

Notes on Shipworms from Visakhapatnam Harbour¹

BY

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(With four text-figures)

In the course of a detailed study of the Teredinidae of Visakhapatnam harbour, the author (1955) was able to describe thirteen species belonging to the genera *Teredo* and *Bankia*. Though Teredines have been extensively studied in various countries, our knowledge of the tropical forms is very meagre. From Cochin harbour, Erlanson (1936) noted the occurrence of five species. Nair (1954, 1955a, and 1955b) reported seventeen species of shipworms from the Madras coast. Roonwal (1954) recorded the occurrence of *Bactronophorus thoracites* from the Sunderbans. Palekar & Bal (1955) described four species of *Teredo* and three species of *Bankia* from Bombay harbour. Nair & Gurumani (1956, 1957) described a new species of *Teredo* from south India.

The present communication deals with ten more shipworms collected from Visakhapatnam harbour. Out of these, five species are the first records from Indian waters. In the treatment of the species the classification given by Bartsch (1922) and Roch (1953, 1955) was followed.

Collections of specimens were made in the Visakhapatnam harbour waters during the years 1953-57 from timber jetties, catamaran logs used for fishing, and standard test boards of deal wood of various convenient sizes.

All drawings were made with the aid of the camera lucida.

SYSTEMATIC TREATMENT OF THE GROUP

Genus *Teredo* Linnaeus

Subgenus *TEREDO* Linn

1. *Teredo (Teredo) bensoni* Edmondson

Subgenus *COELOTEREDO* Bartsch

2. *Teredo (Coeloteredo) singaporeana* Roch

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Subgenus DACTYLOTEREDO Roch

3. *Teredo* (*Dactyloteredo*) *juttingae* Roch

Subgenus LYRODUS Gould

4. *Teredo* (*Lyrodus*) *milleri* Dall, Bartsch, & Rehder

5. *Teredo* (*Lyrodus*) *malaccana* Roch

Genus *Bankia* Gray

Subgenus LILIOBANKIA Clench & Turner

6. *Bankia* (*Liliobankia*) *campanellata* Moll & Roch

Subgenus BANKIELLA Bartsch

7. *Bankia* (*Bankiella*) *carinata* Gray

Subgenus PLUMULELLA Clench & Turner

8. *Bankia* (*Plumulella*) *thielei* Roch

9. *Bankia* (*Plumulella*) *lineata* Nair

Genus *Nausitora* Wright

10. *Nausitora* *dunlopei* Wright

Genus *Teredo* Linnaeus

1758. *Teredo* Linnaeus, in *Syst. Nat.*, ed. 10, p. 651.

1922. *Teredo* Bartsch, in *Bull. U.S. Nat. Mus.* **122** : p. 17.

Pallets are either paddle- or spoon- shaped. They may be distally cupped or not.

Subgenus TEREDO Linn.

1758. *Teredo* Linn., in *Syst. Nat.*, ed. 10, p. 651.

1922. *Teredo* Bartsch, in *Bull. U.S. Nat. Mus.* **122** : p. 17.

Pallets paddle-shaped with the blade cupped distally terminating laterally in sharp points.

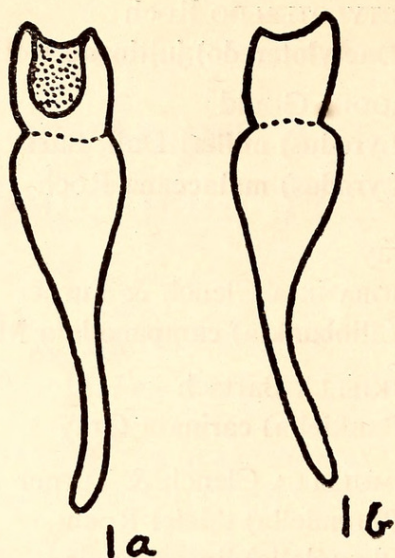
Teredo (*Teredo*) *bensoni* Edmondson

1946. *Teredo* (*Teredo*) *bensoni* Edmondson, in *Occas. Papers B.P. Mus.* **18** : p. 213.

