Mercury, Selenium, Omega-3 Fatty Acids and Canned Tuna

The issue of mercury contamination in fish remains in the news. New studies are being published that give significant new information on both the mechanisms of mercury contamination and the human health implications of current mercury standards. Unfortunately, it appears that all the subsequent media attention has resulted in a generalized backlash against seafood consumption, with negative health implications for some.

Numerous health benefits from seafood consumption have been documented over the past ten years or so. Consumption of omega-3-rich fish is proven to lower risks of cardiac, cardiovascular and eye diseases, and to mediate mood, attention and dementia disorders. Pregnancy diets rich in omega-3 fatty acids help to prevent pre-term births, and a study appearing in the March 2008 *American Journal of Epidemiology* demonstrated that children of women who consumed the most low-mercury, omega-3-rich fish while pregnant — specifically canned tuna— scored the highest on intelligence and motor-skills tests. Additionally, a 2007 study published in *The Lancet*, a leading British medical journal, concluded that avoiding dietary omega-3s during pregnancy has a measurable detrimental health effect: Children whose mothers eat no fish during pregnancy are 29 percent more likely to have abnormally low IQs.

This latter effect may be occurring as an unfortunate result of over-reaction about the threat of mercury contamination by some environmental organizations and then by people who read the resulting headlines. In fact, there are questions about the validity of the EPA and FDA mercury criteria. The EPA included a 1,000-percent safety cushion during the formulation of its methylmercury "Reference Dose" — the maximum level of continuous lifetime exposure believed to be without risk of harm. The FDA set its minimum action level for mercury in commercially available fish to limit consumers' exposure "to levels 10 times lower than the lowest levels associated with adverse effects," which is, in effect, a ten-fold safety factor that is not based on actual scientific data. Many researchers and medical professionals believe that new information supports revision (upward) of U.S. mercury criteria, or at least co-consideration of other critical factors involved, such as the health benefits of seafood and problems with some early mercury studies. Recent work has shown that a mineral nutrient that is prevalent in fish, selenium, reduces the uptake of mercury in consumers. One study stated that "measuring the amount of mercury present in the environment or food sources may provide an inadequate reflection of the potential for health risks if the protective effects of selenium are not also considered."

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In the meantime, some people have stopped eating fish. One seafood promotion group has developed information on canned tuna, in particular. Canned tuna is the cheapest and most readily available source of omega-3 fatty acids in the United States. For many low-income families, canned tuna is the only consistently affordable source of dietary omega-3 fatty acids. Survey data show that in 1999, 80 percent of low-income American households were buying canned tuna. By 2006, and after much news about mercury in tuna, that number had dropped to 69 percent — a decline of about 4.4 million households. During those years, women in those households gave birth to nearly 260,000 children who were put at risk of developmental problems due to lack of dietary omega-3s in their mothers' diets. The seafood group noted that cost was probably not a primary factor in the move away from canned tuna, since its price rose only about 1 percent during that period.

To put this in perspective, some average mercury concentrations of several well known seafoods are:

Chunk light tuna, canned	0.118 ppm (parts per million)
Albacore tuna , canned	0.353 ppm
Shrimp	not detectable
Seatrout	0.256 ppm
Snapper	0.189 ppm
Shark (falls under the "avoid" category)	0.988 ppm

— Glenn Thomas

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Understanding Trophic Levels through Isotope Analysis

Understanding trophic level dynamics has become increasingly important as some fish populations have diminished. The phrase, “fishing down the food web,” is commonly heard in regard to commercial catches shifting toward species lower in the food chain. Fishing pressure on some species has also led to average catch sizes being smaller, and in some cases, the larger species has been replaced altogether by a smaller species.

As a measure of position in the food web, trophic levels range from about 2 to 5. Fish vary in trophic level according to what type of food they eat, as well as the latitude at which they live. Low trophic organisms eat mainly plants and invertebrates, while high trophic level fish eat other fish. Examples of low trophic level organisms include shrimp (2.2) and menhaden (2.25), and higher trophic level species include fish such as mackerels (3.18), snappers (3.9) and groupers (4.1). Knowing whether or not sought-after species are sliding down trophic levels can help with strategies for managing these populations.

