Fish Life History

HOW AQUACULTURE HAS ADAPTED THE LIFE HISTORY OF FISHES

TO: FARMORYWORKS AQUACULTURE TECHNICIAN PROGRAM

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Presentation Overview

Popular Aquaculture Species

- Salmonids
  - Salmon spp.
  - Trout spp.
- Tilapia
- Catfishes
- Percids
  - Yellow Perch
  - Walleye
- Native/Introduced Wild Ranges
- Natural requirements for survival
  - Food sources
  - Spawning/Reproduction
  - Larval Cycles
- Technology/Ways Aquaculture has used or circumvented these natural instincts

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Salmonids: Salmon spp.

Species Backgrounds

- Two Most popular Aquaculture Salmon species
  - Coho Salmon
  - Atlantic Salmon

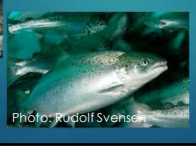
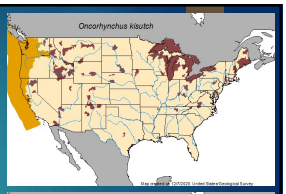
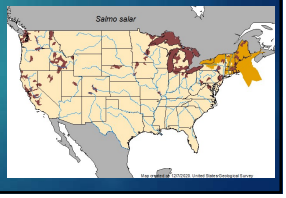


Photo: Rudolf Svensen





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Atlantic Salmon "King of Fish"

- Food Sources
  - Young salmon eat insects, invertebrates, and plankton.
  - The preferred diet of adult salmon is capelin.
- Life History
  - Anadromous: born in freshwater then migrate to saltwater as adults
  - Spend 2-3 years in freshwater as parr before transforming into smolts
    - Smolts organs and gills change allowing them to swim to the ocean where they will spend 1-2 years maturing into adults

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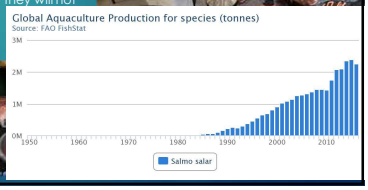
Atlantic Salmon in Aquaculture

- Feed: high protein and oil which come from fish meal and fish oil derived from industrial fisheries
- Culture Methods
  - Net pens in oceans/freshwater hatcheries
  - RAS
- Salmon must be stripped spawned since they will not naturally reproduce in tanks or net pens
- Production Options
  - Rear to filets
  - Egg supply
  - Fingerling



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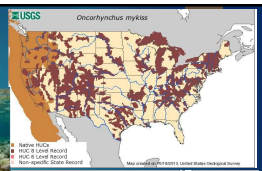
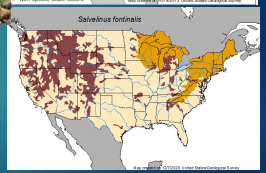
Salmonids: Trout spp.

Species Backgrounds

- Rainbow Trout
  - Steelhead
- Brook Trout





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Rainbow/Steelhead

- Food Sources
  - Opportunistic feeders and will eat anything from aquatic and terrestrial insects, to fish eggs, to small minnows, to crustaceans and worms
- Life History
  - Steelhead are anadromous while rainbow trout spend their lives mostly or entirely in freshwater
  - When spawning, females dig out a depression called a *redd* in the gravelly bottom of stream riffle


Photo: FISHBIO
Rainbow fry

Photo: John McMillan
Steelhead parr

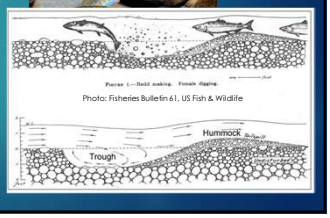

Photo: Fisheries Bulletin 61, US Fish & Wildlife

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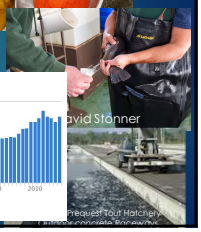
Rainbow/Steelhead in Aquaculture

- Feed: Higher protein content and lipid content
- Culture Methods
  - Raceways
    - Tanks indoors
    - Ponds or Tanks outdoors
- Trout also must be strip spawned since they will not naturally reproduce in tanks or ponds
- Production Options
  - Rear to filets
  - Egg supply
  - Fingerling supply


Photo: WDS/WVAH
Indoor raceways



David Stonner

Pequest Trout Hatchery

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Tilapia
Species Background

- Food Sources
  - They are herbivores who feed mainly on plankton, algae, and other vegetable matter
- Life History
  - In the wild, tilapia are found in turbid rivers and lakes
  - Wild tilapia can spawn throughout the year, with females producing as many as 1,200 eggs per spawn