Pallets paddle-shaped with stout, curved stalk ; blade short, broad and its basal portion gradually merges into the stalk. The distal portion of the blade excavated deeply on the outer surface, inner surface is smooth. Dark brown periostracum covers the blade nearly to its base.

Measurements : Pallets : total length 4.2 mm., out of which 3.5 mm. belongs to the stalk.

Distribution : Honolulu harbour ; very rare in Visakhapatnam harbour.



Teredo (Teredo) bensoni

Fig. 1a : Outer view of pallet $\times 13$; Fig. 1b : Inner view of pallet $\times 13$.

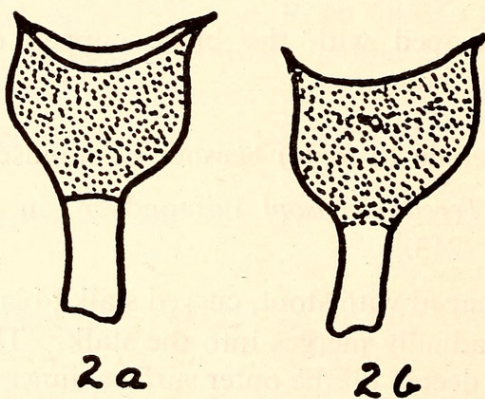
Subgenus COELOTEREDO Bartsch

1953. *Coeloterredo* Bartsch, in *Proc. Biol. Soc. Wash.* 36 : p. 99.

In this subgenus the blade of the pallet forms a hollow cone ; that is, the outer portion is convex while the inner portion of the blade is almost flat.

Teredo (Coeloterredo) singaporeana Roch

1935. *Teredo (Coeloterredo) singaporeana* Roch, in Roch & Moll *Sitz. Ber. Akad. Wien. Wiss. Math. Natw. KI. Abt. I.* 144 : p. 266.



Teredo (Coeloterredo) singaporeana

Fig. 2a : Pallet outer view $\times 12$; Fig. 2b : Pallet inner view $\times 12$.

Pallets with decidedly cup-shaped depression at the distal end. The distal portion is covered with a dark epidermis, which terminates in the form of two lateral horns. Stalk is shorter than the blade and is very stout at the base.

Measurements: Length of stalk 1.3 mm., length of blade 1.7 mm.

Distribution: Singapore, Sumatra, Madagascar, East Africa, Malacca ; rarely found in Visakhapatnam harbour.

Subgenus DACTYLOTEREDO Roch

1941. *Dactyloterredo* Roch, in Moll Sitz. Ber. Ges. Natforsch. Freunde 10 : p. 193.

1952. *Dactyloterredo* Roch, in Moll Inst. Franç. Afrique Noire Catalogue 8 : p. 83.

Pallets are oblong and leaf-shaped and provided with more or less nail-like depression on the outer side of the distal end of the blade.

Teredo (Dactyloterredo) juttingae Roch

1955. *Teredo (Dactyloterredo) juttingae* Roch, in Zool. Meded. 34; p. 135.

Pallets with a blade which is shaped like a finger-nail but it is, however, comparatively smaller in area and does not extend up to the two side walls of the pallet. On the inner side, the blade is concave and smooth and shows a rib running through its centre very much as if the stalk portion extended towards the tip through the pallet. The stalk is very short and stout.

Measurements: Pallets : length of the blade 8 mm. ; length of the stalk 1.5 mm.

Distribution: Sumatra, Philippines, Samoa ; fairly common species in Visakhapatnam harbour and confined to the regions of higher salinities in the harbour area. It was also collected from Kakinada.

Subgenus LYRODUS Gould

1870. *Lyrodus* Gould, in Invert. Mass. p. 33.

In this subgenus the terminal portion is not cupped, but ends in two lateral forks, covered with a periostracum.

Teredo (Lyrodus) milleri Dall, Bartsch, & Rehder

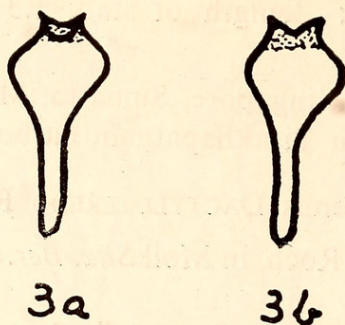
1924. *Teredo affinis* Miller, in Univ. Calif. Pub. Zool. 26 : p. 148.

