NORBIT AQUA

NORBIT UNDERWATER LIGHTS

When choosing lights to manipulate an entire fish population in pens, there are several essential aspects to keep in mind. What are we trying to achieve and why? How do we have control of fish welfare when adding artificial light sources? Is it possible to maintain good HSE with several lamps installed in the pens? Is it cost-effective? When to use lights, depth, intensity, and numbers?

NORBIT has years of experience in developing and producing underwater lights to the aquaculture industry. NORBIT also have trained personnel to support and advise the fish farmers in aspects related to the biological effects and correct use of aquaculture lighting.

After a long and thorough development process, the result is an underwater lamp based on the premises of the fish and the farmer's daily operations.

According to the Brambell committee report from 1965 describing the five freedoms of animals kept under human control, we are committed to giving the animals:

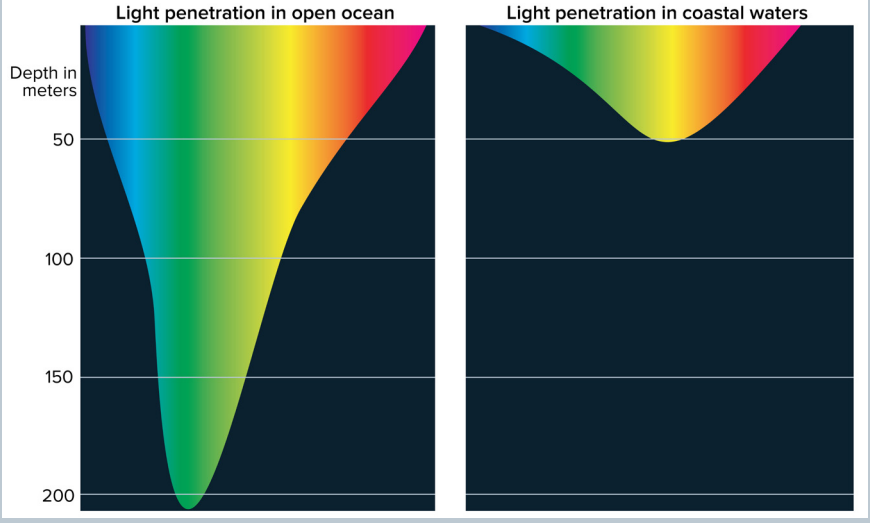
- Freedom from Hunger and Thirst: by ready access to fresh water and a diet to maintain full health and vigour.
- Freedom from Discomfort: by providing an appropriate environment including, shelter and a comfortable resting area.
- Freedom from Pain, Injury or Disease: by prevention or rapid diagnosis and treatment
- Freedom to Express Normal Behaviour: by providing sufficient space, proper facilities, and company of the animal's own kind.
- Freedom from Fear and Distress: by ensuring conditions and treatment which avoid mental suffering

NORBIT FCL600 Aqua Lamp

These five freedoms are NORBIT's guidelines when developing lights for aquaculture.

A light environment where the fish can execute its normal behaviour fulfils one of the five freedoms and lowers stress. The FCL600 presents emitted light horisontally in the pens (illustration) and not only downwards, this makes a “layer” of light without high contrast between light and dark. Maintaining a stress-free migration up to the surface and down again, is absolutely critical since salmons need to fill their swimbladder regularly.

Another important aspect of using artificial light to achieve biological effects is to ensure the light composition. In FCL600 we have special LEDs (light-emitting diodes) emitting exactly the light salmons respond to in a positive, biological way. If we look at the salmon physiology, it has dedicated, specialised receptors in both the eyes and in the brain (photoreceptors) that convert light energy to nerve signals. Salmons have different types of these receptors, but the most dominating and important ones are the ones that respond to blue and green light. These receptors play a significant role in the smoltification process and later the maturation process. The reason why blue and green light has this effect is because of an evolutionary adaptation to light waves that travel deepest in water (ill). The FCL600 consist of a defined mixture of blue and green LED giving exact the light environment salmon wants. This knowledge is scientifically documented.



Light penetration in open and coastal waters

One of the most important unwanted biological rhythms in salmon farming is maturation. This could happen when the fish are in the grow-out facilities (pens or large tanks) and experience shorter days. Since Atlantic salmon spawn in the autumn, shorter days will initiate the maturation process.

