Feature Article

PCB Monitoring on the Oriskany Reef (Part II. Initial Sampling Event)

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In Part I of this article appearing in the July 2008 issue of the AFS *Shellcracker* newsletter we described the sinking on May 17, 2006 of the de-commissioned Navy aircraft carrier *Oriskany(CVA-34)* as a fishing and diving reef in 212 feet of water in the Gulf of Mexico. The 888 foot long vessel rests on an open sand bottom plain within a previously permitted artificial reef area 22.5 nm southeast of Pensacola Pass in federal waters off Northwest Florida.

In the first installment we reported that the primary environmental issue remaining to be addressed at the completion of the Navy's preparation of the vessel for sinking was their decision to leave on board some solid polychlorinated biphenyls (PCBs) incorporated in various materials in the interior of the ship, primarily at levels below the hanger bay deck (main deck below the flight deck). With $20 million already invested in the project, the Navy reported they could not cost effectively remove all the PCB suspect shipboard material without compromising the structural integrity of the vessel to the extent that it could no longer be utilized as an artificial reef.

The EPA classifies PCBs as a probable human carcinogen with other non-carcinogenic harmful health effects possible (see http://www.epa.gov/epawaste/hazard/tsd/pcbs/pubs/effects.htm). The burden of proof was on the Navy to justify their April 28, 2004 request to EPA for a risk-based PCB bulk product disposal approval to sink the ship with PCBs remaining on board. The Navy's task was to demonstrate to the EPA that PCBs leaching over time into the marine environment from shipboard materials (mainly cable insulation and bulkhead insulation) left on the *Oriskany* once sunk as a reef would not pose an unreasonable risk of injury to human health and the environment.

What was Left on Board: PCB Source Term Estimates

The first step the Navy had to take was to sample and quantify the approximate number of pounds of each type of material remaining on board containing suspect PCBs at regulated levels at or above 50 part per million (ppm). Based on PCB sample results of each material type they then estimated the number of pounds of PCBs in each material. The Navy estimated that they would leave about 722.6 pounds of solid PCBs on board. Ninety-five percent of this estimated solid PCB loading amount or 705 pounds was scattered with some variability in concentration throughout the estimated 362,240 pounds of cable insulation remaining in the hundreds of compartments at multiple levels below the main deck. Of 50 electrical cable insulation samples tested for PCBs (sample PCB concentrations ranged from 2.5 ppm to 19,000 ppm; mean: 1493.9 ppm), 35 samples contained PCBs at regulated levels (50 ppm or above).

The next highest concentration of regulated PCBs was found in the fiberglass bulkhead insulation. Although contractors removed 72.6% of the 115, 695 pounds of bulkhead insulation originally onboard, the quantity remaining was estimated to contain about 6.8 pounds of PCBs or 3% of the total 722.6 pounds of PCBs remaining. Five of 32 bulkhead insulation samples analyzed contained PCBs at regulated levels. Sample concentration ranged from 2.5 ppm-6,100 ppm, with a mean of 215 ppm. Rubber products and ventilation gaskets not removed contained 0.4 and 0.1 lbs of PCBs respectively. The estimated 284,044 pounds of paint left on board contained 10.4 lbs of PCBs. None of the paint, rubber, or vent gasket samples were individually at regulated levels ($\geq$ 50 ppm). PCB samples from these sources averaged 11.6, 37.3 and 20.3 ppm respectively (Pape, L.T. 2004. Polychlorinated biphenyls (PCB) source term estimates for *ex-Oriskany* (CVA-34). Rev. 4 (Dec. 7, 2004).

PCB Leaching Rates, Fate and Transport

A second document the Navy developed reported on the results of a simulated shallow water marine environment laboratory study of PCB release rates from representative shipboard PCB-containing materials discussed above. Despite having the lesser quantity of solid PCBs (3% total), PCBs released from fiberglass insulation had a much faster leaching rate (extending over several decades) with more immediate effects than did the wire cable insulation containing 95% of the PCBs. The cable insulation was predicted to slowly leach PCBs at very low concentrations over an extended period of hundreds of years (George, R.D. et al. 2005. Investigation of PCB release-rates from selected shipboard solid materials under laboratory-simulated shallow ocean artificial reef environments).

The Navy used the PCB leach rate information and source term estimates in the development two computer models. One was a Time Dynamic Model (TDM) that calculated the initial pulse concentrations of PCBs released in and immediately around the ship into the water, sediments, and biota at various distances (separated into Zones of

Influence) from the ship over the course of the first two years after sinking. After two years a very low steady state PCB release pattern was predicted to occur. The second model the Navy developed was a Prospective Risk Assessment Model (PRAM). This model estimated release, fate, and transport (including bio-accumulation) of PCBs once leach rates reached the low release steady state about two years post sinking. In conjunction with these models the Navy developed an additional two documents, a human health risk assessment, and an ecological risk assessment.

