua spots per cm2 of caudal fin***	**Predator damage**	**Photo**	**scale sample?**	**Comments**	**≥13 lice/fish?**	**Lice/g fish weight**	**Range**	**Mortality category**	**Number of fish in category**	**Total number of fish in sample**	**% of sample in category**	**projected mortality for category %**	**projected mortality of fish in sample %**
1	360	591	1.27	0	50	4	0	**54**	0.091	2.0	0	Y	Y	y	split tail	Yes	0.091	>0.3	100%	2	31	6.45	6.45	
2	171	59	1.18	0	0	0	0	**0**	0.000	0.0	2	N	Y	y	thin	No	0.000	0.2-0.3	50%	7		22.58	11.29	
3	263	198	1.09	0	16	7	0	**23**	0.116	2.0	1	Y	Y	y	photos of dorsal fin; old damage	Yes	0.116	0.1-0.2	20%	5		16.13	3.23	
4	220	108	1.01	0	60	2	4	**66**	0.611	2.0	1	N	Y	y	photos of lice	Yes	0.611	<0.1	0%	17		54.84	0.00	**20.97**
5	291	294	1.19	0	0	1	0	**1**	0.003	0.2	1	N	Y	y	darker	No	0.003							
6	222	100	0.91	0	0	0	0	**0**	0.000	2.0	2	N	Y	y	lice off	No	0.000							
7	372	540	1.05	0	0	3	0	**3**	0.006	1.5	0	Y	Y	y	lice off, photo of pred damage right flank	No	0.006							
8	215	103	1.04	0	12	5	2	**19**	0.184	2.0	1	N	Y	y	photo of dorsal fin	Yes	0.184							
9	240	135	0.98	0	0	0	0	**0**	0.000	1.0	2	N	Y	y	lice off	No	0.000							
10	250	150	0.96	0	15	2	3	**20**	0.133	2.0	4	N	Y	y	stock fish photo of tail fin	Yes	0.133							
11	204	89	1.05	0	8	7	0	**15**	0.169	1.0	3	N	Y	y	thin	Yes	0.169							
12	247	170	1.13	0	20	12	3	**35**	0.206	1.0	2	N	Y	y	old predator damage	Yes	0.206							
13	260	210	1.19	0	4	8	1	**13**	0.062	2.0	1	Y	Y	y	split tail	Yes	0.062							
14	201	74	0.91	0	0	0	0	**0**	0.000	0.5	0	N	Y	y	thin, lice off, pink dorsal fin	No	0.000							
15	216	108	1.07	0	0	1	0	**1**	0.009	0.5	3	N	Y	y	lice off	No	0.009							
16	247	180	1.19	0	60	30	3	**93**	0.517	2.0	5	N	Y	y	photos of lice on operculum etc	Yes	0.517							
17	220	114	1.07	0	8	21	5	**34**	0.298	2.0	2	N	Y	y	thin extensive lice damage	Yes	0.298							
18	165	44	0.98	0	0	0	1	**1**	0.023	0.0	0	N	Y	y	thin	No	0.023							
19	220	100	0.94	0	0	0	0	**0**	0.000	1.0	2	N	Y	y	lice off thin	No	0.000							
20	170	52	1.06	0	0	1	0	**1**	0.019	0.0	0	N	Y	y		No	0.019							
21	223	112	1.01	0	18	8	1	**27**	0.241	1.0	4	N	Y	y		Yes	0.241							
22	217	102	1.00	0	19	3	2	**24**	0.235	2.0	1	N	Y	y		Yes	0.235							
23	244	165	1.14	0	7	18	0	**25**	0.152	1.0	2	Y	Y	y	old predator damage	Yes	0.152							
24	240	154	1.11	0	6	7	1	**14**	0.091	1.0	2	N	Y	y		Yes	0.091							
25	239	152	1.11	0	17	12	2	**31**	0.204	1.5	2	y	Y	y	split fin	Yes	0.204							
26	180	51	0.87	0	0	0	0	**0**	0.000	0.0	0	Y	Y	y	old predator damage. Very thin	No	0.000							
27	233	137	1.08	0	25	3	1	**29**	0.212	1.5	1	N	Y	y	lice off	Yes	0.212							
28	224	117	1.04	0	2	1	0	**3**	0.026	0.5	1	N	Y	y	lice off	No	0.026							
29	240	168	1.22	0	35	3	0	**38**	0.226	2.0	1	N	Y	y	deformed dorsal fin ?stockie	Yes	0.226							
Averages	**254**	**239**	**1.14**	**0**	**32**	**3**	**1**	**35.75**	**0.20**	**1.5**	**1**													
brn trout	168	54	1.14	0	0	1	0	**1**	0.019	0.0	0	N	Y	y		No	0.019							
brn trout	175	61	1.14	0	0	0	0	**0**	0.000	0.0	0	N	Y	y		No	0.000							

Table 3d ***Data recorded for sea trout sampled at Applecross in 2023****. All fish taken in the sea pool of the Applecross River using a seine net by WRFT team (cont.)*