Compound-specific isotope analysis is becoming popular as a means for studying aquatic food webs. Using the isotope nitrogen-15 ($\delta^{15}N$) is common in aquatic research, due to its abundance and ability to be tracked. This specific isotope can be used to assess the trophic level of top predator species by taking the difference in $\delta^{15}N$ values between the predator and the primary producer trophic levels. It is difficult, however, to obtain accurate $\delta^{15}N$ values from primary producers and consumers since their nitrogen content can fluctuate throughout the year and in general are short lived. Thus, researchers have developed a way to learn about the top and bottom trophic levels from a single sample in the predator fish. Essential amino acids, such as glycine and phenylalanine, contain $\delta^{15}N$ and are only synthesized by plants and bacteria. The $\delta^{15}N$ in these amino acids are not fractionated as they move through the food web, making them easily quantifiable. On the other hand, nonessential amino acids like alanine, aspartic acid and glutamic acid also have $\delta^{15}N$ and are synthesized in fish but not by primary producers. For every trophic level increase, the difference in $\delta^{15}N$ values between essential and nonessential amino acids changes by about 7‰ (parts per thousand). Therefore, by analyzing the ratio of $\delta^{15}N$ found in a predator’s essential and nonessential amino acids, researchers can obtain reliable trophic estimates.

A recent study (Popp et al. 2007) was conducted to assess the trophic level of yellowfin tuna (*Thunnus albacares*) from the nutrient-rich waters of the eastern tropical Pacific. The goal was to determine whether the nitrogen isotopic composition found in amino acids could provide insight into the trophic level of tuna without having to sample primary producers. Using white muscle tissue from tuna, $\delta^{15}N$ was extracted from the two groups of amino acids and analyzed. $\delta^{15}N$ results showed the tuna trophic level to be between 4.2 and 4.6, which was dependent upon the latitude at which they were caught. These results were comparable to a study that derived trophic levels from diet analysis (4.6- 4.7), as well as from a model based on the difference in $\delta^{15}N$ values directly from primary producers and tuna (4.1- 4.9).

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Monitoring the yellowfin tuna trophic level over time will be important in understanding the situation of the population if harvests increase. Evaluation of the historical trophic level, simply by analyzing $\delta^{15}N$ ratios in preserved fish, will help researchers determine if the tuna trophic level has increased or decreased. These methods can also be used and applied for other species of local interest. Determining the historical and current trophic level of highly-sought fish species can be beneficial for fishermen, as well as governing bodies that monitor and regulate quotas. As these isotopic techniques become more widespread, hopefully their application will aid in management strategies to sustain fish populations for generations to come.

— William Sheftall IV

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Interim Measures for Gulf of Mexico Reef Fish Effective Jan. 1, 2009

NOAA Fisheries Service has published a final rule implementing interim measures in the Gulf of Mexico reef fish fishery. The measures go into effect Jan 1, 2009. The Gulf of Mexico Fishery Management Council requested that a temporary rule be effective at the beginning of 2009 to address overfishing of gag, as well as red snapper, greater amberjack and gray triggerfish until more permanent measures can be implemented through Amendment 30B to the Fishery Management Plan. The council developed Amendment 30B to end overfishing of gag, revise shallow-water grouper management measures in light of new information on gag and red grouper stocks and improve the effectiveness of federal management measures. NOAA Fisheries Service is presently reviewing Amendment 30B with subsequent rulemaking occurring later in 2009.
The interim rule will:

- Establish a two-fish gag recreational bag limit (recreational grouper aggregate bag limit will remain at five fish).
- Adjust the recreational closed season for gag to Feb. 1 through March 31 (the recreational closed season for red and black groupers will remain Feb. 15 to March 15).
- Establish a 1.32 million pound commercial quota for gag.
- Require operators of federally permitted Gulf of Mexico commercial and for-hire reef fish vessels to comply with the more restrictive of federal or state reef fish regulations when fishing in state waters for red snapper, greater amberjack, gray triggerfish and gag.

