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THE ACTIVITY OF LIMNORIA TRIPUNCTATA IN PILING CUT-OFFS FROM NA--ETC(U)
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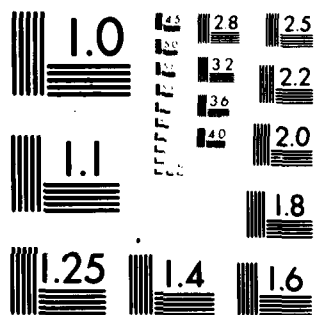
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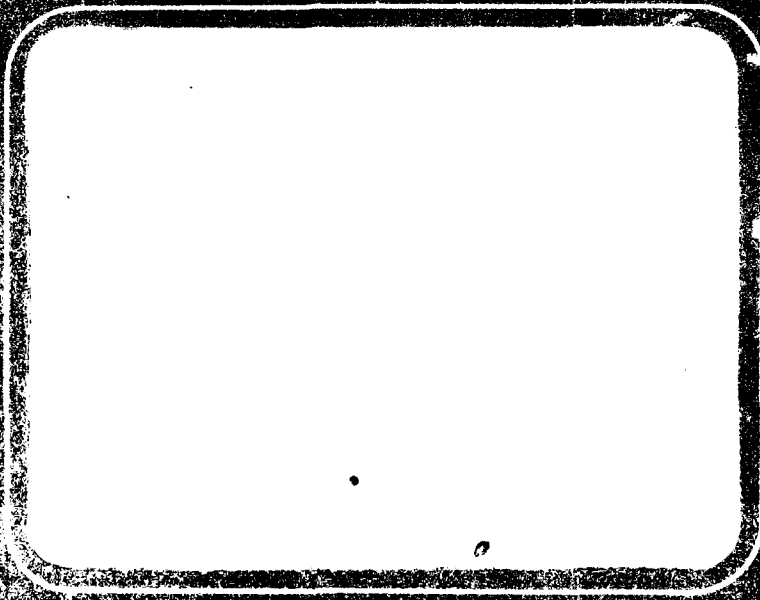


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THE ACTIVITY OF *Limnoria tripunctata*
IN PILING CUT-OFFS FROM
NAPHTHALENE-ENRICHED CREOSOTED PILINGS.

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UNITED STATES DEPARTMENT OF THE NAVY
OFFICE OF NAVAL RESEARCH
MICROBIOLOGY BRANCH

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by

C.I. Belmore

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BATTELLE

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MANAGEMENT SUMMARY

Cut-offs from piling treated with creosote plus additional naphthalene at four levels were exposed to *Limnoria tripunctata* both in the laboratory and in the field.

After six months' exposure, the 20% naphthalene creosote samples showed the most resistance to *Limnoria* attack under laboratory conditions.

The field exposures were heavily fouled by barnacles. Trace attacks of *Limnoria* were found only in one of the 20% naphthalene creosote discs and in one of the 30% naphthalene creosote discs.

THE ACTIVITY OF *Limnoria tripunctata* IN PILING CUT-OFFS
FROM NAPHTHALENE-ENRICHED CREOSOTED PILINGS

by

C.I. Belmore

INTRODUCTION

The need for an improved treatment for marine pilings has been recognized by both the United States Navy and industry. A satisfactory improved treatment must result in piling that will effectively prevent marine borer attack, resist breakage in handling and driving, and be economically feasible. Creosote-impregnated piling satisfies these needs except in areas where the wood-boring crustacean, *Limnoria tripunctata* exists, since *L. tripunctata* is relatively resistant to creosote.

Much has been accomplished in recent years towards improvement of treatments and development of new preservatives against borers and other destructive elements. Through cooperative efforts of industry and the Navy, a working-test exposure was installed in 1978 at Roosevelt Roads, Puerto Rico using piling treated with creosote containing the additive naphthalene in ranges of 10 to 40 percent. The piling cut-offs produced during this installation are being used for laboratory and field exposures to determine the preservative effectiveness of the added naphthalene.

OBJECTIVES

The objectives of this study ^{were} ~~are~~ to determine the preservative effectiveness of various percentages of naphthalene-enriched creosote treatments exposed to *Limnoria tripunctata* attack in the laboratory and in a natural seawater environment; to determine if *Limnoria* attack is accelerated by exposure in the laboratory and to investigate if there are any seasonal

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differences in the rate of *Limmoria* attack in a natural environment where molluscan borers are also present.

MATERIALS AND METHODS

Three-inch discs from pile cut-offs were received at Battelle's William F. Clapp Laboratories in Duxbury, Massachusetts for laboratory exposure and at Battelle's Florida Marine Research Facility in Daytona Beach, Florida for field exposure. A total of 38 discs, nine treated with 10% naphthalene creosote, 10 with 28% naphthalene creosote, 10 with 30% naphthalene creosote, and nine with 40% naphthalene creosote were to be used. ——— p. 3

Laboratory Exposures

Three discs from each treatment were cut into eight pie-shaped segments, the heartwood removed, and the resulting wedge coated with Koppers Bitumastic 300 M on all surfaces except the outside circumferal surface. The uncoated surface of these wedges represents the area normally exposed to *Limmoria* attack on pilings. A fourth disc from each treatment was also cut into eight segments but was not coated. These wedges have the area normally inside a piling exposed to *Limmoria* attack also.