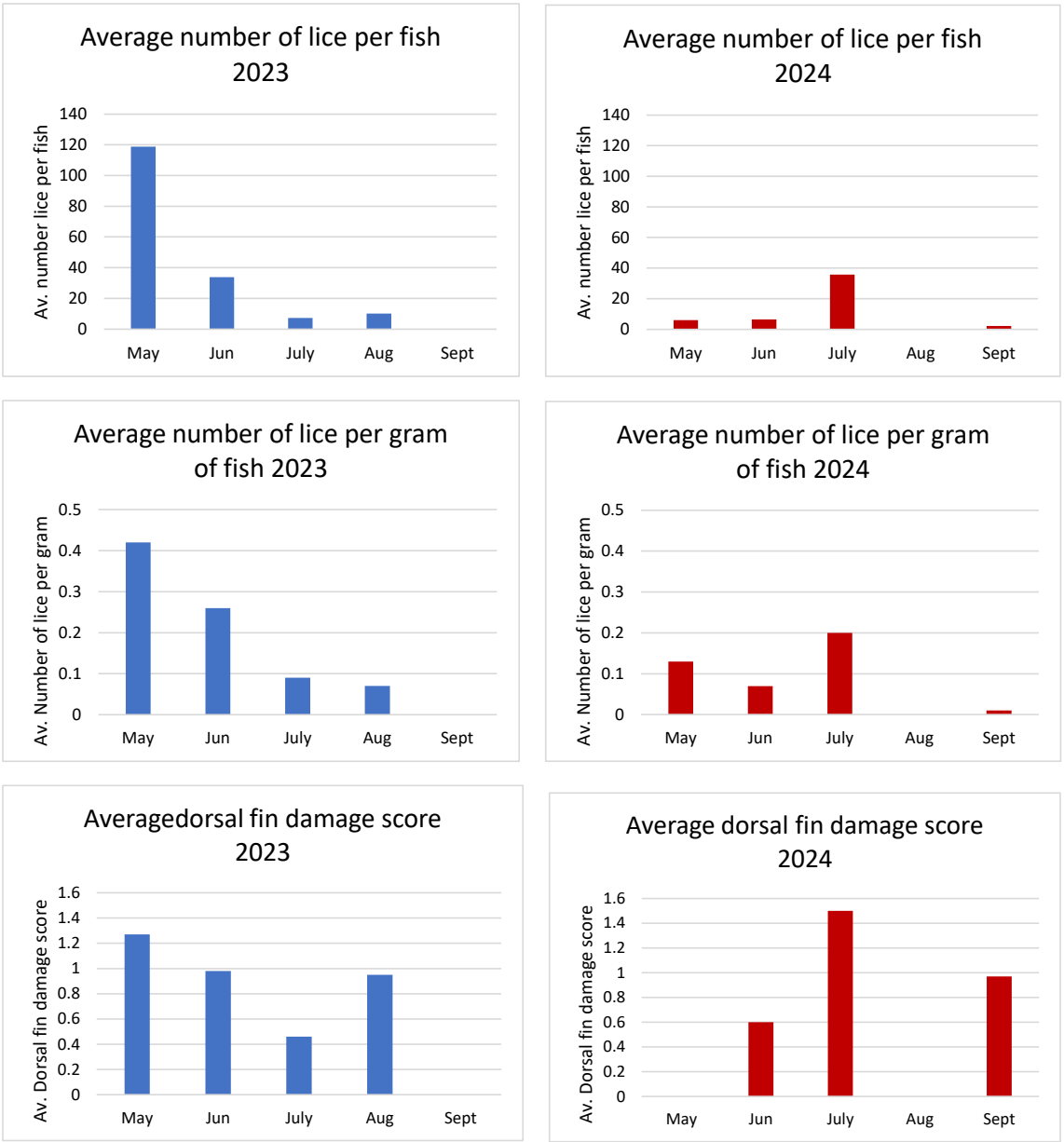
Sample #4: 23rd September 2024

				Caligus	*Lepeophtheirus salmonis*																		
Sea trout no	length (mm)	weight (g)	condition factor	total	Copepodid & Chalimus (estimate)	Pre-adult & adult	Ov. female	Total L. salmonis sea lice	*estimated lice/g fish weight	Dorsal fin damage	*Cryptocotyle ligua spots per cm2 of caudal fin*	Predator damage	Photo	scale sample?	Comments	≥13 lice/fish?	Lice/g fish weight	Range	Mortality category	Number of fish in category	Total number of fish in sample	% of sample in category	projected mortality for category %	projected mortality of fish in sample %
1	285	237	1.02	0	4	2	0	**6**	0.025	2.0	2	N	Y	y	ragged	No	0.025	>0.3	100%	0	24	0.00	0.00	
2	280	225	1.02	0	0	1	0	**1**	0.004	0.5	0	N	Y	y		No	0.004	0.2-0.3	50%	0		0.00	0.00	
3	275	190	0.91	0	0	0	0	**0**	0.000	0.2	1	N	Y	y		No	0.000	0.1-0.2	20%	0		0.00	0.00	
4	315	296	0.95	0	0	0	0	**0**	0.000	2.0	1	N	Y	y	quite thin	No	0.000	<0.1	0%	24		100.00	0.00	**0.00**
5	290	245	1.00	0	0	0	0	**0**	0.000	1.0	1	N	Y	y	silvery finnock	No	0.000							
6	273	202	0.99	0	0	0	0	**0**	0.000	0.5	1	N	Y	y		No	0.000							
7	255	153	0.92	0	0	0	0	**0**	0.000	0.5	1	y	Y	y	old bird beak damage	No	0.000							
8	265	180	0.97	0	13	2	0	**15**	0.083	1.0	3	y	Y	y	photo dsl fin; pred damage healed	Yes	0.083							
9	275	200	0.96	0	0	0	0	**0**	0.000	0.2	2	N	Y	y		No	0.000							
10	233	120	0.95	0	0	0	0	**0**	0.000	0.2	0	y	Y	y	predator damage healed	No	0.000							
11	222	101	0.92	0	0	0	0	**0**	0.000	0.2	4	N	Y	y		No	0.000							
12	383	610	1.09	0	0	3	0	**3**	0.005	1.0	0	N	Y	y		No	0.005							
13	273	199	0.98	0	1	1	0	**2**	0.010	0.5	2	N	Y	y		No	0.010							
14	264	195	1.06	0	2	5	0	**7**	0.036	2.0	3	N	Y	y	Badly damaged	No	0.036							
15	335	395	1.05	0	0	1	0	**1**	0.003	2.0	1	N	Y	y	?Mature female sea trout	No	0.003							
16	273	222	1.09	0	5	1	0	**6**	0.027	1.0	2	N	Y	y		No	0.027							
17	262	185	1.03	0	1	3	0	**4**	0.022	2.0	3	N	Y	y		No	0.022							
18	270	190	0.97	0	0	0	0	**0**	0.000	1.0	0	N	Y	y		No	0.000							
19	235	120	0.92	0	1	0	0	**1**	0.008	1.0	1	N	Y	y		No	0.008							
20	262	168	0.93	0	1	0	0	**1**	0.006	1.0	1	y	Y	y	predator damage healed	No	0.006							
21	205	87	1.01	0	0	0	0	**0**	0.000	0.5	1	N	Y	y		No	0.000							
Averages	**272.86**	**215.24**	**0.99**	**0.00**	**1.33**	**0.90**	**0.00**	**2.24**	**0.01**	**0.97**	**1.43**													
Brn trout	335	382	1.02	0	0	0	0	**0**	0.000	0.0	0	N	Y	y	brown trout	No	0.000							
Brn trout	238	120	0.89	0	0	0	0	**0**	0.000	0.2	0	y	Y	y	predator damage healed	No	0.000							
Salmon	535	1340	0.88	0	0	0	0	**0**	0.000	0.0	0	y	Y	y	Thin, tatty, red vent, wild ?male	No	0.000							

