Ardmair salmon farm EMP

Sea trout and salmon monitoring report for 2024

for MOWI Scotland Ltd., Wester Ross Area District Salmon Fisheries Board and The Highland Council

(photo by Chloe Hall)

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Summary

This document presents the results of wild fish monitoring activities to inform the Ardmair Salmon farm Environment Management Plan [EMP] during the spring and summer of 2024.

Seine netting teams were assembled to sample sea trout in the mouth of the River Kanaird and Inverianvie River (close to the Little Gruinard River SAC for Atlantic salmon) almost monthly between May and September (October for Inverianvie site). In July 2024, the shore by Ardmair was netted instead of the River Kanaird estuary.

Lice counts were high on sea trout sampled at Kanaird in May 2024. Thereafter lice levels were lower on sampled fish. Many fish had lice-damaged but healing dorsal fins in the September sample.

At the new Inverianvie site, initial sampling in May and June produced only two small trout. However, subsequently in July, August and October larger numbers of sea trout were caught, demonstrating that this site can provide useful samples of sea trout for sea lice monitoring purposes using the seine netting method. Lice levels were low on all of the sea trout sampled at the Inverianvie site, and many of these fish had high condition factor scores.

The high counts of sea lice on sea trout sampled at Kanaird in May correlate with high numbers of sea lice reported from the nearby Ardmair salmon farm during spring 2024. This farm was harvested out in May. Improved on-farm control of sea lice is required to better protect wild fish in 2025.

Primarily to learn more about wild salmon populations, juvenile fish were surveyed at some sites in the River Kanaird (and Runie, the major tributary of the River Kanaird) in September 2024 and in the headwaters of the Gruinard River, in early November 2024. Estimated densities of salmon fry and parr were moderate to high at the best sites. Both the Kanaird survey and Gruinard survey included 'marginal habitat' sites above a waterfall where in previous years juvenile salmon have sometimes been missing.

In the River Kanaird, no juvenile salmon were recorded above the Langwell falls. These falls are only occasionally passable. Both salmon fry and salmon parr were recorded below the Langwell falls. As water levels were already high and rising when these sites were surveyed, our results underestimate fish numbers present. On our second Kanaird survey day when river conditions were good, salmon fry and parr were recorded in the upper River Runie (main tributary of the River Kanaird) at numbers and fish sizes indicative of healthy juvenile salmon populations.

In the Gruinard River system, salmon fry and parr were recorded at moderate to high densities at a site near the top of the Abhainn Srath na Sealga. Further upstream, at a site in the Abhainn Loch an Nidd right at the top of the accessible area for adult salmon above an only occasionally passable (to adult salmon) waterfall, both salmon fry and parr were recorded.

Following a low reported rod catch of salmon in the Gruinard River in 2023, it was encouraging to find salmon fry and parr in the Gruinard River headwaters in 2024 at sites furthest from the sea above several obstacles to adult salmon. Thank you especially to MOWI Ardmair team and Keanchulish estate for support with sea trout sampling nearby, and to Gruinard Estate for providing practical support in November 2024 for the survey of juvenile salmon at sites in the relatively remote Gruinard River headwaters.

1. Introduction and background

1.1 Location, some background information and rationale

This document presents the results of wild fish monitoring activities in 2024 to inform the Ardmair salmon farm Environment Management Plan [EMP].

The Ardmair salmon farm is located within the Wester Ross Marine Protected Area [WR MPA], an area of much biodiversity interest. Priority Marine Features [PMFs] present within the WR MPA include seabed habitats e.g. Maerl beds and Seagrass beds (both included in subset of the 11 most vulnerable PMFs in Scotland) as well as marine mammals and fish species including the Herring, the Atlantic salmon and Sea trout.

Salmon rivers which discharge into the Wester Ross Marine Protected Area include the rivers Kanaird, Ullapool, Broom, Dundonnell, Gruinard, Little Gruinard [SAC] and Ewe (Cunningham, 2022). Together, these rivers represent one of few remaining strongholds for wild Atlantic salmon in the west of mainland Scotland.

To provide some protection for wild fish from potential impacts associated with salmon farming, particularly from sea lice infestation, an Environment Management Plan [EMP] was developed for the Ardmair salmon farm. EMPs take an adaptive management approach to the control of sea lice on farmed salmon. They aim to learn from the monitoring of wild fish in nearby waters about how best to manage on-farm sea lice to enable wild fish populations to remain healthy.

Open cage salmon farming started at Ardmair in the early 1980s, by Wester Ross Salmon. Wester Ross Salmon maintained a hands-on 'artisanal' approach to farm salmon production. In the mid-2010s, sea lice control on the Ardmair salmon farm greatly improved using locally caught wrasse (Cunningham et al, 2016). By early 2020s, the on-farm adult sea lice population had been maintained at close to zero over several successive production cycles at Ardmair

Wild sea trout have been netted at the River Kanaird site since 2008 for sea lice monitoring purposes, initially as part of the Tripartite Working Group's wild fish monitoring programme. In some years lice levels were high on sea trout at the Kanaird site with some fish carrying over 100 sea lice. Subsequently, from 2016 to the early 2020s, lice levels recorded on wild fish were much lower.

As the River Kanaird sea trout monitoring site is located in close proximity (within 3km) to the Ardmair salmon farm and has a long record of providing good data for sea lice monitoring purposes, it was chosen as a sea trout monitoring site for the Ardmair EMP. To provide a wider data set, a second sea lice monitoring site at Inverianvie shore (by Gruinard Bay, close to the Little Gruinard SAC) was chosen to provide additional sea lice data. A third site at Ardmair shore was chosen as an alternative for the Kanaird site in July 2024. Sea trout sampling sites are shown together with locations of active salmon farms in 2024 in Figure 1.

In addition to sampling of sea trout for sea lice monitoring purposes, the EMP states that juvenile salmon should be monitored in nearby rivers to understand any changes in the status of wild salmon populations.

Figure 1. Locations of active salmon farms in Wester Ross Marine Protected Area (blue, Wester Ross Fisheries; purple Scottish Sea Farms), and sea trout sampling sites (orange circles) in 2024. Base map OpenStreetMap thank you.

1.2 Monitoring wild salmonids for the Ardmair salmon farm EMP

In 2024, Wester Ross Fisheries Trust [WRFT] was commissioned by MOWI Scotland Ltd (MOWI) to monitor sea trout and juvenile salmon in nearby rivers to fulfil EMP obligations.

The WRFT sea trout monitoring team carried out sampling for sea trout in the River Kanaird estuary and investigated possibilities for netting sea trout at Inverianvie near the mouth of the Little Gruinard River.

The WRFT electro-fishing team carried out an electrofishing survey of sites in the River Kanaird in September 2024 and in the headwaters of the Gruinard River in early November 2024.

Part 2 of this report provides a summary of the findings of sea trout monitoring at Kanaird and Inverianvie in 2024; Part 3, a summary of the results from the juvenile fish survey of sites in the River Kanaird and in the big Gruinard River

Part 2. Monitoring sea lice on sea trout

2.1 Previous wild fish monitoring

Sea trout have been monitored using a sweep net at the River Kanaird site since 2007. The site was initially included as part of the Tripartite Working Group's wild fish monitoring programme, and data reported by the Regional Development Office. In more recent years, netting has taken place at this site by the Wester Ross Fisheries Trust survey team with funding from the Scottish Government via Fisheries Management Scotland [FMS]. Sea trout and sea lice monitoring reports for previous years for the Kanaird site can be found in WRFT Reviews and SWRFT Reviews on the WRFT website, and on the Fisheries Management Scotland website via links here.

2.2 Monitoring of sea trout 2024

The WRFT sea trout sampling team organised four visits to the River Kanaird estuary, one visit to the shore by Ardmair, and five visits to the shore at a new site by the Inverianvie River estuary, Gruinard Bay. The Kanaird sea trout sampling site is located approximately 2km from the Ardmair salmon farm; the Ardmair sea trout sampling site approximately 1.5km from the Ardmair salmon farm. The Inverianvie sea trout sampling site is approximately 19km by sea from the Ardmair salmon farm.

