

# Identification of beetles attacking wood during storage

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## Abstract

A study was conducted to identify beetle species attacking woods during their storage at several timber trading businesses located in Bantaeng, South Sulawesi. The attacked beetle species were identified according to their morphology and the condition of attacked woods including form, frass, tunnels and bored holes. Results showed that there were 12 families of beetles attacking different wood species at the research sites. Among them, eight families were identified as wood destroying beetles. They were Lyctidae attacking *Vatica* spp, *Paraserianthes falcataria*, *Anisoptera* spp, *Durio* spp; Cerambycidae attacking *Cieba pentandra*, *Nephelium lappaceum*, *Lophopetallum* spp, *Lagerstroemia speciosa* Pers; Bostrychidae attacking *Erytrina cristagalli*, *Cieba pentandra*, *Mangifera indica*; Buprestidae attacking *Erytrina cristagalli*; Anobiidae attacking *Durio* spp, *Mangifera indica*, *Erytrina cristagalli*, *Ganua* spp, *Tectona grandis*, *Anisoptera* spp, *Hopea* spp; Scolitydae attacking *Erytrina cristagalli*, *Anthocephalus chinensis*, *Gmelina arborea*, *Lagerstroemia speciosa* Pers, *Durio* spp; Platypodidae attacking *Pterocarpus indicus* Willd, *Mangifera indica* and Curculionidae attacking *A. chinensis*, *Mangifera indica*, *Cieba pentandra*, *Lophopetallum* spp. The other four beetle families (Nitidulidae, Haliplidae, Mordellidae, and Psephenidae) were known as unimportant beetles in wood deterioration.

**Keywords:** wood destroying beetles, timber species, timber storage

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## Introduction

The utilization of wood as construction or non-construction materials is also common in Bantaeng regency of South Sulawesi covering an area of 398.83 km<sup>2</sup> and having a population of 170,057 people. Some available timbers are *Durio* spp., *Erytrina cristagalli*, and *Mangifera indica*. They are easily found at the traditional sawmills and several timber trading businesses. As the wood species belong to the low biological resistant, it is mostly possible for wood destroying organisms, such as insects and fungi to attack such wood species at their time of collection and storage.

Borer beetle is an insect species generally found as the pest attacking living trees and logs or sawn timbers. The beetle uses sugars and starches of wood materials as food resources and because of that, the wood damage can occur. The level of wood damages due to the beetle attack varies with shape, wood portion and intensity (Nicholas 1987).

The purpose of this study was to identify beetles attacking timbers of several wood species during their storage, particularly at timber trading businesses located in Bantaeng, South Sulawesi. The results of this study were expected to be useful in determining required methods for the protection of wood products against beetle attacks.

## Methods

### *Sample Preparation*

Samples were purposively taken from the attacked woods present in the lumber yards of four timber trading businesses (UD Nurul Abadi, UD Ulin Jaya, UD Prakarsa Jaya, and UD Sinar Abadi) located in different areas of Bantaeng, South Sulawesi. The locations of the four trading businesses are in the areas of mountain, seafront, roadside, and near the forest, respectively.

### *Beetle Identification*

The determination of the wood attacked beetles was conducted by the following steps:

- a. Macro- and microscopically Identify the morphology of the attacking beetles including head, antennae, thorax, leg, wing (elytra), abdomen, size measure, form and colour.
- b. Identify the conditions of wood attacked including wood species, yielded frass, tunnel characteristics as well as the form and size of bored holes.
- c. All beetle morphology and the attacked wood characteristics were then analyzed to suit the beetle morphology and attacked wood characteristics shown by references (Eaton and Hale, 1993; Borror *et al*, 1996; Arnett *et al*. 1980).

## Results and Discussion

Observation on the attacked wood at different timber trading businesses showed that the damage rating of the attacked wood varied with the attacking beetle and attacked wood species. Five wood species attacked at UD Nurul Abadi were *Paraserianthes falcataria*, *Cieba pentandra*, *Anisoptera* spp, *Nephelium lappaceum* and *Erythrina cristagalli*. Eight wood species attacked at UD Ulin Jaya were *Pterocarpus indicus* Willd, *E. cristagalli*, *Anthocephalus chinensis*, *Lagerstroemia speciosa* Pers, *Ganua* spp, *Vatica* spp, *M. indica* and *C. pentandra*. Another wood species, *Tectona grandis*, was not attacked by beetles at the timber trading business. Four wood species attacked at UD Prakarsa Jaya were *Lophopetalum* spp, *T. grandis*, *Anisoptera* spp, and *Hopea* spp, but the attacking beetle was not found in *L. speciosa* Pers and *P. indicus* Willd. Five wood species attacked at UD Sinar Abadi were *M. indica*, *Gmelina arborea*, *E. cristagalli*, *L. speciosa* Pers and *Durio* spp. These results indicate that most of the wood species available at the timber trading businesses in Bantaeng belong to the low natural durability and they are potential to be attacked by beetles. All the wood attacking beetles found in the current study are described as follows:

