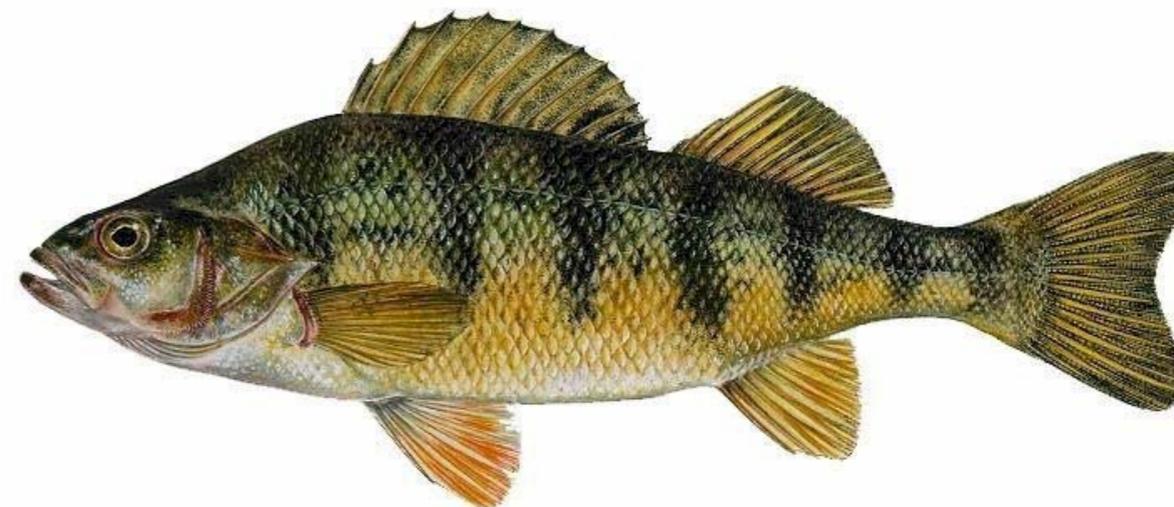




**ANIMAL WELFARE JUDGING AND ASSESSMENT CONTEST 2017**



# Catfish and Yellow Perch Aquaculture Scenario

Animal Welfare Judging and Assessment Contest 2017

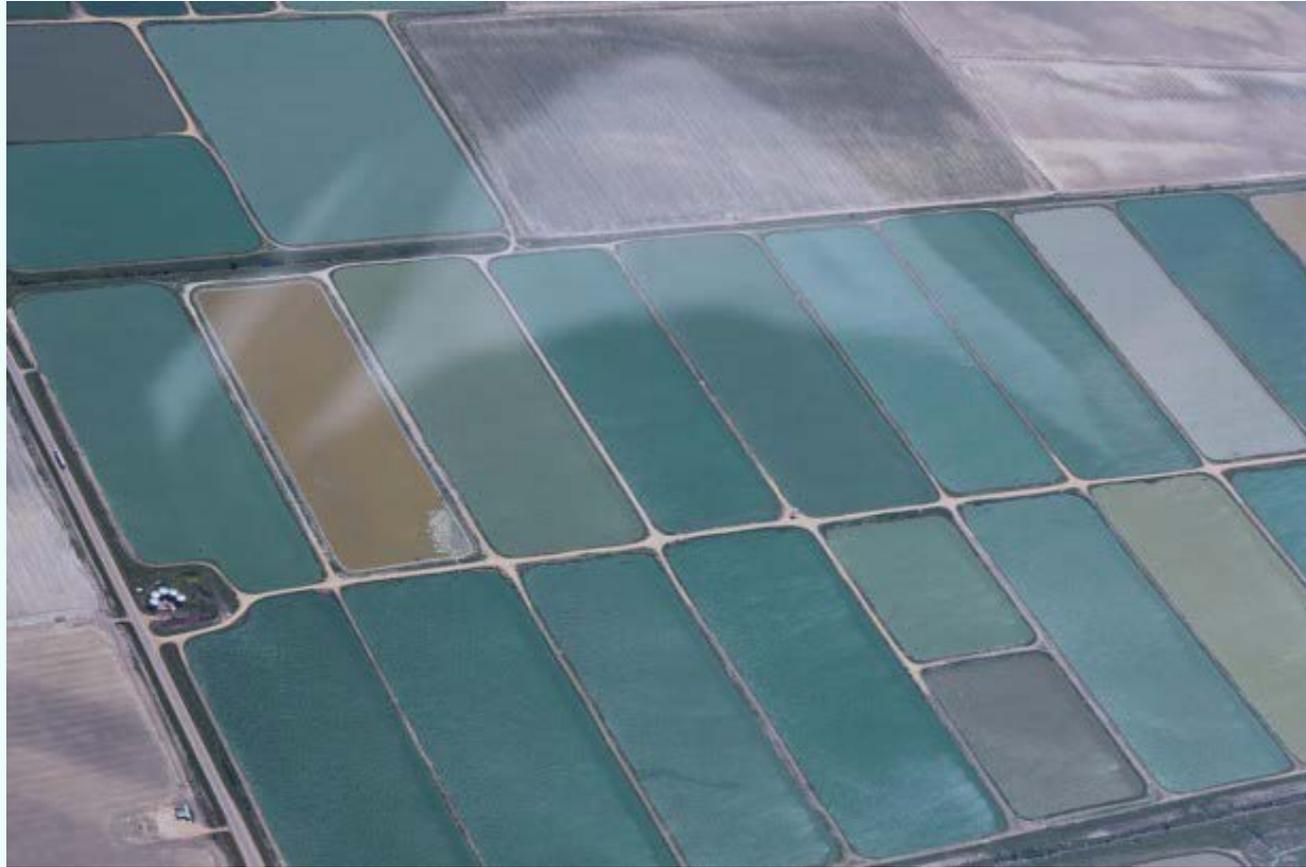
# Note

1. Both farms described are fictitious.
2. Both farms are grow-out only. (Each farm obtains fingerlings from other sources and grow them to market size.)
3. Both farms sell their fish live to outside processors.
4. Both farms are relatively small and are managed primarily by the owners.

# Key Features

	Catfish	Yellow perch
<b>Optimal growth temperature</b>	24-30°C (75-86°F)	21-23°C (70-73°F)
<b>Market size (fish size at harvest)</b>	1.0 lb	0.25 lb
<b>Growth time to market size</b>	12 mo	20 mo
<b>Fish strain</b>	Hybrid catfish ( <i>Ictalurus punctatus</i> x <i>I furcatus</i> ). Genetically superior fish produced by university researchers to show fast growth and high tolerance of low DO and high temperatures.	“Lake Mendota” strain ( <i>Perca fluvescens</i> ). Fish group selected for growth and survival in ponds.
<b>Fingerlings</b>	10 g fingerlings obtained from commercial supplier. The fingerlings are fully acclimated to eating formulated diets.	2 g fish obtained from commercial supplier. The fingerlings are first reared in ponds and then harvested and trained to accepted formulated diets in tanks before restocking in ponds for growout.
<b>High temperature tolerance</b>	38°C (100°F)	30°C (86°F)
<b>Low dissolved oxygen (DO) tolerance</b>	~2 ppt oxygen	~4 ppt oxygen
<b>Initial stocking density (fish/acre)</b>	3,500	10,000
<b>Fish weight at harvest (lbs/acre)</b>	3,500	2,500
<b>Production scenario</b>	Single crop per pond. No multiple cropping with different age groups.	Single crop per pond.

