"SHIPWORMS", THE NAKED CLAMS OF THE NE PACIFIC

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Most beach walkers have encountered "wormwood" as drifting logs and wood debris with calcareous tubes lining a network of tunnels (**Fig. 1 & 2**). Throughout history shipworms have wreaked havoc! Hidden in their tunnels, these clams with tiny shells and elongated bodies resemble worms when their wooden home is split open. They are infamous for their destruction of wooden sailing ships, docks, and any other wood structures in the ocean. However, they are a critical part of the marine ecosystem, transforming the terrestrial energy in wood into clam tissue, larvae, and feces that are integrated into the marine food web. Their empty tunnels provide habitat for a large diversity of organisms. Classified as ecosystem engineers, they create habitat and form the basis of food webs around wood in the ocean. Commonly called shipworms or teredos, they have been recently promoted as "naked clams" or "long oysters" in the attempt to give them more appeal as a harvestable food product (Wiler and Aldridge 2020). Shipworms are harvested to eat, and for their medicinal value, in many countries, including SE Asia, the Philippines and Thailand (Miller 2021; Poon et al. 2025). Their endosymbiotes produce many organic compounds with proven medical and biofuel potential (Chery-Karschney et al. 2024).

Fig. 1 Driftwood log in Ladysmith Harbour with shipworm tubes, *Bankia setacea*. ©R.Harbo

There are many species (approximately 80) of shipworms worldwide, but the diversity in the NE Pacific is limited to one native species, the Feathery Shipworm *Bankia setacea* (Tyron, 1863), and three or more non-native species, including the Naval shipworm *Teredo navalis* Linnaeus, 1758, the Bartsch shipworm *T. bartschi* Clapp, 1923 and the Blacktip shipworm *Lyrodus pedicellatus* (Quatrefages, 1849) (Coan et al. 2000; Harbo et al. 2025). By far, the native species, *B. setacea*, is the one most commonly encountered; it is widespread and easy to identify by its tell-tale feather pallets (Quayle 1992; **Fig. 3 & 4**).

Fig. 2 Wormwood *B. setacea* panel cut from a driftwood log washed ashore in Ladysmith Harbour. ©R. Harbo.

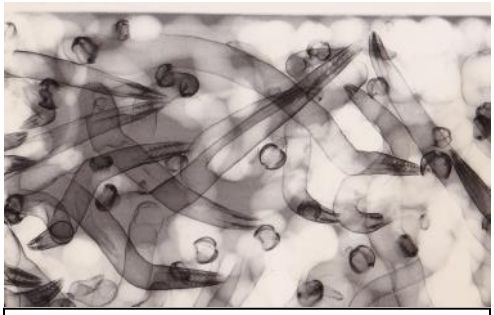

Fig. 3 X-ray of wood, showing *B. setacea*. ©D.B. Quayle.

Fig. 4 *B. setacea* showing feathery pallets. ©Darcy Kehler

DESTRUCTION BY SHIPWORMS

Shipworms are infamous throughout history for destroying wooden ships, wooden dykes, breakwaters and other wooden marine structures (e.g. Nelson 2016). A variety of responses over the millennia have been used in attempts to eradicate and reduce the impact of shipworms, including triple hulls with layered horsehair, tar and brass nails, treated wood and in modern times, concrete and steel pilings in place of wooden pilings, and ship hulls made of fibreglass, steel and aluminum. Due to the change to non-wood materials in maritime structures, interest in shipworm biology decreased in the latter 20th century and little recent research on these important bivalves in the Pacific NW has been undertaken.

To avoid infestations of shipworms, logs have been purposely stored in low salinity estuaries. This has unfortunately led to the accumulation of wood debris and resulted in the destruction of productive estuary habitats. Efforts have been made, and are ongoing, to remove logs from estuaries and increase on-land sorting and storage.

RECENT STUDIES OF SHIPWORMS IN THE NE PACIFIC

Treneman et al. (2018) examined the species diversity and abundance of shipworms found in woody marine debris generated by the Great East Japan Earthquake and Tsunami of 2011 that reached our shores.

