

## A REASSESSMENT OF *VERPA PENIS* (LINNAEUS, 1758) (MOLLUSCA: BIVALVIA: CLAVAGELLOIDEA), A SPECIES PRESUMED NATIONALLY EXTINCT

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### INTRODUCTION

Some members of the superfamily Clavagelloidae are commonly called watering pot shells or waterspout shells. These tubular shells have perforated discs at the anterior end resembling the spout of watering pots, giving them their common name. Their larval stages remain unknown, but it has been postulated that there is probably a planktonic larval stage followed by a pediveliger phase that settles into the substrate as an active juvenile that looks and functions like a typical bivalve, with shell valves that can be closed (see Harper & Morton, 2004; Morton, 2007). Shelly material is then secreted around the body and the bivalve shells eventually unite into an “adventitious tube” which is believed to be constructed in a single episode with no capacity for further expansion (Smith, 1978; Harper & Morton, 2004; Morton, 2007). This immobile “adventitious tube” is the most curious aspect of this superfamily of bivalves, as there is no superficial resemblance to other bivalve molluscs. The occurrence of watering pot shells in Singapore is well documented in the literature (e. g. , Reeve, 1860; Purchon, 1956; Chuang, 1973; Smith, 1976; Morris & Purchon, 1981; Chou et al. , 1994), but their current status is “presumed nationally extinct” (Chou & Tan, 2008). The main purpose of this short note is to reassess the status of the watering pot shell, *Verpa penis* (Linnaeus, 1758), in Singapore.

### CONSERVATION STATUS IN SINGAPORE

*Verpa penis* (as *Brechites penis*) was assigned the status of “endangered/extinct?” in the first edition of the Singapore Red Data Book (Ng & Wee, 1994) and mentions coastal development as the threat without further elaboration (Chou et al. , 1994a). The second edition of the Singapore Red Data Book (Davison et al. , 2008) provided a long awaited update to the status of threatened plants and animals of Singapore. The watering pot shell was listed as “presumed nationally extinct” [i. e. , not having been found alive for more than 50 years] (see Davison, 2008: 1).

### ON THE GENUS *VERPA* RÖDING, 1798

As it may come as a surprise to many that the binomial *Verpa penis* (Linnaeus, 1758) is used herein, a brief nomenclatural note is necessary. The species *Serpula penis* Linnaeus, 1758, was first described in a genus that is now restricted to tube-forming marine worms. Commonly cited as *Brechites penis* or *Penicillus penis* this species should be transferred to the genus *Verpa* (see also Huber, 2010). This action is necessary as the genera *Brechites* Guettard, 1770, and *Penicillus* Bruguière, 1789, as currently understood are distinct (fide Morton, 2007) and the species *Serpula penis* Linnaeus, 1758, corresponds with the diagnosis of *Penicillus*. However, as first pointed out by Dodge (1947: 68, footnote) and most recently by Huber (2010: 776), the name *Penicillus* Bruguière, 1789, is preoccupied by *Penicillus* Guettard, 1770, and the next available name is *Verpa* Röding, 1798. Between two and three *Verpa* species are presently recognised as valid (e.g., see Smith, 1976; Morton, 2007; Huber, 2010). The longitudinal distribution of the genus *Verpa* extends from East Africa to Australia, and latitudinally from the Philippines to Indonesia (see maps in Smith, 1976).

### DISCUSSION

The status of *Verpa penis* as “presumed nationally extinct” in Chou & Tan (2008) is very likely based on the well-known records of Purchon (1956, 1960) of this species from Singapore. He documented two specimens from Bedok, the first specimen on 4 Mar.1954 (Purchon, 1956), and the second on 7 Feb.1959 (Purchon, 1960). Morris & Purchon (1981) also recorded “*Penicillus penis*” (= *Verpa penis*) in Singapore waters with the station numbers 48 and 51,



Fig. 1. *Verpa penis* (ZRC. MOL. 3067), Changi, Singapore. The siphons can be seen protruding from the posterior (right) end of these live specimens. Note that the posterior regions of the adventitious tubes exposed above the substratum are covered with marine growth. Shell length: 107.2 mm (above); 100.8 mm (below). (Photograph by: Teo Rui Xiang).

corresponding to Changi and Bedok, respectively (see Purchon & Purchon, 1981: 298), but as made clear in Purchon & Purchon (1981: 291), all collection in Singapore was done “from August 1950 till November 1960”. Thus, although adding a new locality (i.e., Changi) to the local distribution of *Penicillus penis*, the record by Morris & Purchon (1981) can be regarded as 1960 at the latest. Chuang (1973) seemed to suggest that *Verpa penis* was still extant in Singapore waters at some time within the last 50 years. However, his work could have been overlooked or ignored by Chou & Tan (2008) as there was no clear date of sighting or collection. Therefore, with no additional reports, Purchon (1960) would be the last published record of a live *Verpa penis* in Singapore. This is just short of the 50 years old stipulated for the category of national extinction when the second edition of the Singapore Red Data Book was published in 2008.

