

Seasonal nutrition

Matching fish feed to fish physiology

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In most areas of the world, nature follows the seasons in one way or another. This affects both the physiology and behaviour of animals of different genera. As many fish species are poikilothermic, their internal temperature varies considerably with changes in ambient temperature. In a changing climate, this dependence can have serious implications for natural and captive fish populations when there are rapid drops or rises in ambient temperature, sometimes over short periods of time.

The connection between temperature and metabolism

Variations in body temperature have a pronounced effect on both the rate and efficiency of fish metabolism. Fish metabolism increases at higher temperatures and vice versa. As a result, fish feed intake, nutrient digestibility and nutrient utilisation vary with temperature.

As the seasons change from winter to spring, many fish farms experience a rapid change in water temperature. This is considered to be the most sensitive period in fish farming. The drastic increase in temperature affects the fish's metabolism and challenges their immune system. The fish's difficulty in adapting to the changing environment is often manifested by loss of appetite, apathy and skin lesions. As a result, fish that have problems with changing environmental conditions show reduced growth performance, resulting in lower profits for farmers. In contrast, the transition from winter to spring is a time of change in farm operations as feeding intensity increases.

Warming temperatures boost metabolism

As water temperature increases, fish have a reduced ability to take up oxygen from the warmer water because the solubility of oxygen in water decreases as water temperature increases. This is particularly true for juvenile fish, which are more susceptible to oxygen depletion than adults. To cope with these conditions, fish generally have a high natural capacity to extract oxygen from the water. Therefore, sudden increases in water temperature can become a stressful factor, especially in more intensive farming conditions where additional oxygen supply is limited or too costly. Physiologically, fish adapt to sudden temperature changes by increased respiration and higher levels of stress hormones in the blood.



It is therefore essential to support the fish organism during this potentially stressful period by providing specific nutrients in the diet. Most animals can synthesise vitamin C, but many fish cannot.

Physiologically, vitamin C is the precursor of collagen and is therefore necessary for the formation of connective tissue, scar tissue in wound repair and bone matrix. It also facilitates the absorption of iron and protects tissues from oxidative damage. An enhanced immune response due to high levels of vitamin C supplementation has been documented in many fish species.

Aller Aqua's SPRING EDITION feeds contain an extra dose of vitamin C, which contributes to the formation of red blood cells and stimulates the production of collagen, facilitating oxygen uptake and promoting skin and wound healing. Ultimately, it helps fish through the difficult transition from winter to spring.

Countering stress from high temperatures

The summer period is characterised by high temperatures and the highest metabolism of fish. Heat waves and subsequent high water temperatures during the summer challenge fish when they are close to their physiological limits. Consequently, the summer season can lead to oxidative stress in fish, caused by a combination of high temperatures and increased fish metabolism. Oxidative stress is an imbalance between oxidising substances and antioxidants in favour of the oxidising substances, resulting in damage to body cells. In order to maintain homeostasis, body cells consume more energy to counteract oxidative stress. Symptoms in fish include heat stress, reduced appetite, weakened immune defences and poor quality fish flesh.

To counteract these symptoms, Aller Aqua's SUMMER EDITION feeds are supplemented with natural antioxidants to restore the oxidative balance. Antioxidants have several beneficial effects, including reducing heat stress, stimulating the immune system, increasing feed intake and consequently body weight.

As water temperatures drop in the autumn, fish metabolism slows and they reduce their feed intake. Warm water fish species will stop feeding and prepare for a hibernation period without feeding. It is therefore essential to provide the organism with the necessary energy stores and to support cell function at low temperatures.

Preconditioning for winter

The membranes of all animal and plant cells are made up of membrane lipids of the main groups glycolipids, cholesterol and phospholipids, which form the typical membrane layer necessary for all life. At low temperatures, the fluidity of cell membranes is reduced if they are not supplied with phospholipids rich in highly unsaturated fatty acids, resulting in a reduced exchange of water, gases and proteins.

Aller Aqua's AUTUMN EDITION feeds are formulated with high levels of phospholipids, which promote high digestibility of the feed and ensure preconditioning for the hibernation period. The supply of phospholipids supports the fluidity of the cell membranes and avoids solidification at low temperatures, ensuring optimal cell functionality.

Efficient nutrient uptake during the coldest season

In low winter temperatures, feed intake is reduced and so is the metabolism of the fish. As a result, nutrients from the feed are poorly utilised and may be wasted, which is an inefficient use of valuable feed ingredients.

During the winter season, feed digestibility can be increased by using emulsifiers to improve digestion and nutrient uptake of dietary lipids. This is what Aller Aqua has done in its WINTER EDITION feeds. The lipids in the feed are used efficiently and are not excreted into the environment. This can easily be seen in the reduced or absence of fat films on the water surface and on equipment in a fish farm. As a result, the increased and more rapid availability of energy promotes fish growth even at low water temperatures. Another challenge is the reduction in protein digestibility due to low metabolism. This challenge is addressed by the addition of highly available peptides. In the feed, the peptides increase the digestibility of the protein fraction and the availability of amino acids.

On the other hand, the absorption of nutrients by the epithelial cells in the intestine is an energy-consuming process. The addition of highly available energy sources activates the epithelial cells, which increases the reactive surface in the gut and ultimately improves nutrient absorption.

In conclusion, adapting fish feeds to seasonal temperature differences in a fish farm creates great potential for fish growth, vitality and health and has become a core principle in Aller Aqua's feed formulation. This is why Aller Aqua has introduced the concept of Temperature Adapted Feeds (TAF), which ensures higher feed intake and nutrient digestibility in all seasons. This is achieved by adjusting the nutrient levels in the feed to help different fish species better cope with the challenges of changing environmental temperatures throughout the year. At the same time, nutrient excretion into the environment is kept to a minimum. The concept of Temperature Adapted Feeds covers the four seasons of the year and a wide variety of fish species, as new species are constantly being added to the concept. Temperature Adapted Feeds for different species and seasons are developed in collaboration with international research institutes, fish farms and Aller Aqua Research. It is the result of Aller Aqua's more than 50 years of experience in the fish feed industry, covering feeds for more than 30 species.