Top Selling Items

Skinless Walleye (10lbs) .......... $145.00
Walleye Fillets (11lbs) ............ $135.00
Rainbow Trout (10lbs) .......... $98.00
Domestic Aquaculture Potential

(Reuters) - Aquaculture output is expected to rise 33 percent over the next decade helping to meet the world's growing demand for fish as healthy and nutritious food gains popularity while fishing stagnates, the United Nations' food agency said on Monday.

Tainted Seafood Reaching U.S., Food Safety Experts Say

*While most U.S. seafood is imported, no more than 2 percent is inspected.*
Partnership Success

Wisconsin fish farm gets grant to study hybrid walleye

Northside Enterprises of Black Creek will receive nearly $100,000 from a U.S. Department of Agriculture grant to find more efficient ways to put Wisconsin captive-raised walleye on the market.

The two-phase project will test the newest technologies for producing large purebred walleye fingerlings in recirculating aquaculture systems and ponds for autumn stocking, and then will use these technologies to produce egg-to-plate hybrid walleye—walleye crossed with sauger—in a one-year time frame.

Studies in Iowa and Wisconsin have shown that hybrid walleye grow faster than purebreds and taste virtually identical to purebreds. They also found that walleye fry can be successfully raised in tanks using only pelleted foods, and that spawning walleye can be advanced by at least two months in the spring using environmental and hormonal manipulations.

The USDA grant comes from the Small Business Innovation Research program. Phase I will be conducted collaboratively by Northside and the UW-Stevens Point Northern Aquaculture Demonstration Facility, which has begun raising captive walleye and sauger brood fish to supply the eggs and milt to continue this research.

Northside Enterprises, Black Creek, WI
Edible Success
Northside Enterprises, Black Creek
Intensive Production of Hybrid Walleye (*Sander vitreum* × *S. canadense*) in a Recycle Water System

Gregory Fischer, Facility Operations Manager

University of Wisconsin-Stevens Point
Northern Aquaculture Demonstration Facility
Female Walleye (Sander vitreum) × Male Sauger (Sander canadense) → Hybrid Walleye (Saugeye)
Why Hybrid Walleye (Saugeye)???

Hybrid walleye have many characteristics suitable for aquaculture production:

- Ability to rear and spawn broodstock intensively and out of season.
- Ability to do entire rearing cycle intensively on commercial feeds.
- High growth rates and good feed conversions.
- Existing markets and good prices ($10-12 lb).
- Potential for aquaponics.
ALL: 114 days old reared in recycle water system

Yellow perch
Purebred walleye
Hybrid walleye
Captive Broodstock
Egg Chemical Treatment
Fry Enumeration

Jensorter Fry Counter

XperCount Fry Counter
Early Fry Rearing Room
New Fry Rearing Room
Materials and Methods
Experimental Tank Setup for Phase I-II Intensive Rearing

- 230 L (60 gal) round tanks
- Sidewalls painted black
- Gray bottom
- Adjustable lighting
- Directional flow-thru
  - 20°C (70°F) water (2-6 lpm)
- Clay (old mine #4)
- 24 hr feeders
- Surface spray
- Removable screens
- Daily cleaning system
Turbid

Not Turbid
Turbidity

- Adjustable Peristaltic pump
- Kentucky Clay - Old Mine #4
- 50-80 NTUs
Stocking density of >40fry/L
10,000 fry per tank

Note screen size and turbidity level (lowered for picture)
Otohime fry feed
200 -1400 m

Nelson Silvercup walleye grower
1.0mm
Homemade 24 hour fry feeder
Home-Made Automatic Feeder Pricing

$59.99- Intermatic 24 Hour Mechanical Time Switch
$4.89- Cord
$2.18 per feeder-Plexi-glass ($34.99/16 per sheet)
$1.00- Wood
$5.99- Plastic Welder Epoxy
$0.75- 1 ½” Schedule 40 PVC cap
$0.70- 1” Schedule 40 PVC cap
$0.50- Plastic Bolt
$0.78 per feeder- Door Sweep ($5.49/7 per one 36” long piece)
$1.00- Steel unistrut
$3.00- Additional hardware (steel bracket, nuts, bolts, paint)

Total= about $81.00
Fry Feed

Adjusted daily based on survival
Note: excess feed and clay around center drain
Tank Cleaning
Counting Mortality
Results

Phase I-Fry Culture

Average Survival Phase I Fry at Different Densities

Rearing Density

<table>
<thead>
<tr>
<th>Rearing Density</th>
<th>% Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>17 fry/L</td>
<td>16.7%</td>
</tr>
<tr>
<td>46 fry/L</td>
<td>39%</td>
</tr>
</tbody>
</table>

low density
high density
Cannibalism

Unobserved mortality as high as 50%
Results

Overall Survival Percentages

Intensive Rearing

Phase and fish length

% survival

0-38 mm
38-51 mm
51-102 mm
102-152 mm
152-239 mm

Phase I
Phase II
Phase III

48%
48%
>90%
Note: Density, turbidity and larger screen size
Transition Feeding onto Commercial grower diets

- Palletability or taste issues
- Adding taste enhancers ie Krill
  - Mixing diets
Note: density, turbidity, and fin condition
50-100 mm fish going into RAS for growout
Materials and Methods
Recycle System Used For Phase III-IV Intensive Growout

RAS Parameters:

