

### EAST COAST LIVE! 2000 The Business of Marketing Live Aquatic Products

#### Radisson Hotel Annapolis Annapolis, Maryland

November 1-4, 2000

# Conference Program and Presentation Summaries

Compiled and Edited by

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and

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Wye Research and Education Center
P.O. Box 169, Queenstown, MD 21658

#### With Special thanks to

Rita Baty, Delaware Sea Grant Marine Advisory Service College of Marine Studies, University of Delaware, Lewes, DE 19958

and

June Thomas, Maryland Cooperative Extension, Wye Research and Education Center P.O. Box 169, Queenstown, MD 21658



Radisson Hotel Annapolis, Annapolis, Maryland November 1-4, 2000

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New Jersey Department of Agriculture North Carolina Department of Agriculture National Association of State Aquaculture Coordinators Radisson Hotel Annapolis, Annapolis, Maryland November 1-4, 2000

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#### EAST COAST LIVE! 2000 The Business of Marketing Live Aquatic Products



Radisson Hotel Annapolis, Annapolis, Maryland November 1-4, 2000

# \*\*\* Conference Schedule \*\*\*

#### Wednesday, November 1, 2000

12:00 pm to 7:00 pm Registration

Exhibitor Move-in/Poster Session Set Up

7:00 pm to 9:00 pm Welcome Reception

#### Thursday, November 2, 2000

7:30 am to 5:00 pm	Registration
7:00 am to 8:30 am	Continental Breakfast
8:30 am to 8:40 am	Welcome and Announcements
8:40 am to 10:00 am	Profiles of the East Coast Live Aquatics Industry
10:00 am to 6:00 pm	Trade Show and Poster Session Open
10:00 am to 11:00 am	Refreshment/Trade Show/Poster Session Break
11:00 am to 11:20 am	<b>Profiles of the East Coast Live Aquatics Industry</b> (continued)
11:20 am to 12:00 pm	Market Opportunities for Live Aquatic Products
12:00 pm to 1:30 pm	Lunch
1:30 pm to 2:40 pm	Social, Ethical and Humanitarian Issues
2:40 pm to 3:10 pm	Refreshment/Trade Show/Poster Session Break
3:10 pm to 4:50 pm	Handling, Inventory and Distribution Methods
5:00 pm to 6:00 pm	Happy Hour in the Trade Show Area

#### Friday, November 3, 2000

7:30 am to 5:00 pm	Registration
7:00 am to 8:30 am	Continental Breakfast
8:30 am to 8:35 am	Announcements
8:35 am-10:15 am	Regulatory Issues Affecting the Live Aquatics Industry
10:15 am to 11:00 am	Refreshment/Trade Show/Poster Session Break
11:00 am to 12:00 pm	Marketing Live Seafood
12:00 pm to 1:20 pm	Lunch
1:20 pm to 4:50 pm	Concurrent Sessions:
	1) Finfish, Ornamentals and Aquatic Plants
	2) Molluscs and Crustaceans
	3) Animal Welfare and the Live Aquatics Industry
2:40 pm to 3:10 pm	Refreshment/Trade Show/Poster Session Break
5:00 pm to 6:00 pm	Happy Hour in the Trade Show Area

#### Saturday, November 4, 2000

8:30 am to 5:00 pm Tours

- 1) Biotechnology/Live Seafood Restaurant
- 2) Ornamental Plants and Animals





Noon to 1:30 pm

Radisson Hotel Annapolis, Annapolis, Maryland November 1-4, 2000

# \*\*\* Conference Program \*\*\*

#### Wednesday, November 1, 2000

12:00 pm to 7:00 pm 7:00 pm to 9:00 pm	Registration Exhibitor Move-in/Poster Session Set Up Welcome Reception (included with registration) Dinner on your own	(Main Concourse) (Arundel C) (Arundel B&C)	
Thursday, November 2	, 2000		
7:30 am to 5:00 pm 7:00 am to 8:30 am	Registration (Main Concourse) Continental Breakfast (included with registration) (Main Concourse)		
8:30 am to 10:00 am	Profiles of the East Coast Live Aquatics Indust	ry (Arundel A&B)	
8:30 am to 8:40 am	Conference Welcome, Announcements		
8:40 am to 9:00 am  Global Perspective of the Live Aquatics Industry  Jerome Erbacher, International Trade Specialist,  NOAA, Department of Commerce. Silver Spring, Maryland			
9:00 am to 9:20 am  Overview of Leading Shellfish Species and Markets  John W. Ewart, Aquaculture Specialist,  Sea Grant Marine Advisory Service, University of Delaware. Lewes, Delaware			
9:20 am to 9:40 am	0 am to 9:40 am  Overview of Leading Finfish Species and Markets  Roy Castle, President,  Castle's Aquaculture and Seafood Consulting. Grasonville, Maryland		
9:40 am to 10:00 am	Florida's Tropical and Marine Aquarium Industry Craig A. Watson, Director, Tropical Aquaculture Laboratory, University of Florida. Ruskin, Florida		
10:00 am to 6:00 pm 10:00 am to 11:00 am	Trade Show/Poster Session Open Refreshment/Trade Show/Poster Session Break	(Arundel C) (Arundel C)	
11:00 am to 11:20 am	Profiles of the East Coast Live Aquatics Indus	stry (continued)	
11:00 am to 11:20 am	1:20 am Ornamental Fish and the Water Garden Industry Chip Crum, President, Koi Unlimited. Frederick, Maryland		
11:20 am to Noon	Market Opportunities for Live Aquation	e Products	
11:20 am to 11:40 am	The Market Potential For Live Florida Foodfish in The Northeastern United States David Zimet, Extension Economist, University of Florida. Quincy, Florida		
11:40 am to Noon	Live Seafood and the Processing/Distribution System  Jon Chaiton, Director of Quality Assurance, Inland Seafood, Atlanta, Georgia		

Lunch (included with registration)

(Arundel A&B)

1:30 pm to 2:40 pm	Social, Ethical and Humanitarian Issues	(Arundel A&B)	
1:30 pm to 1:50 pm	Animal Welfare Considerations in Live Aquatic Transport Dr. Jesse Chappell, President, Southland Fisheries Corporation. Hopkins, South Carolina		
1:50 pm to 2:40 pm	The New Social Ethic for Animals: Implications for the Live Aquatics Industry Dr. Bernard Rollin, Department of Philosophy, Colorado State University, Fort Collins, Colorado		
2:40 pm to 3:10 pm	Refreshment/Trade Show/Poster Session Break	(Arundel C)	
3:10 pm to 4:50 pm	Handling, Inventory and Distribution Methods A&B)	s (Arundel	
3:10 pm to 3:30 pm	Handling and Transport of Live Fish George Nardi, Great Bay Aquafarms, Portsmouth	n, New Hampshire	
3:30 pm to 3:50 pm	Live Seafood Shipping Components and Systems Jon Chaiton, Director of Quality Assurance, Inland Seafood, Atlanta, Georgia		
3:50 pm to 4:10 pm	Aquatic Live Holding Systems in The Retail Environment Nareg Grigorian, Vice-President Marine Biotech, Inc., Beverly, Massachusetts		
4:10 pm to 4:30 pm	On the Road Again: The Business of Transporting and Delivering Live Fish Mark Frey, Frey's Fish Ponds, West Chester, Pennsylvania		
4:30 pm to 4:50 pm	Domestic and International Air Shipments of Live Aquatic Products Fred Patterson, US Airways, BWI Airport, Baltimore, Maryland		
5:00 pm to 6:00 pm	Happy Hour (Cash Bar) in the Trade Show area <b>Dinner on your own</b>	(Arundel C)	
Friday, November 3, 20	000		
7:00 am to 8:30 am 7:30 am to 5:00 pm 8:30 am to 8:35 am	Continental Breakfast (included with registration) Registration Open Announcements/Other Information	(Main Concourse) (Main Concourse)	
8:35 am to 10:15 am	Resource Issues, Regulations and the Live Aquatics Industry	(Arundel A&B)	
8:35 am to 8:55 am  Interstate Shipment of Live Aquatic Products  Tom Ellis, Director, Aquaculture and Natural Resources.  North Carolina Department of Agriculture. Raleigh, North Carolina			
8:55 am to 9:15 am	5 am Regional Fishery Resource Management Issues Heather Stirratt, Fishery Management Plan Coordinator, Atlantic States Marine Fisheries Commission. Washington, DC		
9:15 am to 9:35 am	9:15 am to 9:35 am  Non-indigenous Species and the Live Aquatics Industry: Risks and Potential Impacts of Exotic Introductions Carrie Selberg, Habitat Specialist, Atlantic States Marine Fisheries Commission. Washington, DC		
9:35 am to 9:55 am	U.S. Fish and Wildlife Service Regulatory Requirements for Shipping Live Aquatic		

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4:10 pm to 4:30 pm

Catherine Cockey, Wildlife Inspector

	U.S. Fish and Wildlife Service, Baltimore, Mary	aland	
9:55 am to 10:15 am	Aquatic Animal Health Certification for International Dr. Mark Dulin Animal and Plant Health Inspection Service (AP)		
10:00 am to 3:10 pm 10:15 am to 11:00 am	Trade Show/Poster Session Open Refreshment/Trade Show/Poster Session Break	(Arundel C) (Arundel C)	
11:00 am to Noon	Marketing Live Seafood (Arundel A&B)		
11:00 am to 11:20 am	The Live Fish Industry: A Producer's Perspective Brent Blauch, President, Susquehanna Aquacultures, York Haven, Pennsy	lvania	
11:20 am to 11:40 am	The Live Fish Industry: A Wholesaler's Perspective Scott Lee, Deale Aquafarms, Deale, Maryland		
11:40 am to Noon	The Live Fish Industry: A Restauranteur's Perspectiv Ed Shen, Seven Seas Restaurant, Rockville, Mar		
Noon to 1:20 pm	Lunch (included with registration)	(Arundel A&B)	
1:20 pm to 4:50 pm	Concurrent Sessions 1-3 (Arundel A	A, B and Harford Room)	
(Session #1)	Finfish, Ornamentals and Aquatic Plants	(Arundel A)	
1:20 pm to 1:40 pm	Water Amendments to Enhance Live Shipment of Foo Mike Frinsko, Aquaculture Area Agent North Carolina Cooperative Extension Service. C		
1:40 pm to 2:00 pm	Handling and Transport of Marine Finfish for Offshore Production Mike Chambers, University of New Hampshire, Durham, New Hampshire		
2:00 pm to 2:20 pm	20 pm Handling, Transport and Maintenance of Tuna in Sea Cages Sebastian Belle, Maine Department of Marine Resources. Augusta, Maine		
2:20 pm to 2:40 pm	East Coast Live Markets for Tilapia  Jerry Redden, Director  Worcester County Economic Development Office	e, Snow Hill, Maryland	
2:40 pm to 3:10 pm 3:10 pm	Refreshment/Trade Show/Poster Session Break Trade Show/Poster Session Ends	(Arundel C) (Arundel C)	
3:10 pm to 3:30 pm	Domestic and International Shipment of Larval and J Dr. Jesse Chappell, President, Southland Fisheries Corporation. Hopkins, Sout		
3:30 pm to 3:50 pm	pm to 3:50 pm  Handling and Transport of Marine and Freshwater Tropical Ornamentals  Craig A. Watson, Director,  Tropical Aquaculture Laboratory, University of Florida. Ruskin, Florida		
3:50 pm to 4:10 pm	Ornamental Aquatic Plants		

Richard Koogle, Lilypons Water Gardens, Buckeystown, Maryland

Margaret Koogle, Lilypons Water Gardens, Buckeystown, Maryland

Internet Marketing of Ornamental Aquatic Plants and Animals

4:30 pm to 4:50 pm	Handling and Transport of Sportfish for Public and Pu John Sproch, Keystone Aquaculture, Duncannon, P	_	
5:00 pm to 6:00 pm	Happy Hour (Cash Bar)  Dinner on your own	(To Be Announced)	
(Session #2)	Molluscs and Crustaceans	(Arundel B)	
1:20 pm to 1:40 pm	The Live Lobster ( <u>Homarus americanus</u> ) Industry: Past, Colin MacDonald, Clearwater Lobster Bedford, Nova Scotia, Canada	Present, Future	
1:40 pm to 2:00 pm	The East Coast Oyster Industry: Status and Trends Dr. Robert Rheault, Moonstone Oysters. Wakefield, Rhode Island		
2:00 pm to 2:20 pm	The East Coast Hard Clam Industry: Status and Trends Gef Flimlin, Rutgers Cooperative Extension Program, Toms River, New Jersey		
2:20 pm to 2:40 pm	The Blue Mussel Industry in Atlantic Canada and Main Dr. Jeffery Davidson, Atlantic Veterinary College Charlottetown, Prince Edward Island, Canada	ne	
2:40 pm to 3:10 pm	Refreshment/Trade Show/Poster Session Break	(Arundel C)	
3:10 pm	Trade Show/Poster Session Ends	(Arundel C)	
3:10 pm to 3:30 pm	Live Food and Bait Markets for Crawfish Dr. Bill Daniels, Delaware State University. Dover,	Delaware	
3:30 pm to 3:50 pm	Transporting and Marketing Live Shrimp Richard Eager, Swimming RockFish & Shrimp Far Meggett, South Carolina	rm	
3:50 pm to 4:10 pm	The East Coast Soft-Shell Crab Industry  Mike Oesterling, Virginia Sea Grant Advisory Program  Virginia Institute of Marine Science, Gloucester Point, Virginia		
4:10 pm to 4:30 pm	om to 4:30 pm Wet Storage Systems for Oysters and Other Commercially Important Bivalves Dr. Robert Rheault, Moonstone Oysters. Wakefield, Rhode Island		
4:30 pm to 4:50 pm	Live Holding and Transport of Freshwater Prawns (Mac Shawn Coyle, Kentucky State University. Frankfort		
5:00 pm to 6:00 pm	Happy Hour (Cash Bar)  Dinner on your own	(To Be Announced)	
(Session #3) Anii	mal Welfare and the Live Aquatics Industry (F	Harford Room)	
1:20 pm to 2:40 pm	Breakout Session w/ Dr. Bernard Rollin for representatives of industry to discuss the subject of animal rights/welfare issue(	<u> </u>	
2:40 pm to 3:10 pm 3:10 pm 3:10 pm to 4:50 pm 5:00 pm to 6:00 pm	Refreshment/Trade Show/Poster Session Break Trade Show/Poster Session Ends Continue Animal Welfare Breakout Session Discussion Happy Hour (Cash Bar) Dinner on your own	(Arundel C) (Arundel C) (Harford Room) (To Be Announced)	

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#### **Alternate Oral Presentations**

#### National Seafood HACCP Implementation Survey

Ken Gall\* and Doris Hicks\*\*, New York Sea Grant Extension Program, SUNY Stony Brook, Stony Brook, New York. \*\*Sea Grant Marine Advisory Service, University of Delaware. Lewes, Delaware

#### Pay Lakes: The Business of Fee Fishing

Mark Frey, Frey's Fish Ponds, West Chester, Pennsylvania

#### **Insurance for Live Aquatic Products**

Greg Gutchigan, Director, Aquaculture Insurance Services Mariner Management Group, Inc., Allendale, New Jersey

#### Saturday, November 4, 2000

8:00 am to 5:00 pm **Tours** (included with registration; transportation provided, lunch on your own)

**Tour #1)** Biotechnology/Live Seafood: University of Maryland Center for Marine Biotechnology (COMB), Baltimore, Maryland and Gourmet Seafood holding facilities and Seven Seas Restaurant, Rockville, Maryland

Tour #2) Ornamental Plants and Animals: Hunting Creek Fisheries, Thurmont, Maryland and Lilypons Water Gardens, Buckeystown, Maryland

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#### **Poster Presentations (Arundel C)**

**Thursday, November 2, 2000** 10:00 am to 6:00 pm

**Friday, November 3, 2000** 10:00 am to 3:10 pm

#### Overview of the Atlantic Veterinary College Lobster Science Center (LSC)

Dr. Richard Cawthorn, Director, Lobster Science Center (LSC), Atlantic Veterinary College University of Prince Edward Island, Charlottetown, Prince Edward Island, Canada

#### Mussel Production on Prince Edward Island (PEI), Canada

Dr. Jeff Davidson\*, Mr. Garth Arsenault and Mr. Jonathon Spears, Shellfish Research Group, Atlantic Veterinary College, University of Prince Edward Island, Charlottetown, Prince Edward Island, Canada

#### Pathogenic Human Viruses and Shellfish: the USDA Seafood Safety Laboratory

Dr. David H. Kingsley\*, Gloria K. Meade, Michael A. Watson, and Dr. Gary P. Richards, Seafood Safety Laboratory, U.S. Department of Agriculture, Delaware State University, Dover, Delaware

#### Marketing of Live Freshwater Fish and Shellfish in India

Rajendra Badinia\* and T.A. Qureshi, Department of Applied Aquaculture, Barkatullah University Bhopal (M.P.) - 462026. India

#### Horseshoe Crabs: in Search of an Artificial Bait

Kirstin Ferrari\* and Nancy Targett, College of Marine Studies, University of Delaware, Lewes, Delaware

#### Transportation of Pond-raised Hybrid Striped Bass for Live-sale

Brian L. Nerrie\* and Eugene Johnson, Aquaculture Office, Cooperative Extension, Virginia State University, Petersburg, Virginia

#### Horseshoe Crabs and the Live Aquatics Industry

Bill Hall, Sea Grant Marine Advisory Service, College of Marine Studies, University of Delaware, Lewes, Delaware

#### Reducing Horseshoe Crab as Bait in the Virginia Conch Pot Fishery

Robert Fisher, Virginia Sea Grant College Program, Marine Advisory Services, Virginia Institute of Marine Science, Gloucester Point, Virginia

#### What is Happening to the Lobsters in Long Island Sound?

Peg Van Patten\* and Richard A. French, Connecticut Sea Grant Program, University of Connecticut Avery Point Campus, Groton, Connecticut

#### Lobster Health FAQs: Frequently Asked Questions

Peg Van Patten, Connecticut Sea Grant Program, University of Connecticut, Avery Point Campus, Groton, Connecticut

# Open Ocean Submerged Longline Culture of the Blue Mussel in New England: A First Year Progress Report Raymond E Grizzle\* and Richard Langan, Jackson Estuarine Laboratory, University of New Hampshire,

Durham, New Hampshire

#### Normal and Altered Gametogenesis in the Green Sea Urchin - Implications for Aquaculture

Charles W. Walker\*, Laura M. Harrington\*, Michael P. Lesser\* and Michael Devin\*\*
\*Department of Zoology, Center for Marine Biology and Marine Biomedical Research Group, University of New Hampshire, Durham, New Hampshire and \*\*Acadia Seafood International



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#### \*\*\* Oral Presentation Summaries \*\*\*

#### **Profiles of the East Coast Live Aquatics Industry**

#### **Global Perspective of the Live Aquatics Industry**

**Jerome Erbacher**, International Trade Specialist, NOAA, Department of Commerce. Silver Spring, Maryland

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#### U.S. Live Fisheries Trade 1990 - 2000

**Jerome Erbacher**, International Trade Specialist, NOAA, Department of Commerce. Silver Spring, Maryland

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#### **Overview of Leading Shellfish Species and Markets**

**John W. Ewart**, Aquaculture Specialist, Sea Grant Marine Advisory Service, University of Delaware. Lewes, Delaware

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#### Overview of Leading Finfish Species and Markets

**Roy Castle**, President, Castle's Aquaculture and Seafood Consulting. Grasonville, Maryland

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#### Florida's Tropical and Marine Aquarium Industry

Craig A. Watson, Director, Tropical Aquaculture Laboratory, University of Florida. Ruskin, Florida

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#### Ornamental Fish and the Water Garden Industry

Chip Crum, President, Koi Unlimited. Frederick, Maryland

#### GLOBAL PERSPECTIVE OF THE LIVE AQUATICS INDUSTRY

Jerome E. Erbacher

International Trade Specialist
Office of Industry and Trade NOAA, Fisheries
1315 East West Highway Room 3670
Silver Spring, Maryland 20910
Tel: 301-713-2379 x 144

Tel: 301-713-2379 x 14 Fax: 301-713-2384

Email: <Jerome.Erbacher@noaa.gov>

When looking at opportunities for live fish exports, changes occurring in the edible and live seafood trade sectors provide the best indicators of growth, stability and decline. Since 1990, changes have occurred in the geographic distribution of exports and trading blocs for the edible and live fish markets.

This paper will look at four areas:

- 1. A brief summary of exports of edible fisheries products
- 2. U.S. exports of live fish under Chapter 0301 LIVE Animals and Fish
- 3. Exports of Live fish, Molluscs and aquatic invertebrates, under the other Sections of Chapter 3 in the live/fresh categories of the **Harmonized Tariff Schedule** (table)
- 4. Current Imports of live products into China, Japan, Korea, and the EU.

