

Predator Control Plan

Kames Fish Farming Limited



Ardifuir

Reviewed By	■	■							
Date	04/2019	10/2020							

Predator Control Plan

Kames Fish Farming Limited (KFF) sites, equipment and procedures are designed to minimise the interaction between predators and farmed stock.

The following steps are taken to minimize this:

1. Risk identification
2. Monitoring
3. Risk prevention/mitigation measures

Appendix 1 details the step-by-step predator control plan for KFF Sites.

This plan is to be read in conjunction with:

- a) Containment Control Plan
- b) Daily Inspection Procedure
- c) Mortality Management Procedure
- d) Wildlife Management Plan

This plan will be reviewed and updated as frequently as is required, but as a minimum a review will be conducted on an annual basis.

1. Risk identification

	Predator Risk Assessment		
	Risk	Risk Type	Risk Level (H, M, L)
1	Bird predation (terrestrial)	Hérons, ospreys, gulls & eagles	Low
2	Bird predation (aquatic)	Goosanders & cormorants	Low
3	Shark	Spur dog	Medium
4	Mammal predation (native)	Otters & seals	Medium
5	Mammal predation (non-native)	Mink	Low

2. Monitoring

Daily site inspections

KFF undertakes daily farm inspections to; ascertain whether any breaches of containment have occurred in the previous 24 hours that may increase the risk of predation, assess the risk of breaches of containment for the following 24 hours and ensure the maintenance of production unit integrity.

During site inspections KFF employees are vigilant to the presence of predators by visual identification of the animal or from evidence (faeces, containment breaches etc.).

Mortality Management

KFF undertakes frequent removal of mortalities (minimum twice weekly) and mortalities are graded by cause. Physically damaged mortalities indicate that there is predation occurring and mitigating steps should be taken.

Diver inspections

KFF currently has divers remove mortalities and inspect nets bimonthly and/or as requested by site managers. The divers ensure the net is well tensioned, there are no breaches of containment, mortalities are removed and any evidence of predation on the mortalities is recorded in the dive report. The dive report is given to the site manager for review and recorded in the KFF management system.

3. Risk prevention/mitigation measures

Bird predation (terrestrial)

Custom designed “bird friendly” top netting is used to prevent fish predation and bird entanglement. I.e. small mesh size significantly reduces entanglement risk and visible netting.

Bird predation (aquatic) and Shark

Net tensioning, using net weights and/or sinker tubes is employed to prevent fish predation and aquatic bird entanglement. Maximum net mesh size of 25mm is used which prevents interaction and avoids entanglement.

Mortalities are removed twice weekly as a minimum to avoid attracting predation.

Mammal predation (native)

Net tensioning, using net weights and/or sinker tubes, is employed to prevent fish predation from seals and otters.

The site has an ACE Aquatec RT1 acoustic deterrent device (ADD). The device is turned on if seals are seen around the cages. Any site that has a high risk of attack or a history of seal attacks must have a working ADD installed onsite. ADD's must be used with consideration for the potential effects on non-target species such as cetaceans. ADD's must be checked daily and working status recorded. ADD's must be serviced regularly in order to maintain full working operation.

New nets purchased are fitted with False Bottoms with a maximum mesh size of 85mm x 85mm. This has proven effective in seal exclusion on farms suffering a high risk of seal predation as another form of exclusion barrier to predators. These are checked weekly by divers during routine dive operations.

Humane killing, by an approved marksman, is used as a last resort to prevent seals from damaging/entering production units. This decision may only be taken by the KFF Managing Director and/or Production Manager. Dead animals are offered to the relevant authorities and records of this kept as per legislative requirements.

Should predator removal be required for third party owned sites leased to Kames Fish Farming Limited, permission for the killing of predators will be sought from the owner of the site.

KFF currently holds Licence Number – WS12/2020/W.

