

MARINE WOOD-BORING BIVALVES (PHOLADACEA) IN THE GULF OF THAILAND

Wantana Yoosukh¹ & Mayuree Jitkaew²

1. Department of Marine Science, Faculty of Fisheries,
Kasetsart University, Bangkok 10900, Thailand

2. Forest Products Research Division, Royal Forest Department,
Bangkok 10900, Thailand

ABSTRACT

Seven species of marine wood-boring bivalve molluscs were found in the Gulf of Thailand. They are widely distributed both in marine and brackish waters. The specimens were collected from dead mangrove trees, pilings, submerged wood, and test blocks. The various species are identified and the characteristics of pallets and siphons of each species are illustrated. Notes on habitat and distribution are included. The species are *Martesia striata* (Pholadidae), and *Bactronophorus thoracites*, *Dicyathifer manni*, *Teredo furcifera*, *Spathoteredo obtusa*, *Nausitora hedleyi*, and *Bankia gracilis* (Teredinidae).

INTRODUCTION

Marine wood-boring molluscs are important organisms in the marine ecosystem being one of the major agents of wood deterioration, destroying wooden structures that are placed in or floated in the sea. They are bivalve molluscs of the families Pholadidae and Teredinidae. The Pholadidae or piddocks are adapted to boring in wood, firm mud, soft rock, and stony coral. They produce a pear-shaped hole perpendicular to the surface that does not have a calcareous lining. The shells cover the soft body, and in addition to the two calcareous valves, they have at least one and some have as many as four accessory plates. There are siphons at the posterior end but no pallets.

The Teredinidae are commonly called shipworms, pile worms or teredinids. They are highly specialised bivalves adapted for boring into wood. The shells which consist of two valves are greatly reduced and cover only the anterior end of the animal. The long worm-like body being protected by the wood in which they live. The initial entrance hole is extremely small, one to three mm in diameter, then slightly enlarged inside. They usually continue to burrow as long as they live, and make long worm-like tunnels with a calcareous lining. At the posterior end of the body, the siphons protrude from the bur-

row into the water for respiration and feeding. At their base are calcareous structures called pallets which seal off the burrow when the siphons are retracted.

The damage caused by marine wood-boring molluscs is usually undetected until the interior is nearly or completely destroyed and the wood disintegrated. It is for this reason they are often referred to as "termites of the sea".

Taxonomic works on marine wood-boring molluscs collected from various parts of the world were published by Turner (1966, 1971) and a list of 20 genera and 86 species including a key to wood-boring bivalves were made. Rayner (1974) reported 11 genera, 36 species from Papua New Guinea. In Thailand, only a few papers have been published concerned with these animals. The earliest one was by Bartsch (1972) who described two species of shipworm collected from Songkla province and the Chao Phaya River. Five species of marine wood-boring bivalves were listed by Suvatti (1966). Yoosukh *et al.* (1991) found two species of molluscan borers which attacked test blocks submerged at Sriracha Fisheries Research Station, Chonburi province. Nateewathana (1995) reported one species of edible shipworm on sale at markets in Trat and Chonburi provinces.

The present study is intended to be a first guide to identification of marine wood-boring molluscs found in the Gulf of Thailand. This is meant to serve as information for species diversity and species distribution.

MATERIALS AND METHODS

The specimens used in this study were collected occasionally from coastal provinces along the Gulf of Thailand. The investigations involved observations of mangrove trees, pilings, submerged wood, and test blocks for wood preservation. Collected specimens were fixed in 10 % formalin and preserved in 70 % ethyl alcohol. Total lengths (pallets included) were measured in mm. Collection dates, localities and habitats were recorded. Classification and identification follow Turner (1966, 1971). Identification of pholadids is based on shape of shell valves and accessory plates. Characters used to differentiate teredinids are structures of pallets and siphons. The specimens are deposited at Forest Products Research Division, Royal Forest Department, Bangkok, Thailand.

TAXONOMIC ACCOUNT

Seven species of marine wood-boring molluscs were found in the Gulf of Thailand. All of them are bivalves, belonging to 2 families, 3 sub-families, 7 genera and 7 species as listed below.

Family Pholadidae (Subfamily Martesinae):
Martesia striata (Linnaeus, 1758)

Family Teredinidae (Subfamily Teredininae):
Bactronophorus thoracites (Gould, 1856);
Dicyathifer manni (Wright, 1866);
Teredo furcifera von Martens, 1894;
Spathoteredo obtusa (Sivickis, 1928);
Nausitora hedleyi Schepman, 1919;
Bankia gracilis Moll, 1935

Martesia striata (Linnaeus, 1758)
(Fig. 1A,B)

MATERIAL EXAMINED: 6 adult specimens, 25-34 mm in length; 8 young specimens, 16-24 mm in length.
CHARACTERISTICS: Shell wedge shaped,

pale yellow to white, thin and fragile. Valves with apophyses and callum. In addition to the two equivalves, there are three accessory plates (mesoplax, metaplax and hypoplax). Body short, no pallet, capable of complete retraction within valves. Young and adult forms are different. Young shell has wide gap at the anterior end, while in adult the gap is closed by callum, a calcareous deposit.