Making the Case for a PCB Risk-Based Bulk Disposal Approval

The Navy submitted the above models and documents to the EPA to support their case that sinking the Oriskany would not pose an unacceptable risk to the health of fishers and their families, as a result of consumption of fish caught at the Oriskany Reef. From an ecological perspective, the PRAM and TDM calculated that Oriskany Reef generated PCB exposure to benthic, reef, pelagic and other organisms including their consumers did not pose undue risk to ecosystem health. The EPA extensively reviewed these documents both internally and externally. They also sought the consultative assistance of a 13 member independent Science Advisory Board (SAB) composed of PCB experts, ecologists, and ecological modelers. The review process and accompanying coordination with the Navy was completed in October 2005. EPA then advertised in the *Federal Register* on December 19, 2005 their intent to issue an approval for risk-based disposal of PCB bulk product waste and invited interested parties to review and comment. This approval was intended to provide the final regulatory go-ahead to sink the *Oriskany*. EPA conducted a public meeting in Pensacola, Florida on January 10, 2006 where EPA and Navy subject matter experts were available for questions and to obtain additional public input on the Oriskany Reef project. Based upon the generally favorable oral and written public comments received by January 19, 2006, the EPA (Region 4, Atlanta Office, Air, Pesticides, and Toxics Management Division) issued a PCB risk-based disposal approval permit on February 15, 2006 authorizing the *Oriskany* to be sunk with residual solid PCBs on board pursuant to Section 6(e) of the Toxic Substances Control Act (TSCA), 15 USC § 2605(e), and the federal PCB regulations at 40 CFR § 761.62(c). EPA issued the permit jointly to the U.S. Department of the Navy Inactive Ships Program and the FWC. The permit document was later modified on July 16, 2007 to add Escambia County who had become the vessel title and reef permit holder in January 2007.

PCB Tier 1 Monitoring of the Oriskany Reef

As a condition of the PCB risk-based disposal approval, the EPA required that the FWC and Escambia County develop an EPA-approved monitoring plan and undertake a multi-year (five year minimum) Tier 1 Screening Level Monitoring Program at the Oriskany Reef. According to the permit, "this is to be a fish sampling and analysis effort targeted to selected species of commonly consumed fish expected to be present at the Oriskany Reef site and other reference reef sites in the Escambia East Large Area Artificial Reef Site. The purpose is to determine if PCB concentrations in edible portions of such fish exceed a specified screening value."

The EPA established a Tier 1 monitoring screening value of 20 parts per billion (ppb) total PCBs in fish tissue (wet weight) as a mean value for a sample size of at least 15 legal size recreationally targeted fish of the same species. If the mean screening value was exceeded the FWC and Escambia County, following consultation with EPA and the Florida Department of Health would be expected to undertake a more rigorous Tier 2 monitoring program, the extent and duration of which would be determined by the EPA. The trigger for issuing a human health advisory by the Florida Department of Health for a fish species is total PCB levels of 50 parts per million (ppm) or above. The first Florida estuarine PCB fish consumption advisory ever issued was on August 22, 2007 for the lower Escambia River (Escambia and Santa Rosa Counties, Northwest Florida, the site of a 1969 PCB spill). The advisory cautioned limiting weekly consumption of striped mullet (*Mugil cephalu*s) caught in the area to six ounces of fish prepared with skin off (see: http://www.escambiahealth.com/recent_hot_topics/2007/fish.htm). No marine PCB fish advisories have been issued by the Florida Department of Health to date.

The monitoring budget restricted each Oriskany Reef sampling event effort to individual analysis of 30 legal size fish of the grouper-snapper complex. Two primary species representing two different feeding guilds originally targeted for sampling were a reef obligate species, gray triggerfish (*Balistes capriscus*) and a reef-associated species, red snapper (*Lutjanus campechanus*). We expected, during each sampling event to harvest and analyze 15 red snappers and 15 gray triggerfish, all of legal size and intact (no predator damage). The PCB "skin-on fillet" analysis results for each specimen were to be summed and averaged for each species with the mean (ideally of at least 15 fish of the same species) predicted not to exceed the EPA recommended mean screening value of 20 ppb total PCBs wet weight. Non-target fishes that included transient species like amberjacks and other migratory pelagic fish, not expected to spend much time at the Oriskany Reef, as well as non-food fish and sublegal target fish were not retained. Due to depths fished (130-212 feet) there was the potential for discard mortality due to barotraumas even with venting and rapid release. Fishing was to be conducted no longer than needed to secure 30 samples of legal size fish. Besides red snapper and gray triggerfish, alternate target reef fish specimens of legal size that might be retained if caught in sufficient numbers of legal size included grouper species, red porgies (*Pagrus pagrus)*, vermilion snapper (*Rhomboplites aurorubens)* and gray snapper (*Lutjanus griseus).*