In the event that it has become necessary to humanely dispatch a predator, KFF keeps the following records for inspection:

- a) Name of all persons with a valid firearms certificate that are deemed competent to perform the task.
- b) Details of any bullets used and returned, in the ammunition register
- c) Details of the animal that has been shot, including:
 - i. The species

- ii. The time and date of dispatch
- iii. The location
- iv. The reason for shooting

All attempts must be made to recover the body of the animal and this must be recorded. The carcass must be disposed of in accordance to the law.

After every shooting incident, a review of all predator exclusion procedures must be undertaken and records kept of such reviews.

Mammal predation (invasive species)

When required, trapping, using approved traps, and the humane killing of non-native mammals is employed to prevent non-native mammals damaging/entering production units. Dead animals are offered to the relevant authorities or disposed of according to the relevant legislation.

Future deterrents

Kames Fish Farming is continually reviewing its predation risk assessments and are looking for ways to further reduce the risk of predator attacks.

Kames Fish Farming Limited Predator Control Plan for Kames Fish Farming

The following steps are followed sequentially by Kames Fish Farming Ltd to minimise predator attacks on caged fish.

1. High net tension and net quality are significant factors in the minimisation of escapes and predator attacks. As an initial attempt to curtail the interactions between seals and the stock, KFF will install nets with sinker tubes and/or net weights and nets with appropriate strength and quality specifications available. Nets will be tensioned with the deployment of sinker tubes or weights, maintaining maximum net wall tension and thus deter the likelihood of attack.



2. If required and possible, the installation of curtain nets will be expected to significantly reduce the interaction between the surrounding wildlife and farmed stock.



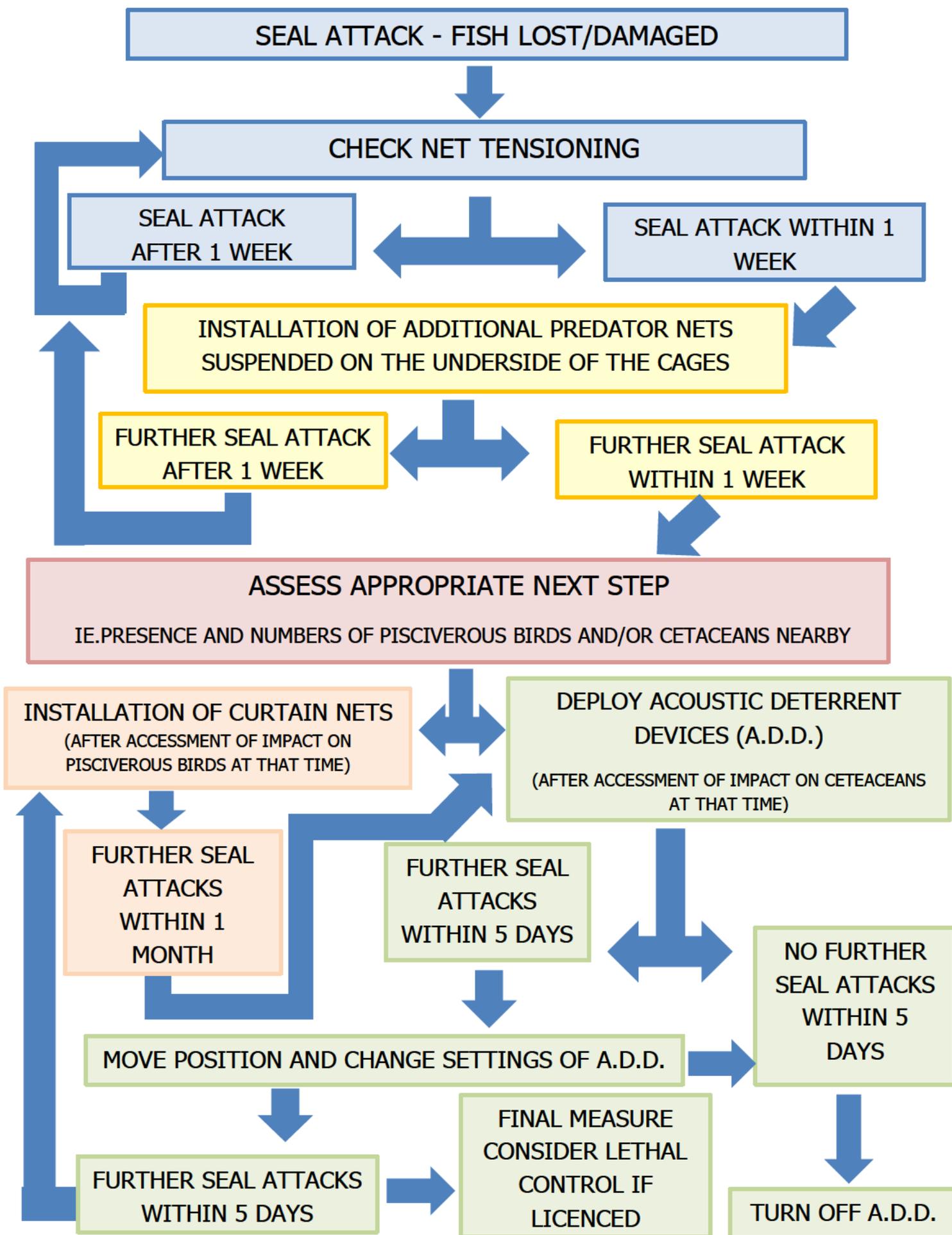
3. Dead fish will be regularly removed to remove the availability of this potential food source.