Each visit focussed on using a seine net. The net used was approx. 47m x 3m of mesh size 14mm knot to knot, with floats on top and a lead weighted line on the bottom.

On each occasion, the minimum team size was five people (usually six or more). The sampling team included experienced snorkellers to man-handle the lead line of the seine net over the riverbed or seabed where there were many stones that snagged the net and would otherwise have made netting ineffective.

Sampling days are listed in Table 2a for the Kanaird and Ardmair sites and in Table 2b for the Inverianvie site.

Initial sampling visits in May and June to the Inverianvie site were from mid-tide towards low tide, without much success. Subsequently, the netting team explored opportunities for netting sea trout at this location just after high tide using snorkellers. This proved to be more successful. The Inverianvie sampling in September was cancelled due to poor weather and sea conditions. Instead, we returned on 7th October 2024, when 17 sea trout were caught.

Table 2a: Sea trout monitoring days at Kanaird & Ardmair in 2024

Visit	Date	Methods used	Number of trout processed
#1	24th May 2024	Seine net sea pool of river	13
#2	20th June 2024	Seine net sea pool of river	21
#3	15th July 2024	Seine net shore	2
#4	6th August 2024	Seine net sea pool of river	12
#5	18th September 2024	Seine net sea pool of river	17

Table 2b: Sea trout monitoring days at Inverianvie shore in 2024

Visit	Date	Methods used	Number of trout processed
#1	9th May 2024	Seine net shore	1
#2	19th June 2024	Seine net shore	1
#3	11th July 2024	Seine net shore	5
#4	8th August 2024	Seine net shore	3
#5	7th October 2024	Seine net shore	17

All fish caught were transferred to a tub. Fish were lightly sedated using fish anaesthetic (eugenol). The length (in mm), weight (to nearest 5g) and records of the following were noted: numbers of sea lice (three life-stage 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 water following recovery.

2.3 Sea lice monitoring results

Results are presented in Table 3 and Table 4

Altogether 92 trout were processed; 65 from the Kanaird & Ardmair sites; and 27 from the new Inverianvie site.

Notable samples were as follows:

- On 24th May, the 13 trout were taken at Kanaird, mostly carrying high numbers of sea lice (Table 3a). Nearly all of the sea lice were small chalimus lice.
- On 20th June, 21 trout were taken at Kanaird (Table 3b). Lice number were low; however, most of the larger fish had dorsal fin damage scores indicative of earlier sea lice infestation.
- On 18th September, 17 trout were taken at the Kanaird estuary (Table 3e). Again, lice numbers were low, however most of the larger fish had dorsal fin damage scores indicative of earlier sea lice infestation.
- On 7th October, 17 trout were taken at the Inverianvie (Gruinard Bay) site (Table 4e). These fish had low numbers of lice, many of them had high condition factor scores. Some of these fish had healed dorsal fins indicative of sea lice infection earlier in the year

In summary, lice numbers were high on sea trout at the River Kanaird site in the May 2024 sample but low at all sites thereafter. Some of the fish, particularly the larger sea trout at both the Kanaird and Inverianvie sites, had stunted dorsal fins indicative of previous damage by sea lice.

Table 3a ***Data recorded for sea trout sampled at Kanaird in 2024****. All fish taken in 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 Kanaird and Ardmair in 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.

Sample #1: River Kanaird estuary, 24th May 2024

				Caligus	*Lepeophtheirus salmonis*																	
Fish 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 lingua* 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	156	35	0.92	0	95	0	0	**95**	2.714	0	0	N	Y	y	small early stage lice	Yes	2.714	>0.3	100%	8	13	61.54	61.54	
2	167	41	0.88	0	86	0	0	**86**	2.098	0	0	N	Y	y		Yes	2.098	0.2-0.3	50%	1		7.69	3.85	
3	285	239	1.03	0	5	1	0	**6**	0.025	0	0	N	Y	y	lice off, lice scarring along back	No	0.025	0.1-0.2	20%	1		7.69	1.54	
4	171	51	1.02	0	120	0	0	**120**	2.353	0	1	N	Y	y		Yes	2.353	<0.1	0%	3		23.08	0.00	**66.92**
5	185	59	0.93	0	64	0	0	**64**	1.085	0	0	N	Y	y		Yes	1.085							
6	135	20	0.81	0	0	0	0	**0**	0.000	0	0	N	Y	y		No	0.000							
7	150	33	0.98	0	8	0	0	**8**	0.242	0	2	N	Y	y	some lice off	No	0.242							
8	164	42	0.95	0	50	0	0	**50**	1.190	0	1	N	Y	y		Yes	1.190							
9	135	24	0.98	0	0	0	0	**0**	0.000	0	0	N	Y	y		No	0.000							
10	157	42	1.09	0	45	0	0	**45**	1.071	0	0	N	Y	y	quite fat	Yes	1.071							
11	273	214	1.05	0	156	0	0	**156**	0.729	0	0	N	Y	y	intestine parasite	Yes	0.729							
12	137	23	0.89	0	3	1	0	**4**	0.174	0	0	N	Y	y		No	0.174							
13	162	41	0.96	0	44	0	0	**44**	1.073	0	0	N	Y	y		Yes	1.073							
	175.15	**66.46**	**0.96**	**0.00**	**52.00**	**0.15**	**0.00**	**52.15**	**0.98**	**0.00**	**0.33**													

Explanation (for Tables 3a – 3e and Table 4):

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.

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
<20% sea lice related mortality or early return to freshwater

https://www.researchgate.net/publication/266672998_Risk_assessment_of_the_environmental_impact_of_Norwegian_Atlantic_salmon_farming

Table 3b & 3c ***Data recorded for sea trout sampled at Kanaird and Ardmair in 2024.*** *All fish taken in using a seine net by WRFT team.*

Sample #2: River Kanaird estuary, 20th June 2024

				Caligus	*Lepeophtheirus salmonis*																	
Fish 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 cm^2 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	147	29	0.91	0	0	0	0	**0**	0.000	0	0	N	Y	y	sandeel 40mm pulled out or mouth; estuarine	No	0.000	>0.3	100%	1	21	4.76	4.76	
2	325	395	1.15	0	0	0	0	**0**	0.000	2	1	N	Y	y		No	0.000	0.2-0.3	50%	1		4.76	2.38	
3	185	70	1.11	0	65	0	0	**65**	0.929	1	2	N	Y	y		Yes	0.929	0.1-0.2	20%	0		0.00	0.00	
4	280	240	1.09	0	0	0	0	**0**	0.000	0	0	N	Y	y	slightly estuarine	No	0.000	<0.1	0%	19		90.48	0.00	**7.14**
5	223	120	1.08	0	0	2	0	**2**	0.017	0	2	N	Y	y		No	0.017							
6	397	656	1.05	0	2	5	0	**7**	0.011	1	20	N	Y	y	?male	No	0.011							
7	300	264	0.98	0	0	0	0	**0**	0.000	1	3	N	Y	y	male fin pics	No	0.000							
8	470	1035	1.00	0	5	4	0	**9**	0.009	2	30	N	Y	y	hen	No	0.009							
9	330	350	0.97	0	1	2	0	**3**	0.009	2	3	N	Y	y		No	0.009							
10	220	130	1.22	0	4	1	0	**5**	0.038	2	1	N	Y	y	plump	No	0.038							
11	190	65	0.95	0	0	0	0	**0**	0.000	0	0	N	Y	y	silvery	No	0.000							
12	185	65	1.03	0	0	0	0	**0**	0.000	0	1	N	Y	y		No	0.000							
13	173	63	1.22	0	4	0	0	**4**	0.063	0	0	N	Y	y	kink in caudal fin	No	0.063							
14	163	41	0.95	0	0	0	0	**0**	0.000	0	0	Y	Y	y	?bird damage	No	0.000							
15	147	40	1.26	0	0	0	0	**0**	0.000	0	0	N	Y	y		No	0.000							
16	185	66	1.04	0	19	0	0	**19**	0.288	0	0.5	N	Y	y	net or predator damage	Yes	0.288							
17	145	24	0.79	0	0	0	0	**0**	0.000	0	0	N	Y	y		No	0.000							
18	170	54	1.10	0	0	0	0	**0**	0.000	0	0	N	Y	y		No	0.000							
19	155	34	0.91	0	0	0	0	**0**	0.000	0	0	N	Y	y	estuarine	No	0.000							
20	155	25	0.67	0	0	0	0	**0**	0.000	0	0	N	Y	y		No	0.000							
21	155	35	0.94	0	0	0	0	**0**	0.000	0	0	N	Y	y		No	0.000							
Av.	**223.81**	**181.00**	**1.06**	**0.00**	**5.40**	**0.93**	**0.00**	**6.33**	**0.07**	**0.92**	**5.25**													