1938. *Teredo (Cornuterredo) milleri* Dall, Bartsch, & Rehder, in B.P. Mus. Bull. 153 : p. 210.

1942. *Teredo (Cornuterredo) milleri* Edmondson, in Occas. Papers B.P. Mus. 17 (10) : p. 114.

1955. *Teredo (Lyrodus) milleri* Roch, in Riv. Biol. Colon. 13.

Pallets with slender stalk ; blade consisting of a short, urn-shaped, calcareous base, surmounted by a dark brown periostracum which is typically two pointed,



Teredo (Lyrodus) milleri

Fig. 3a : Outer view of pallet $\times 17$; Fig. 3b : Inner view of pallet $\times 17$.

Measurements : Pallets : total length 1.4 mm. ; stalk 0.8 mm.

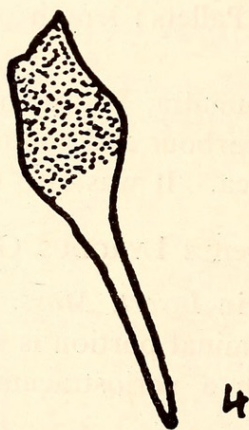
Distribution : Hawaii ; very rare in Visakhapatnam harbour.

Remarks : Only ten young immature specimens were collected from the test boards at Naval base in Visakhapatnam harbour.

***Teredo (Lyrodus) malaccana* Roch**

1935. *Teredo (Lyrodus) malaccana* Roch, in Sitz. Ber. Akad. Wiss. Wien. Math. Natw. KI. Abt. I. 144 : p. 269-270.

1955. *Teredo (Lyrodus) malaccana* Roch, in Zool. Meded. 34 : p. 136-139.



Teredo (Lyrodus) malaccana

Fig. 4 : Pallet, inner view $\times 10$.

Pallets slender and typically of *Lyrodus* shape ; blade covered by dark brown periostracum which occupies greater portion of calcareous blade and is not produced into distinct lateral forks.

Measurements : Pallets : total length 4.1 mm. ; length of stalk 2.2 mm.

Distribution : Malaya, Indonesia, very few forms collected from the Visakhapatnam harbour.

Genus **Bankia** Gray

1840. *Bankia* Gray, in Synop. Brit. Mus. Ed. 42 : p. 154.

1922. *Bankia* Bartsch, in Bull. U.S. Nat. Mus. 122 : p. 7.

The pallets consisting of a series of cone-in-cone structures which give them the appearance of the ear of wheat.

Subgenus **LILIOBANKIA** Clench & Turner

1946. *Liliobankia* Clench & Turner, in Johnsonia 2 : p. 17.

Pallets have a moderately wide and smooth margin of periostracum which is produced laterally to form wide, blunt awns. The embryonic cones are not crowded at the tip of the pallet but are distally spaced.

Bankia (Liliobankia) campanellata Moll & Roch

1931. *Bankia (Liliobankia) campanellata* Moll & Roch, in Proc. Malac. Soc. Lond. 19 : p. 215.

1955. *Bankia (Liliobankia) campanellata* Roch, in Zool. Meded. 34 : p. 140.

Pallets consisting of a series of widely spaced cones ; calcareous portion of each cone funnel-shaped ; periostracal margin of the outer surface slightly U-shaped and smooth while the inner margin is flat ; laterally the periostracum is produced into wide, blunt awns which are curved upwards.

Measurements : Pallets : total length 30 mm., of which 15 mm. go to form the stalk.

Distribution : Malaya Archipelago, Sumatra ; most common species of *Bankia* in Visakhapatnam harbour.

Subgenus **BANKIELLA** Bartsch

1921. *Bankiella* Bartsch, in Proc. Biol. Soc. Wash. 34 : 26.

