Fact Sheet 2022

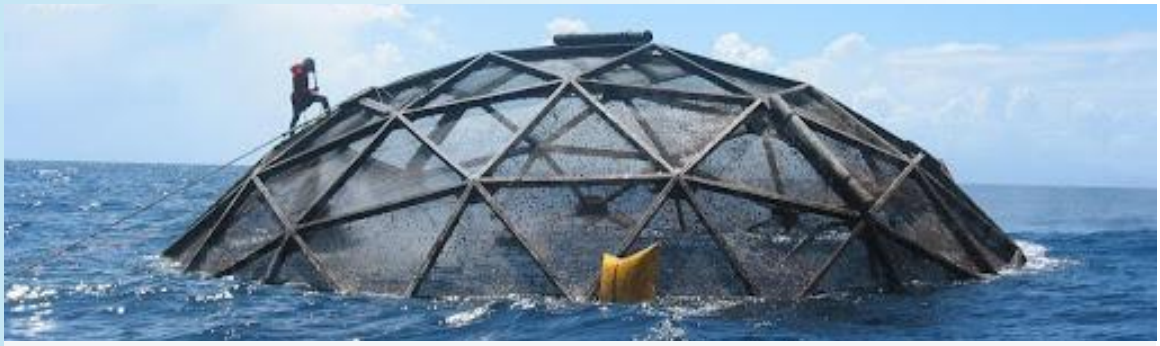
Potential Risks of Aquaculture Escapes

NOAA FISHERIES

Office of Aquaculture

Advanced containment systems and improved management practices have dramatically reduced unintentional aquaculture escapes. Federal and state permits require containment management systems at all marine sites, and these measures are enforced through regular inspections and audits. Equipment and husbandry continue to evolve and improve as operators test new designs and materials.

Learn more:
fisheries.noaa.gov/aquaculture



An aquaculture cage sits on the surface of the ocean for cleaning and inspection at Snapperfarm, Inc., a commercial open ocean finfish operation in Culebra, Puerto Rico. Credit: NOAA Fisheries.

Fish Farms and Escapes

Escapes of fish raised in aquaculture can present two types of risk to wild populations: genetic and ecological. The primary concern with escaped fish is the nation that they will adversely impact wild stocks, either through competition for food or habitat, disease, or through reproductive mixing.

Fish may escape in weather events like severe storms, from damaged nets, or during harvest operations. However, advances in cage design including stronger net material, improved mooring components, and additions of anti-predator nets have dramatically reduced unintentional escapes. Best management practices including choosing appropriate cage technology for the area, routine inspection, and good maintenance have also aided in the reduction of escapes.

POTENTIAL ECOLOGICAL IMPACTS

Typically, domesticated fish raised in captivity are poor performers and have low fitness in the wild. Escapees quickly become prey to other predators, lessening their potential for food and habitat competition. In the case of Atlantic salmon, there is no evidence that the species is able to create a self-sustaining population in the Pacific Ocean, despite both accidental and intentional releases in the past.

Ecological concerns also include the risk of disease transfer to wild fish populations. Disease is a fact of life in all animal populations, including livestock farming systems on land and in water. When finfish aquaculture operations are in the marine environment, water moves freely between farms and the ocean. Disease risk flows both ways, with farm and wild populations having the potential for transmission of disease and the introduction of nonnative pathogens and parasites. To reduce these potential risks, many farmed fish are vaccinated against diseases that have caused problems in the past. Implementing other proactive measures to prevent disease, such as providing appropriate stocking densities, minimizing stress, and improving farm siting, also decrease the risk of disease.

WHY FARM SEAFOOD?

Today, the United States ***imports between 70-85% of the seafood we eat*** *by value–more than any other country. Global and domestic demand for seafood continues to grow. Even as we maintain and rebuild our wild harvest fisheries, we cannot meet increasing domestic demand for seafood through wild-caught fisheries alone.*

Marine aquaculture provides a domestic source of economically and environmentally sustainable seafood that complements and supports our wild fisheries production.

Learn more:
fisheries.noaa.gov/aquaculture

POTENTIAL GENETIC IMPACTS

If farmed fish were to escape and interbreed with wild populations, there could be potential for negative effects on wild populations. Reproduction between farmed and wild fish may have negative genetic consequences for the mixed population, lowering fitness and potentially limiting the ability of the wild fish to respond to changing environmental conditions. These potential impacts to the genetic diversity of wild fish can be minimized by selecting hatchery broodstock from local wild fish so the genetic makeup is similar to wild counterparts. Stocking of sterile fish, or a single-sex population of fish, are also tools that can reduce potential genetic impacts related to reproduction.

OFFSHORE AQUACULTURE ESCAPES GENETICS ASSESSMENT MODEL

To address these genetic concerns from escape events, NOAA Fisheries and ICF co-developed a decision support tool called the Offshore Mariculture Escapes Genetics Assessment (OMEGA) model.

The OMEGA model is a mathematical model with inputs that include the size and growth characteristics of the cultured fish, with frequency and magnitude of escape events, survival rates of escapees in the wild, probability of escaped fish encountering wild counterparts and interbreeding, and the dynamics of the wild population. Outputs from OMEGA describe the influence these aquaculture escapees may have on the survival and fitness of the mixed population over time.

This model can help conduct aquaculture escape risk assessments on species identified as potential candidates for marine finfish aquaculture development in the U.S. These species-specific risk assessments can then be used to identify conditions that lead to potentially greater risk from (or to) a marine species and factors that contribute to higher risk. These analyses can help NOAA Fisheries understand how escape risk varies by differences in a species' life history (e.g., population status, age at maturity, fecundity, etc.), differences in aquaculture operations (e.g., size of fish and length of time fish are in the pen, culture methods, etc.), and geographic settings of an aquaculture operation (e.g., proximity to the wild populations, severity of potential weather). Results can provide broad guidance to inform decisions regarding developing candidate species for aquaculture.

02/2022