### 1. Famili Anobiidae

Anobiidae beetles attacked *E. cristagalli* and *Ganua* spp. at UD Ulin Jaya; *T. grandis*, *Anisoptera* spp and *Hopea* spp at UD Prakarsa Jaya; and *M. indica* at UD Sinar Abadi. In this study, the type of insects was found and collected from the sapwood of those wood species. This finding was in line with the previous result showing that Anobiidae mainly attack the sapwood of hardwood and softwood (Eaton and Hale, 1993). This research also demonstrated that this family of beetle attacked the wood during their drying processes as well as at their dry condition.

Morphologically, the wood attacking beetle of this family is known as *Anobium fulvicorne* (Fig.1C.). It is proved by the colour of metallic green adults, 4.25 mm in length, slightly bowed and furry head. Besides, their antennae measured 1.125 mm in length consisting of 10 segments (Fig.1A.); circular cylindrical; getting out bigger and longer. It is also with serrated legs and their end nails have the length of 2.5 mm (Fig.1B.).

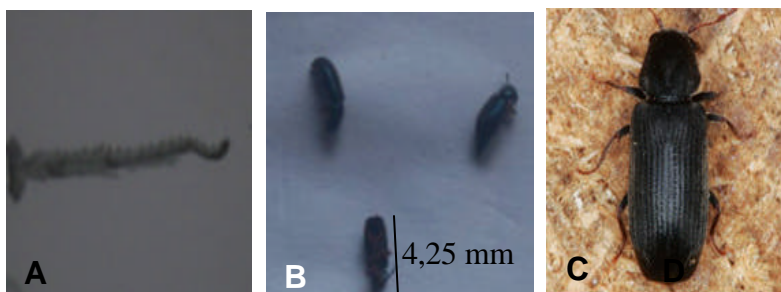


Fig.1. Morphology of Anobiidae found on *E. cristagalli* [(A) leg; (B) adults' beetle of *A. fulvicorne*] with the reference (C) of *A. fulvicorne* (Benisch, 2007)

Although the beetle was not visually found, the analysis on the characteristics of the attacked wood indicated that *M. indica*, *A. chinensis*, and *Ganua spp.* (Fig.2.) timbers were attacked by the beetle species. It was proved by the fact that no frass existed, exit holes of 1-6 mm in diameter, and round shape. Since Eaton and Hale (1993) stated that exit holes of Anobiidae range from 1,5 to 3 mm in diameter with circular shape, this research results indicated that the wood species were also attacked by other beetle species.

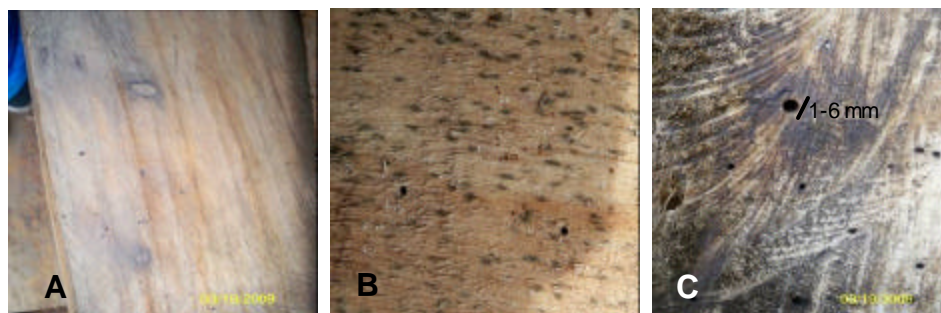


Fig.2. Characteristics of attacked wood by Anobiidae [(A) *M. indica*; (B) *A. chinensis*; and (C) *Ganua spp*]

## 2. Famili Bostrychidae

Bostrychidae beetles attacked *E. cristagalli* at UD Nurul Abadi, and *M. indica* at UD Ulin Jaya. In this study, the type of insects was found and collected from the sapwood of those wood species. This research also demonstrated that this family of beetle attacked the wood during their drying processes as well as at their dry condition. This finding was in line with the previous result showing that Bostrychidae only attack sapwood in newly dried until dried condition (Eaton and Hale, 1993)

Although the beetle was not visually found, the analysis on the characteristics of the attacked wood as shown at Fig 3 indicated that the wood was attacked by a species of this beetle family. It was proved by the fact that frass produced in the form of powder with a

medium-size, spherical pellets, separate pile, exit holes 2-6 mm in diameter and round to oval shape. Since Eaton and Hale (1993) stated that exit holes of Bostrychidae larvae range from 2,5 to 7 mm in diameter with frass produced a fine powder to coarse; visible and not a separate pile.

