

Environmental Management Plan

1. Purpose & Scope

Two pen groups, Reintraid and Torgawn, are currently active within Loch a Chairn Bhain. This Environmental Management Plan (EMP) sets out the measures to be employed in relation to the Loch a Chairn Bhain marine fish farm site to mitigate against potential impact on wild salmonids as hosts of Freshwater Pearl Mussels (FWPM) within Clashnessie Burn, part of the Abhainn Clais an Eas and Allt a' Mhuilinn Special Area of Conservation (SAC). This EMP also details the monitoring and reporting to be undertaken by the farm operator to allow efficacy of these measures to be verified. Loch a Chairn Bhain is one of a number of areas farmed in the region, and as such this document constitutes a site-specific commitment for the site to join the management, monitoring, reporting and review measures in place in relation to Clashnessie Burn.

Survey data suggests the Clashnessie Burn FWPM population selectively utilises juvenile Brown Trout (*Salmo trutta*), which may remain resident in the burn or migrate to coastal waters as Sea Trout. As such this EMP relates to managing and monitoring potential interactions with Sea Trout in coastal waters, as hosts of FWPM, which by default extends to all anadromous wild salmonids in Clashnessie Bay and surrounding area.

2. On-farm Sea Lice Management

Management of sea lice is essential to protect the health and welfare of farmed stock and to mitigate the risk of interaction between farmed and wild salmonids in terms of sea lice infection. The operator will employ an Integrated Pest Management Strategy for sea lice at the site, widely recognised as the most effective method of parasite control and farmed fish health management. Prevention and early intervention are the basis of the strategy, with control measures including strategic stocking, good husbandry, biological control using cleanerfish and access to medicinal treatment. Specific practice with regards to each control measure is set out in the following sections. In the event of preventative and early intervention measures being insufficient to satisfactorily control a sea lice challenge on site, corrective measures and the trigger points for these are also set out.

2.1 Strategic Stocking

Loch Duart Ltd (LDL) operates a policy of single year class stocking within Farm Management Areas (FMAs) in compliance with the Code of Good Practice for Scottish Finfish Aquaculture (CoGP). Separation of year classes is recognised as a significant factor in sea lice control. The Loch a Chairn Bhain site, within FMA M-6, will be stocked with a single year class, and indeed operated as a single yearclass with the adjacent Calbha and Badcall FMAs M-4 & M-5, going beyond CoGP requirements.

It is also one of LDL's key policies to operate an extended fallow after each production cycle. Fallows for Loch a Chairn Bhain will be approximately 4 months in duration, further aiding lice control as the long fallow ensures there is no risk of infection between generations. This fallowing regime, whereby for four months in any two-year period the site is fallow, means that a zero lice burden can be guaranteed for the farm in that period, and during the stocked phases focused control measures will be employed to minimise the risk of lice presence. Section 2.5 below details the efficacy of sea lice control at the site.

2.2 Husbandry Measures

In addition to strategic stocking, good husbandry and welfare measures are a first line of defence against sea lice. A good rearing environment maintains optimal fish health, lowering the risk of sea lice infection. LDL carry out the following to achieve this:

- **Vaccination** – vaccines are administered prior to smolt input to support fish health during the marine growing cycle. With protection provided by vaccination the risk of viral and bacterial disease adversely affecting sea lice monitoring, control options and infection susceptibility will be reduced.
- **Low stocking density** – a maximum density of 15kg/m³ across the site, in accordance with RSPCA Assured recommendations. This both mitigates stress to promote optimal fish health and reduces the potential for lice infection as the number and density of potential hosts is reduced.
- **Daily checks** – fish and the on-farm water quality are checked daily by experienced husbandry staff, so that any potential issues are quickly identified and appropriate action taken to avoid compromising fish health.
- **Good net hygiene** – maintained using air-drying swimthrough and net washing methods. This ensures efficacy of biological sea lice control with cleanerfish, maintains good water quality within the pen, reduces potential habitat for larval sea lice and provides an opportunity for good observation of fish health.
- **High quality diet** – used to ensure optimal fish health and includes targeted use of functional feeds which can help prevent sea lice infection.
- **Minimised stock handling** – stocks are subject to just one planned handling event, to size grade and maintain low stocking densities. Minimal handling in this manner reduces stress, promotes optimal fish health and most importantly minimizes any interruption of biological sea lice control during the cycle.