2.4 Sea lice monitoring discussion

Sampling at Applecross in 2024 was again successful so far as being able to assess levels of sea lice infestation levels of sea trout and associated damage. Figure 4 contrasts the results for samples of sea trout taken in 2023 with those taken in 2024.

Figure 4. Summary graphs for sea lice counts and associated damage for samples of sea trout taken at Applecross in 2023 compared to 2024.



In contrast to 2023, lice levels were low on the sea trout sampled in May (just one fish) and June (34 fish) 2024. All measures indicate that lice infestation pressure of sea trout in June 2024 was less than in in 2024.

However, the July 2024 sample was more licey than the July 2023 sample, with many fish in the July 2024 sample carrying high burdens of lice and / or showing signs of associated damage to their dorsal fin.

This suggests an increase in lice infestation pressure in nearby water in early summer of 2024. No sample was possible in August 2024 to compare with August 2023. The fish taken in the September 2024 sample carried few lice; however, many of the sea trout had dorsal fin damage indicative of infestation by high numbers of lice earlier in the year.

All the fish in both years were taken in the sea pool of the Applecross River, just after high tide. The tide only reaches this pool in spring tides. Therefore fish which remain here are likely to be sitting in freshwater most of the time, unless they follow the tide in and out.

Thus, this sampling site is a place where sea trout experiencing discomfort from sea louse infestation may 'return early' too, where they can rid themselves of sea lice. Early-stage *L. salmonis* lice may detach from sea trout in freshwater after a few days (Wright et al, 2016); for larger mobile lice this can take up to two weeks.

So many of the trout in both years may have been early-returned fish; sea trout that had moved into freshwater because they were in discomfort from sea lice infestation.

Table 4 provides some data for reported sea lice counts on farms in the area for spring – summer 2024.

Table 4. Reported adult female sea lice counts and reported monthly biomass figures from Scotland Aquaculture website (http://aquaculture.scotland.go.uk/). Figures highlighted in bold and in pink suggest multiple potential sources of larval sea lice.

Reported adult female sea lice figures (from Scotland's Aquaculture website)														
Site	Portree	Potree Outer	Sconser Quary	Maol Ban	Cairaidh	Scalpay	Loch Alsh	Ardintoul	Loch Duich	Kishorn West	Kishorn A	Kishorn B	West Strome	Sgeir Dughall
Company	Bakkafrost	Bakkafrost	MOWI	MOWI	MOWI	MOWI	MOWI	MOWI	MOWI	SSF	SSF	SSF	Bakkfrost	Bakkfrost
Distance to Applecross (km approx)	30	30	19	23	20	18	22	26	31	17	21	24	26	26
Week (2024)														
38 (Sep)	fallow	fallow	**0.64**	0	0.02	0.1	**0.47**	fallow	0	fallow	fallow	fallow	0	fallow
37 (Sep)	fallow	fallow	**0.58**	0.28	**1.75**	0.12	**0.46**	fallow	0	fallow	fallow	fallow	0	fallow
36 (Sep)	fallow	fallow	**0.71**	**0.88**	**1.62**	0.11	**0.32**	fallow	0	fallow	fallow	fallow	0	fallow
35 (Aug)	fallow	fallow	**1.01**	**0.95**	**0.9**	0.11	**0.34**	fallow	0	fallow	fallow	fallow	0	fallow
34 (Aug)	fallow	fallow	**1.02**	**0.29**	0.15	0.2	0.26	fallow	0	fallow	fallow	fallow	fallow	fallow
33 (Aug)	fallow	fallow	**0.84**	**0.43**	0.03	0.15	fallow	fallow	0	fallow	fallow	fallow	fallow	fallow
32 (Aug)	fallow	fallow	0.221429	0.09	0.033333	0.225	fallow	fallow	fallow	fallow	fallow	fallow	fallow	fallow
31 (July)	fallow	fallow	0.16	0.03	0.01	0.11	fallow	fallow	fallow	fallow	fallow	fallow	fallow	fallow
30 (July)	fallow	fallow	0.04	**0.54**	0.28	0.09	fallow	fallow	fallow	fallow	fallow	fallow	fallow	fallow
29 (July)	fallow	fallow	0.01	0.19	0.28	0.05	fallow	fallow	fallow	fallow	fallow	fallow	fallow	fallow
28 (July)	fallow	fallow	0.01	0.28	0.23	0.04	fallow	fallow	fallow	fallow	fallow	fallow	fallow	fallow
27 (July)	fallow	fallow	0.17	0.29	0.12	0.01	fallow	fallow	fallow	fallow	fallow	fallow	fallow	fallow
26 (June)	fallow	fallow	0.125	0.164706	0.029412	0.02	withdraw	withdraw	withdraw	fallow	fallow	fallow	fallow	fallow
25 (June)	fallow	fallow	0.18	0.14	0.1	0.01	withdraw	withdraw	withdraw	fallow	fallow	fallow	fallow	fallow
24 (June)	fallow	fallow	0.11	0.05	0	0.03	withdraw	withdraw	withdraw	fallow	fallow	fallow	fallow	fallow
23 (June)	fallow	fallow	0.18	0.03	0	0.06	0.4	withdraw	withdraw	fallow	fallow	fallow	fallow	fallow
22 (June)	fallow	fallow	0.03	0.00	fallow	0.01	**0.41**	**0.2**	**0.40**	fallow	fallow	fallow	fallow	fallow
21 (May)	fallow	fallow	0.05	0	fallow	0	**0.47**	**0.32**	**0.40**	fallow	fallow	fallow	fallow	fallow
20 (May)	fallow	fallow	0.03	0	fallow	0	**0.48**	**0.34**	**0.40**	fallow	fallow	fallow	fallow	fallow
19 (May)	fallow	fallow	0.08	0	fallow	0	**0.48**	**0.37**	**0.40**	fallow	fallow	fallow	fallow	fallow
18 (May)	withdraw	fallow	0.02	0	fallow	0	**0.35**	**0.36**	0.3	fallow	fallow	fallow	fallow	fallow
17 (April)	0.4	fallow	0	fallow	fallow	0	**0.19**	**0.32**	0.12	fallow	fallow	fallow	fallow	fallow
16 (April)	0.4	fallow	fallow	fallow	fallow	0	0.08	0.31	0.2	fallow	fallow	fallow	fallow	fallow
15 (April)	0.37	fallow	fallow	fallow	fallow	falllow	0.07	0.32	0.17	fallow	fallow	fallow	fallow	fallow
14 (April)	0.33	fallow	fallow	fallow	fallow	falllow	0.08	0.36	0.12	fallow	fallow	fallow	fallow	fallow
Reported monthly biomass (tonnes)														
Sept	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Aug	?	?	?	?	?	?	?	?	?	?	?	?	?	?
July	?	?	?	?	?	?	?	?	?	?	?	?	?	?
June	0	0	1749	633	366	310	**1479**	**917**	1381	0	0	0	0	0
May	0	0	1498	483	0	186	**1984**	**2497**	1581	0	0	0	0	0
April	544	0	457	0	0	115	**2219**	**2453**	1599	0	0	0	0	0
March	545	0	0	472	0	0	2182	2099	2094	0	0	0	945	0
February	966	334	575	826	0	0	2059	1928	2112	0	0	0	1529	0
http://aquaculture.scotland.gov.uk/														