Twelve coated and four uncoated wedges per treatment were exposed to active *Limmoria tripunctata* attack in flowing seawater tables in the laboratory on October 31, 1979. An untreated soft pine coupon, measuring 73 mm x 103 mm x 18 mm, was added to each table to serve as a control. These samples comprised Series 1.

The second series of samples was placed in laboratory water tables on March 24, 1980, during a normally heavy *Limmoria* migrating season (March-April). During preparation of the discs on October 9, 1979, two of

the discs were spoiled. Since replacements were not received, the second set of exposures was not a complete replicate of the first set. Only the 10% and 40% naphthalene creosote discs were available for the second series. Preparation and method of exposure were the same as used in Series 1.

Field Exposures

The cross-section surfaces of 16 discs (four per treatment) were drilled with a 5/8" (16 mm) center hole, coated with Koppers Bitumastic 300 M on the sawn surfaces, mounted on four galvanized steel rods, and submerged vertically in the natural seawater environment at the Florida Marine Research Facility at Daytona Beach, Florida. Each rod held one disc from each treatment simulating an in-place piling. Four rods and discs for Series 1 were installed September 17, 1979; the remaining discs received were installed on two rods with three discs each for Series 2 on March 27, 1980. The order of arrangement of discs on the rods is shown in Table 1.

RESULTS AND DISCUSSION

Laboratory Exposures

Inspections for *Limnoria* attack were performed monthly. The results of these inspections are shown in Table 2.

All treated wedges remained free of *Limnoria tripunctata* for over two months. Wedges with 30% and 40% naphthalene creosote treatments remained free of *L. tripunctata* attack for over five months except that one of the uncoated 40% wedges had a trace attack at the five-month inspection period.

The heaviest *Limnoria* attack was present in the 40% uncoated wedges at the six-month inspection period.

→ The 20% naphthalene creosote wedges showed the most resistance to *Limnoria tripunctata* attack in the laboratory exposures. → p. 7

TABLE 1. ORDER OF DISC PLACEMENT ON RODS FOR FIELD EXPOSURES
AT DAYTONA BEACH, FLORIDA

Set					
1	2	3	4	5	6
10%	20%	30%	40%	30%	20%
20%	30%	40%	10%	20%	30%
30%	40%	10%	20%	20%	20%
40%	10%	20%	30%		

Sets 1-4 installed September, 1979
Sets 5-6 installed March 27, 1980

TABLE 2. NUMBER OF *Limmoria* TUNNELS IN WEDGES
ON LABORATORY EXPOSURE

Treatment	Sample Number	Months Exposed					
		1	2	3	4	5	6
10% naphthalene creosote (Coated)	1			9	11	14	27
	2						1
	3						
	4						
	5						
	6						
	7			67	70	70	70
	8					2	2
	9						
	10						4
	11						
	12						
10% (Uncoated)	1						
	2			13	13	15	15
	3			15	15	15	15
	4			7	7	7	12
	C		1	420	480	550	700
20% naphthalene (Coated)	1						
	2						
	3						
	4						
	5						1
	6						
	7						
	8						
	9						3
	10			1	1	2	2
	11						
	12						
20% (Uncoated)	1						
	2					4	4
	3						
	4						
	C		10	300	330	350	650

TABLE 2. Continued

Treatment	Sample Number	Months Exposed					
		1	2	3	4	5	6
30% naphthalene creosote (Coated)	1						
	2						
	3						5
	4						
	5						4
	6						19
	7						2
	8						
	9						1
	10						12
	11						8
	12						
30% (Uncoated)	1						
	2						30
	3						38
	4						8
	C		8	36	110	180	450
40% naphthalene creosote (Coated)	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						
	11						
	12						9
40% (Uncoated)	1					6	40
	2						10
	3						12
	4						19
	C		18	225	390	500	700

C = Untreated pine coupon

No *Limoria* tunnels in any of the wedges of series 2 after one month exposure

→ In Field Exposures

An inspection of the discs on field exposure was made on March 27, 1980. Results of this inspection are summarized in Table 3. All discs were heavily fouled. The dominant fouling organisms were barnacles, mainly *Balanus eburneus* with lesser amounts of *Balanus amphitrite*. Traces of hydroid (*Tubularia*), a few polychaetes (*Nereis*), and amphipods were also observed.

The fouling was scraped off and the discs inspected for the presence of *Limnoria* tunnels and other marine borers. The discs were then resubmerged. No evidence of any other borers except *Limnoria* was observed on the discs.

Traces of *Limnoria* attack were found in the field exposures in one of the 20% and one of the 40% naphthalene creosote treated discs.

TABLE 3. NUMBER OF *Limnoria* TUNNELS IN DISCS ON FIELD EXPOSURE
FOR SIX MONTHS

Set	Treatments			
	10%	20%	30%	40%
1				
2		10		
3				6
4				

Installed September 17, 1979
Inspected March 27, 1980

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