Best Practice Guidance Document: Pinniped Predator Control.

Seal shooting must be prohibited without exception. Anti- predator nets should be used in the first instance on farms where seals are abundant or known to be problematic. Nylon containment nets should be sufficiently tensioned using weights to maintain shape so that seals cannot easily manipulate them. The use of Acoustic Deterrent Devices (ADDs) should be regulated such that only acoustic patterns known not to cause any harmful effects on target (pinnipeds) or non-target (cetaceans) species should be used, following further research in this area (e.g. startle ADDs).

Pinniped attacks: The issue for fish farms

Pinnipeds, such as seals and sea lions, are natural predators of fish. Fish farms therefore represent a highly attractive option for an easy meal. The Scottish Salmon Producers Organisation (SSPO) commented that 500,000 salmon a year are killed by seals each year, either directly from the physical attack or indirectly from stress[i], costing the industry an estimated £13m a year. In addition to causing fish mortalities, predator damage to nets was the second largest cause of escapes from Scottish farms between 2009 to 2012 (causing 22% of all escape events)[ii].

Effective pinniped predator control is vital to protect the welfare of the fish being farmed. However, some of the current methods employed may cause harm to both the predators themselves and to non-target marine mammals. This document reviews the welfare effects of the most common methods of pinniped control on marine mammals to provide guidance on the appropriate practices which should be employed.

Lethal predator control

Lethal predator control measures are currently permitted by most certification schemes as a last resort to predator attacks, including higher welfare schemes such as RSPCA Assured and Soil Association in the UK. Consequently, Scottish government figures indicate that almost 2,000 seals (1,956) have been shot since 2011 when the licensing requirement for seal shooting took effect[iii]. In Canada, shooting mammals as a lethal predator control measure in aquaculture has gradually decreased over the past two decades, but marine mammal fatalities (mostly harbour seals and California sea lions) in British Columbia totalled 617 between 2010 and 2019[iv].

The US will soon be banning imports of salmon from countries which use lethal predator control in accordance with the US Marine Mammal Protection Act (MMPA) which requires harvesting nations to prohibit the intentional mortality or serious injury of marine mammals[v]. In order to maintain exports to the US, the Scottish and Canadian governments have now announced plans to prohibit seal shooting. It is hoped that other countries will follow suit.

Whilst there is a need to ensure the welfare of farmed fish against predator attacks, the welfare of the predators themselves must also be protected. The shooting of predators must therefore be prohibited without exception, and adequate non-lethal methods be deployed instead.

Anti-predator nets

Typical cage netting (usually nylon) used to contain fish are relatively flexible and seals can manipulate the slack in the nets to grab fish swimming near the edge of the pen. Increasing the tension in these nets by increasing the weighting used to maintain net shape is likely to limit the access of fish from predators[vi].

Specialist anti-predator nets can be used as additional reinforcement and are usually placed outside the traditional cage netting. These are manufactured from high density polyethylene (HDPE) and are tougher and more rigid than nylon nets. They can be supported by additional weights and create sufficient tension to prevent seal attacks. Sufficient tensioning of the netting must be maintained and netting must be checked regularly, to prevent entanglement and drowning of predators.

Net tensioning and anti-predator nets should be used as the first port of call for predator deterrence, ensuring that appropriate measures are taken to prevent entanglement of predators.

Figure 1. Sapphire Sealpro (left) and Saphire Ultracore (right) as examples of HDPE predator netting (Garware Technical Fibres Ltd: https://www.garwarefibres.com/netting-suppliers/net-for-aquaculture/grow-out-cage-nursery/).

Acoustic deterrent devices

Acoustic deterrent devices (ADDs) create a temporary sonic fence around a salmon farm. They aim to unsettle or cause discomfort to approaching animals if they come within close range. ADDs are now commonplace in the salmon farming sector, with around two thirds of farms in Scotland now deploying them [vii]. Since 2020 Scottish farmers are required to conduct risk assessments in conjunction with Marine Scotland on the use of ADDs[viii]. Since Scottish farmers *expect and require effective acoustic devices to remain a part of the suite of predator deterrent measures* [viii], the use of ADDs is predicted to increase as lethal predator control methods are banned.

There is, however, a growing body of evidence indicating that ADDs may have adverse negative effects on both pinnipeds and non-target mammals such as cetaceans (e.g. dolphins, whales, porpoises). Research indicates that that ADDs may cause long-term damage to the hearing of seals and cetaceans[ix] [x] [xi] [xii], as well as affecting local abundances of these animals. ADDs can cause at least temporary displacement of cetaceans, whilst seals develop a level habituation to the ADDs and are not always deterred by the noise[xiii] [xiv] [xv] [xvi] [xvii]. The effectiveness of ADDs in reducing predator attacks is therefore considered to be equivocal [xvii] [xviii] [xix].

There are, however, promising new technologies that may effectively deter predators without causing adverse effects on target and non-target species. Startle ADD, or Targeted Acoustic Startle Technology (TAST), triggers a startle reflex through a short-onset sound in target species. Early trials of this system have shown fish loss reductions of 91-97% compared to control sites[xx], no effects on the abundances of harbour porpoises around farms[xx,xxi], and no habituation of seals[xx,xxii] - so long-term effectiveness is more likely than with traditional non-startling acoustic stimuli.

The use of ADDs should be restricted to those which have been proved to have no adverse effects on target and non-target marine species. We therefore recommend that ADDs are not used until sufficient research has been undertaken to identify the acoustic characteristics which are effective against predators and do not cause long-term harm to marine mammals (e.g. TAST).

Others

Harassment techniques are used by farmers to prevent predator attacks. These may include noise deterrents (e.g. the use of airguns or predator vocalisations), visual deterrents (e.g. models of top predators) or moving deterrents (e.g. chasing problematic predators with a boat). Harassment techniques such as these have not been found to have lasting effectiveness due to rapid habituation of pinnipeds[xxiii, xxiv, xxv,xxvi]. They are therefore not currently recommended as they are unlikely to provide adequate protection for the fish.

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