SETTLEMENT OF MARINE BORING BIVALVE LARVAE ON WOOD SOAKED HORIZONTALLY AND VERTICALLY IN PELABUHAN RATU BAY, WEST JAVA

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ABSTRACT

Pieces of red meranti wood (*Shorea leprosula*) were soaked in horizontal and vertical positions in sea water for 9 weeks. Two species of bivalves settled on the wood: *Bankia campanellata* (Moll & Roch) and *Martesia striata* (Linné). Average densities of settling larvae were 125 ind. 100 cm^{-2} on horizontal wood, and 95 ind. 100 cm^{-2} on vertical wood, indicating a tendency to settle on the top side of the wood. The number of larvae settling on wood immersed at the surface was not significantly different from wood at 1.25 m depth.

INTRODUCTION

The life cycle of marine boring bivalves has two phases, a planktonic stage for dispersal, and a benthic stage where the bivalves bore in wood and similar substrata. The settlement response in marine invertebrate larvae is regulated by a number of intrinsic and extrinsic factors (Hadfield 1984), including light and gravity (Yulianda 1992), larval age (Hadfield 1977), and physical and chemical characteristics of available substrata (Crisp 1974). It has long been recognised that larvae of marine borers display high specificity for the substrata.

Marine borers are harmful to man's interests because much money must be spend on rehabilitation of facilities and wooden infrastructure. Wood soaked in sea water must be protected against attack by borers. One way would be to use resistant types of wood, but that usually implies high cost because such wood is expensive. Other ways may be discovered if more knowledge were available on the biology of larvae, but so far only few studies have been carried out on larvae of boring bivalves with a view to improve management of submerged wood. The aim of this study is to study the response of marine boring larvae to wood soaked horizontally and vertically, and to estimate the survival rate of adult boring bivalves.

MATERIALS AND METHODS

Slabs of wood, red meranti (*Shorea leprosula*) measuring 15 x 12 x 3 cm, were used to collect larvae of marine boring bivalves. The slabs were anchored in horizontal and vertical positions at the surface (0 m) and at 1.25 m depth and left in the sea water for 9 weeks. Water quality was recorded once per week during the first six weeks: temperature, Secchi disc depth (transparency), pH, salinity, dissolved oxygen (DO), and biochemical oxygen demand (BOD).

Settled larvae were counted on the surface of the slabs. Settlement started after 7 weeks, and continued through the following two weeks. After 9 weeks the slabs were broken to extract, identify, and count the adult marine borers.

RESULTS AND DISCUSSION

Only two species, *Bankia campanellata* (Moll & Roch) and *Martesia striata* (Linné) settled and grew on red meranti soaked in sea water for 9 weeks. The reason that only 2 species were found may be related to the water quality, mainly a very poor transparency; 105-147 cm (Tab. 1). The present study site was situated ca. 100 m from the fishing port which has poor water quality. Another reason for the low species number may be that only one kind of wood was used in this

Table 1. Water quality measured during 6 weeks.

Week	Depth (m)	Temp. (°C)	Transparency (cm)	Salinity (‰)	pH	DO (ppm)	BOD (ppm)
2nd	0.00	29.0	105	35.0	8.0	6.37	0.8
	1.25	27.8	105	34.5	7.7	6.37	0.8
4th	0.00	28.3	168	34.0	7.7	6.57	1.0
	1.25	27.0	168	33.5	7.8	6.17	1.3
6th	0.00	27.0	148	34.5	7.8	6.97	1.2
	1.25	26.3	148	33.0	7.8	6.37	1.0
7th	0.00	28.5	204	34.5	7.6	6.77	1.4
	1.25	26.3	204	34.5	7.5	6.57	1.2
8th	0.00	27.8	130	35.0	8.8	6.97	1.1
	1.25	26.0	130	34.5	8.1	6.57	1.0
9th	0.00	28.5	141	34.0	7.6	7.47	1.5
	1.25	26.8	141	32.5	8.0	6.97	1.2

study. Taxa of boring bivalve larvae respond to characteristics of different types of wood (Turner 1966; Muslich 1989). Finally unknown factors may play a role, such as competition among the larvae, and a preference to settle on wood already containing their own species.