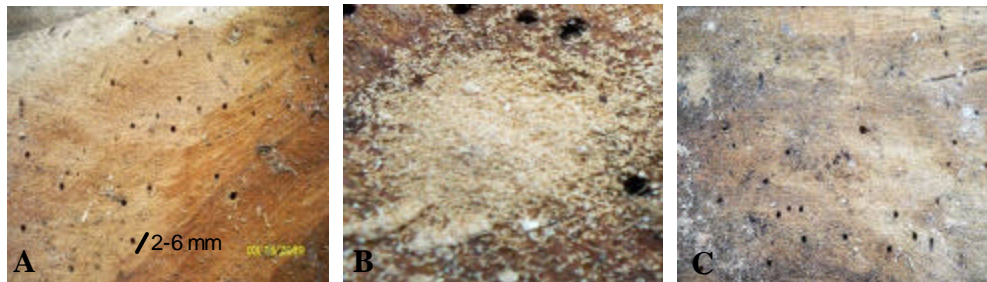


Fig.3. Characteristics of attacked wood by Bostrychidae: (A) The exit hole on *C. pentandra*; (B) Frass of *M. indica*; and (C) The exit hole on *E. cristagalli*

### 3. Famili Cerambychidae

Cerambychidae beetles attacked *C. pentandra* and *N. lappaceum* at UD Nurul Abadi; *L. speciosa Pers* at UD Ulin Jaya; and *Lophopetallum spp* at UD Prakarsa Jaya. In this study, the type of insects was found and collected from the sapwood of those wood species. This research also demonstrated that this family of beetle attacked the wood during their storage at wet condition. This finding was in line with the previous result showing that Cerambychidae mainly attack the sapwood of hardwood and softwood with unseasoned logs or timber (Eaton and Hale, 1993).

Morphologically, the wood attacking beetle of this family is known as *Obrea tripunctata*. It is proved by the colour of creamy white larvae with a rounded head, and 45 mm in length (Fig. 5). Since Borror *et al.* (1996) stated that Cerambychidae is wood driller in the larval stadium. The adults' beetle laid their eggs in crevices in bark, and larvae drill into the wood. Larvae tunnel were round in transverse slices. These beetles are often called round-headed driller.



Fig.4. A larva of *Obrea tripunctata* found on *C. pentandra*

Although the beetle was not visually found, the analysis on the characteristics of the attacked wood as shown at Fig 4 indicated that the wood was attacked by a species of this beetle family. It was proved by the fact that exit holes of 3-8 mm in diameter, and round to

oval shape. This family also made tunnels or galleries in wood longitudinal direction. This finding was in line with the previous result showing that exit holes of Cerambycidae has 3-10 mm in diameter with circular to oval in shape (Eaton and Hale, 1993)

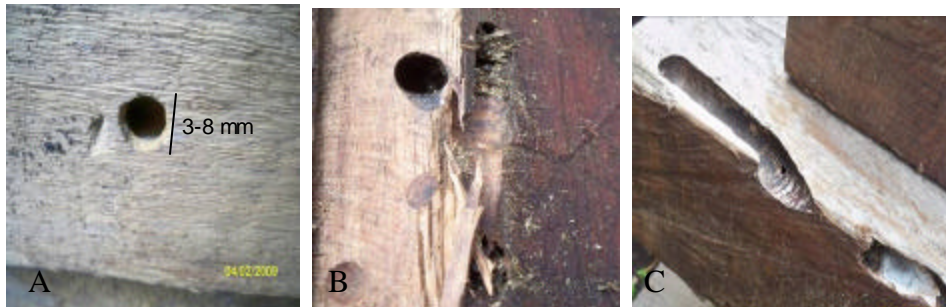


Fig.5. Characteristics of attacked wood by Cerambycidae [(A) The exit hole on *Lophopetallum* spp; (B) The exit hole on *L. speciosa* Pers; (C) tunnel/gallery on *N. Lappaceum*]

#### 4. Famili Curculionidae

Curculionidae beetles attacked *A. chinensis*, *P. indicus* Willd, *M. indica* and *C. pentandra* at UD Ulin Jaya; and *Lophopetallum* spp at UD Prakarsa Jaya. In this study, the type of insects was found and collected from the sapwood of those wood species. This research also demonstrated that this beetle family attacked the wood at dry condition and rotten. This finding was in line with the previous result showing that Curculionidae mainly attack the sapwood of hardwood and softwood (Eaton and Hale, 1993).

