

Marine Wood Destroying Organisms – Historic & Current Control Methods

Shane C. Kitchens, PhD
Terry L. Amburgey, PhD

INTRODUCTION

Wood is the most environmentally sensitive and economically feasible construction material that can be utilized. However, protecting wood products when subjected to marine environments requires finding a system that will both protect wood from Marine Wood Destroying Organisms (MWDOs) and cause minimum disturbance to the surrounding aquatic ecosystem. MWDOs have been causing challenges for both the shipping and marine construction industries, as well as owners of docks, bulkheads and other wooden structures on marine water-front properties, for thousands of years. Records as far back as 412 B.C. indicate that various blends of protection agents such as arsenic and sulfur mixed with oils have been utilized on wood (ships, piling, etc.) subjected to marine environments in an attempt to prevent infestations of MWDOs. More recently, creosote used either alone or in combination with various compounds containing copper, arsenic, or other metals have been used as biocides to decrease the susceptibility of wood to MWDOs. With the movements over the last three decades in the United States and elsewhere to decrease the industrial chemical pollution of aquatic ecosystems, and the subsequent cleanup efforts by

local and federal organizations, coastal waters have become much cleaner. At the same time, however, the use of biocides to protect wooden structures in marine environments has been closely regulated. This increase in water quality and biocide regulation has resulted in increased populations of aquatic organisms, including MWDOs, and has resulted in increased deterioration of wood products. The regulations imposed on the use of the wood protection biocides has removed several historical wood treatment options from being utilized in aquatic applications. With the combination of these events, it has become necessary to develop and implement innovative protection systems for wood utilized in waters inhabited by MWDOs using techniques not based solely on the use of biocides.

DESCRIPTION AND TYPES

MWDOs are defined and classified into two groups. The first group is Mollusks that contains what are commonly referred to as “Shipworms” and “Boring Clams”.



Figure 1 Shipworms accessed from Google Photos 2-2017

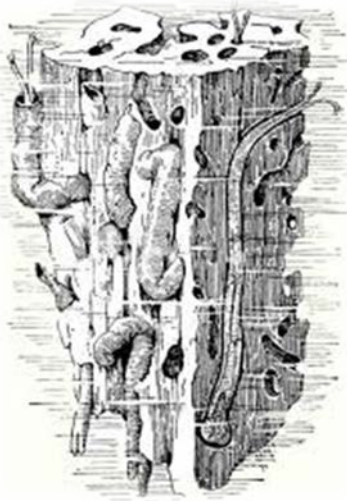


Figure 2 Shipworms accessed from Google Photos 2-2017

Shipworms and Boring Clams are related to other bivalves such as oysters and mussels. The two most common Shipworms that infest wood products subjected to marine environments in the United States belong to the genera of *Teredo* and *Bankia*. Shipworms average four to six inches in length and less than one-quarter inch in diameter, but some species can grow to be over one inch in diameter and measure over six feet long. Shipworms will attack any untreated wood submerged in salt water. The greatest deterioration currently is done to pilings, wooden boats, bulkheads, docks and bridges. Shipworms prefer warm salt water, and more than one-half of the volume of a pile may easily be destroyed without any evidence of injury being apparent on the pile's surface. The greatest damage in a piling usually occurs just above the mud line, although entrance holes may be found throughout the submerged area. Entrance holes about one-sixteenth inch in diameter are bored into the surface of the wood by the free-swimming larvae. Adults are confined to the wood interior where they form shell-lined galleries as they feed on the wood. Boring Clams (*Martesia*) also commonly known as the "wood piddock" have been documented

attacking creosote timbers, concrete, and even the lead sheathing of underwater cables.



Figure 3 Boring Clams accessed Google Pictures 2-2017

The boring clams are three-quarter to one inch in length and have brittle, white to dark grayish shells which gape at both ends. These organisms thrive in sea water (full salinity or only slightly brackish water), have world-wide distribution, but are not as common as Shipworms.

The second group of MWDOs is defined as Crustaceans. The three most common genera are *Limnoria*, *Sphaeroma*, and *Chelura* which are often grouped together and are known as "gribbles".