All measures implemented through this final temporary rule will terminate on June 1, 2009, unless extended on an interim basis for an additional 186-day period, or replaced by measures implemented through another rule. A copy of the interim rule is available from the Sustainable Fisheries Division of NOAA Fisheries Service's Southeast Regional Office, 263 13th Avenue South, St. Petersburg,

Fla. 33701. Electronic copies of the final rule may be obtained from the *Federal Register* Web site at http://www.gpoaccess.gov/fr/index.html (do an advanced search under final rules for "page 73192"). For more information on Gulf of Mexico shallow water grouper fishery, log onto: http://sero.nmfs.noaa.gov/ or call 727-824-5305.

Aquaculture Fishery Management Plan Update

Final action on a proposed Aquaculture Fishery Management Plan (FMP) that would implement a regional permitting process for regulating aquaculture in the federal waters of the Gulf of Mexico was delayed last month to allow for the review of public comments received as late as Oct. 27, the deadline to submit formal comments.

The Gulf of Mexico Fishery Management Council agreed the delay would also provide NOAA General Counsel the additional time needed to review the latest changes to both the FMP and the regulations prior the council taking final action. Under development for nearly six years, the Aquaculture FMP provides a process to ensure that aquaculture operations undertaken in the Gulf of Mexico EEZ are environmentally sound, sustainable and provide maximum benefits to the nation.

A final public hearing will be held during the January council meeting in Bay St. Louis, Miss., at the Hollywood Casino Hotel. Public testimony is scheduled to begin Wednesday, Jan. 28, 2009, at 1:15 p.m. The final draft of the FMP is expected to be available at the first of the year and it will be posted on the Gulf Council Web site at that time.

A list of frequently asked questions is also available on the Council's web site at www. gulfcouncil.org - click Library in the left navigation.

Gulf Longline/Sea Turtle Problems Prompt Council Action

Gulf Fishery News: A recent report by the Southeast Fisheries Science Center shows the estimated take of sea turtles in the bottom longline fishery in the Gulf of Mexico exceeds the authorized bycatch allowance. This increase in bycatch has prompted the Gulf of Mexico Fishery Management Council to immediately begin developing an amendment to address the issue. Already scheduled are two scoping meetings to explore possible alternatives to reduce sea turtle takes to levels that do not jeopardize the continued existence of the population.

Members of the longline fishing industry are working hard to develop gear modifications to help reduce turtle bycatch. Glen Brooks with the Gulf Fisherman's Association demonstrated to council members during an informal Q&A session held in Mobile, Ala., two different gear modification prototypes. The modifications are fairly simple and, if proven effective, would be easy to implement across the bottom longline fishery.

The gear would, of course, have to be tested and approved, but Brooks is hopeful that the industry efforts will limit other possible restrictions, and he's working closely with officials to get the modifications approved as quickly as possible.

The council is required by the Endangered Species Act to take action to provide protection for threatened loggerhead sea turtles from interactions with fishing gear. Similarly, National Standard 9 of the Magnuson-Stevens Fishery Conservation and Management Act requires the council to reduce

bycatch to the extent practicable, and where it cannot be reduced, to reduce bycatch mortality. Scoping meetings will be held from 6-9 p.m. Dec. 9, 2008, at the Hilton Garden Inn in Panama City, Fla., and Dec. 10, at the City of Madeira Beach Municipal Building in Madeira Beach, Fla.

The meetings are part of the initial phase of preparing a plan amendment and are designed to identify issues and a reasonable range of alternatives to address those issues. Some alternatives that may be considered include time/area closures, gear modifications, effort limitation and other measures to reduce sea turtle takes and mortality from interactions with bottom longline gear in the reef fish fishery. The public is encouraged to attend and provide comments and suggestions; public input will then be used to further develop the amendment.

