

Notes on the Distribution of Wood-Boring Teredines in the Tropical Indo-Pacific

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EXTENSIVE WORK has been carried out on the taxonomy of the Teredinidae of the east coast of India, the Philippines, the Hawaiian Islands, and other areas in the Pacific (Becker, 1958; Daniel, 1956; Nair, 1961²; Rajagopal, 1964; Saraswathi, 1964; Sivickis, 1928; Bartsch, 1921, 1922, 1927; Moll and Roch, 1931; Roch, 1935, 1940, 1955a, 1955b; Miller, 1924; Edmondson, 1941, 1942, 1946, 1959). Recently Turner (1966), in her "Catalogue of the Teredinidae," has redefined the genera and proposed a new system of classification. During a recent survey of the Teredinidae of the Hawaiian Islands it was possible for the author to collect material, study Dr. Edmondson's types, and draw conclusions on the possible mode of distribution of the teredines in the tropical Indo-Pacific area.

The study at Hawaii was based on collections at different sites on the island of Oahu, the island of Kauai and from Dr. C. H. Edmondson's type collections at the Bishop Museum in Honolulu. Also panels of Douglas fir and white pine were suspended at various depths at two different sites—one at Kewalo Basin, Honolulu and the other at Coconut Island, Kaneohe—and teredines were collected after an immersion period of about 3 months. Material from the Madras coast was collected from drift logs washed ashore on the Madras beach (Mylapore and Triplicane areas), from floating pieces of wood, from underwater wooden structures like piles and catamarans, and from test planks which were submerged in Madras harbour during 1965–1967. Specimens collected were identified using Turner's revised classification. The following are the species that occur on the Madras and Hawaiian coasts. Of the 18 species (11 of them new species) described by Edmond-

son, only 12 seem to be valid. Also, 27 species of teredines have been described from the Madras coast and these refer only to 13 valid species. The original names as well as synonyms (* from the Madras coast, ° from the Pacific islands) have been listed here.

Bankia carinata Gray

**Bankia* (*Bankiella*) *edmondsoni* Nair

**Bankia* (*Bankiella*) *indica* Nair

Bankia campannelata Moll and Roch

**Bankia* (*Bankia*) *bengalensis* Nair

Bankia bipennata Turton

**Bankia* (*Plumulella*) *lineata* Nair

**Bankia* (*Neobankia*) *lineata* Nair

**Bankia* (*Neobankia*) *denticuloserrata* Daniel

Lyrodus pedicellatus Quatrefages

**Teredo* (*Teredo*) *indica* Nair

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

**Teredo* (*Teredo*) *madrasensis* Nair

°*Teredo* (*Teredo*) *honoluluensis* Edmondson

°*Teredo* (*Teredops*) *diegensis* and var. *midwayensis* Edmondson

Dicyathifer manni Wright

**Teredo* (*Kuphus*) *manni* Wright

Teredora princesae Sivickis

**Teredo* (*Teredora*) *gregoryi* Dall et al.

**Teredo* (*Teredora*) *minoris* Nair

**Teredo* (*Dactyloteredo*) *diederichseni* Roch

°*Teredo* (*Teredora*) *gregoryi* Dall et al.

Nototerodo edax Hedley

**Teredo* (*Psiloterodo*) *tondiensis* Nair and Gurumani

**Teredo* (*Dactyloteredo*) *juttingae* Roch

Uperotus clavus Gmelin

**Teredo* (*Teredora*) *clava* Gmelin

**Teredo* (*Teredora*) *vattanensis* Nair and Gurumani

**Teredo* (*Teredora*) *rebderi* Nair

Nausitora dunlopei Wright

**Bankia* (*Nausitora*) *madrasensis* Nair

**Nausitora lanceolata* Rajagopal

Teredo furcifera von Martens

**Teredo* (*Teredo*) *furcillatus* Miller

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² Refer to Nair (1961) for earlier papers.