4. In the event that preventative measures 1 to 3 fail to be satisfactorily efficient at deterring attacks, acoustic seal scaring devices will be installed in the cages. KFF favours triggered devices, which react and emit a pulse of sound only in the event of predator attack by seals. As well as being efficient, humane, and non-lethal, these devices reduce potential impacts on other non-target species.

5. In the event that preventative measures 1 to 4 fail to be satisfactorily efficient at deterring attacks, lethal control may be used under licence at this site.

FLOW DIAGRAM SHOWING TRIGGER LEVELS USED TO DETERMINE THE APPROPRIATE PREDATOR CONTROL METHODS FOR SEAL ATTACKS ARDIFUIR



ACE AQUATEC – SYSTEM OVERVIEW V2

Unit	Frequency	Source Level	SPLPeak*	Duty Cycles
RT1	0.8-1.2kHz	Max: 198dB re1uPa rms @ 1m Average within a transmission: 185dB re1uPa rms @ 1m	SPL Peak 198db + 3 = 201dB re 1uPa @1m	12-144 Scrams per hour 0.7% - 8%

The RT1 is a commercially available triggered, low frequency deterrent that has been developed by Ace Aquatec in collaboration with St Andrew's University (SMRU). Ace won a Queen's Award for innovation for this technology in 2017. Goetz 2008 and Olesiuk 2012 suggested that for the least impact on cetaceans such as porpoises deterrent systems should preferentially be developed that make the majority of their energy below 5kHz, and preferentially under 2kHz. The RT1 is designed to maximise impact on seal predation while reducing impact on non-target species. It does this by employing a randomised signal generator to avoid habituation and deafness in seals (Southall et al. 2007); lower frequency sound (0.8-1.2kHz) to avoid the sensitive hearing range of porpoises (R. Kastelein et al 2011); seal detection triggers (thermal, night vision and long distance camera) to allow noise to be activated only when predatory behaviour is detected; and electric decoy fish to create conditioned avoidance behaviour allowing acoustic volumes to be reduced (D.Thompson et al SARF 2012 review). Studies have shown the Ace Aquatec acoustic signals are able to reduce predation rates with 50% improvement over existing systems (K.F.Whyte 2015), while having minimal impact on porpoise detection rates (studies ongoing under a SAIC project with [Redacted] of SMRU).