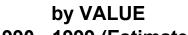
HTS	Description
301100000	Fish, Ornamental, Live
301910000	Trout
301920000	Eels (Anguilla Spp.), Live
301930000	Carp, Live
301990000	Fish, Live, Not Elsewhere Specified (Nesoi)
306210000	Rock Lobster and Other Sea Crawfish, Including in Shell,
306220010	Lobsters (Homarus Spp.),
307100020	Seed Oysters, Live
307100040	Oysters Except Seed, Live, Fresh, Chilled, Frozen, Dried, Salted or in Brine
307210000	Scallops, Live, Fresh Chilled
307310010	Mussels Live, Fresh or Chilled, Farmed
307310090	Mussels Live, Fresh or Chilled, Not Farmed
307600000	Snails, Other than Sea Snails, Live, Fresh, Chilled, Frozen, Dried, Salted, Brine
307910029	Sea Urchin, Live, Fresh or Chilled (Except Roe)
307910030	Conch, Live, Fresh or Chilled (Welks)
307910040	Molluscs and Aquatic Invertebrates, Nesoi, live, Fresh or Chilled

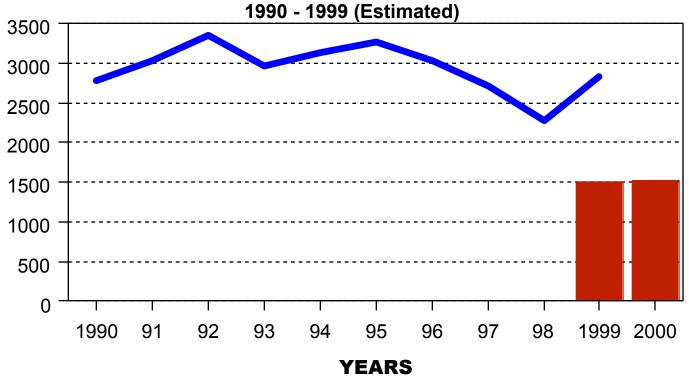
# U.S. Live Fisheries Trade 1990 - 2000

Jerome Erbacher
National Marine Fisheries Service



# U.S. EXPORTS of EDIBLE FISH



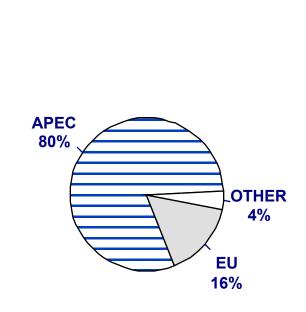


─Edible Fisheries Exports ■Jan.-Jul. 1999-2000

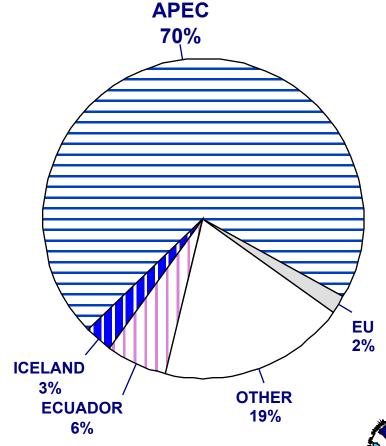


# **U.S. EXPORTS AND IMPORTS, 1999**

(Value)



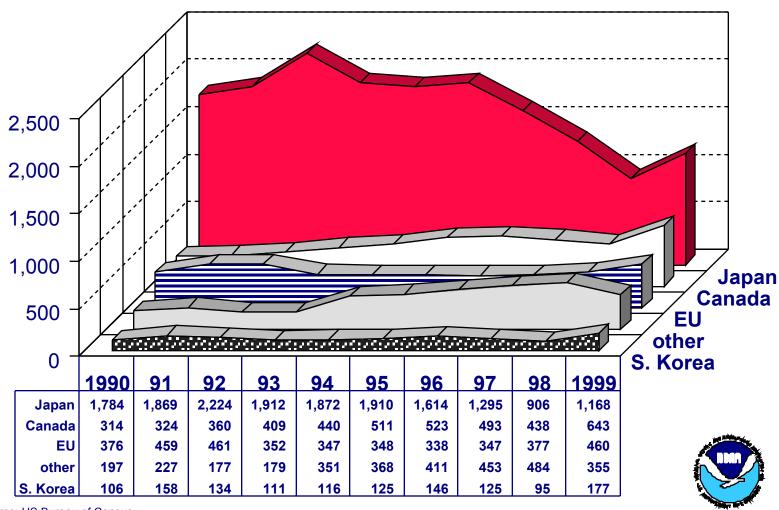
**EXPORTS: \$2.83 Billion** 



**IMPORTS:** \$ 9.30 Billion

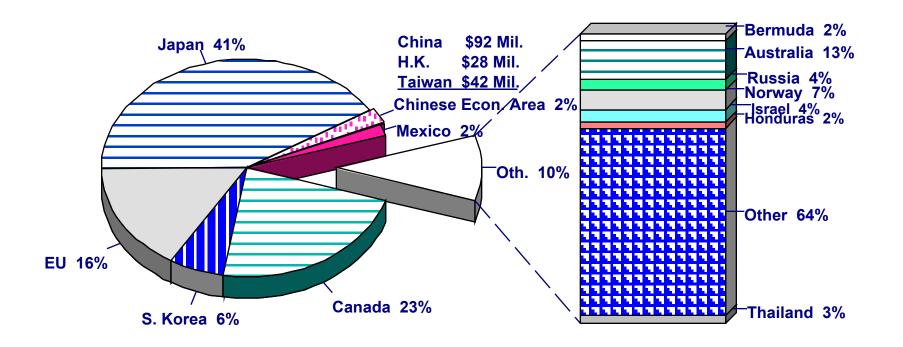
# **U.S. SEAFOOD EXPORTS, 1990 - 1999**

(\$ Million)



Source: US Bureau of Census

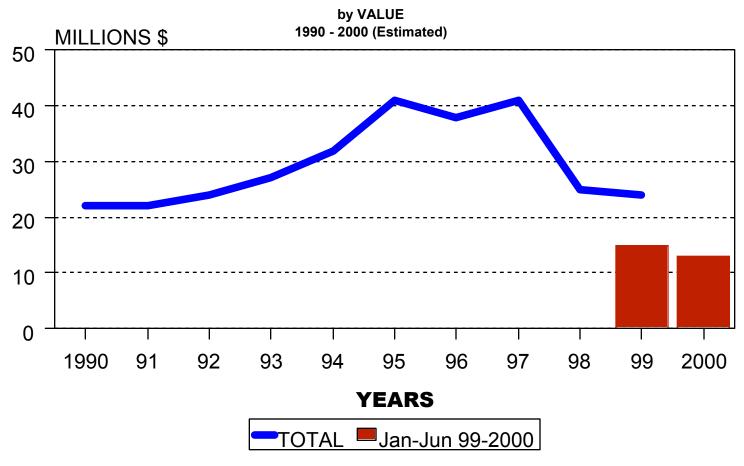
# Top U.S. Export Markets, 1999



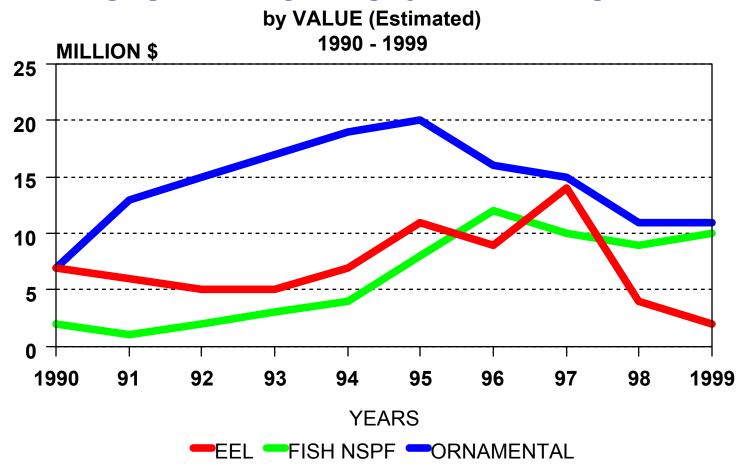
Total U.S. Exports: \$ 2.83 Billion



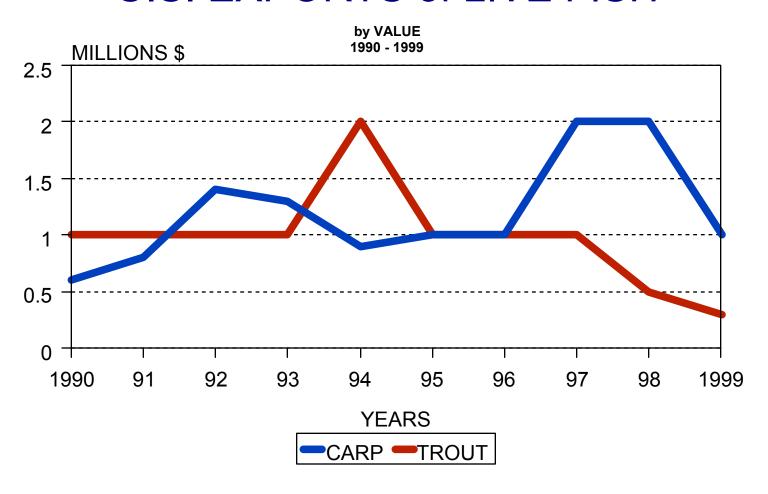
# U.S. EXPORTS of LIVE FISH



# U.S. EXPORTS of LIVE FISH

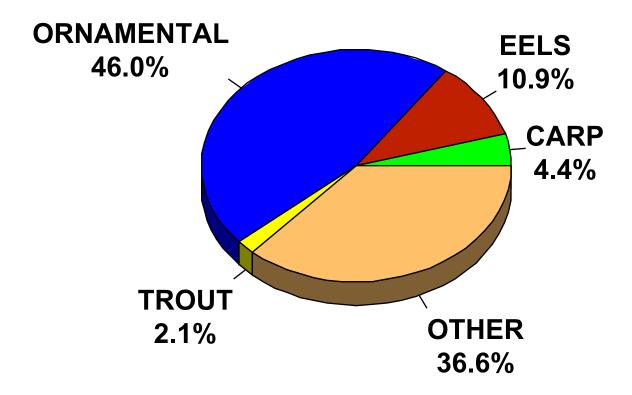


# U.S. EXPORTS of LIVE FISH



# U.S. LIVE FISH EXPORTS by PRODUCT TYPE

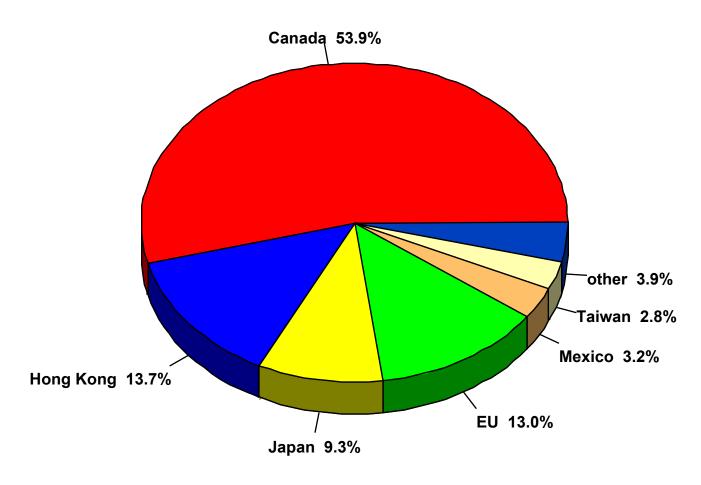
by VALUE 1999



**TOTAL: \$ 15.2 MILLION** 

## **U.S. LIVE FISH EXPORTS**

by VALUE AND COUNTRY 1999

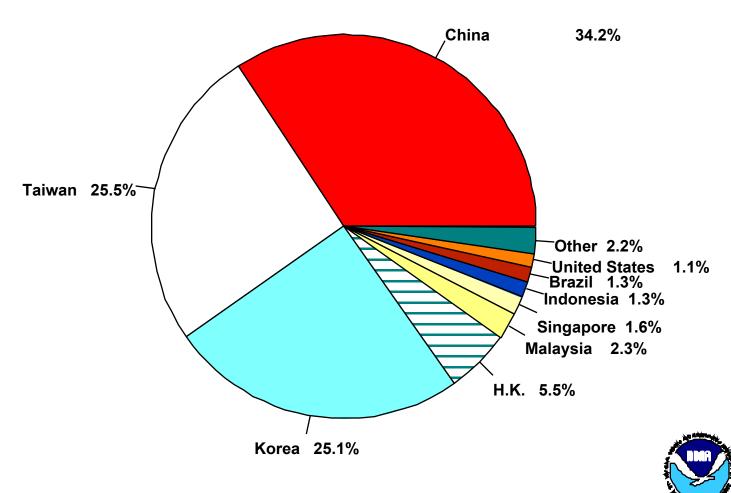


 $\hbox{U.S. DOC, BUREAU of CENSUS}$ 

**TOTAL: \$24.3 MILLION** 

# **Total Japan Live Fish Imports**

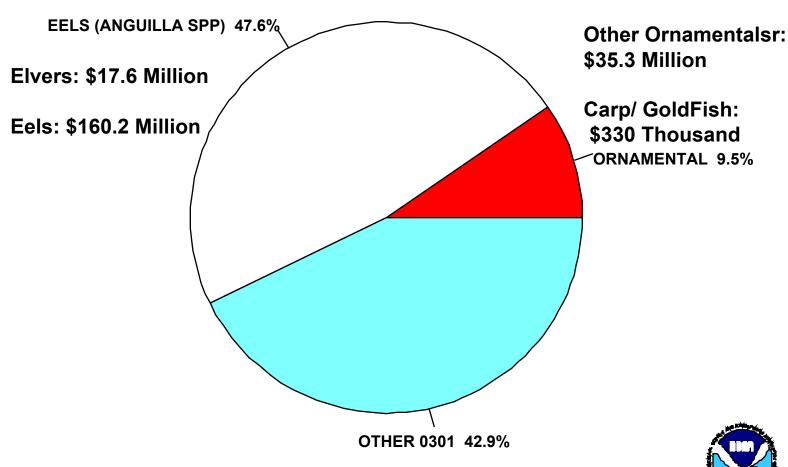
by VALUE AND COUNTRY 1999



Source: World Trade Atlas Total: \$374 Million

# **Total Japan Live Fish Imports**

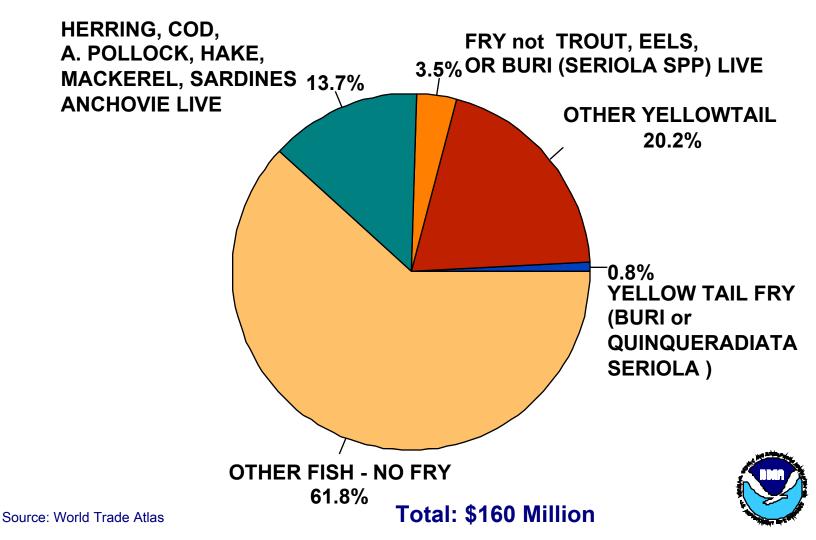




Source: World Trade Atlas Total: \$374 Million

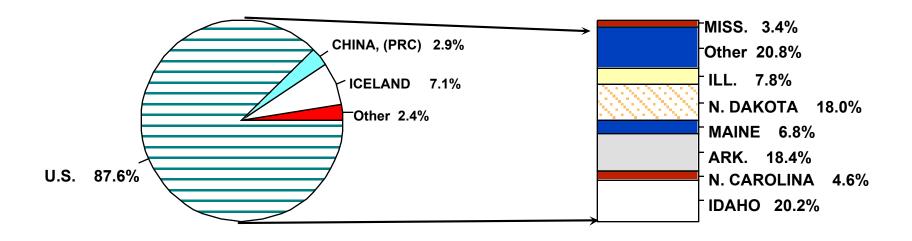
# Other Japanese Live Fish Imports

VALUE AND PRODUCT 1999



# **Total Canadian Live Fish Imports**

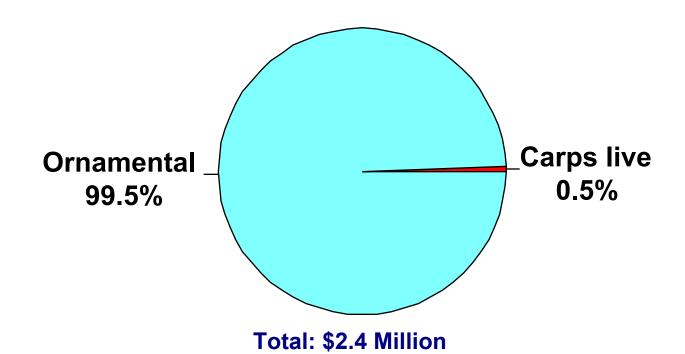
by VALUE AND COUNTRY 1999



**Total: 14.5 Million (Canadian \$)** 



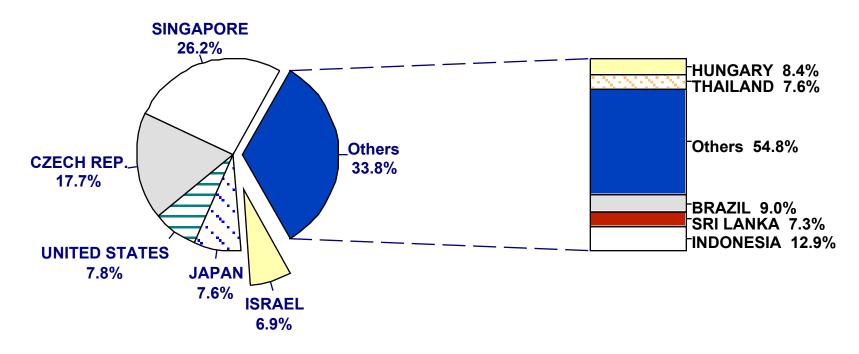
# Total Mexico Live Fish Imports by VALUE AND PRODUCT 1997



Source: FAO

# **Total EU Live Fish Imports**

by VALUE AND COUNTRY 1999



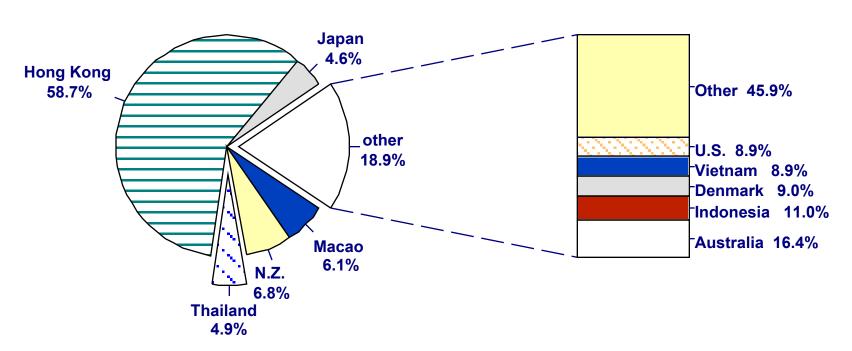
**Total Live Fish Imports 1.1 Billion (ECU)** 



Source: EuroStat

# **Total Taiwan Live Fish Imports**

by VALUE AND COUNTRY 1999



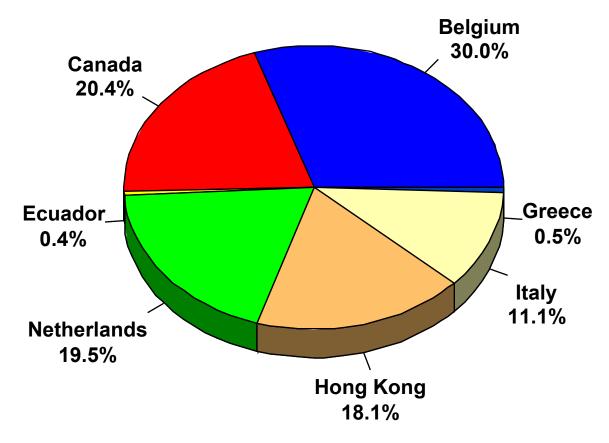
**Total Live Fish Imports: \$10.3 Million (US)** 



Source: World Trade Atlas

# **U.S. LIVE EEL EXPORTS**

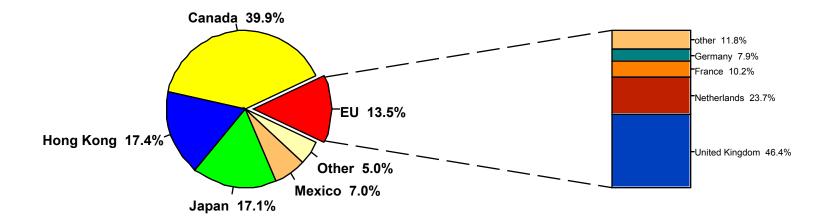
#### by VALUE AND COUNTRY 1999



Total: \$2.4 Million

#### U.S. LIVE ORNAMENTAL EXPORTS

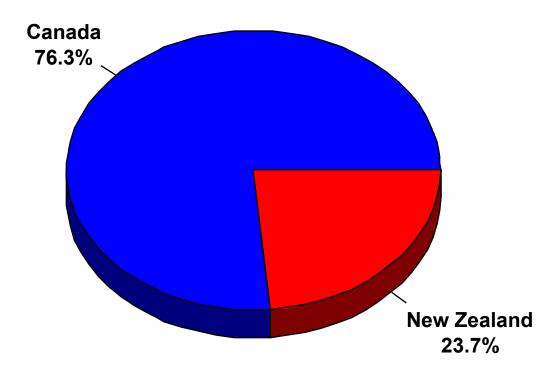
#### by VALUE AND COUNTRY 1999



**TOTAL: \$10.8 MILLION** 

# **U.S. LIVE TROUT EXPORTS**

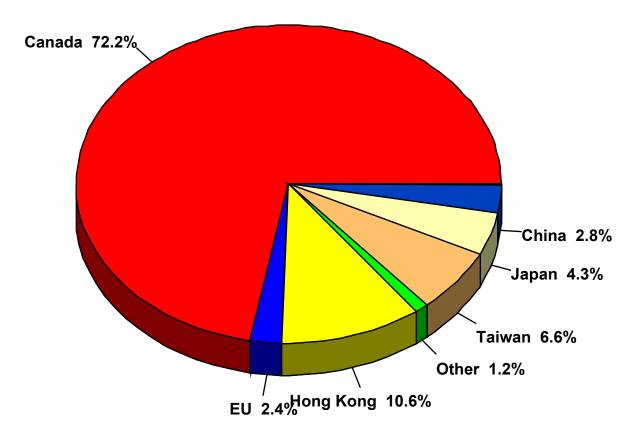
#### by VALUE AND COUNTRY 1999



TOTAL: \$340 thousand

# U.S. LIVE FISH EXPORTS (Not Specified)

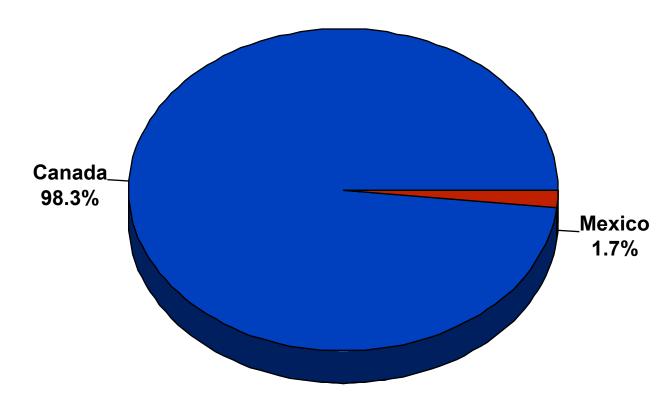
#### by VALUE AND COUNTRY 1999



**TOTAL: \$9.5 MILLION** 

# U.S. LIVE CARP EXPORTS

# by VALUE AND COUNTRY 1999



**TOTAL: \$1.1 MILLION** 

U.S. DOC, BUREAU of CENSUS

#### OVERVIEW OF LEADING SHELLFISH SPECIES AND MARKETS

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#### **Presentation Summary**

Eastern states, particularly those in the Mid-Atlantic region and New England and the Canadian Maritime Provinces, have a long history of shipping live shellfish to local, regional, national and international markets. Several species of marine shellfish (crustaceans and bivalve molluscs) from coastal fisheries and/or aquaculture production constitute the mainstay of live seafood shipments and are traded live in export, wholesale and retail markets. Five leading shellfish species shipped live within this region include the American lobster, blue crab, American oyster, hard clam (northern quahog) and the blue mussel.

Commercial fisheries for the American lobster (<u>Homarus americanus</u>) exist from Atlantic Canada to the Mid-Atlantic states, but the industry is centered in Canada and New England. The Provinces of Nova Scotia, Prince Edward Island and New Brunswick account for approximately 85 percent of Canadian production while Maine and Massachusetts are leading states for U.S. landings. Markets for live product included wholesale, processing, retail, restaurants and international exports.

Commercial fisheries in the Chesapeake and Delaware Bays are the principal source of the blue crab (<u>Callinectes sapidus</u>). Live markets for blue crabs include seafood distributors, retailers, restaurants and processors. Virginia and Maryland are leading states for both hard crab and soft crab production. The majority of soft crab production in the region is sold live to wholesale and retail outlets and restaurants and to processors who clean, re-pack and freeze the product for redistribution. Approximately 75% of Virginia soft crab production is sold live.

Leading bivalve molluscs produced from and aquaculture and commercial fisheries include the American oyster (<u>Crassostrea virginica</u>), the hard clam or northern quahog (<u>Mercenaria mercenaria</u>) and the blue mussel (<u>Mytilus edulis</u>). Live markets for oysters and mussels include seafood distributors, retailers, restaurants and processors. Principal markets for hard clams include seafood wholesale and retail outlets and restaurants.

Information on other species of marine and freshwater shellfish shipped or imported live in the region from fishery, aquaculture sources to wholesale, retail and restaurant and ethnic markets is also presented.

#### OVERVIEW OF LEADING FINFISH SPECIES AND MARKETS

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# **Presentation Summary**

The presentation will center on what species, size, etc. are up and coming or would be suitable for the live food fish market. Most of the newer finfish are marine or brackish water species. The Southern Canada, Northeast Mid-Atlantic and to some degree Southern U.S. regions have seen a rapidly expanding live market for finfish species. New and previously underutilized species are in demand to satisfy this growing market. The market was once limited to the Asian community but now is expanding to the gournet and white tablecloth restaurants, supermarkets and seafood markets in the Northeast U.S. Problems exist with the supply of the newer species as most are wild caught and the market opportunity for the commercial fishermen is unknown.

