Occurrence of Farmed Atlantic Salmon in Western River Basin Districts during August & September 2024

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Inland Fisheries Ireland, River Erriff National Salmonid Index Catchment, Aasleagh, Leenane, Co. Mayo

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1 Executive summary

On 11th August 2024, an escape of farmed salmon from a single open-net salmon pen at the Rosroe Salmon Aquaculture site in Killary Fjord, Co. Mayo occurred. Within days, Inland Fisheries Ireland (IFI) staff at the River Erriff National Salmonid Index Catchment (NSIC), located at the head of Killary Fjord, detected farmed salmon entering the river and anglers in nearby rivers began reporting catches of suspected escaped farmed salmon. IFI circulated notice of the escape event to salmon fisheries in the general area. Within weeks, suspected farm escapes were caught by anglers in rivers ranging from as far south as the Corrib River Co. Galway and as far north as the River Moy, Co. Mayo. Further fish were caught in draft nets deployed in Killary Fjord as well as at the fixed Aasleagh fish trapping facility at the River Erriff NSIC.

In total, 50 suspected farm fish caught and retained across a total of 10 rivers (in addition to a specimen caught in a draft net deployed in Killary Fjord) throughout mid to late August and September were made available to IFI staff at the River Erriff NSIC and underwent full sampling at the NSIC Aasleagh laboratory. These fish were verified as being of farm-origin, through combination of external inspection, internal dissection, scale analysis and genetic analyses. Furthermore, five specimens (including from two additional individual rivers) were also suspected as being of farmed origin through inspection of scale samples provided by anglers. External morphological examination of suspected farm fish showed several characteristic traits that distinguished these specimens from wild Atlantic salmon in Irish rivers during this period, including fin ray deformities, shortened snouts and gill covers and colouration patterns. Scale analysis of suspected farm fish showed larger smolt size, younger smolt age and the absence of a sea winter band which distinguished them from wild Atlantic salmon. Subsequent genetic analyses of tissue samples unambiguously assigned all 50 of the sampled specimens to a farm-origin Atlantic salmon strain and not to wild Irish populations. Internal examination revealed a 60:40 female-to-male sex ratio and established that a proportion (20%) of male farm escapees captured in freshwater were sexually mature and would be capable of spawning during the upcoming 2024−2025 wild salmon spawning season. Combining results from the 50 full examinations of retained specimens and scale analysis of five additional scale-only samples, in total 55 farm escapees were confirmed across 12 rivers in the Western River Basin District between 17th August and 30th September.

Given the timing of the Killary fish farm escape event, the subsequent occurrence of farmed fish in rivers within the vicinity of the farm in the following weeks, their comparable size to those that escaped from the farm and the absence of reports relating to farm fish escapes at other aquaculture sites, it is reasonable to conclude that the farmed fish detected in wild salmon rivers during mid-late August and September 2024 arose from the single escape event at the Killary fish farm. An initial figure of approximately 7,000 −8,000 escaped fish was reported by the farm[1]. Using established rod-angling exploitation rates for rivers with documented numbers of escaped farmed salmon, it was estimated that over

[1] https://www.oireachtas.ie/en/debates/question/2024-09-26/72/

450 fish potentially entered these 12 rivers in the weeks immediately following the escape. This estimate is based only on confirmed farm escapee occurrences and omits all catches not officially reported and verified through sampling and does not include any escaped fish potentially present in smaller unmonitored rivers without angling effort or that migrated upriver following the conclusion of the salmon angling season on 30th September.

The substantial geographical extent of documented upriver migration of farmed fish, spanning well over 100 km in both north and south directions from the presumed source of the escapees in Killary, potentially exposed up to 30 individual wild Atlantic salmon rivers to upriver migration of escaped farm fish from August onwards. Furthermore, given the propensity of farm fish at this earlier phase of maturation to undertake sea migrations following the escape, there is a distinct possibility that farm-origin fish could return from the marine environment in subsequent migration years at a much more advanced stage of sexual maturity. Such fish may be much more difficult to distinguish from wild fish owing to recovery of fin deformities. Overall, this documentation of a single, relatively small escape in terms of reported numbers, highlights the potentially large-scale ecological implications that can arise more generally from marine salmon aquaculture escape events. Regional wild salmon populations can be exposed to interbreeding with genetically distinct, domesticated farm-origin fish, which can have substantial consequences for wild population genetic integrity, with small river populations of Atlantic salmon most at-risk in this regard.

2 Project personnel and acknowledgments

The report was written by Dr Seán Kelly, Hannah Adons, Joaquin Nunez, Enda O'Brien, Padraic O'Malley and Dr Michael Millane (IFI). IFI staff in the Connemara/Ballinakill, Galway, Bangor and Ballina Districts are thanked for collection and collation of farmed fish samples. John Coyne (IFI) is sincerely thanked for provision of genetic sampling materials and information related to gonadal maturity assessments. Jamie Coughlan, Oliver Stuart, Thomas Reed and Phil McGinnity (UCC) are gratefully acknowledged for providing genetic analyses of suspected farm escapes. Tom McDermott (Marine Institute) is also acknowledged for initial liaisons and consultation with IFI staff regarding the escape event at Killary farm. The authors sincerely thank all fishery managers and anglers who reported catches of suspected farm fish and made available retained suspected fish to IFI scientific staff for further analyses and verification.

3 Introduction

On Sunday 11th August 2024, a breach in one of the open-net salmon pens at Rosroe Salmon Aquaculture site, Killary Harbour occurred. The damage was suspected to have arisen from a wellboat which had been providing routine disease treatment for farmed salmon prior to the onset of inclement weather conditions. Inland Fisheries Ireland (IFI) were not officially notified of the escape event. The first suspected farmed salmon was caught by an angler on the River Erriff on the tidally-influenced Beat 9 (below the river entry point) on the 17th August 2024. Anglers and fishery clubs in the region were alerted by IFI to report any suspected farmed fish encountered, and in instances where a fishery was open for harvest, retain any suspected farmed fish for analyses and verification purposes. All retained specimens were sent to IFI scientific staff based at the Aasleagh laboratory in the River Erriff National Salmonid Index Catchment (NSIC). During the period 17th –24th August several suspected farmed salmon were caught and retained in rivers in the immediate vicinity of the Killary farm (Rivers Erriff, Bundorragha and Dawros). On the 25th August, two weeks after the escape event, a farmed specimen was caught and retained (and subsequently confirmed as being of farm-origin) on the Owenmore River, Co. Mayo, some ~80 km north of the Killary fish farm location. Caught and retained suspected farmed fish subsequently verified through sampling as being of farm-origin were documented for an additional six rivers (Ballynahinch (Co. Galway), Bunowen (Co. Mayo), Carrowniskey (Co. Mayo), Corrib (Co. Galway), Moy (Co. Mayo), Owenduff (Co. Mayo)) during the August – September salmon angling season. An additional farm fish was caught in a draft net deployed in Killary Fjord in the vicinity of the farm on 27th August 2024. Furthermore, scale samples received from suspected farmed fish rod-caught on two additional rivers (Screebe (Co. Galway), Cashla (Co. Galway)) were provided to IFI and whilst the full carcass could not be fully examined through internal dissection or genetic analyses, scale analysis revealed the same growth/age patterns as observed for fully verified farmed fish samples, indicating the presence of farmed fish in these additional rivers.

4 Confirmed reports of escaped farmed fish from individual rivers

The figures in this section pertaining to numbers of farmed fish caught and numbers of individual rivers with farmed fish present during August and September 2024 deals strictly with confirmed cases of farmed salmon i.e. those specimens which were retained and sampled by IFI staff and subsequently verified as being of farm-origin. Therefore, the numbers reported here in terms of 1) the total number of fish caught and 2) the total numbers of rivers with farmed fish present are to be regarded as an absolute minimum, as they omit information pertaining to any suspected farmed fish specimens that may have been caught but were either released or not provided for further sampling and verification.

4.1 Ballynahinch

The Ballynahinch River flows into Bertraghboy Bay in southwest Connemara. A single suspected farm escapee was caught through angling and retained on the Ballynahinch River on the 16th September and subsequently verified as being of farm-origin through sampling.

4.2 Bundorragha

The Bundorragha River (Delphi fishery) constitutes the closest major river to the site of the Killary fish farm. The mouth of this river enters the northern side of the fjord less than 10 km directly upstream of the Killary farm site. Two suspected farmed salmon were caught through angling, retained and made available for further sampling to confirm farm-origin. The first of these fish was caught in the Meadow Pool in the lower reaches on the 19th August. The second sampled farmed fish was caught in Doo Lough on the 3rd September. The Delphi fishery management subsequently reported a total figure of 19 suspected farmed fish being caught on this river system. However only two of these fish were fully examined and verified by IFI staff.

4.3 Bunowen

The Bunowen River enters into Clew Bay along the southern coastline, north of the Killary fish farm location. A single suspected farm escapee was caught through angling and retained on the Bunowen River near Louisburgh village on the 15th September and subsequently verified as being of farm-origin through sampling.

4.4 Carrowniskey

The Carrowniskey River drains directly into the Atlantic Ocean through the Roonagh Lough tidal lagoon in southwest Mayo, just north of Killary Fjord. A single suspected farm escapee was caught through angling and retained on the Carrowniskey River on the 17th September and subsequently verified as being of farm-origin through sampling.

4.5 Cashla

The Cashla (Costello-Fermoyle) River drains into Cashla Bay between Carraroe and Rossaveel in southern Connemara. Whilst no full specimen was retained and made available for full examination, a scale sample was retrieved from a suspected farm-origin fish on 27th September and examined by IFI staff. The patterns of growth and age were characteristic of the scales examined for fully verified specimens, indicating that farm escapes had entered this river system.

