วารสารวนศาสตร์ปีที่ ๓ ฉบับที่ ๓
กรกฎาคม-กันยายน ๒๕๒๗
Thai Journal of Forestry

ความเสียหายของไม้อาบน้ำยา ซีซีเอ ที่ถูกเพรียงน้ำเค็มทำลายในระยะสามเดือน

MARINE BORER ATTACK ON SOME TIMBERS TREATED WITH CCA WOOD PRESERVATIVE AND EXPOSED FOR THREE MONTHS IN SEA-WATER

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ABSTRACT

Eight species of CCA treated and untreated timbers were exposed to marine borers attack at Sriracha, Cholburi. This report is based on the first 3 month inspection period, Results indicate that all treated samples survived the three months exposure, while untreated material were slightly to severely damaged by the borers.

บทคัดย่อ

รายงานผลการตรวจสอบการทำลายของเพรียงที่มีต่อไม้อัดน้ำยาซีซีเอ (คอปเปอร์โครม-อาร์เซนิก-) รวมแปดชนิดที่นำไปแช่น้ำทะเลที่สถานีวิจัยประมง ศรีราชา เป็นเวลา ๓ เดือน รวมทั้งไม้ชนิดเดียวกันที่ไม่อาบน้ำยา

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INTRODUCTION

Destruction of timbers by marine borers has long been a problem for the coastal population of Thailand. The use of heavy durable timbers with frequent maintenance. or total replacement, is the only solution for fishermen with their fishing craft of marine installations, meanwhile wharves of other large scale constructions are usually made by using concrete pilings or concrete casings.

In recognition of the economic importance of the problem, the Faculty of Forestry with co-operation of the Faculty of Fisheries, Kasetsart University, has set up a preliminary investigation on the marine borer hazards to some timber species, treated and untreated, the order to gather basic information on the performance of test samples and also on the types of attacking organism involved.

MATERIAL AND METHOD

Eight timber species were collected from the Forest Industry Organization's sawmill in the form of 100 X 25 mm planks, 2 m in length, unsurfaced, air-dry condition. These were :

1.	Yaang (Dipterocarpus sp.)	(2)	(0.75)
2	Makhamong (Afzwlia xylocarpa)	(4)	(0.80)
3	Son songbai (Pinus merkusii)	(2)	(0.69)
4	Takhian thong (Hopea ordorata)	(3)	(0.77)
5	Tabeak (Lagerstroemia calyculata)	(3)	(0.83)
6	Kraton (Sandoricum koetjape)	(2)	(0.48)
7	Teenpet (Alstonia scholaris)	(1)	(0.42)
8	Krabok (Irvingia malayana)	(2)	(0.82)

The numbers in parentheses indicate the timbers's natural durability group, assigned by the Forest Products Research Division, Royal Forest Department as below, and its specific gravity respectively.

Group	life (Years)
1	Not over 2
2	2-6
3	6-10
4	Over 10

With each individual species, the planks were cut into test blocks 150 mm in length along the grain and numbered consecutively from 1 to 72 (about 12 blocks from each plank of 2 m length). Six inspections have been scheduled at intervals of 3, 6, 12, 18, 24 and 30 months. Therefore the test blocks were divided into six groups of 12 blocks. At the end of each period one group will be raised from the test site for inspection without resubmergence. For a total of 8 species there will be 8 X 12 or 96 blocks at each inspection.

Within 12 blocks in each group, four blocks were untreated, another four were treated with a 3 per cent concentration of CCA type C and the last four with a 6 per cent concentration. One 8 mm hole was drilled through the face in the middle of the block before treatment. The full-cell process was employed with 630 mm initial vacuum for 15 min ffollowed by 10.5 kg/cm^2 pressure for 10 min. All species were treated in the same charge for each concentration. The dry salt retention in each block was determined from the difference in weight before and after treatmen

S-lon viny 1 pipes, with bends, 25 mm internal diameter were used to make twelve one meter square frames suitable for fastening the test blocks with 6 mm nylon ropes. For convenience in handling, four timber species, each represented by the 12 treated and untreated blocks already described, were fastened in each frame. In this manner there were six pairs of frames being submerged for 6 inspections; one pair to be raised for each periodic inspection represents 8 timber species. Each species represents 3 treatments of 4 test block i.e., 0, 3 and 6 % CCA (Figure 1).

TEST STATION

Three weeks after treatment and assembly, on February 27, 1984 all twelve frames were fixed in the sea at Sriracha Fisheries Research Station, Sriracha district, Cholnburi Province, inner Gulf of Thailand, about 120 km from Bangkok.