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# FLORIDA'S TROPICAL AND MARINE AQUARIUM INDUSTRY

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# **Presentation Summary**

Florida dominates in domestic, United States production of freshwater tropical fish for the aquarium industry. In addition, the state has an emerging industry involved in production of marine ornamental species. Freshwater aquatic plants are also a major component of Florida's aquaculture production, supplying plants for both the aquarium and ornamental pond industry.

Production of freshwater fish includes over 800 varieties of fish. Most production occurs south of the "freeze line", which is arbitrarily marked by Interstate 4. A major concentration of farms is located in the Tampa Bay region. This concentration is due to favorable climate, soil type, water, and proximity to a major urban area, which possesses the necessary infrastructure to support the industry, especially Tampa International Airport. Of the 200 farms in the state, 140 of them are located within 50 miles of Tampa International Airport. Most production of tropical

fish occurs in open ponds, but more and more development is occurring in closed, recirculating water systems.

Aquatic plants were historically, primarily collected from the waterways of the state, which are rich in species important to the aquarium hobby. In the past ten years, controlled production has replaced much of this supply, and modern farming practices including tissue culture and hydroponic systems are being employed. Except for a few species which are still easier, and more economically obtained from natural waterways, aquaculture supplies most of the plants sold in North America.

Marine ornamentals are still be collected from the wild in Florida, most notably from the coral reef systems of South Florida. Annual landings are estimated to be worth \$4-5 million. However, aquaculture has begun to account for a portion of the supply. While the number of fish, invertebrates, and plant species which have successfully been put into captive production is dwarfed by the number of species available from the wild, considerable investment is occurring into this endeavor.

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# ORNAMENTAL FISH AND THE WATER GARDEN INDUSTRY

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# **Presentation Summary**

The ornamental fish industry is integral to the water gardening hobby. The water gardening hobby can be divided into two subsets: ornamental fish and ornamental plant based ponds. Water gardening is the fastest growing segment of gardening for over fifteen years. Gardening is the largest hobby in the United States. The ornamental fish side of the market is smaller then the plant generated segment of the market at approximately 10% of the total water gardening market. The entire market will have to more than treble on the East Coast of the United States to reach current market levels extant in Europe. At various times of the year demand for ornamental fish outstrips production.

Different style demographics usually accompany the division between fish and plant. Men typically favor fish, women typically favor the plants. Interest in filtration and or plumbing is more prevalent in the fish segment, there is comparably little interest in those matters for plant oriented ponds. Both types of ponds are easy enough to maintain if one follows the basic guidelines, which can differ (pond depth for example).

There is a further division within the pond fish segment; goldfish and koi. Goldfish being any of a species of fish that date back to genetic manipulation that can be traced to at least 600 years ago. Koi are Carp with a fancy paint job. However, they have garnered most of the

interest lately. This is do to three key factors. First the koi are large - easy to see and appreciate. Second the koi are interactive, they can be trained in rudimentary fashion. The koi are collectable, sometimes generating outrageous prices.

There are three main koi sources, although they are grown all over the world. Japan has the oldest koi and the most established and sought after blood lines. Israel offers koi that offer wonderful metallics and colors at a somewhat lesser price. Domestic fish with nice colors are available, but normally do not offer the bright colors of the Israeli or Japanese fish, or the collectable patterns of color we see from Japan. America does have the lead in the newer butterfly koi segment. There are different methods of farming, ice melt off in Japan, slow run-through in Israel and America. Japan can grow the fish larger faster.

Disease and quarantine are primary concerns. Each country has different methods of regulating. Israel's government has been very closely involved in their ornamental aquaculture program. Individual companies treat the fish differently upon taking them out of the pond or upon importation. Many feel the pressing cash need and rush the fish into the market too early. A stressed fish picks up a malady much more easily than a rested healthy fish. But when the impaired fish is seen in a tank it is seen as Typhoid Mary, thus some sections of the market perpetually shoot themselves in the foot. A good quarantine protocol makes money in more sales, more live fish to sell, and saved profits through not having to replace already sold fish that came down with a malady.

For goldfish there are several strong growers that can play on any international level, situated right here in the United States. The East Coast is dotted with them and the Ozark region is strong. There are a number of growers in the Gulf States as well.

For the top end of Fancy Goldfish I felt Hong Kong was the king. Apparently the Chinese government did not see this as part of their new plans for the region as my existing known sources are no longer available (I have no idea whether they moved out quickly or if they are at they

bottom of the Hong Kong Harbor). I think this move will hurt an already sagging, if not fundamentally moribund market segment: ultra fancy goldfish. For the most part koi seem to have stolen their thunder and the true avid premium goldfish collector is rare indeed.

Making money growing ornamental fish is a strange and wonderful phenomenon. It is usually less expensive to buy in quality stock from an established breeder than to contemplate converting even already owned land into fish production. The good news is the market is growing, and rapidly at that, and the prices that are paid for good fish remain quite elastic, allowing an over all increase in the retail price of fish.

Radisson Hotel Annapolis, Annapolis, Maryland November 1-4, 2000

# **Market Opportunities for Live Aquatic Products**

# The Market Potential For Live Florida Foodfish in The Northeastern United States

**David Zimet\* and Paul Zajicek** University of Florida. Quincy, Florida

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Live Seafood and the Processing/Distribution System

**Jon Chaiton**, Director of Quality Assurance Inland Seafood, Atlanta, Georgia

# THE MARKET POTENTIAL FOR LIVE FLORIDA FOOD FISH IN THE NORTHEASTERN UNITED STATES

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# Presentation Summary and Paper

This research effort is a part of the search for alternatives for those fishers affected by the 1995 Constitutional Amendment banning the use of certain fishing gear. Representatives of state agencies, educational and research institutions, and fishers identified marketing live wild-caught fish as a highly ranked alternative for fishers. This study is a result of that finding.

The live fish market has several salient features. The market for live marine fish has been created and is dominated by Asian cultures, even in the U.S.. In California in 1998, fishermen received a price premium for live fish of two to three times the price of traditional iced product. Prices ranged from \$.75 to \$5.50 per pound for live fish. In the U.S. Mid Atlantic limited supplies generate higher prices in the winter months than the warm season months. Buyers confirmed that the market could readily absorb Florida live fish during the winter.

Delivery from Florida to northeastern markets could be difficult. The distance to those markets from Florida makes quick service difficult and costly. Fishers must commit to a marketing plan that includes specific quality and handling standards. Transportation to northeastern markets from the Panacea area will cost about \$0.50 per pound of fish and about \$0.30 per pound to Atlanta. A holding facility to control water temperatures, acidity, and level of salinity is important to assuring that good quality fish with as few stress-related problems as possible arrive at the final destinations.

#### Introduction

In late February, 1999, the Apalachee Regional Planning Council and the Florida State Rural Development Council co-hosted a meeting of people who had been searching for water-based alternatives for those fishers adversely affected by the 1995 Constitutional Amendment banning the use of certain fishing gear (commonly called the Net Ban). Representatives of the fishing community as well as state agencies and research and education institutions attended. Fishery and aquaculture candidate species were reviewed and prioritized based on what was known about the species and what knowledge and other resources were lacking concerning those alternatives. In addition, discussion included the potential for research on promising species, groups of species and markets. Marketing live fish was a highly ranked alternative for wild-caught fish common to Florida. Live fish marketing seemed to have two major advantages:

- 1. There was sufficient knowledge about catching, holding, and transporting live fish and
- 2. Knowledge gaps related to markets; not technical production.

In sum, the marketing of live fish would depend solely on fisheries resources, the hauling of live fish to specific markets, and the markets themselves, not upon technical unknowns.

# Methodology

This study was composed of five parts: 1) a written market survey to live fish haulers and buyers, 2) participation in the Second International Conference for Marketing and Shipping Live Aquatic Products Conference, 3) roundtable discussion with the Florida Fishermen's Federation, 4) a trip to the northeastern United States to meet with live fish buyers and haulers and 5) extensive discussion with potential buyers during the 2000 International Boston Seafood Show.

## Market Survey

Live fish buyers and haulers were identified from live hauler lists maintained by the Florida Department of Agriculture and Consumer Services and Maryland Department of Agriculture, advertisements in *Aquaculture Magazine* and the attendee list for the 1996 Marketing and Shipping Live Aquatics Conference. A three-page, written survey was developed to thoroughly probe live marine fish market demand, value, price and business practices, purchases and prices for live freshwater fish and contract hauler hauling activity (see Appendix A). A total of 31 written surveys were faxed or mailed. The mailed copies included a post paid return envelope. Six responses were received and two surveys were returned as undeliverable.

# **Live Aquatic Products Conference**

The Second International Marketing and Shipping Live Aquatics Products Conference, held in Seattle, was attended. The primary purpose of attendance was to gather information and contacts so as to further develop thinking regarding the marketing and shipping of live products. A simple rule-of-thumb approach to identifying candidate live haul species was gained at the conference: If a fish can withstand rough on-board handling and live for several hours or more, then that species would be a good candidate for live hauling.

Use was made of that rule in discussions with fishers and buyers throughout the research. Approximately 120 attendees and speakers from 15 countries participated. Topics included specific market descriptions (Hong Kong), shipping technology (wet and dry air transport and vessel transport) and human health issues (Hazard Analysis Critical Control Point programs).

# Florida Fishermen's Federation

A half-day meeting was held with Ray Pringle, Executive Director, and Rod Graddy and Ronald Fred Crum, members, of the Florida Fishermen's Federation at their offices in Panacea. The potential to harvest, handle and market live marine fish in the Big Bend Region of Florida. They were enthusiastic for the concept and endorsed the hypothesis that winter-caught and marketed live marine fish could be sold at prices well above traditional dockside values. The construction of live fish holding facilities and boat modifications were discussed and the

potential sources of technical information identified (Florida Sea Grant Extension Program and Florida Cooperative Extension Service). In addition to live marine fish, the availability, marketability and value of live crustaceans (blue crab and mantis shrimp) and seaweed was discussed. Mr. Pringle agreed to serve as a contact point in the event buyers wished to speak to someone immediately regarding product availability and prices. As a result of the meeting he and Mr. Graddy attended the International Boston Seafood Show to learn more about the size and scope of the seafood industry.

# Northeastern Market Survey

Mr. Roy Castle, Chief, Aquaculture/Seafood Programs, Maryland Department of Agriculture, was contacted. He had worked with live fish buyers in the northeast for 10 years and is widely known within the trade. During five years, 1995 - 2000, he has worked to develop live fish buyer appreciation for farm-raised fish from intensive recirculating systems in his state. The limited response to the written survey made it necessary to visit buyers one-on-one. Mr. Castle informed the researchers that Asian buyers rarely respond to written queries and that they prize the development of personal rapport, valuing the effort made to visit their business.

As a result of conversations with Mr. Castle a week of visits to live fish buyers in Baltimore, Washington DC, Philadelphia and New York. Mr. Castle planned to accompany the researchers for the first several days and arranged for travel in the company of Rob Newburg of Stoney Ridge Aquaculture (a buyer and contract hauler of live marine fish) to the International Boston Seafood Show for one day, returning to New York for the balance of the week. The objective was to interview 15 to 20 buyers and haulers. Plans changed because most of the New York fish buyers who were to be interviewed planned to visit the International Boston Seafood Show and would not confirm prior appointments and because a price war had broken out between the New York and Baltimore-Washington live fish buyers and suppliers. New York suppliers were "invading" the Baltimore-Washington market and selling below their cost. Thus in person interviews were held with the largest live fish buyer in the Washington DC metro area and the largest live fish buyer in Philadelphia at their places of business. A wholesaler at the Jessup Market of fresh, on-ice fish and shellfish that specialized in Asian restaurants and six buyers during two days at the International Boston Seafood Show were also interviewed (these buyers and other contacts are listed as Appendix B).

## International Boston Seafood Show 2000

There are two seafood shows in the United States: Boston and Long Beach. Boston attracts in excess of 14,000 buyers and contains 750 exhibits. The Florida Department of Agriculture and Consumer Services (FDACS) has coordinated and managed a pavilion of Florida seafood companies at Boston for the last eight years. By maintaining a presence at the FDACS booth, project personnel interviewed six live fish buyers.

#### Results

This section summarizes the information obtained from the interviews and secondary sources related to the specific issues of the interviews: species availability and price.

#### Market and Price Information

The market for live marine fish has been created and is driven by Asian cultures (Cambodian, Chinese, Japanese, Korean, Vietnamese and others) that perceive value in consuming a cooked product that was alive minutes before preparation. The demand for live fish (and other edible saltwater species) is growing in the United States. Discussion starts with a review of the Pacific Rim market for live fish because Asian-Americans exhibit the same food preferences typical of their countries of origin. Fish species, size and valuation will and have been carried forward with strong cultural ties to the United States.

#### Asian Pacific Rim

As Pacific Rim countries have developed stronger economies and rising per capita income so has the demand and value for edible live marine species increased. Hong Kong is currently a hot spot for the consumption of live marine species (fish, crabs, lobsters and shrimp) harvested from throughout the southern Pacific or air freighted in from Australia and the United States. The southern Chinese like to eat fish and Hong Kong is a free port not subject to tariffs. The Hong Kong chefs have developed a steaming technique for live fish that yields a product widely appreciated by the Chinese. The appreciation is spreading to Taiwan and Japan (Chan, 1999). Annual sales of live fish in Hong Kong is estimated to be 600 million to 700 million fish or about 60 percent of the live fish trade on the Pacific Rim. The other principal markets for live fish are China, Japan and Taiwan (Savoy, 1999).

Surprisingly, 75 percent of the live fish sold in Hong Kong are derived from 12 species: humphead wrasse, leopard coral trout, spotted coral trout, high-finned grouper, green grouper, flowery grouper, tiger grouper, giant grouper, red grouper, mangrove snapper and brown spotted grouper (Lau and Jones-Parry, 1999). Current retail prices can range from grouper \$20 per kilogram (\$9 per pound), coral trout \$40 per kilogram (\$18 per pound) to humphead wrasse \$60 per kilogram (\$27 per pound). However, the current Hong Kong economy is not strong and prices prior to this downturn were much higher. For example live humphead wrasse at one time sold at retail for \$180 per kilogram (\$82 per pound) (Savoy, 1999).

Hong Kong prices are directly related to season, quality, volume, certain intrinsic values for specific species and size. During seasonal festivals prices rise. Large amounts of fish entering the market immediately depress price. The incidence of ciguatera related illness, which is increasing as fish are harvested over reefs farther away from Hong Kong, affects all fish prices negatively as word spreads through the city that people are getting sick. Intrinsic value may also be related to a reputation for medicinal use (as an extreme example a live jewfish, a species reputed to have medicinal value, sold for \$10,000 in 1996) or color(Chan, 1999). Those fish with red coloration are valued because "red" is a sign of good fortune or plentifulness. The size of the live fish is critically related to its value. The fish must fit the plate with an overall nose to tail fork length of 35 centimeters to 50 centimeters (14 inches to 20 inches). Larger fish are discounted unless they were special ordered for a banquet (Chan, 1999).

#### California

Fishermen in California recently "discovered" a market for live fish. The growth in the number of fishers targeting live fish has grown considerably in the last ten years. In 1988, the

California Department of Fish and Game first recognized that a fishery existed for live fish and during 1989 counted 76 fishermen involved in harvesting live fish. In 1999, it estimated that more than 1,000 fishermen harvested live finfish. To a certain extent, harvest practices vary according to location or water depth. Wading, paddle boards, and skiffs are used to harvest fish from the intertidal zone to about 20 fathoms. California fishermen landed 415 tons of live fish during 1998 to take advantage of premium prices that ranged from two to three times the value for traditional iced product at the dock. Fresh dead prices ranged from \$.25 per pound to \$1.50 per pound and live prices ranged from \$.75 per pound to \$5.50 per pound. In addition, there are numerous off-loading points on the California coast to receive live fish into aerated holding tanks that are in-turn visited by wholesalers that consolidate the catch into aerated tank trucks (Pattison, 1999).

#### US Mid-Atlantic

Discussions with live fish buyers in the region from Baltimore to New York revealed relative uniformity in prices. Generally, delivered to the buyer price ranged from \$5.00 per pound to \$7.00 per pound for the multiple species (black sea bass, redfish, sheepshead, strawberry grouper, squirrelfish, bluefish, red snapper, mangrove snapper, skate and others) that may be used to comprise a total load of 1,500 pounds to 2,000 pounds in any one delivery. Similar to the Hong Kong market, a large delivery of one species type temporarily floods the market and drives price downward. Live fish buyers want a mixed species load of fish. Certain fish command higher prices than the norm. Puffer fish, for example, are worth \$8.00 per pound and red, copper colored redfish obtain \$5.00 per pound.

During the holding and handling of live fish some fish will die. These freshly dead fish are of interest to the live fish buyer and can be added to the load as iced product in coolers. Sellers should be aware that the buyer will expect these fish to be in premium condition with no scale loss, bruising, scars or cuts. The Maryland Department of Agriculture has recently worked up a table of species and prices that illustrates the relationship between live and fresh, on-ice prices.

Table 1. Northeast U.S. Market Prices for Two Pound Fish Courtesy Maryland Department of Agriculture March, 2000			
Species	Live per Pound	Fresh, On-Ice per Pound	
Black Grouper	\$5.50	\$4.00	

Black Sea Bass	5.50	3.00
Florida Pompano	5.00	5.50
Gray Grouper	5.50	4.00
Redfish	3.50	2.50
Summer Flounder	5.00	3.50
Yellow-tail Snapper	5.00	3.50

Fresh, on-ice fish are usually discounted from \$1.50 per pound to \$2.50 per pound (except in the case of Florida Pompano that increases \$.50). Whether the effort to carefully pack and ship fresh, on-ice fish is remunerative will depend upon the value in local markets of the species.

## **Analysis**

The analysis is divided into two major subsections. The first concerns demand, including price and other market information, and the second relates to the logistics of supplying markets.

#### Demand

Demographics, seasonality, mixed loads/distribution are included in the discussion concerning demand. Demographics are included because of the importance of the Asian community in the live fish market.

# **Demographics**

Asians or people of Asian extraction live in the US (Table 2). There are several geographic areas with large populations of Asians and people of Asian extraction or heritage. California is the largest area of concentration (3.94 million) and the Northeast is the second largest (2.24 million). The age of the Asian populations in the US are approximately the same as those for the US as a whole. The age profile of the Asian population in different locations of the US is fairly consistent, but is slightly younger in the Northeast than in California. The incomes of Asians in both regions are virtually identical. The family income of Asians is greater than that of the general US population, but the per capita income of the Asian population is less. From those data we can infer that Asian families are larger than those of the US population in general.

The 1995 median household income of the counties comprising the Atlanta area was approximately \$44,000 (ERS), greater than the US median household income of 1998. Given the consistency in income between California and Northeast Asian populations, it is likely that the income and consumption patterns of the Atlanta Asian population would be similar to that of those in the other regions. Thus, it seems likely that live fish would be welcomed by the Atlanta Asian population. While the Asian population in the Atlanta area (total population 3.7 million and 96,000 Asians) is not so large, it is large enough to warrant consideration by North Florida

fishers. The Atlanta Asian population is, after all, greater than one third of the entire population of Leon County (Tallahassee).

	Table 2. U.S.			
Category	US	California	Northeast	Atlanta
Total	9,740	3,940	2,240	96
less than 20	3,077 (31.6)	1,186 (30.1)	670 (30.0)	NA
20 - 44	4,193 (43.0)	1,631 (41.4)	940 (42.0)	NA
45 - 64	1,791 (18.4)	780 (19.8)	480 (21.6)	NA
65 and over	682 (7.0)	343 (8.7)	140 (6.4)	NA
Median Age, US all	35.2	NA	NA	NA
Median Age, Asian	31.5	32.0	31.8	NA

Source: http://www.census/hhes/income/histinc/

	Table 3. Median and Mean Incomes, 1998			
Category	All	US (\$) Asian	California, Asian (\$)	Northeast, Asian (\$)
Family: median inc.	38,885	46,637	40,623	40,634
Family: mean inc.	51,855	60,208	NA	NA
Av. Per capita	20,120	18,709	NA	NA

Source: http://www.census/hhes/income/histinc/

# Winter Season

At the outset of this research it was assumed that the winter season (approximately November through April) would be the period of the year when supplies of live fish from the central and northern Atlantic coast are limited due to weather. This hypothesis was verified. Because of limited supplies (vis a vis demand), prices are higher in the winter months than the warm season months, making the effort of catching, handling, holding and delivering live fish into this market more attractive to Florida fishermen.

Buyers confirmed that the market could readily absorb Florida live fish during the winter. They emphasized that demand is strongest in February because of the Asian New Year. However, buyers are more concerned about the overall availability of live fish due to the implementation of fishery quotas and closures. For example, in the Mid Atlantic black sea bass

was a 12 million pound fishery that now has a quota limit of 3 million pounds. Last summer New Jersey-based fishermen delivered to the live market 750,000 pounds of live black sea bass in a weight range of 1 pound to 2 pounds and a delivered price of \$7.00 to \$10.00 per pound. Buyers were concerned about what the next several years would bring in the way of fishery closures. They were very interested in the availability of live fish from Florida but were wary of making firm commitments until the quality and delivery of the product could be proven to them.

#### Mixed Loads

Fortunately for Florida Big Bend fishers, Baltimore-Washington DC-Philadelphia buyers indicated that they are not as interested in a single species as they are in mixed loads. Such loads should include at least four or five species; evenly divided in weight or number among the species. This mixed load preference indicates that the live fish market is not robust and that caution must be used when supplying the market with fish. It does did not seem that set amounts of specific species will be requested and thus there is a great possibility that the species mix can be flexible, alleviating some risk. The buyers also stated that they would like to receive orders weekly. A full load of 1,500 - 2,000 pounds of live fish could be easily attained on a weekly basis. After a business of delivering live fish is established, it is likely that more than one load per week will be ordered. Weekends are the busiest days in restaurants and because of the buying habits of retail customers, it is likely that additional fish delivery will be sought for the same day as the original order. If such is the case overhead costs will be almost doubled, but transactions costs will remain approximately constant.

## **Logistics**

A specific progression of activities necessary to supply live fish. Fish must be caught, held and maintained, and distributed. Although holding must occur before distribution, the discussion concerning distribution is presented first because the holding facility should be designed to meet the needs of distribution. Without proper distribution, the commercial aspect of the enterprise will die.

#### Distribution

Distribution includes transportation from one geographic location to another and the delivery of product to specific clients. As with all perishable product, the major responsibility of the supplier is to deliver the quantity and quality anticipated by the buyer at the agreed upon time. Distribution plays a major role in accomplishing that task. Some conditions and situations exist that would make delivery difficult to clients in the northeastern markets. The distance to those markets from Florida would make quick service difficult and costly. To overcome potential problems the distribution system must be an integrated with an effort to promote and sell live fish and the services the business is providing. The fishers must develop and commit to a marketing plan that includes specific quality and handling standards before distribution starts. As time passes the marketing and distribution plan will probably be modified based upon experience. Transportation to northeastern markets from the Panacea area will cost about \$0.50 per pound of fish and about \$0.30 per pound to Atlanta. The fish should be transported in 0.50 - 0.75 gallons of water per fish. The water should be from taken from a holding facility to maintain fish health.

A Florida-based supplier of live fish would have to make a critical decision early in the process of deciding to enter the live fish market. The choice is to sell to an established distributor, or several distributors, who would assume the risk of local delivery problems and of non or late payment from retailers, or to distribute directly to the retail trade. Delivering to established distributors reduces the handling related risk for the fisher and would be easier than delivering orders to each individual customer. If fishers were to deliver to individual customers either a smaller truck would have to be used to lower operating delivery costs with higher capital costs or the same truck for long hauling and deliveries to customers. In any event the fishers would assume delivery risk. In addition to the transportation risks assumed by delivering to multiple locations there are financial risks and decisions that must be made regarding accounts receivable or carrying cash in high risk urban environments.