4.6 Corrib

The River Corrib flows out through Galway city into the inner northeast corner of Galway Bay. A single suspected farm escapee was caught through angling and retained on the River Corrib at the Galway Weir on the 9th September and subsequently verified as being of farm-origin through sampling. A scale sample retrieved from a second suspected rod-caught fish at the Galway Weir on 8th September was also analysed. Given the

similarities to scales analysed for confirmed farm-origin fish, this fish was also classified as a farm escape. This location represents the southernmost river along the coast from the Killary fish farm from which a farm escapee was officially recorded.

4.7 Dawros

The Dawros River empties in Ballinakill Bay, the next major coastal embayment to the south of Killary Harbour. In total, three suspected farmed salmon were caught, retained and underwent further sampling to verify farm-origin on the Dawros River. The first fish was caught on the 20th August, with subsequent fish caught on the 21st August and 2nd September in the lower reaches of the system near the river mouth at Derryinver Bridge. A scale sample retrieved from a fourth suspected farm specimen also caught on 2nd September was later assessed through scale analysis and confirmed as having similar age/growth to verified farm specimens more thoroughly examined.

4.8 Erriff

The first confirmed escaped farmed salmon was captured on Beat 9 on the Erriff River on 17th August 2024. Beat 9 is the lowermost fishing beat on this river and lies in the tidally-influenced water below Aasleagh Falls (river-entry point) at the head of Killary Fjord, some 15 km from the Killary fish farm. From the 17th August to the 9th of September a total of 34 suspected farmed salmon were caught, retained and sampled in the Erriff fishery through combination of angling catches (26 total) and farmed fish entering the fixed Aasleagh trap facility (seven total), which intercepts upstream migrating fish. One suspected fish was caught-and-released by an angler but a scale sample taken subsequently revealed this fish to have been of farm-origin, bringing the total number of confirmed farm escapees detected in this river to 35.

4.9 Killary Fjord

Draft nets were deployed in Killary Fjord in the vicinity of the Killary fish farm during the week of the 26th August, specifically to capture any escaped farm fish arising from the escape incident that occurred there. A single fish caught on the 27th August was retained and provided for further sampling and subsequently verified as being of farm-origin.

4.10 Moy

The River Moy flows northward into Killala Bay in north Mayo. A single suspected farm escapee was caught and retained by an angler on the River Moy in Ballina on the 26th September 2024 and subsequently verified as being of farm-origin through sampling. This location represents the northernmost river along the coast from the Killary fish farm from which a farm escapee was officially recorded.

4.11 Owenduff

The Owenduff River flows into Blacksod Bay just south of Tullaghan Bay in northwest Mayo. Two suspected farmed salmon were captured through angling on the Owenduff River

and retained for further sampling and farm-origin verification. The first was caught on 24th September in Ballycroy and the second on the 30th September.

4.12 Owenmore

The Owenmore River is a large river flowing southwest into Tullaghan Bay in northwest Mayo. In this river, three suspected farmed salmon were caught, retained and underwent further sampling to verify farm-origin. The first fish was caught in the lower part of the river on 25th August. Additional fish were caught on the 30th September in the estuary and in Bangor. In addition, reports of suspected (but released) farmed fish on the lower reaches of the river were provided as early as the 18th of August, less than one week after the initial escape event. These reported fish could not be officially confirmed as being of farm-origin. However, photographic evidence indicates a strong likelihood they were given the external morphological similarities to subsequently sampled fish verified as farm-origin.

4.13 Screebe

The Screebe River flows through the saline upper, middle and lower Lough Ahalia system before draining into Camus Bay in southern Connemara. Whilst no full specimen was retained and made available for full examination, a scale sample was retrieved from a suspected farm-origin fish on 30th September. The patterns of growth and age were characteristic of the scales examined for fully verified specimens, indicating that farm escapes had entered this river system.

4.14 Summary of collated information

In total, 50 fish suspected as being of farm-origin after being caught were retained and presented to IFI scientific staff for full examination at the River Erriff NSIC laboratory. These fish were caught across a total of ten individual river systems, with an additional specimen caught in a draft net deployed in Killary Fjord. They were all subsequently verified as being farm-origin fish through detailed examination (Sections 5, 6, 7). Scale samples retrieved from suspected fish caught (but not provided for full examination) on the Corrib, Dawros and Erriff rivers, as well in two other rivers (Cashla and Screebe) were examined and confirmed as being from farm-origin fish, owing to similarities in the observed scale age and growth patterns documented for specimens verified as being farmed through the full examination process (Figure 1). This brings the total number of farm escapees confirmed across 12 separate river systems to 55 (Figure 1). The full suite of biological information recorded during examination and described in the following sections is shown in the Appendices to this report (Table 1 and Table 2). The breakdown of confirmed numbers recorded for each river as well as number of days between the occurrence of the farm escape incident at Killary Fjord salmon farm and first detection of confirmed farm escapees in each individual river are displayed in Table 3 of the Appendices.

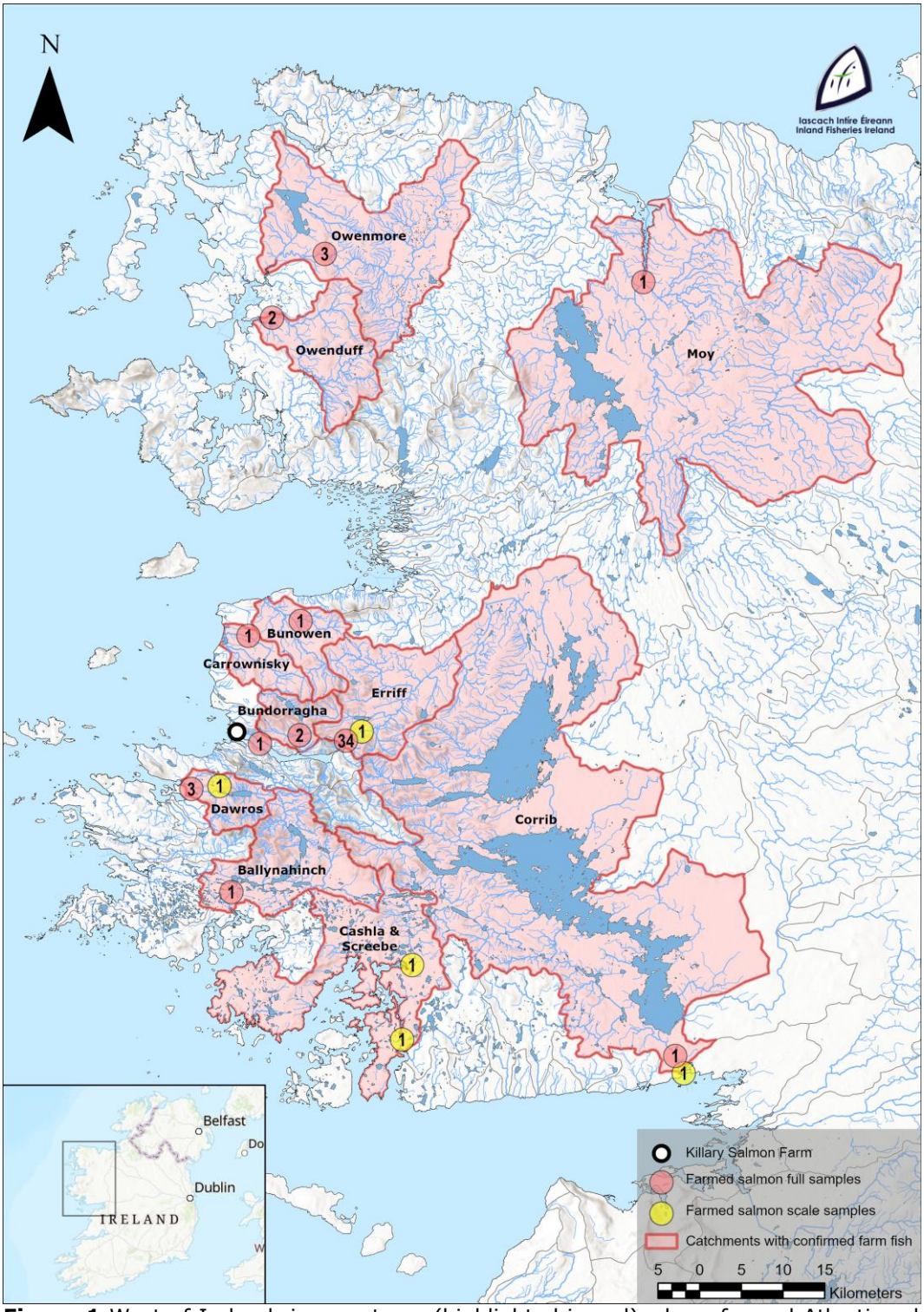

Figure 1 West of Ireland river systems (highlighted in red) where farmed Atlantic salmon were captured and confirmed through sampling during mid-late August-September 2024. Numbers inside the sample sites represent the number of samples for that location. Also shown is the location of the Killary Fjord marine salmon farm, the site of an escape event on August 11th 2024 (Information on the numbers and time of documented occurrence of farm escapees in each river is displayed in the Appendices, Table 3).

5 Biological sampling

Sampling of the 50 suspected farmed salmon specimens retained and provided to IFI involved: 1) external morphological examinations to assess distinguishing features associated with farm-origin salmon and length/weight measurements, 2) internal dissection to determine sex, gonadal maturity, gut contents, and internal parasitism, 3) removal of scale samples for aging analyses and 4) tissue sampling for genetic analyses. A standardised set of photographs of the full carcass, dorsal fin, caudal fin, head/snout, internal body cavity (including gonads) and scale samples were taken and maintained on record for every examined specimen.

5.1. Morphological examination

A combination of external morphological traits are routinely used to identify escaped farmed salmon from wild salmon. Fiske *et al*. (2005) provide a comprehensive description of differences in the external morphology of farmed and wild salmon that can be used to distinguish both forms and an IFI report published in 2017 by Gargan et al. (2017) highlighted the primary distinguishing features between farm-origin salmon that occurred in western Irish rivers during a 2017 escape event. In reared fish, damage on fin tissue frequently causes the fin rays to grow together and lose evenly arched or straight rays as seen in wild fish. Fins of reared fish lose their normal shape and often appear torn, wavy and fused together.