Although the beetle was not visually found, the analysis on the characteristics of the attacked wood as shown at Fig 6 indicated that the wood was attacked by a species of this beetle family. It was proved by the fact that frass produced in the form of spherical fine powder, exit holes 1-1.5 mm diameter and round to oval shape. Since Eaton and Hale (1993) stated that exit holes of Curculionidae range from 1 to 1.5 mm in diameter with round to oval shape, fine granules frass and tunnel produced slightly oval and serrated. Three species found are *Lixus convexus* Say, *Cossonus linearis* and X species.

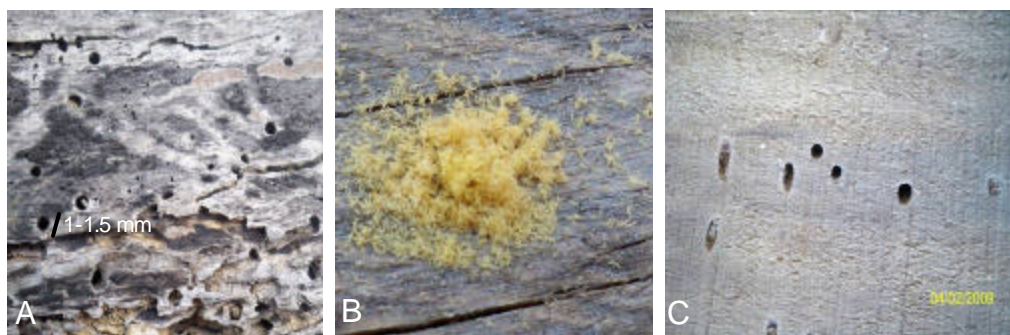


Fig.6. Characteristics of attacked wood by Curculionidae [(A) The exit hole on *Lophopetallum* spp; (B) Frass of *Lophopetallum* spp; (C) The exit hole on *P. indicus* Willd]

#### 4.1. *Lixus concavus* Say

The adults of this beetle showed black colour (Fig. 7A) and 20 mm in length. Besides, their antennae measured 2.75 mm in length consisting of 10 segments (Fig. 1A.); rather long with the same length and large of each segment (Fig. 9B.). It also has legs with 5.25 mm in length (Fig. 7C.).

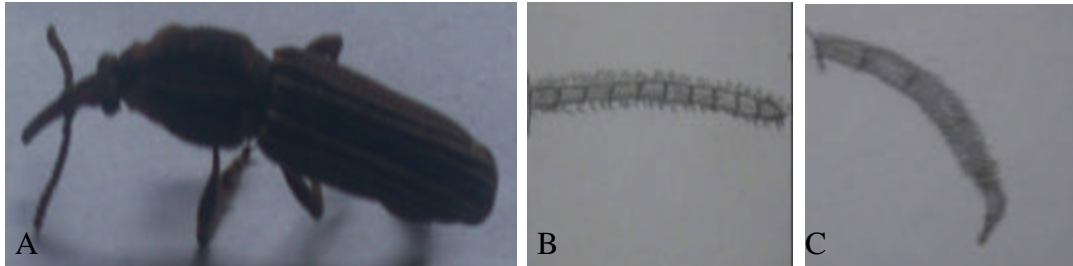


Fig.7. Morphology of *L. concavus* Say found on *P. indicus* Willd [(A) Adults' beetle; (B) Antennae; (C) Leg]

#### 4.2. *Cossonus linearis*

The adults of this beetle showed black colour (Fig. 8A.) and 6 mm in length. Besides, their antennae measured 0.87 mm in length consisting of 7 segments (Fig. 8B); and the end of antennae is rounded shape. It also has legs with 1.75 mm in length; rather short with two branches like claw at the point (Fig. 8C.).

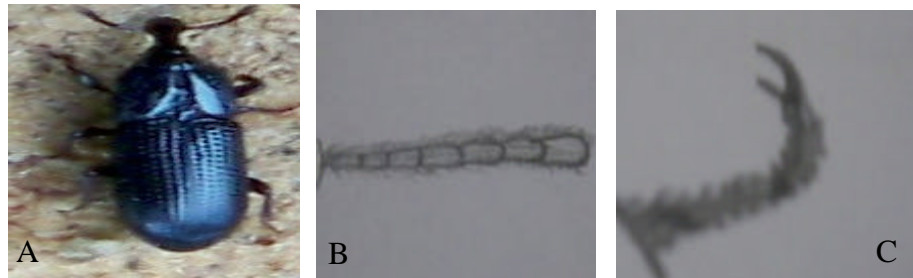


Fig.8. Morphology of *C. Linearis* found on *M. indica* [(A) Adults' beetle; (B) Antennae; (C) Leg]

#### 4.3. Species X

The wood attacking beetle of this family is still unidentified (Fig. 9A). The adults of this beetle showed red colour and 4.24 mm in length. Besides, their antennae measured 2.25 mm in length consisting of 11 segments; and each segment has oval round and small (Fig. 9B.). It has 2.75 mm legs with cylindrical base and saw-blade like from the middle to the end of the legs (Fig.9C.).