## **Holding Facilities**

In many ways holding facilities are part of the distribution system. A holding facility with the ability to control water temperatures, acidity, and level of salinity is an important first step to assuring that good quality fish with as few stress-related problems as possible arrive at the final destinations. Communications must be maintained between the operators of a Florida live fish holding facility and the northeastern-based receiving facility. The facility operators must bring their water quality parameters into equilibrium. Especially important to the wellbearing of the fish upon delivery are water temperature, pH<sup>1</sup> and salinity<sup>2</sup>. Temperature during the winter months will not be a problem. Florida caught fish will be acclimated to colder water temperatures and the temperature in the hauling tanks (usually insulated to prevent rapid temperature change) will not fall at so rapid a rate as to cause problems. Over the short term a pH difference of greater than one unit and salinities that vary from 3 parts per thousand to 5 parts per thousand can cause health and survival problems for the fish. There are several exceptions to consider. Hauling live fish for 20 or more hours between Florida and Baltimore will trigger pH changes within the hauling tank water due to excretions from the fish. In order to minimize such changes the fish should be purged for two days before shipping. In addition, typical businessrelated information must be exchanged between sellers (holding facility) and buyers regarding size, volume and species of fish to be shipped or ordered.

# **Conclusions**

A minimum of two investments will have to be made in order to implement the decision to supply live fish to distant markets. A holding facility will have to be established and a live haul truck procured. In order to enter the 2000/01 market, decisions concerning organizational structure and operational responsibilities as well as those for the described investments will have to be made in short order.

<sup>&</sup>lt;sup>1</sup>Acidity or pH is a measure of the concentration of hydrogen ions in the water. The pH scale ranges from 1 to 14. A pH value of 7 is neutral. Values below 7 to 1 indicate increasing acidity and from above 7 to 14 indicate increasing alkalinity.

<sup>&</sup>lt;sup>2</sup>Salinity is a measure of dissolved salts in seawater. Sodium chloride makes up about 85 percent of the salts in seawater. Oceanic salinity, on average, is about 35 parts of salt per 1,000 parts of seawater (35 ppt). Open ocean salinities can range from 32 ppt to 38 ppt while shallow coastal waters can range from 27 ppt to 30 ppt and estuaries can vary from 0 ppt to 30 ppt.

Critical to the success of a Florida-based live fish business is the decision to become a supplier to an established distributer or distributors or to deal directly with customers. In both cases, because of the strong association of the live marine fish business with Asian Americans, it is strongly recommended that a well-designed and intensive effort be made by Florida fishers to meet and get to know their buyers. Asian Americans are averse to establishing a business relationship without first getting to know their suppliers on a one-on-one basis.

It is also recommended that a new business start by establishing business relationships with live fish buyers that are close to home. Several Florida and Georgia-based businesses buy live marine fish. Those contacts are included in Appendix B. The Florida supplier may experience competition from other live fish suppliers, but that background will prove invaluable to the honing of the business and technical skills necessary to be successful.

As a next step, and only after experience has been gained in product quality, desired species, delivery and handling, the live fish supplier should begin the planning necessary to deliver to the northeastern US market. There may be less competition from other live fish suppliers, especially during the winter months, but the market will probably be more complex with a greater array of Asian cultures, product demands (quality and volume) and delivery situations.

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# Appendix A

Division of Aquaculture 1203 Governor's Square Boulevard, Fifth Floor Tallahassee, Florida 32301

Fax: 850/410-0893

# Live Marine Fish Market Survey

	we wanthe fish wanket surve	J
Please correct and/or add informat	tion to the following company info	ormation:
Contact person:		
Company name:		
Company address:		
Phone:		
E-mail:	Web site:	
Questions:		
Or, I am interested in being consale (check one blank): Yes	eck one blank): Yes No. ntacted by commercial fishermen o No this question because you are	ffering live marine fish for
· ·	cies, please go to questions 5 a	
2. Please indicate your current or on a (pick one):	projected amounts of live marine f	fish that you do or might buy
weekly basis	(pounds) monthly basis	(pounds)
range of prices) and preferred live the different species of flounders,	that you are interested in buying an weight in pounds. Please note if y grouper, grunts, mullet, snappers on ary name and fill-in prices on the factorial states.	ou are not concerned about r sea trouts, check "species

Species Summer Price Winter Price Preferred Weight

Amberjack		
Black Drum		
Black Sea Bass		
Bluefish		
Flounder ( species does not matter):		
All Flounder		
Gulf	<del></del>	
Southern		
Summer		
Gaff Topsail Catfish		
Grouper ( species does not matter):		
All Grouper		
Black		
Gag		<del></del>
Nassau		
Red		<del></del>
Scamp		
Snow		<del></del>
Warsaw		
Yellowedge		
Yellowfin		<del></del>
Grunt		<del></del>
Jack Crevalle		<del></del>
Mojarra	<del></del>	<del></del>
Mullet ( species does not matter):		
All Mullet		
Black		
Silver		
<del></del>		
Mutton Snapper		
Pompano Sand Perch		
Sea Trout ( species does not matter):		
All Sea Trout Sand		<del></del>
<del></del>		
Silver	<del></del>	
Spotted		
Sheepshead		
Snapper ( species does not matter):		
All Snappers		
Gray		
Lane		
Mutton		
Red		

(Question 3 continued)				
Species Summe	er Price	Winter Price	Preferred Weig	<u>eht</u>
Silk				
Vermillion				
Yellowtail				
Sturgeon				
Tripletail				
White Grunt			<del></del>	
Whiting				
Additional live species that are	e were not listed,	but that you are in	nterested in buying:	
<u>Name</u>	Summer Price	Winter Pr	rice Prefer	red Weight
				<del></del>
				<del></del>
4. When purchasing live fish	your most comm	on payment pract	tice is (check one)?:	
pay immediatel	y by cash or che	ck	pay on account	
5. If you do not purchase live quantities and prices?	marine fish, wha	at live species do y	ou purchase and who	at are typical
<u>Name</u>	Price R	ange Qu	<u>uantity</u>	
			<del></del>	
			<del></del>	
6. If you are a contract hauler	, what are the tr	uck load maximun	ns for:	
summer	(pounds)	winter	(pounds)	
and, how many trucks	do vou have ava	ilable for Florida d	luring:	
,	do you have ava	indoic for Fromad d	$\mathcal{E}$	

For all survey respondents, please: 1) forward this survey to live marine fish buyer(s), or 2) list potential buyers for us to send them a survey. Please return the survey in the enclosed envelope or fax to 850/410-0893.

# Appendix B

# Live Fish Buyer List

A.E.G. Trading 206 Centre Street

New York, New York 10013 Telephone: 212/966-6299\

Jon Chaiton

AmeriFresh Seafood, Division of Emerald

Partners, Inc.

Post Office Box 4484 Marietta, Georgia 30061 Telephone: 770/928-3920

Fax: 770/928-1206

Danny Chan Aquabest, Inc. 125 East Broadway

New York, New York 10002 Telephone: 212/285-1422 Fax: 212/964-2210

John Chen 68 John Street

Brooklyn, New York 11201 Telephone: 718/625-7487

Thomas Chou Captain Thomas 937 North Front Street Philadelphia, Pennsylvania 19123

Telephone: 215/829-1260

John Agnelli, President Colorado Corona (Canada) Inc. 40 Beverly Street Ontario, Canada M 5T 1X9 Telephone: 416/591-6949 Fax: 416/221-5190 Chinatown Seafood & BBQ Restaurant Chinatown Seafood Market 1103 North Mills Avenue Orlando, Florida 32803 Restaurant phone: 407/896-9383

Market phone: 407/896-0280

Fax: 407/896-8850

E-mail: mabelfan@aol.com

Beaver Fisheries 20 Taber Road

Etobicoke, Ontario Canada M9W 3A5

Telephone: 416/748-6416

Fax: 416/748-9361

Jonathan Fan, Senior Manager D & J Trading Company, Inc.

Post Office Box 117

New York, New York 10013-0117

Telephone: 718/259-1887

Fax: 718/259-7923

Far East Fishing Industries 2172 East 19<sup>th</sup> Street Brooklyn, New York 11229 Telephone: 718/891-2948 Fax: 718/934-4714

Fortino's Supermarket Ltd Post Office Box 2600 90 Glover Road Hamilton, Ontario Canada L8N 4G1 Telephone: 905/389-9098

Tai Shing Liu Hang Li Company 369 Park Avenue Brooklyn, New York 11205 Telephone: 718/875-4909 Fax: 718/875-4913

Happy World America Company 111 East Main Street Gloucester, Massachusetts 01930 Telephone: 508/283-1324

Fax: 301/208-2042

Jon Chaiton
Inland Seafood
1222 Menlo Drive
Atlanta, Georgia 30318
Telephone: 404/350-5850 ext

Telephone: 404/350-5850 ext. 188

Fax: 404/350-5855

Kazy Kurokawa Kazy's Gourmet 9256 Markville Drive Dallas, Texas 75243

Telephone: 972/235-4831 or 235-4835

Fax: 972/235-0408

Michael Lam 115 Ravel Road North York, Ontario Canada M2H 1T1 Telephone: 416/298-4416 Fax: 416/298-4833

Edward Shen, President MIE Group Gourmet Seafood Inc. Gourmet Inc. HPS Inc. 7600-G Rickenbacker Drive Gaithersburg, Maryland 20879 Telephone: 301/212-9655 Fax: 301/208-2042

The New World Group, Inc. 39 Bowery Street, Suite 98 New York, New York 10002 Telephone: 212/941-0538 Fax: 212/941-4696

Richmond, BC Canada V6V 2R5 Telephone: 604/278-2998

Fax: 604/278-6829

E-mail: francistchao@home.com E-mail: nexus@axionet.com

Alex Fung Seafood City Grocery, Inc. 7733 Olive Boulevard St. Louis, Missouri 63130 Telephone: 314/721-6688 Fax: 314/721-2995

Robert Newberry Stoney Ridge Aquaculture Box 36 Crump, Maryland 21628 Telephone: 410/778-1382

Sung Ye International Post Office Box 130403 New York, New York 10013-0995 Telephone: 800/850-SUNG or 917/846-6803

Joey Daniels
Wanchese Fish Company
Post Office Box 369
Wanchese, North Carolina 27981
Telephone: 252/473-5001
Fax: 252/473-5004
Web Site: http://www.wanchese.com

Phat Minh Mot, Chairman Wing Phat Supermarket 1122-38 Washington Avenue Philadelphia, Pennsylvania 19147 Telephone: 215/336-2803 or 426-4777

Fax: 215/336-2721

Francis Tshao Nexus Seafood Trading 107-2691 Viscount Way Mike Crosby World Trade Centre 1800 Argyle Street, Suite 900 Halifax, Nova Scotia, Canada B3J 3N8



Telephone: 902/420-7233

Fax: 902/420-8308

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#### LIVE SEAFOOD AND THE PROCESSING/DISTRIBUTION SYSTEM

Jon Chaiton

Director of Quality Assurance Inland Seafood 1222 Menlo Drive Atlanta, GA 30318

Tel: 770-928-3920 Fax: 770-928-1206

E-Mail: <pooch@mindspring.com>

# **Presentation Summary**

Seafood only becomes a perishable product after it dies. Extending the time the product stays alive so that it is arrives alive, closer to the end user, reduces decomposition levels and allows the product to be sold for a higher price due to increased quality.

Typically, live seafood handlers believe they will only receive top dollar if the products are sold alive to a live market. The problem with this line of thinking is that it is like having tunnel vision. Ethnic and live markets in the United States are limited in size and number and can not accommodate the ever increasing group of live seafood handlers and aquaculturists that are bent

on getting their product to the market in a live state. In the United States the infrastructure and demand for holding and selling live seafood is not equal to that of Japan or Asia.

There exists an alternative for marketing live seafood to live buyers. This alternative is based on quality. But it takes knowledge of live holding and transport techniques coupled with an understanding of the marketplace to be able to see the big picture and reap the benefits. Rather than suffer the frustration of trying to get live fish into the live market why not look at receiving top dollar a different way; through delivery of top quality seafood. In the United States the market place for fresh dead, high quality seafood is thousands of times larger than the live market.

Two scenarios are described. The first outlines how and why fish are typically of a reduced quality through standard traditional seafood handling and distributions lines. The second describes how top dollar can be earned by providing high quality seafood through utilization of standard live holding components and techniques.

# \*\*\* Social, Ethical and Humanitarian Issues \*\*\*

# **Animal Welfare Considerations in Live Aquatic Transport**

**Jesse Chappell**, President, Southland Fisheries Corporation. Hopkins, South Carolina

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# The New Social Ethic for Animals: Implications for the Live Aquatics Industry

**Bernard Rollin**, Department of Philosophy, Colorado State University, Fort Collins, Colorado

\*\*\*\*\*

# Animal Ethics and the Live Aquatic Animal Trade

**Bernard Rollin**, Department of Philosophy, Colorado State University, Fort Collins, Colorado

# ANIMAL WELFARE CONSIDERATIONS IN LIVE AQUATIC TRANSPORT

Jesse Chappell

President Southland Fisheries Corporation 600 Old Bluff Road Hopkins, SC 29061 Tel: 803-776-4923

Email: <sfcfish@aol.com>

# **Presentation Summary**

Production of aquatic animals and plants has its own set of risks. Transportation to the client in a healthy, robust condition is of prime importance to the producer and client alike. A discussion of the causes of stress and the immediate and near term consequences as a result of inappropriate handling and transportation will be aired.

Current best methods to avoid stress on fish in transport will be discussed beginning with harvest carrying through grading, parasite prophylaxis and load out onto ground and air transport equipment systems. Also discussed will be some of the many places in the normal protocol plans go awry and cause stress on fish and culturist alike.

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# THE NEW SOCIAL ETHIC FOR ANIMALS: IMPLICATIONS FOR THE LIVE AQUATICS INDUSTRY

Bernard Rollin

Department of Philosophy Colorado State University Fort Collins, CO 80523 Tel: 970-491-6885 or 6315

# Presentation Summary and Paper (Animal Ethics and the Live Aquatic Animal Trade)

Over the past three decades, Western society has grown increasingly concerned with issues of animal treatment. This has occurred because of demographic changes, media coverage, increased moral awareness, new theoretical approaches to animal obligations, and changes in animal use. The traditional anti-cruelty ethic no longer suffices; most animal suffering is not the result of cruelty. Thus new laws have proliferated reflecting this new concern about suffering "beyond cruelty." Implications for the live aquatic animal trade and a strategy for a proactive response will be discussed.

# ANIMAL ETHICS AND THE LIVE AQUATIC ANIMAL TRADE

Bernard Rollin, Department of Philosophy, Colorado State University, Fort Collins, CO 80523

Anyone who reads a newspaper or watches television cannot have failed to notice an ever-increasing social concern with animal treatment during the past three decades in the U.S., Canada, Australia, New Zealand and Western Europe. This concern has had a major impact on all areas of animal use in society and, in the U.S., has been operative on federal, state, and local legislative and regulatory levels. According to the National Cattlemen's Association and the National Institutes of Health who have no vested interest in inflating the influence of this issue. since 1980 Congress has received more letters, phone calls, faxes, and personal contacts on animal welfare issues than on any other matter. Numerous locales have abolished the steeljawed trap by statute; others like Colorado, by public referendum. Spring bear hunts, where there is a danger of shooting a lactating mother and orphaning cubs, have suffered similar fates. In Colorado, over 70% of the public voted to abolish the hunt; in Ontario, it was abolished by the Minister of the Environment, despite the fact that it brings in considerable money to the province. In Europe, confinement agricultural practices that are the mainstay of North American animal agriculture have been swept away by public concern expressed in legislation, with Sweden leading the way in 1988 with what the New York Times called a "Bill of Rights" for farm animals. Whereas 20 years ago one could find no U. S. federal legislative proposals pertaining to animal welfare, recent years have witnessed as many as 60 such proposals each year in Congress alone, ranging from attempts to protect animals in research, to saving marine mammals from becoming victims of tuna fishermen, to curtailing the exotic bird trade. Other animal uses, such as cosmetic testing, have been changed by people voting with their pocketbook; the Body Shop became a billion dollar company by disavowing such testing. According to the executive director of the American Quarter Horse Association, their single biggest expense is tracking horse welfare legislation at all levels of government. In 1998, such proposed legislation filled a volume the size of a big-city telephone book. And in California, last year voters passed a bill making the slaughter of horses for food or shipping horses for that purpose a felony.

Perhaps most indicative of the degree of U.S. public commitment to animal welfare was the passage of two pieces of federal law in 1985 aimed at regulating the use of animals in research, and particularly at minimizing animal pain and suffering. The reason these laws are so significant is that they were vigorously opposed by the research community, who went so far as to threaten the public with grave danger to human health, and particularly to children's health, if the laws were passed. The research community even produced a less than subtle film entitled "Will I be All Right, Doctor?," with the query coming from a sick child and the reply coming from a pediatrician who in essence affirmed, "You will be, if they leave us alone to do as we wish with our animals." Yet despite this naked appeal to fear, the expensive research animal protection laws moved through Congress easily, even though roughly 90% of the animals used in research are rats and mice. If the public can generate sufficient moral concern about these animals to tolerate alleged risks to children's health, despite the fact that they are not cute and cuddly, are indeed repulsive to most people and traditionally associated in the public mind with filth and disease, it is clear that the treatment of any animal can become the focus of public concern.

It is thus quite manifest that animal welfare is a force to be reckoned with socially, more so than ever in human history. In work that I did for USDA explaining the emergence of this

social phenomenon, I distinguished five reasons why it has developed so strongly during the last 30 years.

In the first place, major demographic changes have altered the paradigm for what an animal is in the social mind. A century ago, when the society was highly agricultural, if one had asked the man in the street, urban or rural, to state the first word that came to his mind when one said "animal," it would have been "horse," "cow," "food," "work," etc. With well under 1% of the public engaged in production animal agriculture, and with increasing urbanization, this is no longer the case. The paradigm for an animal is now the companion animal, with almost 100% of the pet-owning public declaring that their animals are "members of the family."

Second, the mass media, most notably newspapers and television, have discovered that "animals sell papers," (recall Animal Planet, an entire television station devoted to animals), and that exposés of animal abuse sell even more papers. Such exposure has greatly sensitized the public to animal welfare issues. A significant example occurred some years ago when the press revealed that two whales were trapped in an Arctic ice floe. In response to a major U.S. public outcry, the Russians sent an icebreaker to release these animals. Was this an overflowing of Russian compassion? Hardly. ("Russian compassion" is, like "military intelligence," an oxymoron!) Rather, some clever Kremlin politicians realized that the cheapest way to win U.S. public opinion was to help the animals. If the U.S. public had not been aware of the situation, the Russians doubtless would have sent a whaling boat.

Suffice it to say that surveys of the general public since 1990 repeatedly reveal that at least 85% of the general public believe animals have rights!

Third, the last 50 years in the U.S. have seen the American citizen's moral vision expand to include a wide variety of traditionally disenfranchised human beings — black people, women, handicapped persons, children, and so on. This same "moral searchlight" has inevitably focused on the environment and on animals, especially since many animal activist leaders are veterans of other moral crusades, such as civil rights, women's causes, and the labor movement.

Fourth, numerous philosophers and scientists have offered rationally based, readable, moral arguments for extending greater moral status to animals in ways that have captured the public imagination. Jane Goodall, for example, has turned the bulk of her attention to animal welfare issues. Peter Singer's book, <u>Animal Liberation</u>, has been in print constantly for 25 years. Books like the <u>The Horse Whisperer</u> and <u>When Elephants Weep</u> are best-sellers.

Finally, and most important, the major changes in animal use that have occurred since World War II have called forth a demand for new and expanded ethical categories. Traditional animal use was largely agricultural – food, fiber, locomotion and power. The essence of traditional agriculture was <a href="https://www.husbandry">husbandry</a> (from the Old Norse word for "bonded to the household"). Husbandry meant putting the animals into the ideal environment they were evolved for, and then augmenting their natural ability to survive with protection from famine, drought, predation, disease, etc. We put square pegs into square holes, round pegs into round holes, and created as little friction as possible doing so. If we harmed the animals we harmed ourselves. So powerfully is this "ancient contract" ingrained in the human psyche, that when the Psalmist wishes to metaphorize God's relationship to Man, he uses a paradigm case of husbandry – the shepherd: "the Lord is my shepherd, I shall not want. He leadeth me to green pastures. He maketh me to lie down beside still waters. He restoreth my soul." We want no more from God

than a shepherd provides for his animals. Thus as long as husbandry was the guiding principle of agriculture, the only social ethic needed was <u>prohibition of overt cruelty</u>, to catch the few deviates who caused suffering for no reason.

The anti-cruelty ethic is almost as old as human history. It can be found in the Bible, as in the injunction not to muzzle the ox when it is threshing grain. The owner of the ox loses little by letting the ox eat the few bits of grain that fall down; the animal suffers greatly by not being permitted to enjoy a favored food. Muzzling the ox creates <u>unnecessary suffering</u> and no human benefit. The prohibition against cruelty was carried on through the Rabbinical tradition, ancient and medieval philosophy, and into modern times, where it is law in virtually all civilized societies.

Traditionally, given predominantly agricultural uses of animal, the anti-cruelty ethic was designed to catch sadists and psychopaths who, as modern research has confirmed, begin with animals and move to people. The ethic was not meant to preclude all infliction of pain on animals — some pain was taken for granted, for example in branding, castration, and dehorning cattle or trapping varmints. Such pain was perceived as necessary to "minister to the necessities of man," as one law puts it, or rather to minister to normal human needs and desires. Anti-cruelty was directed against deliberate, willful, unnecessary, purposeless, sadistic, deviant infliction of pain and suffering, or outrageous neglect, such as not feeding and watering.

In short, traditional agriculture was roughly a symbiotic fair contract — "we take care of the animals and they take care of us," as western ranchers still say. But this changed after World War II. With the loss of agricultural land and labor to urbanization, an industrialized view of agriculture emerged to produce cheap and plentiful food and industry values of efficiency and productivity replaced husbandry values. Given the advent of "technological sanders" such as antibiotics and vaccines we could now force square pegs into round holes, and put the animals into situations where though their welfare was negatively affected, profit and productivity were not.

The infliction of suffering that was not deliberate cruelty was further strengthened by the rise of large amounts of biomedical research and testing on animals at roughly the same time. Again, though researchers are invariably motivated by decent considerations such as curing disease and promoting health, and corporations by the desire to protect the public against toxicity of household products, and themselves from lawsuits, not by cruelty, the net result was an explosion of animal suffering that inexorably called forth new ethical concepts beyond deliberate cruelty.

In fact, a moment's reflection reveals that the vast majority of animal suffering today is not the result of cruelty, but rather is the result of decently motivated activities. For example, the cases of sadistic cruelty pale in comparison to the fact that we produce 8 billion broiler chickens a year in confinement, with 80% of them bruised or fractured as they go to market. To go "bey ond cruelty," then, society has looked to the ethical concepts it uses for people and applied them, appropriately modified, to animals. In summary form, the new ethic says that when we use animals, as when we use people, we must respect their basic biological and psychological needs and natures (such respect for humans is encoded in rights), what I have called their telos, following Aristotle — the "horseness of the horse," the "pigness of the pig." Since such respect no longer follows automatically from husbandry, this ethic demands that we legislate or

With public sensitivity to animals so intensified by all of the factors enumerates above, it is no surprise that social tolerance for animal abuse – whether the result of cruelty or not – has diminished precipitously. The new ethic of respect for animal needs and natures has abolished the old zoos that were little more than prisons for animals, for example. But the new concern for animals has also considerably broadened and expanded what counts as cruelty, and has also considerably truncated the sorts of reasons that provide valid justifications for hurting animals. In the past, society was content to interpret the prohibition against unnecessary suffering in the cruelty laws as meaning that animal suffering would be tolerated only as long as it wasn't sadistic, or totally purposeless, or if it was inconvenient or expensive to eliminate it. Ever increasingly, society will accept animal suffering as necessary only if a) the suffering occurs in the context of a use beneficial to most people and b) it is impossible to alleviate, as occurs when we do biomedical research for human or animal health on animals and create disease, injury, stress, etc. in them. Even in such cases, where society sees suffering as inevitable, it will control such behavior to assure that such suffering is minimal, as when the laboratory animal laws mandate pharmacological control of pain, and living environments that suit the animals' natures.