The density of larvae on slabs was 51-218 ind. 100 cm^{-2} during week 7 and 8. The density of larvae was significantly different on upper horizontal surfaces versus lower horizontal surfaces, and on horizontal surfaces versus vertical surfaces (non parametric test). The larval density was not significantly different when surface slabs were compared with slabs from 1.25 m depth (Tab. 2)

Even though larval densities could not be tested significantly different as a function of depth, the densities tended to be higher in surface water than in deeper water (1.25 m) for horizontal and vertical positions (Figs. 1, 2). This tendency indicates a positive response to light because the light intensity is higher at the surface than in 1.25 m depth. This is also in accordance with a higher number of larvae settling on the upper surface than on the under side of the slabs.

The larvae settled in higher numbers on horizontal slabs than on vertical slabs during the weeks 7 and 8 (Figs. 1, 2; Tab. 2). This could possibly be explained as an effect of gravity, making it easier for larvae to settle on horizontal surfaces. But it is unknown how larvae penetrate the boundary layer since currents around slabs were not studied.

Larval counts were lower during weeks 7 and 8 than during weeks 8 and 9 (Fig. 3). The highest settling was recorded on top of slabs at 1.25 meter depth during the second period. But, the lowest settling was also found during the second period, on the under side of slabs at 1.25 meter depth. Although the number of settling larvae was high during the second period, the relative

Table 2. Non parametric test of density of marine boring larvae on upper horizontal surfaces versus lower horizontal surfaces, slabs anchored at the surface versus 1.25 m depth, horizontal surfaces versus vertical surfaces (Wilcoxon Rank method).

Treatment	R-cal.	R-tab. (α=0.05)	Significance
Top/under side	111	115	significant
Surface - deeper layer	147	115	not significant
Horizontal - vertical	114	115	significant

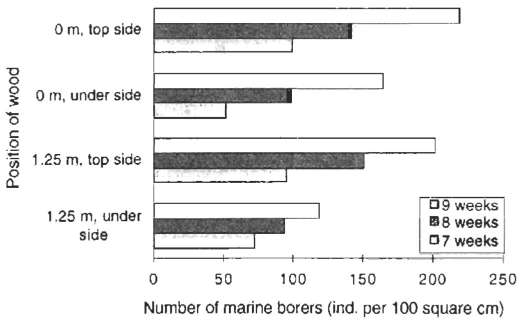

Figure 1. Number of marine boring larvae settled on wood soaked horizontally at two different depths.

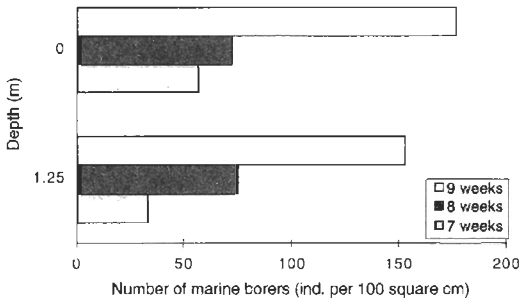

Figure 2. Number of marine boring larvae settled on wood soaked vertically at two different depths.

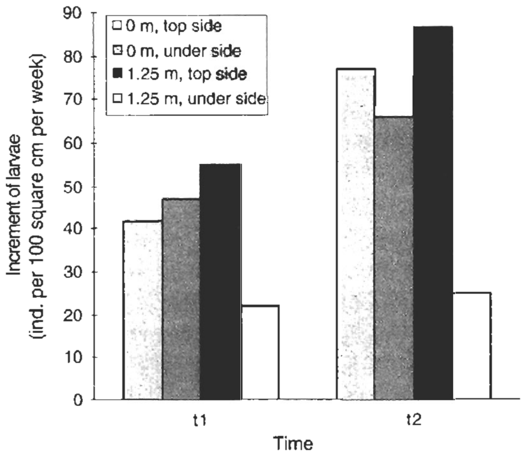

Figure 3. Larvae settlement rate per week.

increment tended to be smaller after the first period (Fig. 3). This is probably caused by the limiting carrying capacity of wood after week 8, when many larvae had settled.

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