- The RT1 uses brief, randomised sound pulses that reduce the chances of habituation (Southall et al. 2007)
- It utilises short duration bursts that can be safely presented at higher source levels than longer ones (Goetz 2008)
- When combined with the triggering device the RT1 emits significantly lower duty cycles by triggering sounds only when a predator is detected, and volumes can be indexed against distance of the predator from the cages
- It targets specific species by choosing a frequency band in the sensitive hearing range of seals (0.8-1.2kHz; Olesiuk 2012) but not of porpoises and dolphins.

Unit	Frequency	Source Level	SPLPeak*	Duty Cycles
US3	8-11kHz	Max: 190dB re1uPa rms @ 1m Average within a transmission: 180dB re1uPa rms @ 1m	SPLPeak = 190db + 3 = 193dB re 1uPa @1m	12-144 Scrams per hour 0.7% - 8%

The Ace Aquatec US3 is differentiated from traditional single frequency, single tone transducers by offering a modulated frequency output with short, randomised tonal bursts.

- The US3 uses brief, randomised sound pulses that reduce the chances of habituation (Southall et al. 2007)
- It utilises short duration bursts that can be safely presented at higher source levels than longer ones (Goetz 2008)
- When combined with the triggering device the US3 emits significantly lower duty cycles by triggering sounds only when a predator is detected, and volumes can be indexed against distance of the predator from the cages
- Studies have shown the Ace Aquatec acoustic signals are able to reduce predation rates with 50% improvement over existing systems (K.F.Whyte 2015).

*SPLPeak value is a measurement primarily designed for measuring impulsive noise such as explosions or pile driving. For a sinusoidal, band limited sound like ours it is simply the Max rms value +3dB

Ace Aquatec Triggering Device



Thermal / night vision camera activation triggers allow deterrents to be activated only when predatory behaviour is detected using machine learning.

Features:

- 360-degree auto rotation
- Zoom up to 10km
- Thermal imaging detects heat signature and 2D camera zooms in
- Night vision included for 24 hour usage
- Awarded funding from a CFAS grant to automatically identify seal heads. Tested in the field for last 6 months at a site in mainland Scotland and commercial systems now available.
- Ace has trained 1000 images of seal heads and 500 porpoises to create a neural network capable of automating seal detection. Images were sourced from MMO observation and academic research. This system will be included in ongoing academic validation with St Andrews University. Training in detection of various odontocetes is ongoing.
- Seal detection can evoke a low volume sound, ramping up to higher volumes if the seal tracking distance decreases.

A triggering method that plays sounds when seals approach could help to postpone habituation...or [cause it to be] partly prevented (p.40) (Goetz 2008)

Ace Aquatec ARD Mode (Automatic Ramp Down)



ARD (Automatic Ramp Down) mode delivers a configurable decrease in the duty cycle from 8% to zero over a 45-day period.

- Phase 1: 3 x days at 144 SPH (Scrams per hour). 8% Duty Cycle over 3 days.
- Phase 2: 14 x days at 72 SPH. 4% Duty Cycle over 14 days.
- Phase 3: 28 x days at 12 SPH after which the system mutes itself. 0.7% Duty Cycle over 28 days.

The worst-case scenario of 144 scrams per hour = 288 seconds (4 minutes 48 seconds) per hour, or 6,912 seconds (115 minutes 12 seconds) per 24-hour period. (8% Duty Cycle)

Synchronised Duty Cycle

The Ace Aquatec synchronised duty cycle can be activated to ensure all devices run in synchronisation across the site; this reduces the total timed output to create a universal duty cycle across the site which is much lower than individualised duty cycles.

Scram / Tonal Length

'Scram' is the term used to describe the tonal acoustic output of the Ace Aquatec acoustic deterrents. A scram consists of a tonal pattern playing for an average of 2.8 seconds. A 2.8 second scram contains tonal bursts every .5 seconds with 0.25s intervals in between creating a total tonal acoustic output of approximately 2 seconds.

Non-Impulsive Deterrents

The Ace Aquatec deterrents utilise a sinusoidal, band limited sound output and are not considered impulsive devices. No registration with the JNCC is required.