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A boring time at Brickyard Beach

by Andrew Hebda and Gwyneth Jones

In reading about lithophagous (rock-boring) clams in North America, we came across a reference to two west coast species that were reported to occur in the general area of Nanaimo. In the summer of 2008, while visiting Gabriola, we met Nick Doe, who indicated that there were boring clams accessible at lower tides in False Narrows (the channel between Gabriola and Mudge Islands). Specifically, he indicated that they could be found if one went straight out into the channel from the western range marker. Unfortunately, the tides were not very favourable at that time, so we decided to hunt for these clams the following year.

While visiting again in 2009, we asked around a bit more about possible locations and came across reference in the *Nanaimo Free Press* of July–August 1885 to William Flewett encountering a strange clam trapped in sandstone off DeCourcy Island. The Gabriola Museum History Committee, on their Flewett family webpage, noted that this was probably one of the piddocks, (family *Pholadidae*), but insufficient information was provided to confirm which species it could have been.

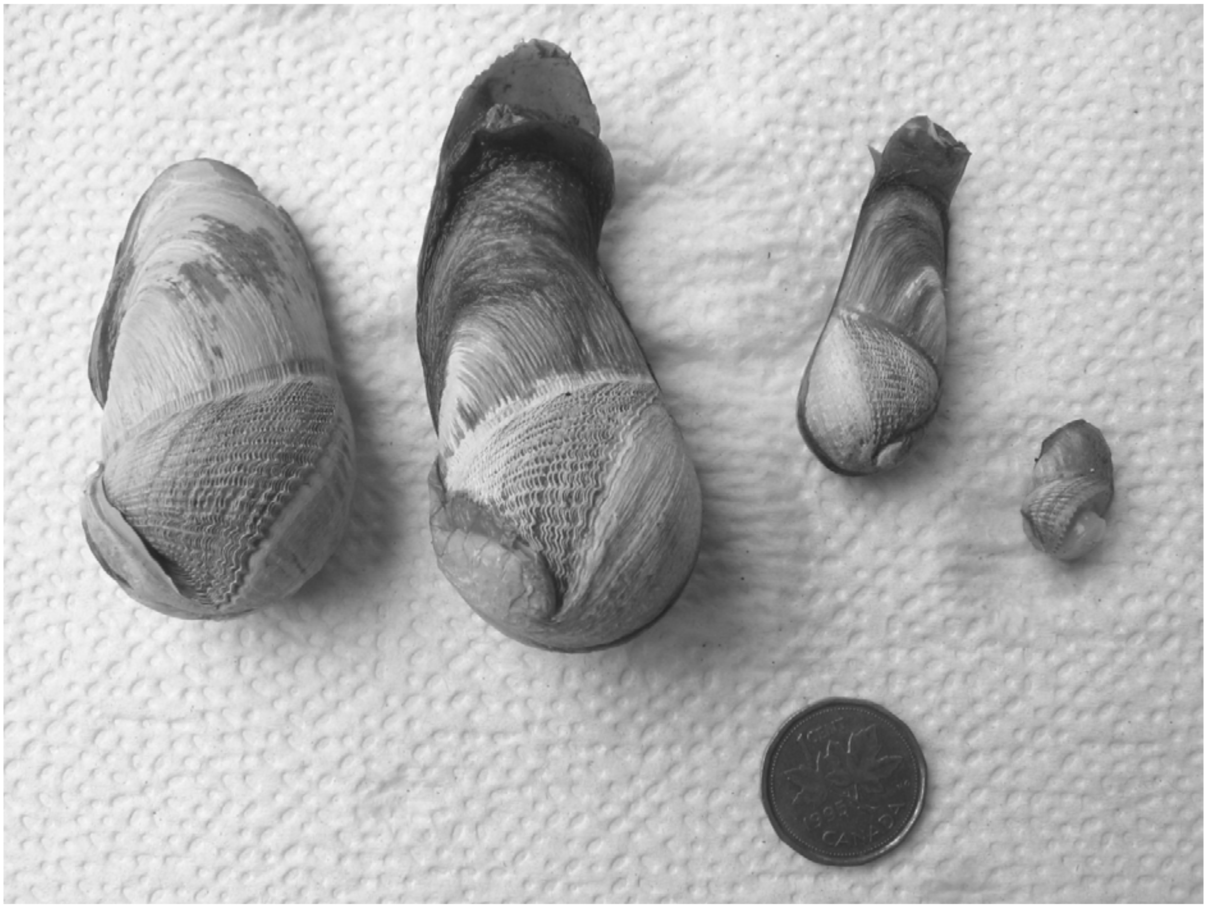
On July 8, 2009, accompanied by Lucy Hebda, we visited the lower intertidal stretch of the Narrows in order to determine to which of the piddocks Nick was referring. Low tide was estimated to be at 13:15 hrs, so we followed the tide down at the north range marker from about 12:55 onward.