In contrast to 2023, biomass and reported sea lice level on farms in the east of Skye early in Spring 2023 were low. This correlates with low numbers of lice reported on sea trout at Applecross in May and June 2024.

Possible origins for the higher numbers of lice recorded on sea trout in the July sample include large farms in the Loch Alsh – Loch Duich area, which carried some fish until late June, and the recently restocked east of Skye farms. Salmon farms in the Loch Kishorn area were fallow throughout this period.

At the time of writing (November 2024), SEPA has indicated that salmon farms in this area may be a focus for the introduction of a new monitoring programme to inform regulation of sea lice on salmon farms to protect wild fish. Up to date on farm fish numbers can help with understanding likely sources and sinks for sea lice within the area.

2.5. Conclusions and implications for wild salmon populations

The WRFT sea trout sampling team were again successful in obtaining large samples of sea trout at Applecross in 2024. All fish were taken using a seine net from the sea pool of the Applecross River.

In May and June 2024, burdens of small early-stage chalimus sea lice were lower than at the same time in 2023. However, lice counts were higher in July 2024 than in July 2023. Many fish sampled in September 2024 had damaged dorsal fins indicating that lice had been shed prior to being sampled.

Consequences for wild salmon populations

It is important to be able to understand the risk to wild salmon populations. Research in Norway[1] (Vollset *et al*, 2017) has clarified relationships between lice levels on sea trout and on post-smolt salmon migrating nearby. It is beyond the scope of this report to provide a prediction of % mortality for post-smolt salmon migrating through the Inner Sound; however, by following Vollset et al (2017), such an estimate could be made using data provided here and from sampling sites on the east of Skye.

The 2023 Applecross Sea trout monitoring report (Cunningham, 2023) considered the implications of high lice counts on sea trout Applecross in May and June 2023 for post-smolt salmon migrating through nearby waters; and predicted that mortality could be high, with few grisle returning to nearby rivers in 2024. For post-smolt salmon migrating through the Inner Sound, the lower burdens of lice on sea trout in May and June 2024 compared to same months in 2023 would suggest lower sea lice infestation pressure.

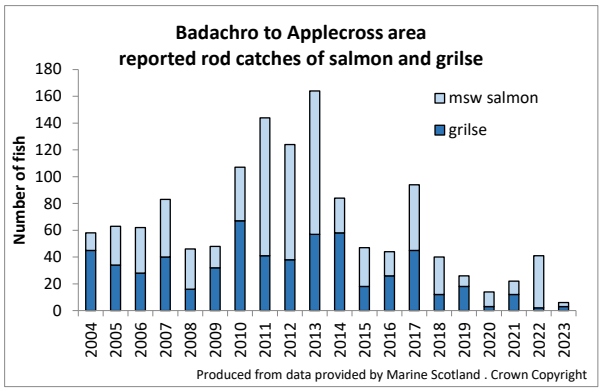
A relationship between salmon catches in the River Carron and nearby salmon farm production cycles was discussed in the SWRFT Review 2018 (Cunningham et al 2018). Subsequently sea lice infestation pressures in the wider area may have increased as a consequence of increases in overall levels of farm salmon production within the East of Skye – Loch Kishorn areas and with corresponding increases in larval sea lice emissions, leading to even greater mortality of post-smolt salmon from the River Carron, so fewer returning salmon and lower rod catches (Figure 5).

