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PUTTING OFFSHORE AQUACULTURE IN PERSPECTIVE

In the national push to expand United States aquaculture in offshore waters, it seems that everyone is either all for it or dead-set against it. There is so much misinformation circulating that it has become difficult to make an informed decision on the issue. Let's look at some of the background of the National Aquaculture Plan and some of the facts about marine aquaculture in this country.

What is "Offshore" and why does anyone want to grow fish there?
Generally, "offshore" refers to federal waters (aka the Exclusive Economic Zone or EEZ) from 3 to 200 miles out. Growing seafood in inshore areas (along the coasts) of the U.S. is practical in very few cases, for several reasons:

1) Wetland and water quality regulations often prevent siting aquaculture operations in coastal zones.
2) In many areas, coastal property is expensive, and landowners don't want highly visible commercial operations in their view.
3) Conflicts with other existing users (particularly navigation, and commercial and recreational fishing) can be serious.
4) Most states limit private use of public waters.
5) Growing seafood is neither easy nor cheap to accomplish, particularly in our country, with relatively high labor costs.

If marine aquaculture is an expensive process, how can anyone make money at it?
Much of our cultured marine seafood is shrimp, coming from countries with cheap coastal land, limited environmental regulations and low labor costs. In addition, many countries have plowed public funds into development of aquaculture industries. Some of the cultured seafood that is pouring into U.S. markets is being processed and packaged in brand new, state-of-the-art plants, built using various amounts of national economic-incentive funds.

Another factor in the push to develop U.S. aquaculture offshore is the escalating value of premium seafoods. As stated previously, growing fish is a fairly expensive process, but the success of the salmon farming industry is an example of a situation where the market will bear the price of a valued seafood product. Other examples of marine fish that are supporting relatively high values include recent successes with cobia (in a number of places; see July *Lagniappe* http://www.seagrantfish.lsu.edu/pdfs/lagniappe/2007/07-01-2007.pdf) and Kona Kampachi (aka almaco jack) in Hawaii. The latter types of fast-growing, high-value marine fish are the most likely candidates for Gulf of Mexico offshore culture. The technology for construction of large deep water net-pens has been developing rapidly in these and other operations, such as tuna grow-out. Tuna grow- out involves the capture of young tunas, which are then fed in open-water pens until they reach premium value. Profitability for this type of operation was considered extremely unlikely in previous decades, but current values for prime tuna have created an explosion in this industry.

Why is the U.S. government promoting aquaculture?

Basically, NOAA and other administration sources are concerned about the trade imbalance in seafood. At present, we import about 80 percent of all the seafood we eat (and more than 90 percent of the shrimp). The National Offshore Aquaculture Act was first introduced in 2005, but failed to move out of Congress. Revisions were made, particularly to address perceived weaknesses in permitting processes and to address environmental concerns, and the bill became the National Offshore Aquaculture Act of 2007. A major push to advance this initiative by using the Gulf of Mexico as the early model is currently being considered by the Gulf of Mexico Fishery Management Council (see below).

What are the concerns with this initiative? Are they valid?

Like most of the “green” groups, the folks at Food and Water Watch believe “This plan is bad for human health, the ocean environment, and coastal fishing communities. Advocates of this dirty and dangerous industry are hoping to sneak it into the Gulf under the radar of public opinion….” A critical look at the long list of Food and Water Watch concerns:

1) Concerns for Coastal Communities: the development of offshore aquaculture in the Gulf could depress fish prices and negatively impact commercial and recreational fishermen and women.

Possible but unlikely. Salmon farming did cause reduced value in wild salmon (for a while), but these fish were being farmed in several countries, and oversupply became a problem. Now, good marketing is putting wild salmon into a superior position. Seafood from U.S. offshore aquaculture will probably never be cheap. It’s just as likely that high-value cultured fish could help bring prices up. Coastal fishing communities are currently in crisis in this country: the flood of imports and the high costs of fuel and insurance and everything else are pushing people out of the business. New fish-growing industries could be sources of badly needed income in coastal communities.