Commerce, Interior Departments Announce Launch of National System of Marine Protected Areas

The U.S. departments of Interior and Commerce have jointly announced the availability of the final Framework for the National System of Marine Protected Areas of the United States, completing a cooperative, multi-year effort to provide a comprehensive approach to the protection of the nation's natural and cultural marine treasures.

The National System of Marine Protected Areas is the first formal mechanism for coordinating MPAs across all levels of government. The agencies also announced the nomination process for federal, state, territorial, tribal and local sites to join the National System of Marine Protected Areas.

MPAs are defined areas where natural or cultural resources are given greater protection than the surrounding waters. In the U.S., these areas may span a range of habitats including the open ocean, coastal areas, inter-tidal zones, estuaries and the Great Lakes.

"Today's announcement highlights a new focus on working together across jurisdictions to conserve our common ocean heritage," said Timothy Keeney, deputy assistant secretary for oceans and atmosphere. "Through the national system of MPAs, we will have a more efficient, effective approach to conservation of the nation's important natural and cultural marine resources."

The publication of the Framework for the National System of Marine Protected Areas of the United States of America provides a blueprint for building the national system of MPAs. The framework outlines key components of the national system, including overarching national system goals and priority conservation objectives; MPA eligibility criteria; a nomination process for existing MPAs to be included in the national system; and a science-based, public process for identifying conservation gaps in existing protection efforts where new MPAs may be needed.

"This lays the groundwork for a national system of MPAs that will ensure that our ocean's resources are conserved for future generations," said Kaush Arha, deputy assistant secretary for fish, wildlife and parks. "Our nation as a whole will benefit from this comprehensive and representative system that not only enhances conservation and collaboration, but also will identify biologically or culturally important areas that are currently not adequately protected to ensure their long-term viability."

In addition to public comments, extensive advice on the development of the national system and the Framework came from the 30-member MPA Federal Advisory Committee (MPA FAC) – a group composed of natural and social scientists, state and tribal resource managers, commercial fishermen,

anglers, energy and tourism industry representatives, divers and environmentalists. The MPA FAC was created in 2003 and has been working since then to develop recommendations for designing and implementing the national system.

Mark Hixon, MPA FAC chair and professor of zoology at Oregon State University, notes that “Marine Protected Areas can be a controversial topic, yet the process we announce today is evidence that people with different views and interests can collaborate on the management of our valuable ocean resources.”

MPA FAC vice-chair Bob Zales II, owner of Bob Zales Charters in Panama City, Fla., and president of the National Association of Charterboat Operators, added, “The national system provides a science-based and transparent process for identifying areas where new protection efforts may be needed. This is the type of open process that ocean users want to see.”

Presidential Executive Order 13158 of May 2000, calls for a scientifically based, comprehensive national system of MPAs that represents the nation’s diverse marine ecosystems and natural and cultural resources. NOAA’s National Marine Protected Areas Center led its development on behalf of the departments of Commerce and Interior, and in consultation with federal agencies, coastal states and territories, tribes, federal fishery management councils and the public. The national system does not establish any new legal authorities to designate MPAs, but provides a mechanism for MPAs across all levels of government to work together more effectively to achieve common goals.

The Department of Commerce, through NOAA, and the Department of the Interior will build the national system gradually over time. Priority conservation objectives, identified in the Framework document, will guide the development of the national system and identify existing MPAs to be included, as well as conservation gaps which might be addressed through the establishment of new MPAs.

This announcement also marks the start of the nomination process for sites to join the national system. MPAs meeting the eligibility criteria defined in the Framework are invited to nominate themselves through their federal or state managing agency. All nominated sites will be available for public comment at www.mpa.gov.

MPAs that are accepted into the national system will be the focus of cooperative efforts to address common resource management challenges and will be placed on the official List of National System MPAs, which will be available to the public via the Federal Register and on www.mpa.gov. The framework document is available for download now www.mpa.gov.