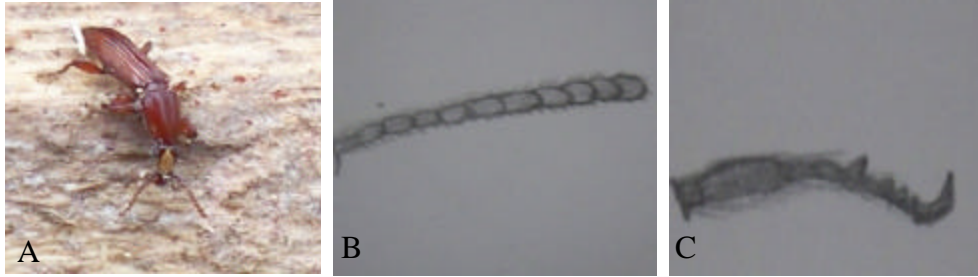


Fig.9. Morphology of Species A found on *C. Pentandra* [(A) Adults' beetle; (B) Antennae; (C) Leg]

## 5. Famili Lyctidae

Lyctidae beetles attacked *P.falcataria* and *Anisoptera spp* at UD Nurul Abadi, and *Vatica spp* at UD Ulin Jaya. In this study, the type of insects was found and collected from the sapwood of those wood species. This research also demonstrated that this family of beetle attacked the wood during their storage at wet condition and while dried. This finding was in line with the previous result showing that Lyctidae mainly attack the sapwood of susceptible hardwood species which have sufficient starch and this beetle family attacked the wood at newly dried condition (Eaton and Hale, 1993).

Although the beetle was not visually found, the analysis on the characteristics of the attacked wood as shown at Fig 10 indicated that the wood was attacked by a species of this beetle family. It was proved by the fact that frass like powder, and small exit holes of 0.8-2 mm in diameter. Since Eaton and Hale (1993) stated that their small exit holes of Lyctidae range from 0.8 to 2 mm in diameter with circular, and frass produced like powder especially on horizontal surfaces.



Fig.10. Degradation of wood and Frass Produced by Lyctidae: (A) frass of *Anisoptera spp*; (B) Frass of *Vatica spp*; (C) The exit hole on *P.falcataria*.

## 6. Famili Platypodidae

Platypodidae beetles attacked *E. cristagalli* at UD Ulin Jaya. In this study, this beetle family attacked the wood at wet condition. It is in accordance with the findings that Platypodidae particularly attack softwood and hardwood with higher moisture content (Eaton and Hale, 1993)

Morphologically, the wood attacking beetle of this family is known as *Platypus wilsoni* Swaine (Fig.11A.). It is proved by the colour of blackish brown adults, 3.7 mm in length,

elongated, slender and cylindrical; head slightly wider than pronotum; elytra are not flat; such as fine lines are prominent and parallel; tip of elytra tapering shape and split in two. Besides, their antennae are genikulat elbow-shaped and only one segment; covered with quite long smooth hair (Fig.11B.); the first segment is long; the next segment short and turned on the pedicel. It is also with tarsus tip shaped like a hook with sharp branch and curve; while the femur enlarged; tibia are very spiky thorns and stiff; and tarsus covered with fine hairs (Fig. 11C).

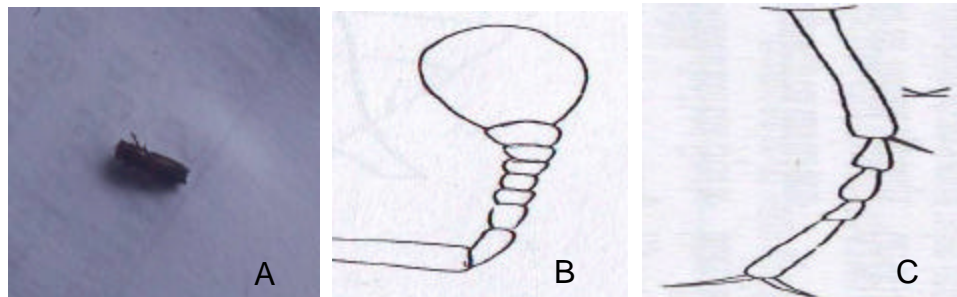


Fig.11. Morphology of Platipodidae found on *M. Indica* [(A) Adults' beetle of *P. wilsoni* Swaine; (B) Antennae; (C) Leg]

Although the beetle was not visually found, the analysis on the characteristics of the attacked wood as shown at Fig 12 indicated that the wood was attacked by a species of this beetle family. It was proved by the fact that pinhole-borer of 0.5-1 mm in diameter. Since Eaton and Hale (1993) stated that no frass, and pinhole-borer up to 1,5 mm in diameter.