2) Consumer Health Concerns: The draft amendment allows for the use of federally approved antibiotics, hormones, antifoulants and pesticides in offshore aquaculture. It fails to require testing of fish feed for contaminants such as PCBs, dioxins and mercury, which can accumulate in the flesh of farmed fish.

Valid, but unlikely. The list of federally approved fish treatments is very short, even shorter than the lists for other food animal culture. Fish farmers will have to be careful in the use of any treatments, due to regulations and constraints of profitability. Contaminants in fish feed are no more or less of a problem than they are in any animal feed, or in the flesh of wild fish, for that matter.

3) Environmental Concerns: The draft amendment fails to cap aquaculture operations’ use of feed containing fishmeal and fish oil produced from wild fish. It can take two to six pounds of wild fish, such as Gulf menhaden, to produce one pound of farmed fish. These forage fish, which are prey for a variety of fish, birds and mammals, are a vital component of the Gulf marine ecosystem.

A valid concern. Hopefully, market pressures will help to solve this problem. Researchers all over the globe are working on ways to increase the percentage of plant products in animal feeds. Fish meal and fish oil are relatively expensive; no one wants to use any more than necessary.

4) Environmental Concerns: The draft amendment fails to establish stringent standards to prevent or mitigate potential pollutant releases. Water flowing out of fish farms can carry excessive nutrients, particulates, metals, antibiotics, pesticides, and other chemicals.

Some of these are valid concerns, particularly nutrient pollution and organic "loading." Potential offshore culturists argue that the fertilizer off a few cornfields far exceeds the nutrients from a fish cage operation, and that demonstration cage projects in deep water have shown no major impacts. However, large numbers of cage operations could add measurable levels of nutrients. The draft amendment does not ignore these problems.

5) Escapement: Cages will allow some fish escapes into the open ocean. Escapement can affect native populations through disease and dilution of locally adaptive gene complexes, disrupt natural ecosystems.

A valid concern. Recent data demonstrate, in some cases, a lack of adaptive fitness in hatchery-reared fish. The potential for impacts to native populations in the Gulf is unknown, and probably varies by species and local conditions. Some culturists point out that this same lack of "survivability" in hatchery fish indicates reduced probability of impacts to wild stocks. But some fish always escape culture systems – non-native species should not be used. The transfer of disease from cultured fish to wild stocks is possible, but the risk of crowded cultured fish "catching" something from the wild is greater.

6) Competing/Conflicting Interests: Areas of current significant competing economic use or public value must be eliminated for consideration for open ocean aquaculture.

True. Conflicts with existing uses of offshore sites are bound to occur, but the total "footprint" of aquaculture operations will probably be tiny compared to the total available ocean area. Still, extensive preliminary research will be required on any proposed sites.

7) Growing Exotic / Mutated Species / Genetically Modified /Transgenic Organisms (GMOs)

See Number 5: Most regulators agree that only native species should be used, and that we should definitely avoid the mutated species!

All this uproar from environmental and fishing groups is serving a valuable service by demanding that potential problems be addressed. While there are unquestionably valid concerns about offshore aquaculture, the permitting process that is being proposed is quite strict. We can't forget the overriding problem of U.S. seafood trade imbalances; we must find better ways to provide both wild and cultured fish to our markets, for the sake of both consumers and coastal community providers. Ultimately, any seafood produced in this country will undergo far better controls and inspections than applied to what is imported. The current situation of importing nearly all of our seafood from loosely regulated international sources is far from ideal.

Sources:
NOAA 10 - Year Plan for MARINE AQUACULTURE; October 2007 http://govdocs.aquake.org/cgi/reprint/2007/1114/11140010.pdf

Protecting the Gulf from a Dangerous New Industry (Food and Water Watch, http://www.foodandwaterwatch.org/fish/fish-farming/gulf-of-mexico

GULF COUNCIL TO CONDUCT AQUACULTURE AMENDMENT HEARINGS

The Gulf of Mexico Fishery Management Council has scheduled a series of public hearings to solicit public comment on a draft Aquaculture Amendment. The draft amendment will require persons to obtain a permit from the National Marine Fisheries Service (NMFS) in order to participate in aquaculture by constructing an aquaculture facility in the Exclusive Economic Zone (EEZ: the Federal Waters generally between 3 and 200 miles offshore) of the Gulf of Mexico. Each application for permit must comply with many permit conditions related to recordkeeping and operation of the facility. These permit conditions will assure the facility has a minimal affect on the environment and on other fishery resources.