Salmon that start to mature in captivity will experience stress, loss of appetite, osmotic problems, and reduction of muscle tissue. Since blue and green photoreceptors are the primary regulators in this process, it is vital to expose salmon in the dark periods to light with a high composition of blue and green wavelengths.

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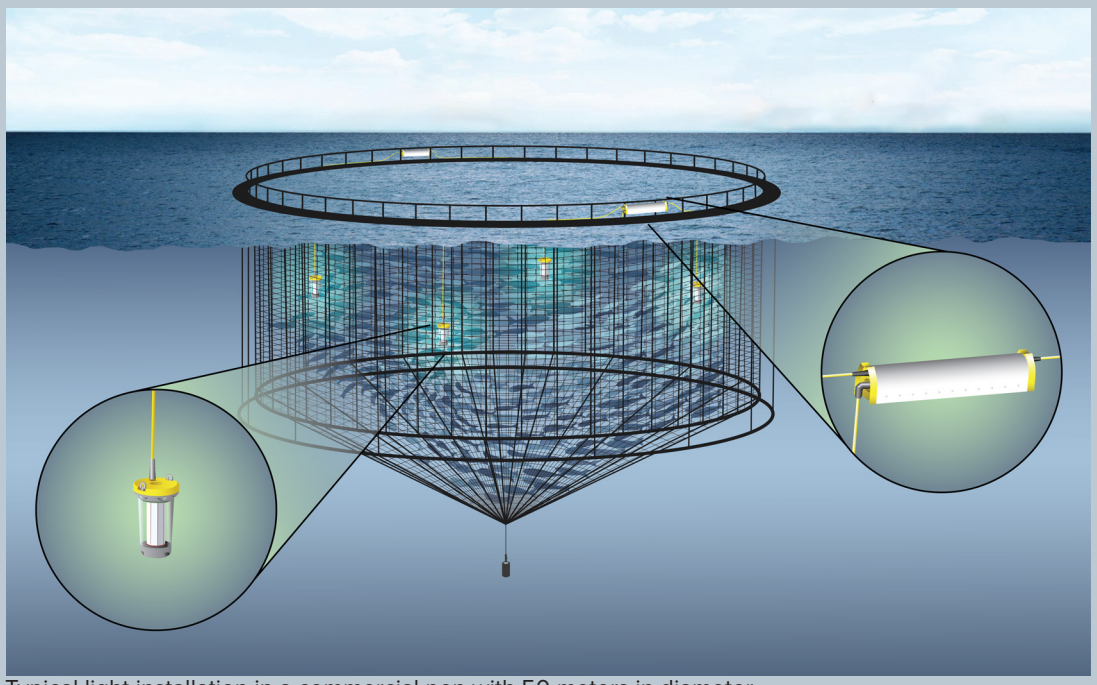

Typical light installation in a commercial pen with 50 meters in diameter

By holding back the maturation process, it will also be possible to get a significant growth effect, this comes naturally since energy from the feed pellets is used to build muscle cells instead of gonads. In several cases, we have seen up to 15 % better growth in pens with correct artificial light compared to pens with “standard” light sources.

Correct light will give a growth effect, but it will also enhance the welfare for the fish in total, giving less stress fulfilling another one of the five freedoms. A less stressed salmon is also more resistant to virus, fungi and bacteria giving a reduction in mortality numbers.

It’s not only the emitted light from FCL600 we have focused on but also the construction, choice of material, weight, corrosion, and ease of installation and operation.

The luminaire is made of reusable, synthetic housing with an inner cooling core of aluminium bronze which is 100 % reusable. We have also taken into account that fish tend to collide with units placed in a pen or tank. Hence the FCL600 have no sharp edges, mounting arrays or other obstacles that could harm the fish or tangle up in the net leading to escapes.

A standard setup in a pen with a 160 meters circumference uses 4 lights in a quadratic orientation. These lights need both power and control electronics. Instead of integrating these functions into the submerged luminaire, NORBIT has made a new and revolutionary power distribution cabinet (PDC). Traditional solutions are usually cabinets attached to a pole at the railing of the floating collar. The FCL PDC has a rectangular shape, is completely sealed, and attaches under the handrail using heavy-duty Velcro straps, making the installation process extremely easy and quick furhtermore the installation under the handrail makes it safer and easier to use the walkway at the floating collar.

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