- **Teredo* (*Teredo*) *parksii* var. *madrasensis* Nair
 °*Teredo* (*Teredo*) *parksii* Bartsch
 °*Teredo* (*Cornuteredo*) *bensoii* Edmondson
Teredothyra smithi Bartsch
 **Teredo* (*Nototeredo*) *nambudalaiensis* Nair and Gurumani
 **Teredo* (*Zopoteredo*) *bengalensis* Nair
Teredothyra excavata Jeffreys
 **Teredo* (*Teredothyra*) *linearis* Nair
 °*Teredo* (*Teredothyra*) *palauensis* Edmondson
 °*Teredo* (*Teredothyra*) *subicensis* Edmondson
Bankia bipalmulata Lamarck
 **Bankia* (*Bankia*) *bipalmulata* Lamarck
 °*Bankia* (*Bankiella*) sp.
 °*Bankia* (*Neobankia*) *hawaiiensis* Edmondson
 °*Bankia* (*Neobankia*) *konaensis* Edmondson
Nausitora sp.
 °*Bankia* (*Nausitora*) *oahuensis* Edmondson
Teredo bartschi Clapp
 °*Teredo* (*Teredo*) *bartschi* Clapp
 °*Teredo* (*Teredo*) *hiloensis* Edmondson
Lyrodus medilobata Edmondson
 °*Teredo* (*Cornuteredo*) *medilobata* Edmondson
Teredo triangularis Edmondson
 °*Teredo* (*Cornuteredo*) *medilobata* Edmondson
Lyrodus affinis Deshayas
 °*Teredo* (*Cornuteredo*) *milleri* Dall et al.
Teredo fulleri Clapp
 °*Teredo* (*Zopoteredo*) *fulleri* Clapp
Teredo clappi Bartsch
 °*Teredo* (*Zopoteredo*) *trulliformis* Miller

From Table 1 it is clear that while 11 species of teredines are generally well distributed from Madras to the Philippine coast, the others are mostly confined to Hawaii and the Pacific, and are not represented in the rest of the areas. Of the seven species recorded from Hawaii, *T. bartschi*, *T. clappi*, and *T. fulleri* seem to extend farther and invade the Gulf of Mexico and the Caribbean while others are indigenous.

L. pedicellatus, *T. princesae*, *T. furcifera*, and *T. excavata* are known to occur not only along the Madras coast, in Southeast Asia, and near

TABLE 1

THE DISTRIBUTION OF IMPORTANT SPECIES OF WOOD-BORERS IN THE INDO-PACIFIC AREA

SPECIES	MADRAS	INDONESIA AND PACIFIC ISLANDS			HAWAII	OTHER ISLANDS*
		INDONESIA	PACIFIC ISLANDS	PHILIPPINES		
<i>Bankia carinata</i>	X	X	X			
<i>Bankia campannelata</i>	X					
<i>Bankia bipennata</i>	X		X			
<i>Lyrodus pedicellatus</i>	X	X	X	X	1,2,3,4	
<i>Dicyathifer manni</i>	X		X			
<i>Teredora princesae</i>	X	X	X	X	2,3,4,5	
<i>Nototeredo edax</i>	X	X	X			
<i>Upevotus clavus</i>	X					
<i>Nausitora dunlopei</i>	X	X	X			
<i>Teredo furcifera</i>	X	X		X	1,2	
<i>Teredothyra smithi</i>	X		X			
<i>Teredothyra excavata</i>	X	X	X	X		
<i>Bankia bipalmulata</i>	X	X	X	X		
<i>Nausitora</i> sp.				X		
<i>Teredo bartschi</i>				X		
<i>Lyrodus medilobata</i>				X		
<i>Teredo triangularis</i>				X	1,7	
<i>Lyrodus affinis</i>				X		
<i>Teredo fulleri</i>				X	1,6,7	
<i>Teredo clappi</i>				X	1,7	

* The numbers in this column refer to species reported by Dr. Edmondson from the island of Samoa (1), Canton (2), Johnston (3), Midway (4), Wake (5), Christmas (6), and Palmyra (7).

the Philippine and Hawaiian islands, but also from Samoa, Canton, Johnston, Midway, Wake, Palau, Christmas, and Palmyra islands—all in the tropical Pacific. Hence these species are cosmopolitan in distribution. *T. princeae* was collected from floating timber by the Vityas Expedition (from station No. 5209 in the Indian Ocean), and identified by the author.

While most of the species reported from Madras are from pelagic timber only a few have been successful in invading timbers from enclosed waters (*L. pedicellatus* and *T. furcifera* in Madras harbour; *L. pedicellatus*, *T. furcifera*, *B. campannelata*, *D. manni*, and *N. hedleyi* in Pulicat Lake).

