Wild or Farmed?
A discussion about how to sustain the options for your Dinner Table

USC Wrigley Institute for Environmental Studies
Phil Hagenah

Chair, Wrigley Advisory Board

USC Wrigley Institute for Environmental Studies
Roberta Marinelli, Ph.D.

Director, Wrigley Institute

USC Wrigley Institute for Environmental Studies
Wild or Farmed?
The Future of Food from the Sea
Global Aquatic Production

Food & Agriculture Organization

Production (million tonnes)

Year

Total Production

Capture fisheries

Aquaculture


0 20 40 60 80 100 120 140 160 180 200
Farmed Production, by Country

In 2011, global production = 83.7 Mt
U.S. = 0.4 Mt (0.5 %)

The U.S. imports 91 percent of its seafood
Continental Areas Proportional to Aquaculture Production
Geography of U.S. Aquaculture Production

- Pacific salmon, Atlantic salmon
- Pacific oysters, Manila clam, blue mussels, geoduck
- Hawaiian yellowtail
- American oyster, Northern quahog
- Channel catfish, Red swamp crawfish
- Rainbow trout
- Atlantic salmon
- Cobia
U.S. Yields & Kinds of Corn

Civil War to 2012

Bushels per acre

Year

open-pollinated

b=0.02

double cross

b=1.04

single cross

b=1.77

Hybrid Vigor in Corn & Oysters

G. H. Shull, 1908. *Proc. ABA*

Hedgecock et al., 1995. *Aquaculture*
Recognize this common fruit?

Photograph by Prof. Ivan W. Buddenhagen
Sterile Triploids Eliminate Interaction of Wild & Farmed
Sam King ‘77
CEO, King’s Seafood Company

USC Wrigley Institute for Environmental Studies
Sam King, CEO/President, King’s Seafood Company
KING’S SEAFOOD COMPANY
RESTAURANTS
Impact that the decline of wild seafood has had on our company: Increase in cost and consistency of supply.

<table>
<thead>
<tr>
<th>Seafood</th>
<th>2010 price per pound</th>
<th>2014 price per pound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alaskan Halibut</td>
<td>$14.00</td>
<td>$22.00</td>
</tr>
<tr>
<td>Tuna</td>
<td>$11.00</td>
<td>$14.00</td>
</tr>
<tr>
<td>Salmon, Farmed</td>
<td>$3.25</td>
<td>$5.25</td>
</tr>
<tr>
<td>Salmon, Wild</td>
<td>$11.50</td>
<td>$16.50</td>
</tr>
<tr>
<td>Shrimp, Wild 16/20</td>
<td>$8.50</td>
<td>$11.75</td>
</tr>
<tr>
<td>Shrimp, Farmed 16/20</td>
<td>$7.25</td>
<td>$10.00</td>
</tr>
<tr>
<td>Tilapia</td>
<td>$4.00</td>
<td>$5.50</td>
</tr>
<tr>
<td>Trout</td>
<td>$4.00</td>
<td>$5.50</td>
</tr>
<tr>
<td>FIELD</td>
<td>CONTENT</td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>--------------------------</td>
<td></td>
</tr>
<tr>
<td>NAME OF EXPORTER</td>
<td>RAAGU COMPANY PVT.LTD</td>
<td></td>
</tr>
<tr>
<td>PROCESSING PLANT</td>
<td>OCEAN FRESH FISH PROCESSING FACTORY</td>
<td></td>
</tr>
<tr>
<td>CONSIGNEE</td>
<td>Fresh Catch Inc</td>
<td></td>
</tr>
<tr>
<td>EU APPROVAL NO.</td>
<td>MDV 012</td>
<td></td>
</tr>
<tr>
<td>LOT ID.</td>
<td>RC/FCI/14/064</td>
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</tr>
<tr>
<td>BOX NO.</td>
<td>108</td>
<td></td>
</tr>
<tr>
<td>PRODUCTION DATE</td>
<td>04-Mar-14</td>
<td></td>
</tr>
<tr>
<td>USE BY DATE</td>
<td>17-Mar-14</td>
<td></td>
</tr>
<tr>
<td>FRESH YELLOWFIN TUNA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PACKING STYLE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOINS</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>G&amp;G (WHOLE)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WRAP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NET WT (KGS)</td>
<td>112.60</td>
<td></td>
</tr>
<tr>
<td>GROSS WT (KGS)</td>
<td>125.50</td>
<td></td>
</tr>
<tr>
<td>TOTAL NO. OF BOXES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESTINATION</td>
<td>LAX</td>
<td></td>
</tr>
<tr>
<td>FISHING AREA</td>
<td>FAO ZONE 51</td>
<td></td>
</tr>
<tr>
<td>COOK BEFORE CONSUMPTION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KEEP REFRIGERATED 0 TO 2 DEGREE CELSIUS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRODUCT OF REPUBLIC OF MALDIVES</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Common Name: Yellowfin Tuna
Scientific Name: Thunnus albacares
GRADE: 1  2+ (2)
Net Weight: 28.8 LBS
COO: Maldives - Wild
Number of loins if more than 1:
Processed and Packed by
Fresh Catch Inc.
2615 Rousselle Street,
Santa Ana, CA 92707
Sergey Nuzhdin, Ph.D.

Professor of Biological Sciences

USC Wrigley Institute for Environmental Studies
Packed candies contained:

**Animal / Plants:**
pig (64.7%), cow (47.1%), hake (11.8%), chicken (5.5%);
maize (38.9%), wheat / rye (27.8%),
honeybush / chestnut (11.1%),
tobacco / cocoa (5.5%).

(some) Conclusions:
94% have undeclared ingredients
38.9% have food allergens
2 “vegetarian” have porcine.

USC entering Collaboration with:
M. Muñoz-Colmenero,
E. García-Vázquez (University of Oviedo)
<table>
<thead>
<tr>
<th><strong>ECOLOGY</strong></th>
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<tbody>
<tr>
<td>Collect and survey natural variation</td>
</tr>
<tr>
<td>Identify adaptive alleles for environmental extremes</td>
</tr>
<tr>
<td>Wild variation into phenology-normalized backgrounds</td>
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<tr>
<td>Trait discovery for abiotic stress tolerance</td>
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<tr>
<td>Identify agronomic genes for climate resilience</td>
</tr>
<tr>
<td>Breeding climate-resilient chickpea</td>
</tr>
</tbody>
</table>

**CLIMATE RESILIENT CROPS**

**PRE-BREEDING MODELING**

**GENOMICS GERMPAISM**

**NATURAL CLIMATE RESILIENCE**

**UC Davis (Douglas Cook)**

**Ethiopian Institute for Agricultural Research**

**Harran University and Partners**

**University of Southern California**

**Florida International University**
C. reticulatum
C. echinospermum
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