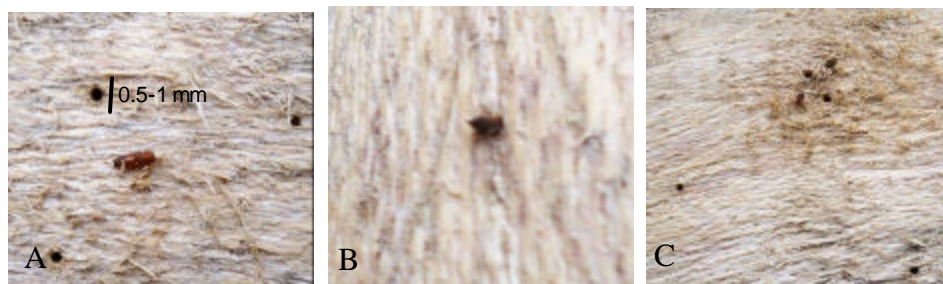


Fig.12. Characteristics of attacked wood by Platipodidae [(A), (B) dan (C) The exit hole on *E. Cristagalli*]

## 7. Famili Scolytidae

Scolytidae beetles attacked *A. chinensis* at UD Ulin Jaya; *G.arborea* at UD Sinar Abadi; and *L. speciosa Pers* at UD Sinar Abadi. Two wood attacking beetle species identified in this family are known as *Dendroctonus pseudotsugae* and *Ips pini* Say. In this study, the type of insects was found and collected from the sapwood of those wood species. This research also demonstrated that this family of beetle attacked the wood during their storage at wet condition. It is in accordance with the findings that Scolytidae particularly attack softwood and hardwood with higher moisture content (Eaton and Hale, 1993)

Although the beetle was not visually found, the analysis on the characteristics of the attacked wood as shown at Fig 13 indicated that the wood was attacked by a species of



this beetle family. It was proved by the fact that exit holes of 0.5-5 mm in diameter, and circular until oval shape. Since Eaton and Hale (1993) stated that no frass of Scolytidae, exit holes range from 0.5-3 mm in diameter with circular shape and galleries with fungal stain in surrounding tunnels.

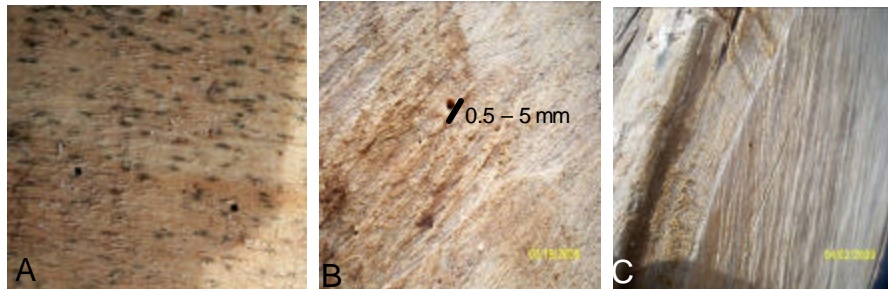


Fig.13. the exit hole of Scolytidae [(A) *A. chinensis*; (B) *E. cristagalli* and; (C) *G. arborea*]

### 7.1. *Dendroctonus pseudotsugae*

The adults of this beetle showed blackish brown; tip of elytra reddish brown, and 5 mm in length. Body is slightly curved with head bent down and almost not visible from above. The surface of elytra and abdomen are characterized by bumps rough (not smooth) and covered by hair erect and rigid. Besides, their antennae measured 1.75 mm in length consisting of one segment (Fig.1A.); where the last segment is enlarged and covered with fine hairs (Fig. 14B.). Antennae type is genikulat elbow-shaped; the first segment is long; the next segment is short and turned on the pedicel. It is also with pretarsus (nail) having an anchor-shaped on tip of tarsus, tapered and curved; the end of the tibia is characterized by a very sharp-pointed spines and stiff (Fig. 14C.).

