



LOUISIANA FISHERIES FORWARD PROGRAM ●●●

ICING PRACTICES AND CATFISH QUALITY



QUALITY + EDUCATION + SUSTAINABILITY

A white paper submitted to:
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Submitted by:
LOUISIANA SEA GRANT COLLEGE PROGRAM

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WILD CAUGHT CATFISH OVERVIEW

Catfish is the largest freshwater fishery in the U.S.; blue catfish (*Ictalurus furcatus*) is the main species harvested, followed by channel catfish (*Ictalurus punctatus*). In 2017, wild-caught catfish harvest was 13 million pounds. Louisiana harvests the most wild catfish (41%), followed by Maryland and Virginia. Catfish is among the top 10 seafood products consumed by Americans. In the early 2000's, annual consumption was over one pound per capita (ppc), which dropped to 0.50 ppc by 2012. In recent years, consumption has increased to 0.51 ppc in 2016, 0.53 ppc in 2017, and 0.56 ppc in 2018. Catfish is a diverse group in the order of Siluriformes. Historically, the U.S. Department of Food and Drug Administration (FDA) was in charge of the safety of all seafood characterized products; however, in 2008, Congress moved the siluriform fish inspection to the U.S. Department of Agriculture's Food Safety and Inspection Service (USDA/FSIS).

Under USDA's final rule published in 2015, effective in March 2016, and fully enforced on September 1, 2017, siluriform processing facilities have to comply with facility standards. They must develop and implement protocols and record-keeping associated with Sanitation and Hazard Analysis and Critical Control Points (HACCP) to assure the safety of the product.

In addition to required documentation, facilities are inspected once per production shift. Facilities are granted 40 hours a week (Monday-Friday) of inspection at no cost; however, processors are required to pay for overtime, holidays, and weekends. The high cost to cover overtime inspection hours forced facilities to reduce days to process and pounds of fish to be processed. According to a Louisiana Sea Grant survey completed by Louisiana fish house owners in 2018, this has resulted in a reduction of fishermen and processors wanting to fish and process catfish. On the other hand, under USDA regulations, processors are allowed to receive, store, and ship catfish out of inspection hours.

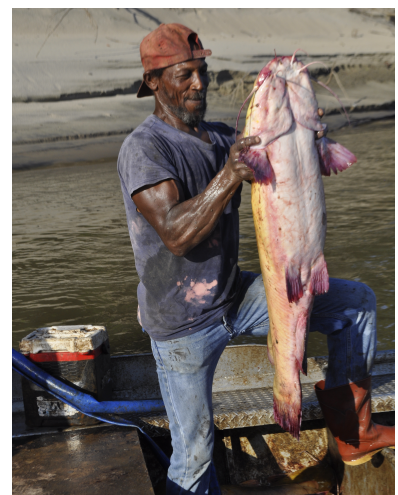


Table 1. Treatment groups for whole and gutted catfish.

Group	Treatment
IG	Iced gutted
IW	Iced whole
NG	No ice gutted
NW	No ice whole



Pseudomonas spp. is one of the main microorganism responsible for seafood spoilage (Photo: <https://www.cdc.gov/hai/organisms/pseudomonas.html>).

RESEARCH

Extended shelf life of whole and gutted fish, with and without ice, was evaluated to determine if quality could be maintained. This would enable U.S. wild catfish processors to receive fish after hours of operation, holidays, and weekends so they can process during approved hours of inspection.

Iced whole and gutted catfish were purchased from a local fish market within 12 hours of harvesting (fish iced on boat). Fish were transported on ice to the LSU campus in Baton Rouge, separated into four groups and stored on flake ice at a 1:2 fish to ice ratio (Table 1).

Fish were stored in an ice chest within a walk-in cooler. Microbiological stability was evaluated for four days. Microbial evaluation included Aerobic Plate Count (APC), Enterobacteriaceae, *Pseudomonas*, *Staphylococcus aureus*, yeast, and mold.

The preliminary data did not show a difference between gutted and whole fish; however fish that were not iced reached unsafe levels of microbes after one day of storage while the iced fish remained at a safe level through the full study (Figure 1). Additionally, *Pseudomonas*, a recognized spoilage microorganism in seafood, also showed higher counts of colonies per gram for non-iced fish (>3 Log CFU/g after one day of storage) compared to iced fish (<3 Log CFU/g through the study) (Figure 2).

An APC count greater than 6 Log colony forming units per gram (CFU/g) is the unsafe limit for raw seafood products.

