

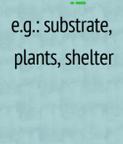
Enrichment for fish during rearing



What is environmental enrichment?

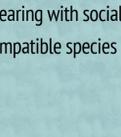
Environmental enrichment is the increase in intricacy of an animal's environment to prevent negative welfare (preventing stereotypical behaviours, poor health, and chronic levels of stress) and promote positive welfare (promote the display of natural behaviours and enable animals to experience positive emotions).

structural



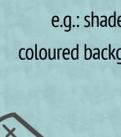
e.g.: substrate, plants, shelter

social



e.g.: rearing with socially compatible species

sensory



e.g.: shade, coloured background

types of enrichment



e.g.: changes in water flow, suitable currents, manipulable objects



e.g.: flavoured feed, variable sized pellets

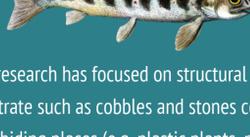
occupational

dietary

The research

Atlantic salmon

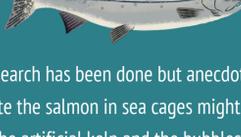
Juvenile



The research has focused on structural enrichment. Substrate such as cobbles and stones combined with hiding places (e.g. plastic plants, pipes) can lower stress, improve fin condition, and improve special learning.



Adult



No research has been done but anecdotal reports indicate the salmon in sea cages might benefit from the artificial kelp and the bubbles created to oxygenate the water when sea lice skirts are used.



Provide enrichment but with caution

Juvenile salmon can be territorial, when providing structural enrichment, sufficient enrichment must be provided to avoid increase in territorial behaviour

Research needed

Research is needed into other types of enrichment for juvenile salmon and enrichment research is needed for salmon in sea cages.

Rainbow trout

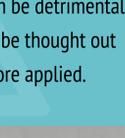
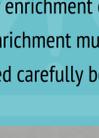
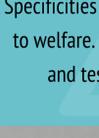
Juvenile



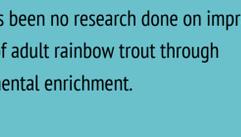
Fin condition has been improved from the addition of substrate.

Currents can change swimming patterns.

Playing Mozart can lower stress.



Adult



There has been no research done on improving welfare of adult rainbow trout through environmental enrichment.

Provide enrichment but with caution

Specificities of enrichment can be detrimental to welfare. Enrichment must be thought out and tested carefully before applied.

Research needed

Research is needed looking at a wider range of welfare indicators in juvenile rainbow trout and enrichment research is needed for adult rainbow trout.

Gilthead sea bream

Juvenile and adult



Gravel is the most studied enrichment for improving the welfare of gilthead sea bream. It can lower stress, aggression, and permits the fish to display natural behaviours by manipulating the substrate. Age affects the gravel colour preference.



Vertical suspended ropes inside rearing cages can increase space use, improve fin condition, lower aggression, and improve cognition.



Playing Mozart can lower stress.

Provide enrichment but with caution

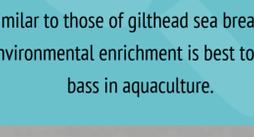
The risks of biofouling on the ropes must be considered when these are used over long periods, longer trials under aquaculture settings are needed.

Research needed

Further research is needed on the potential benefits of non-structural enrichment for gilthead sea bream.

European sea bass

Juvenile and adult



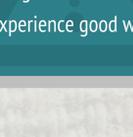
No research on environmental enrichment has been found for European sea bass. Rearing techniques for European sea bass are often similar to those of gilthead sea bream however research is needed to determine what species-specific environmental enrichment is best to improve the welfare of European sea bass in aquaculture.

Pangasius

Juvenile



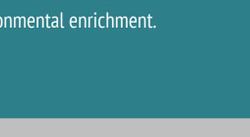
Only one study has looked at enrichment for pangasius. The study found that green background can lower stress during rearing.



Provide enrichment but with caution

Little is known about the natural behaviour and ethological needs of pangasius to experience good welfare.

Adult



There has been no research done on improving welfare of adult pangasius through environmental enrichment.

Research needed

More research into the wants and needs of pangasius is needed. This will help to better understand the need of pangasius in aquaculture systems. Research on enrichment is also needed.

Call for action

1

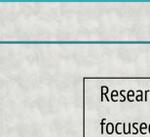
Environmental enrichment testing is needed in commercial fish farms.

This is best accomplished through case studies.

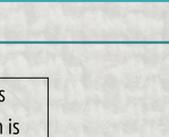
Food companies who have fish in their supply chains need to collaborate with their suppliers to establish best practice protocols in order to improve the welfare of farmed fish through environmental enrichment.

Could you be the first?

2



vs.



The majority of research on environmental enrichment for farmed fish species have focused on weight gain and preventing poor welfare by lowering stress and reducing physical damage.

Little research has been aimed at providing farmed fish species with positive welfare such as enabling fishes to display desired behaviours and experiencing positive emotions.

3



Research into enrichment for aquaculture has focused on small juveniles. Little information is available on enrichment during grow-out.

Research on enrichment during grow-out is desperately needed to improve the lives of the billions of fish farmed every year.



For more information, see the detailed literature review:

<https://www.ciwf.org.uk/media/7443855/environmental-enrichment-for-fish-in-aquaculture.pdf>