The initial Oriskany Reef sampling event occurred Dec. 14, 2006, about seven months post sinking. Diver observations

during the first few months following the sinking indicated that targeted fish like red snapper, although arriving at the ship within the first few weeks appeared to be mostly sublegal. Sampling was delayed until a sufficient sample size of legal size fish could be obtained and to allow some exposure of the fish to the environment around the vessel. To ensure achieving the target number of legal size fish, a mix of conventional hook- and -line fishing, a commercial 15 hook bandit rig and four commercial chevron fish traps were used. Cut Boston mackerel and squid were used as bait with all fishing gear. We requested and received a Letter of Acknowledgement from the National Marine Fisheries Service authorizing the use of prohibited gear (chevron traps) and collection of fish out of season and over the recreational limit for research purposes. The sampling platform used was a commercial snapper vessel.

Fishing occurred during daylight hours. Four chevron traps were each deployed twice at depths of 137 (flight deck) and 212 feet (seafloor adjacent to the hull) for soak times of about two hours per set. Fishing effort terminated immediately upon harvest of the 30 required legal size specimens. After capture, fish retained for analysis were rinsed in ambient seawater, measured, individually wrapped whole in laboratory grade aluminum foil, double bagged and sealed in laboratory grade plastic bags with sample I.D. label and chain of custody information. Fish were placed on ice in project-designated clean coolers, and once on shore transported to a walk-in freezer facility. There the individual packaged specimens were frozen, then air shipped frozen on dry ice in sealed coolers to an EPA approved laboratory, the Geochemical and Environmental Research Group (GERG) Environmental Science laboratory at Texas A and M University. A skin-on fillet from each fish specimen was homogenized and individually analyzed for all 209 PCB congeners as well as total PCBs using USEPA Method 1668A for high resolution gas chromatography/high resolution mass spectrometry and in accordance with the lab's standard operating procedures.

Results and Discussion

During the initial sampling event of December 14, 2006, no gray triggerfish were caught. Red snapper dominated the landings with thirty legal size red snapper retained. Red snapper total lengths with two exceptions suggested specimens were in the 2-4 year old age classes. With the exception of two larger red snapper specimens (808 mm and 795 mm, total length) that entered one of the chevron traps together, the remaining red snappers kept for PCB analysis were at or just above the minimum legal size of 406 mm (16 inches total length) (range 404-475 mm) The remaining 20 discarded red snapper were 25-50 mm below legal size. An additional 12 juvenile red porgy, and a sublegal almaco jack were also discarded. Fifteen of 30 fish had total PCB levels exceeding 20 ppb with the average total PCB concentration value at 34.137ppb. Six of 30 fish had PCB levels ranging from 68.0 to109.8 ppb that exceeded the recommended 50 ppb PCB Florida Department of Health (DOH) fish consumption screening limits.

We recognized that leaving the skin on the sample fillets when they were individually homogenized for analysis could possibly increase the PCB sample readings. However, we felt that some fishers might prepare the fish for eating in a skin-on condition. We therefore proceeded with the more conservative analysis of the muscle fillet with the skin left on.

The desired sampling outcome to be achieved is to protect human health. We are doing this by monitoring PCB concentrations in legal size recreationally targeted food fish of the grouper-snapper reef fish complex caught at a potential PCB point source pollution location (Oriskany Reef) to find out if PCB screening thresholds set by the EPA are being surpassed. In this case the EPA screening threshold mean of 20 ppb total PCB threshold was exceeded for red snapper for the first sampling event but did not exceed the DOH screening limit. The time spent by the different harvested red snapper specimens feeding and residing in the vicinity of the Oriskany Reef was unknown as was the prior PCB body burden of the fish arriving at the reef. Some red snapper could have been exposed to the Oriskany Reef environment and been resident for at least six months or they could have been recent arrivals to the reef. The largest and probably oldest red snappers (795 and 808 mm TL) did not have the highest PCB concentrations. Variability in PCB body burden concentrations may also reflect not only differences in diet, and area inhabited but also fish condition, with fatter specimens more prone to accumulate PCBs.

Red snapper, like a number of other Gulf of Mexico reef fishes in the grouper-snapper complex, are currently overfished and undergoing overfishing. The Gulf of Mexico Fisheries Management Council in conjunction with the National Marine Fisheries Service have a federal mandate under the Magnusen Fishery Conservation and Management Act (as amended in 1996) to end overfishing by 2010. Within the last year, red snapper bag limits in federal waters have been `reduced from four to two fish per angler and the recreational red snapper season has been reduced from April 30 through October 31 to June 1 to August 5th. This fact combined with climbing gas prices, and the 45 nautical mile round trip transit distance to the Oriskany Reef are all serving to reduce recreational fisher access to red snapper and other targeted reef fish species on the Oriskany Reef. This further reduces exposure to individual fishers and their families. Additionally, Gulf wide mercury advisories for red snapper currently recommend consumption of no more than one six ounce servings per week for women of childbearing age and young children and two servings per week for all others (FDOH Fish Consumption Advisory, 2008).