This new way of thinking has had and will have considerable impact on all of animal use. It will, as it has done the world over in agriculture and research, proscribe activities that significantly violate animal's natures. But, perhaps even more important, it will no longer tolerate suffering to which alternatives exist, and no longer tolerate major suffering that does not benefit society in general. In other words, what is actionable under the anti-cruelty ethic and laws will be expanded, as when USDA was successfully prosecuted in 1984 when it mandated hot iron face-branding of dairy cows it had bought to thin the U.S. herd. A New York State judge said that USDA was indeed guilty of cruelty, for it had not attended to or considered non-painful ways of identifying these animals.

This, then, is a brief summary of the social ethical forces characterizing society's views of animals at the beginning of the new millennium. All indications point to this ethic expanding, not diminishing. And, like most other ethical movements, as its zeal increases it will claim some victims who cannot accommodate new ways of thinking. All too many middle-aged men, for example, who grew up in an era when whistling at women was acceptable if not <u>de rigueur</u>, have been bloodied in the context of a world wherein one cannot even compliment a female co-worker on her appearance without being accused of seeing her merely as a body.

In sum, as social concern about animals has grown in society, three responses have developed that have had or will have major impact on those who make their living from animals: While society is not yet generally abolitionist in its view of animal use, it has shown its willingness to abolish "frivolous uses" such as horse tripping, cosmetics testing on animals, and even circuses. Usually, however, it will tend to try to assure that animals used by humans live full and decent lives, with their natures and basic interests met and their suffering minimized.

1) As mentioned earlier, the legal system will move "beyond cruelty" in regulating animal treatment as the restricted nature of the anti-cruelty ethic is understood. A beautiful explanation of this move can be found in a 1985 case animal activist attorneys brought against the New York State Department of Environmental Conservation (or land management). The lawyers were after the steel-jawed trap, but knew that previous attempts to prosecute trappers

under cruelty laws were thrown out by the Courts since the trap was a "standardly accepted device." This time they tried a different tack, arguing that the New York State government department was guilty of cruelty not because it allowed the use of the trap <u>per se</u>, but because such use was unregulated. Thus an injured animal could be held in the trap indefinitely without food, water or medical attention, which did count as cruelty.

The judge's response was ingenious. If it were up to me personally, he affirmed, he would ban the steel-jawed trap immediately, as it has been banned in many countries. But, he pointed out, it is not up to him. The society has not spoken against the trap for fur, pest control or recreation. Thus, if the plaintiffs wish to end the trap use, they should change the social ethic and go not to the judiciary, but to the legislature.

As we have indicated, citizens increasingly are taking this tack and hence the proliferation of laws we mentioned earlier. Laws could easily be passed limiting practices you take for granted which either cause suffering or violate animal nature.

2) Sympathetic judges and prosecutors will increasingly expand cruelty notions beyond the deviant and intentionally sadistic to anything causing pain that could be avoided, as we saw in the USDA face-branding decision. Precedent for this sort of approach exists in your industry. As early as 1911, a New York judge pointed out that what counts as cruelty changes with degree of social concern, and that the concept could in principle apply to turtles being imported for soup who were placed on their backs and tied together by a rope passing through a hole in the fin of such animal, or to live codfish thrown in barrels of ice and sold as live cod, or to animals cooked alive.

More recently, in the past two years, animal rights groups -- including Chinese groups -- have brought suit against merchants in San Francisco's Chinatown for cruelty for keeping live fish and other animals under conditions of pain, suffering, distress, and deprivation.

3) Campaigns can be launched to boycott animal products perceived to be produced or transported cruelly. Such campaigns have been directed against <u>paté de foie gras</u> produced by force-feeding, tuna that uses nets imperiling dolphins, the live lobster trade, and has virtually destroyed the white veal industry.

What areas of your industry are vulnerable?

First of all, we have mentioned the furor in Chinatown. The same sorts of concerns could be directed against routine practices in your industry. These include the decompression associated with fishing leading to rupture of animal organs; netting practices; death by suffocation when animals are thrown on ice; sorting of fish using spiked rods; the practice wherein crabs have legs torn off and are thrown back to regenerate. It is revelatory to me about evolving social thought that some ten years ago, at an annual meeting of the fishery managers of Colorado and Wyoming, hardly radical enclaves, participants expressed major concern with catch and release fishing, and the suffering it engenders. It is now far more widely accepted than ever before that fish and other aquatic animals feel pain. It is further known that fish are among the animals most susceptible to stress and stress-induced disease, which economic rationality above dictates you would reduce -- the social ethical concerns simply increase the imperative.

Second, the transport of live fish involves much animal suffering. Some carp have their months sewn together for transport to prevent cannibalism. Other fish are transported with insufficient oxygen. Many are crushed; many die of heat stress or decimation. Still other sea life such as lobsters have their claws fastened shut. Many animals shipped by air die from extremes of temperature on the tarmac.

Third, the sale and boiling of live shellfish – shrimp, lobsters, and crabs, has raised serious opposition in Britain, with main stream moderate groups such as RSPCA and UFAW supporting restaurant boy cotts affirming that the animals are suffering, a claim buttressed by research in the U.K. A new, humane stunner has been developed. PETA has orchestrated an effective campaign some years ago demanding that large, old lobsters be returned to the sea.

These are just a few of the issues that I, as an outsider, see as obviously placing your industry in jeopardy in the face of the new ethic we outlined. I'm sure you could greatly proliferate examples from your own specialized knowledge. The obvious question, then, is what you should be doing proactively to avoid consumer boycotts, disastrous cruelty cases where even if you win you lose, and onerous regulations devised by people who mean well but don't understand the industry.

For twenty-five years, I have worked to help various animal user groups stay in accord with the social ethic for animals. After five years of working with the CSU veterinary school, I was gratified to find that we were written up in <a href="Nature">Nature</a> as the best animal-using campus from an animal welfare point of view in the U.S. I was also part of the group that wrote the 1985 U.S. federal laws that helped assuage public concern about the treatment of animals in research. I have also worked with U.S. cattlemen and the governments of the U.S., Canada, Holland, Australia and New Zealand to achieve similar goals and am currently creating a mechanism for self-examination with the National Western Livestock Show and Rodeo.

There are two notions pivotal to the success we have enjoyed. One is to embark on a campaign of detailed and critical self examination. An industry like yours must have an inventory of practices that may be out of harmony with the emerging ethic we have described.

Second, you must continually monitor and explore the emerging social ethic and use it as a yardstick to gauge industry activities and future plans.

Third, you must have viable action plans for rectifying and changing the problematic practices you unearth. If you tell the truth, admit your shortcomings, and have a plan for correcting problem areas, the public will give you some leeway and allow you reasonable time to change established practice. If you lie or prevaricate or attempt to obfuscate, on the other hand, you will be relentlessly plagued by the media. Remember: if Nixon had told the truth, he probably would have remained President – the American public, at least, tends not to kick you when you are down and admit your problems.

Towards these ends, I would recommend that you immediately plan a conference or large portion of a conference specifically focusing on animal welfare issues in your industry and on the emerging social ethic for animals (if nothing else, this shows the public you are concerned). Contrary to human nature, it would be wise to listen to and work with your moderate and rational critics. After you have explored the issues, you should set up a committee of top people from the

industry to explore alternatives to morally unacceptable practices. (Many animal welfare problems and the stress they occasion are in any case also costly to the industry in the form of sick, injured, or dead animals.) You should also set up a timetable for implementing changes, express concern for and commitment to proper animal treatment, and publicize your plan for self-regulation.

The trick is to behave proactively and preemptively – if you wait for a crisis, it will be too late. And do not make the mistake of directing your ire against extremists – in the end, it is the general public, not the most radical activists who must be satisfied with your commitment to animal welfare.

## EAST COAST LIVE! 2000 The Business of Marketing Live Aquatic Products



Radisson Hotel Annapolis, Annapolis, Maryland November 1-4, 2000

# Handling, Inventory and Distribution Methods

# Handling and Transport of Live Fish

George Nardi, Great Bay Aquafarms, Portsmouth, New Hampshire

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# **Live Seafood Shipping Components and Systems**

Jon Chaiton, Director of Quality Assurance, Inland Seafood, Atlanta, Georgia

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# Aquatic Live Holding Systems in The Retail Environment

**Nareg Grigorian**, Vice-President Marine Biotech, Inc., Beverly, Massachusetts

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On the Road Again: The Business of Transporting and Delivering Live Fish

Mark Frey, Frey's Fish Ponds, West Chester, Pennsylvania

\*\*\*\*\*\*

# **Domestic and International Air Shipments of Live Aquatic Products**

Fred Patterson, US Airways, BWI Airport, Baltimore, Maryland

## HANDLING AND TRANSPORT OF LIVE FISH

George Nardi

Great Bay Aquafarms Inc. 153 Gosling Rd. Portsmouth, NH 03801 Tel: 603-430-8057

Fax: 603-430-8059

Email: <gaquafarm@aol.com>

# **Presentation Summary**

Transport survival of live fish is critical to the success of commercial fish farms. There are a variety of transport methods that have routinely been used with success, but variables, such as size, species, density and length of transport greatly effect this success. Great Bay Aquafarms has experience in the transport of juvenile through market size summer flounder and has identified a number of issues that need to be addressed when working with a new species, particularly flatfish versus roundfish.

Water quality issues related to type of transport, density and size of fish revolve around the ability of the transport to minimize stress. Our experience in transport has been learned through some trial and error. Both the successes and failures of this experience will be discussed. Commercial success requires maximizing the number of fish to volume of water while maintaining

a high degree of survival for subsequent grow-out.

\*\*\*\*\*

## LIVE SEAFOOD SHIPPING COMPONENTS AND SYSTEMS

Jon Chaiton

Director of Quality Assurance Inland Seafood 1222 Menlo Drive Atlanta, GA 30318 Tel: 770-928-3920

Fax: 770-928-1206

E-Mail: <pooch@mindspring.com>

# **Presentation Summary**

Proper knowledge and application of live seafood shipping components and systems is essential to maintain healthy fish and shellfish in any non-natural environment, especially when species are held in high density. Options in tanks, filters, pumps aerators, solid removal, temperature control, de-gassing and sanitation are explained.

Component applications for various transport and holding systems including: On-board vessel transport, overland transport, static holding, and temporary holding are discussed. Principals such as side loops, flow control, low-head low-energy systems, live seafood packing and systems designs to minimize stress and optimize health are also discussed.

\*\*\*\*\*\*

## AQUATIC LIVE HOLDING SYSTEMS IN THE RETAIL ENVIRONMENT

Nareg D. Grigorian

Vice President Marine Biotech, Inc. 54 West Dane Street, Unit A Beverly, MA 01915 Tel: 978-927-8720

Fax: 978-921-0231

Email: <nareg@marinebiotech.com> Website: <www.marinebiotech.com>

# **Presentation Summary**

The use and management of aquatic holding systems is no longer an issue exclusive to the production aquaculturist, research scientist and aquarist. Expanding commercial interest in marketing live aquatic species, both as a bulk commodity and for retail point of sale merchandising, places unique demands on live holding systems. Maintaining live aquatic species requires special consideration in order to preserve product quality and ensure profitability. An outline will be presented providing the Seafood Retailer with a checklist of considerations, an overview of available equipment, and a look to the future as the industry evolves.

Historically, live holding systems in the retail setting have been relegated to the "lobster tank" in the corner. Often cloudy and brown the water and the product within made a less than appetizing display. Keeping pace with merchandising trends, today's live holding systems have developed into sophisticated machines dressed as contemporary furniture. Purveyors of fresh live seafood are interested in more than selling live lobster. Varieties of live aquatic species are now being evaluated for retail sale. Marine and freshwater species, shellfish, finfish, and crustaceans are all candidates for live aquatic vending.

When making a purchasing decision, the retailer must look under the hood. The machine being considered must satisfy not only merchandising objectives for styling and decor but also the specific physiologic requirements of the target species, and the overall cost of ownership of the equipment. As more "exotic" and non-traditional species are being traded, the retail manager must be aware of and compliant with regulatory, hygiene and safety issues. The machine must create an environment that addresses these specific criteria.

Being an educated consumer in this market is paramount to success.

# ON THE ROAD AGAIN: THE BUSINESS OF TRANSPORTING AND DELIVERING LIVE FISH

Mark Frey

Frey's Fish Ponds 217 East Evans Street West Chester, PA 19380 Tel: 610-738-3200

Email: <markfrey@gte.net>

# **Presentation Summary**

This presentation reviews the technical and logistical requirements for surface transport of live sportfish and foodfish to locations along the eastern seaboard and midwest. Practical considerations for successful handling and delivery are described along with the equipment used for live hauling.

\*\*\*\*\*\*

# DOMESTIC AND INTERNATIONAL AIR SHIPMENTS OF LIVE AQUATIC PRODUCTS

Fred Patterson

Cargo Sales US Airways BWI Airport Baltimore, MD 21240 Tel: 410-993-4976

# **Presentation Summary**

This presentation reviews the technical and logistical requirements for shipment of live aquatic products to both domestic and international destinations. Live product trans-shipment activity at Baltimore-Washington International (BWI) Airport is described along with support facilities and services. Examples include cold storage and the only U.S. Fish and Wildlife Service inspection gateway in the Mid-Atlantic region with on-site inspectors to expedite clearance of live animals, fish and game.

# EAST COAST LIVE! 2000 The Business of Marketing Live Aquatic Products



Radisson Hotel Annapolis, Annapolis, Maryland November 1-4, 2000

# Resource Issues, Regulations and the Live Aquatics Industry

# **Interstate Shipment of Live Aquatic Products**

**Tom Ellis**, Director, Aquaculture and Natural Resources North Carolina Department of Agriculture and Consumer Services. Raleigh, North Carolina

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# Interactions Between Regulatory Agencies and Live Aquatic Industries: Case Studies of the Atlantic States Marine Fisheries Commission

**Heather Stirratt**, Fishery Management Plan Coordinator Atlantic States Marine Fisheries Commission. Washington, DC

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# Non-indigenous Species and the Live Aquatics Industry: Risks and Potential Impacts of Exotic Introductions

Carrie Selberg, Habitat Specialist Atlantic States Marine Fisheries Commission. Washington, DC

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# U.S. Fish and Wildlife Service Regulatory Requirements for Shipping Live Aquatic Products

**Catherine Cockey**, Wildlife Inspector U.S. Fish and Wildlife Service, Baltimore, Maryland

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# **Aquatic Animal Health Certification for International Trade**

Dr. Mark Dulin

Animal and Plant Health Inspection Service (APHIS), USDA. Washington, DC

# INTERSTATE SHIPMENT OF LIVE AQUATIC PRODUCTS

Tom Ellis

President, National Association of State Aquaculture Coordinators (NASAC) and

Director North Carolina Department of Agriculture & Consumer Services P.O. Box 27647 Raleigh, NC 27611 Tel: 919-733-7125

Fax: 919-733-1141

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# **Presentation Summary**

Do you know the intrastate and interstate regulations for transporting live fish across the nation? What about the rules in your own state? Where do you go for permission?

This presentation provides a farmer, hauler or purchaser of live aquatic animals, insight into the requirements of various states across the nation. Situations (health certification, species, triploidy, etc.) which are of no concern to some states are of major importance to others. Examples will be presented of rules and contact points for movement of Yellow Perch, Rainbow Trout and Triploid Grass Carp.

# INDUSTRIES: CASE STUDIES OF THE ATLANTIC STATES MARINE FISHERIES COMMISSION

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# **Presentation Summary and Paper**

The Atlantic States Marine Fisheries Commission (ASMFC) is an inter-jurisdictional body responsible for fisheries management in state waters along the Atlantic seaboard of the United States. The purpose of the Commission is to promote the better utilization of the fisheries of the Atlantic coast through the development of an interstate fishery management program and through the prevention of physical waste of Atlantic fisheries from any cause. The Commission currently manages over 21 shell, marine, and anadromous species. Many of these species are harvested for sale in live fish markets.

Of the ASMFC's managed species, Atlantic Sturgeon, Tautog, and Horseshoe Crab are currently supplied for live markets for commercial aquaculture, domestic/international foodfish, and biomedical purposes. The physical resiliency of these species, combined with the declining availability of other economically valuable finfish species provides an added incentive for trade of these species in live fish markets.

While markets for these species are expanding, stocks demand that we take regulatory action to reduce directed harvest. This management obligation is challenged by the need to effectively balance demands of growing live fish markets with sustainable fisheries management. Regulatory issues mounting as a result of ineffectively balancing these two responsibilities are realized in the development of illegal markets, increased fishing mortality, and irreparable impacts to genetic and/or ecological diversity. A proactive approach for identifying management strategies to address complex interactions between management initiatives and current/future use of the resources is required to avoid such undesirable outcomes.

#### Introduction

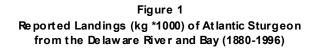
The Atlantic States Marine Fisheries Commission (ASMFC), along with it's individual state partners is responsible for fisheries management in state waters along the Atlantic seaboard of the United States. The purpose of the Commission is to promote the better utilization of the fisheries of the Atlantic coast through the development of an interstate fishery management

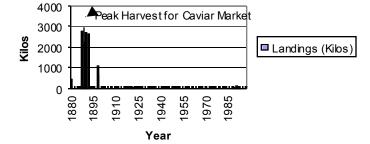
program and through the prevention of physical waste of Atlantic fisheries from any cause. The Commission currently manages over 21 shell, marine, and anadromous species. Many of these species are harvested for sale in live fish markets.

Of the ASMFC's managed species, Atlantic Sturgeon, Tautog, and Horseshoe Crab are supplied by live markets for the purposes of commercial aquaculture, domestic/international foodfish, and biomedical purposes. The physical resiliency of these species, combined with the declining availability of other economically valuable finfish species provides an added incentive for trade in live fish markets. Changes in harvest history and management are presented here as case studies of the challenges regulatory agencies face when trying to find a balance between live market demands and conservation management obligations for marine finfish species.

#### Case Study: Atlantic Sturgeon Management and Live Markets, a Coastwide Experience

While Atlantic Sturgeon are known as a very resilient species, barriers to upstream migration, habitat destruction, and increasing fishing pressure on the species during the early 1800's greatly reduced the abundance of Atlantic Sturgeon along the eastern seaboard (Figure 1).





Domestic and international demand for caviar has historically been the principal incentive for wild harvest of Atlantic Sturgeon. The first caviar derived from Delaware River Sturgeon was produced in 1853 for market sales.<sup>3</sup> In-river harvests of spawning aggregations were greatly enhanced in the late 1800's with the development of the gillnet.<sup>4</sup> While availability of Atlantic Sturgeon may have appeared unlimited, increasing market demand and increasing caviar prices quickly resulted in increased harvest for the species.

Given the economic incentive to continue fishing for wild Atlantic Sturgeon to meet market demands, declines in population abundance over time quickly caught the attention of fishery managers worldwide. Domestically, the ASMFC was motivated to prepare a fishery management plan (FMP) for Atlantic Sturgeon in an effort to better manage the species throughout its range of distribution. Despite the action taken by the ASMFC through implementation of the 1990 FMP, Atlantic Sturgeon stocks continued to deteriorate. In 1996, the ASMFC decided to amend the FMP and notified the public that a moratorium on harvest and possession was necessary to conserve remaining Atlantic Sturgeon stocks. Following public hearings on this proposed action in 1998, the ASMFC implemented a coastwide moratorium on possession and harvest of Atlantic Sturgeon in state waters via the approval of Amendment 1 to

<sup>&</sup>lt;sup>142</sup> Waldman et al. "Caviar trade in North America: An historical perspective," in the Proceedings of the Symposium on the Harvest, Trade, and Conservation of North American Paddlefish and Sturgeon, held at the Tennessee Aquarium 7-8 May 1998, 77-89. Washington, D.C.

the Interstate Fishery Management Plan for Atlantic Sturgeon. The Secretary of Commerce followed suit by implementing and enforcing a moratorium in the exclusive economic zone (EEZ).

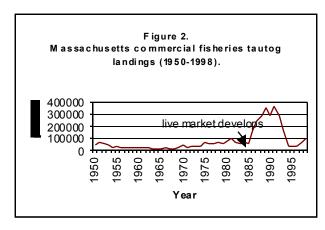
Economic incentives to trade in Atlantic Sturgeon remain intact notwithstanding existing moratoriums on possession and harvest throughout much of the species range. Risks associated with poaching activities, or unlawful harvest, are considerably high even though stiff penalties are in place to enforce the moratorium. The moratorium has also resulted in the expansion of existing live markets for Atlantic Sturgeon to supply aquaculture operations with broodstock for grow-out and propagation purposes.

Economic incentives to trade in live Atlantic Sturgeon fingerlings have challenged the ASMFC to address concerns regarding aquaculture. Species specific issues relating to the collection of wild broodstock, genetic integrity/hybridization, escapement, and ecological impacts have surfaced with the culmination of two requests for exemption to the moratorium on possession and harvest as stipulated in Amendment 1. Currently, the ASMFC is in the process of drafting regulations to prevent adverse impacts as well as reduce risks associated with trade of Atlantic Sturgeon in live markets.

#### Case Study: Tautog Management and the Live Market, the Massachusetts Experience.

Tautog (*Tautoga onitis*) is a species particularly well suited to live marketing and the necessary long-term storage because of its hardiness. It has a low metabolic rate and can be stored quite readily in the confined conditions of seawater holding tanks. From the mid-1980's to the mid-1990's the state of Massachusetts witnessed a remarkable rise in the landings and marketing of tautog due to the development of live marketing.

Prior to the early 1980's the primary outlet for tautog was the retail sale of whole fish and fillets for limited ethnic markets. Beginning in the mid 1980's a market developed for tautog delivered alive to ethnic (primarily Asian) restaurants in Boston, New York, Philadelphia and Montreal, Canada. The marketing of live tautog is still common today, if not at previous levels. Live market growth and the commensurate higher ex-vessel prices for the small (personal helping) sized fish spawned increases in the fishing effort of existing fishermen at that time. It also stimulated an increase of entrants into small-scale fisheries with gear types that could land a hardy live product, notably fish pots and hook gears. Also, during this same time period there was a shortage of common groundfish species on the market due to increasing management restrictions and declining stocks. As a consequence of both of these factors the demand for

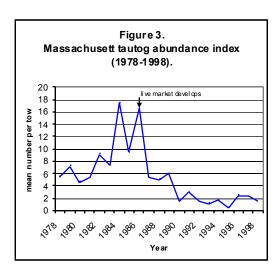


tautog increased dramatically with a commensurate increase in commercial landings (Figure 2).

Soon fisheries independent indices of abundance started to decline dramatically (Figure 3), but truncation of the age distribution of local stocks was not immediately apparent. Both are common signs of overfishing. It is presumed that age truncation was not apparent early in the overfishing stage because the decline in

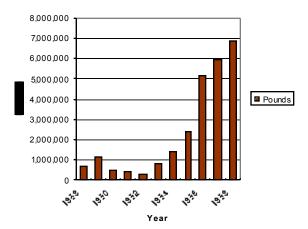
abundance of smaller fish masked the cropping of larger fish. Clearly local tautog stocks, especially in light of their conservative growth pattern and long lived live history, were at risk. For tautog the increase in fishing pressure followed by a rapid decline in abundance after a brief increase in landings and catch per unit of fishing effort followed the classic pattern of fish stock overexploitation, commonly called "the one way trip".

Regarding management, most states had no minimum sizes or very small minimum sizes for tautog in the early 1980's. Massachusetts was no exception with a 12-inch (total length) minimum size. This small minimum size coupled with an increased demand for the smaller fish shifted the normal exvessel cull away from larger (>16 inch) fish that yielded a reasonable fillet size to the 12 to 14 inch fish worth a premium in the live trade. As live market demand increased simultaneously with demand from traditional markets ex-vessel prices soared from an average of 30 to 40 cents per pound to greater than \$1 per pound. Current prices for live market tautog are in excess of \$2 per pound.



Increased effort, landings and declines in abundance in turn triggered decisive and strong management actions in Massachusetts. These actions were mirrored shortly thereafter by other New England states. The first local management action was the banning of gillnet use in areas where tautog could be targeted. Pot limits and limited entry schemes were enacted for the fish pot fisheries. Additionally, bycatch was restricted in the lobster pot fishery. Most importantly the minimum size was increased to 16" to discourage the landing of smaller fish. Commercial and recreational daily bag and possession limits were also instituted at this time. Over time fishing effort for tautog continued to shift southward to states without restrictive minimum sizes or other regulations, this created management pressure which lead to the formation of the existing interstate fisheries management

Figure 4. Horseshoe Crab Landings (1989-1998)



plan (FMP). Those states have since implemented similar regulations through the FMP process.