Oyster Seed Ground Vessel Permits Go on Sale

The Louisiana Department of Wildlife and Fisheries (2008) begin selling an oyster seed ground vessel permits on Nov. 17. This new permit was established as an oyster industry initiative by Act 922 of the 2008 regular legislative session and will be required by Jan. 1, 2009, for boats harvesting oysters for commercial purposes from the public oyster seed grounds or reservations, except those public areas in Calcasieu and Sabine lakes.

The permit will be issued in the name of the vessel owner who must identify the permitted vessel by the state registration number or U.S. Coast Guard documented number. Qualifying criteria for obtaining a permit was outlined by the new law and there are three ways a vessel owner can qualify to purchase a permit:

1. Vessels owners who owned a vessel that was properly licensed and had trip-ticket recorded oyster landings between Jan. 1, 2004, and May 31, 2007.

2. Vessel owners who purchased or constructed a vessel and licensed that vessel between Jan. 1, 2004, and April 30, 2008, and that vessel had trip-ticket recorded oyster landings between the time of construction/purchase and July 1, 2008.

3. Vessel owner who was/is constructing a vessel and that vessel is verified as being at least 50 percent complete in its construction by July 1, 2008.

Permits are only required for those taking oysters from the public grounds for commercial purposes and an appeals board is being established to hear appeals of permit applications previously denied by the department and appeals based on hardship. Act 922 prohibits LDWF from accepting new applications for the oyster seed ground vessel permits after Dec. 31, 2009. The permit is $15 for residents and $60 for non-residents. The taking of oysters from the public natural reefs, oyster seed grounds or reservations without an oyster seed ground vessel permit will result in a class two violation.

For more information or applications, contact the licensing section at 225/765-2898. To review notices of intent passed by the Louisiana Wildlife and Fisheries Commission relative to this permit, visit the LDWF Web site at www.wlf.louisiana.gov/education/commissionactions.

Bycatch Reduction Device Regulations Changing in Gulf of Mexico Shrimp Fishery

NOAA Fisheries Service has published the final rule to change the use of bycatch reduction devices (BRDs) in the Gulf of Mexico shrimp fishery. These changes:

- Decertify the Expanded Mesh BRD.
- Decertify the Gulf Fisheye BRD.
- Establish a more restrictive placement for the Fisheye BRD.

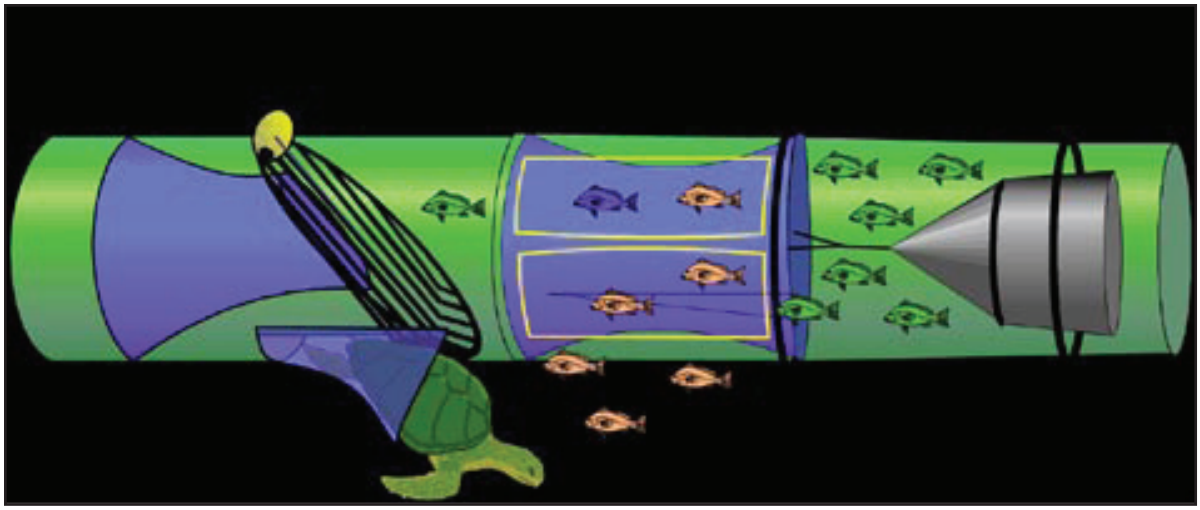
The intent is to improve bycatch reduction in the Gulf of Mexico shrimp fishery to better meet the requirements of the Magnuson-Stevens Fishery Conservation and Management Act. These changes are effective May 18, 2009.

