BORING MARINE BIVALVES AND A SPHAEROMATID (CRUSTACEA) ATTACKING WOOD FOR BOAT BUILDING - IDENTIFICATION AND INTENSITY, JAVA, INDONESIA

By Fredinan Yulianda

Faculty of Fisheries, Bogor Agricultural University, Kampus Darmaga IPB, Bogor 16680, Indonesia

ABSTRACT

Six species of marine borers: the bivalves *Teredo bartschii*, *T. navalis*, *T. campanullata*, *Bankia campanellata*, *Martesia striata*, and the crustacean *Sphaeroma* sp. were found in woods kept in sea water for 2 months. Only wood of Indonesian merbau (*Intsia bijuga*) and red meranti (*Shorea leprosula*) were attacked. The intensity was 0.33 according to the NWPC Standard defining 4 levels of attack intensity. The attack intensity was influenced by specific weight of wood, cellulose and silica contents. The attack intensity had negative correlation with the specific weight and silica content, but low correlation with the cellulose content.

INTRODUCTION

Wood used for boat building is subject to attack by marine borers in the sea and brackish water. When attacked, the life time of a wooden boat is shortened. Considering the dwindling resources of suitable wood traditionally used for construction of hulls, it is important to know the organisms attacking different kinds of wood in contact with the sea water. Several factors influence the attack intensity of marine borers. For the first, the kind of wood is important. Soft wood is more susceptible to attack than hard wood. In other words, the specific weight, the cellulose, and the silica contents play a role. Environmental conditions and the amount of fouling also influence the attack intensity and the species of marine borers. Previously, an inventory of boring organisms has been carried out on the north coast of Java, which is shallow and relatively calm. Boring species were *Teredo theracites*, *Dicyather manni*, *Martesia triata*, *Bankia campanellata*, *Teredo bartschii*, *Limnoria lignorum*, *Sphaeroma* sp., and *Chelura* sp. (Report No. 109 LPHH, 1978; Proceeding of PIPK, 1983; Research page No. 22, 1986 *in* Widagdo 1993).

MATERIALS AND METHODS

The study was carried out during 2 months at Rambut Island, the Seribu Islands, the Java Sea. Five kinds of wood were used: teak (*Tectona grandis*), Indonesian keruing (*Dipterocarpus confertus*), Indonesian kapur (*Dryobalanops aromatica*), Indonesian merbau (*Intsia bijuga*) and red meranti (*Shorea leprosula*). Experimental woods measured 2.5 x 5.0 x 30 cm. The pieces of wood were anchored at a depth of ca. 1 meter. After 60 days, the pieces of wood were broken to extract, identify, and count the marine borers. The attack intensity of marine borers was estimated using the Standard of NWPC (Nordic Wood Preserves Council) No. 1.4.2.2./73. The NWPC Standard defines 4 levels of attack intensity depending on the amount of wood containing boring organisms:

0 = no attack
$0 < x \leq 1/3$ = low attack
$1/3 < x \leq 2/3$ = moderate attack
$2/3 < x \leq 3/3$ = high attack

RESULTS AND DISCUSSION

Five molluscan and one crustacean borer were identified. The molluscs encompassed (families in bold) **Teredinidae**: *Teredo bartschii, Teredo navalis, Teredo campanullata, Bankia campanellata*. The genera *Teredo* and *Bankia* have white colour and a soft body shaped like a worm, the length is about 2-3 cm. The body of those animals is covered with mucus. The anterior end carries a pair of shells used for making excavations in the wood. There are two calcified structures called "pallet", shaped like a feather duster or oar, on the posterior body (Fig. 1). There is a lime layer in the bore hole. **Pholadidae**: *Martesia striata*, has a shell covering about 1 cm of its body length. There is no lime layer in the bore hole. The crustacean belonged to **Sphaeromatidae**: *Sphaeroma* sp. The length is about 10 mm, and the width about 6 mm.

Indonesian merbau (*Intsia bijuga*) and red meranti (*Shorea leprosula*) were attacked by marine bores. The attack intensity on both woods was 0.33 during 2 months (Table 1). Three kinds of wood were not attacked (Table 1).

Woods with low specific weight and silica content were more easily attacked by marine borers. Woods of Indonesian merbau and red meranti have lower specific weight and silica content compared to others (Table 1). Correlation between attack intensity and specific weight, and between attack intensity and silica content are good (Table 2). The relationship between attack intensity and cellulose content is very low (r square = 18.5 %) (Table 2). There is no, or a very low correlation.