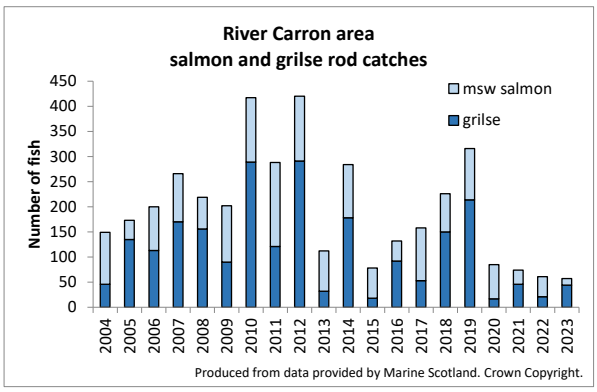
Did the reported rod catch of grilse and MSW salmon for the River Carron in 2024 follow the same pattern as for other previous recent years? Is this relationship statistically significant?

Will 2025 be a better grilse year for anglers fishing the River Carron than 2024?

[1] Vollset et al (2017) Salmon lice infestation on sea trout predicts infestation on migrating salmon post-smolts https://academic.oup.com/icesjms/article/74/9/2354/3860036

Figure 5. Reported rod catch graphs for the Rivers in the Badachro – Applecross area and for the Kishorn-Carron area. Contrast rod catch figures for the Kishorn-Carron area (mostly River Carron rod catch) from which post-smolt salmon must swim through Loch Kishorn and the Inner Sound en-route to the open sea with those for major rivers which flow into the Wester Ross MPA.





3. Juvenile fish survey of the Applecross River

3.1 Introduction to juvenile fish survey

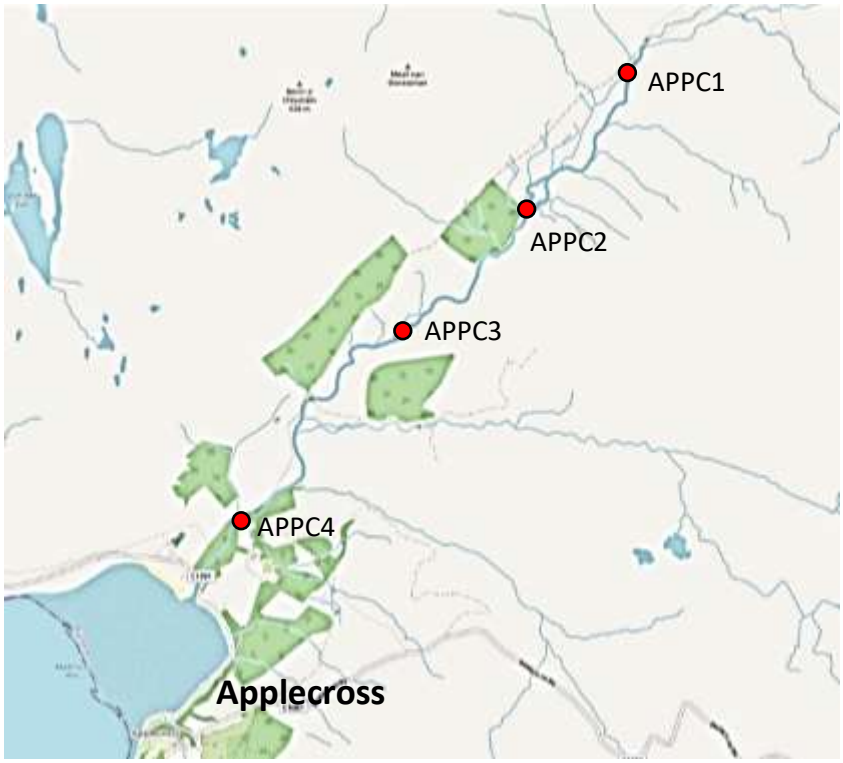
This part of the report presents the results of an electro-fishing survey of sites in the Applecross River to inform the Coal Mor EMP. The survey took place on 5th September 2024. Water levels were low and good progress was made.

The survey focussed on finding out about the distribution and abundance of juvenile salmon (*Salmo salar*), trout (*Salmo trutta*) and eel (*Anguilla anguilla*) within the mainstem Applecross River, the core area of juvenile salmon habitat within the river system.

3.2 Locations and methods

Four sites were surveyed along the main Applecross River between the top of the vehicle track and the sea as shown in Figure 6.

Figure 6. Locations of electrofishing sites surveyed on 5th September 2024. Base map OpenStreetMap thank you.



At each site, the team fished for a minimum of 10 minutes in a standardised way, covering a minimum wetted area of almost 100m^2 (one site was subsequently estimated at 97.5m^2). A one-run, semi-quantitative methodology, following Scottish Fisheries Coordination Centre [SFCC] protocol and NEPS Single Run protocol, was used to produce Catch Per Unit Effort [CPUE] data and minimum density estimates for juvenile salmon and trout.

Surveys were led by WRFT Biologist Peter Cunningham with assistance from Nic Butler, both with SFCC electrofishing qualifications. An Electrocatch backpack discharging 350-400 volts was used.

All fish were lightly sedated (in eugenol, c. clove oil), measured to the nearest mm and returned to the water following recovery. Minimum fish density estimates (in numbers of fish per $100m^2$) were obtained.

3.3 Results

A summary of results can be found in Table 5, together with some data from other recent surveys.

Fishing was effective in so far as most of the juvenile trout and juvenile salmon that were seen were caught.

Salmon

Salmon fry were recorded at all sites. Numbers (Catch Per Unit Effort [CPUE] & estimated minimum densities) were highest at sites APPC2 and APPC3 in the middle part of the river. Only one salmon fry was recorded at the top site APPC1.

Salmon fry were from 48mm to 69mm in length at the middle two sites (where they were most numerous); and 67mm to 80mm at the lowest site (APPC4) where densities were lower and feeding opportunities better.

Salmon parr (assumed to be mostly 1 year old fish) were recorded at all sites. Numbers (Catch Per Unit Effort [CPUE] & estimated minimum densities) were highest at sites APPC2 and APPC3 in the middle part of the river

Parr were from 84mm to 116mm in length at the two middle sites (APPC2 & APPC3); and slightly larger than this, 106mm to 128mm, at the top site (APPC1); and 112mm to 135mm at the bottom site (APPC4), where CPUE and estimated densities were low.