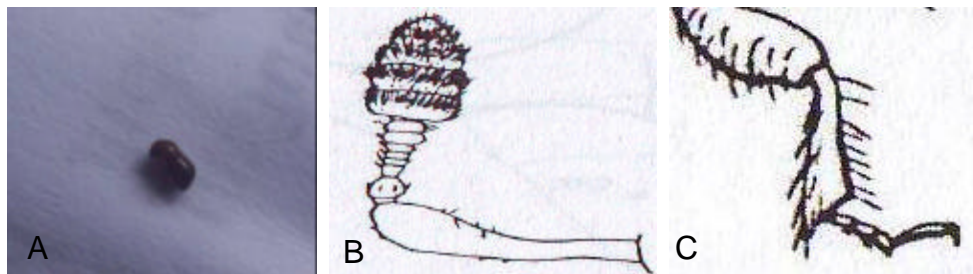


Fig.14. Morphology of Scolytidae found on *Durio* spp. [(A) Adults' beetle of *D. Pseudotsugae*; (B) Antennae; (C) Leg]

### 7.2. *Ips pini* Say

Figure 15A shows the adult of *I. pini* Say beetle measuring 4.25 mm in length and unseen antennae. Besides, their legs are very short (0.375 mm) with circular-oval shape.

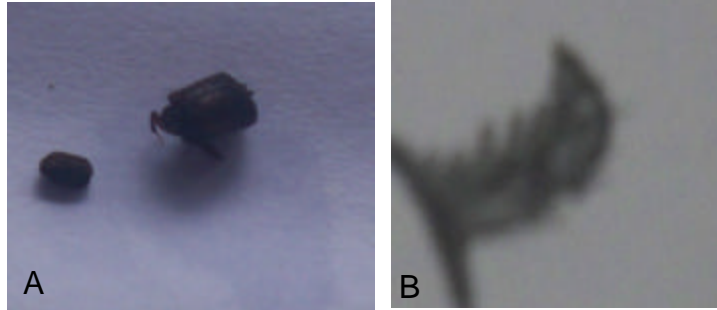


Fig.15. Morphology of Scolytidae found on *G. arborea* [(A) Adults' beetle of *I. pini* Say; (B) Leg]

### 8. Famili Nitidulidae

Nitidulidae beetles attacked *Durio* spp during its storage at wet condition. This family is picnic beetle who's always on the move habitat. Morphologically, the colour is orange with black spots adults, and 15 mm in length (Fig. 16A.). Besides, their antennae measured 3.25 mm in length (Fig. 16B.). It is also with spines legs and 3 mm in length (Fig. 16C.); at the end of legs are tapered and each of nail has two branches.

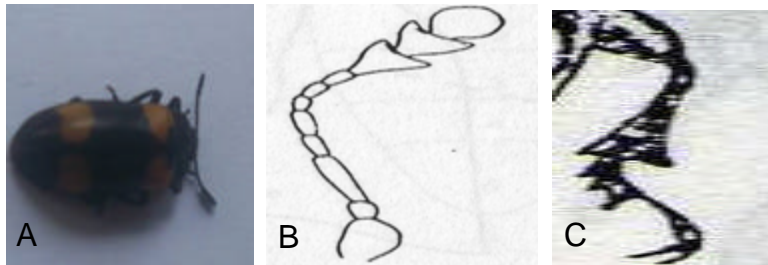


Fig.16. Morphology of Nitidulidae found on *Durio* spp [(A) Adults beetles; (B) Antennae; (C) Leg]

### 9. Famili Buprestidae

Buprestidae beetles attacked *E. Cristagalli* at UD Nurul Abadi. In this study, this family of beetle attacked the wood during their storage at wet condition. The adults of this beetle showed metallic green colour and elongated body with 25 mm in length (Fig. 17A.). Besides, their antennae measured 3 mm in length consisting of ten segments; and the end of antennae is pointed shape (Fig. 17B.). It is also with tapered tip of legs and their end nails have the length of 7 mm; the base of leg is very short and thin while the end is fat (Fig. 17C.).



Fig.17. Morphology of Buprestidae found on *E. Cristagalli* [(A) Adults beetles; (B) Antennae; (C) Leg].

### 10. Famili Haliplidae

Haliplidae beetles attacked *Ganua spp* during its storage at newly dried. The common habitat of this family is in the flower, but is also found in wood; most likely these beetles lay their eggs in wood. The adults of this beetle showed orange with black spots colour; small rounded body shape and 3.75 mm in length. Besides, their antennae measured 2.5 mm in length consisting of 11 segments, and small spherical shape of each segment (Fig.18B). It is also with two branches of claw and 0.75 mm in length of legs (Fig.18C).