# Catfish Farm



- 163 acre farm in Mississippi.
  - Adjacent to another catfish farm.
  - Most ponds are >7 acres.
- Water from high-capacity well.
- The fish are not size-graded during production.
- Higher-density culture.
  - Aeration needed to maintain dissolved oxygen (DO) levels at critical times (i.e., when fish are large in the fall when feeding amounts are high).

# Yellow Perch Farm



- 40 acre farm in Wisconsin.
  - Surrounded by corn and soybean farms.
  - 17 ponds that range in size from 0.25 to 4 acres.
- Water from high-capacity well.
- Fish are not size-graded during production.
- Ponds are completely harvested every November.
  - The ponds are all drained and allowed to freeze over the winter to sterilize the ponds and eliminates unwanted organisms such as predatory insects and “intruder” fish like bullhead catfish and sunfish (bluegills).
- Fish that have not reached market size are held in large tanks over winter and restocked into ponds in spring to resume grow out.
  - Fish are maintained on cold well water and grow very slowly and eat very little over the winter.

# Personnel

## Catfish

- Family farm managed by owner and his family.
- The husband is a businessman with a degree in accounting.
- The wife is a large animal veterinarian who works for Mississippi State University.
- Their daughter recently graduated with a degree in aquaculture (emphasis on fish nutrition) from Auburn University, and she now works full-time at the farm.

## Yellow Perch

- Managed by owner and one technician.
- The owner was a former dairy cow researcher at the University of Wisconsin.
  - He is active in the state aquaculture association and often collaborates with aquaculture researchers in the state who use his farm to conduct field trials.