Trout

Small numbers of brown trout were recorded at all sites, at low CPUE and estimated densities.

Eels

An eel was seen at the lowest site (ACC2), but not captured for measurement. No eels were seen at the higher sites.

3.4 E-fish survey discussion

In previous years the Applecross River has been subject to a stocking programme of juvenile salmon. However, the juvenile salmon recorded in 2024 are understood to have been of wild spawned origin.

Results from the two sites in the middle section of river are indicative of a reasonably healthy juvenile salmon population in this part of the system; though estimated densities of juvenile salmon at the top and bottom site are indicative of suboptimal numbers of juvenile salmon within the river system overall.

These findings are therefore in agreement with the ‘Category 3’ conservation grading by the Scottish Government; that there have been inadequate numbers of adult salmon returning to the river in recent years to fully repopulate all available habitat with juvenile salmon.

However, some adult salmon have been entering the river and spawning, maintaining a wild salmon population; one that may be able to recover in future years, and adapt to changing environment, when conditions in the marine environment improve.

Table 5. Juvenile fish survey results for Applecross River. Sites surveyed in 2024 for EMP monitoring purposes are shown with results for surveys in 2023 and in 2017 (when sites in the headwater stream was surveyed)

Colour coding relates to Wester Ross scales of relative abundance or minimum density estimates for fish: green is for over 2 fish per minute or over 0.200 fish per m^2; yellow, for 1.00 to 1.99 fish per minute or 0.100 to 0.199 fish per m^2; orange for 0.50 to 0.99 fish per minute or 0.050 to 0.099 fish per m^2; and red for 0.01 to 0.49 fish per minute or 0.001 to 0.049 fish per m^2. Further explanation of this colour scheme can be found in Cunningham (2022b) https://www.wrft.org.uk/files/Status%20of%20Wild%20Salmon%20in%20Wester%20Ross%20Report%20for%202021v1Feb22.pdf .

Date	Site code	Site location (all Bruachaig River)	OS Grid Ref.		Conduct. (µS)	Temp. (°C)	Time fished (mins)	Wet area (approx.	Number of fish caught					Fish per minute				Minimum density (fish per m^2)				Comments
			easting	northing					sal fry	sal par	trt fry	older trout	eels	sal fry	sal par	trt fry	older trout	sal fry	sal par	trt fry	older trout	
06/09/2017	APP1	Side of main river by top of vehicle track	174812	849075	38	11.9	5	nr	**15**	**7**	0	0		**3.00**	**1.40**	0.00	0.00	**nr**	**nr**	nr	nr	probably stocked
06/09/2017	APP2	Allt Coire Attadale, right channel by island & above	176131	848662	29	11.9	11	nr	**3**	**0**	3	3	1	**0.27**	**0.00**	0.27	0.27	**nr**	**nr**	nr	nr	?wild
06/09/2017	APP3	Allt Coire Attadale, side of main channel by landslip	176850	848239	25	11.8	11	nr	**0**	**0**	3	13	2	**0.00**	**0.00**	0.27	1.18	**nr**	**nr**	nr	nr	exploratory
06/09/2017	APP4	Un-named burn, by quadbike track	175867	849397	49	12.4	4	nr	**0**	**0**	4	4		**0.00**	**0.00**	1.00	1.00	**nr**	**nr**	nr	nr	exploratory
19/07/2023	APP5	Main river about 1km upstream from Hartfield House	173351	847471	48	14.4	16	225	**16**	**13**	3	1	2	**1.00**	**0.81**	0.19	0.06	**0.07**	**0.06**	0.01	0.00	sal fry 56mm - 68mm; largest parr 182mm
27/09/2023	NEPS_03719	small burn in woods, NEPS23_03719	171736	846369	nr	nr	13	100	**0**	**0**	1	3		**0.00**	**0.00**	0.08	0.23	**0.00**	**0.00**	0.01	0.03	burn may have dried up in spring
27/09/2023	APP6	small burn top of woods edge of field	171776	846480	nr	nr	8	nr	**0**	**0**	5	2		**0.00**	**0.00**	0.63	0.25	**nr**	**nr**	nr	nr	follow up to NEPS site; slightly higher
05/09/2024	APPC1	near head of glen above humpback bridge	174760	848980			12	97	**1**	**8**	2	3	1	**0.08**	**0.67**	0.17	0.25	**0.01**	**0.08**	0.02	0.03	sal fry 67mm; sal par 106mm - 128mm
05/09/2024	APPC2	just above plantation	173991	848061	39	15.6	11	115	**18**	**17**	3	1	2	**1.64**	**1.55**	0.27	0.09	**0.16**	**0.15**	0.03	0.01	sal fry 56mm - 69mm; sal par 88mm - 116mm
05/09/2024	APPC3	midway up glen	173060	847267	42	16	10	150	**21**	**11**	4	0		**2.10**	**1.10**	0.40	0.00	**0.14**	**0.07**	0.03	0.00	sal fry 48mm - 66mm; sal par 84mm - 106mm
05/09/2024	APPC4	below bridge	171820	845963	72	12	10	110	**6**	**5**	1	1	4	**0.60**	**0.50**	0.10	0.10	**0.05**	**0.05**	0.01	0.01	sal fry 67mm - 80mm; sal par 112mm - 135mm

Colour scheme for WRFT e-fish results for Wester Ross area relating to fish abundance
over 2 fish per minute or over 0.200 fish per m^2
1.00 to 1.99 fish per minute or 0.100 to 0.199 fish per m^2
0.50 to 0.99 fish per minute or 0.050 to 0.099 fish per m^2
0.01 to 0.49 fish per minute or 0.001 to 0.049 fish per m^2.

* An additional electro-fishing site was surveyed in the Cuaig River on 5th September 2024 (to the north of Applecross); no juvenile salmon were recorded. Salmon fry were recorded at the same site in the Cuaig river 2007.