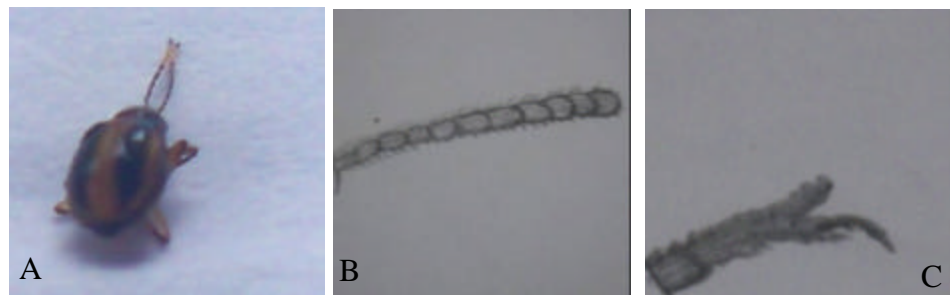


Fig.18. Morphology of Haliplidae found on *Ganua spp*. [(A) Adults beetles; (B) Antennae; (C) Leg]

### 11. Famili Mordellidae

Mordellidae beetles attacked *Lophopetallum spp* at UD Perkasa Jaya. In this study, this family of beetle attacked the wood during their storage at dry condition. The adults of this beetle showed red adults, 35 mm in length and cylinder. Besides, their antennae measured 10 mm in length consisting of two segments with cylinder and thorny shapes (Fig.19B.). It also has 0.75 mm tapered legs (Fig.19C.).

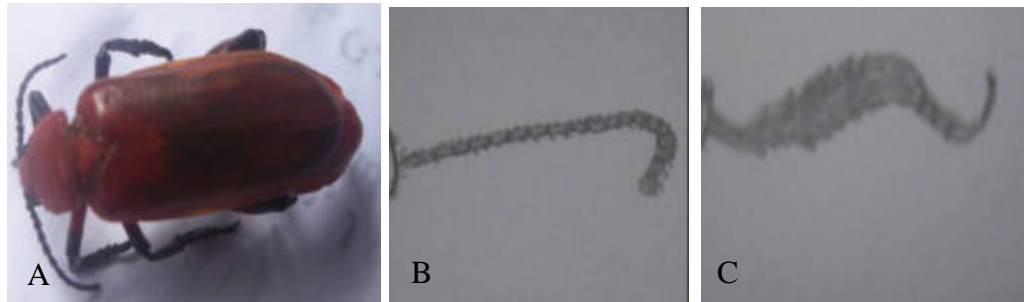


Fig.19. Morphology of Mordellidae found on *Lophopetalum spp* [(A) Adults beetles; (B) Antennae; (C) Leg]

## 12. Famili Psephenidae

Psephenidae beetles attacked *E. Cristagalli* at UD Ulin Jaya. In this study, this family of beetle attacked the wood during their storage at wet condition. Although this beetle is generally known as water beetle, this study demonstrated the presence of its larvae in wood. This result indicated that the stages of eggs and larvae in its life cycle could be present in wood. This is supported also by the location situated on the seafrent. The adults of this beetle showed brown cream colour (Fig. 20A.) and 12 mm in length. Besides, their antennae measured 3 mm in length consisting of 20 segments; each segment is cylinder and thorny (Fig. 20B.). It is also with thorny legs and 2.5 mm in length with claw in top (Fig. 20C.).

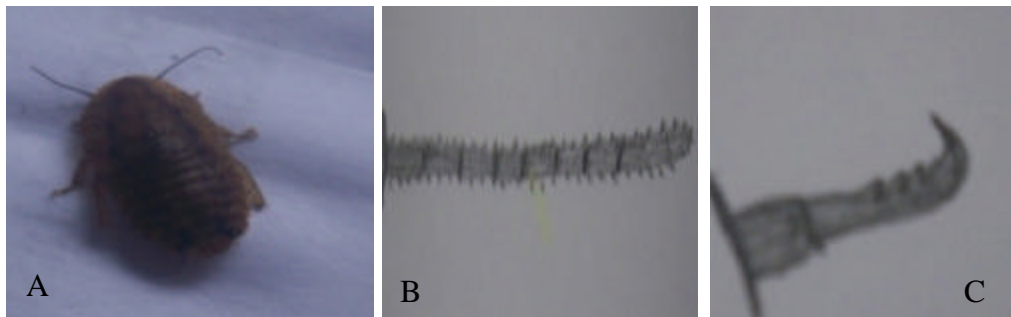


Fig.20. Morphology of Psephenidae found on *E. Cristagalli* [(A) Larva; (B) Antennae; (C) Leg]

## Conclusions

Beetles attacking woods at the lumber yard of timber trading businesses in Bantaeng, South Sulawesi varied with wood species and the location or condition of their storage. There were 12 families of beetles attacking different wood species at the research sites. Eight families (Lyctidae, Cerambycidae, Bostrychidae, Buprestidae, Anobiidae, Scolitydae, Platypodidea and Curculionidae) were identified as wood destroying beetles and the other four beetle families (Nitidulidae, Haliplidae, Mordellidae, and Psephenidae) were known as unimportant beetles in wood deterioration.

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