All 50 examined farm escapees exhibited the morphological features used to distinguish farm-origin fish from wild fish to varying extents (Plates 1-4). A very clear indicator of a suspected farmed fish was the 'fresh-run' silver appearance of farm escapees (Plate 1). Given that farm-origin fish began showing up in rivers during late August and September when most wild counterparts had begun to exhibit a darkened, river resident external colouration, farmed fish retained a colouration comparable to early summer wild fish returning fresh from oceanic waters, with a black dorsal strip, silver flanks and white underbelly. Scales on suspected farm escapees were also easily detached with handling compared to wild fish captured during this time period. Notably, dorsal fins were clearly torn or fused in virtually all specimens (Plate 2a and 2b) and caudal fins were underdeveloped with a torn and/or rounded appearance (Plate 3a and 3b), lacking the marked tips and wider tail flare seen in wild salmon (Plate 3c). Farm specimens also typically presented a shortened, "stubby" snout often with prominent teeth compared to wild fish migrating upstream during this period of the year (Plate 4). A proportion of examined specimens also exhibited a noticeably shortened gill cover.

Plate 1 Example of an escaped farmed salmon specimen rod-caught on the River Erriff, 21/08/2024. The obvious bright silver colouration was highly conspicuous for this stage of the season when the vast majority of wild salmon had begun to take on a more darkened, river-run colouration.

Plate 2a Typical dorsal fin appearance displayed by a farm escapee, illustrating a fused, torn appearance.

Plate 2b A second example of typical dorsal fin appearance in examined farmed specimens, illustrating a wavy, fused fin ray.

Plate 3a Example of caudal fin presentation in a farm escapee. Fin is underdeveloped and rounded, lacking the wider flare and marked tips compared to wild salmon.

Plate 3b Second example of caudal fin presentation in a farm escapee. Fin is underdeveloped compared to wild salmon and exhibiting a torn, frayed appearance.

Plate 3c Example of a wild Erriff salmon caudal fin for comparison, showing wider tail flare, sharper, elongated tips and lack of torn, frayed condition along the fin edge.

Plate 4 Head of an escaped farmed salmon specimen, showing a shortened, "stubby" snout and evidence of opercular shortening. Not all examined specimens illustrated these traits.

Length of farm escapees ranged from 47.1 cm to 64.3 cm, with an average length of 55.6 cm (Figure 2a). Weight ranged from 0.94 kg to 2.49 kg, with an average weight of 1.58 kg (Figure 2b). The mean condition index, *k*, $[log_{10}(Weight(kg)/Length(m)^3]$ of farm escapees was 0.96 (Figure 2c). By way of comparison, Erriff wild grilse returning during August and September 2024 sampled at the Aasleagh laboratory (n = 38) had a mean length of 56.7 cm (range: 47.4 – 67.5 cm), a mean weight of 1.88 kg (range: 0.95 kg – 3.30 kg) and a mean *k* value of 1.00.

The mean *k* value of farm-origin fish appeared to decrease with time from the initial escape event (Figure 3), implying either that escapees lost body condition in the weeks following the escape or that those fish with higher condition migrated into rivers earlier.

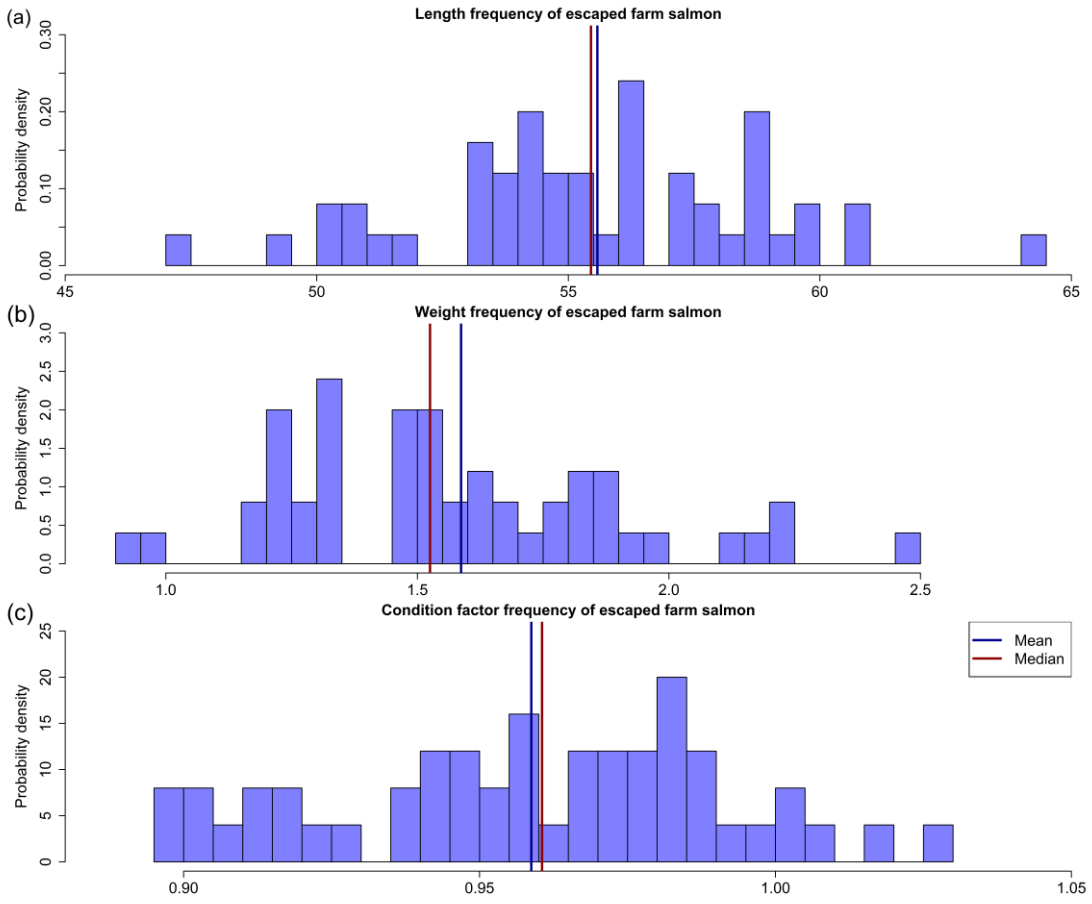

Figure 2. Histogram of (a) lengths (cm), (b) weights (kg) and (c) condition factor of all retained farmed salmon specimens that underwent biological examinations during August and September 2024.

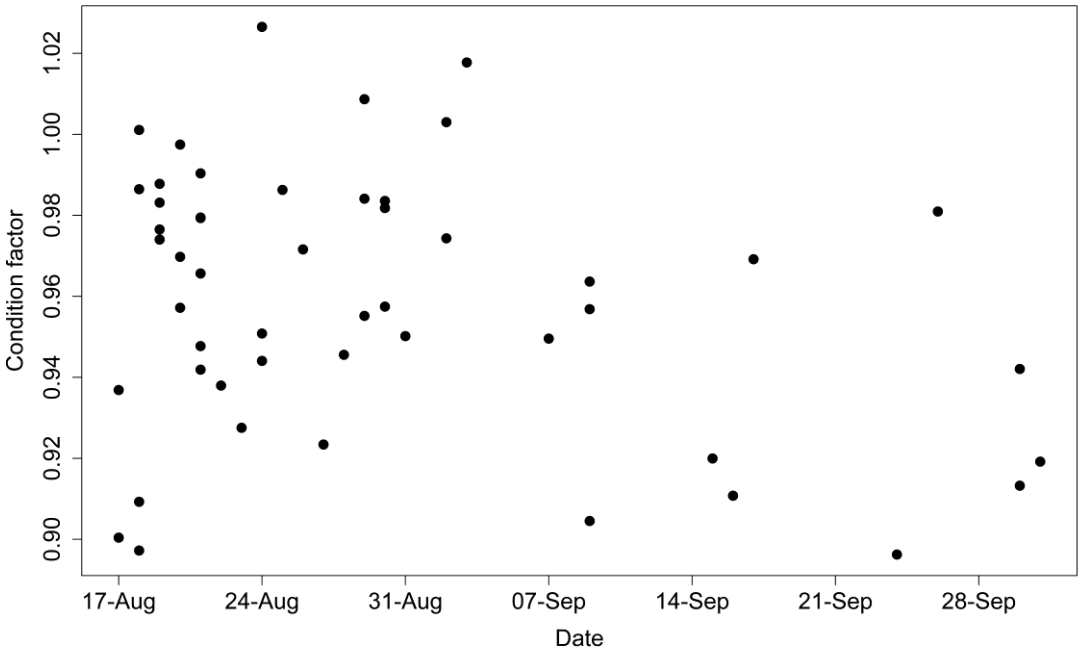

Figure 3. Condition factor of caught and retained farmed salmon specimens that underwent full biological examination over time.

5.2. Internal dissections

Internal dissections of the 50 retained specimens allowed the determination of sex ratios. Thirty of the farm escapees were female and 20 were male (60:40 female-to-male sex ratio). Gonadal maturity was determined following the methodology outlined in Murza and Khristoforov (1991). For males, gonad colouration, general characteristics, width (to the nearest mm) and weight (to the nearest 0.001 g) were recorded. For females, gonad colouration, general characteristics, width (to the nearest mm), length (to the nearest mm) and weight (to the nearest 0.001 g) were recorded. Coefficient of maturity, expressed as $(Gonadal\ Weight\ (g)/Body\ Weight\ (g)) \times 100$, was also recorded. Gonadal maturity stage was assigned per individual based on the range of these criteria. All females examined showed a gonadal maturity of Stage III (early), indicative of the degree of sexual maturity that would only occur in Atlantic salmon during their marine period (i.e. prior to their return spawning migration to freshwater) (Plate 5). Sixteen out of 20 examined male fish were classed as having a gonadal maturity of Stage I or slightly more advanced at Stage I active, similarly indicative of the level of sexual maturity associated with foraging Atlantic salmon during their marine phase (Plate 6). However, four of the examined males (a proportion of 20% of all examined male specimens) showed a more advanced stage of gonadal maturity, Stage III (Plate 7). This stage only occurs during specific seasons of the year associated with the completion of sexual maturity and spawning. For male specimens, gonadal maturity stage appeared to be correlated with overall body condition, with males having a higher body condition showing more advanced stages of sexual maturity (Figure 4).