Sample #3: Ardmair Shore, 15th July 2024

				Caligus	*Lepeophtheirus salmonis*																	
Fish 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 cm^2 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	228	138	1.16	0	5	4	0	**9**	0.065	2	0	N	Y	y	badly scaled	No	0.065	>0.3	100%	0	2	0.00	0.00	
2	210	80	0.86	0	7	3	0	**10**	0.125	1.5	1	?	Y	y	bird damage?	No	0.125	0.2-0.3	50%	0		0.00	0.00	
																		0.1-0.2	20%	1		50.00	10.00	
Av.	**219.00**	**109.00**	**1.01**	**0.00**	**6.00**	**3.50**	**0.00**	**9.50**	**0.10**	**1.75**	**0.50**							<0.1	0%	1		50.00	0.00	**10.00**

Table 3d & 3e ***Data recorded for sea trout sampled at Kanaird in 2024.*** *All fish taken in using a seine net by WRFT team.*

Sample #4: Kanaird estuary, 6th August 2024

				Caligus	*Lepeophtheirus salmonis*																		
Fish 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	245	186	1.26	0	2	0	0	**2**	0.011	0	1	N	Y	y		No	0.011	>0.3	100%	0	12	0.00	0.00	
2	197	81	1.06	0	0	0	0	**0**	0.000	0	0	N	Y	y		No	0.000	0.2-0.3	50%	1		8.33	4.17	
3	262	217	1.21	0	0	0	0	**0**	0.000	0	2	N	Y	y	fat	No	0.000	0.1-0.2	20%	0		0.00	0.00	
4	185	67	1.06	0	0	0	0	**0**	0.000	0	3	N	Y	y	thin	No	0.000	<0.1	0%	11		91.67	0.00	**4.17**
5	193	70	0.97	0	20	0	0	**20**	0.286	0	1	N	Y	y		Yes	0.286							
6	175	50	0.93	0	0	0	0	**0**	0.000	0	0	N	Y	y	estuarine	No	0.000							
7	184	67	1.08	0	1	0	0	**1**	0.015	0.2	0	N	Y	y		No	0.015							
8	194	80	1.10	0	0	0	0	**0**	0.000	1	1	N	Y	y	thin	No	0.000							
9	227	124	1.06	0	0	0	0	**0**	0.000	0.5	4	y	Y	y		No	0.000							
10	200	80	1.00	0	6	0	0	**6**	0.075	0.5	4	N	Y	y		No	0.075							
11	200	74	0.93	0	0	0	0	**0**	0.000	0	1	N	Y	y		No	0.000							
12	170	45	0.92	0	2	0	0	**2**	0.044	0	1	y	Y	y	thin	No	0.044							
Av.	**202.67**	**95.08**	**1.05**	**0.00**	**2.58**	**0.00**	**0.00**	**2.58**	**0.04**	**0.18**	**1.50**													

Sample #5: Kanaird estuary, 18th September 2024

				Caligus	*Lepeophtheirus salmonis*																		
Fish 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	410	670	0.97	0	0	0	0	**0**	0.000	2	0	Y	Y	y	thin female, old predator damage (healed)	No	0.000	>0.3	100%	0	17	0.00	0.00	
2	440	991	1.16	0	0	0	0	**0**	0.000	2	25	N	Y	y	female ready to spawn cood condition	No	0.000	0.2-0.3	50%	0		0.00	0.00	
3	360	475	1.02	0	0	0	0	**0**	0.000	2	10	N	Y	y	thin estuary male?	No	0.000	0.1-0.2	20%	0		0.00	0.00	
4	325	372	1.08	0	0	0	0	**0**	0.000	2	0	N	Y	y	healthy female, bit thin	No	0.000	<0.1	0%	17		100.00	0.00	**0.00**
5	270	250	1.27	0	0	0	0	**0**	0.000	1	1	N	Y	y	silvery plump maturing female?	No	0.000							
6	345	470	1.14	0	0	0	0	**0**	0.000	2	0	N	Y	y	famale, whirly scales	No	0.000							
7	280	239	1.09	0	0	0	0	**0**	0.000	0.5	8	N	Y	y	female, silvery good dondition	No	0.000							
8	235	140	1.08	0	0	0	0	**0**	0.000	0.5	1	N	Y	y		No	0.000							
9	234	142	1.11	0	0	0	0	**0**	0.000	0	1	N	Y	y	small parasite like louse back of fin chloe pho	No	0.000							
10	235	148	1.14	0	0	0	0	**0**	0.000	0	0	N	Y	y	estuary trout	No	0.000							
11	235	130	1.00	0	0	0	0	**0**	0.000	1.5	0	N	Y	y	bit thin	No	0.000							
12	217	113	1.11	0	0	0	0	**0**	0.000	1	0	N	Y	y	thin	No	0.000							
13	205	88	1.02	0	0	0	0	**0**	0.000	0	4	N	Y	y	thin	No	0.000							
14	193	79	1.10	0	0	0	0	**0**	0.000	0	1	N	Y	N	no scales taken	No	0.000							
15	238	134	0.99	0	0	0	0	**0**	0.000	0.2	2	N	Y	Y	silvery fish	No	0.000							
16	196	76	1.01	0	0	0	0	**0**	0.000	0	5	N	Y	y		No	0.000							
17	213	92	0.95	0	0	0	0	**0**	0.000	0	6	N	Y	y		No	0.000							
Av.	**272.41**	**271.12**	**1.07**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.86**	**3.76**													

Table 4a, b & c ***Data recorded for sea trout sampled at Inverianvie in 2024.*** *All fish taken in using a seine net by WRFT team. See Table 3 for explanation.*

Sample #1: 9th May, 2024

				Caligus	*Lepeophtheirus salmonis*																	
Fish	**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**	**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	155	35	0.94	0	0	0	0	**0**	0.000	0	0	N		No	0.000	>0.3	100%	0	27	0.00	0.00	
																0.2-0.3	50%	0		0.00	0.00	
																0.1-0.2	20%	0		0.00	0.00	
																<0.1	0%	27		100.00	0.00	**0.00**

Sample #2: 19th June, 2024

				Caligus	*Lepeophtheirus salmonis*																	
Fish	**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**	**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	160	42	1.03	0	0	0	0	**0**	0.000	0	0	N	slightly estuarine	No	0.000	>0.3	100%	0	27	0.00	0.00	
																0.2-0.3	50%	0		0.00	0.00	
																0.1-0.2	20%	0		0.00	0.00	
																<0.1	0%	27		100.00	0.00	**0.00**

Sample #3: 11th July, 2024

				Caligus	*Lepeophtheirus salmonis*																	
Fish	**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**	**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	530	1664	1.12	0	0	2	0	**2**	0.001	1	0	N	hen	No	0.001	>0.3	100%	0	5	0.00	0.00	
2	380	610	1.11	0	10	10	4	**24**	0.039	1	1	Y		Yes	0.039	0.2-0.3	50%	0		0.00	0.00	
3	405	795	1.20	0	0	0	0	**0**	0.000	0	0	N	good condition hen	No	0.000	0.1-0.2	20%	0		0.00	0.00	
4	405	703	1.06	0	0	5	1	**6**	0.009	2	1	Y	photo of dorsal fin	No	0.009	<0.1	0%	5		100.00	0.00	**0.00**
5	397	682	1.09	0	0	0	2	**2**	0.003	2	1	Y	healed	No	0.003							
Av.	**423.40**	**890.80**	**1.11**	**0.00**	**2.00**	**3.40**	**1.40**	**6.80**	**0.01**	**1.20**	**0.60**											

Table 4d & e ***Data recorded for sea trout sampled at Inverianvie in 2024****. All fish taken using a seine net by WRFT team.*