The upper beach above was a mixture of bedrock and small cobble, with a wide band of bay mussels (*Mytilus trossulus*) just above the marker (about a third of the way down to the water line). Low tide was reported to be at 0.7 m, well below the range marker. From the marker to the water, there was a mixture of substrates, ranging from fine cobble and sands, mixed with empty *Mytilus* valves (shells) especially in the tidepools, and bedrock, principally shale, covered with attached green algae, *Ulva lactuca*, sea lettuce, and *Ulva intestinalis* (formerly *Enteromorpha intestinalis*), maidenhair or sea hair lettuce.

Under the algae, we noted both eroded and un-eroded bore holes within the shale as well as sandstone bedrock. The openings of the un-eroded holes were small (3–5 mm) with a chamber of increasing diameter beneath. Most exposed burrows were empty, or with empty valves or other intertidal organisms residing within. Some, however, had thick siphons, up to 9 cm in length, originating in paired valves in the bottoms of the burrows. When we cracked open the shale, we exposed numerous live clams. These were boring clams of the family *Pholadidae*.

Examination of internal and external anatomy revealed that two species were represented in the sample, the rough piddock, *Zirfaea pilsbryi* and the flat-tip piddock, *Penitella penita*.

Members of this family have several unusual features both in their anatomy as well as their life cycles.



Piddocks from False Narrows, Gabriola. Three flat-tip piddocks, *Penitella penita*, *left*, and a rough piddock, *Zirfaea pilsbryi, right.*

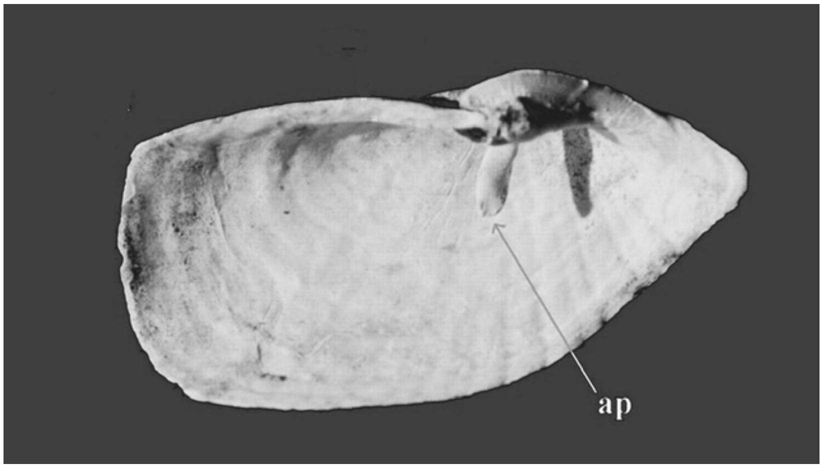
Photo by Gwyneth Jones

Unlike other bivalves, the valves are not articulated (held together by ligaments at the hinge line) but, rather, the individual valves are held to each other by ligaments which are attached to structures called apophyses—seen as small tongue-like projections on the inside margins of the valves. Because of this, it is unusual to find paired valves together, unless they are still within the substrate.

This image on the next page shows the apophysis (ap) of a related species from Atlantic Canada, *Barnea truncata.*

The second unusual element relates to how the species reproduce. Males release sperm into the water column, where it is taken up through female siphons. Upon fertilization, eggs are then released as free-swimming, veliger larvae into surrounding waters.

After a period of development, larvae settle on substrates, probably at slack tide, and begin drilling into the substrate surface. They then metamorphose and begin their boring cycle. The initial hole is small, at most, a couple of millimetres in diameter. As they bore in, they also keep growing, producing a hole that gets wider as it gets deeper. The result is a weakly funnel-shaped burrow, which prevents the individual from emerging, but offers it protection from predators.



Valves in piddocks are held together by ligaments attached to structures called apophyses—small tongue-like projections (ap) on the inside margins of the valves.

Photo by Christina McCorry

Due to the presence of an extensive attached macro-algal cover on the firm substrates throughout the year, especially during reproductive periods, occurrence and densities of these piddocks in the False Narrows are somewhat limited. ◊

References

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Notes

This section of *SHALE* provides an opportunity for contributors to present the partial results of ongoing research, publish less-than-normal-length articles, and provide "interesting facts".

Minimizing greenhouse gas: bridge v. ferry—*by Nick Doe*

In reality, comparing the greenhouse gas (GHG) emissions from the ferry to the GHG emitted by cars travelling via a hypothetical bridge is comparing apples with oranges because the switch from a ferry to a bridge would bring about all sorts of changes in islanders' travelling habits. Nevertheless, the question gets asked, how much more fossil fuel does the ferry use than would be used if all the cars on the ferry used their own engines on a bridge?

That the cars would use less is pretty much a given because pushing something through water requires a lot more energy than pushing something through less-dense air.

The ferry uses about 115 litres of fuel per crossing. The capacity of the ferry is around 72 cars, but on average, the ferry travels only 48% loaded, carrying around 35 cars. The distance from a hypothetical bridge at El Verano and the present ferry terminal in