No internal parasites were noted for any of the examined farmed fish and several fish had partial gut contents indicative of recent feeding.

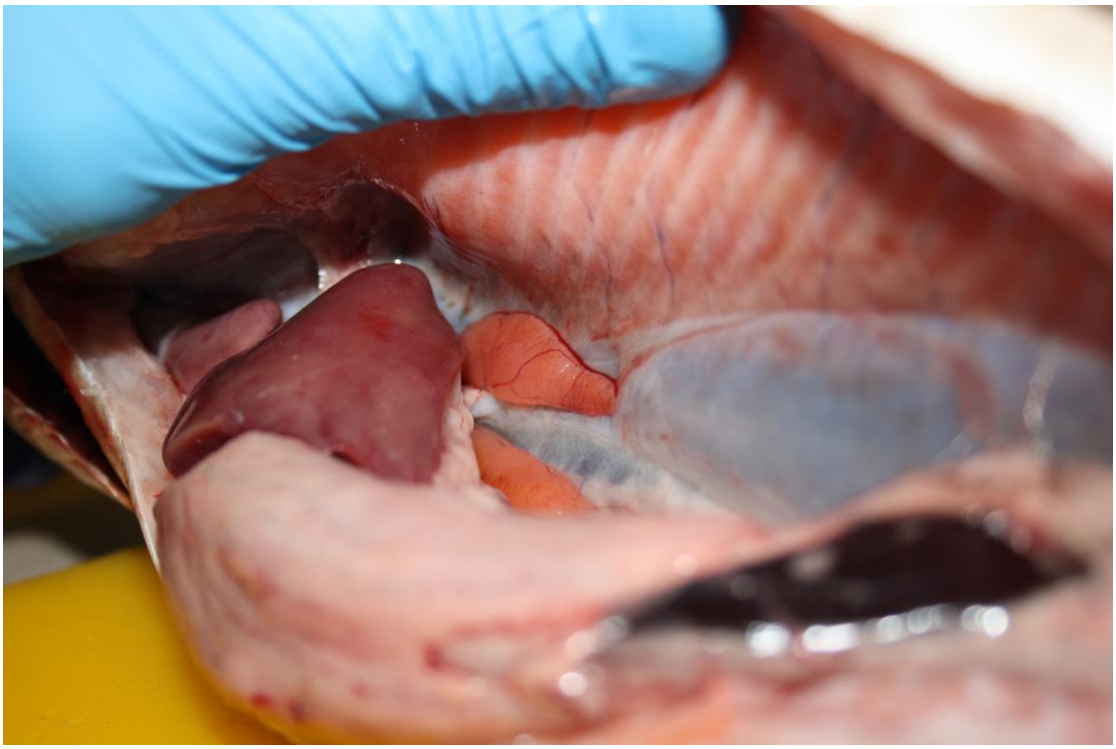

Plate 5 Typical gonadal maturity stage of the ovaries (immature) observed in all examined female farm fish specimens.

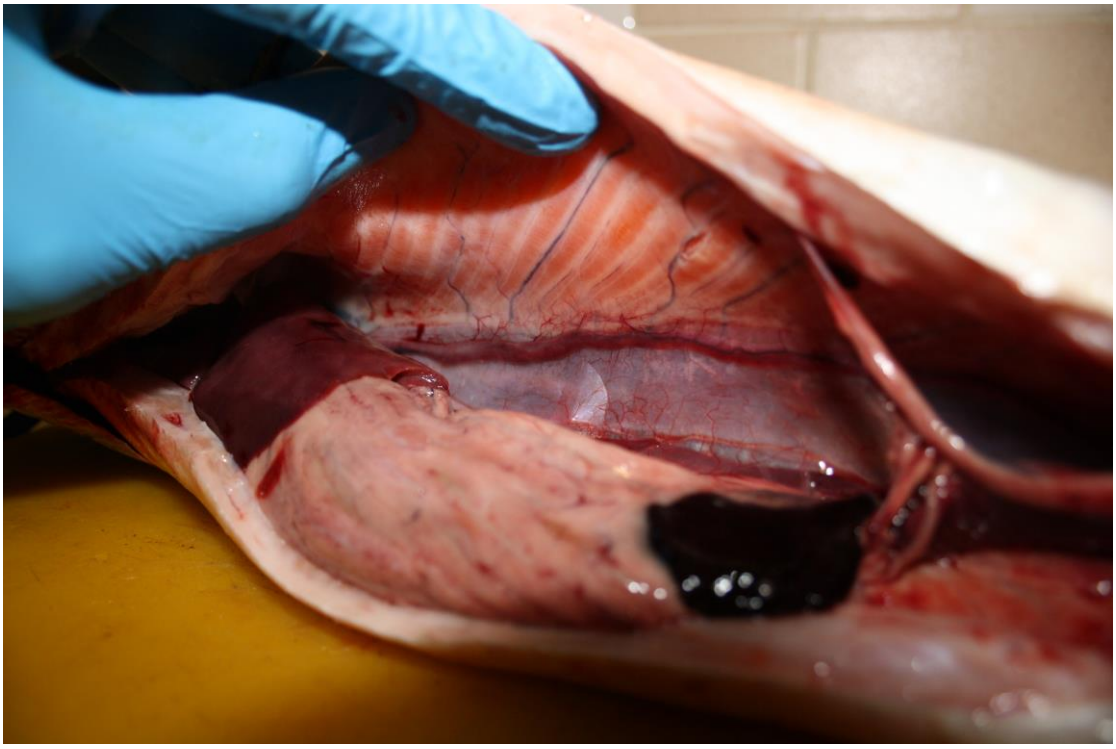

Plate 6 Typical gonadal maturity stage of the testes (immature) observed in majority of examined male farm fish specimens.

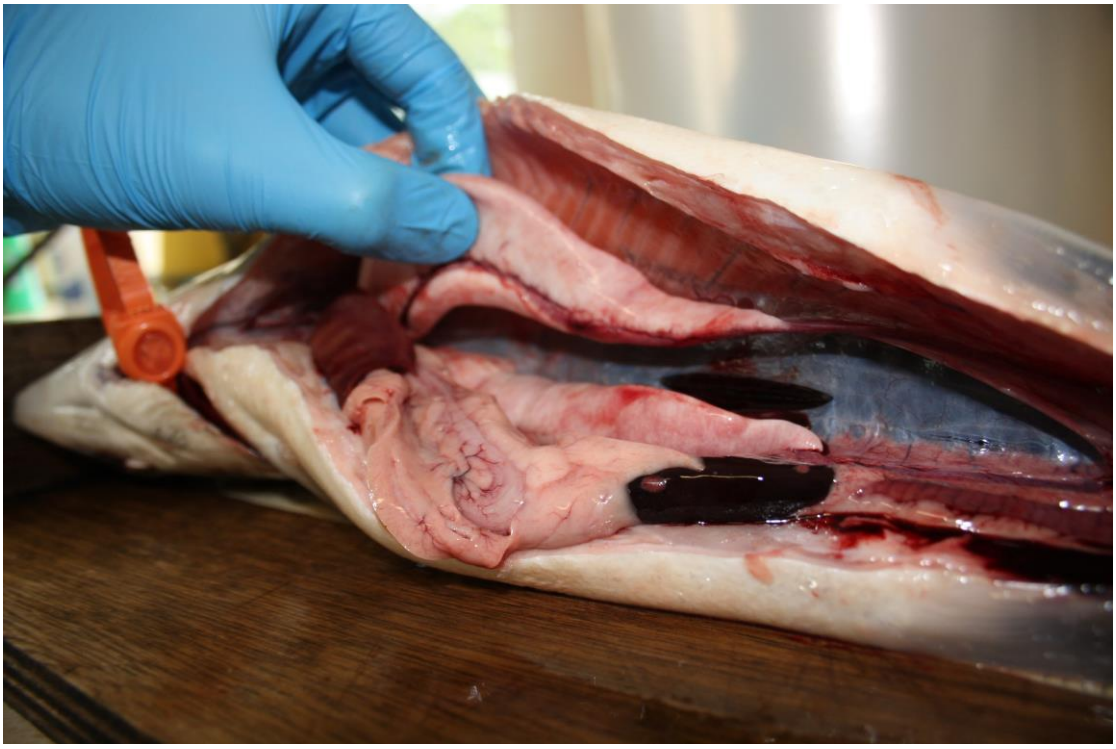

Plate 7 Gonadal maturity of the testes observed in a proportion of sexually mature male farm fish specimens.