The council is encouraging public participation in this process. Copies of the draft amendment and other related materials can be obtained by calling 813/348-1630.

Meetings begin at 6 p.m. and will conclude no later than 9 p.m. at the following locations:

Monday, Dec. 10, 2007,

- Hilton Houston Hobby Airport, 8181 Airport Boulevard, Houston, TX 77061. 713/645-3000
- Comfort Inn North, 2260 54th Avenue North, St. Petersburg, FL 33714
  727/362-0075

Tuesday, Dec. 11, 2007

- Hilton New Orleans Airport, 901 Airline Drive, New Orleans, LA 70062
  504/469-5000

Wednesday, Dec. 12, 2007

- Wingate Inn, 12009 Indian River Road, Biloxi, MS 39540
  228/396-0036

Thursday, Dec. 13, 2007

- Ashbury Hotel, 600 Beltline Highway, Mobile, AL 36608
  251/344-8030

AQUATIC ECOSYSTEM MANAGEMENT PART 3– *SOLVING THE PROBLEMS*

Ecological research has increased tremendously during the 20th century, shifting management from each single species to community or ecosystem based management approaches. This shift is accomplished by protecting and enhancing habitats, maximizing biodiversity, while striving to satisfy a myriad of management objectives. The determination of organism-to-habitat relationships has become particularly important due to the nature and extent of aquatic habitat modifications that have occurred during the last century. Additionally, much research has been directed at adapting management strategies to target the “whole picture,” which includes life histories, biological requirements and trophic interactions of all aquatic species, as well as the impacts and needs of the various human user groups. This last article presents a few examples of successful management strategies for particular environments, but the general theme remains applicable to the vast majority of aquatic ecosystems.

A number of top-predator fish stocks in both freshwater and marine systems have collapsed as a result of over harvesting. Consequently, some of these communities have shifted into seemingly irreversible new states. However, one experiment showed, for predators (brown trout) feeding on prey (Arctic char) that exhibit food-dependent growth, that culling of fish prey can actually promote predator recovery. They removed old stunted individuals of a prey-fish species in a large, low-productive lake, which caused an increase in the availability of small-sized prey which allowed the predator to recover. The shift in community state has been sustained for more than 15 years after the cull ended, and represents an experimental demonstration of an alternative stable state in a large-scale field system. Because most animals exhibit food-dependent growth, shifts into alternative stable states may be common in nature and may require counterintuitive management strategies.

Another interesting example of the complex nature of managing aquatic ecosystems comes from a unique 50-year time series of data on growth of the major predator (pike) in Lake Windermere in northwest England. This lake was fished for centuries until 1921, when the net fisheries were closed. Net fishing did not reopen until 1944, at which time biologists began tracking the age and growth of individual pike landed, as well as the population size and mortality through tag and recapture. They were able to show that fishing did indeed remove the larger, faster-growing fish whereas natural sources of mortality did the opposite (i.e. natural selection promotes larger sized fish). Thus, many traditional fishing practices set the stage for rapid, undesirable evolutionary changes, including slower growth, earlier adult maturation, and permanently smaller size. Such rapid changes suggest that evolutionary dynamics must also be incorporated into fisheries management.

Aquatic ecosystems provide many benefits for humans besides the use of individual fish stocks (e.g. oxygen production from phytoplankton); however, their complexity makes the valuation of benefits outside direct consumption of fish stocks difficult. Historically, fish stocks were often interpreted as a homogeneous capital category. Fish stocks were believed to generate a usable amount of fish, with the fish's reproduction rate corresponding approximately to the rate of return on capital. Because a fish stock does not exist on its own in an ecosystem, but interacts with other species as either prey or predator stock, single stock models have been expanded to include multi-species aspects. However, multi-species models still view fish stocks as capital stocks, thus continuing to exclude the species' ecosystem functions and services.