Frames were fastened together horizontally making a 3 X 4 square metre pattern, inside a 4 X 4 metre floating steel cage anchored to the sea bottom. They were weighed down about one metre below the surface. The sea depth at the test site is 5 m. Distance from the shore is about 500 m (Figure 2).

The water temperature, salinity and pH at the Sriracha Fisheries Research Station were recorded daily all the year round. Tables 1 and 2 give summaries of information collated during the 3 months immersion.

FIRST INSPECTION RESULTS (after 3 months)

On May 24, 1984 two frames which contained 8 species were raised and brought to the Faculty of Forestry for close inspection. Test blocks were covered with fouling, about 2-5 cm thick without any apparent distinct difference between treated and untreated specimens. The fouling had been observed to have begun as early as one month after submersion. It was scraped off for surface inspection. Internal inspection was carried out after cleaving the blocks along the grain at one or two places aleng the width.

a. Fouling organisms : consisted mainly of

Acorn barnacles (Balanus sp.)

These were associated with amphipods and brittle stars.

b. Boring organisms : two genera of molluscan borers were found in irregular tunnels throughout the blocks Figure 4. They were indentified a Lyrodus pedicellatus (Teredinidae) and Martesia striata (Pholadidae). There was no trace of any crustacean borers in any specimen of the 8 timber species.

Damage assessment was made by direct visual inspection as employed by Suhirman and Eaton (1981) i.e.,

No attack score 0

Slightly attacked score 1

Moderately attacked score 2

Severely attacked score 3

Very severely attacked score 4

Results of the surface and internal damage found are given in Table 3.

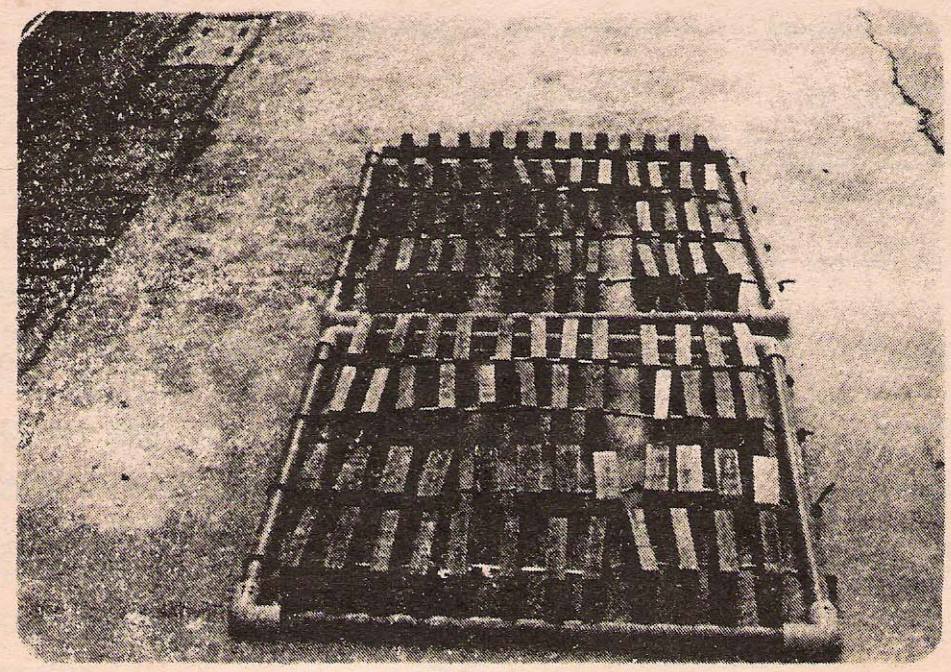


Figure 1. Two frames containing 8 timber species for each inspection. Six pairs for six inspections