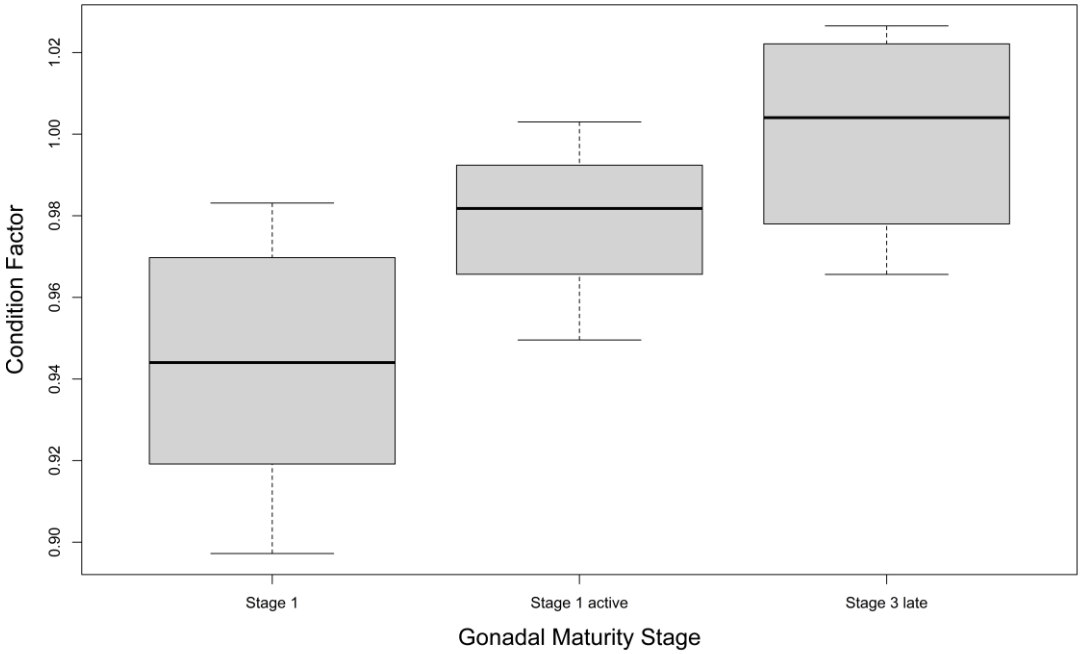

Figure 4. Gonadal maturity stage of male-only farm specimens expressed according to overall body condition factor.

6 Scale analysis

Detailed scale analysis was undertaken after scales were prepared and cleaned. The primary differences in scale characteristics between farm-origin salmon and wild salmon are described in Lund & Hansen (1991). Farm-origin fish were distinguished through scale reading based on a combination of traits including a substantially larger proportion of the total scale growth occurring during the freshwater stage, a younger smolt age and the absence of a sea-winter band, which is typically observed in wild Atlantic salmon (Plate 8a and 8b).

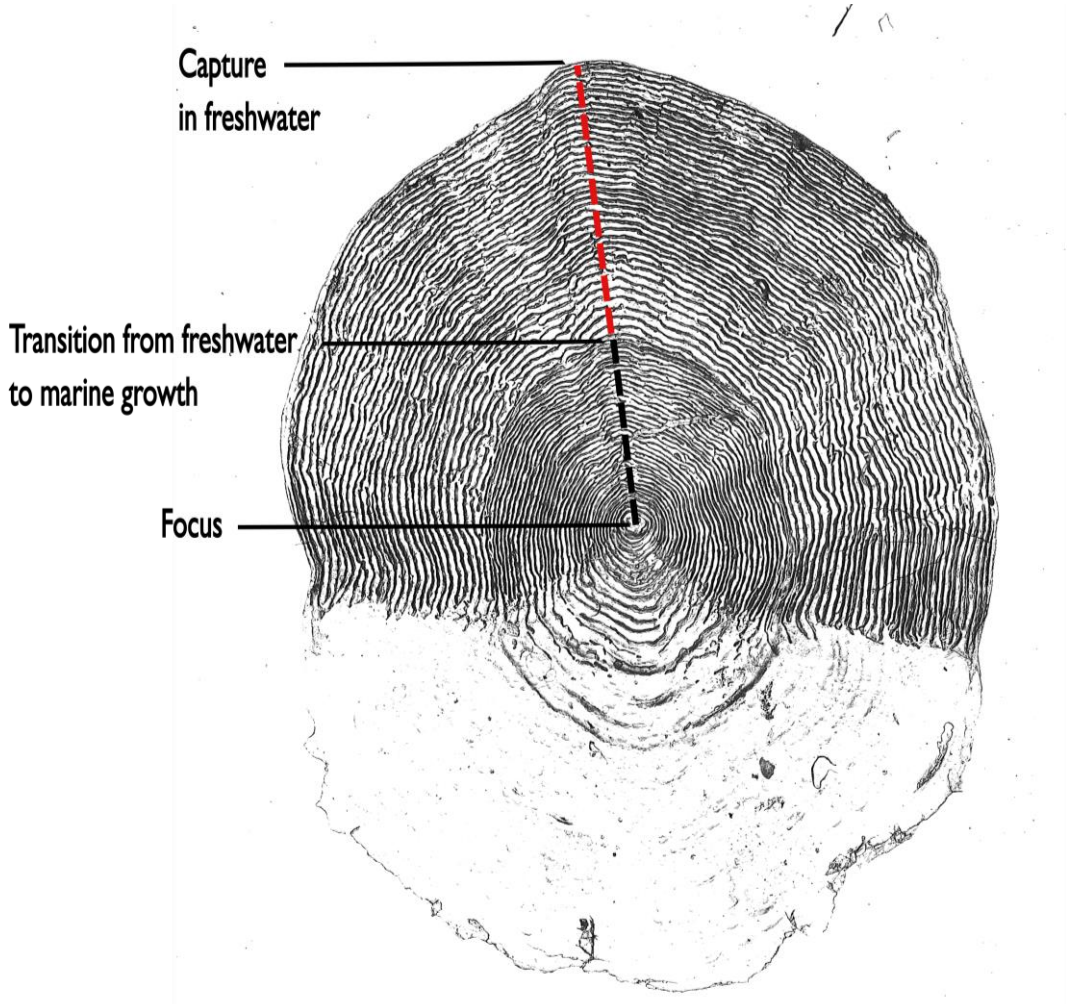

Plate 8a. Example of a typical farmed salmon scale obtained from a suspected escapee captured in the River Erriff NSIC Aasleagh fish trap facility on 20th August 2024. Discernible traits indicating that this fish was of farm-origin include the substantial portion of the scale comprising freshwater juvenile growth, the young smolt age (1-year old smolt) and the linear marine growth lacking a sea-winter band indicative of a period of reduced marine growth rate.. This specimen was 50.4 cm and weighed 1.16 kg.

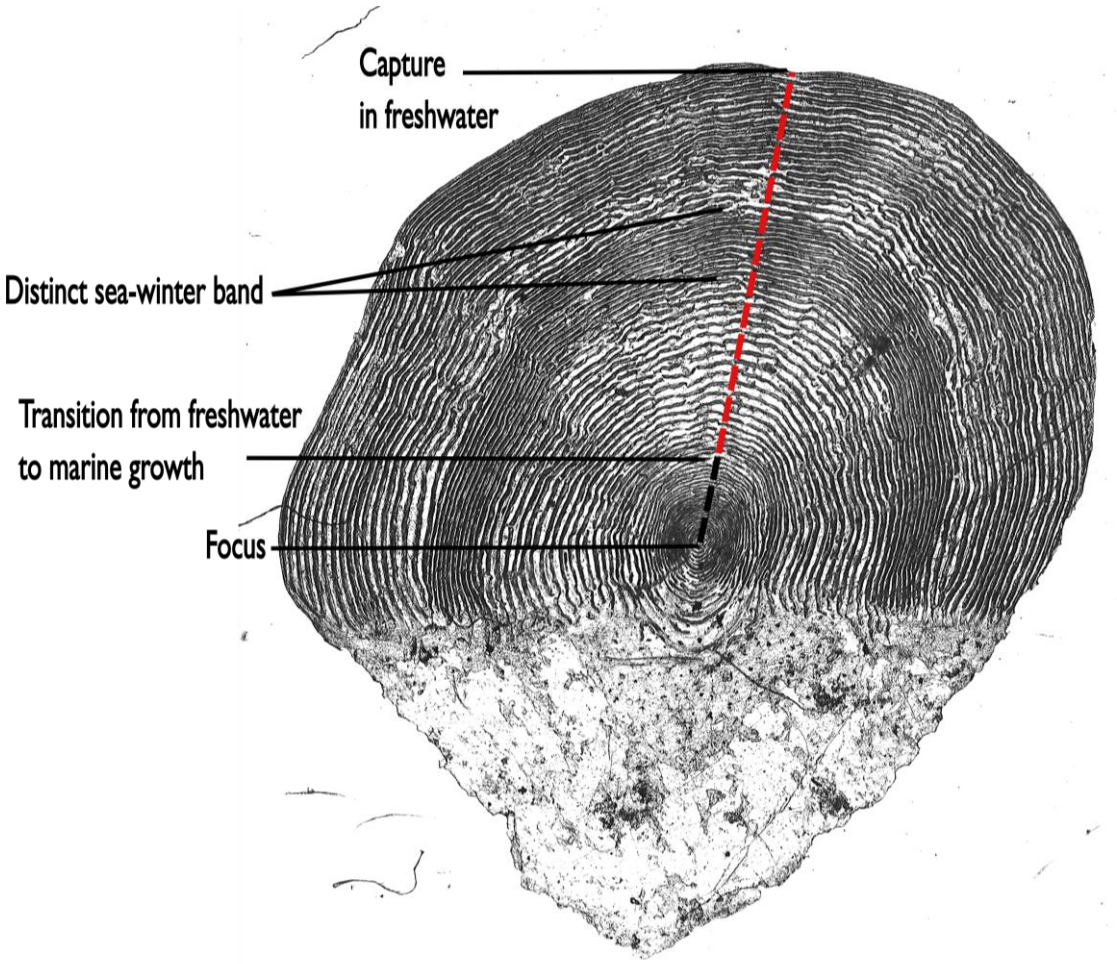

Plate 8b. Example of a typical wild salmon scale obtained from a River Erriff fish sampled at the NSIC Aasleagh fish trap facility on 26th July 2024. Traits that discern this wild salmon scale from the farm-origin fish scale in Plate 8a include the substantially smaller portion of scale growth comprising the juvenile freshwater stage, older smolt age at marine entry (2+ in this example) and presence of a sea-winter band indicating that this fish spent one winter at sea before returning to the river environment (1-sea winter grilse). This specimen was 57.0 cm and weighed 2.07 kg.