The idea of natural capital was developed to not only define stocks of natural resources (like fish stocks) as "capital stocks," but to also integrate ecosystem services and functions into the analysis. Using the theory of funds, an interpretation of capital beyond the single or multi-species stock approach, all entities are acknowledged that provide material goods, non-material services or both. There are two groups of funds – living and non-living funds (i.e. biotic and abiotic). Living funds have the ability to reproduce, but they also require services from the non-living funds for survival (e.g. fish need clean water to live). Furthermore, over time living funds can increase the stock of non-living funds (e.g. growth of coral reefs over thousands of years). Non-living funds, in contrast, are characterized by their services to living funds as well as their potential to be consumed.

According to this concept, fish are living funds that produce food for humans and other organisms and provide services to the aquatic environment. Because the approach requires a minimum stock size to maintain these functions and services, only the amount above this level is available for consumptive use. The usable portion of the fish biomass, continuously replenished by living funds, generates a flow of goods that is dependent on the services of the living and non-living funds from which it is generated. In contrast to both the single-stock and multi-species models, this theory of funds goes beyond the precautionary principal of "within safe biological limits" by incorporating a stock's services and functions to the ecosystem. The notion that less interference with the natural ecosystem translates into better living environments for fish is commonly referred to as ecosystem-based management. Thus this ecosystem-based management approach focuses not only on maintaining strong stock levels of the target species, but also on protecting biological diversity and general environmental quality.

With 75 percent of all commercially valuable fish stocks fully exploited, overused, or collapsed and in a state of recovery, a more comprehensive approach needs to be developed to overcome the existing impasse between economic and ecological interests. Under this approach, a fish stock recovery program must consist not only of investments in natural capital through reduced catches, but also through switching to less destructive fishing methods to protect the overall system. Additionally, policy makers must assist (i.e. incentives) and biologists must educate fishermen during the early years of the program, to address concerns about economic losses in the initial years of any adjustment period, and actually generate fishermen's support for these measures.

An example of this natural capital, ecosystem-based management strategy has been proposed for the Baltic Sea cod fishery. This brackish water, semi-enclosed sea has only a few fish species (cod, herring, sprat and flatfish species) making the interactions between living and non-living funds less complex. Over the last 25 years the cod stocks have decreased due to annual fishing limits consistently set above recommended levels, combined with the fishing fleet relying extensively on trawling capture methods that produce bycatch mortality and benthic habitat degradation. The proposed management strategy starts with permanently fixing the number of fishing licenses thus allowing fishermen to directly benefit from future increases in the fish stock. The second task is to introduce an adjustment period during which the cod stock can recover, which would be followed by a switch to fishing methods with minimal negative impacts as the final measure.

It was predicted that using more selective trawl nets (larger mesh with small fish escape windows) would allow the cod stock to recover in 3-5 years by increasing the average age of the fish landed. This would allow for younger fish to spawn before being caught and allow for the same tonnage to be landed while catching fewer, larger individuals. After the initial 5-year period of lowered quotas, in which fishermen would be provided incentives (loan guarantees and/or direct payments) to implement the measures, the quota could then be raised annually due to the increasing biomass. The second crucial policy task would be to reduce fishermen's long-term uncertainty by guaranteeing specific shares of total future landings, which could be accomplished using the individual transferable quota system currently used by New Zealand and Iceland. This reduced fleet combined with a shift to a less destructive long-line technique, which depends on stock size for its success, could lead to a balance between stock size and fishing effort.

Although the last example is theoretical, it provides a framework by which policy makers, fishermen, and biologists all contribute to a strategy that invests in natural capital by understanding the whole ecosystem. Through education and understanding, fish biologists may be able to develop the societal literacy needed for sustainability, which includes learning how humans affect biota, and recognizing how intact ecosystems contribute to aesthetic, emotional, intellectual, physical, social, and spiritual dimensions of human lives.