4. Conclusions and recommendations (for discussion)

- Another successful year of sea trout sampling at Applecross, with sample sizes large enough to be able to assess lice infestation pressures.
- Lice levels on sea trout were much lower in May and June 2024 than in May and June 2023; indicative of an improved situation for post-smolt salmon migrating nearby too.
- As in 2023, there are several possible sources of sea lice recorded in July 2024 on sea trout at Applecross. Because of the high biomass of salmon farming in the area from which larval lice may drift towards Applecross, all farms need to do as much as they can to synchronise sea lice control and keep on-farm lice levels much lower than recommended CoGP levels. It is beyond the scope of this report to comment on likely connectivity between farms (so far as sea lice cross- infection goes); this may be something that could be explored further to advantage of both industry and wild fish health.
- Data can also be used to learn more about relationships between sea lice levels on sea trout at Applecross and wild salmon populations around the Inner Sound area, where post-smolt salmon are likely to migrate through the Inner Sound area and subject to sea lice potentially emanating from several sources.
- In terms of sample sizes, Applecross may now be the most reliable wild fish monitoring site in the Inner Sound area for assessing sea lice infestation pressure upon wild fish.
- Monitoring of sea trout at Applecross should therefore continue in future years.

- Juvenile salmon (both fry and parr) assumed to be of wild origin, were recorded at moderate estimated densities in the Applecross River in September 2024. However, few fish were found at the top and bottom sites; suggesting sub optimal densities consistent with a 'Category 3' conservation grade.
- The genetic make up of wild salmon in the Applecross River is unknown. Are these fish much the same as other wild salmon in e.g. the River Carron? Or does the Applecross River retain a unique wild salmon population?

Acknowledgements

For help with sea trout sampling in 2024 thank you to David Abrahams and Applecross Trust; and Gregor Watson, Alison Hewitt, Rob Macrae, Nic Butler, Chloe and Ant Hall, Lara Soloman,), Mark Adams; Jim Raffell and Owen Kilbride (Marine Directorate).

References

Birkeland, K. and Jakobsen, P.J. (1997) Salmon lice, *Lepeophtheirus salmonis*, infestation as a causal agent of premature return to rivers and estuaries by sea trout, Salmo trutta, juveniles. Environmental Biology of Fishes 49, 129–137. https://doi.org/10.1023/A:1007354632039

Wright, DW, F. Oppedal, T. Dempster (2016) Early-stage sea lice recruits on Atlantic salmon are freshwater sensitive. J. Fish Dis., 39 (10) pp. 1179-1186, https://doi.org/10.1111/jfd.12452

Cunningham, Peter *et al* (2018) Skye and Wester Ross Fisheries Trust Review 2018 https://www.wrft.org.uk/files/SWRFT%20Review%20February%202018%20Final%20for%20web%20V2.pdf

Cunningham, Peter (2022a) Applecross sea trout monitoring report for Loch Ainort, Caol Mor & Inner Sound EMP, 2022. Unpublished report prepared for MOWI. Wester Ross Fisheries Trust

Cunningham, P (2022b) Status of juvenile Wild Atlantic Salmon in Wester Ross, Northwest Scotland Report following 2021 field season https://www.wrft.org.uk/files/Status%20of%20Wild%20Salmon%20in%20Wester%20Ross%20Report%20for%202021v1Feb22.pdf

Cunningham, Peter (2023) Applecross sea trout monitoring report for Loch Ainort, Caol Mor & Inner Sound EMP, 2023. Contract report prepared for MOWI. Wester Ross Fisheries Trust https://www.wrft.org.uk/files/Applecross%20Sea%20trout%20monitoring%20report%20Nov23.pdf

Scotland's Aquaculture website http://aquaculture.scotland.gov.uk/default.aspx

Taranger, G. L., Karlsen, Ø., Bannister, R. J., Glover, K. A., Husa, V., Karlsbakk, E., Kvamme, B. O., Boxaspen, K. K., Bjørn, P. A., Finstad, B., Madhun, A. S., Morton, H. C., and Sva˚sand, T. (2014) Risk assessment of the environmental impact of Norwegian Atlantic salmon farming. ICES Journal of Marine Science, (PDF) Risk assessment of the environmental impact of Norwegian Atlantic salmon farming (researchgate.net)

Vollset *et al* (2017) Salmon lice infestation on sea trout predicts infestation on migrating salmon post-smolts https://academic.oup.com/icesjms/article/74/9/2354/3860036

Appendix 1. Sampling at Applecross further notes and some photos

Please note that all fish in photos were lightly sedated before being returned after recovering from anaesthetic

Sea trout sampling visit #1: 30th May 2024

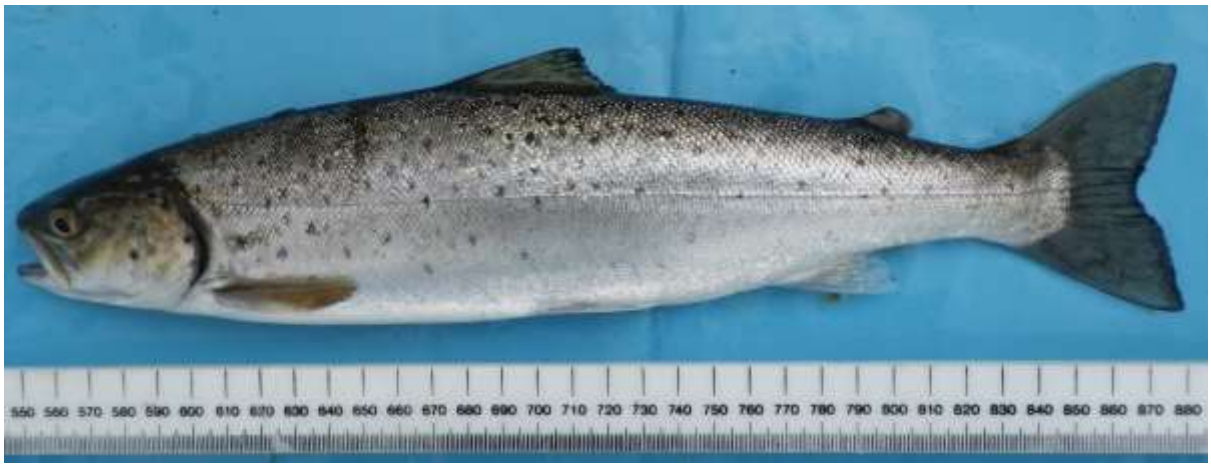
Two sweeps of sea pool; just one sea trout caught (below right) 170mm (6 lice)

Sea trout sampling visit #2: 25th June 2024

Pictures below by Mark Adams.