7 Genetic analyses

Tissue samples were extracted from the tail fin of each of the 50 sampled suspected farm escapees and preserved in ethanol for subsequent genetic analyses. An additional tail fin tissue sample taken from a wild Erriff salmon was also included to serve as a control. Genetic analyses were undertaken by the School of Biological, Earth and Environmental Sciences, University College Cork and tissue samples were provided without inclusion of any prior sampling information in order for the genetic screening to be carried out blind. All samples (n=51) were screened with microsatellite DNA loci and additionally 46 of these samples underwent screening using SNP loci.

Clustering analysis using the microsatellite DNA loci indicated that all samples with the exception of one (wild Erriff salmon) belonged to the same genetic group (**Figure 5.**). This

genetic group is strongly associated with the genetic profile of known farmed samples rather than Irish wild salmon population samples.

Figure 5. Clustering of screened tissue samples based on microsatellite DNA loci (all samples with the exception of #40 (wild Erriff salmon) belong to the same genetic group).

7.1. Genetic assignment using microsatellite DNA loci

Genetic assignment using microsatellite DNA loci from each sample used local wild Irish salmon populations (Corrib, Erriff, Cashla and Ballinahinch) and a sample of farmed salmon collected from Fanad Head, Co. Donegal in 2017. A routine STRUCTURE-based approach was used to partition each sample to these population samples (wild Irish or farm-origin Irish). 49 of the 50 provided samples of suspected farm escapees were assigned as being of farmed origin; one farm-escapee sample could not be unambiguously assigned to either group (Appendices, Table 2). The wild Erriff salmon sample was correctly assigned as being of Irish wild origin.

7.2. Genetic assignment using semi-diagnostic SNP loci

Genetic SNP loci that have substantial allele frequency differences between Irish wild and farmed Atlantic salmon populations have been identified as part of the current EMFAF programme investigating the potential for genetic introgression between farm-origin salmon and wild salmon populations (https://www.fisheriesireland.ie/what-we-do/research/geneflow). Wild and farmed salmon genetic baseline groups have been constructed from wild Atlantic salmon populations (from numerous Irish populations) and from samples taken from Irish salmon farms. Use of SNP loci will generally provide more reliable genetic assignment of individual samples to either group. 46 tissue samples (out of the 51 total samples provided) were screened using SNP loci. Of these, 45 could be unambiguously assigned to farm-origin, with one sample (the wild Erriff salmon) being definitively assigned to wild Irish origin (**Figure 6.**). The one suspected farm sample that could not be unambiguously assigned to either group using microsatellite DNA loci was definitively assigned to the farmed origin group using SNP loci (Appendices, Table 2).

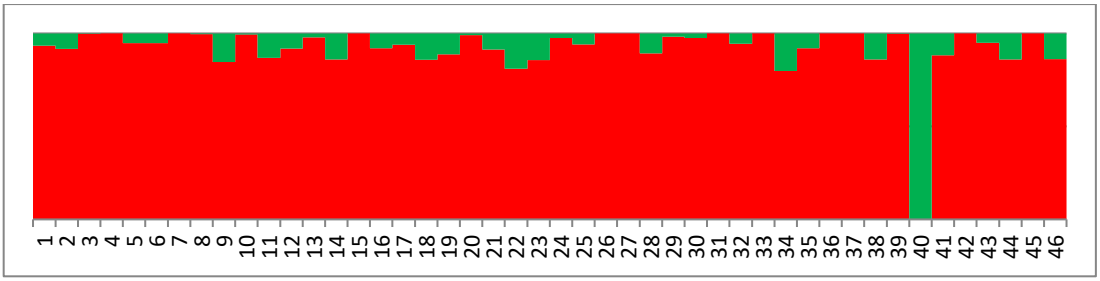

Figure 6. Partitioning of 46 tissue samples to Irish (green) or farmed (red) baseline. Sample #40 is the tissue sample taken from a known wild Erriff salmon.

7.3. Summary of genetic analyses

The combined use of microsatellite DNA loci and SNP loci to genetically assign tissue samples submitted to either a wild Irish genetic baseline group or farmed Irish genetic baseline group confirmed that all 50 of the suspected farm escapees were of farm-origin (Appendices, Table 2). The only suspected farm escapee ambiguously assigned using microsatellite DNA was definitively assigned as farm-origin using SNP loci. Furthermore, an undisclosed tissue sample from a wild Erriff sample submitted as a control and included in the genetic analyses was unambiguously assigned as wild Irish using both methods, validating the accuracy of the assessments.

8 Estimation of numbers of escaped salmon in rivers

It is generally not possible to accurately estimate the total abundance of escaped farmed salmon that may have been present in river systems from mid-late August up to the winter salmon spawning season due to several factors. Firstly, not all captured farm escapees were officially reported nor retained for further examination and verification of farm-origin. Whilst anecdotal reports of anglers capturing suspicious fish in rivers during mid-late August through September were frequent and widespread, official statistics on the actual numbers caught could not be established without subsequent inspection of whole retained specimens or at the very least through scale sample analysis. In salmon rivers with mandated catch-and-release fishery regulations for example, fish superficially suspected of being farm-origin could not be culled. Secondly, a number of smaller rivers with very little angling effort occur along the Mayo-Galway coastline between the River Moy in Ballina and the River Corrib in Galway and farm fish may have potentially entered such rivers undetected. Thirdly, the salmon angling season ends on the 30th September, meaning that any upriver migration of farm escapees following this date would largely have occurred without detection. In this regard, the numbers reported here verified through full examination or scale-only analysis represent an absolute minimum confirmed abundance.

However, some insight into the potential scale of escaped salmon numbers in wild salmon rivers during this period can be achieved by inferring the total abundance of farm escapees from angling exploitation rates. For several of the rivers with documented occurrences of escaped farmed salmon, angling exploitation rates have been derived from actual long-term salmon rod catch and fish counter data (Millane *et al*. 2017). Depending on the system, angling can exploit <5% to over >20% of a given population which

suggests that the total numbers of escapees in these systems is substantially higher than those detected in angling catches. For example, in the Dawros River, it has been determined that 11.8% of the total salmon population present each year is exploited by anglers (Millane *et al*. 2017). As four farmed fish were officially recorded (following examination) in the angling catch, this suggests that a total of 34 farmed fish may actually have been present in the river. Fish counters on the Ballinahinch, Bunowen, Cashla, Corrib, Dawros, Erriff, Owenduff and Owenmore allow use of river-specific rod exploitation rates. A likely rod exploitation rate based on the Technical Expert Group On Salmon (TEGOS) river rod catch exploitation rates applied for the 2024 angling season was applied to the Bundorragha, Carrowniskey, Moy and Screebe rivers, for which fish counter data could not be utilised. Estimates of the number of farmed fish in rivers range from <10 in the Bunowen and Moy rivers to >100 in the Bundorragha and Erriff rivers. An overall total abundance of 456 escaped farmed salmon were estimated to be present in 12 western rivers during the mid-late August/September 2024 period (Table 1). However, it is reiterated that this estimate is based on the absolute minimum number of confirmed escaped farmed salmon captured in rivers in this region and omit entirely any captured fish that were not officially reported by anglers, undetected presence of farm escapees in smaller western rivers without significant angling effort and upriver migration of farm escapees after 30th September.

Table 1 Estimated total abundance of escapee farmed salmon present in each river system based on median angling exploitation rates (Millane *et al*. 2017).

River	Number of farm escapees	Median exploitation rate (%)	Estimated total abundance
Ballinahinch	1	4.4	23
Bundorragha	19*	15.0	127
Bunowen	1	15.3	7
Carrowniskey	1	5.0	20
Cashla	1	6.1	16
Corrib	2	10.7	19
Dawros	4	11.8	34
Erriff	28**	17.9	156
Moy	1	15	7
Owenmore	3	29.4	10
Owenduff	2	12.0	17
Screebe	1	5.0	20
Total	**64**		**456**

*Whilst only 2 full specimens were retained and provided for sampling to confirm farm-origin, the fishery management of the Bundorragha system confirmed a total of 19 farm escapees had been caught on this system from mid-late August

** 28 is the number of farm escapees caught through angling alone on the Erriff (omits any fish captured in the trap)

9 Discussion

External morphology, internal examination, scale and genetic analyses from 50 available specimens and an additional five scale-only samples confirmed the presence of at

least 55 farmed salmon across 12 rivers in western Ireland between 17th August and 30th September 2024. The timeline of occurrence of farm-origin fish in Atlantic salmon rivers and the spatial distribution of these rivers coincided with the known escape event that occurred in the Killary Fjord salmon farm on the 11th August 2024. As such it is reasonable to conclude that farmed salmon from the Killary marine aquaculture site dispersed into wild Atlantic salmon rivers in significant numbers in the weeks following the escape incident.

Farm escapees encountered during this period were verified using multiple validation techniques. The condition of the dorsal and caudal fin were consistently the best indicators of external morphology to accurately demarcate farm-origin fish from wild salmon (shorten, torn and/or fused dorsal ray fins and rounded, torn caudal fins). A substantial proportion of the confirmed farm escapes also had shortened "stubby" snouts and some evidence of opercular shortening, although given that these observations were not observed in all examined farmed specimens these criteria should be considered as secondary diagnostics following fin inspection. The "fresh-run" silver appearance of farm escapees in late August and September also clearly aroused suspicion when encountered – however, this colouration criteria would not have been an accurate method for distinguishing farm-origin from wild salmon had the escape event occurred during June or July. Examination of scales revealed that farm escapees exhibited scale patterns identifiable as salmon of farmed origin, with larger juvenile growth proportion, younger smolt age and the absence of a sea winter band compared to wild salmon. The same scale patterns observed in five scale-only samples received from anglers allowed the confirmation of these fish as farm escapees. Genetic analyses of tissue samples taken from the 50 fully sampled farm escapees unambiguously assigned all of these fish to Irish farm-origin salmon genetic baselines. A single known wild Erriff salmon tissue sample included with these genetic analyses was definitively assigned to a wild Irish salmon genetic baseline, verifying the accuracy of the genetic analyses.