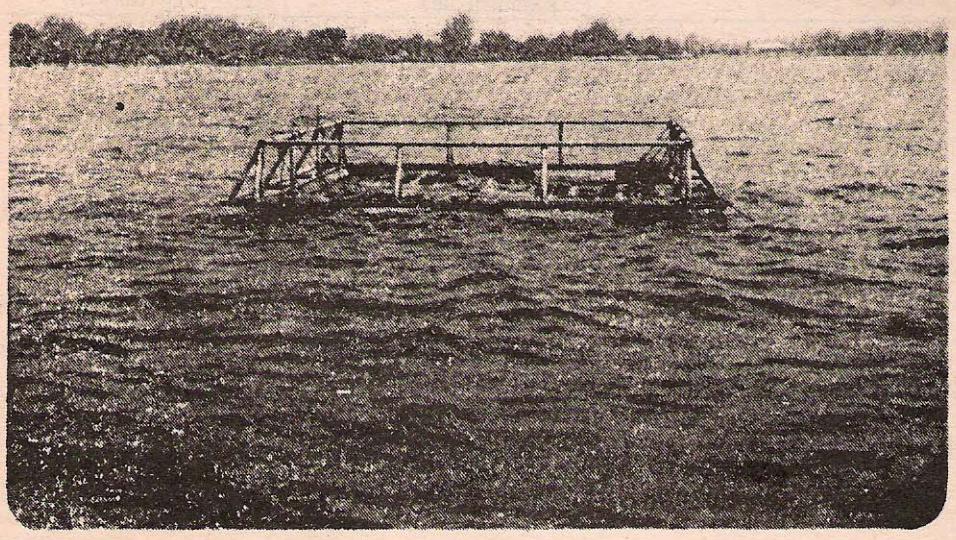


Figure 2. A 4 X 4 m steel cage, with floals, into which 12 frames were fastened,

Table 1. Some properties of sea-water at the test site, March-May 1984

Date	Water temperature (°C)	Salimity (ppt)	pH
1 - 6 March	28 - 30	30 - 32	8.24 - 8.30
18 - 24 April	27 - 30	31 - 33	7.25 - 8.32
4 - 15 May	32 - 37	31 - 36	7.99 - 8.65
16 - 24 May	31.5 - 35	30 - 33	7.75 - 8.65

Collecting times were 9.00 am and 15.00 pm

Table 2. Tide records at Koh Srichang Reference Station during March-May 1984

Date	Range of tide	
	Maximum (dm)	Mininum (dm)
1 - 10 March	31 - 36	10 - 16
11 - 20	31 - 40	9 - 15
21 - 31	32 - 37	9 - 14
1 - 10 April	32 - 35	9 - 16
11 - 20	35 - 38	6 - 17
21 - 30	32 - 34	6 - 17
1 - 10 May	32 - 36	7 - 14
11 - 20	34 - 37	5 - 19
21 - 31	29 - 36	8 - 19

Table 3. Condition of test blocks after three months submersion

(February 27, -May 24, 1984)

Timber species		Untreated	CCA 3 %	6 %
		(4 blocks)	(4 blocks for each conc.)	
1 Yaang		Ext. 0,0,0,0	0,0,0,0,	
(Dipterocarpus sp.)		Int. 0,0,0,0	0,0,0,0	
2 Makhaa mong		Ext. 0.5,0.5,0.5,0.5	0,0,0,0	
(Afzelia xylocarpa)		Int. 3,3,4,3	0,0,0,0	
3 Son songbai		Ext. 0.5,0.5,0.5,0.5	0,0,0,0	
(Pinus merkusii)		Int. 3,3,3,2	0,0,0,0	
4 Takhian thong		Ext. 0.5,0.5,0.5,0.5	0,0,0,0,	
(Hopea odorata)		Int. 1,1,0.5,1	0,0,0,0	
5 Tabaek		Ext. 0.5,0.5,0.5,0.5	0,0,0,0	
(Lagerstrocmia calyculata)		Int. 0.5,0.5,0.5,0.5	0,0,0,0	
6 Kraton		Ext. 1,1,1,1	0,0,0,0	
(Sandoricum koetjape)		Int. 4,4,4,4	0,0,0,0	
7 Teenpet		Ext. 1,1,1,1	0,0,0,0	
(Alstonia scholaris)		Int. 3,3,3,3	0,0,0,0,	
8 Krabok		Ext. 0,0,0,0	0,0,0,0	
(Irvingia malayana)		Int. 0,0,0,0,	0,0,0,0	

Note : Damage assessment was made on both exterior (surface) and interior of the blocks.

Table 4. CCA retention (kg/m^3) of the test blocks (of 3 months inspection)

Timber species	Average and Range	
	3 %	6%
1 Yaang	5.42 (5.22 - 5.73)	12.40 (7.69 - 24.51)
2 Makhaa mong	2.93 (2.46 - 3.29)	4.88 (4.06 - 5.54)
3 Son songbai	16.02 (14.24-18.42)	23.49 (21.06- 25.86)
4 Takhian thong	5.24 (3.66 - 7.14)	6.81 (0.60- 13.64)
5 Tabaek	1.11 (0.91 - 1.31)	1.72 (1.12- 2.37)
6 Kraton	16.42 (6.54 -22.47)	33.32 (26.47- 38.92)
7 Teenpet	21.34 (18.42-22.87)	35.77 (34.61- 36.46)
8 Krabok	7.54 (5.84 - 8.70)	11.06 (6.70 -18.16)