- 53,000 L water capacity
- 33 m³ tank culture space
- Fluidized sand biofilter
- Drum Filter
- Dual drain circular tanks
- Oxygen cone
- In sump electric heater
- 23°C (74°F) Water temp.
- 24hr In Tank Lighting
MARINE BIOTECH®
CycloBio® Fluidized Bed Biofilter
Cyclonic Sand Biofilter and Degassing Column
MARINE BIOTECH®

Culture Tanks - Multi-Piece (Panels)
Duel Drain Cornell Style Fiberglass Rearing Tanks
Tank Screens
MARINE BIOTECH®

Oxygen and Ozone Contact Cones
Sump with Recirculation Pumps
WARMWATER RAS SYSTEM PARAMETERS

Temp: 70F -20C
Oxygen: >5.0mg/L
TDGP: <102%
CO2: <20mg/L
pH: 6.5-8.0
Alkalinity: 150-400 mg/L
TSS: <20mg/L
Total Ammonia: <1.0mg/L
Unionized Ammonia: <0.0125mg/L
Nitrite: <0.1mg/L
Salinity: 1.5-2.5ppt
Nitrate Nitrogen <100ppm
In Tank Lighting for Growout
Grading
## Results

Overall Hybrid Walleye Survival Percentages
Intensive Rearing-4 years of data

<table>
<thead>
<tr>
<th>Year</th>
<th>Phase I</th>
<th>Phase II</th>
<th>Phase III</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>55%</td>
<td>43%</td>
<td>92%</td>
</tr>
<tr>
<td>2010</td>
<td>46%</td>
<td>50%</td>
<td>93%</td>
</tr>
<tr>
<td>2011</td>
<td>39%</td>
<td>53%</td>
<td>92%</td>
</tr>
<tr>
<td>2012</td>
<td>43%</td>
<td>64%</td>
<td>90%</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>46%</strong></td>
<td><strong>53%</strong></td>
<td><strong>92%</strong></td>
</tr>
</tbody>
</table>
Results

Growth Rates

Hybrid Walleye vs Purebred Walleye Growth in Weight

- Phase I: Early Lifestage Rearing
- Phase II
- Phase III: Growout in Recycle System

Growth Rates over Days Post Hatch from April to March.
Results

Extended Growout Growth Rates

Weight gain of Hybrid Walleye Reared in Recycle System at 23 C

Extended Growout Growth Rates

Fingerling phase II
DGR=0.5 g/day

Growout phase III
DGR=1.6 g/day

Days Post Hatch

Grams
1 year old Hybrid Walleye (1.0kg)
## Results

**Observed Feed Rates and Conversion %**

<table>
<thead>
<tr>
<th>Phase</th>
<th>TBWFD(%)</th>
<th>FC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase I</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>Phase II</td>
<td>15</td>
<td>7</td>
</tr>
<tr>
<td>Phase III</td>
<td>7.5</td>
<td>4</td>
</tr>
<tr>
<td>Phase IV</td>
<td>2</td>
<td>1.6</td>
</tr>
</tbody>
</table>
Recycle System Water Quality Operating Parameters
Tank Density: 34 kg/m³

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Average Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (°C)</td>
<td>23</td>
</tr>
<tr>
<td>Dissolved oxygen (mg/L)</td>
<td>&gt;7.0</td>
</tr>
<tr>
<td>pH</td>
<td>7.7</td>
</tr>
<tr>
<td>Carbon dioxide (mg/L)</td>
<td>6.8</td>
</tr>
<tr>
<td>Total ammonia nitrogen (mg/L)</td>
<td>0.011</td>
</tr>
<tr>
<td>Nitrite nitrogen (mg/L)</td>
<td>0.061</td>
</tr>
<tr>
<td>Calculated unionized nitrogen (mg/L)</td>
<td>0.0003</td>
</tr>
<tr>
<td>Total suspended solids (mg/L)</td>
<td>2</td>
</tr>
<tr>
<td>Alkalinity (mg/L)</td>
<td>151</td>
</tr>
</tbody>
</table>
Fillet Yield: 45 - 50%  Scaled, Skin on, Hand filleted  

Fillet Market price: $$10-12.00/ lb
Consumer Reports - Taste Tests

A+
Conclusions

• Walleye and hybrid walleye can be successfully raised indoors using early advanced spawning, incubation, and rearing techniques.

• Initial data suggests that growth rates of hybrid walleye are higher than purebred walleye.
Commercial Intensive Production Recommendations

- Phase I
  High density/short time frame in tank
  Water Temperature: 20°C
  Density: 30 days @ 46 fry/L
  Feed: Otohime
  TBWFD: >20% @ 24hr
  Turbidity: 50-100 NTU

*Grade in tank every week as soon as possible from Phase I-III.

- Phase II
  Water Temperature: 20°C
  Density: 10 days @ 4 fish/L
  Feed: Nelson SC Walleye Grower
  TBWFD: >15% @ 24hr
  Turbidity: 25-50 NTU
Intensive RAS Production Recommendations

- Phase IIb - Intensive Culture
  Water Temperature: 20-24°C
  Density: 4 fish/L
  Feed: Nelson SC WG
  TBWFD: 6-10% @ 24hr

- Phase III - Growout
  Water Temperature: 23-24°C
  Density: 60kg/m³
  TBWFD: 1.5-2.0% @ 24hr
  Feed: Nelson SC WG
Acknowledgements

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- Dr. Robert Summerfelt (retired), Iowa State University

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Mention of trade name, proprietary product, or specific equipment does not constitute a guarantee or warranty and does not imply approval to the exclusion of other products that may be suitable.

http://aquaculture.uwsp.edu
gfischer@uwsp.edu
Never Give up or

Did I bite off more than I can handle