In addition, LDL are committed to continual improvement in farming operations. Over the last ten years LDL have worked to identify key sea lice control points in the farming cycle and develop suitable interventions to support sea lice management. Developments include:

- Use of filtration during certain fish handling events to catch lice which, if present, could be shed to surrounding waters as a result of the handling process
- Early deployment of cleanerfish at all sites, with suitable husbandry measures in place to ensure '24/7' sea lice management and minimise the potential for infection to become established
- Use of low-salinity bath treatments as a non-medicinal health control, primarily for gill health management but also supporting sea lice control by maintaining good fish health and therefore minimising risk of infection

2.3 Treatment Strategy

Biological control forms the basis of sea lice management at the Loch a Chairn Bhain site; authorisation is in place for the use of both wrasse and lumpsucker cleanerfish species. Cleanerfish are deployed early in the cycle, from smolt input, and daily cleanerfish husbandry routines of supplementary feeding, mortality or moribund removal, net hygiene maintenance, provision of hides and cleanerfish stock control are in place to ensure efficacy. Detailed data provided by sea lice monitoring (Section 3) is used to inform any biological control adjustments needed, such as alteration of stocking % or supplementary feeding regime to optimise lice control.

Supply of cleanerfish is secured from several sources, to reduce the reliance on any one source, and the following measures are employed to ensure minimal requirements:

- Deployment of cleanerfish early in the farming cycle for sustained sea lice management, requiring lower stocking %, rather than use as an 'emergency treatment'
- Documented cleanerfish husbandry and health monitoring routines to maximise survival
- Reuse of cleanerfish where compatible with Marine Scotland Fish Health Inspectorate, RSPCA Assured and CoGP criteria to minimise the need for new stocks and to optimise efficacy through the deployment of 'trained' cleanerfish across the site

In the event that the measures outlined above require augmentation, a clear decision-making process is in place to determine when additional intervention is necessary. Section 2.4 sets out the trigger points for such additional intervention measures, which in consultation with the designated Veterinary Surgeon for the site, are based upon the following factors:

- Preventing the development of adult female and gravid salmon lice (*L.salmonis*)
- Trigger levels set out in the National Strategy for Control of Sea Lice on Scottish Salmon Farms within the CoGP – this being 0.5 and 1.0 adult female salmon lice per fish for the periods Feb-June and Jul-Jan respectively

- Presence of other lice species namely *Caligus* sp.

Where further intervention is required decisions are carefully made to ensure the best possible strategy is applied. Non-medicinal controls and both in-feed and bath treatment medicinal solutions may be used:

- Additional cleanerfish stocking, including the use of 'trained' fish to help establish efficacious lice control
- Use of licensed medicines; permitted medicine quantities allow for effective in-feed and bath treatment throughout the production cycle
- If medicines are utilised, a rotation of licensed products will be sought to ensure long term efficacy of the medicines used
- Sensitivity tests (bioassays) to monitor the efficacy of available medicines, to inform treatment choice to ensure the best possible results are achieved
- Targeted harvesting to remove populations where lice are prevalent and to reduce stocking levels on site which both minimizes host availability and maximises cleanerfish efficacy

Ultimately interventions are planned and carried out in accordance with CoGP requirements and in compliance with Marine Scotland Fish Health Inspectorate's Sea Lice Enforcement Policy.

Should medicinal treatments be required, a number of measures are in place to ensure that effective treatment is achieved in a responsible manner.

Bath products are administered within a fully enclosed water volume (typically a tarpaulin, but if deemed beneficial treatment by wellboat may be completed under CAR License). Medicine-specific dosage systems are used to dose products, ensuring an effective treatment by achieving the correct treatment dose throughout the tarpaulin enclosure.

For in-feed treatments a functional feed may be used alongside to optimise efficacy of the in-feed medicine. This may be through promoting gut health to ensure good absorption of the medicine, or through boosting other aspects of fish health such as immune response or mucus production.

For all treatments, in-feed and bath, a synchronous approach is used. Fish within a year class and area will be treated simultaneously. For bath treatments the aim is to treat all pens in as short a time frame as possible.

SEPA Licenses for the Reintraid and Torgawn pen groups permit the following medicine quantities to be utilised:

- Slice – Reintraid treatable for first year of cycle, Torgawn maximum biomass treatable up to 3.6 times throughout cycle
- AMX – 2 pens treatable in 3 hrs; fully stocked site treatable in 6-7 days in practical terms
- Salmosan – Reintraid 1 pen treatable in 24 hrs, Torgawn 2 pens treatable in 24hrs; fully stocked site treatable in 2 weeks in practical terms
- Paramove 50 – permitted for use under PSWP, site treatable in 6-7 days in practical terms

It should be noted that medicinal treatment is used at the site in support of the non-medicinal techniques outlined above. Management using these techniques has resulted in there being limited medicinal treatment for *L.salmonis* infection, with four medicinal bath treatments across the site since 2016 and very limited Slice treatment for control of Caligus lice early in the cycle.