Examination of gonadal tissues revealed a 60:40 sex ratio of female-to-male farmed salmon specimens. All females examined were considered to be at an early-stage of sexual maturation (immature), consistent with the sexual maturity stage associated with the marine foraging phase of wild Atlantic salmon. 20% of the male escaped salmon examined however, were classified as sexually maturing, consistent with wild male salmon on their initial upriver migration prior to the spawning season. These fish would have been capable of contributing to the 2024 salmon spawning season which generally takes place in late December, highlighting the potential risk of interbreeding with wild salmon and the subsequent negative impacts of introgression on wild Irish salmon populations. Irish farmed salmon are derived from Norwegian stocks, which have been artificially bred to select for domestication traits such as rapid growth, which favours harvestable returns. These stocks represent a significantly different genetic lineage compared to wild Irish salmon, which have evolved over thousands of years to become ultra-adapted to their local freshwater and marine environment. Thus, introduction of genes that may be favourable in domesticated aquaculture settings may be highly detrimental to the fitness of any offspring

produced in the wild as a result of farm-wild salmon interbreeding (e.g. McGinnity *et al*. 2003; Thorstad *et al*. 2008). Rapid growth and faster metabolism may reduce lifetime survival of farm-wild hybrids impacting the total generational survival stemming from a spawning season where introgression of farm genes occurs. Furthermore, offspring of farm and farm-wild hybrids grow faster as juveniles and may be capable of displacing and excluding much smaller wild salmon parr from valuable freshwater habitat resources. Finally, following upriver migration, the in-river presence of farm escapees in the lead up to spawning season may perturb wild salmon spawning activity, as valuable spawning habitat space is a finite resource in river systems.

Using rod angling exploitation rates and the officially documented number of farm-escapes subsequently confirmed through sampling of whole carcasses or scales, it is estimated that at least several hundred farmed salmon may have entered wild salmon rivers in Western River Basin Districts from 17th August until 30th September 2024. This is likely to be a highly conservative estimate given that not all of the angling captures of suspected farmed salmon were officially reported and documented, the potential for farmed salmon to have entered rivers in the region with little or no angling activity and the potential for farmed salmon to have migrated upriver following the conclusion of the angling season on 30th September. Therefore, the true extent of the abundance of farm escapees in Irish rivers is unknown. Assuming these farm escapees emanated from the single escape event which occurred at the Killary salmon farm on August 11th, and given the figures reported by the farm in relation to the numbers escaped (7000 – 8000), the total estimate of farmed salmon abundance in Irish rivers in the following weeks was at least ~6% of the total escape reported. It is likely to have been an even larger estimate however, owing to the limitations of accurately estimating farmed salmon abundance for the reasons outlined above.

This documented occurrence of farm escapees in wild Atlantic salmon rivers in the Western River Basin District during 2024 follows a similar event which occurred during August and September 2017, when it was estimated that up to 500 farm escapees entered into a subset of rivers throughout the same region, including Erriff, Bundorragha and Dawros rivers (Gargan *et al.* 2017). Similar to the current event, a proportion of male farm escapees were shown to be sexually mature. The source of the 2017 escape was not officially confirmed. Such repeat escape events, particularly if sexually mature farm fish are capable of interbreeding with wild populations, can have cumulative negative impacts on the overall genetic integrity of wild west of Ireland salmon populations.

Of noteable concern is the wide geographical extent over which farm-origin salmon occurred in wild Irish salmon rivers. In total, 12 rivers had instances of farm escapes ranging from the River Moy in northern Mayo to the River Corrib in inner Galway Bay. Assuming the Killary fish farm site was the source of these escapes, this represents a distance far in excess of 100 km along the coastline in both northerly and southerly directions. There are 30 wild Atlantic salmon rivers in total occupying the coastline between the River Moy and River Corrib, with all of these rivers potentially exposed to upriver intrusion by farm escapes. Twenty-six of these rivers comprise Special Areas of

Conservation, legally protected by the EU Habitats Directive, of which Atlantic salmon are a qualifying interest. This is the first documented case in Ireland showing a potential spread of farm escapees following such events to this extent. The incident highlights that marine salmon aquaculture in Ireland poses not only well-documented impacts from sea lice and escapes on salmonid rivers in the immediate vicinity of a single farm site but also may potentially impact wild stocks in rivers over 100 km along the coastline in either direction from the site of the farm through escape events. This should be considered when assessing the potential environmental impacts of the marine salmon aquaculture sector in Ireland on wild salmon stocks. In addition, the ongoing EMFAF programme investigating the potential for genetic introgression between farm-origin salmon and wild salmon populations and associated follow-up surveillence initiatives may facilitate an evaluation of the impacts of this escape event on subsequent generations of wild Irish salmon stocks in potentially impacted river systems. Finally, IFI intend to remain vigilant to the possibility of farm escapees that may have migrated to sea initially following the escapement returning to western rivers next year.

10 References

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11 Appendices

Table 1. Results of biological sampling and morphological examination of each captured and retained farm escapee.

Sample ID	Date	Capture Location	Capture Method	Fork length (cm)	Weight (kg)	Condition Factor	Colour	Snout condition	Gill cover	Dorsal fin condition	Caudal fin condition
1	17/08/2024	Erriff	Rod	54.4	1.28	0.90	Silver	Shortened	-	Torn	Rounded, torn
2	17/08/2024	Erriff	Rod	58.6	1.74	0.94	Silver	Shortened	Shortened	Torn, fused	Rounded, torn
3	18/08/2024	Erriff	Rod	61.0	2.20	0.99	Silver	Shortened	Shortened	Torn, fused	Rounded, torn
4	18/08/2024	Erriff	Rod	49.2	0.94	0.90	Silver	Shortened	-	Torn, fused	Rounded, torn
5	18/08/2024	Erriff	Rod	55.0	1.35	0.91	Silver	Shortened	Shortened	Torn	Rounded, torn
6	18/08/2024	Erriff	Rod	56.1	1.77	1.00	Silver	Shortened	-	Fused	Rounded, torn
7	19/08/2024	Erriff	Rod	57.6	1.80	0.97	Silver	-	Shortened	Torn, fused	Rounded, torn
8	19/08/2024	Erriff	Rod	54.3	1.54	0.98	Silver	Shortened	-	Torn, fused	Rounded, torn
9	19/08/2024	Erriff	Rod	54.8	1.60	0.99	Silver	-	-	Fused	Rounded, torn
10	19/08/2024	Bundorragha	Rod	54.1	1.50	0.98	Silver	Shortened	-	Torn, fused	Rounded, torn
11	20/08/2024	Erriff	Rod	57.5	1.89	1.00	Silver	Shortened	Shortened	Torn, fused	Rounded, torn
12	20/08/2024	Dawros	Rod	50.9	1.23	0.97	Silver	Shortened	Shortened	Torn, fused	Rounded, torn
13	20/08/2024	Erriff	Trap	50.4	1.16	0.96	Silver	Shortened	Shortened	Torn	Rounded
14	21/08/2024	Erriff	Trap	56.2	1.64	0.97	Silver	Elongated	-	Fused	Rounded, torn
15	21/08/2024	Erriff	Trap	61.0	2.22	0.99	Silver	Elongated	-	Torn	Rounded, torn
16	21/08/2024	Erriff	Rod	58.3	1.89	0.98	Silver	Shortened	Shortened	Torn, fused	Rounded, torn
17	21/08/2024	Erriff	Rod	50.8	1.25	0.98	Silver	Shortened	Shortened	Torn, fused	Rounded, torn
18	21/08/2024	Dawros	Rod	53.4	1.35	0.95	Silver	Shortened	Shortened	Torn, fused	Rounded, torn
19	21/08/2024	Erriff	Rod	59.9	1.88	0.94	Silver	-	-	Torn, fused	Rounded, torn
20	22/08/2024	Erriff	Rod	55.6	1.49	0.94	Silver	Shortened	-	Fused	Rounded, torn
21	23/08/2024	Erriff	Rod	52.0	1.19	0.93	Silver	-	Shortened	Torn, fused	Rounded, torn
22	24/08/2024	Erriff	Rod	55.3	1.51	0.95	Silver	Shortened	-	Torn	Rounded, torn
23	24/08/2024	Erriff	Rod	57.6	1.68	0.94	Silver	Shortened	-	Torn, fused	Rounded, torn
24	24/08/2024	Erriff	Trap	58.7	2.15	1.03	Silver	Elongated	-	Fused	Rounded