Sample #4: 8th August, 2024

				Caligus	*Lepeophtheirus salmonis*																	
Fish	**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**	**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	540	NR	NR	0	0	0	0	**0**	0.000	1	0	N	Recapture taken in July sweep	No	0.000	>0.3	100%	0	3	0.00	0.00	
2	152	42	1.20	0	0	0	0	**0**	0.000	0	0	N		No	0.000	0.2-0.3	50%	0		0.00	0.00	
3	375	584	1.11	0	14	6	5	**25**	0.043	1	3	N		Yes	0.043	0.1-0.2	20%	0		0.00	0.00	
																<0.1	0%	3		100.00	0.00	**0.00**
Av.	**356**	**313.00**	**1.15**	**0.00**	**4.67**	**2.00**	**1.67**	**8.33**	**0.01**	**0.67**	**1.00**											

Sample #5: 7th October, 2024

				Caligus	*Lepeophtheirus salmonis*																	
Fish	**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**	**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	510	1450	1.09	0	0	15	0	**15**	0.010	0.5	0	N	Fem,	Yes	0.010	>0.3	100%	0	17	0.00	0.00	
2	405	688	1.04	0	0	3	0	**3**	0.004	0.2	1	N	Fem,	No	0.004	0.2-0.3	50%	0		0.00	0.00	
3	375	600	1.14	0	2	4	0	**6**	0.010	0.5	4	N	Fem,	No	0.010	0.1-0.2	20%	0		0.00	0.00	
4	480	1230	1.11	0	0	0	0	**0**	0.000	0	1	N	Fem, photo with male#5	No	0.000	<0.1	0%	17		100.00	0.00	**0.00**
5	435	1005	1.22	0	2	2	0	**4**	0.004	0.2	0	N	Male, photo with fish above	No	0.004							
6	354	469	1.06	0	0	4	0	**4**	0.009	0	0	N	silvery	No	0.009							
7	395	668	1.08	0	3	0	0	**3**	0.004	0.5	1	N	Fem	No	0.004							
8	410	769	1.12	0	1	2	0	**3**	0.004	0	1	N	Male	No	0.004							
9	425	860	1.12	0	0	1	0	**1**	0.001	0	0	N	Male	No	0.001							
10	390	645	1.09	0	0	0	0	**0**	0.000	1	0	N	Male, healed dorsal fin	No	0.000							
11	380	565	1.03	0	2	1	0	**3**	0.005	2	0	N	Male, healed dorsal fin	No	0.005							
12	410	744	1.08	0	0	0	0	**0**	0.000	1	2	N	Fem, healed forsal fin	No	0.000							
13	410	810	1.18	0	1	4	0	**5**	0.006	1	0	N	Fem	No	0.006							
14	395	736	1.19	0	2	7	0	**9**	0.012	1.5	0	N	Fem, healing dorsal fin	No	0.012							
15	350	453	1.06	0	4	3	0	**7**	0.015	2	0	N	Fem, healing dorsal fin	No	0.015							
16	282	238	1.06	0	0	0	0	**0**	0.000	1	0	N	Plump	No	0.000							
17	345	476	1.16	0	1	1	0	**2**	0.004	0	0	N	Male	No	0.004							
Av.	**397.12**	**729.76**	**1.09**	**0.00**	**1.06**	**2.76**	**0.00**	**6.00**	**0.01**	**0.67**	**0.59**											

2.4 Sea lice monitoring discussion

High numbers of sea lice were recorded on sea trout sampled at the Kanaird site in May 2024. Most of these lice were small chalimus lice, indicative of recent infection, most likely in the sea nearby. Lice levels recorded were high enough to damage sea trout and contribute to elevated mortality (c. Tarranger et al 2014).

Subsequently, sea trout sampled from June to October (inclusive) from both sites had low numbers of sea lice. However, many of the larger fish sampled during summer and autumn 2024 had damaged dorsal fins associated with earlier sea lice infection.

WRFT also received reports and some pictures from anglers of sea trout carrying high numbers of sea lice caught nearby in May 2024. So based on the data collected by the WRFT sampling team and other reports, sea lice infection pressure on wild fish was high in the spring 2024; but thereafter dropped during the summer of 2024.

Data published on the Scotland Aquaculture website provides an indication of potential sources of the sea lice on wild sea trout at the Kanaird site in May 2024. Reported adult female lice levels recorded at the Ardmair salmon farm were above the Salmon Farming industry's Code of Good Practice [CoGP] sea lice level of 0.5 adult female lice per farmed salmon during April and May 2024. The Ardmair salmon farm is less than 3km from the Kanaird sea trout monitoring site.

Other potential salmon farm sources of sea lice affecting sea trout in the area in spring 2024 include the Wester Ross Fisheries Corry farm, where sea lice levels on farmed fish remained low throughout the spring 2024 period; and the Scottish Sea Farms Tanera farm (Summer Isles) where the CoGP sea lice thresholds were exceeded throughout the period April to mid July 2024. Reported sea lice levels at the WRF Ardessie salmon farms were low in April and May 2024.

The Ardmair salmon farm was fallowed in early June 2024 (data from Scotland's Aquaculture website). Following restocking, lice levels remained low on farmed salmon at the Ardmair farm until mid-September, correlating with low numbers of sea lice recorded on sea trout sampled at the Ardmair shore and Kanaird sites in June, July, August and September. Subsequently, sea lice levels at the Ardmair salmon farms rose to over two adult female lice per fish during the autumn 2024; use of the Thermolicer in week commencing 28th October seems to have helped to reduce lice numbers (ibid).

2.5 Conclusions from sea lice monitoring and recommendations

In May 2024, sea lice levels were too high to safeguard the health of sea trout in the sea around the River Kanaird area. The nearby Ardmair salmon farm is the closest potential salmon farm source of sea lice for wild sea trout sampled at the nearby Kanaird site. Figures for on-farm sea lice counts published on the Scotland's Aquaculture website indicate high on-farm adult female sea lice counts on farmed fish at the Ardmair farm during the winter and early spring of 2024.

High sea lice infestation pressure in this area during the spring is also of concern for wild post-smolt salmon migrating from the rivers Kanaird, Ullapool and Broom and potentially to post-smolt salmon from the Gruinard and Little Gruinard rivers too, depending on plankton drift (associated with tides and weather patterns) and salmon smolt migration routes.

To better protect sea trout and migrating salmon smolts in 2025 it is important to maintain much lower levels of sea lice on salmon farms in the area during the winter and early spring of 2025 than reported for this period in 2024 on Scotland's Aquaculture website.

Part 3. Juvenile fish surveys in the River Kanaird (= River Canaird) and Gruinard River

3.1 Introduction to juvenile fish survey

This part of the report presents the results of an electro-fishing survey of selected sites in the River Kanaird and Gruinard River in 2024.

The survey focussed primarily on finding out about the distribution and abundance of juvenile salmon (*Salmo salar*) in headwater streams of both river systems. Trout (*Salmo trutta*), eel (*Anguilla anguilla*) and minnow (*Phoxinus phoxinus*) were also recorded.

3.2 Locations and methods

Four sites were surveyed in the upper parts of the area accessible to wild salmon in both the Gruinard River and the River Kanaird, and an additional site in the lower River Kanaird. Locations of electro-fishing sites are shown in Figure 3a and 3b.

Sites in the Kanaird were surveyed on 11th September and 30th September. On the earlier date water levels were already too high by the time we got started for even semi-quantitative e-fish surveying. Water levels were much lower on 30th September.

A survey of sites in the Gruinard River headwaters is a major expedition requiring a 4x4 off road vehicle and an all-terrain vehicle. On 6th November, support was kindly provided by Gruinard Estate to enable a survey to be undertaken. The survey followed the stag stalking season, a time when estate staff were able to provide support. This is much later in the year than when e-fishing is usually undertaken, however we fortunate to get a good weather window: high water temperatures and low water levels. At this time of year (November) care has to be taken not to disturb spawning adult salmon or sea trout. So, sites chosen for e-fishing were located away from salmon spawning habitat, and an initial check was carried out to see if there were any signs of adult fish nearby.