Our intent during future sampling is to expand sampling efforts to include sampling of other targeted fish species when available, sample also at a reference artificial reef deployed at the same time as the Oriskany, but several miles away, and conduct some analysis comparisons of "skin-on" and "skin-off" fillets from the same fish as well as repeat skin-on sample analysis of the same fish to look at PCB concentration variability within individual fish.

the Shellcracker

FLORIDA CHAPTER OF THE AMERICAN FISHERIES SOCIETY

http://www.sdafs.org/flafs

October, 2008

President's Message:

Dear Florida AFS members,

It is with mixed emotions that I sit down to write the President's address for the October 2008 newsletter. The excitement and anticipation that comes with the first call for papers to our annual meeting is tempered by the profound sadness that fills our Chapter due to the untimely passing of one of our own, Rich Cailteux. Rich embodied all the things that make fisheries biology such an tremendous profession: collegiality, earnestness, a drive to leave things better than they were found, a sincere willingness to help others as they strive for the same, and a passion for family, friends, and fish. A fitting tribute to Rich's professional contributions and strong personal traits appears in this Shellcracker in an obituary written by several of our members who knew Rich best. Please pay particular attention to its last paragraph and honor Rich's memory in a manner benefitting the collegiality and friendship he displayed during his time with us.

Thinking about Rich and our upcoming annual meeting reminds me of some things that I think many of us take for granted during our various pursuits. Among the various professions of friends of mine who work outside of fisheries biology, none have ever been described to me in the same ways that I can describe the close-knit group of folks in our field. I sincerely believe that results from a passion that most fisheries biologists I have encountered have for the natural world and well-managing the resources in it. We are all individuals, for sure, but I have witnessed a thousand acts of kindness and helpfulness among my colleagues that I am not sure exists to the same level in other professions. And hearing stories the past couple weeks about Rich Cailteux's professionalism and collegiality truly reminds me of all the better things about being a fish biologist.

All of us have a colleague or two, perhaps even a mentor, whom we do not see as often as we would like and to whom we maybe never really have expressed how grateful we are for their friendship, guidance, and support. I would encourage all of us to take some time this fall and reconnect with some of those folks who have helped us along the way. We know all too well that fisheries is not the most lucrative of professions, but the feedback folks receive from others they have helped or collaborated with certainly goes a long way toward fueling the fire that I believe drives us. I actually took the time last spring to do just what I am suggesting and the response I received, in turn, confirmed for me the importance of that sort of thank-you.

The most tangible form of reconnection for the fisheries community in Florida occurs annually at our Chapter meeting. President-elect Deb Murie is putting together a symposium to honor the myriad contributions Rich Cailteux made during his career (see call for papers in this issue), and Linda Lombardi -Carlson has been working overtime to ensure the best arrangements are in place for our venue, meals, and socials. There may be a time in the next couple months when Deb, Linda, or Andy Strickland, the raffle chair, call upon you for help in pulling together some aspect of our 2009 meeting. Please be as responsive to their requests as you are able; these folks have and will continue to put much time into organizing and planning our meeting and any help you can provide will be greatly appreciated. Lastly, make

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sure graduate students are aware of and apply early for both the Rottman Scholarship and travel awards. Details about those applications are available on the Chapter's website.

I hope you all have a safe and productive fall and that outdoor activities provide rich and relaxing experiences.

Best Regards,

Will

Upcoming Events

October 20 – 24: Fifth World Fisheries Congress 2008. Pacifico Yokohama, Japan. www.5thwfc2008.com

October 28 – 29: Coastal Research Symposium. Biloxi, Mississippi. http://masgc.orgbaysandbayous

November 7 – 8: Eighth Annual AFS Student Colloquium. Pikeville, Tennessee. http://orgs.thtech.edu/sfa

November 9 – 13: Integrating Biogeochemistry and Ecosystems in a Changing Ocean: Ecological and Biogeochemical Interactions in End to End Food Webs Workshop. Miami, Florida. www.confmanager.com/main

November 14 – 16: Third International Bonefish and Tarpon Symposium: Research and Conservation for the Future. Dania Beach and Islamorada, Florida.

Check out our Parent Society's calendar at http://www.fisheries.org/Calendar.shtml for other events not listed here!

Interested in contributing something to the Shell-Cracker? Email Jackie Debicella at *jackiedebo@hotmail.com* with any articles or information that you would like to be included in the next issue. The deadline for the next issue is December 30th, 2008, so start fishing...

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