# Water Quality

## Catfish

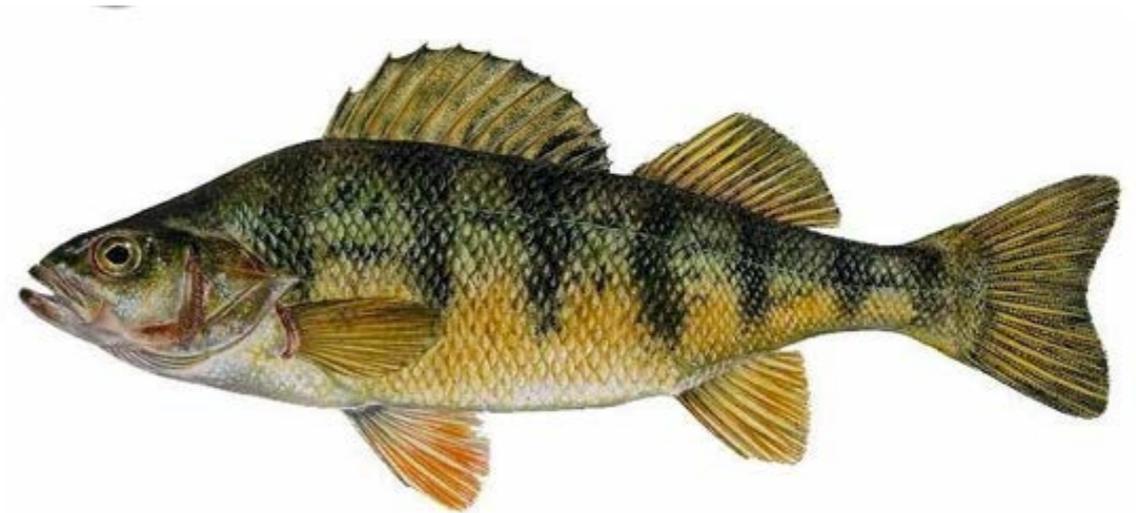
- High-density fish production.
- Water quality issues sometimes occur when fish reach harvest size and feeding rates increase.
- Water temperature can reach 34-36°C in summer.
- Large diurnal dissolved oxygen (DO) fluctuations occur in the fall when fish are large and feed input is high.
  - DO levels drop to less than 2.0 ppm at dawn.
- Paddle-wheel aerators are used to prevent fish mortalities due to hypoxia.



# Water Quality

## Yellow Perch

- Lower-density fish production.
- Few water quality issues.
- Water temperatures in the ponds vary from 4°C in winter to ~25°C in the summer.
  - Well water (10°C) is added to the ponds when temperatures exceed 25°C.
- Dissolved oxygen levels never fall below 4 ppm.



# Nutrition & Feeding

## Catfish

- Fish are fed complete catfish diets that vary in pellet size and protein concentration depending on fish size.
  - Small fingerlings are fed small floating pellets (3 mm) containing 32-36% plant protein (e.g., soybean meal, cottonseed meal, corn gluten, corn germ meal).
  - Fish grown to market size are fed larger floating pellets containing 28-32% plant protein.
- Feed is purchased from a local commercial feed producer throughout the season.
  - Feed is stored in large bins adjacent to the ponds.
  - There have been rare instances when the feed in the bins becomes wet from rain and contaminated with fungus.



**Figure 1.** Various types of catfish feeds. Top left, fry feed (powder); top right, fingerling feed (3 mm in diameter, floating); bottom left, food fish feed (5 mm, floating); bottom right, slow-sinking feed (4 mm).

# Nutrition & Feeding

## Yellow Perch

- No diets specifically formulated for yellow perch are available on the market.
  - Smaller fish (2-10 g) are fed floating trout or salmon diets that contain 45-50% fish meal protein and high fat levels.
  - Larger fish are fed larger floating pellets containing less protein (28-32%).
- The use of floating feeds allows managers to observe feeding behavior.
- Some yellow perch develop “fatty liver syndrome” presumably due to the high carbohydrate and lipid content of the salmonid diets.
- All feed for an entire growing season is purchased in spring.
  - Feed is packaged in 50 lb bags and stored in a temperature-controlled warehouse until needed.