At each site, the survey team fished for a minimum of 8 minutes in a standardised way, usually covering a wetted area of 80m^2 or more. 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 (expressed as numbers of fish caught per minute) and minimum density estimates (expressed as numbers of fish per m^2) for juvenile salmon and trout.

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

All fish were lightly sedated (in eugenol, c. clove oil) and measured to the nearest mm (fork length) and returned to the water following recovery.

Figure 3a. Locations of electrofishing sites in the River Kanaird surveyed on Base map OpenStreetMap thank you.

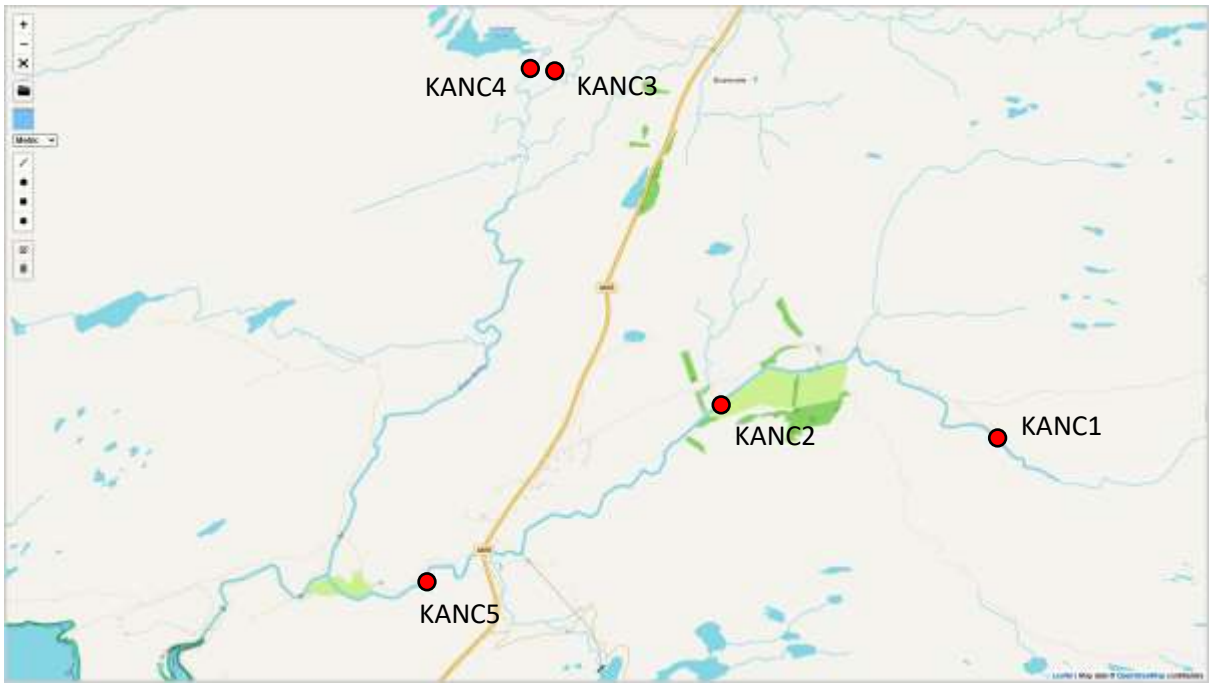

Figure 3b. Locations of electrofishing sites in the Gruinard River surveyed on 10th September 2024. Base map OpenStreetMap thank you.

3.3 Results

A summary of results can be found in Table 5a (River Kanaird) and Table 5b (Gruinard River).

Results are presented as numbers of fish caught per minute; minimum fish density estimates (in numbers of fish per m^2) were also obtained for most sites.

3.3.1 Results from River Kanaird survey

The Kanaird survey on 11th September 2024 had to be abandoned due to rising river levels following heavy rain. So, data for sites KANC1 and KANC2 does not reflect actual fish abundance; minimum estimates only. KANC1 is located above the Langwell falls and has previously been monitored every second year; only occasionally have salmon fry been found above the fall in past 10 years. However, KANC2, below the falls, is typically a site where high numbers of salmon fry and salmon parr are recorded; the low numbers of both salmon fry and salmon parr recorded here on 11th September 2024 can probably be best explained by high water levels and difficult fishing conditions. Data is available for KANC1 and KANC2 from a survey in 2023 for hydropower wild fish monitoring contract; these sites will most likely be surveyed again in 2025.

The River Kanaird was revisited on 30th September 2024 when three sites were surveyed (KANC3, KANC4 and KANC5). Salmon fry numbers were high at site KANC3 in the main site surveyed in the headwaters of the River Runie. This is an important spawning area, so that's good. At site KANC4 in a smaller tributary stream nearby, the presence of both salmon fry and parr is of interest as there is a small waterfall between this site and the main stream; so, another good result; juvenile salmon were not found here during the previous survey in 2021 (Cunningham, 2022).

At the downstream site (KANC5) salmon fry numbers were high; but salmon parr numbers were perhaps slightly lower than might have been anticipated.

Overall – the high fry numbers at two sites (KANC3 and KANC5) and presence of salmon fry at two other sites (KANC2 and KANC4) provide evidence of widespread salmon spawning within the River Kanaird system in 2023.

The survey was carried out to complement a survey of sites in 2023 including sites fished for the National Electrofishing Programme of Scotland to minimise duplication of effort. Results from 2023 are discussed in Cunningham 2024.

Table 5a. Juvenile fish survey results for sites fished in River Kanaird in 2024. Water levels were too high on the 11th of September 2024 to be able to get quantitative data; Catch Per Unit Effort [CPUE] data for KANC2 greatly underestimate actual fish abundance. Water levels were low and conditions good for electro-fishing on 30th September 2024.

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 m²; yellow, for 1.00 to 1.99 fish per minute or 0.100 to 0.199 fish per m²; orange for 0.50 to 0.99 fish per minute or 0.050 to 0.099 fish per m²; and red for 0.01 to 0.49 fish per minute or 0.001 to 0.049 fish per m². 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	Code	Site	Easting	Northing	conductivity µS	temp °C	time (mins.)	wet area (approx) m2	sal fry number	sal par number	trt fry number	older trout number	sal fry per minute	sal par per minute	trt fry per minute	old trt per minute	sal fry per m²	sal par per m²	trt fry per m²	older trout per m²	eels	minnows	Comments
11/09/2024	KANC1	Glen Cottage	218686	902126	38	10	10	n/r	0	0	0	1	0.00	0.00	0.00	0.10	#VALUE!	#VALUE!	#VALUE!	#VALUE!	4		river high - fished edge of channel
11/09/2024	KANC2	below Yogi's field	216601	902485	43	10.1	15	n/r	3	5	1	1	0.20	0.33	0.07	0.07	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0	2	river high - fished edge of channel
30/09/2024	KANC3	Allt Liath Doire	215435	905149	61	8.8	12	100	36	7	5	1	3.00	0.58	0.42	0.08	0.36	0.07	0.05	0.01			
30/09/2024	KANC4	Lochan an Dubha burn 300m downstream of loch	215173	905191	45	9.9	6	80	2	2	4	2	0.33	0.33	0.67	0.33	0.03	0.03	0.05	0.03			
30/09/2024	KANC5	below main road	214112	901159	85	9.9	10	150	32	9	2	0	3.20	0.90	0.20	0.00	0.21	0.06	0.01	0.00	13		

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 m²
	1.00 to 1.99 fish per minute or 0.100 to 0.199 fish per m²
	0.50 to 0.99 fish per minute or 0.050 to 0.099 fish per m²
	0.01 to 0.49 fish per minute or 0.001 to 0.049 fish per m².

3.3.2 Results from Gruinard River survey

Moderate to high numbers of salmon fry and parr were recorded at GRNC1, at the top of the Abhainn Srath na Sealga (see Table 5b). These fish were small for their age and rather thin, reflecting a near carrying capacity population of juvenile salmon (as many juvenile salmon as the river can support).

At the second site GRNC2 in a small tributary burn below the waterfall (Eas Ban), there were no salmon fry. The high number of parr is probably associated with dispersal of juvenile salmon from spawning areas in the bigger river further downstream.