Sea trout sampling visit #2: 25th June 2024 (continued)

Sea trout 335mm



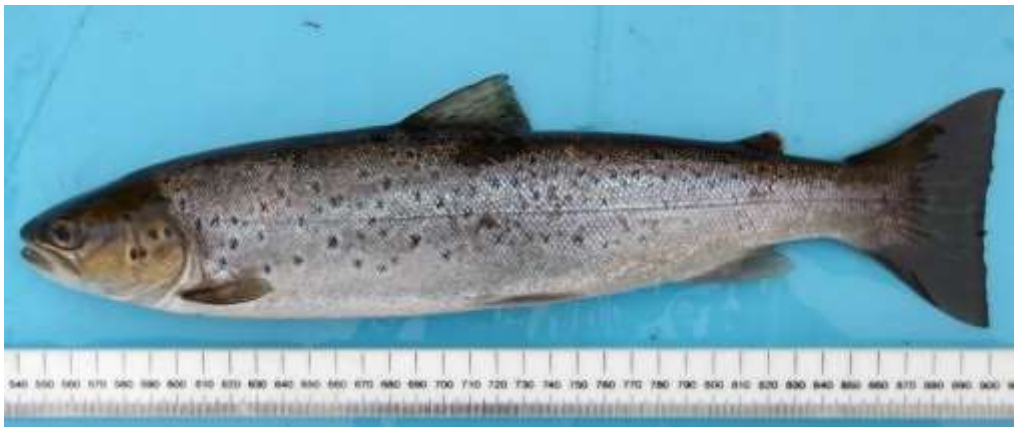
(left) dorsal fin of sea trout 390mm; (right) adult lice on sea trout 210 mm

Sea trout netting team 25th June 2024

Sea trout sample visit #3: 24th July 2024

Counting lice on sea trout

Sea trout 372mm



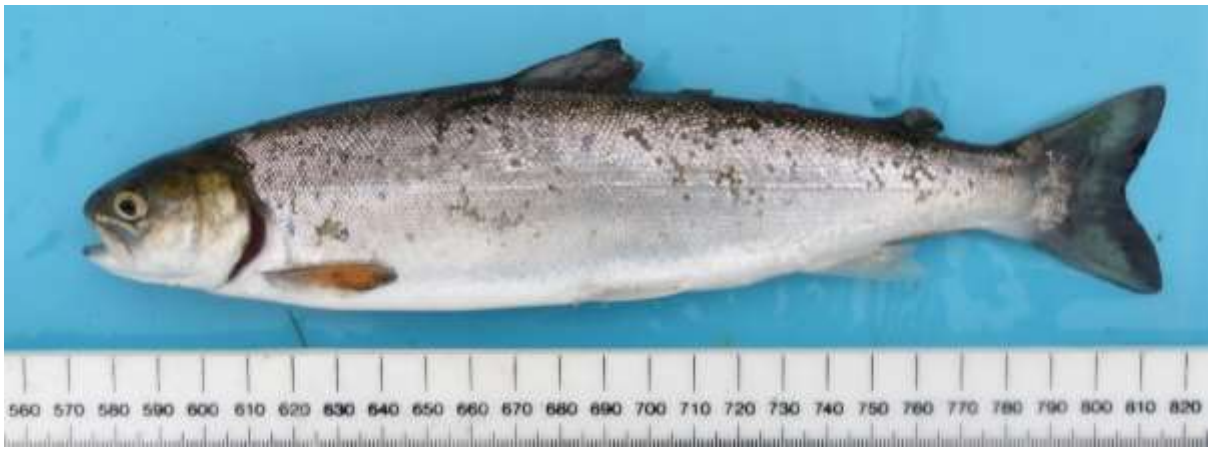
(left) Lice on 220mm sea trout; (right) lice on 247mm sea trout

Sea trout sample visit #3: 24th July 2024 (continued)

(left) dorsal fin of 215mm sea trout; (left) dorsal fin of 247mm sea trout

(below)

247mm sea trout



(left) head of 247mm sea trout; (right)

Sea trout sample visit #4: 23rd September 2024

Team

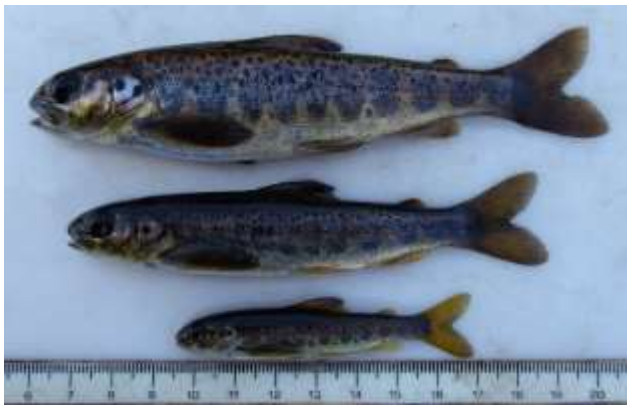
Male sea trout (383mm) and male brown trout (335mm)

Thin salmon (thought to be a grilse) 535mm

Dorsal fin of sea trout

Juvenile fish survey 5th September 2024 site photos and some fish

(left) Top site, APPC1; (right) Juvenile salmon from APPC1 all lightly sedated before being returned

(left) APPC2; (right) juvenile salmon from APPC2


(left) APPC3; (right) juvenile salmon, trout and possible sat x trt hybrid fry [fish on left] from APPC3


Juvenile fish survey 5th September 2024 site photos and some fish (continued)

Site APPC4

Large salmon parr and salmon fry at site APPC4