A BRD is certified for use in the shrimp fishery if testing demonstrates the BRD reduces finfish bycatch at least 30 percent by weight. The Fisheye BRD, which is the most popular device in the fishery, must be placed along the top center of the cod end of a shrimp trawl no further forward than 11 feet from the cod end tie-off rings. The Gulf Fisheye BRD is the same fisheye-type device that may be placed 15 meshes on either side of top center, between 8.5 feet and 12.5 feet from the cod end tie-off rings, thus expanding the allowable placement of the device in the cod end. These two (overlapping) configurations of the fisheye-type device are also certified for use in the South Atlantic region.

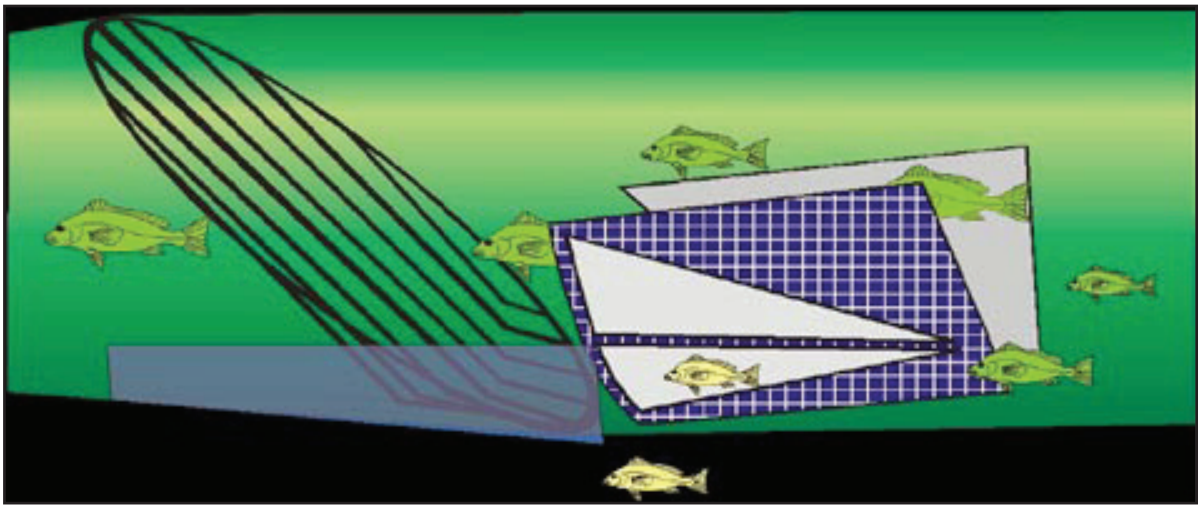
New data collected aboard Gulf of Mexico shrimp vessels indicated that a fisheye-type device placed more than 9 feet forward in the cod end of the net does not exclude 30 percent of the finfish by weight. Therefore, the final rule will decertify the Gulf Fisheye BRD as it is designated in the regulations, and will restrict the allowable placement of the Fisheye BRD to no farther forward than 9 feet from the tie-off rings.

Recent tests of the Expanded Mesh BRD in the Gulf of Mexico indicate it is only achieving about a 17 percent reduction in the weight of total finfish bycatch. The final rule also decertifies the Expanded Mesh BRD in the Gulf of Mexico.