# Case Study: Horseshoe Crab Management and the Live Market, the Coastwide Experience

The Atlantic States Marine Fisheries Commission (ASMFC) developed an Interstate Fishery Management Plan (FMP) for Horseshoe Crab in 1998. The goal of this Plan is to conserve and protect the horseshoe crab resource to maintain sustainable levels of spawning stock biomass to ensure its continued role in the ecology of coastal ecosystems, while providing for continued use by current and future generations of the fishing and non-fishing public, hemispheric shorebird populations and other dependent wildlife, including the federally listed sea turtles, and biomedical industry.

In the late 1800s and early 1900s, horseshoe crabs were harvested for fertilizer and livestock feed. Early harvest records are suspect to under-reporting, but indicate between 1 to 4 million horseshoe crabs harvest annually, primarily from Delaware Bay. This fishery practice ceased in the 1960s with the development of synthetic fertilizers, increased public complaints about the odor from the manufacturing plants which dried and ground horseshoe crabs, and possibly due to overfishing. Currently, horseshoe crabs are considered as the primary bait for commercial conch and eel fishermen. Commercial landings data were relatively incomplete until 1999 but have undoubtedly increased in the past 10 years, averaging nearly 3 million horseshoe crabs annually between 1995 and 1997 (Figure 4).

Horseshoe crabs play an important ecological role in the food web for migrating shorebirds, finfish and Atlantic loggerhead turtles, a federally listed (threatened) species. The Delaware Bay estuary is the largest staging area for shorebirds in the Atlantic flyway and is the second largest staging site in North America. As many as 1 million migratory shorebirds converge on the shorelines of Delaware Bay to feed and rebuild energy reserves prior to flying an additional 4,000 kilometers to complete their northward spring migration to nesting areas. Migratory shorebirds arrive in Delaware Bay and adjacent areas along the Atlantic coast at the same time that horseshoe crabs are mating along the beaches. The Delaware Bay staging area is unique and of particular importance to shorebirds for the following reasons: contains the largest concentration of spawning horseshoe crabs along the Atlantic coast, resulting results in an abundance of horseshoe crab eggs along the surface for feeding shorebirds, shorebirds use few major stopovers during their spring migration; and shorebirds arrive at stopover sites with little to no fat reserves. An estimated 80 and 30 percent of the hemispheric population of red knots and sanderlings, respectively, use the Delaware Bay as a staging area.

Scientists have used horseshoe crabs in eye research, surgical sutures and wound dressing development, and detection of bacterial endotoxins in drugs and intravenous devices. Limulus Amoebocyte Lysate (LAL), a clotting agent in horseshoe crab blood, has made it possible to detect human pathogens such as spinal meningitis and gonorrhea in patients, drugs, and all intravenous devices. In 1979, the U.S. Food and Drug Administration (FDA) issued draft guidelines for the use of LAL as an end-product pyrogen test for endotoxin in medical devices and injectable drugs. The LAL is currently the worldwide standard for screening medical equipment for bacterial contamination; any drug produced by a pharmaceutical company must pass a LAL screening. No other known procedure has the same accuracy as the LAL test. There are currently five biomedical companies collect horseshoe crabs for LAL production along the Atlantic coast. The reported number of horseshoe crabs used for LAL production has increased from 130,000 horseshoe crabs in 1989 to 280,000 horseshoe crabs in 1998. To obtain LAL, manufacturing companies catch primarily adult horseshoe crabs, collect a portion of their blood, and then release them alive as required by FDA. Post-bleeding mortality has been estimated between 5 and 15 percent (14,100 - 42,250 horseshoe crabs) annually. Total mortality, including pre-bleeding mortality from collection practices, is currently being examined.

An estimated 50,000 horseshoe crabs are also collected alive for the marine life trade, and education and scientific purposes. However, there are concerns that the number of horseshoe crabs sold for the marina life trade is under-estimated due to insufficient reporting requirements from this industry. This issue is currently being addressed.

The status of the horseshoe crab population along the Atlantic coast is poorly understood due to the limited amount of data on this resource. Stock assessment research and monitoring programs are being initiated but are not expected to provide for a formal stock assessment until 8-10 years. Given the absence of data, fishery managers have been faced with a complex management decision. Commercial fishermen argue that fishery managers should take limited to no steps in controlling the harvest of horseshoe crabs, while shorebird conservation organizations and members, and the biomedical industry recommend implementing significant harvest reduction measures until an accurate assessment is available.

In February 2000, the member states of ASMFC responded to the concerns of its stakeholders and approved an Addendum to the Horseshoe Crab FMP which established a coastwide state-by-state cap on horseshoe crab bait landings at 25 percent below the 1995-1997 average, and encouraged Maryland and New Jersey to maintain their more restrictive harvest levels which have achieved a 75 and 50 percent reduction, respectively. There are still no restrictions on the collection of horseshoe crabs for the biomedical industry, marine life trade, and education and scientific purposes. However, the ASMFC is currently evaluating the use of horseshoe crabs for these purposes to determine if improved monitoring and/or restrictions are necessary. The National Marine Fisheries Service is also considering the establishment of a horseshoe crab reserve (no harvest area) in federal waters within an area encompassing a 30 mile radius off the mouth of Delaware Bay which may limit the collection of horseshoe crabs for biomedical purposes.

#### Regulatory Challenges/Issues

It is anticipated that new markets will develop and existing markets will evolve and expand with changes in consumer demand and technology. One benefit gained from evolving and newly created markets is increasing economic opportunities available to resource user groups. Incentives, such as reduced by catch and/or target species mortality and the ability to provide fresher fish to consumers, are just a few options presently supporting the development of new technology in live fish markets.

Clearly the development of additional new markets for marine/aquatic species, especially species already fished at high levels presents the potential for many challenges to fisheries managers. These issues should also be of concern for potential live market entrepreneurs since effort and investments in the development of markets may never be recouped if stringent fisheries management measures are enacted.

As a result of this interactive relationship, marine resource managers are challenged by the need to effectively balance changing demands of growing live fish markets with sustainable fisheries management. Regulatory issues mounting as a result of ineffectively balancing these two responsibilities are realized in the following ways:

**Direct stock management implications** - The increased pressure on smaller more valuable fish works against maximization of yield-in-weight per recruit and the maintenance of traditional spawning stock biomass targets necessary to sustain stocks over time. To put it in another way, without strict harvest controls recruitment and yield over fishing are inevitable.

**Indirect increases in mortality** - High grading of catch at sea may result in increases in mortality through discarding. This problem is not as severe for tautog and possibly not for other species targeted for live marketing because the principal gear types commonly selected by fishermen have low mortality rates for discards.

**Landings monitoring and enforcement** – The product may bypass the traditional point of sale, wholesale markets, and be marketed to dockside mobile vendors or direct to restaurants. This practice makes the tracking of landings and enforcement of regulations more difficult. It also can effect needed biological sampling of the catch.

**Black-market activity risk increases** - High demand and high values for low volume coupled with non-traditional buyers can easily stimulate a black-market fishery. The fishery becomes diffuse with smaller individual vessel landings.

**Political problems** – Fishermen's resistance to restrictive management measures increase because the economic stakes are higher.

**Reduced economic incentive to reduce fishing effort** - Normal economic incentives to reduce effort in times of low stock abundance are distorted, i.e. economic overfishing levels are reached later making stock declines to lower levels inevitable.

**Consumer negative** – Prices of the product increase dramatically for traditional buyers.

#### Recommendations

A proactive approach in identifying management barriers and strategies to address complex interactions between management initiatives and current/future use of the resources in question is required to avoid such undesirable outcomes.

#### **Conclusions**

In conclusion, live market development for traditionally landed marine/aquatic species like Atlantic Sturgeon, Tautog, and Horseshoe Crab can bring with them a large suite of unique management problems to be overcome. Some results of market development are potentially positive for the fisheries and fisheries management. Only with a proactive approach to identifying and solving these unique challenges, before market development, can fisheries managers and live market business people hope to adequately maintain a sustainable fishery.

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# NON-INDIGENOUS SPECIES AND THE LIVE AQUATICS INDUSTRY: RISKS AND POTENTIAL IMPACTS OF EXOTIC INTRODUCTIONS

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#### **Presentation Summary**

Throughout the world's oceans and estuaries, non-indigenous species are being introduced into water bodies in which they are not historically found. These introductions are taking place at an alarming rate and while many of these species do not thrive in their new environments, the few that do can have significant impacts on their new ecosystems. The pathways through which

these introductions take place are varied, numerous and potentially include the live aquatic market.

The live aquatic species trade through its normal practices has the potential to introduce non-indigenous species to new ecosystems. These introductions are often unintentional such as through packaging and disposal or done by those uninformed of the consequences of introducing non-native species to an area. Not only can the live aquatic trade present a potential risk of introducing non-indigenous species to ecosystems, but the invaders themselves pose risks to the live aquatics industry. Unintended genetic alterations and especially disease introductions could be detrimental to many parts of this industry.

Individuals and organizations can take several steps to prevent or at least further slow the introduction of non-indigenous species into the environment. Often these steps are simple and in the best interest of the industry. It is important to use a precautionary approach at all stages of the process.

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#### U.S. FISH AND WILDLIFE SERVICE REGULATORY REQUIREMENTS FOR SHIPPING LIVE AQUATIC PRODUCTS

Catherine Cockey

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#### **Presentation Summary**

The USFWS regulates the import and export of all wildlife and wildlife products with some exemptions being given to certain shellfish and fishery products. Wildlife is required to be imported/exported at one of 13 ports designated for this activity. In addition, importer/exporters of wildlife must be licensed by the Service and pay a \$55 user fee per import/export. All wildlife must be declared to the Service using the USFWS Form 3-1777 along with other entry documents, and held for inspection and clearance by a Fish & Wildlife Inspector prior to release from Customs detention

In addition to the more familiar Endangered Species Act, the Service enforces CITES (the Convention on International Trade of Endangered Species). This worldwide treaty lists species that are in need of protection. CITES permits are required for imports and exports of species such as queen conch (Strombus gigas) and sturgeon caviar (Acipenserformes). The Service also enforces the injurious species regulations. The import of live injurious species such as mitten crabs and zebra mussels is prohibited.

The following is a summary of the wildlife that would be exempt from needing to meet F&W import/export requirements (note: ornamental fish shipments must meet F&W regulations):

- 1. Shellfish and fisheries products IMPORTED for purposes of human or animal consumption. This exemption does not apply to wildlife requiring a permit pursuant to part 17 or 23 (endangered or CITES species). This does NOT include the import of LIVE fish, but does include live shellfish.
- 2. Shellfish and fisheries products EXPORTED for human or animal consumption. The export exemption is broader than for imports, and includes live aquatic invertebrates of the class Pelecypoda (oysters, clams, mussels and scallops) as well as live farm-raised fish and farm-raised fish eggs. Again, none of these exemptions apply to species listed on part 17 or 23.

Note: Fish taken in violation of any state law would also be in violation of the Lacey Act and subject to Fish and Wildlife action.

#### AQUATIC ANIMAL HEALTH CERTIFICATION FOR INTERNATIONAL TRADE

Mark P. Dulin

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#### **Presentation Summary**

USDA, APHIS has responsibility for protecting the Nation's livestock and poultry species. Our first line of defense is to minimize the potential for the introduction of exotic disease pathogens. The APHIS, VS, National Center for Import and Export evaluates requests for the importation of live animals and animal products. If such importations can be done without risking disease introduction (through such things as quarantine and diagnostic testing of imported animals) APHIS allows the livestock/poultry species to be imported. For animal products (meat, dairy, etcetera)---APHIS requires overseas processing (cooking, pasteurization, irradiation, etc.) to inactivate the disease agents which could potentially exist in that product. However, USDA, APHIS currently lacks the regulatory authority to prevent the introduction of pathogenic agents affecting aquatic species (unless such imports could also cause disease in livestock or poultry).

USDA, APHIS would like to provide the same range of services to the US aquaculture industry as it currently provides to livestock and poultry industries. This includes such things as technical assistance, research support, disease prevention, regulatory control, and most importantly, leadership to ensure the adequacy and safety of the Nation's food supply and the economic security of farmers. Until such time as the U.S. Congress mandates authority to USDA, APHIS to for protecting the US aquaculture industries, we do not believe that US aquaculture producers are receiving the full benefit of what APHIS could offer relative to enhancing the health status of the Nation's captive-reared aquatic species.

USDA, APHIS does have regulatory authority relative to the export of aquatic species, and most countries throughout the world recognize APHIS as the competent authority with jurisdiction over export animal health certification/diagnostic testing of animals for export. APHIS has an extensive network of accredited veterinarians, USDA-approved laboratories, and Area offices throughout the US to assist with exports.

When requested to do so by industry, APHIS, National Center for Import and Export will negotiate with foreign countries to develop "export protocols" for a particular aquatic species. APHIS works to ensure that the zoosanitary regulations for live aquatic species and aquatic products are based on valid science and risk assessment. Once agreement has been reached with a particular country for the export requirements of a particular species, that countries import requirements are posted on the APHIS web site: <www.aphis.usda.gov>. USDA-accredited veterinarians can then perform the required health examination, and submit the necessary specimens to USDA-approved laboratories which perform the testing required by the receiving

country. The international export health certificate is then presented to an APHIS "Area Veterinarian in Charge" for review, to ensure that it satisfies the demands of the receiving country. If everything is correct, the Area Veterinarian in Charge will endorse the certificate and apply the USDA embossed seal. A complete listing of the locations for APHIS, Area offices is available off the APHIS web site: <www.aphis.usda.gov>.

APHIS also plays an important role in other activities which benefit the Nation's aquatic animal industries. This includes such things as regulation of vaccines and biologic reagents for use with aquatic species; the control of nuisance mammals and birds that can cause serious economic damage to aquaculture-reared aquatic species.

In summary, APHIS is still in the developmental stages of providing the range of services to aquaculture producers, that we provide to livestock and poultry producers. While our headquarters and field support personnel are willing to help in every way they can--we do not yet have the authority for a full range of services. We invite you to initiate contact with our Area offices/field personnel to share your specific needs pertaining to animal health issues. Within the scope of the limited regulatory which we have, we'll assist in any way we can.



# \*\*\* Marketing Live Seafood \*\*\*

The Live Fish Industry: A Producer's Perspective

**Brent Blauch**, President, Susquehanna Aquacultures, York Haven, Pennsylvania

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The Live Fish Industry: A Wholesaler's Perspective

Scott Lee, Deale Aquafarms, Deale, Maryland

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The Live Fish Industry: A Restauranteur's Perspective

Ed Shen, Seven Seas Restaurant, Rockville, Maryland

#### THE LIVE FISH INDUSTRY: A PRODUCER'S PERSPECTIVE

Brent W. Blauch

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#### **Presentation Summary**

For over ten years, Susquehanna Aquacultures, Inc. has been supplying live hybrid striped bass to customers in the northeastern United States and Canada. While sales for recreational angling continue to grow, the overwhelming demand for these fish continues to be the live food fish markets. Food fish customers, whether distributors, supermarkets, or restaurants, desire continuous supplies of consistent quality and consistent sized products, uninterrupted by seasonal variations. Unlike the wild capture fisheries, which are subject to catch limits and restricted fishing times, aquaculture produced supplies have potential for year-round harvests and managed quality, offering customers the type of reliable sources they can depend upon. Operating a farm to provide the year-round sales of consistent size and quality is much easier planned than accomplished. While our company has consistently sold fish on a year-round basis, manipulating inventories to maintain consistent sizes and quantities each week has proven to be a very challenging task.

Hybrid striped bass are delicious, have excellent texture, make a beautiful presentation, and have the perfect body for whole fish preparation. Do these qualities make marketing easier? Or does marketing these qualities make sales easier? Marketing has everything to do with making potential customers WANT your product. Sales come later, by moving a product to someone who already wants it. Marketing live fish products has everything to do with demonstrating that the species tastes good (of course), handles well (tank life), looks good, can be supplied consistently, and above all else, IS WORTH THE MONEY! Marketing must continue through every sale, by helping customers learn more about the product, how to handle it, and how to use more of it. By diligently demonstrating that all of the product claims can be met consistently, new users can be attracted to take new production. Whenever new production comes on line WITHOUT associated marketing, the only attractive feature to a current customer becomes price, and many new and seasonal producers often fall victim, offering their fish well below the established market prices - just to move them. Live fish markets are always impacted by the cheaper fish, not only from the inadequate price structure but often from inferior quality as well. Live fish that don't live long or that look in poor health reflect poorly on the species, not just on the farmer, and serve to erode the "marketing" that prompted the demand in the first place. If the fish doesn't taste good, has poor texture, looks pale and sickly, or has a mishapened body, how can the customer ever be convinced its "worth the money"? Whatever size producer you are in whatever specie you produce, its extremely important to maintain the integrity of the marketing for your product. Devaluing your farm's product is one thing; devaluing the species marketing is quite another.

#### THE LIVE FISH INDUSTRY: A WHOLESALER'S PERSPECTIVE

Scott Lee

Deale Aquafarms 441 Baytron Road East Deale, MD 20751 Tel: 240-508-7365

#### **Presentation Summary**

This presentation discusses the business of producing, holding, buying, selling and marketing live seafood products at the wholesale level.

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THE LIVE FISH INDUSTRY: A RESTAURANTEUR'S PERSPECTIVE

Ed Shen

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Tel: 301-770-5020

#### **Presentation Summary**

This presentation describes the procurement, handling, distribution and marketing of live seafood products in the retail setting of a Asian restaurant with live display tanks.

#### EAST COAST LIVE! 2000 The Business of Marketing Live Aquatic Products



Radisson Hotel Annapolis, Annapolis, Maryland November 1-4, 2000

## \*\*\* Finfish, Ornamentals and Aquatic Plants \*\*\*

#### Water Treatment Amendments for Live Shipment of Finfish

**Mike Frinsko**, Aquaculture Area Agent North Carolina Cooperative Extension Service. Greenville, North Carolina

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#### **Handling and Transport of Marine Finfish for Offshore Production**

Mike Chambers, University of New Hampshire, Durham, New Hampshire

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#### Handling, Transport and Maintenance of Tuna in Sea Cages

Sebastian Belle, Maine Department of Marine Resources. Augusta, Maine

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#### East Coast Live Markets for Tilapia

**Jerry Redden**, Director Worcester County Economic Development Office, Snow Hill, Maryland

\*\*\*\*\*\*

#### Domestic and International Shipment of Larval and Juvenile Fish

**Jesse Chappell**, President, Southland Fisheries Corporation. Hopkins, South Carolina

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#### **Ornamental Aquatic Plants**

Richard Koogle, Lilypons Water Gardens, Buckeystown, Maryland

Radisson Hotel Annapolis, Annapolis, Maryland November 1-4, 2000

## Finfish, Ornamentals and Aquatic Plants (continued)

#### **Internet Marketing of Ornamental Aquatic Plants and Animals**

Margaret Koogle, Lilypons Water Gardens, Buckeystown, Maryland

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#### Handling and Transport of Marine and Freshwater Tropical Ornamentals

**Craig A. Watson**, Director Tropical Aquaculture Laboratory, University of Florida. Ruskin, Florida

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#### Handling and Transport of Sportfish for Public and Private Stocking

John Sproch, Keystone Aquaculture, Duncannon, Pennsylvania

#### WATER AMENDMENTS TO ENHANCE LIVE SHIPMENT OF FOODFISH

#### Mike Frinsko

Aquaculture Area Agent NCSU Cooperative Extension Service College of Agriculture and Life Sciences North Carolina State University Greenville, NC 27834 Phone: 252-757-2802 ext 43

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#### **Presentation Summary**

Successful live-shipment of finfish requires maintenance of high quality environmental transport conditions. This usually involves two treatment strategies. The first is to limit the production of toxic metabolic waste by-products. The second involves removal or otherwise altering these materials and their effects after they have been produced and entered into the transport environment. Both include treating for stress.

Limiting the production of metabolic wastes usually involves a combination of preshipment treatments. These "pre-conditioning" techniques often consist of purging the digestive tract of feed and reducing body temperature. Stress management includes a variety of gentle handling practices and use of approved anaesthetics and/or salts. Most preconditioning success hinges on a facility being properly equipped with adequate holding space, water chillers, a clean water supply, and other appropriate handling/holding devices.

After the fish are preconditioned, they are usually placed in some type of enclosed holding container for the shipping event. This could range from a truck mounted fiberglass or aluminum transport tank to a simple plastic shipping bag sealed with water and pure oxygen, placed in a freight box.

Regardless of the transport method or equipment used, maintaining a high level of environmental water quality is mandatory for a successful shipping outcome. Supplying adequate hardness and buffering capacity to the water supply and maintaining an adequate temperature can be critical to the success of live-shipping fish. Reducing stress via salt and/or anaesthetic additions is also necessary. Ammonia ( $NH_3$ ) and carbon dioxide ( $CO_2$ ) are the main metabolites of concern to culturists. Some methods exist to nullify the effects of both chemicals.

This presentation will review a typical strategy for enhancing survival of finfish during transport using approved chemical amendments. Other selected materials having various or uncertain regulatory status will be discussed.

#### HANDLING AND TRANSPORT OF MARINE FINFISH FOR OFFSHORE PRODUCTION

Michael D. Chambers

University of New Hampshire Jere Chase Ocean Engineering Laboratory 24 Colovos Road Durham, NH 03824-3505 Tel: 603-862-3394

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#### **Presentation Summary**

The handling and transport of marine fish is one of the most important activities in offshore aquaculture production. Months of hard labor and careful culture can be lost in a few minutes of mismanaged transportation. Proper knowledge of transport techniques and of specific requirements and demands of each species is essential.

The acclimation of the fish to their new environment prior to transfer is vital to their survival. Many factors during the transport process, even with the best of care, can cause stress to the fish and result in a low survival rate. Reasons for mortality include: excessive handling, insufficient oxygen, over stocking, mechanical failure, changes in water quality, and human error.

Planning and preparation are key components to a successful transport. Having things organized logistically from truck to boat and boat to sea cage will make for a smooth transition. In addition, acquisition of appropriate equipment to facilitate the transfer will reduce stress and in the end, maintain a higher quality product.

Procedures for safe handling and transport of marine fish will be reviewed.

#### HANDLING, TRANSPORT AND MAINTENANCE OF TUNA IN SEA CAGES

Sebastian Belle\*, Paula Sylvia and Alastair Smart

TAAG The Aquaculture Advisory Group Box 487 Boothbay, ME 04537 USA

(Sylvia and Smart) The Aquaculture Advisory Group, Box 487, Boothbay, ME 04537

#### **Presentation Summary**

World production of several farmed species of Scombrids has increased dramatically in the last ten years. The principle species currently farmed are the Northern Bluefin Tuna (<u>Thunnus thynnus</u>) and Southern Bluefin Tuna (<u>Thunnus maccoyii</u>). Additional emerging species include Bigeye Tuna (<u>Thunnus obesus</u>) and Yellowfin Tuna (<u>Thunnus albacares</u>). Although substantial work has been done on the reproduction and juvenile rearing of yellowfin and bluefin tunas, consistent high quality numbers of juveniles for ongrowing in cage farms are not currently available.

The lack of consistent supplies of hatchery reared juveniles has led to broad experimentation in different methods of capture and transport of wild tuna juveniles. Methods used have included, well boats, trucking, air shipping and tow cages. A brief summary of each method and their respective strengths and weaknesses is presented. Currently large ocean tow cages and smaller tanks boats are the standard methods used with small tank boats being used exclusively in Japan.

Substantial progress has been made in the last ten years in Scombrid husbandry, and handling techniques. Scombrid species present unusual challenges due to their high activity levels, demanding water quality requirements, size, susceptibility to physical injury or stress and a lack of basic physiological and behavioral research. Scombrid culturalists have attempted to adapt a broad range of techniques developed for other less challenging species with mixed results. Critical issues in nutrition, handling and husbandry are summarized and their current state of development discussed.