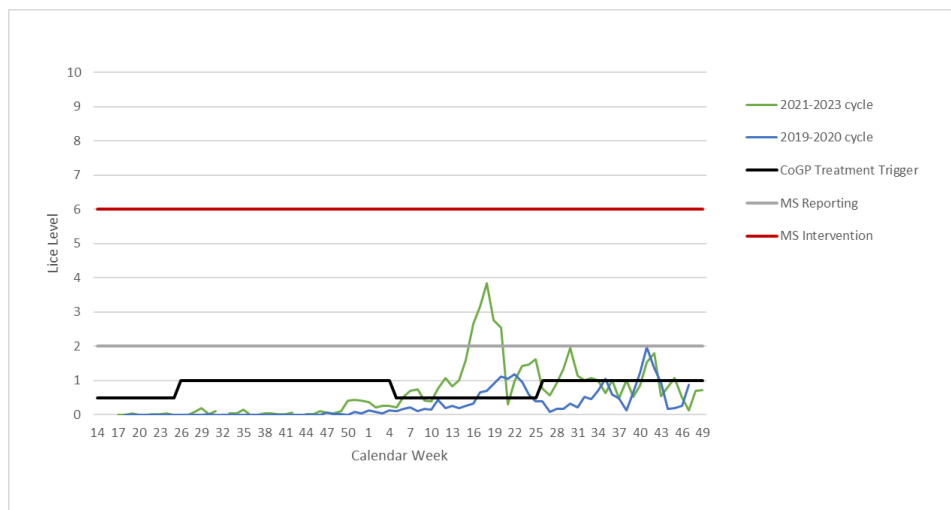
2.4 Triggers & Escalation Measures

The table below summarises the sea lice control measures available for the Loch a Chairn Bhain site, the trigger for each measure and factors considered in the selection process. Both routine (i.e. expected operational norm) and escalation measures are outlined, to give a clear pathway of the controls used to maintain low lice levels at the site protecting both on-farm and wild stocks.

| | Control Measure | Trigger | Factors Considered in Selection |
|---------------------|--|--|--|
| Operational Norms | Fallow prior to stocking | Site operational | N/A - control always used |
| | Single year-class stocking | Site operational | N/A - control always used |
| | Husbandry (<i>low stocking density, minimal handling, net hygiene, high quality diet, daily checks</i>) | Site operational | N/A - control always used |
| | Cleanerfish stocking & management | Site operational | N/A - control always used |
| | Sea lice barriers/skirts | Smolt input & infection risk | To be used if there is evident risk of <i>L.salmonis</i> infection on to farm from external source(s) |
| | Filtration system on fish-handling equipment | Handling event e.g. harvest | N/A - control always used |
| | Adjustment of cleanerfish stocking & management (<i>review net hygiene, alter feeding, review hides, introduce 'trained' fish</i>) | Adult Female/Gravid lice level above zero | N/A - control always used |
| Escalation Measures | Augmentation of cleanerfish stocking (<i>increase stocking %, introduce 'trained' fish</i>) | Adult Female/Gravid lice level approaching CoGP trigger | Used prior to medicinal intervention given proven level of efficacy |
| | Medicinal treatment - in-feed | Adult Female/Gravid lice level above CoGP trigger or <i>Caligus spp.</i> present | Used primarily against <i>Caligus spp.</i> or early life-stages of <i>L.salmonis</i> |
| | Medicinal treatment - bath | Adult Female/Gravid lice level approaching MS Reporting threshold | Medicine selection dependent on sensitivity-test results, lice stage & medicine rotation |
| | Mechanical treatment | Adult Female/Gravid lice level approaching MS Reporting threshold | Dependent on health status, size and condition of fish |
| | Low-salinity treatment | Gill health challenge | Supports fish health to reduce risk of sea lice infection & also directly disrupts lice e.g. <i>Caligus spp.</i> |
| | Harvesting | Adult Female/Gravid lice level not reduced by above measures | N/A - ultimate control measure should other methods fail to bring sea lice levels back to below CoGP trigger |