The third site, GRNC3, is located above a waterfall which is only occasionally passable to adult salmon. In surveys in previous years juvenile salmon have often been absent from this site. So, the occurrence of large salmon fry was of interest. Note that they are much larger here, because of low densities, than at site GRNC1 below the waterfall.

Of particular interest was the occurrence of both salmon fry and salmon parr at the top site GRNC4.

Two adult salmon were seen on spawning habitat about 400m upstream from top site GRNC4, so likely three year classes of juvenile salmon in succession in this part of the river system.

Table 5b. Juvenile fish survey results for the Gruinard River.

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	Code	Site	Easting	Northing	conductivity µS	temp °C	time (mins.)	wet area (approx) m2	sal fry number	sal par number	trt fry number	older trout number	sal fry per minute	sal par per minute	trt fry per minute	old trt per minute	sal fry per m^2	sal par per m^2	trt fry per m^2	older trout per m^2	eels	Comments
06/11/2024	GRNC1	Abhainn Srath na Sealga at top of alder wood	208874	878853	49	10.4	10	100	15	22	1	0	1.50	2.20	0.10	0.00	0.15	0.22	0.01	0.00	1	sal fry 40-52mm, sal par 58-92mm
06/11/2024	GRNC2	Allt Eighidh (Eas Ban burn)	209063	878555	58	10.7	8	90	0	23	3	2	0.00	2.88	0.38	0.25	0.00	0.26	0.03	0.02		sal par 64-101mm
06/11/2024	GRNC3	Abhainn Loch an Nid	208599	877462	34	10.9	8	100	2	0	6	10	0.25	0.00	0.75	1.25	0.02	0.00	0.06	0.10		sal fry 73-74mm; trt fry 65-80mm; trt 101-350mm
06/11/2024	GRNC4	Abhainn Loch an Nid	207981	875690	34	10.2	8	75	10	10	0	4	1.25	1.25	0.00	0.50	0.13	0.13	0.00	0.05		sal fry 43-54mm; sal par 94-139mm; spn salmon ~400m ^strm

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.

3.4 Discussion of juvenile fish survey

Useful data was collected to provide an indication of the health of juvenile salmon populations in both the River Kanaird and on the Gruinard River focussing on marginal habitat in headwater streams.

On 11th September 2024 we looked for any signs of juvenile salmon in the River Kanaird at the top site KANC1; none were found. The high water on day of survey made finding juvenile salmon more difficult, so it is possible that if there were juvenile salmon at this site they could have been missed. The site was also fished in 2023, no salmon fry or parr were found at this site on that occasion either; however, they have been found in other previous recent years.

Juvenile salmon have been found only rarely above the Langwell falls in recent years. KANC1 was surveyed in 2023 (for Hydro contract) and may be surveyed again in 2025. Overall – the high fry numbers at two sites (KANC3 and KANC5) and presence of salmon fry at two other sites (KANC2 and KANC4) provide evidence of widespread salmon spawning within the River Kanaird system in 2023. However, parr numbers were a little lower than might have been anticipated at KANC3 and KANC5.

For the Gruinard, every site told a different story. Numbers of juvenile salmon (both fry and parr) were close to what one would expect at site GRNC1; the absence of salmon fry but good numbers of salmon parr at GRNC2 is also close to what one would expect for a small tributary stream.

The occurrence of juvenile salmon at sites GRNC3 and GRNC4 above the waterfall shows survival of wild salmon population right up to the top of the accessible limit. Finding salmon fry at 3 out of 4 sites was a good result following very low numbers of adult salmon in reported rod catches in 2023 (see Appendix 3).

4. Conclusions and recommendations (for discussion)

- Useful samples of sea trout were obtained at both the Kanaird site and the new Inverianvie (Gruinard Bay) site to be able to assess sea lice levels and the condition of sea trout
- High numbers of sea lice were recorded on sea trout in the sample taken at the Kanaird site in May 2024.
- The WRFT seine netting team gained useful experience in sampling sea trout at the new Inverianvie culminating with a sample of 17 sea trout in early October.
- Sea lice levels were low on nearly all fish in samples taken in June, July, August, September and October.
- Some larger sea trout had sea lice damaged dorsal fins at both sites, mostly healed so stunted fins.
- To protect migrating wild post-smolt salmon as well as sea trout, it is important to maintain much lower sea lice levels on farmed salmon at the Ardmair salmon farm especially during period February to May 2025 than achieved in spring 2024.
- Juvenile salmon were not recorded at a site in the upper River Kanaird above the Langwell falls, but present at all other sites surveyed in both the River Kanaird (and Runie) and Gruinard headwaters.
- The occurrence of salmon fry at three out of four sites in the Gruinard headwaters was reassuring after low numbers of reported rod caught salmon in the Gruinard River in 2023.

Acknowledgements

For help with sea trout sampling in 2024 thank you especially to Nic Butler, Chloe Hall, Ant Hall, MOWI Ardmair staff (including provision of boat for sweep netting at Ardmair shore on 15th July), Nicky Middleton-Jones, Jim Henderson, Rachel Hedley; Kaenchullish estate, staff and guests. Thank you very much to Gruinard estate and Gary Ross and Eric Ross for providing transport and assistance to do the Gruinard River headwaters survey in November 2024.

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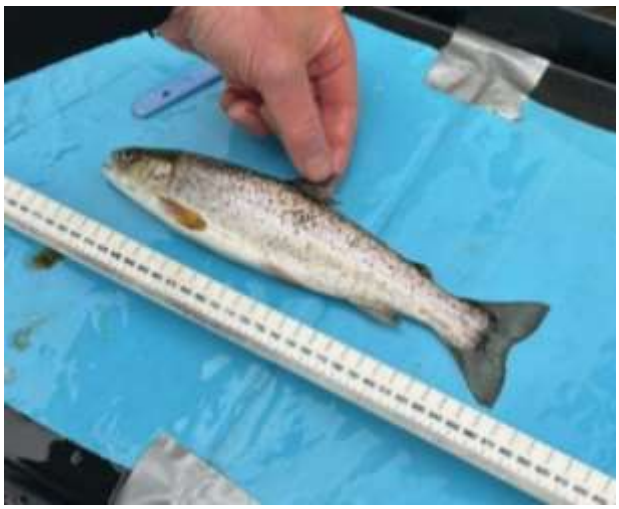
Appendix 1. Sea trout monitoring photos

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

Kanaird Visit # 1: 24th May 24 (photos by James Spence)

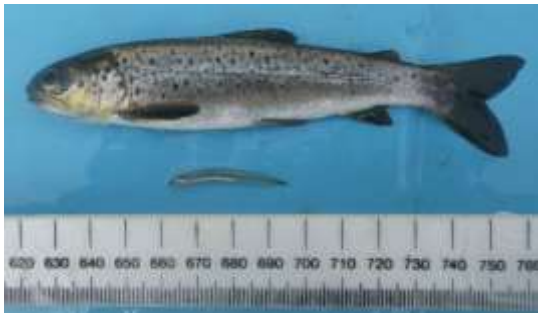
(below) a trout 273mm (fish no 12), approx. 156 chalimus lice



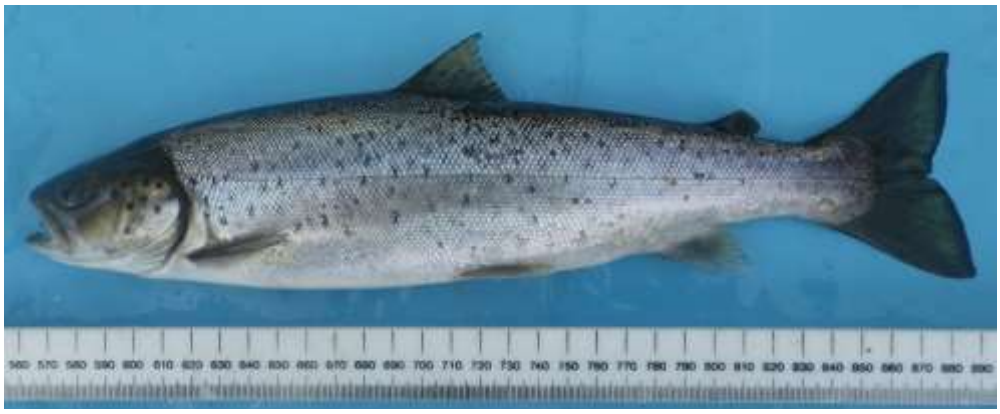
(left) Sea trout 171mm (fish no.5), with approx. 120 lice (right) post smolt sea trout in tub showing dark marks on back where lice have been attached.