Photo: Hatchery International

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Tilapia and Aquaculture

- Feed: Lower protein and fat content since they are not a piscivorous fish
- Tilapia is the second most prolific species grown in aquaculture
- Tilapia is farmed in 5 countries with the largest producers being Asian countries
- Culture methods
  - Ponds
  - Tanks
  - Aquaponics
- Under ideal farming conditions females spawn every 17 days
- If water quality and temperatures are manipulated to a favorable environment market sized fish can be obtained in seven to ten months


Photo: Biodinamica


Photo: East Coast Aquaculture


Photo: Global Aquaculture Alliance

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Catfishes: Channel Catfish
Species Background

- Food Sources
  - feed primarily on small fish, crustaceans (crayfish), clams and snails, aquatic insects and small mammals.
  - There are even reports of channel catfish eating small birds.
- Life History
  - Channel catfish spawn, depending on the latitude, during the months of April through July

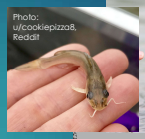


Photo: u/cookiepizza8, Reddit

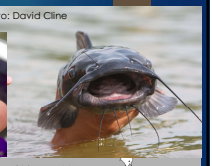
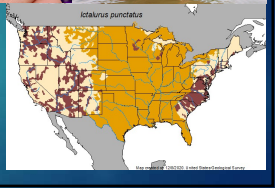


Photo: David Cline



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Channel Catfish and Aquaculture

- Feed: plant protein compromises most of the protein content
- Culture Methods
  - Ponds
- Production Options
  - All in house operations typically


Photo: Professional Aquaculture Services


Photo: Global Aquaculture Alliance

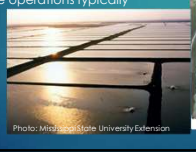
Photo: Mississippi State University Extension


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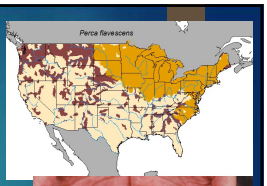
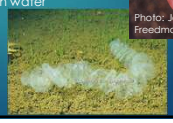
Percids: Yellow Perch
Species Background

- Food Sources: small invertebrates and fish
- Life History
  - Yellow perch spawning occurs during the spring as water temperatures rise along the shorelines
  - Yellow perch are found in ponds, lakes, the pools of creeks and slow flowing rivers
  - Typically, lower populations since they are a prey species and are not tolerant of certain water conditions





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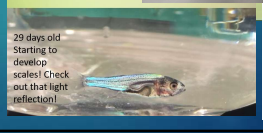
Yellow Perch and Aquaculture
Larviculture

- No mouth and terrible eyesight post-hatch
- Due to poor eyesight perch are fed live feed then weaned onto dry pellets
  - This is called feed training
- Huge barriers to Larviculture
  - Hatching success
  - Swim bladder inflation
  - Feed training
  - Cannibalism



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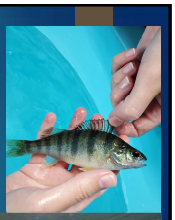
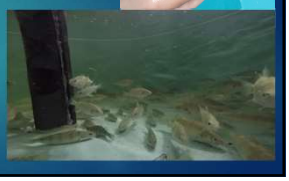
Yellow Perch and Aquaculture

- Feed: Medium protein content with low lipid content
- Culture Methods
  - Ponds
  - Tanks (RAS and Flow-through)
  - Aquaponics
- Production Options
  - Fingerlings
  - Grow-out facility for filets
- Highly desirable species but no developments have been made in this sector for decades





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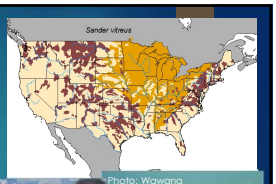
Percids: Walleye
Species Background

- Food Sources:
  - Juvenile walleye feed on invertebrates and small fish
  - Adult walleye feed mostly on fish such as yellow perch and minnows
- Life History
  - Walleye have extremely keen eyesight, even in low light conditions
  - The spawning group will move to shallow water



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Walleye and Aquaculture
Larviculture

- Walleye are cultured differently than yellow perch even though they are cousin species
- Walleye Eyesight
  - Turbidity and why
  - Low Light conditions
- Feed Training made easy

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Walleye and Aquaculture

- Feed: Medium protein content with low lipid content
- Culture Methods
  - Ponds (primarily seen in state hatcheries)
  - Tanks: Flow-through or RAS
  - Aquaponics
- Much more research has gone into this species
  - Considered much easier compared to yellow perch
  - Larviculture techniques are well documented

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Indoor Aquaculture Versatility

- Ponds are great but…
  - Mother Nature
  - Stuck to one growing season unless you cold bank (only certain species will be able to be cold banked)
  - Limited species options
- Indoor tanks offer more versatility
  - Climate control
  - Wider option for species selection
  - RAS technology has come a long way in helping make aquaculture more sustainable

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Questions?

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