#### EAST COAST LIVE MARKETS FOR TILAPIA

Jerry Redden

Director Worcester County Economic Development Office Snow Hill, MD Ph: 410-632-3112 Fax: 410-632-2631

Email: <ecodevo@ezy.net>

#### **Presentation Summary**

This presentation reviews the history and growth of the production and live sales of tilapia

in major markets along the eastern seaboard. The current status of live tilapia markets is discussed with an assessment of future market direction and potential.

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#### DOMESTIC AND INTERNATIONAL SHIPMENT OF LARVAL AND JUVENILE FISH

Jesse Chappell

President Southland Fisheries Corporation 600 Old Bluff Road Hopkins, SC 29061 Tel: 803-776-4923

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#### **Presentation Summary**

An overview of current live transport methods used on young commercial finfish seedstock for successful road and air transport will be presented. A guide for loading rates relative to temperature will be discussed as well as water stabilizers and stress minimization methods. Logistical and biological bottlenecks of short and long distance transportation will be presented.

#### ORNAMENTAL AQUATIC PLANTS

Richard M. Koogle

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#### **Presentation Summary**

Aquatic plants have been grown for their ornamental value for centuries. This type of water gardening has become extremely popular over the last 30 years in the United States. Reasons for this include development of inexpensive materials, increased environmental awareness, and a vast amount of information/products available that have made it very easy.

Aquatic plants are considered hardy or tropical. Hardy plants survive freezing weather conditions and re-grow from dormant roots in the spring. Tropical plants cannot tolerate cold or freezing conditions. The three main categories of these plants are water lilies, lotus (all hardy) and marginal or shallow water plants.

Typically these plants are grown in lined tanks of shallow water (18" or less), though some varieties will do well in earthen bottom ponds. Most cultivation is done outdoors although cold frames are very helpful in boosting new spring growth for the April-June period of highest market demand. Heated greenhouses are required for year round production of tropical plants.

Virtually all aquatic plants are propagated through root division or cuttings. Some varieties are currently reproduced via tissue culture in a lab. Aquatic plants are generally very easy to grow, require no special soils, minimal fertilization, and are very disease and pest resistant. They are shipped/transported bare root with wet newspaper in plastic lined boxes.

The rise in water gardening popularity, and the number of wetland reclamation projects, continues to fuel the demand for these aquatic plants. There is a solid market through the entire U.S. and the best areas include the entire East Coast, the Upper Midwest and the Gulf Coast States, including Texas.

#### INTERNET MARKETING OF ORNAMENTAL AQUATIC PLANTS AND ANIMALS

Margaret Thomas Koogle

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#### **Presentation Summary**

Lilypons Water Gardens is an aquatic nursery that grows approximately 70% of the aquatic stock it resells to consumers along with related hard goods necessary to construct and maintain a water garden. We market our products through direct mail, a retail store, and the Internet. We currently market our products on the Internet 1) via our own Website; and 2) as a drop ship supplier for <garden.com>.

Our Website started in 1997 as an information site only. In 1999 we added the ability to shop online and are currently enhancing the Website for 2001. Internet sales account for 15% of our revenue.

If you are considering entering the Internet as a marketing vehicle, the following should be considered: 1) goal; 2) name registration; 3) server; 4) format; 5) creation; 6) promotion; 7) maintenance; and 8) fulfillment.

# HANDLING AND TRANSPORT OF MARINE AND FRESHWATER TROPICAL ORNAMENTALS

Craig A. Watson

Director

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#### **Presentation Summary**

Ornamental tropicals, destined for the aquarium and outdoor pond hobbies are transported globally via an intricate and sophisticated system. Animals and plants are successfully shipped from any point of the globe to another within time frames slightly in excess of travelers. Within major production regions, ornamental fish and plants often are a major (if not THE major) air freight commodity.

Ornamental fish and plants, while supplied by the thousands, are most often sold as individuals. The hobby ist is extremely demanding that each purchased individual displays good health, and any other characteristics of the given variety (i.e. flowing fins, intact foliage, bright color, etc.), making handling and transportation of utmost importance in providing the market with a quality product. Especially with wild-collected specimens, there may be numerous points of possession between production and the final purchase by the hobby ist, and each is responsible for maintaining the health and condition of the product.

Within this market, speed of movement is of the utmost importance, as the plants or animals are typically at the greatest point of stress during shipment. Rapid movement from point A to B, to C, etc. is critical. The best suppliers are experts in scheduling shipments and most have strong relationships with air lines which serve the industry.

Success in this industry begins with purchase of a product from a reputable and skilled supplier, who is capable of consistently providing specimens which are good health and condition to begin with. Afterwards, great care is given to inventories prior to shipment. Proper conditioning, including prophylactic treatments for common disease problems, "purging", etc. are essential.

Packaging tropical ornamentals for shipment is almost an art form, and while modern technology is being employed more and more, is in large part dependent upon experience with individual varieties, and their associated nuances. However, there are some standard principles which apply to the industry across the board, especially in water quality maintenance.

#### HANDLING AND TRANSPORT OF SPORTFISH FOR PUBLIC AND PRIVATE STOCKING

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#### **Presentation Summary**

This presentation reviews the business of producing, transporting and marketing of both cold water and warm water finfish species for public stock enhancement and public/private recreational fisheries. Warm water finfish species sold and transported by Keystone Aquaculture include hybrid bluegills, channel catfish, largemouth bass, fathead minnows and grass carp. Cold water species include rainbow , brook and brown trout, walleye and yellow perch.

#### EAST COAST LIVE! 2000 The Business of Marketing Live Aquatic Products



Radisson Hotel Annapolis, Annapolis, Maryland November 1-4, 2000

### \*\*\* Molluscs and Crustaceans \*\*\*

#### The Live Lobster (Homarus americanus) Industry: Past, Present, Future

**Colin MacDonald**, President Clearwater Lobsters. Bedford, Nova Scotia, Canada

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The East Coast Oyster Industry: Status and Trends

**Robert Rheault**, President Moonstone Oysters. Wakefield, Rhode Island

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The East Coast Hard Clam Industry: Status and Trends

**Gef Flimlin**, Marine Agent Rutgers Cooperative Extension Program, Toms River, New Jersey

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The Blue Mussel Industry in Atlantic Canada and Maine

**Jeffery Davidson**, Atlantic Veterinary College Charlottetown, Prince Edward Island, Canada

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Live Food and Bait Markets for Crawfish

William H. Daniels\*, Steven J. Gabel, and Steve Sanford Delaware State University. Dover, Delaware

Radisson Hotel Annapolis, Annapolis, Maryland November 1-4, 2000

### **Molluscs and Crustaceans (continued)**

#### Transporting and Marketing Live Shrimp

**Richard Eager**, President Swimming RockFish & Shrimp Farm. Meggett, South Carolina

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#### The East Coast Soft-Shell Crab Industry

**Mike Oesterling**, Virginia Sea Grant Advisory Program Virginia Institute of Marine Science, Gloucester Point, Virginia

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#### Wet Storage Systems for Oysters and Other Commercially Important Bivalves

**Robert Rheault**, President Moonstone Oysters. Wakefield, Rhode Island

\*\*\*\*\*

Live Holding and Transport of Freshwater Prawns (Macrobrachium rosenbergii)

James Tidwell, Shawn Coyle\* and Timothy Woods, Kentucky State University. Frankfort, Kentucky

#### LIVE LOBSTER (HOMARUS AMERICANUS) INDUSTRY: PAST, PRESENT, FUTURE

#### Colin MacDonald

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#### **Presentation Summary**

The lobster <u>Homarus americanus</u> has been harvested for time immemorial off the eastern shores of North America, ranging from South Carolina to the shores of Labrador. It has enjoy both plenty, scarcity, favour and shame in its history, being enjoyed by both King and pauper in its time as a delicacy and a dietary mainstay.

Currently the industry is enjoying a relative boom but what does this say of its past and future and why is it or has it or will it face these possible realities. To hope to understand one must look critically at the two very different methods of prosecuting the fishery as evidenced in the Canadian and the United States east coast lobster harvesting and distribution industries where a very different and similar animal is subject to very different harvesting, holding and marketing philosophies. As well one must explore the basic tenants that guide the decision making process within the chambers of power that chart the industry's course

And then you have Clearwater, most certainly an anomaly but is it truly a leader or just a maverick in what is seen as a traditional maritime industry where one of the elder statesmen was heard to proclaim "who the hell do those two boys ( John Risley and Colin Mac Donald cofounders of Clearwater) think they are, the industry has been doing it this way for the past 100 years, why do they think it needs to change and what arrogance to think they can make it change".

In the end you will have a prediction of both a desired future based on the Clearwater philosophy of doing business and the more likely future based on the realities of political expediency and the failure to learn from or respect the lessons of the past.

#### THE EAST COAST OYSTER INDUSTRY: STATUS AND TRENDS

#### Robert Rheault

President Moonstone Oysters 1121 Mooresfield Road Wakefield, RI 02879 Tel: 401-783-3360 Email: <oysters@ids.net>

#### **Presentation Summary**

Up until a few years ago Long Island Sound was the second largest producer of oysters (after Louisiana) with Connecticut landings on the order of \$45M (almost all cultured). Landings fell 72% following a devastating outbreak of MSX in 1997. Fortunately the protozoan parasite is almost absent from recent samples and a healthy crop of 1 and 2 year old oysters should start to hit the market in about 2 more years. Sets look good and production should recover soon. The state boasts about 65,755 acres under cultivation by over 100 lease holders.

Growers on the Long Island side of the Sound are also recovering and can expect to regain their \$5M in oyster landings as well. On Long Island there has been a recent surge of interest in aquaculture with a number of small farms getting started in the wake of the collapse of the wild harvest. Currently about 42% of the state's oysters are cultured.

In fact this trend is occurring across New England with every state reporting a growing number of new applicants for small leases for shellfish aquaculture. This is nothing new for Massachusetts (where about 200 small farms produce \$5M in clams and oysters), but if the movement catches on in Maine, Rhode Island and Long Island (states where shellfish culture has been relatively limited) there will be a major impact in the years to come.

Rhode Island has enjoyed three years of fantastic harvests following an unprecedented set in 1995, however the parasitic disease Dermo and heavy harvest pressures are gradually depleting the landings.

Many growers are turning to floating upwellers to accelerate nursery culture and to cage culture to improve survival and growth rates of the oysters. Scarce supplies of wild oysters, strong demand by a growing number of fashionable new raw bars and high prices for quality cultured oysters are driving the trend.

Commercial wild harvests in Delaware and Chesapeake Bays remain relatively low. The volume of landings from one year to the next is primarily influenced by the relative activity or virulence of Dermo and MSX diseases.

#### THE EAST COAST HARD CLAM INDUSTRY: STATUS AND TRENDS

#### Gef Flimlin

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#### **Presentation Summary**

The Northern Quahog or Hard Clam, <u>Mercenaria mercenaria</u>, has been a mainstay of inshore coastal fisheries along the Atlantic Coast for many years. However, increases in coastal development, elimination of habitat, dredging, point and non-point runoff, and continued harvest without sufficient natural replenishment has changed the fishery from what it was 50 years ago.

Traditionally the hard clam fishery on the East Coast consisted of small boats with a solitary clammer working with hand harvesting gear taking a modest number of clams daily. This fishery was limited to approved waters that were in the public domain. Clams were sold to local dealers who would distribute them locally, and also ship to other population centers throughout the East and Mid-West.

In the 1970's the face of the industry changed with two variations on the traditional fishery. Stocks of clams were reduced and the industry needed other opportunities for harvest to remain in the fishery. Access to closed or special restricted waters was allowed under state sponsored relay or depuration programs, and the science of aquaculture began to be accepted by the shellfish industry and the states and towns as a way to allow the production of this species in leased or granted areas.

Aquaculture has grown significantly with significant production in most of the Atlantic Coast States. This clam culture industry is changing the way clams are brought to market. It has spawned a new industry of shellfish hatcheries. Growers have improved and adapted nursery and growout methods for efficiency and use in their local areas. The industry is examining the product form in which the clams are presented to the public. Publicly funded research has been sporadic, partially due to the silence and lack of organization of the industry. There has been an appearance of a new disease and competition from other cheap shellfish in the marketplace. And the industry grows slowly under the scrutiny of coastal resource managers intent on protecting Submerged Aquatic Vegetation and Essential Fish Habitat.

There will be growth in the hard clam culture industry once the growers realize how similar the challenges they face are. The market will grow with the introduction of new processing methods and the introduction of value added products, which can be used in the restaurants and the home. Distribution expansion will follow.

#### THE BLUE MUSSEL INDUSTRY IN ATLANTIC CANADA AND MAINE

Jeff Davidson\* and Garth Arsenault

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#### **Presentation Summary**

The blue mussel (<u>Mytilus edulis</u>) industry in Atlantic Canada and Maine is only a little more than twenty years old. A few pioneers of the industry started researching and experimenting with the cultivation of the wild blue mussel in the mid 1970's. In Maine, the predominate method of mussel farming is bottom culture while in Prince Edward Island suspended longline culture is the method of choice. In 1999, Maine produced almost 2 million pounds of mussels worth over \$725,000 while Prince Edward Island produced over 30 million pounds worth over \$20 million. While Maine's production figures have fluctuated greatly over the last 20 years, production on Prince Edward Island has steadily increased. Limits to further increased production in Prince Edward Island is lack of suitable deep water (™0 feet) and the ability of the water to support satisfactory growth. Early starts in Maine at suspension culture were plagued by eider duck predation and poor site selection. Development of suspended mussel culture in Maine will depend on the acceptability of rafts as the structure of choice. Eider duck predation can be averted by the use of duck predator net suspended from the rafts and raft culture can take advantage of the large areas of ice free deep water to grow mussels.

The majority of both Maine and Prince Edward Island mussels are sold live for the food service market in Canada and the United States. Secondary processing such as smoking and pickling is conducted in production areas further away from the large markets eg. Newfoundland. Overall markets appear very strong. The availability of the product year round and the increased quality of the meats resulting from aquaculture growing techniques have contributed greatly to this demand.

#### LIVE FOOD AND BAIT MARKETS FOR CRAWFISH

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#### **Presentation Summary**

While crawfish in Louisiana are typically sold live to the food market, crawfish along the East Coast are sold live for both the food and bait markets. In North and South Carolinas, the two dominant species of crawfish (red swamp and white river crawfishes) are mostly sold to the food market. The only other state to have much production is New York where crawfish are mainly sold as bait. In Delaware, Delaware State University's aquaculture program has been researching the intensive production of the eastern white river crawfish for both bait and food markets. Many of the other crawfish sold for bait are captured from the wild.

Regardless of the market, crawfish are typically transported live in containers that keep them cool and moist. In North Carolina, all crawfish are transported in insulated containers (ice chests) with open drains and a thin layer of ice on top of them. Crawfish do not need to be submersed in water and are usually better off being kept moist by holding them in sphagnum moss, newspaper or other materials that maintain a humid environment. For holding, crawfish can be kept under spray systems or in cages in ponds. For the food market, crawfish are often purged (allowed to clear their guts) by holding them in purging tanks or in cages in ponds or canals. During purging (>12 hours), crawfish are denied access to feeds or other potential food.

Market prices vary among states and products. In North Carolina, all crawfish are sold retail (no processors) for about \$2.50/lb. At the NC Crawfish Growers' Association's annual crawfish promotional boil at the Farmer's Market in Raleigh, crawfish were sold live (\$4.00/lb) or boiled (\$5.00/plate - about 1 lb.). Prices for 2-3 inch crawfish (bait) in New York range from \$0.07 for hard-shelled to \$0.15-0.20 for soft-shelled crawfish and 6-7 million are sold annually.

This year in Delaware, the untested market of crawfish as a bait for saltwater fishing was explored. Based upon surveys taken among recreational fishermen, the average preferred length of crawfish was 3 inches. Most anglers were willing to substitute or pay a price equivalent to that for bullhead minnows (\$1.00/dz) or finger mullets (\$3.00/dz). Some were willing to pay prices equivalent to that for grass shrimp (\$3.00/cup), bait shrimp (\$4.00/cup) or bloodworms (\$5.50/dz). While the crawfish worked well in catching sea trout (weakfish), flounder, blue fish, tautog, and croaker, some education of the fishing community is needed to develop this

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#### TRANSPORTING AND MARKETING LIVE SHRIMP

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#### **Presentation Summary**

Live transport of shrimp via truck has been done for many years within the (fishing) bait industry. Live shrimp transported for human consumption is a more recent marketing tool and has been an expanding endeavor especially within the Asian ethnic communities of the northeast. The principal markets for live food shrimp shipments has been the Baltimore to Toronto corridor along the East Coast of the U.S. with locally important but much less significant pockets in the Southeast. New York trucks outfitted for live fish hauling started coming to South Carolina shrimp farms in 1991 for shrimp, but by 1998 had ceased the expensive effort in favor of "in the dry" air shipment techniques. Today nearly all live food shrimp sales are from daily air-cargo shipments. The retail price for a pound of live shrimp in New York's China Town area has dropped from \$14.50 per pound to \$6.50 per pound or less because of the less expensive dry air shipment vs. wet trucking and because of intensive competition.

Live shrimp for bait continues to be transported by trucks within only the Southeast and so far only as far north as Ocean Isle North Carolina in extreme southeastern North Carolina. Air shipment of bait is, this author has found, unsatisfactory unless the bait can be completely sold by the second day. This affords existing farms in South Carolina or new indoor units further north, the opportunity for a more northerly expansion of this lucrative aspect of the business.

Current wholesale and retail market prices of live shrimp are discussed with cost figures from typical South Carolina shrimp production farms. The outlook for the future of farmed supply and wild sources is discussed. The relative merits of the native pink, brown and white shrimp and exotic Pacific white and blue shrimp are discussed.

Two live-haul shrimp units regularly used in the transport of bait shrimp by Swimming RockFish and Shrimp Farm are on display.

#### SOFT SHELL CRAB MARKETING AND DISTRIBUTION

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#### **Presentation Summary**

Soft shell blue crabs (<u>Callinectes sapidus</u>) have been produced commercially for over 150 years in the Chesapeake Bay states. Since the earliest beginnings of the industry, soft shell blue crabs have been marketed primarily as a live product. Shipped and marketed alive is still the most prevalent practice within the soft crab industry. The season for live soft crabs has changed as more southern states have begun shedding soft crabs. Where the fresh (live) season for soft crabs used to be from April to October, the season now runs from February to November.

All soft shell crab production relies upon the wild-harvest of pre-molt crabs, that are landed alive and held in shedding systems until they shed their hard outer shells. Shedding systems can be traditional in-water floats, shore-side flow-through water systems or located away from natural water sources in recirculating water facilities. The advent of recirculating water shedding systems has expanded the production of soft shell crabs and presented additional opportunities to soft crab producers.

The shedding process is initiated primarily by warming water temperatures, so states in the southern region begin harvesting pre-molt crabs earlier than the mid-Atlantic region. The use of recirculating water systems permits the facility operator to control the environmental parameters within the shedding system, especially water temperature and salinity. Pre-molt crabs from more southern regions can be transported to recirculating water shedding systems, where the water salinity and temperature have been adjusted to mimic the pre-molt source. In this manner, soft crabs can be produced sometimes months before pre-molt crabs are available in the local area and the producer can take advantage of higher prices associated with the beginning of the live soft crab market season.

Traditional markets for soft crabs were New York, Baltimore and Washington, DC. However, as transportation and refrigeration technology improved, the distribution of soft crabs began to expand beyond the mid-Atlantic region. Live soft crabs are now shipped all over the United States and the world. A soft crab shed in Chesapeake Bay today could be in Tokyo within 30-hours and sold as a live product. Until recently, the United States was the only producer of soft shell crabs. As new fisheries for swimming crabs develop around the world, the production of soft shell crabs will also continue to expand.

# WET STORAGE SYSTEMS FOR OYSTERS AND OTHER COMMERCIALLY IMPORTANT BIVALVES

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#### **Presentation Summary**

Bivalve shellfish are commonly shipped live and (depending on the species and storage conditions) and can be expected to tolerate dry cold storage for as long as several weeks. Many factors can affect the shelf life (and quality) of shellstock including, the season of harvest, the physiological condition of the animal, the rate at which the animal is chilled, the storage temperature, the humidity and oxygen content of the air during dry storage, and the potential of re-immersing (or wet storing) the animal.

Wet storage describes a method used to improve the shelf life and quality of bivalve shellfish. Used widely to allow mussels and soft-shell clams to spit sand and grit, wet storage is also widely used to stockpile clams and oysters and other species with limited shelf life. Wet storage can be done by holding animals in the natural water column for days or months using aquaculture techniques, or it can be done in land-based tanks using either flow-through or recirculating seawater.

This presentation will discuss the current regulations governing wet storage, the technical considerations used in constructing and operating land-based wet storage systems and the marketing advantages that wet storage provides to the shellstock processor.

#### rosenbergii)

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#### **Presentation Summary**

The production of freshwater prawns in temperate regions of the United States has increased substantially in the past 5 years. However, due to the temperature constraints of temperate production, a relatively narrow marketing window exists for live and fresh product forms. The profitability of this enterprise is largely dependant on an ability to harvest, hold, and transport live product. If efficient harvest, holding and transport techniques can be developed the potential exists for sales of large amounts of product in the live ethnic markets of Chicago, New York, and Toronto. However, to date, wholesale buyers have often experienced problems in handling live prawns including: long waits for transport trucks picking up product, poor post-harvest survival in transport and in retail outlets, and limited seasonal availability.

The research approach at Kentucky State University has focused on improving post-harvest survival through better harvest and handling practices and extending the market season. Incorporation of catch basins in production ponds and later harvest dates (cooler water temperatures) have greatly improved post-harvest survival. The recent availability of pond-side holding tanks were farmers can harvest the prawns a day prior to pickup has greatly improved turnaround times for transport trucks. To address the problem of seasonal availability, a recent study evaluated the effect of water temperature (20, 24, and 28 ° C) in post-harvest holding tanks on prawn survival for a 90 day period. Additional research needs are the determination of optimal transport densities and evaluation of the potential benefit of added substrate in the transport containers.

#### EAST COAST LIVE! 2000 The Business of Marketing Live Aquatic Products



Radisson Hotel Annapolis, Annapolis, Maryland November 1-4, 2000

### **Animal Welfare and the Live Aquatics Industry**

Bernard Rollin, Department of Philosophy, Colorado State University, Fort Collins, CO 80523 Tel: 970-491-6885 or 6315; Email: <a href="mailto:chrollin@vines.colostate.edu">colorado State University, Fort Collins, CO 80523 Tel: 970-491-6885 or 6315; Email: <a href="mailto:chrollin@vines.colostate.edu">colorado State University, Fort Collins, CO 80523 Tel: 970-491-6885 or 6315; Email: <a href="mailto:chrollin@vines.colostate.edu">chrollin@vines.colostate.edu</a>

The last 30 years have witnessed the rise of a new ethic for animals all across the western world. For a variety of reasons, control of animal pain and suffering has become a major social and political issue in the U.S., Europe, Australia and Canada. This has led to new laws and regulations in areas of animal use that traditionally enjoyed laissez faire, including research and agriculture. Animal welfare and other politically active groups, while largely concentrating their efforts on terrestrial animal industries, have also targeted some segments of the live aquatics industry. Underestimating or being unprepared to deal with the effects of public and media attention directed towards a company's policies and methods for handling and transporting live aquatic animals (even if perfectly humane and defensible) can have significant negative consequences, most often when least expected.

Dr. Bernard Rollin, Colorado State University, Fort Collins, Colorado, internationally recognized for his innovative work on this subject with other animal production industries, will give a keynote presentation entitled **The New Social Ethic for Animals: Implications for the Live Aquatics Industry**. Dr. Rollin will explain the nature of this new ethic, the reasons for its development and what participants in the live aquatics industry must do to deal with it proactively. Dr. Rollin will also moderate a second follow-up session **Animal Welfare and the Live Aquatics Industry**, to provide the opportunity for an in-depth discussion with representatives of the live aquatics industry about specific scenarios, strategies and solutions for effectively dealing with this issue.