Pallets consisting of a series of cone-in-cone elements covered by a thin membrane which is neither fimbriated nor denticulated at the free margin, but entire.

Bankia (Bankiella) carinata Gray

1827. *Bankia carinata* Gray, in Phil. Mag. 2 : p. 411.

1954. *Bankia (Bankiella) indica* Nair, in Rec. Ind. Mus. 52, (2-4) : p. 393-396.

1955. *Bankia (Bankiella) carinata* Roch, in Zool. Meded. 34 : p. 139.

Pallets with cone-in-cone type joints which are funnel-shaped ; the blade consists of well-spaced cups, the rims of which are covered by brown periostracum ; the outer side of the blade is convex and the inner side flat,

Measurements: Pallet length 9.5 mm. ; length of stalk 5.0 mm.

Distribution: Indonesia, Malacca ; in India this species was previously recorded from Calcutta, Bombay, and Madras ; very rare in Visakhapatnam harbour.

Subgenus *PLUMULELLA* Clench & Turner

1946. *Plumulella* Clench & Turner, in *Johnsonia* 2 : p. 24.

Pallets have long serrated awns. The periostracal margins on both the inner and outer surfaces of each cone are finely to coarsely serrated.

Bankia (Plumulella) thielei Roch

1935. *Bankia (Plumulella) thielei* Roch, in Roch & Moll Sitz. Ber. Akad. Wiss. Wien. Math. Natur. Abt. I. 144 : p. 275.

1955. *Bankia (Plumulella) thielei* Roch, in *Riv. Biol. Colon.* 13.

Pallets consisting of closely-spaced cones ; the periostracal margin of the outer and inner surfaces is coarsely-serrated ; stalk is approximately of equal size as the blade of the pallet.

Measurements: Pallets : total length 11 mm., of which 5.8 mm. go to form the stalk.

Distribution: Madagascar ; only two pallets were collected once at entrance channel in Visakhapatnam harbour.

Bankia (Plumulella) lineata Nair

1955. *Bankia (Neobankia) lineata* Nair, in *J. Madras Univ.* 25 : p. 109.

This species was first described by Nair (1955) and included under the subgenus *Neobankia* ; but according to the classification given by Clench and Turner (1946) for the genus *Bankia*, it belongs to the subgenus *Plumulella*, as the pallets possess long serrated awns.

Pallets feather-shaped with a cylindrical stalk ; the blade consists of distinct cone-in-cone structures, the lateral borders of which are drawn out into slender awns ; the inner margin of each cone forms a slender cup while the outer margin is deeply concave.

Measurements: Pallet length 9.2 mm. ; length of stalk 4.0 mm.

Distribution: Madras ; only few pallets were collected from naval base in Visakhapatnam harbour.

Genus *Nausitora* Wright

1864. *Nausitora* Wright, in *Trans. Linn. Soc. Lond.* 24 : p. 456.

Pallets consisting of a series of cone-in-cone elements which are not entirely free at their distal ends, but fused on the exterior surface,

Nausitora dunlopei Wright

1864. *Nausitora dunlopei* Wright, in *Trans. Linn. Soc. Lond.* **24**: p. 451.

Pallets with a cylindrical stalk which is curved and tapers to a fine sharp point; the outer surface of the blade is convex and roughly imbricated; on the inside the blade shows a series of transverse laminae.

Measurements: Pallets: length of blade 8 mm.; length of stalk 5 mm.

Distribution: Australian waters; rare in Visakhapatnam harbour, also recorded from Madras and Hooglee River.

SUMMARY

The present survey extends our knowledge of shipworms from Visakhapatnam harbour over previous records by listing ten more species. Of these five species *Teredo* (*Teredo*) *bensoni*, *Teredo* (*Coeloteredo*) *singaporeana*, *Teredo* (*Lyrodus*) *milleri*, *Teredo* (*Lyrodus*) *malaccana*, and *Bankia* (*Plumulella*) *thielei* are recorded for the first time from Indian waters.

Teredo (*Dactyloteredo*) *juttingae* and *Bankia* (*Liliobankia*) *campanellata* are of very common occurrence in Visakhapatnam harbour.

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