2.5 Control Efficacy

The graph below illustrates the level of adult and gravid female salmon lice (*L.salmonis*) present at the site during the most recent completed cycle (2019-2020) and the current cycle (2021-2023), showing lice levels found during weekly monitoring relative to CoGP Treatment Trigger levels and Marine Scotland Reporting and Intervention Thresholds. During the 2019-2020 cycle non-medicinal control measures were sufficient to control sea lice levels, with augmentation of cleanerfish stocking bringing levels back down when at times Code of Good Practice Treatment Trigger levels were exceeded. At no point in the 2019-2020 cycle were Marine Scotland thresholds met. The 2021-2023 cycle has faced significantly more of a challenge, with lice control at another site influencing infection pressure within Loch a Chairn Bhain. This resulted in an escalation which could not be controlled by normal measures alone, and a combination of additional cleanerfish stocking, medicinal treatment, mechanical treatment and harvesting were used to reduce lice numbers. While the current cycle has seen elevated lice levels, the control measures documented within this EMP have had demonstrable effect in bringing numbers back down, and as previous cycles evidence, this level of escalation is not the norm. As such, good lice control going forwards is reasonably anticipated, as is the minimal likelihood of any interaction between the farm and wild salmonids as hosts of FWPM in the Clashnessie Burn.



3. On-farm Sea Lice Monitoring

Sea lice monitoring is carried out every week, all year round, on all stocked LDL sites. Fully trained, designated staff carry out the sampling – either the LDL Fish Health team or experienced Husbandry staff.

For the Loch a Chairn Bhain area (as defined by Marine Scotland Authorisation) a minimum of 5 pens is sampled, often more. Five fish are taken from each pen and anaesthetised; any attached or mobile stages of lice are identified, counted and recorded for each individual fish. This data is then used to produce an average louse count per fish.

From each week's count detailed records of any lice present, including the population structure in terms of life stage, are produced for each site. The data can be viewed on a pen-by-pen basis or as a farm site average. This detailed information is used to ensure the effectiveness of cleanerfish or in the planning of other interventions where necessary.

The above monitoring programme is in compliance with the National Strategy for the Control of Sea Lice on Scottish Salmon Farms. It is subject to statutory inspection by Marine Scotland Fish Health Inspectorate and non-statutory independent verification by the West Sutherland Fisheries Trust.

Lice count information is shared with other interests via Salmon Scotland and reported to Marine Scotland on a weekly basis. As per Section 6.0 below this data will also be made available to the Highland Council and National Technical Group as a requirement of this EMP, allowing the efficacy of on-farm sea lice controls, and therefore protection of wild fish as FWPM hosts, to be assessed.

4. Monitoring of Juvenile Wild Salmonids

A sufficient density of wild salmonids is required to support FWPM populations, with juvenile fish in particular acting as hosts for the Glochidia larval stage of the FWPM lifecycle. While the Loch a Chairn Bhain marine fish farm remains operational, annual monitoring of juvenile wild salmonids in the Clashnessie Burn of the Abhainn Clais an Eas and Allt a' Mhuilinn SAC will be undertaken by the farm operator, allowing ongoing assessment of the status of the FWPM-host population. LDL have arranged for this work to be completed by the West Sutherland Fisheries Trust (WSFT) as an expert third-party with relevant licensing and experience of undertaking previous surveys in the watercourse.

Three survey locations within the SAC will be monitored, between the seaward end of the Clashnessie Burn and the waterfall upstream. These match locations previously surveyed by WSFT and for which historic data exists.

Electrofishing will be undertaken at each of these locations on one occasion during the summer period July to September. Fish caught will be identified to species and length measured to 1 mm. The survey methodology used by WSFT will follow the Scottish Fisheries Coordination Centre protocol, be compatible with Marine Scotland Science requirements and follow best practice with regards to wild fish monitoring.

As per Section 6 below, results from the juvenile monitoring surveys undertaken by WSFT on behalf of LDL will be reported to the Highland Council and National Technical Group.

5. Monitoring of Sea Lice on Wild Salmonids in Coastal Waters

While sea lice dispersal modelling and wild fish migratory studies have not presently been undertaken specifically in relation to the Loch a Chairn Bhain site and wild salmonids associated with the Clashnessie Burn FWPM population, it is recognised that on-farm and wild-salmonid sea lice levels in the area could be related. Modelling, survey and monitoring information will likely add to this picture in future, but at present and for the purposes of this EMP it is accepted that potential sea lice dispersal within Loch a' Chairn Bhain, connected to the wider Eddrachillis Bay area which Clashnessie Bay adjoins, could have bearing on the Clashnessie Burn FWPM population. As such, wild fish monitoring in coastal waters will be undertaken.

Fishing survey work will be undertaken in Clashnessie Bay, to allow assessment of wild salmonid health in terms of sea lice levels in coastal waters. This will be carried out by the operator on an annual basis while the Loch a Chairn Bhain marine fish farm site is operational. LDL have arranged for this work to be completed by the WSFT as an expert third-party with relevant licensing and experience of undertaking coastal surveys to monitor for sea lice.

