

Effects of climate change on rearing Tilapia in earthen ponds

Risks from climate change on rearing Tilapia in earthen ponds

1. Risks from high water temperatures during the summer

During the summer months, when the days are long and direct heating from the sun is at its greatest, the water in ponds become separated into thermal layers; with the warmest - as high as 33 degrees Celsius - located at the surface of the pond.

The primary effect of thermal separation is a decrease in the pond's overall oxygen content; effectively making the pond inhospitable for the fish. Furthermore, high water temperatures encourage the disintegration of organic matter, such as Aluminium, which could lead to a harmful accumulation. Combined, the effects of decreased oxygen and water poisoning, will suppress the fish's appetite, induce stress, and ultimately lead to a premature death (see Figure 1).

2. Risks from low water temperatures during the winter

Less sunshine during the winter months means that the water in ponds remain relatively cool throughout the day; and drop at night. The effect of this on the fish is poor appetite; as cold temperatures interrupt the fish's normal digestion. In consequence, inadequate nutrition intake leads to poor growth, and therefore requires the farmer to extend the rearing period.

3. Risks from floods

During the rainy season, surplus rain water could cause the ponds to become flooded. This is especially true in lowland areas, such as lower Northern Thailand, and upper Central Thailand; two regions that often have to contend with flooded ponds after extended periods of rain.

Flooding can cause extensive damage to the ponds. Not to mention that the fish can escape and therefore produce a lower yield for the farmers, or on the other hand, introduce other aquatic life that could disrupt the original system.

4. Risks from droughts

During drought season, farmer's often face the difficulty of how to replenish water in their ponds. This is especially true for farmers with ponds outside irrigation areas or are located far from water wells. Ponds rearing large fish are also more prone to risks, since less water and a hot climate will have an effect on the temperature and composition of the water, in turn encourage plankton growth; which can diminish water quality. Poor water quality implies an unsuitable living environment, which might lead the fish to become stress, weak, and eventually die.

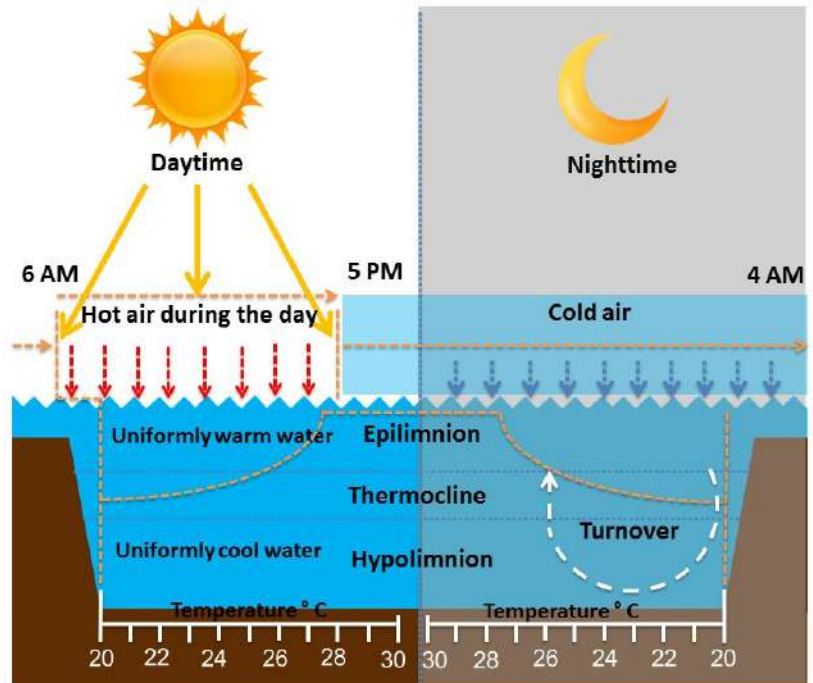


Figure 1: Thermal layering of the water during summer

"If the weather is very cold, fish won't eat as much. If it's a very hot day, the fish won't be able to adapt fast enough."

Somchit Junta/Chiang Mai



"During March-April-May if there's been long periods of drought, then there will be problems, but if there's no drought than there won't be as many problems, and the fish won't die."