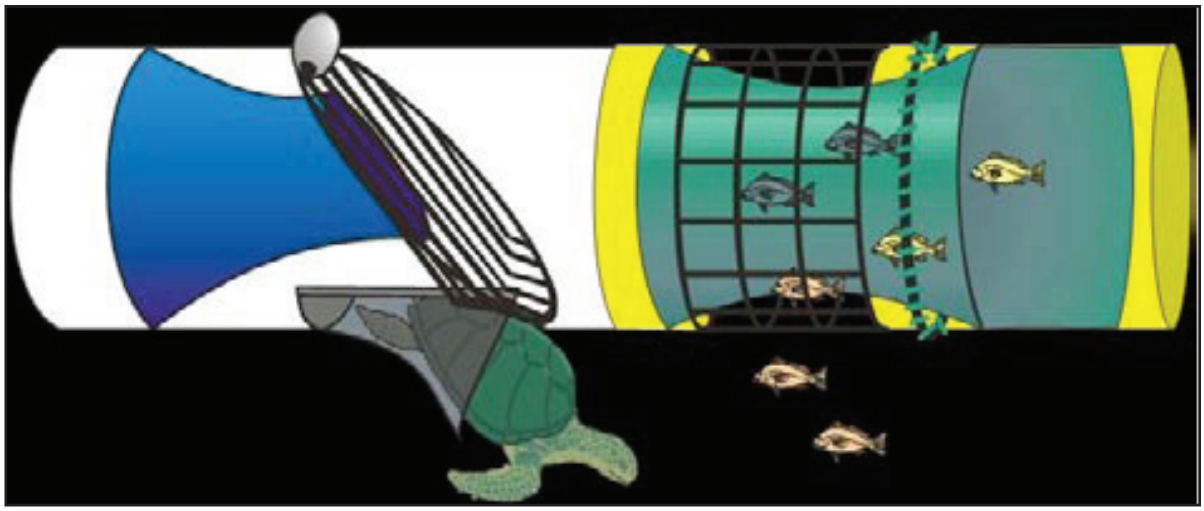
Illustrations of the various BRD designs (see below) and installation instructions for some of the BRDs can be found at http://sero.nmfs.noaa.gov/sf/BRDs.htm. Additional questions regarding BRDs and their installation should be directed to the Harvesting Technology Branch, NOAA Fisheries Service, Mississippi Laboratories, Pascagoula Facility, 3209 Frederic Street, Pascagoula, Miss. 39568-1207; phone 228/762-4591.



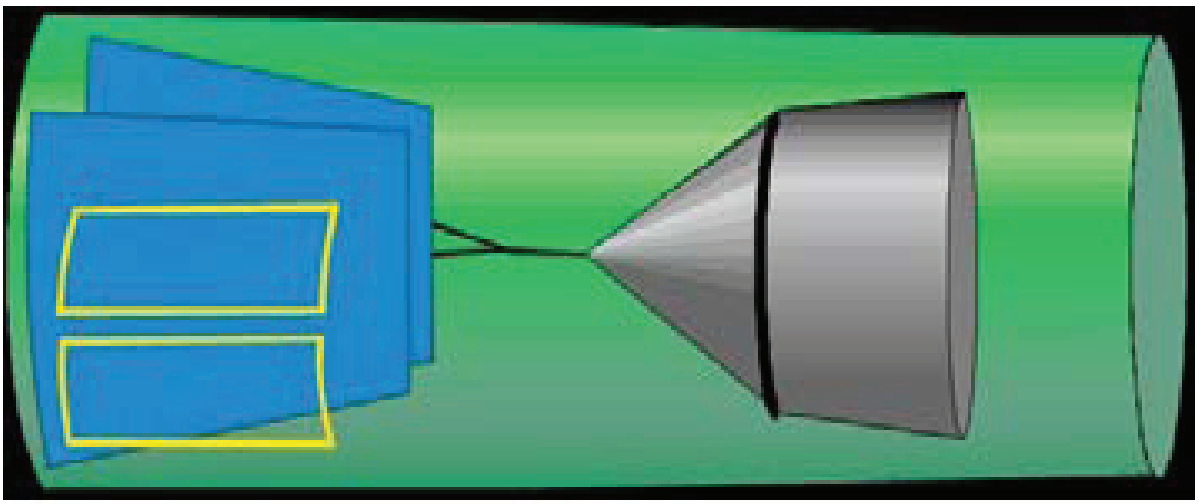
The Jones-Davis BRD, also showing a TED (left). Water flow is left-to-right.
Courtesy NOAA Fisheries and Gulf of Mexico Fishery Management Council.