A recent study in Ladysmith Harbour (Harbo et al. 2025) found two non-native species, *Teredo bartschi* and *T. navalis*, in addition to the native *B. setacea*. The occurrence of the non-native species was not related to tsunami debris. The three species are described and illustrated below.

FEATHERY SHIPWORM *Bankia setacea* (Tyron, 1863) – our one native species

Divers often encounter *B. setacea* in logs and other debris on the ocean floor (**Fig. 5**). Underwater photographers have captured this clam with long protruding siphons. The white strings are discharged faecal matter, termed "frass" (**Fig. 6 & 7**). Jackie Hildering (2015) documented spawning activity from a "smoking log" (**Fig. 8**).

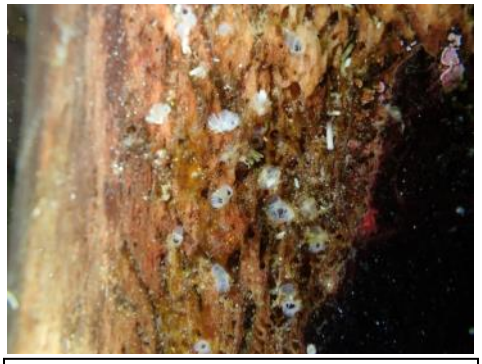

Fig. 5 Siphons showing at early settlement of *B. setacea*. ©Em Lim

Fig. 6 Mass of siphons and white "frass" of *B. setacea*. ©Neil McDaniel

Fig. 7 Close-up of siphons of *B. setacea*. ©Neil McDaniel

Fig. 8 A "smoking log" with *B. setacea* releasing both eggs and sperm. March 2015. ©J. Hildering.

BARTSCH SHIPWORM *Teredo bartschi* W. Clapp, 1923 – a non-native species

This shipworm is described and illustrated in Coan et al. (2000) and Harbo et al. (2025). This shipworm was found in foreshore surveys in 1981, 2014 and 2024 from test panels that were placed on bricks in an intertidal drainage channel in Ladysmith Harbour (**Fig. 9**). Based on the smaller size of this shipworm and the morphology of the pallets collected (**Fig. 10**), this shipworm was identified as *Teredo bartschi*. This finding is the northernmost record for this species in the NE Pacific.

Fig. 9 Hugh MacIntosh samples a test panel in Ladysmith Harbour. ©R. Harbo

Fig. 10 The unique pallet of *T. bartschi* from Ladysmith Harbour. ©Hugh MacIntosh, RBCM.

NAVAL SHIPWORM *Teredo navalis* Linnaeus, 1758 – a non-native species

This cosmopolitan species has only been recorded on a couple of occasions in our waters: Willapa Bay, Washington in 1957 and in the warm waters of Pendrell Sound, B.C. in 1963. On our shoreline surveys in Ladysmith Harbour in 2024 we found a large log heavily infested with large shipworms at the surface of the log (**Fig. 11**). There were no tell-tale feathery pallets of *Bankia* and examination of the pallets (**Fig. 12**) confirmed that these were the Naval shipworm *Teredo navalis*.

Fig. 11 Log infested with *T. navalis*. Ladysmith Harbour, March 2024. ©R. Harbo

Fig. 12 The pallet (left) and siphons (right) of *T. navalis.* Ladysmith Harbour. ©Hugh MacIntosh, RBCM.

CONCLUSIONS

The pathway of introduction of the two non-native species remains uncertain. The possibilities include shipping activity, oyster aquaculture activity and the transport of logs along the coast. It is a mystery why *T. navalis* has not been recorded since the 1950-1960's in B.C. and Washington and why it is limited to warm water harbours. The introduction of *T. bartschi* in Ladysmith Harbour dates back to a 1981 finding in that location, when it was reported in error as *Lyrodus takanshimensis* (Popham 1983).

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