Figure 3. Fouling on test blocks after 3 months submersion

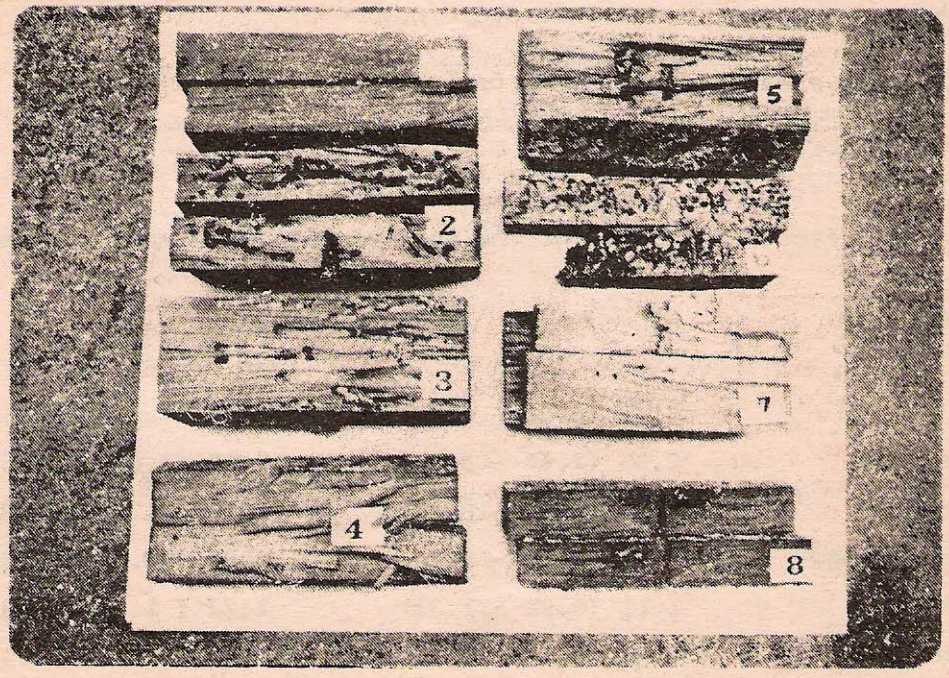


Figure 4. Condition of test blocks from 8 species. Please refer to Table 3 for numbers indicating timber species

DISCUSSION

a. Surface condition of test blocks

After the fouling was removed, the surface of the untreated and treated blocks of all eight species appeared intact i.e., no erosion by animals, except the slight abrasive damage on the arris of some specimens, caused by mechanical contact with others. Close inspection of the untreated blocks revealed numerous small holes 0.5 - 3 mm in diameter among the blocks being attacked. As incated in Table 3, the damage scores were slight to nil with respect to the surface condition of all blocks.

b. Internal condition

In the untreated blocks being attacked, intersticed tunnels 3-6 mm diameter were distributed over the cleaved surface. Some were lined with thin, calcareous material belongs to Lyrodus pedicellatus. Other holes were oval-shaped, usually bigger, and without a calcareous lining. Some of these holes the clam-like pholads Martesia striata, were found in the holes. No crustacean borers were detected in any of the blocks. There was no attack in any of the blocks treated with 3 % and 6 % CCA preservative in any species(Figure 5 and 6).

c. Resistance of untreated timber species - 3 months

From Table 3, it is noted that untreated Yaang (Dipterocarpus sp.) and Krabok (Irvingia malayana) survived the three months exposure. Other six species were attacked with varying degrees of damage. Kraton (Sandoricum koetjape) is the most susceptible. Yaang, Son, Krabok and

Kraton belong to the same natural durability group and it is interesting that Yaang and Krabok exhibit some resistance to marine borers during the three months at least, more than others that belong to the higher natural durability group. Order resistance to marine borer attack over 3 months would therefore be the following : Yaang and Krabok, Tabaek, Takhian thong, Son songbai, Teenpet, Makhamong, Kraton.

d. Resistance of treated timber species

There was no damage to any of the treated blocks of any species during the 3 months exposure. Data on the dry salt retentions shown in Table 4 are taken from those blocks raised after three months. Since all 8 timber species were treated in the same charge, the data can be used as indication of the treatibility of the species under the same treatment conditions. Judged by retention alone, and if it is assumed that the rest of the blocks still submerged hold the same retention levels, it is expected that Tabaek (No.5) should fail first while Teenpet (No.7) would be the last.

CONCLUSIONS

Results from a three months inspection of 8 timber species reveal that untreated Yaang and Krabok indicate comparative resistance to marine borer attack. Other six untreated species were attacked by teredine borers Lyrodus pediceelatus and a clam-like pholad, Martesia striata No crustacean damage was observed in any of the blocks from this inspection. The order of resistance to marine borers is not the same as the timbers' natural durability under terrestrial conditions.