Sample ID	Date	Capture Location	Capture Method	Fork length (cm)	Weight (kg)	Condition Factor	Colour	Snout condition	Gill cover	Dorsal fin condition	Caudal fin condition
25	25/08/2024	Owenmore	Rod	59.1	2.00	0.99	Silver	-	Shortened	Torn, fused	Rounded, torn
26	26/08/2024	Erriff	Rod	64.3	2.49	0.97	Silver	-	Shortened	Torn, fused	Rounded, torn
27	27/08/2024	Killary	Draft net	54.0	1.32	0.92	Silver	Shortened	-	Torn, fused	Rounded, torn
28	28/08/2024	Erriff	Trap	55.4	1.50	0.95	Silver	-	-	Torn, fused	Rounded, torn
29	29/08/2024	Erriff	Trap	54.5	1.46	0.96	Silver	Shortened	Shortened	Torn	Rounded, torn
30	29/08/2024	Erriff	Rod	58.6	1.94	0.98	Silver	-	Shortened	Torn, fused	Rounded, torn
31	29/08/2024	Erriff	Rod	56.5	1.84	1.01	Silver	Shortened	Shortened	Torn, fused	Rounded, torn
32	30/08/2024	Erriff	Rod	54.0	1.51	0.98	Silver	Shortened	-	Torn, fused	Rounded, torn
33	30/08/2024	Erriff	Rod	50.5	1.24	0.98	Silver	Shortened	Shortened	Torn, fused	Rounded
34	30/08/2024	Erriff	Rod	55.5	1.55	0.96	Silver	-	-	Fused	Rounded, torn
35	31/08/2024	Erriff	Rod	53.3	1.35	0.95	Silver	Shortened	-	Fused	Rounded
36	02/09/2024	Erriff	Trap	54.5	1.63	1.00	Silver	-	-	Fused	Rounded, torn
37	02/09/2024	Dawros	Rod	51.4	1.28	0.97	Silver	-	-	Torn, fused	Rounded, torn
38	03/09/2024	Bundorragha	Rod	60.0	2.25	1.02	Silver	Elongated	-	Torn, fused	Rounded, torn
39	07/09/2024	Erriff	Rod	58.8	1.81	0.95	Silver	-	Shortened	Torn, fused	Rounded, torn
40	09/09/2024	Erriff	Rod	57.3	1.51	0.90	Silver	-	Shortened	Fused	Rounded, torn
41	09/09/2024	Erriff	Rod	56.4	1.65	0.96	Silver	-	-	Torn, fused	Rounded, torn
42	09/09/2024	Corrib	Rod	58.9	1.85	0.96	Silver	Shortened	Shortened	Torn, fused	Rounded, torn
43	15/09/2024	Bunowen	Rod	56.5	1.50	0.92	Silver	-	-	Torn, fused	Rounded, torn
44	16/09/2024	Ballynahinch	Rod	54.8	1.34	0.91	Silver	-	-	Torn	Rounded, torn
45	17/09/2024	Carrowniskey	Rod	56.5	1.68	0.97	Silver	-	-	Torn, fused	Rounded, torn
46	24/09/2024	Owenduff	Rod	54.0	1.24	0.90	Silver	-	-	Torn, fused	Rounded, torn
47	26/09/2024	Moy	Rod	47.1	1.00	0.98	Silver	Shortened	-	Torn, fused	Rounded
48	30/09/2024	Owenmore	Rod	53.5	1.34	0.94	Silver	-	-	Fused	Rounded, torn
49	30/09/2024	Owenduff	Rod	53.3	1.24	0.91	Silver	Shorted	Shortened	Torn, fused	Rounded, torn
50	30/09/2024	Owenmore	Rod	57.4	1.57	0.92	Silver	Shortened	-	Torn, fused	Rounded, torn

Table 2. Results of sex and gonadal maturity determination, scale analysis and genetic analyses for each captured and retained farm escapee.

Sample ID	Date	Capture Location	Sex	Gonad width (mm)	Gonad length (mm)	Gonadal Weight (g)	Coefficient of gonadal maturity	Sexual maturity stage	Farm or wild scale traits	Genetic assignment from microsatellite DNA loci	Genetic assignment from SNP loci
1	17/08/2024	Erriff	Female	10	35	1.811	0.141	Stage III early	Farm	Farmed	Farmed
2	17/08/2024	Erriff	Male	3	NA	0.856	0.049	Stage I	Farm	Farmed	Farmed
3	18/08/2024	Erriff	Female	11	33	1.782	0.081	Stage III early	Farm	Farmed	Farmed
4	18/08/2024	Erriff	Male	3	NA	0.562	0.060	Stage I	Farm	Farmed	Farmed
5	18/08/2024	Erriff	Male	4	NA	0.688	0.051	Stage I	Farm	Farmed	Farmed
6	18/08/2024	Erriff	Female	10	31	1.879	0.106	Stage III early	Farm	Farmed	Farmed
7	19/08/2024	Erriff	Male	3	NA	0.654	0.036	Stage I	Farm	Farmed	Farmed
8	19/08/2024	Erriff	Male	4	NA	0.670	0.044	Stage I	Farm	Farmed	Farmed
9	19/08/2024	Erriff	Female	12	40	1.691	0.106	Stage III early	Farm	Farmed	Farmed
10	19/08/2024	Bundorragha	Female	11	34	1.973	0.132	Stage III early	Farm	Farmed	Farmed
11	20/08/2024	Erriff	Female	12	41	1.886	0.100	Stage III early	Farm	Farmed	Farmed
12	20/08/2024	Dawros	Male	2	NA	0.401	0.033	Stage I	Farm	Farmed	Farmed
13	20/08/2024	Erriff	Female	9	42	1.497	0.129	Stage III early	Farm	Farmed	Farmed
14	21/08/2024	Erriff	Male	35	NA	77.500	4.726	Stage III late	Farm	Farmed	Farmed
15	21/08/2024	Erriff	Male	29	NA	53.000	2.387	Stage III late	Farm	Farmed	Farmed
16	21/08/2024	Erriff	Female	9	35	1.661	0.088	Stage III early	Farm	Farmed	Farmed
17	21/08/2024	Erriff	Female	11	29	1.369	0.110	Stage III early	Farm	Farmed	Farmed
18	21/08/2024	Dawros	Female	10	30	1.594	0.118	Stage III early	Farm	Farmed	Farmed

Sample ID	Date	Capture Location	Sex	Gonad width (mm)	Gonad length (mm)	Gonadal Weight (g)	Coefficient of gonadal maturity	Sexual maturity stage	Farm or wild scale traits	Genetic assignment from microsatellite DNA loci	Genetic assignment from SNP loci
19	21/08/2024	Erriff	Male	6	NA	1.015	0.054	Stage I	Farm	Farmed	Farmed
20	22/08/2024	Erriff	Female	9	30	1.526	0.102	Stage III early	Farm	Farmed	Farmed
21	23/08/2024	Erriff	Female	9	37	1.562	0.131	Stage III early	Farm	Farmed	Farmed
22	24/08/2024	Erriff	Female	10	33	1.672	0.111	Stage III early	Farm	Farmed	Farmed
23	24/08/2024	Erriff	Male	3	NA	0.854	0.051	Stage I	Farm	Farmed	Farmed
24	24/08/2024	Erriff	Male	34	NA	60.500	2.814	Stage III late	Farm	Farmed	Farmed
25	25/08/2024	Owenmore	Female	12	39	2.109	0.105	Stage III early	Farm	Farmed	Farmed
26	26/08/2024	Erriff	Male	3	NA	0.925	0.037	Stage I	Farm	Farmed	Farmed
27	27/08/2024	Killary	Female	11	40	1.977	0.150	Stage III early	Farm	Farmed	Farmed
28	28/08/2024	Erriff	Female	10	28	1.896	0.126	Stage III early	Farm	Farmed	Farmed
29	29/08/2024	Erriff	Female	10	34	1.721	0.118	Stage III early	Farm	Farmed	Farmed
30	29/08/2024	Erriff	Female	10	29	1.800	0.093	Stage III early	Farm	Farmed	Farmed
31	29/08/2024	Erriff	Female	12	37	1.887	0.103	Stage III early	Farm	Farmed	Farmed
32	30/08/2024	Erriff	Male	3	NA	0.761	0.050	Stage I active	Farm	Farmed	Farmed
33	30/08/2024	Erriff	Female	12	31	1.369	0.110	Stage III early	Farm	Farmed	Farmed
34	30/08/2024	Erriff	Female	11	39	1.708	0.110	Stage III early	Farm	Farmed	Farmed
35	31/08/2024	Erriff	Female	11	33	1.818	0.135	Stage III early	Farm	Farmed	Farmed
36	02/09/2024	Erriff	Male	4	NA	0.664	0.041	Stage I active	Farm	Farmed	Farmed

Sample ID	Date	Capture Location	Sex	Gonad width (mm)	Gonad length (mm)	Gonadal Weight (g)	Coefficient of gonadal maturity	Sexual maturity stage	Farm or wild scale traits	Genetic assignment from microsatellite DNA loci	Genetic assignment from SNP loci
37	02/09/2024	Dawros	Female	11	32	1.651	0.129	Stage III early	Farm	Farmed	Farmed
38	03/09/2024	Bundorragha	Male	47	NA	296.000	13.156	Stage III late	Farm	Ambiguous	Farmed
39	07/09/2024	Erriff	Male	4	NA	0.680	0.038	Stage I active	Farm	Farmed	Farmed
40	09/09/2024	Erriff	Male	5	NA	0.746	0.049	Stage I	Farm	Farmed	Farmed
41	09/09/2024	Erriff	Male	7	NA	1.234	0.075	Stage I	Farm	Farmed	Farmed
42	09/09/2024	Corrib	Male	4	NA	0.805	0.044	Stage I	Farm	Farmed	Farmed
43	15/09/2024	Bunowen	Female	10	30	2.000	0.133	Stage III early	Farm	Farmed	Farmed
44	16/09/2024	Ballinahinch	Female	9	30	1.578	0.118	Stage III early	Farm	Farmed	Farmed
45	17/09/2024	Carrowniskey	Female	12	35	1.866	0.111	Stage III early	Farm	Farmed	Farmed
46	24/09/2024	Owenduff	Female	11	27	1.903	0.153	Stage III early	Farm	Farmed	Not analysed
47	26/09/2024	Moy	Female	10	33	1.024	0.102	Stage III early	Farm	Farmed	Not analysed
48	30/09/2024	Owenmore	Female	11	39	1.710	0.128	Stage III early	Farm	Farmed	Not analysed
49	30/09/2024	Owenduff	Female	13	35	2.165	0.175	Stage III early	Farm	Farmed	Not analysed
50	30/09/2024	Owenmore	Male	4	NA	0.737	0.047	Stage I	Farm	Farmed	Not analysed

Table 3. Total numbers of confirmed farm escapees by capture location, with numbers verified by full examination and numbers verified through scale analysis only indicated.

Location	Number of verified farm escapees	Number of days between Killary farm escape and first detected presence	Number of farm escapees verified through full examination of retained specimen	Number of farm escapees verified through scale analysis only
Ballinahinch	1	37	1	-
Bundorragha	2	9	2	-
Bunowen	1	36	1	-
Carrowniskey	1	38	1	-
Corrib	2	30	1	1
Cashla	1	48	-	1
Dawros	4	10	3	1
Erriff	35	7	34	1
Killary Fjord	1	17	1	-
Moy	1	47	1	-
Owenduff	2	45	2	-
Owenmore	3	15	3	-
Screebe	1	51	-	1

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