Bernard E. Rollin is Professor of Philosophy, Professor of Physiology and Biophysics, and Director of Bioethical Planning at Colorado State University. Rollin taught the first course ever developed on the subject of veterinary medical ethics and was a pioneer in reforming animal use in surgery teaching and laboratory exercises in veterinary colleges. He is a principal architect of federal legislation dealing with the welfare of experimental animals, and has testified before Congress on animal experimentation. He has consulted for various agencies of the governments of the U.S., Canada, Australia, the Netherlands, New Zealand, and South Africa on many aspects of animal research, for the Office of Technology Assessment of the U.S. Congress on genetic engineering of animals, and for NIH on animal pain. He has consulted for the USDA/CSRS on farm animal welfare research, and for APHIS on future planning. He currently writes a popular monthly column on veterinary ethics for the Canadian Veterinary Journal. His papers have appeared in a wide variety of publications including The Journal of Animal Science, The American Psychologist, to The Journal of the American Veterinary Medical Association, Progressive Farmer, and Equus. Rollin is a recipient of the Brownlee Award for outstanding achievement in Animal Welfare Science by the Animal Welfare Foundation of Canada, and the Distinguished Service Award from the Colorado Veterinary Medical Association.

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# \*\*\* Alternate Oral Presentations \*\*\*

## **National Seafood HACCP Implementation Survey**

### Ken Gall\* and Doris Hicks\*\*

\*New York Sea Grant Extension Program, SUNY Stony Brook, Stony Brook, New York.

\*\*Sea Grant Marine Advisory Service, University of Delaware. Lewes, Delaware

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Pay Lakes: The Business of Fee Fishing

Mark Frey, Frey's Fish Ponds, West Chester, Pennsylvania

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#### **Insurance for Live Aquatic Products**

**Greg Gutchigan**, Director, Aquaculture Insurance Services Mariner Management Group, Inc., Allendale, New Jersey

#### NATIONAL SEAFOOD HACCP IMPLEMENTATION SURVEY

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#### **Presentation Summary**

In 1998 Sea Grant's Seafood Specialist working with the New York Seafood Council developed a survey questionnaire to document the document the time, effort, and resources that the seafood industry in New York had devoted to the HACCP implementation process and the impacts that the training program and HACCP requirements had on their businesses. This was one of the first attempts to evaluate these changes in the U.S. Survey results were distributed to seafood businesses in NY, industry and government officials and even used by FDA officials in testimony presented to Congress in 1999 on HACCP programs.

In 1999, NY Sea Grant took the lead in conducting a similar survey across the U.S. Questionnaires were mailed to over 4,700 firms in all of the U.S. states and territories in November 1999. Between the two surveys, data from survey questionnaires provided by 727 seafood firms was compiled. Over 80% of these firms indicated that they would not have been able to develop their HACCP plan and comply with the new FDA regulation without the training program delivered by seafood specialists across the country. Significant changes were documented in the way seafood safety hazards are controlled and how sanitation programs are conducted in firms ranging from small one person companies to large firms with more than 100 employees. Considerable investments were also made in equipment and facilities to meet the new FDA HACCP requirements.

On average, firms spent over \$15,000 each on HACCP requirements and over \$10,000 on sanitation requirements. As a result most firms were positive about the increased knowledge and skill that they had obtained in controlling food safety hazards, and considerable concern about the increased costs associated with implementing and maintaining their HACCP system. When costs were compared to annual sales, the impacts of HACCP implementation appeared to be as much as 10 times greater for the smallest companies as compared to the largest.

#### PAY LAKES: THE BUSINESS OF FEE FISHING

Mark Frey

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#### **Presentation Summary**

This presentation reviews the technical and logistical requirements for operating a live pay lake or fee fishing business. Topics covered include site and species selection, pond and stocking management practices, marketing, state regulations and other business considerations.

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#### INSURANCE FOR LIVE AQUATIC PRODUCTS

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#### **Presentation Summary**

Land shipments of live aquatic products are increasing in direct proportion to the availability of those products from various production sources. The emerging aquaculture industry in the US is a significant factor in the overall analysis.

The growing demand for live food fish in the major cities in the US and Canada principally driven by the ethnic markets have increased the opportunity for live haul specialists, as well as farmer delivered movements. Many live sales are still FOB farm gate, but more and more farmers are delivering live products to customers as a differentiation strategy.

Live movements represent an increased exposure to underwriters when presented as a stand alone insurance opportunity. While the value at risk at any one time is relatively small in comparison to those values present in grow-out operations, the variables of transit perils such as collision, upset, overturn, as well as simple stress to the biomass in transit, creates concerns for underwriters.

Typical insurance concerns deal with the frequency of transits, distance of trips, duration

of trips, stocking density in transit, and the equipment used for the trips. The elements of insurability involve use of purpose built live haul equipment with individual holding tanks. The ability to supply steady aeration in transit with continuous monitors in the vehicle cab of flow is critical. Continuous movement is also critical. In the event of long trips, multi drivers are required to prevent lay overs.

Generally, live transits can be added to stock insurance policies for small additional premiums. Transit only policies can also be purchased. These policies are typically written on a reporting basis whereby premiums are based on actual values in transit. Most polices can be written on an all risk basis. Typically, perils excluded from any all risk contract include, intentional

slaughter, delay, loss of value and or market, malicious acts by the insured or his employees, war, and nuclear risks. In addition, losses to live animals because of differences in the conditions between the transporting conveyance and the final holding containers are excluded.



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# \*\*\* Poster Presentation Summaries \*\*\*

#### Overview of the Atlantic Veterinary College Lobster Science Center (LSC)

**Dr. Richard Cawthorn**, Director LSC Lobster Science Center, Atlantic Veterinary College University of Prince Edward Island, Charlottetown, PE C1A 4P3 Canada

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#### Mussel Production on Prince Edward Island (PEI), Canada

Dr. Jeff Davidson\*, Mr. Garth Arsenault and Mr. Jonathon Spears
Shellfish Research Group, Atlantic Veterinary College
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# Pathogenic Human Viruses and Shellfish: the USDA Seafood Safety Laboratory

Dr. David H. Kingsley\*, Gloria K. Meade, Michael A. Watson, and Dr. Gary P. Richards
Seafood Safety Laboratory, U.S. Department of Agriculture
Delaware State University, Dover, DE 19901

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# Marketing of Live Freshwater Fish and Shellfish in India

#### Rajendra Badinia\* and T.A. Qureshi

Department of Applied Aquaculture, Barkatullah University Bhopal (M.P.) - 462026. India

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Horseshoe Crabs: in Search of an Artificial Bait

Kirstin Ferrari\* and Nancy Targett
College of Marine Studies, University of Delaware, Lewes, DE 19958



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# \*\*\* Poster Presentation Summaries \*\*\*

### Transportation of Pond-raised Hybrid Striped Bass for Live-sale

## Brian L. Nerrie\* and Eugene Johnson

Aquaculture Office, Cooperative Extension, Virginia State University, Petersburg, VA 23806

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### Horseshoe Crabs and the Live Aquatics Industry

#### Bill Hall

Sea Grant Marine Advisory Service, College of Marine Studies University of Delaware, Lewes, DE 19958

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# Reducing Horseshoe Crab as Bait in the Virginia Conch Pot Fishery

#### **Robert Fisher**

Virginia Sea Grant College Program, Marine Advisory Services Virginia Institute of Marine Science, Gloucester Point, VA 23062

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### What is Happening to the Lobsters in Long Island Sound?

#### Peg Van Patten\* and Richard A. French

Connecticut Sea Grant Program, University of Connecticut 1084 Shennecossett Road, Groton, CT 06340

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# Lobster Health FAQs: Frequently Asked Questions

#### Peg Van Patten

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# \*\*\* Poster Presentation Summaries \*\*\*

# Open Ocean Submerged Longline Culture of the Blue Mussel in New England: A First Year Progress Report

Raymond E Grizzle\* and Richard Langan
Jackson Estuarine Laboratory, University of New Hampshire, Durham, NH 03824

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# Normal and Altered Gametogenesis in the Green Sea Urchin - Implications for Aquaculture

Charles W. Walker\*, Laura M. Harrington, Michael P. Lesser and Michael Devin
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#### OVERVIEW OF THE ATLANTIC VETERINARY COLLEGE LOBSTER SCIENCE CENTRE

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# Poster Summary

The Atlantic Veterinary College Lobster Science Centre (AVC LSC) was recently established at the University of Prince Edward Island in Charlottetown, PEI, Canada. Developed with support from the Atlantic Canada lobster & related industries, the Canadian federal government, and the provincial government of Prince Edward Island, the AVC Lobster Science Centre will build on the successes of AVC's lobster health research program.

The mission of the AVC Lobster Science Centre is to apply the principles of veterinary medicine to the health of individual lobsters and the lobster resource in general and to other crustacean fisheries. Ultimately, the goal of the Centre is to increase economic and social benefits from the lobster industry, through research and educational programs, within a cooperative framework. Industry and government participate directly as members of the Centre's Management Council, Science Advisory Committee, and Communications Committee.

The work of the AVC Lobster Science Centre will be significant regionally, nationally and internationally in creating and expanding knowledge about the lobster fishery. AVC researchers' close ties with the lobster industry will be a major factor in the success of the Centre. To ensure the survival of the lobster fishery, the AVC LSC will learn more about lobster health and then share the information with all stakeholders. Researchers anticipate that much of the lobster health research will be applicable to other crustaceans such as crabs, shrimps and prawns, globally.

The Atlantic Veterinary College has a solid research record in lobster health, as well as fish health and aquaculture. The AVC Lobster Science Centre is an excellent opportunity to further support the lobster industry and the Atlantic region.

#### PRINCE EDWARD ISLAND BLUE MUSSEL PRODUCTION

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# Poster Summary

The blue mussel (<u>Mytilus edulis</u>) industry in Prince Edward Island has grown from its modest start in the mid 1970's to the most important aquaculture sector today. In 1999 the industry exported thirty-one million pounds of mussels to markets all over North America, the value of which exceeded twenty million dollars (U.S.). Additionally, the approximately one hundred and twenty-five mussel growers and eight processing plants creates employment for over two thousand people either directly or indirectly.

Mussel growers on Prince Edward Island have developed a culture method referred to as the "Longline" method. This method of growing mussels uses lines which are suspended in the water column. The longlines are usually three to six hundred feet in length and are securely anchored at each end and buoyed up with Styrofoam or plastic floats. Longlines are placed side by side and usually from twelve to forty feet apart in a mussel lease.

In late Spring or early Summer, when water temperatures reach 15-18 degrees centigrade, sexually mature male and female mussels release eggs and sperm into the water, where fertilization occurs. Three to four weeks after fertilization these free-swimming larva will attach to a suitable site where they will grow for the remainder of their life. Mussel growers take advantage of this natural spawning process by suspending frayed rope in the water column in areas where mussels abound, expecting the larva to settle on the "seedlines". In the fall, mussel seed (10-20 mm) is collected from these lines. The seed is cleaned, graded and placed in small mesh "socks" which are 6-10 feet in length. These socks are tied to the longlines about 12-18 inches apart and left to grow to market size at approximately 60 mm. The time on the sock to market varies from 12-24 months depending on growing conditions.

Mussels are harvested on Prince Edward Island year round. Boats or barges are specially equipped with hydraulic powered booms and winches to lift the longlines up above the surface of the water to enable the socks to be removed and placed in tubs onboard the vessel. During winter most of the mussel producing areas freeze over with up to three feet of ice. Winter harvesting involves pulling the longlines up through holes cut in the ice, removing the socks and hauling the mussels to shore on sleds by snowmobiles or trucks. Harvested mussels are taken directly to a processing plant where they are cleaned, graded and packaged. Deliveries are made to most North American markets within two to three days after harvesting.

# PATHOGENIC HUMAN VIRUSES AND SHELLFISH: THE USDA SEAFOOD SAFETY LABORATORY

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#### Poster Summary

As part of the USDA Food Safety initiative, a laboratory on the campus of Delaware State University has been established to investigate the presence of human enteric viruses in molluscan shellfish. Shellfish have the ability to bio-concentrate enteric viruses as well as other human pathogens when exposed to human sewage. Furthermore these viruses are environmentally stable, frequently persisting in water, shellfish tissues and estuary sediments for several weeks. Since oysters and clams are often consumed raw, virus contaminated shellfish present a significant risk to consumers. Present efforts within the laboratory include tissue culture-based and molecular biological based RT-PCR methods for detection of hepatitis A, and Norwalk viruses in oysters and clams. Secondly, research on potential depuration processes, a possible means of

eradicating viral pathogens from live shellfish, is being conducted.

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#### MARKETING OF LIVE FRESHWATER FISH AND SHELLFISH IN INDIA

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#### Poster Summary

During 1998-99 India's total fish production was 5.26 million tonnes. Marine and freshwater fish contributed 2.69 and 2.57 million tonnes each. The export of fishery products

equaled 3.03 million tonnes valued at (Rupees) Rs.46,270 million (US\$1=Rs.44.50). The majority of export products include marine prawn, fish, and cephalopods. Contribution from freshwater fishery products and live fishes is negligible. Some trial consignments of live crabs have been transported by air cargo to the South East Asian markets.

Marketing of fish in live form is prevalent in many parts of India, particularly the inland states. The technology employed for live fish transportation and marketing is not sophisticated and needs to be upgraded. Prawns, mussels, crabs and fish are available for marketing and export in live condition.

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#### HORSESHOE CRABS: IN SEARCH OF AN ARTIFICIAL BAIT

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# Poster Summary

The decline of the horseshoe crab population has elicited concern among Delaware's fishermen, conservationists, and regional biomedical suppliers. Each of these groups has a vested interest in the availability of horseshoe crabs. A preferred bait for eel and conch, horseshoe crabs are increasingly harvested as fishermen abandon heavily regulated fisheries for this previously

unregulated fishery. In addition, their eggs are critical fuel for shorebirds migrating to arctic breeding grounds. Finally, horseshoe crabs are extremely valuable to the biomedical industry as a source of the clotting agent Limulus amoebocyte lysate.

In order to slow the population decline and balance conservation with watermen's economic concerns, two questions must be addressed. First, can the horseshoe crab resource be sustained without economically collapsing local fisheries? Second, can local fisheries persist without collapsing the horseshoe crab population? We believe a cost-effective artificial bait that mimics female horseshoe crab bait would significantly reduce fishing pressure on horseshoe crabs.

We have identified a chemical cue in horseshoe crab eggs that may be attracting eels and conch to fishermen's pots. While developing a cost-effective synthetic alternative of this complex chemical cue is unlikely, hemolymph from horseshoe crab blood may provide a sustainable source of the attractant. Our research confirms that hemolymph, a waste by-product of the LAL industry, contains a chemical compound similar to the attractant in horseshoe crab eggs. If incorporation can be optimized, this cost-effective artificial bait will provide a long-term, sustainable solution to the current horseshoe crab dilemma.

#### TRANSPORTATION OF POND-RAISED HYBRID STRIPED BASS FOR LIVE-SALE

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# Poster Summary

An increasing demand for live hybrid striped bass in restaurants in the Tidewater Area of Virginia stimulated the development of successful techniques for supplying the live fish demand. Four important components are included in the transportation of life fish to market. They are handling, harvest, holding, and hauling.

Hybrid striped bass are susceptible to bacterial and fungal infections if not handled properly. An innovative harvesting method is used with a 1.25-cm square mesh seine pulled by jet-skis to prevent gilling. Fish are graded in-pond to allow fish less than one pound to escape. They are loaded into hauling units filled with pond water and transferred into 3-meter diameter by

one-meter deep steel fiberglass lined holding tanks. Transfer is made by gradually mixing oxygenated ground water from the holding tank with water in the hauling tank. Fish are held unfed at low-density (<50 kg/tank) for 5-days to allow for removal of stressed fish. Water quality in the holding tank is maintained by a constant flow of 200 liters/minute of aerated ground water at 12-14° C.

Fish are weighted in water and stocked into a truck mounted tank holding 1200 liters of aerated groundwater. Stress is reduced by adding approximately 3.5-kg salt to the tank water. Water temperature during transport does not increase appreciably, and supplemental dissolved oxygen is maintained >5 ppm by diffused air. Bottled oxygen is carried for emergency use. Oxygen is monitored using tank based probes leading to meters located in the truck cab.

Water from the hauling tank is mixed with water in the receiving display tank. Hybrid striped bass (>500 g) are carried in water to the display. Concerns include end-user liability issues, improved techniques for anesthesia, and development of opportunities for additional sales in urban areas within a range of 150 miles of the farm.

#### HORSESHOE CRABS AND THE LIVE AQUATICS INDUSTRY

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# Poster Summary

Horseshoe crabs (<u>Limulus polyphemus</u>) have a long history of harvesting beginning with coastal indigenous indians who utilized them for food, fertilizer and as canoe balers. Indians taught early settlers to use them as fertilizer which initiated a commercial industry that survived into 1960's. Today the horseshoe crab appears to be over fished as populations are on the decline apparently due to the impact of the bait industry that harvests millions for eel, conch, lobster, and catfish pots. Currently, states all along the east coast, in concert with the Atlantic States Marine Fisheries Commission are initiating management regulations to regulate their harvest as there are a number of competing uses for this unique species. In addition, NOAA is setting up a sanctuary area just outside the Delaware Bay.

Horseshoe crabs are the most studied marine invertebrate in the world primarily because of the biomedical industry. Their blood is used to make a product called Limulus Amoebocyte Lysate (LAL), which when processed is worth over \$15,000 a liter. LAL is used to test bacterial contamination, a test required by the FDA for all intravenous drugs and prosthetics LAL is a growing industry that is currently valued at over \$100,000 a year. New tests for human bacterial diseases like meningitis have been approved and others will likely follow. Horseshoe crabs have been used in eye research for decades, cancer research, and the shell used to develop new thread suture materials for surgery.

Recently, juvenile horseshoe crabs have been appearing in pet fish trade as aquarists are using them in their home marine tanks. They make a unique display animal, require little care, and are easily accessible. This novel use will probably continue to grow and expand.

#### REDUCING HORSESHOE CRAB AS BAIT IN THE VIRGINIA CONCH POT FISHERY

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## Poster Summary

The objective of this research was to determine if reducing the amount of horseshoe crab bait placed in a mesh bait bag would affect the number of conch caught per trap. It was theorized that if scavenger animals are kept away from the bait by the use of the mesh bags, then less

bait would be needed and the bait used will continue to attract conch during the total time traps are in the water.

Whole female and male horseshoe crabs were tested as conch bait against halves, thirds and quarters of crabs cut and placed in mesh bait bags. One whole female crab, or two whole male crabs were used as the control groups for this study which mimicked traditional commercial usage of crabs as conch bait. The treatment groups were: half of a female or two halves of male crabs placed in a mesh bait bag, representing a reduction of one half the traditional bait usage; one third of a female crab representing a third reduction; and one quarter of a female, or one half of a male crab representing a quarter reduction. Female treatment groups were tested against female controls, and male treatments against male controls.

Eighteen lines totaling 346 treatment groups (traps) and 341 control groups were tested. No significant differences were observed in the number of conch caught per pot between using half the amount of bait traditionally used in the commercial conch industry and the traditional amount. Both male and female half-crab test groups showed a slight decrease in total catch (5.9% and 6.1% respectively) from the control groups, but were not statistically different.

Throughout the study the amount of conch caught per pot within a trap line was highly variable; however, variability was high for both testing groups. This indicated that both the treatment and the control groups fished equally in areas of both high and low conch densities. Catch rates began to decline once the bait was reduced to thirds (18.2%), and sharply fell with the reduction to quarters (26.4-39.6%). In areas of high conch densities, the whole crabs

consistently caught more conch than the third or quarter crab, but in areas of low conch densities catch was more equal.

#### WHAT IS HAPPENING TO THE LOBSTERS IN LONG ISLAND SOUND?

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## Poster Summary

Recently, lobsters in Long Island Sound have been experiencing unprecedented outbreaks of disease that have resulted in massive mortalities, particularly in the western Sound. Economic impacts on the lobster fishery and related industries have been devastating. Hundreds of thousands of lobsters have died and more than 1300 lobstermen Sound-wide are impacted by the loss estimated to be about \$16 million per year.

Other economically important species such s blue crabs and sea urchins are also experiencing unexplained die-offs in parts of the Northeast United states, which may or may not result from the same cause as the lobster mortality. Possible causes of this phenomenon are presented along with efforts being undertaken by the industry and researchers to better understand and deal with the problem.

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#### LOBSTER HEALTH FAQS: FREQUENTLY ASKED QUESTIONS

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#### Poster Summary

Recent unprecedented mass mortalities of lobsters in Long Island Sound have had a devastating economic impact on the lobster fishery and related industries. This presentation provides some basic answers to frequently asked questions related to the status of the fishery, local economic impact, public health concerns, possible causes, significant environmental factors and a source for additional information.

# OPEN OCEAN SUBMERGED LONGLINE CULTURE OF THE BLUE MUSSEL IN NEW ENGLAND: A FIRST YEAR PROGRESS REPORT

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### Poster Summary

The blue mussel (<u>Mytilus edulis</u>) has supported a substantial aquaculture industry in New England for 20 years. The predominant method is bottom culture in shallow, nearshore waters. The present project is aimed at assessing the development of suspension culture techniques in open ocean waters of New England, and involves spat/seed collection and growout.

Spat collection experiments conducted in 1998 and 1999 showed wide spatial and temporal variability in set densities, but adequate numbers were caught in spring/early summer both years near the mouth of the Piscataqua River, New Hampshire. Major problems encountered were overgrowth of the collectors by tubularian hydroids and apparent stunting of the seed at high mussel densities. Sufficient seed to stock >700 meters of socking material were obtained in 1998.

These mussels were deployed to the submerged longline, which is constructed of 2.8 centimeter "polysteel" rope, on July 2, 1999. The longline is located 10 kilometers offshore from Portsmouth Harbor, New Hampshire in about 60 meters of water.

Mussel size and environmental quality have been monitored monthly since July. Overall, the mussels averaged 1.0 millimeter shell growth/week from 2 July through 9 November. Based on growth data thus far, a total time from spat set to harvest could be substantially less than 2 years.

# NORMAL AND ALTERED GAMETOGENESIS IN THE GREEN SEA URCHIN - IMPLICATIONS FOR AQUACULTURE

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#### Poster Summary

During the annual reproductive cycle, gonads of both sexes of the sea urchin pass through a characteristic series of structural changes (Walker 1982; Pearse and Cameron 1991; Walker et

al. 1998). These changes can be classified according to the activities of the two major populations

of cells that compose the germinal epithelium. These cellular populations are either: a) germinal cells (oogonia -> fully mature ova in the ovary or spermatogonia -> fully differentiated spermatozoa in the testis); or b) somatic cells called nutritive phagocytes (NP) and present in both

sexes (Caullery 1925; Holland and Giese 1965; Holland and Holland, 1969; Kobayashi and Konaka, 1971).

It is important to recognize that the size of sea urchin gonads does not necessarily relate to the progress of gametogenesis alone. One must very carefully consider the stage of gametogenesis

that characterizes a particular individual in order to determine what cellular population (germinal or somatic) actually predominates in size and/or numbers within its germinal epithelium (Walker et al.1998).

Changes in the germinal epithelium of the sea urchin gonad have been described using the staging systems of Fuji (1960 a, b) based on germinal cells and of Nicotra and Serafino (1988) based on nutritive phagocytes (NP) (Unuma et al. 1998, 1999; Byrne 1990; Meidel and Scheibling 1998; Walker and Lesser 1998; Walker et al. 1998; Harrington 1999). A valid staging system must simultaneously consider both populations of cells and provide the basis for a cellular

understanding of gametogenesis. We employ the following stages: a) Inter-Gametogenesis and NP Phagocytosis, b) Pre-Gametogenesis and NP Renewal, c) Gametogenesis and NP Utilization and d) End of Gametogenesis, NP Exhaustion and Spawning.

This Information is also available on the Internet at <a href="http://zoology.unh.edu/faculty/walker/urchin/gametogenesis.html">http://zoology.unh.edu/faculty/walker/urchin/gametogenesis.html</a>>.



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# Fish Farming News

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Radisson Hotel Annapolis, Annapolis, Maryland November 1-4, 2000

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