- Craig Gothreaux

Sources:

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Conover, D. O. 2007. Nets versus nature. Nature. 450: 179-180.

Doring, R. and T. M. Egelkraut. 2007. Investing in natural capital as management strategy in fisheries: the case of the Baltic Sea cod fishery. Ecological Economics. article in press.

Persson, L., P. A. Amundsen, A. M. De Roos, A. Klemetsen, R. Knudsen, and R. Primicerio. 2007. Culling prey promotes predator recovery – alternative states in a whole-lake experiment. Science. 316: 1743-1746.

FAMILY PROFILE: CENTRARCHIDAE – SUNFISHES

Green sunfish
Photo credit: Duane Raver, U.S. Fish and Wildlife Service

The family Centrarchidae is comprised of 32 species, including the black basses (*Micropterus spp*.), bream (*Lepomis spp*.) and crappies (*Pomoxis spp.*). These important sportfish are native to North America, with all but one species naturally occurring east of the Rocky Mountains.

Centrarchids build nests for spawning, and the developing eggs and young are generally defended by the male. However, some sunfish species have also evolved “alternative” male reproduction tactics, including female mimicry and “sneaky males.” Both are ways for males to obtain reproductive success while avoiding the expense of nest construction and defense.

Centrarchids exhibit a diversity of food habits. Differences in food habits correspond to mouth size, the shape and length of the gill rakers and whether mandibular jaws or the pharyngeal jaws (inside the throat) predominate in the feeding mechanism. Mandibular jaws are dominant in piscivorous or insectivorous fishes such as bass or bluegill. Snail eaters have enlargement of the pharyngeal jaws and associated musculature (for crushing shells).

Hybridization is common among many sunfish species. Identification of sunfishes can be confounded further by the increase in relative body depth with increasing body size.This article will focus on the characteristics, fisheries, and biology of the bream and crappie species commonly caught in Louisiana waterways.

The vast majority of information in these articles comes directly from Inland Fishes of Mississippi by Stephen T. Ross, and printed by the University Press of Mississippi (http://www.upress.state.ms.us/books/398). Louisiana does not have a recent book of its own that focuses on the inland fishes (Dr. Douglas’ Freshwater Fishes of Louisiana is very useful but was written in 1974), but one is supposedly in the making. Additionally, The Fishes of Tennessee by David A. Etnier and Wayne C. Starnes, and printed by the University of Tennessee Press, offers an equally impressive account of many of the same species (http://utpress.org/a/searchdetails.php?jobno=T00420).

Green Sunfish –(*Lepomis cyanellus*): These are robust, shallow-bodied sunfish with fairly large mouths. The back is brownish gray to olive, the sides are a lighter green or slate with light blue or emerald flecks, and the undersides of the head and body are yellow-orange. The cheek is marbled with iridescent blue-green, and the lower part of the iris is red or orange. The U.S. angling record for green sunfish is 1.11 kg (2.44 lb) from Oklahoma.

In general, green sunfish are less desirable as a sportfish because of their tendency to form stunted populations, particularly in small ponds. They also tend to compete with more desirable species, such as bluegill, and should not be stocked in farm ponds if the goal is good bream and bass fishing. Green sunfish are commonly used as live bait on trotlines, set hooks, and jugs for catfish. They are sometimes caught while fishing for basses or crappies because their large mouth makes them susceptible to larger baits and lures.

In preparation for spawning, male green sunfish fan out a depression in shallow water. Males actively court females by rushing out towards them, and then returning rapidly to the nest, all while producing a series of distinctive grunts. Green sunfish have a well-developed social system with dominant and subordinate individuals. Dominant fish are generally lighter colored and are usually the largest individuals. Small fish feed primarily on aquatic insects and small crustaceans. As they get bigger, they feed on larger aquatic insects such as mayfly larvae. Large fish feed heavily on large crustaceans such as crawfish. Green sunfish may also feed on the young of many species of fish, and in streams where green sunfish are not native, they have been implicated in causing the disappearance of several native minnows.