Kanaird Visit #2: 20th June24

ST147mm Kanaird 20 June 24



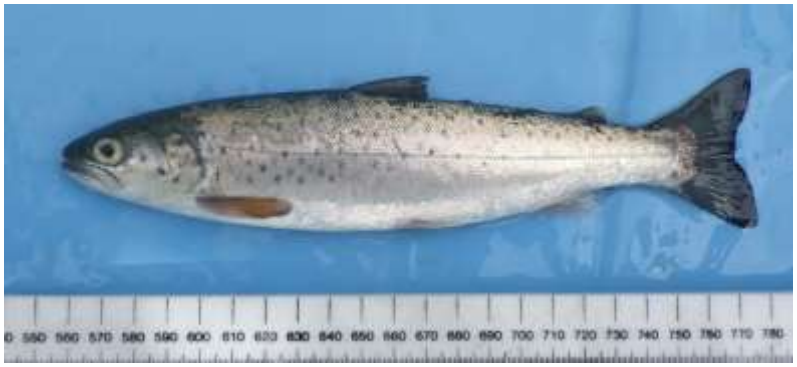
ST325mm Kanaird 20 June 24



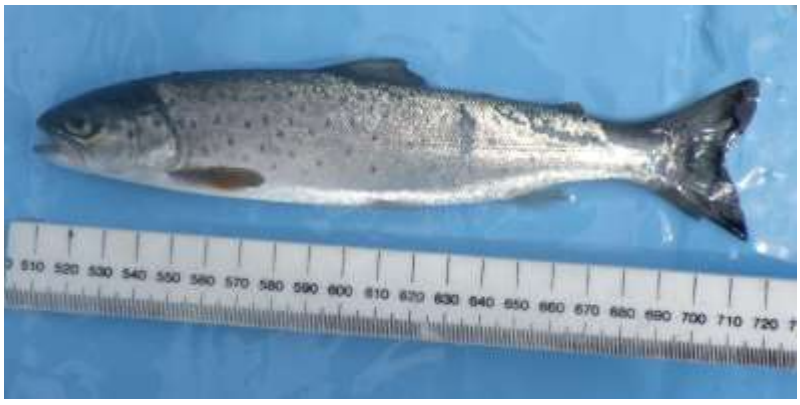
ST470mm Kanaird 20 June 24

Ardmair (instead of Kanaird) Visit #3: 15th July 2024 (pics by Chloe Hall)