It may be of interest to note the records of occurrence of *B. nordi* Moll (Rajagopal, 1964) and *B. rochi* Moll (Rajagopaliengar, 1961) for the first time along the northeast coast of India at Calcutta.

The apparent discontinuity in distribution of some of the species in the Indo-Pacific area is probably due to non-availability of wood for transportation, lack of intensive collection efforts, or to hydrobiological factors like temperature and salinity which influence breeding. It is also possible that adults may not be able to tolerate wide ranges of temperature and salinity, and this may be a controlling factor for their successful establishment.

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REFERENCES

- BARTSCH, P. 1921. A new classification of the shipworms and descriptions of some new wood-boring molluscs. Proc. Biol. Soc. Wash. 34:25.
- 1922. Monograph of American shipworms. Bull. U.S. Natl. Mus. 122:1.
- 1927. The shipworms of the Philippine Islands. Bull. U.S. Natl. Mus. 100 (2) pt. 5:533.
- BECKER, G. 1958. F.A.O. Report No. 795 to the Government of India.
- CLAPP, W. F. 1924. A new species of *Teredo*. Trans. Acad. Sci. St. Louis 25(1):12.
- DALL, W. H., P. BARTSCH, and H. F. REHDER. 1938. A manual of the recent and fossil pelecypod mollusks of the Hawaiian Islands. Bull. B.P. Bishop Mus. (Honolulu) 153:1.
- DANIEL, A. 1956. A new wood-borer, *Bankia* (*Neobankia*) *denticuloserrata* from Madras. J. Madras Univ. 26 B(3):593.
- EDMONDSON, C. H. 1941. A recent shipworm survey in Hawaii. Sixth Pacific Science Congress, Proc. 3:245.
- 1942. Teredinidae of Hawaii. Occ. Pap. Bishop Mus. (Honolulu) 18:211.
- 1946. Dispersal of shipworms among Central Pacific islands, with descriptions of new species. Occ. Pap. Bishop Mus. (Honolulu) 18(15):211.
- 1959. Two new species of *Teredo*, subgenus *Teredothyra* from the Western Pacific. Occ. Pap. Bishop Mus. (Honolulu) 22(11):203.
- MILLER, R. C. 1924. Wood-boring mollusks from the Hawaiian, Samoan and Philippine islands. Univ. Calif. Publ. Zool. 26:145.
- MOLL, F. 1936. Les animaux rongeurs de bois sur les côtes de l'Indochine. J. Conchyliol. 80:296.
- MOLL, F., and F. ROCH. 1931. The Teredinidae of the British Museum, the Natural History Museums of Glasgow and Manchester and the Jeffrey's Collection. Proc. Malacol. Soc. London 19(4):210.
- NAIR, N. B. 1961. Some aspects of marine borer problem in India. J. Sci. Industr. Res. 20A (10):584.
- RAJAGOPAL. 1964. Two new species of marine borers of the genus *Nausitora* (Mollusca: Teredinidae) from West Bengal, India. J. Bombay Nat. Hist. Soc. 61(1):108.
- RAJAGOPALIENGAR. 1961. A new species of the marine borer, *Bankia* (*Neobankia*) *roonwali* (Mollusca: Teredinidae) from India. Science and Culture 27:550.
- ROCH, F. 1935. Ueber einige neue Teredinidenarten. Sitzungs. Akad. Wiss. Wien 144:263.

- 1940. Die Terediniden des Mittelmeeres. *Thalassia* 4(3):147.
- 1955*a*. Die Holz- und Stein-zerstorenden Tiere der afrikanischen Küstengewässer. *Riv. Biol. Coloniale* 13:71.
- 1955*b*. Die Terediniden Ost- und Westindiens der Holländischen Museumssammlung zu Amsterdam und Leiden. *Zool. Meded. Rijks. Nat. Hist. Leiden* 34(8):135.
- SARASWATHI, M. 1964. Shipworms from the Cochin harbour, southwest coast, India. *J. Mar. Biol. Assoc. India* 6(2):309.
- SIVICKIS, P. B. 1928. New Philippine shipworms. *Philippine J. Sci.* 37:285.
- TURNER, R. D. 1966. A survey and illustrated catalogue of the Teredinidae (Mollusca: Bivalvia). *Mus. Comp. Zool. Publ. Harvard Univ., U.S.A.*