Green sunfish frequently hybridize with other sunfishes, including bluegill, longear and redear. Hybrids between a female green sunfish and a male bluegill (known as "hybrid bream") often are stocked in small ponds as a put-and-take fishery. When properly managed, these aggressive, fast-growing, and easy-to-catch fish can produce excellent results during one generation, but subsequent generations tend to exhibit variable proportions of the characteristics of the parent species. Green sunfish hybrids with redear sunfish are also marketed for pond fishing. Hybrids with bluegill or redear sunfishes are fertile and can breed with native fishes. The Louisiana record for hybrid bream is 2.5 lb, caught by J.W. Parker, Jr. in June of 1961.

Warmouth – (*Lepomis gulosus*): The other "large-mouth" bream. Also known as goggle-eye, these are mottled, somewhat elongate and robust fish with a large mouth and a tooth patch on the tongue. The back is dark brown to light olive green. The sides have an irregular pattern of double dark bars, or vermiculations, with light greenish to gold reflections; the belly is white to yellow-orange. Overall, the body often has a purplish tinge.

Warmouth
Photo credit: Duane Raver, U.S. Fish and Wildlife Service

The angling record for warmouth is 1.1 kg (2.4 lb), from Florida in 1985. The Louisiana record is 2.13 lb, caught by Frank E. Dean Jr. in the Atchafalaya Basin in July of 1987.

Warmouth are popular sportfish and are excellent eating. Unlike other sunfishes, they do not tend to overpopulate ponds nor develop stunted populations. As their name implies, warmouth are known for their aggressive strikes. Like basses and crappies, warmouth are often located near bushes or logs, and often surprise anglers who think they have hooked a much larger fish. Their large mouths (and ability to gulp a large meal) make them susceptible to many types of bait, and are primarily caught by crappie and bream anglers fishing along shoreline areas. Smaller fish tend to remain in shallow water, usually in some form of dense cover, but larger fish occur more in deep water.

Spawning begins in May and can continue into August. The male excavates a nest using violent sweeps of his tail, often while in a nearly upright position. Nests are placed in areas with some amount of rubble, leaves or silt, usually in association with cover. Nests are usually not located in open areas with clean sand. A courting male approaches a potential mate with his gill covers flared out and his mouth open. His body color rapidly changes to yellow and his eyes become blood-red. A receptive female is directed to the nest by the male and both fish swim in a circular pattern with the female nearer to the nest. While releasing her eggs, the female jerks her body violently and actually strikes the male's side. The contact apparently triggers the release of sperm. A male may court and spawn with several females.

Larval warmouth feed on small crustaceans (copepods, ostracods, cladocerans), which continue to be important for juveniles. As size increases, aquatic insect larvae (mayflies, damselflies, caddisflies) are included in the diet as are crawfish. Large warmouth feed on small fish, but crawfish continue to be the principal prey. In Lake Pontchartrain, major food items include grass shrimp, mud crabs, and other unidentifiable organic material. Most feeding activity takes place at night or during dusk or dawn with relatively little feeding activity during midday. During the summer, warmouth may consume prey amounts equivalent to 4 percent of their body weight per day.

- Craig Gothreaux

Sources:
Ross, Stephen T. 2001. *Inland Fishes of Mississippi*. University Press of Mississippi.

Douglas, N.H. 1974. *FreshwaterFishes of Louisiana*. Claitor Publishing.

Louisiana Outdoor Writers Association - http://www.laoutdoorwriters.com/index.asp?pg=fr_choose

UNDERWATER OBSTRUCTIONS

In accordance with the provisions of R.S. 56:700.1 et. seq., notice is given that 24 claims in the amount of $104,112.39 were received for payment during the period Oct. 1, 2007 – Oct. 31, 2007.

There were 22 claims paid and two claims denied.