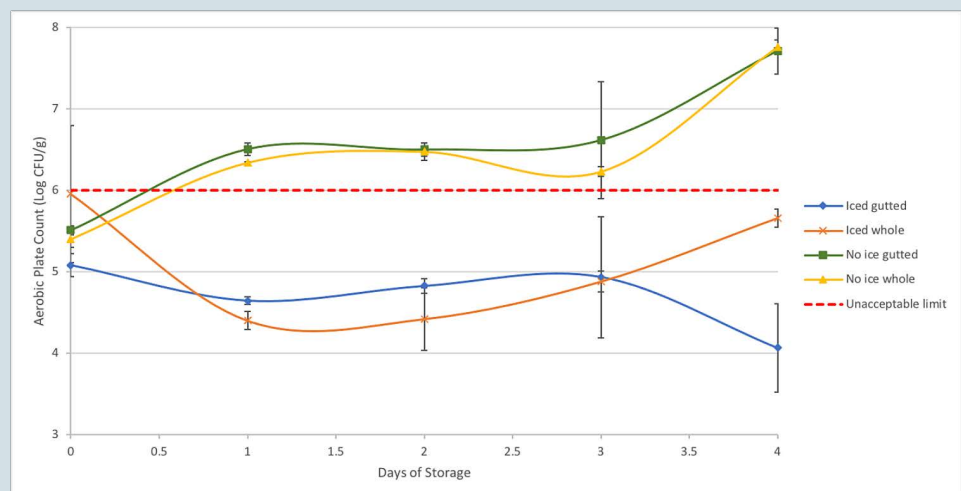


Figure 1. APC counts of catfish flesh during a four-day storage study comparing the four treatment groups (Each error bar is constructed using one standard deviation from the mean).

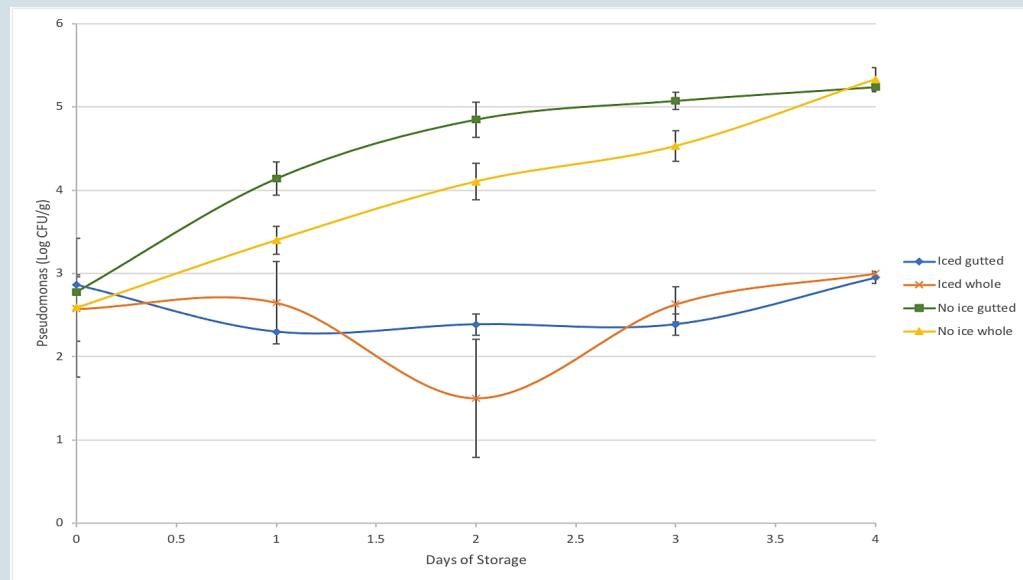


Figure 2. *Pseudomonas* counts of catfish flesh during a four-day storage study comparing the four treatment groups (Each error bar is constructed using one standard deviation from the mean).

RECOMMENDATIONS

- To achieve the benefit of ice, use a 1:2 fish to ice ratio.
- Proper icing at harvest is necessary to enhance fish quality/safety and allow longer shelf life.
- Proper fish icing practices allow storage of fish during weekend and holidays.
- If fishermen properly ice fish during harvest, a fish house can store whole fish for four days without compromising fish quality and safety.

An extended storage time allows fishermen to harvest on holidays, weekends, and during favorable conditions. Following these recommendations will allow fish houses to better plan hours of operation within USDA hours of inspection.



Iced catfish fillets



Iced whole catfish (36.3°F)



Improperly iced fish



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