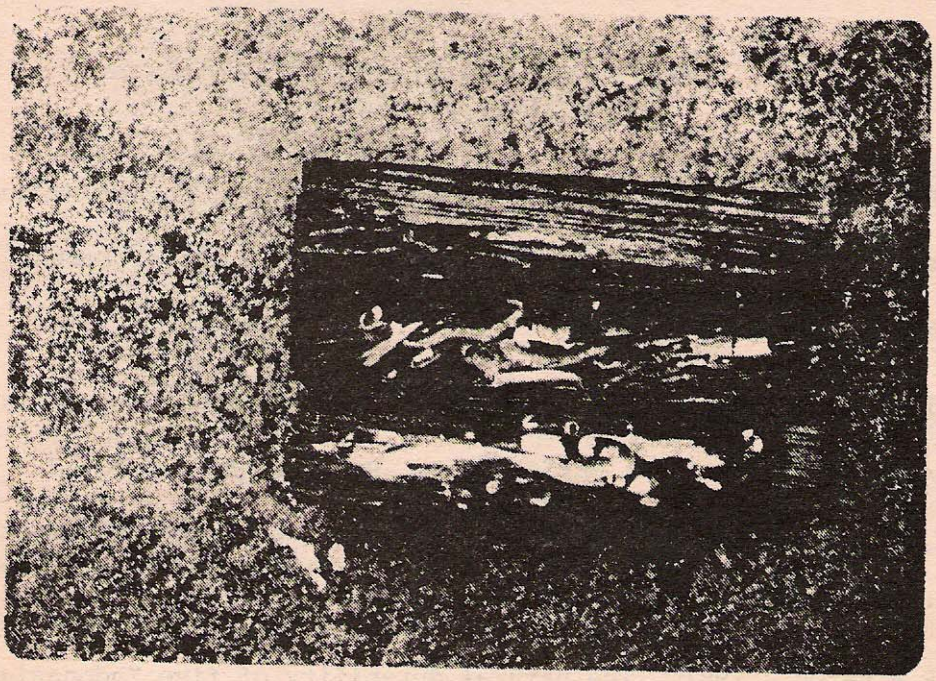


Figure 5. Pinus merkusii being attacked by teredine borers

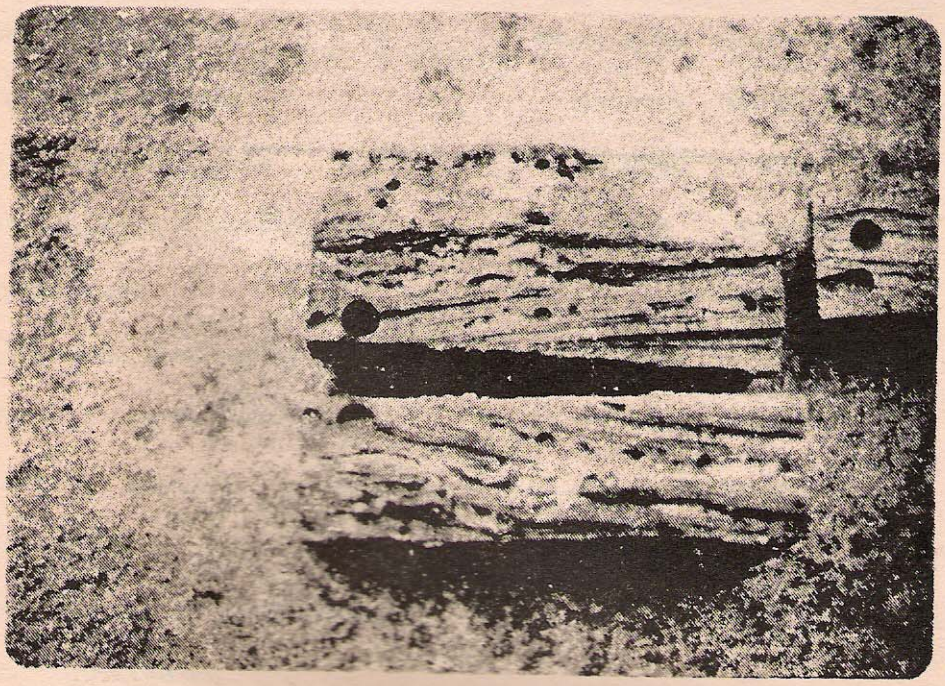


Figure 6. Alstonia scholaris being attacked by both teredine borers and Martesia (bigger, oval shaped holes)

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