Trout diets fed to yellow perch

# Stress & Behavior

## Catfish

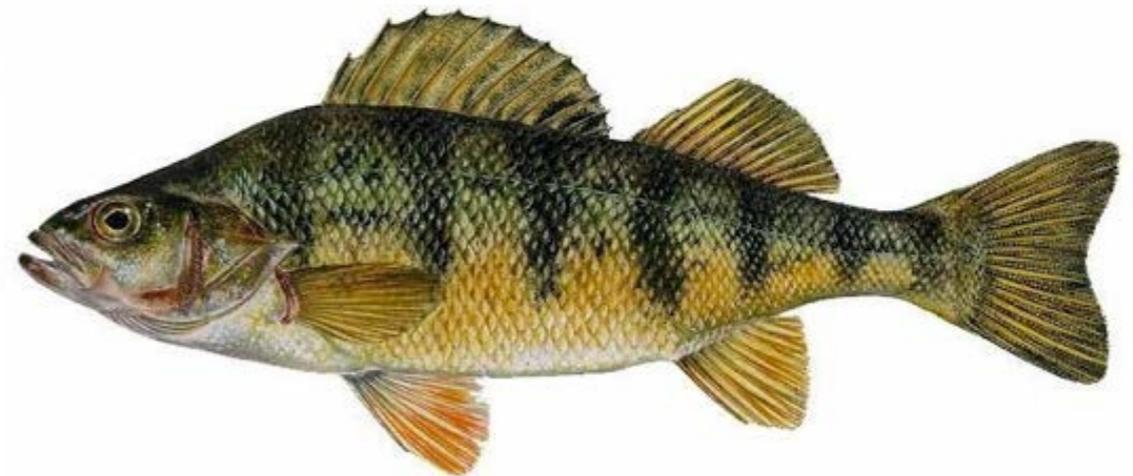
- Feeding behavior is assessed by using feeding floating pellets and observing the rate of feed consumption and the number of fish feeding at one time.
  - Feed consumption is typically reduced when dissolved oxygen (DO) levels in the water fell below ~5 mg/L, although fish continue to feed at DO levels as low as 3 mg/L.
- Larger, presumably dominant, fish typically feed first and can exclude the smaller fish.
  - Eventually, larger fish become satiated and allow smaller fish access to food.
  - All fish feed sufficiently.
- When DO levels drop below ~3 mg/L, fish can be observed piping at the surface of the water.



# Stress & Behavior

## Yellow Perch

- Yellow perch feed much less aggressively than catfish.
  - Yellow perch are reluctant to feed on the surface.
  - As a result, it is difficult to estimate the feeding responses and fish numbers in the pond.
- Yellow perch are a schooling species and feeding is facilitated by group feeding.
- No stereotypic behaviors indicative of stressed fish are observed (e.g., fish swimming in circles, etc.).
  - Such observations are difficult to make in pond-reared fish, however, and it cannot be ruled out that they do occur.



Yellow perch

# Health and Disease

## Catfish

- The farm typically has few problems with disease.
  - There is constant, low-level mortality (several fish per pond per day) throughout the growing season of unknown etiology.
- There was an incidence of Enteric Septicemia caused by the gram-negative bacterium, *Edwardsiella ictaluri*.
  - This followed an unusually hot period in September when pond temperatures were ~34°C for 8 days straight.
  - 27% of the fish contracted the disease and died.



# Health and Disease

## Yellow Perch

- The farm has few problems with viral or bacterial diseases.
- Approximately 30% of the stocked fish die before harvest.
  - The causes of death are predation by insects, amphibians, birds and “intruder” fish (e.g., bullhead catfish, sunfish).
  - Most mortalities are thought to occur in the first few weeks after stocking the ponds.
- A small percentage (< 5%) of the harvested fish are infested with black spot caused by digenetic trematodes.
  - These trematodes required two intermediate hosts for their development: (1) predatory birds (e.g., herons), and (2) mollusks (snails).
  - Infected fish typically show normal growth and feeding behavior, but cannot be sold due to unsightly appearance.



# Harvesting & Processing

## Catfish

- Fish are harvested at a weight of 1.0 lb.
  - A team of skilled laborers is hired to harvest.
  - Fish are harvested using tractor-pulled seines.
  - Fish are lifted into an aerated transport truck using a large net and crane.
- The fish are transported live to a local processor 30 min away in aerated transport trucks.
  - No fish die during transportation.
- At the processor, the fish are unloaded into baskets and weighed.
- Fish are placed on a conveyor belt that carries them under electrodes that stun the fish with an electric current.
  - The system is optimized to ensure that the fish are rendered completely unconscious by the current.
- Fish are killed by decapitation and filleted by machine.



# Harvesting & Processing

## Yellow Perch

- Fish are harvested at a weight of 0.25 lb.
  - Fish are harvested by owner and technician.
  - They use a human-pulled seine net.
- The concentrated fish are netted into 5-gallon buckets and hand carried to a transport truck.
- Fish are transported to a local processor 45 min away.
  - Water in the transportation truck is ice-cold.
- The freezing water kills the fish during transportation.
- At the processor, the fish are placed into vats of ice water, and the ice-cold fish are hand filleted.

