

## SEAFOOD HACCP

Fisheries — a modern-day reliving of the transition from a hunter-gatherer economy to an agricultural economy:

### Harvesting

Finfish are harvested by net or by hook, largely from marine waters.

Shellfish are bottom-dwellers and must be harvested with dredges or tongs.

Among crustacea, shrimp are typically netted, whereas lobsters and crabs are usually trapped.

Net harvesting has become very sophisticated, but is still subject to capture species other than what was sought.

Increased harvesting efficiency has also led to depletion of some important economic species, although some of this depletion also results from the loss of breeding habitats, far from the harvest sites.

### Aquaculture

Many economic species of seafood can be bred and raised under human control. Aquaculture affords opportunities to produce seafood that presents fewer risks to the consumer; the challenge is keeping the chosen species healthy while bringing large quantities to marketable size.

Some finfish, and even crustacea, can be raised in quantity inland, in fresh water impoundments.

Because many aquaculture establishments are located on seashores or in estuaries, some have been accused of occluding breeding habitats of wild species.

### Hazards

Seafoods harvested from the wild present a number of threats to human health, many of which are reviewed below.

Risks are greatest with seafoods that **may** be eaten raw (e.g., finfish in ceviche or sashimi) or that are **most often** eaten raw (e.g., some species of molluscs).

Concerns with shellfish are enhanced by the fact that these animals feed by filtration and so can concentrate pathogens from their environment; some predatory finfish may concentrate toxicants and parasites from smaller fish that they eat.

Aquaculture offers some opportunities to select sites and monitor water quality; these become potential critical control points.

Harvesting of “wild” seafoods may be prohibited in certain waters, certain seasons, or both, to minimize risk to the consumer; such measures may be critical control points, but they present great difficulties in enforcement.

Recorded (by CDC) outbreaks of seafood-borne disease in the U.S., 1993– 1997:

Agent	Shellfish	“Other fish”	All vehicles
<i>Clostridium botulinum</i>	0	1	13
<i>Clostridium perfringens</i>	1	0	57
<i>Salmonella</i> spp.	1	0	357
<i>Shigella</i> spp.	2	0	43
<i>Staphylococcus aureus</i>	0	1	42
<i>Vibrio parahaemolyticus</i>	1	0	5
Ciguatoxin	0	54	54
Paralytic shellfish	1	0	1
Scombrototoxin	0	66	66
Noroviruses	3	0	9
Other viruses	6	0	24

Known hazards from seafoods:

Shellfish

Bacteria: *Salmonella* spp., *Shigella* spp., *Vibrio* spp.

Toxins: paralytic shellfish, others

Viruses: hepatitis A, Norwalk-like

“Finfish”:

Bacteria: (*Bacillus cereus*), ***Clostridium botulinum***, *Salmonella* spp., (*Shigella* spp.), (*Staphylococcus aureus*), *Vibrio cholerae*, *Vibrio parahaemolyticus*

Toxins: ciguatoxin, “scombrototoxin,” tetrodotoxin (pufferfish only)

Parasites: anisakids (also in squid), *Diphyllobothrium latum*, flukes

Crustacea: *Vibrio parahaemolyticus*

HACCP for seafoods was mandated in 1995 and implemented in 1997. All aspects of seafood commerce in the U.S. except harvest at sea are subject to HACCP requirements. A videotape from the Alaska Seafood Marketing Institute will be shown. Other, on-line resources are listed below.

**Seafood Network Information Center** (located here at UC-Davis)

<<http://seafood.ucdavis.edu>>

**U.S. Food and Drug Administration Seafood HACCP**

<<http://www.cfsan.fda.gov/~comm/haccpsea.html>>

**Fish & fisheries products hazards & controls guidance:** Third edition, June 2001. U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition.

<<http://www.cfsan.fda.gov/~comm/haccp4.html>>

**Compendium of Fish and Fishery Product Processes, Hazards, and Controls  
National Seafood HACCP Alliance for Training and Education**

<<http://seafood.ucdavis.edu/haccp/compendium/compend.htm>>

**Seafood HACCP Alliance HACCP Training Curriculum Manual (Blue Book)**

<[http://seafoodhaccp.cornell.edu/manuals\\_pdf.html](http://seafoodhaccp.cornell.edu/manuals_pdf.html)>

**2003 National Shellfish Sanitation Program (NSSP), Guide for the Control of Molluscan Shellfish, Model Ordinance. Interstate Shellfish Sanitation Conference.**

<[http://www.pcsa.org/Government\\_Pages/NSSP.html](http://www.pcsa.org/Government_Pages/NSSP.html)>

This is a voluntary program developed by the Interstate Shellfish Sanitation Conference in cooperation with FDA. It is advisory to states, which retain the primary legislative authority over shellfish in the U.S.

**Federal regulations: 21 CFR Part 123--Fish and Fishery Products****Depuration**

Shellfish must be from approved or restricted water (see NSSP)

Plant designed to provide clean water, so that live shellfish cleanse themselves

Verification is based on elimination of fecal coliforms

**FDA Food Code 2005:** retailing and food service; Ch. 3 contains sections regarding fish and (especially) mollusks

<<http://www.cfsan.fda.gov/~dms/fc05-toc.html>>

**Summary**

HACCP is required for seafoods in U.S. as of December 18, 1997.

Emphasis is on processors and importers.

Most critical control points are based on events at receiving and on maintaining appropriate temperatures.

Other than correcting temperature settings, most intervention strategies are based on discarding the product.