Clashnessie Bay is not an area currently fished by WSFT, and suitable methodology needs to be developed for the site. A feasibility evaluation has been completed for the site by WSFT, and the proposed method has been developed in consultation with Marine Scotland Science and other Fisheries Trusts taking into account the fact that the site is not suitable for sweep netting and the status of Sea Trout is not known for the area.

A two-phase approach is proposed. Initially, a smolt trap will be deployed at the seaward end of the Clashnessie Burn, April – May in the first year of sampling. The trap will be checked daily, and will allow confirmation that migratory salmonids are entering the Clashnessie Bay area. Any fish caught will be anaesthetised, weight, length and species recorded prior to recovery in clean water and release downstream of the trap. Any Sea Trout captured will also be marked with an Elastomer tag behind the eye for subsequent identification in the coastal nets. Following first confirmation of smolt presence, coastal sampling will commence. Monitoring undertaken in 2021 and 2022 did not identify any migratory salmonid run from Clashnessie Burn.

A fyke net and leader will be positioned lying perpendicular to the shoreline within Clashnessie Bay, aiming to catch fish moving along the coastline to/from Clashnessie Burn. The exact location will be selected on the basis of suitable water depth and refined with catch success as the survey work progresses.

The net will first be deployed in May and checked daily for a period of a week during May, June and July to coincide with periods of wild salmonid movements. During each survey week, the net will be lifted daily Monday to Friday and any fish transferred to a container onboard a small work vessel. Salmonids will then be anaesthetised and weight, length and sea lice count recorded prior to recovery in clean seawater. All salmonids and any non-target species caught will be returned to the sea north of the net. In periods when the net is not being fished the rear end of the fyke will be left open for fish to pass through. The net and all associated anchors will be removed by 31st July at the latest. The target sample

size will be 30 fish between a minimum of two sampling months, in line with Marine Scotland Science protocols.

6. Reporting, Analysis & Review

Data from on-farm and wild fish monitoring will be submitted to the Highland Council and National Technical Group on an annual basis. Specifically, this will include on-farm lice count data, results from survey work undertaken by WSFT to monitor juvenile wild salmonids in Clashnessie Burn and sea lice count data from coastal netting. Reporting of sea lice information and coastal netting will be made on completion of the coastal monitoring i.e. by 31st August each year that the farm remains operational. Reporting of juvenile survey findings will be made following completion of the annual electrofishing work i.e. by 30th November each year that the farm remains operational. The operator will provide opportunity to discuss monitoring results and management interventions if deemed appropriate by the regulatory authorities. Records will also be available at LDL offices for inspection by the Highland Council or National Technical Group should this be required at times out with the annual reporting schedule; records held include on-farm fish numbers corresponding to monitoring data.

If following analysis of the annual monitoring information by the Highland Council and National Technical Group there is sufficient scientific evidence to conclude that operations in Loch a Chairn Bhain are contributing to an elevated risk to the Clashnessie Burn FWPM feature of the Abhain Clais and Eas and Allt a' Mhuilinn SAC, by way of impact on FWPM hosts via sea lice interactions which could lead to an adverse effect on the site integrity, appropriate management interventions would be implemented to address this risk including those instructed by the Highland Council.

This EMP will be reviewed at the end of each production cycle at the Loch a Chairn Bhain site i.e. every two years. This will include a report following internal review by LDL of sea lice control measures used on-farm to give an update on efficacy and include any new or modified measures available. It is anticipated that feedback from the Highland Council and National Technical Group, based on the results of monitoring undertaken as part of this EMP, will also be available for inclusion in the review. The review report and updated EMP document will then be submitted to the Highland Council and National Technical Group by 31st December every two years for approval, prior to the start of the next cycle. As a minimum the review report and EMP update will include:

- A summary of results from the wild fish monitoring programme, and if required suggested actions to safeguard FWPM within the SAC from potential sea lice interactions with the site
- Analysis of on-farm lice levels relative to Marine Scotland and CoGP thresholds
- A record of actions taken to manage sea lice during the production cycle
- A management plan for the following production cycle

In the unlikely event that further clarity or action is required, submission of the above documents would be followed up with meetings and discussions as deemed appropriate by the Highland Council and National Technical Group.

Document History

| Version & Date | Comments |
|----------------|--|
| V1 Dec 2022 | Adaptation of Reintraid EMP to explicitly include Torgawn, both being within Loch A Chairn Bhain (MS site); Update of EMP with 2021-2022 data |