Latitude/Longitude Coordinates of reported underwater obstructions are:

27 19.726	89 52.101	JEFFERSON
29 04.883	90 27.215	TERREBONNE
29 04.994	90 20.714	TERREBONNE
29 06.823	90 17.925	LAFOURCHE
29 07.134	90 08.634	JEFFERSON
29 07.151	90 17.143	LAFOURCHE
29 07.238	89 24.642	PLAQUEMINES
29 13.890	89 54.440	JEFFERSON
29 14.204	89 54.282	JEFFERSON
29 14.880	89 54.190	JEFFERSON
29 15.507	89 55.163	JEFFERSON
29 15.655	89 55.765	JEFFERSON
29 16.366	89 57.111	JEFFERSON
29 16.441	89 56.287	JEFFERSON
29 17.465	89 48.140	PLAQUEMINES
29 17.611	89 50.186	JEFFERSON
29 23.229	90 26.471	TERREBONNE
29 43.729	89 27.848	ST. BERNARD
29 45.853	89 49.108	PLAQUEMINES
29 51.306	93 25.663	CAMERON
29 51.531	93 20.899	CAMERON
29 54.529	89 47.415	ST. BERNARD
30 08.481	89 47.249	ORLEANS
30 10.534	89 48.176	ST. TAMMANY

A list of claimants and amounts paid can be obtained from Gwendolyn Thomas, administrator, Fishermen’s Gear Compensation Fund, P.O. Box 44277, Baton Rouge, LA 70804 or you can call (225)342-0122.

THE GUMBO POT

Pecan-Crusted Speckled Trout

Allyse Ferrara

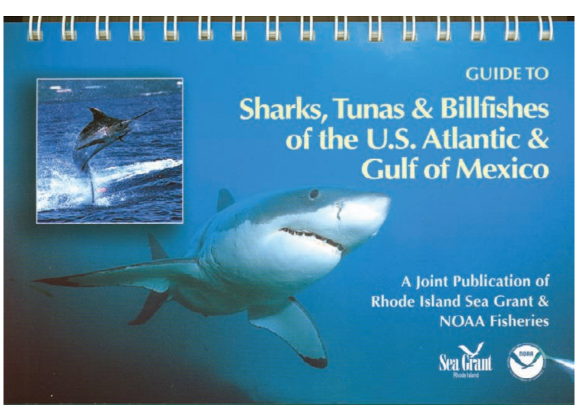
Cookware:
Kitchen blender
Medium mixing bowl
Heavy skillet

Ingredients:
8 medium speckled trout filets (Allyse says any fish will work)
1/3 cup pecan halves
1/2 cup all purpose flour
1/2 tablespoon finely ground black pepper or to taste
1/2 teaspoon white pepper
1/4 teaspoon freshly ground nutmeg
1/4 teaspoon salt
Cayenne pepper to taste
Olive oil to coat bottom of skillet

Methods: Grind the pecans in a kitchen blender until they have a powder-like fine texture. Thoroughly mix the ground pecans with the remaining dry ingredients. Dredge the fish filets in the pecan mixture and pan fry in the oil until golden brown. Serves four.

If you want to make a white sauce with your fish, turn to medium heat and add 2 tablespoons of butter to pan after frying fish. Melt butter then reduce temperature to low. Add ½ cup of fat free half-and-half or cream. Stir, scraping bottom, until sauce begins to thicken. Add salt and pepper to taste and turn off heat. Serve sauce over rice or pasta topped with pan-fried fish filets.

This recipe provided by Quenton Fontenot at Nicholls State University, chief editor of Recipes for Recovery: A Cookbook of Louisiana Seafood Recipes, assembled for the Louisiana Chapter of the American Fisheries Society. For copies of this interesting and unusual cookbook, contact Kristi Butler at kbutler@wlf.louisiana.gov.



Looking for a Holiday gift?

A Guide to Sharks, Tunas and Billfishes is available for $25 + $3 p/h from Louisiana Sea Grant. Make checks payable to Louisiana Sea Grant College Program, 105 Sea Grant Building, LSU, Baton Rouge, LA 70803.

Subscription Renewal Time

To receive the hard-copy (black-and-white) edition in the mail, please send your mailing address and a check or money order for $10 (payable to LSU AgCenter) to:

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