HABITAT: Burrow in submerged wood in the intertidal and subtidal zones, Koh Yaw (Songkla), 30.8.1995; Sriracha Fisheries Research Station (Chonburi), 28.1.1990.

DISTRIBUTION: World wide, warm temperate to tropical areas.

Bactronophorus thoracites (Gould, 1856)
(Fig. 1C)

MATERIAL EXAMINED: 7 specimens, 233-318 mm in length.

CHARACTERISTICS: Teredinid form, valves small with apophyses and no accessory plate. Pallets at posterior end having unique character of the genus and species. Pallets non-segmented and asymmetrical, composed of blade and stalk. Blade more or less triangular in outline with shallow cup from which protrudes a pustulose, calcareous dagger-like extension. Siphons relatively short and united except at the tip.

HABITAT: Collected from dead mangrove tree, *Xylocarpus moluccensis* Roem. Mangrove Forest Management Unit, Nong Sa No (Trat), 7.8.1991 and 29.5.1996.

DISTRIBUTION: Australia, Southeast Asia, India.

Dicyathifer manni (Wright, 1866)
(Fig. 1D)

MATERIAL EXAMINED: 7 specimen, 32-318 mm in length.

CHARACTERISTICS: Teredinid form. Pallets almost entirely calcareous, non-segmented, composed of a single piece. Blade of the pallet is broadest at the distal margin,

tapering toward the stalk, slightly cupped. Inner face of blade flat and nearly straight at distal margin. Outer face of blade convex, distal margin moderately U-shaped. Siphons separated.

HABITAT: Collected from dead mangrove tree, *Xylocarpus moluccensis*. Mangrove Forest Management Unit, Nong Sa No. (Trat), 7.8.1991 and 29.5.1996.

DISTRIBUTION: Indo-Pacific, Tropical to subtropical, marine and brackish water.

Teredo furcifera von Martens, 1894
(Fig. 1E)

MATERIAL EXAMINED: 6 specimens, 28-67 mm in length.

CHARACTERISTICS: Teredinid form, pallets non segmented. Blade of the pallet has transverse ridge at widest point. The calcareous portion extends to tip of blade, and is covered by thin, light brown periostracum. Distal margin of both outer and inner face V-shaped but inner face less so. Siphons long and separated.

HABITAT: Attack test blocks, Sriracha Fisheries Research Station (Chonburi), 28.1.1990.

DISTRIBUTION: World-wide, tropical to subtropical areas.

Spathoteredo obtusa (Sivickis, 1928)
(Fig. 1F)

MATERIAL EXAMINED: 3 specimens, 67-195 mm in length.

CHARACTERISTICS: Teredinid form, pallets paddle-shaped. Blade of the pallet has light brown periostracum usually appearing as band across middle of blade on outer face. Distal portion of outer face covered with finely papillate calcareous incrustation. Siphons are united for most of their length.

HABITAT: Burrow in wooden pole at the sea coast, Koh Lam Ya (Rayong), 18.3.1992.

DISTRIBUTION: Indo-Pacific, tropical areas.

Nausitora hedleyi Schepman, 1919
(Fig. 1G)

MATERIAL EXAMINED: 6 specimens, 82-205 mm in length.

CHARACTERISTICS: Teredinid form, blade of pallet much longer than stalk. Segments of blade closely packed, built upon a central stalk which extends the whole length of blade and usually covered with light brown periostracum. Siphons united for about three-fourths of their length.

HABITAT: Burrow in wooden poles at the sea coast, Koh Yaw (Songkla), 30.8.1995.

DISTRIBUTION: Indo-Pacific, tropical areas, marine.

Bankia gracilis Moll, 1935
(Fig. 1H)

MATERIAL EXAMINED: 3 specimens, 37-53 mm in length.

CHARACTERISTICS: Teredinid form and elongated pallets. Blade of the pallet composed of numerous cone like elements on a central stalk. Cones distinctly separate, are easily dislodged from stalk. Base of cone calcareous, brown periostracum extends as a border, produced laterally as awns. Both inner and outer margins of cones serrated, serrations on outer face long and rather wide, on inner face long and narrow. Siphons fairly long and united except at the tip.

HABITAT: Collected from dead mangrove tree, *Xylocarpus moluccensis*. Mangrove Forest Management Unit, Nong Sa No (Trat), 29.5.1996.

DISTRIBUTION: Restricted to tropical and warm temperate waters.