Jai Pinthong/Uttaradit

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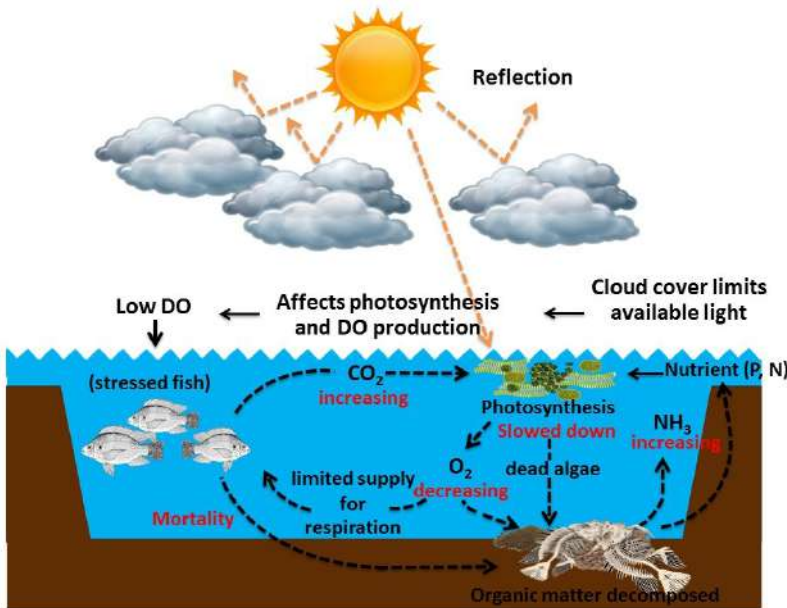


Figure 2: The various mechanisms that occur in a pond during the rainy season

5. Risks from low oxygen content in ponds during the rainy season

During the transition period between summer and the rainy season, farmers are often faced with the dilemma of dying fish, due to lack of sufficient oxygen content, this, and the fact that Aluminium sediments become mixed into the water.

The main contributing factor to oxygen content in a pond is exposure to sunlight; whence oxygen is created and stored during the daytime and used at night. During the transition period between summer and the rainy season, photosynthesis is limited, since clouded skies prevent optimal synthesis of oxygen. Therefore, less oxygen is available for the fish to use during the night. In addition, if it rains, this will cause the water temperature to drop, in turn, stir up the water and cause sediments to be distributed throughout the pond.

Thus, farmers rearing large fish often have to contend with dying fish during this seasonal transition period (see Figure 2).

Practice guidelines to help minimize risks associated with the seasonal transition period

1. Farmers should consider installing oxygen generators in ponds where the fish have grown to market size and are pending to be sold. If the fish rise up to the water surface, behaving as if it were drawing air, this is a good indication that the pond is in a state of low oxygen, and that there is a high chance that death will follow. It is generally well known that pumping air into the water is an effective way to improve oxygen availability, and furthermore, encourage water circulation. Favorite methods to increase oxygen content include the use of water aerators or air pumps; both of which also help to reduce accumulation of carbon dioxide in the water.
2. Farmers should consider replenishing the water supply in their ponds as often as necessary, and take control of the amount of plankton so as not to have too much of it present; whereby the accepted amount is at 30 centimeters on the secchi disk. If there is too much plankton (over 500 micrograms per liter, or 20 centimeters on the secchi disk) this will lead to a critical level of oxygen deficiency (less than 1 milligram per liter), which is dangerous to the survival of Tilapia.
3. Farmers should consider controlling feed. A surplus of fodder will simply introduce waste and Ammonia to the water, which can lead to the fish becoming stress and possibly die from it. When it's not possible to change the water or during periods of cold temperature, fish tend to eat less; and so adjusting feed accordingly might prove advantageous.
4. Farmers should consider planning their yield around the risks associated with the season they are rearing the fish in; whether it be during flood or drought seasons. Having a private nursery might be beneficial.
5. Farmers should consider adapting their Tilapia rearing habits. For example, it is recommended that fingerlings of a large size be released in order to reduce the total amount of rearing time, or that fish with a low density (2 bodies per square meter) be taken out. By applying this contingency, the pond is more likely to yield fish of a higher quality, in turn, fetching a better profit.