High specific weight of wood can slack off marine borer attack because of the dense structure. Silica is a poison for marine borers (Southwell & Bultman 1971 *in* Muslich *et al.* 1988), so a high silica content can reduce attack by marine borer. Wood that contains much cellulose is more easily attacked by marine borers, mainly of the family Teredinidae, because cellulose is a source of food for these bivalves (Turner 1966).

Table 1. Type, specific weight, cellulose content, silica content of wood and attack intensity of marine borer.

Kind of wood	Specific weight	Cellulose content (%)	Silica content (%)	Attack intensity
Teak	0.67	47.5	0.40	0
Indonesian keruing	0.80	51.4	0.60	0
Indonesian kapur	0.81	60.0	0.60	0
Indonesian merbau	0.63	46.9	0.20	0.33
Red meranti	0.52	50.8	0.30	0.33

Table 2. Correlation between specific weight, silica, and cellulose of wood attacked by marine borers; n = 5, degrees of freedom = 3

Parameters of the regression analysis	regression equation	std error of Y est.	std. error of X coef.	r^2
Y = attack intensity X = specific weight	Y = 0.988 - 1.25 X	0.1168	0.4796	0.6923
Y = attack intensity X = silica content	Y = 0.502- 88.3 X	0.1022	0.2829	0.7646
Y = attack intensity X = cellulose content	Y = 0.902 - 1.50 X	0.1901	0.0181	0.1853

Teredo navalis Spengler

Teredo bartschi Clapp

Teredo campanullata Sowerby

Bankia campanellata Moll & Roch

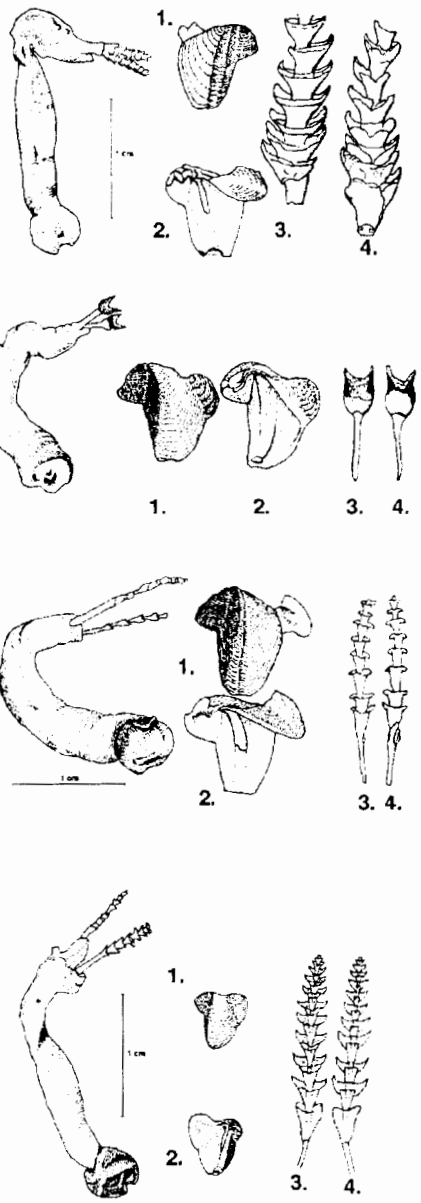

Figure 1. Morphology of marine borers (1: shell from the outside, 2: shell from the inside, 3: pallet from the outside, 4: pallet from the inside).

REFERENCES

Muslich, M., Nurwati & M. Utama. 1988. Proses Radiasi Dalam Industri, Sterilisasi Radiasi dan Aplikasi Teknologi Nuklir Dalam Hidrologi. Pusat Penelitian dan Pengembangan Hasil Hutan, Bogor. 56 pp.

Turner, R. D. 1966. A Survey and Illustrated Catalogue of the Teredinidae. Harvard University, Cambridge, Mass. 265 pp.

Widagdo. 1993. Pengaruh Bahan Pengawet Kreosot Terhadap Sifat Fisis dan Mekanis Enam Jenis Kayu Melalui Uji Serangan "Marine Borer". Jurusan Teknologi Hasil Hutan. Fakultas Kehutanan IPB. Bogor. 62 pp.