ST228mm Ardmair 15 Jul 24



ST210mm Ardmair 15 Jul 24

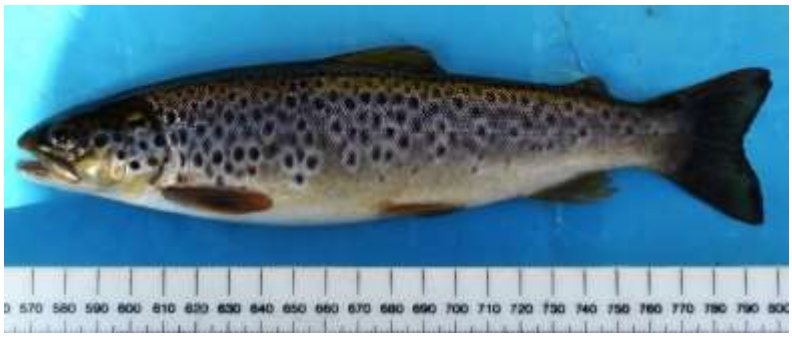


Kanaird Visit #4: 6th August 2024

Team, Kanaird 6th August 2024

ST262 mm Kanaird 6th Aug 2024

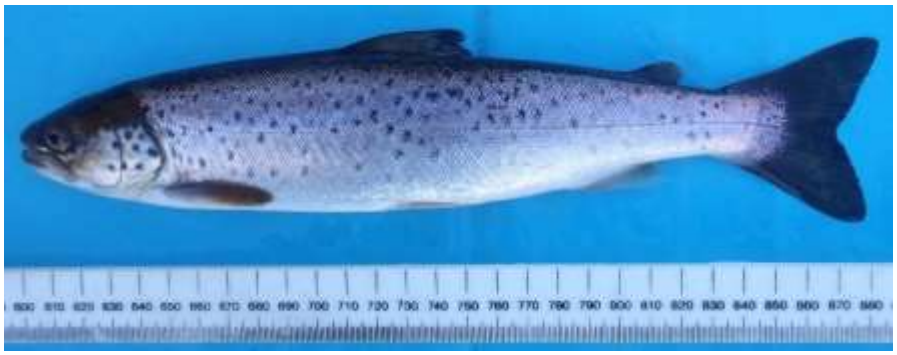
T245 mm Kanaird 6th Aug 2024



Kanaird Visit #5: 18th September 2024

ST440mm Kanaird 18 Sept 2024

ST280mm Kanaird 18 Sept 2024

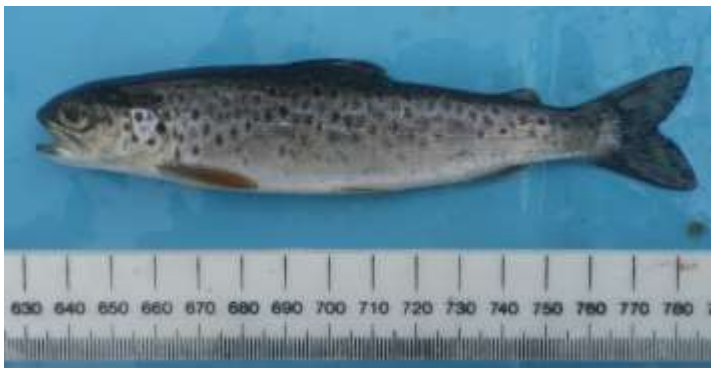


ST410mm Kanaird 18 Sept 2024

Inverianvie sweep netting photos

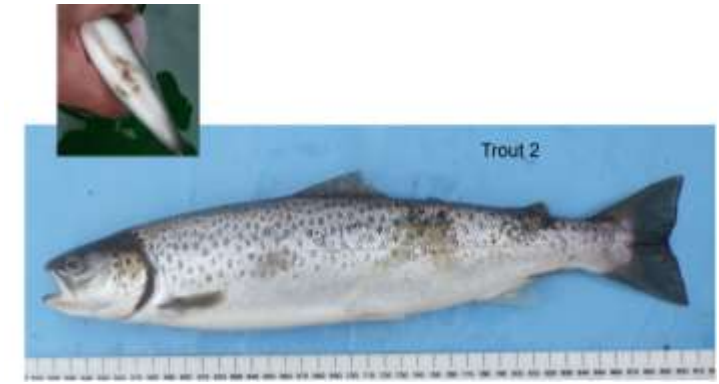
Visit #219th June 2024

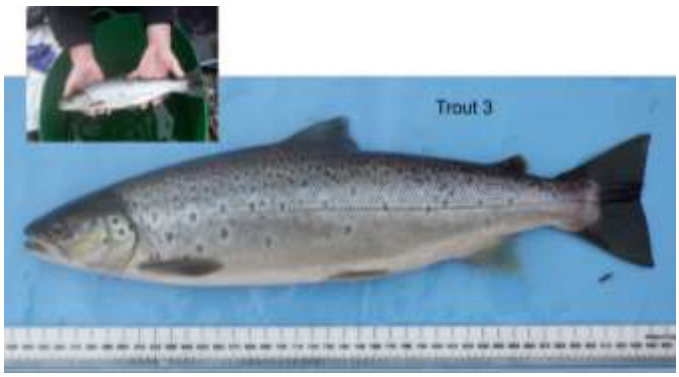
ST160mm Inverianvie 19June 24



Visit #3:11th July 2024

Pictures by Chloe Hall

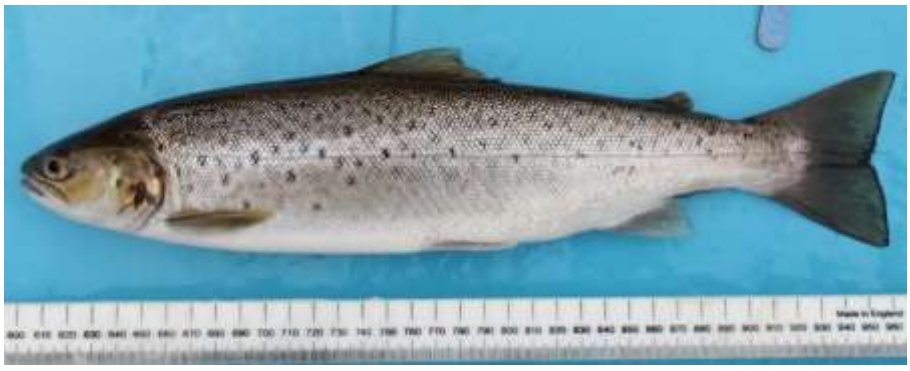




Visit #4: 9th August 2024

Sea trout 540mm Inverianvie (Gruinard Bay), 8 August 2024, no lice seen. This fish was also taken on 11th July at same location, recognised by spot pattern and where scale sample had been taken. Scale regrowth can be seen where scale sample taken on 11th July.

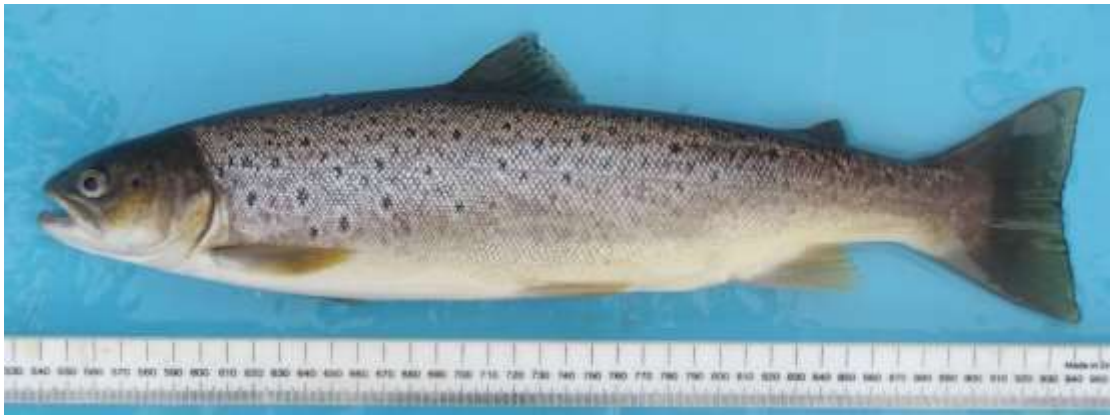
Sea trout 375mm Inverianvie (Gruinard Bay), 8 August 2024; 25 lice counted on this fish, mostly small chalimus stage.



Visit #5: 7th October 2024

Male sea trout 435mm & female sea trout 480mm Inverianvie, 7th October 2024

Female sea trout 410mm Inverianvie, 7th October 2024



Appendix 2: Juvenile fish sampling photos

Juvenile fish survey Kanaird River 11th September and 30th September 2024 site photos and some fish

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

KANC1 by Glen Cottage, 11th September 2024; juvenile trout from this site

KANC2 below Langwell, 11th September 2024; juvenile trout, salmon and a minnow from this site

KANC3, 30th September 2024 (photos by Nic Butler)

KANC4, 30th Sept 2024 (photos by Nic Butler)

KANC5, 30th Sept 2024 (photos by Nic Butler)

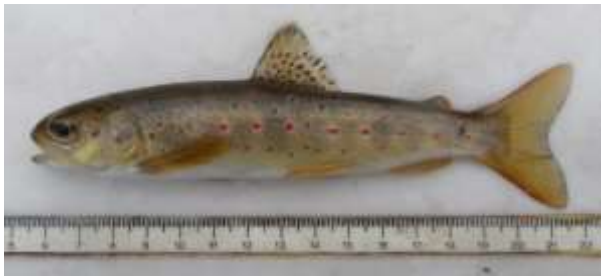
Juvenile fish survey Gruinard River headwaters, 6th November 2024 site photos and some fish

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

GRNC1 Abhainn Srath na Sealga, 6 Nov 2024.

GRNC2 Eas ban burn, 6 Nov 2024.

GRNC3 Abhainn Loch an Nid, 6 Nov 2024.

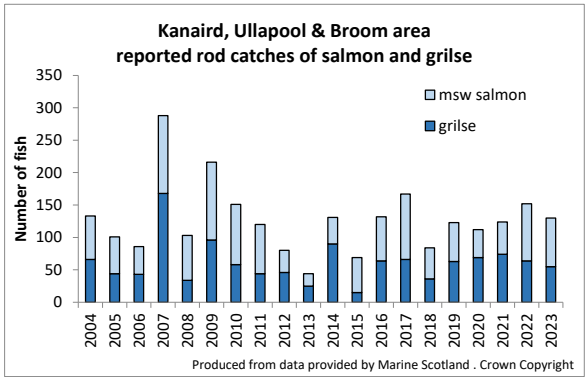


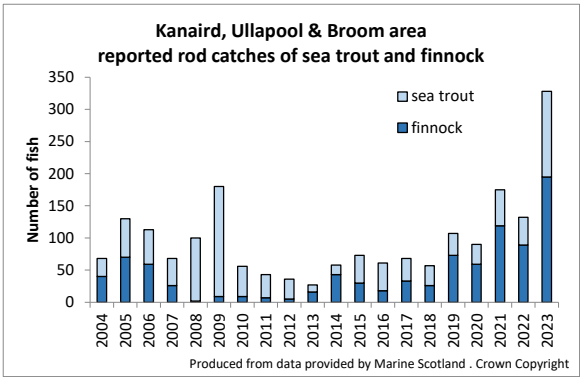
GRNC4 near top of Abhainn Loch an Nid, 6 Nov 2024. Salmon fry and large parr

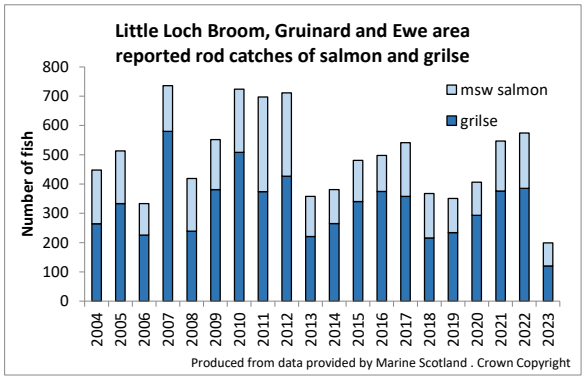
Appendix 3. Reported rod catches of salmon and sea trout for nearby rivers

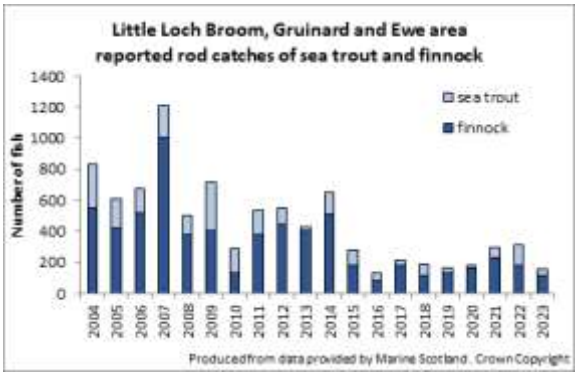
Graphs for rod catches of salmon and sea trout for the main rivers around the Ardmair salmon farm are shown below. From data published by the Marine Directorate of the Scottish Government via links at https://marine.gov.scot/data/marine-scotland-salmon-and-sea-trout-catches-salmon-district-shinyapp

Note that there was an increase in the number of rod caught sea trout and finnock reported for the Kanaird – Broom area in years up to 2023.









Figures for 2024 rod catches area awaited.