Figure 4 *Limnoria* Damage accessed Google Pictures 2-2017



Figure 5 *Limnoria* "Wood Gribble" accessed Google Pictures 2-2017

Limnoria is the most important of the three in the United States and the free-swimming adults range from one-eighth to one-quarter inch in length. *Limnoria* burrow into the wood and can attack untreated, copper-containing (CCA), and creosote-treated piles and other wood components. The damage is not as extensive as the burrowing of shipworms, for instead of boring deeply into the wood the "gribbles" excavate galleries at or just under the surface at between the half and high-tide levels. This forms a honeycomb of burrows just under the surface of the wood, and water currents and tidal action gradually wear away these weak areas until piles gradually assume an "hour-glass" appearance at low tide. *Limnoria* migrate short distances from one wooden structure to another and the new location then becomes a breeding site.

CONTROL

Historical control methods for these organisms have ranged from chemical treatments to physical barrier systems. The current challenges to protecting wood from MWDOs

are to have a balanced approach to protecting the wood while causing minimum disturbance to the aquatic ecosystem. The most common wood preservation chemicals historically and currently used have been creosote and copper-containing products such as CCA, ACZA and others, used either alone or as dual treatments. Creosote use in most aquatic environments in the U.S. has been stopped due to regulations, but copper-containing products are still utilized. Historically, both products have been utilized alone and in combination depending on the specific MWDO populations. With the ban of creosote, the dual creosote / CCA treatment is not available, leaving a void in the protection from MWDOs in aquatic environments where both *Teredo* and *Limnoria* MWDOs are present.

Physical barriers such as polyolefin films, PVC, metal, and concrete sheathing, various coatings and fiberglass have been used, alone or in combination with biocides, for the protection of wood from MWDOs. Effective barriers both limit MWDOs contact with wood and decrease the oxygen available for their respiration at the wood surface, but all of these products have challenges when placed in the corrosive environment of salt/brackish water. These challenges range from corrosion, water intrusion, UV deterioration, cost, and environmental concerns. Some such barriers are not sufficiently robust to withstand impacts caused from boat hulls.

Recently developed barrier systems offer a very effective, durable, cost-efficient, and easily applied barrier to address the challenge posed by the increased MWDOs population. This increased population of organisms is creating more durability pressure on wood utilized in aquatic environments.

New barrier systems (Durosleeve™ and SnapJacket™) made from very safe, durable, and proven PVC compounds can be applied to new or existing pilings, poles and various other products utilized in marine construction. These robust products can protect new piling from MWDOs and can be utilized to restore and provide future protection for in-place piling.



Figure 6 SnapJacket™ Installation during Restoration of Damaged Marine Piling Courtesy of Waterline Restorations



Figure 7 Durosleeve™ Installation on a New Dock in South Alabama

CONCLUSIONS

MWDOs cause over \$50 million dollars of damage in the United States to wood used in marine aquatic environments annually. With the increased water quality regulations and

aquatic organisms that attack wood it is critical to address this current challenge without relying solely on wood-protecting biocides. The protection system must be neutral to the aquatic environment to enhance both water quality and the life cycles of wood products. This is currently possible by utilizing the combination of current American Wood Protection Association (AWPA) approved products for use in aquatic environments and new robust and effective PVC barrier systems that do not rely primarily on biocides for their efficacies. The PVC barrier systems are currently produced under the tradenames Durosleeve™ and SnapJacket™. These advanced technologies are compatible with current wood preservative formulations, 100% recyclable, cost effective, durable, and prevent wood to water contact. The proper utilization of these systems will increase the life of wood products which increases the value for the end user, protects our natural resources, potentially decreases the amount or minimizes the need for wood protection biocides (research projects ongoing), and reduces the amount of products introduced into landfills.

LITERATURE UTILIZED

Amburgey, T.L. and S.C. Kitchens. 2007. Other Wood Destroying Organisms. Lecture FP Wood Protection and Deterioration. Mississippi State University.

Castagna, Michael. 1961. Shipworms and Other Marine Borers. Fishery Leaflet 505. United States Department of the Interior Fish and Wildlife Service Bureau of Commercial Fisheries.