DISCUSSION

Taxonomic studies on marine wood-boring molluscs are quite limited especially in Thailand. Turner (1966) has studied the shell form, morphology, and anatomy of the soft part and also life history of various species of teredinids. She found that the differences shown by the pallets are striking and each

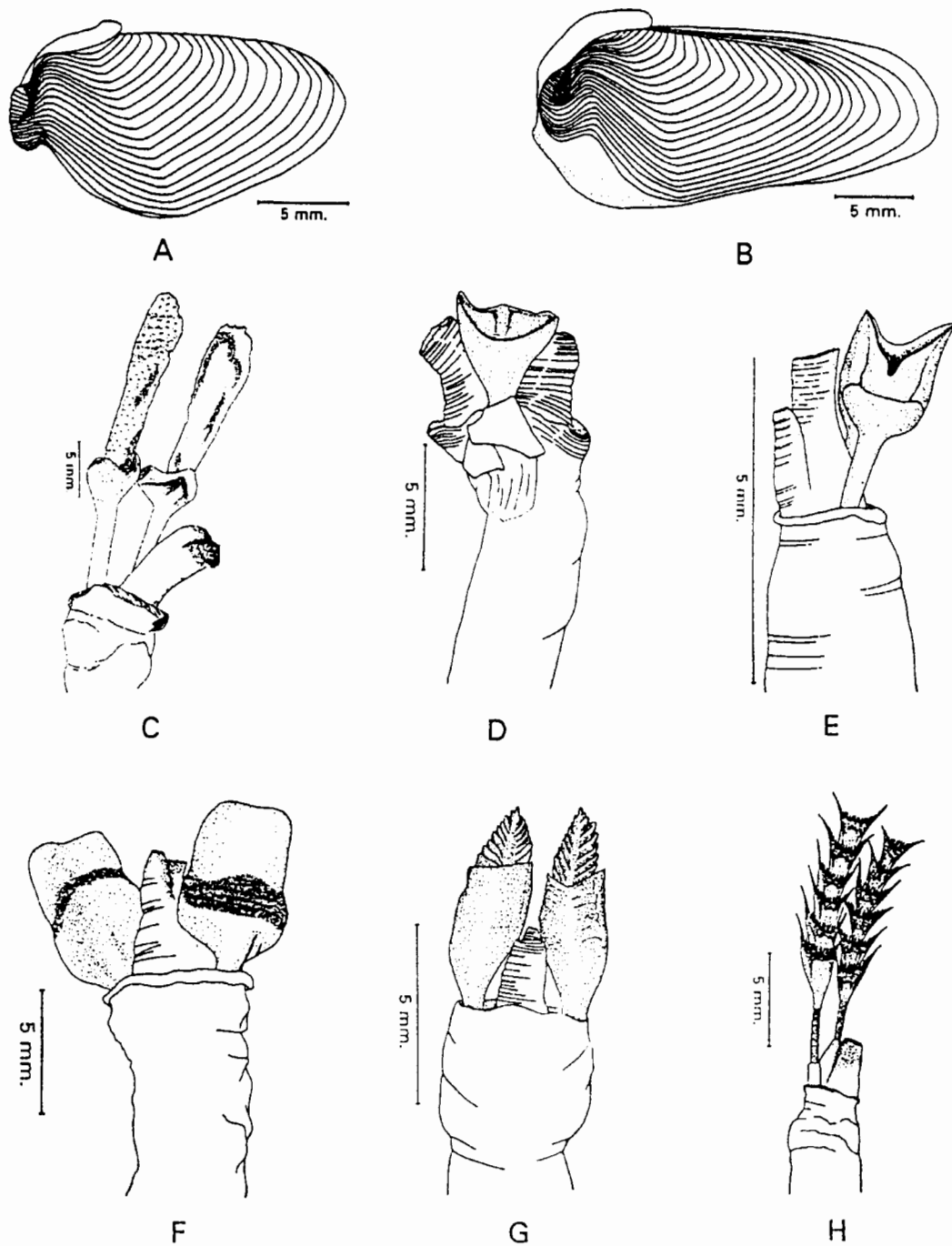


Figure 1. (A)-(B). External features of *Martesia striata* (Linnaeus), (A). Young specimen, (B). Adult specimen. (C)-(H). Pallets and siphons of teredinids. (C). *Bactronophorus thoracites* (Gould), (D). *Dicyathifer manni* (Wright), (E). *Teredo furcifera* von Martens, (F). *Spathoteredo obtusa* (Sivickis), (G). *Nausitora hedleyi* Schepman, (H). *Bankia gracilis* Moll.

specimen can be readily placed in a genus. The shells of teredinids belonging to different genera are so similar that it is not possible to use them for taxonomic purposes. Also Moore (1969) stated that the species are usually distinguished on the basis of pallets and siphons, and that the shells are almost useless in classification as they are extremely variable, depending upon the age of the specimen and the ecological conditions affecting it. Similar shell form may appear in widely separated genera. For the above reasons, only pallets and siphons were used for identification in the present studies. In Thailand, the teredinids or shipworms are consumed as human food, especially on the

east coast of the Gulf of Thailand. They are sold at the local markets such as Khlung market (Chantaburi) and Trat market (Nateewathana 1995). Although all teredinid species are edible, the larger ones such as *Bactronophorus thoracites* (Gould) and *Dicyathifer manni* (Wright) are preferred.

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