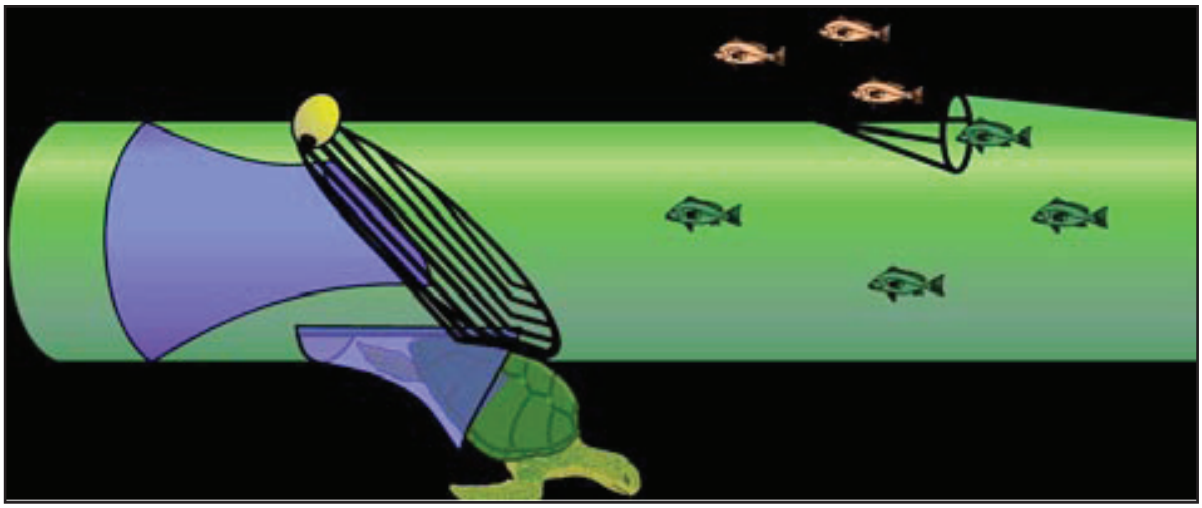
The Composite Panel BRD, also showing a TED (left). Water flow is left-to-right.
Courtesy NOAA Fisheries and Gulf of Mexico Fishery Management Council.



The Extended Funnel BRD, also showing a TED (left). Water flow is left-to-right.
Courtesy NOAA Fisheries and Gulf of Mexico Fishery Management Council.



The Modified Jones-Davis BRD. Water flow is left-to-right.
Courtesy NOAA Fisheries and Gulf of Mexico Fishery Management Council.



The Fisheye BRD, also showing a TED (left). Water flow is left-to-right.
Courtesy NOAA Fisheries and Gulf of Mexico Fishery Management Council.

THE GUMBO POT

Oyster Tasso Stew

Its winter and the ersters are fat, so here is another way to cook them. This is a traditional Eastern style that we've modified over the years. Very simple and very good.

Ingredients

1 quart shucked oysters
4 tablespoons sliced tasso
1 quart half-and-half
2 cups milk
Three tablespoons butter
Three large cloves fresh garlic
One stalk celery
Three tablespoons fresh parsley
Three green onions
Red pepper, salt

Rig a large double boiler with one pot sitting in a larger one so that the bottom of smaller pot suspends just below the surface of the boiling water. Slice the tasso and vegetables very thin – shaved. Slice all the green onions, tops and bottoms. Chop the parsley medium fine. Add all to melting butter and add half-and-half and milk. Salt and pepper to taste and cook in double boiler about 30 minutes (it won't quite boil, or scorch either). Hand-check each oyster for shell and set aside. Using fine-mesh sieve, strain oyster liquor into the pot and add oysters. Should take about another 15 minutes for the oysters to gently cook. Start diet tomorrow.

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