Is this species really extinct or simply rare in Singapore? Evidence suggests that it is not extinct in Singapore. Over the past decade or so, we have encountered empty shells and fragments (parts of the adventitious tube or the anterior disc) in the field. Even before the large-scale reclamation projects that would, understandably, have smothered entire populations of the watering pot shells, Purchon (1956) had already mentioned that fragments of the watering pot shells were obtained only at rare intervals, both from intertidal collections and from dredge hauls. Furthermore, this group of bivalves is well known to be rather rare throughout its distribution range. Smith (1976) noted that clavagelloideans are only sparsely represented in collections, adding that they are rarely taken alive and that most specimens housed in collections are dead collected shells, either dredged or washed up on beaches. This could perhaps be explained by their mode of living. The animals live embedded in the substratum, and even when individuals are somehow dislodged, the fragile shells are unlikely to remain complete for long. Morton (2007: 20) stated, that in “extant species [of Clavagelloidea] are arguably, for so obviously amazing shells, among the rarest of living animals [...]”. Probably, this very rarity has made determining the local conservation status of *Verpa penis*, so difficult.

For shelled molluscs, empty shells, and even fragments as long as they are identifiable, are often used as evidence of a species’ occurrence in a particular area. Nevertheless, it could still be argued that the shells of *Verpa penis* previously encountered are remains of supposedly demised populations and do not conclusively show that *Verpa penis* is still extant in Singapore. A specimen with the animal inside, and probably alive when found, was collected at Changi on 31 Dec.2009. More recently, on 19 Jan.2011, two living specimens (see Fig. 1) were found at the same area. All specimens were found lying on the surface of the muddy sand flat exposed during low tide. Judging from the condition of the exterior of the shells, the latter two animals were dislodged very recently. Causation of their removal from the substratum is unknown, but these specimens establish without doubt the continued presence of the species in Singapore. Voucher specimens (ZRC. MOL. 3066; ZRC. MOL. 3067) were deposited in the Zoological Reference Collection (ZRC) of the Raffles Museum of Biodiversity Research (RMBR), National University of Singapore.

In the past, *Verpa penis* was recorded around the east, southeast, and south of Singapore (Purchon, 1956, 1960; Chuang, 1973; Morris & Purchon, 1981; Purchon & Purchon, 1981), areas that have since been reclaimed. From the mid-1990s to the present, empty shells or fragments have also been found at other sites, washed up on the intertidal zone, often among debris around the high-tide line. Since 1996, locations where specimens have been observed include Pasir Ris, Loyang, Pulau Ubin, Pulau Sekudu, Pulau Tekong, Changi, East Coast Park, and Tuas (S. K. Tan, unpublished data). Although relatively scarce, the sizable number of empty shells and fragments of the species encountered over the years suggests that the animals still inhabit these areas, probably in muddy sand substrata at the low water mark or subtidally as suggested by Purchon (1956).

Another issue that has caught our attention is the prevailing confusion surrounding the supposed orientation of the animals in situ. Some authors (e. g. , Tan & Chou, 2000; de Bruyne, 2003) mentioned the living animal as buried vertically with the anterior end (with the perforated disc) flush with or above with the substratum surface, with food and water being drawn through the perforations in the disc while others (e.g. , Purchon, 1960; Smith, 1971) describe the position as being an exact reverse with the anterior end buried in the substrate and siphons at the posterior end above the substrate. The internal anatomy of the watering pot shells has been studied and described (e.g. , Purchon, 1956, 1960; Morton, 2006; 2007), and with knowledge of the internal anatomy of the animal, the suggestion that the animal lives buried in the substrate with the anterior end showing above the substrate would be, in Purchon's (1960) words, "clearly absurd".

## CONCLUSIONS

The 2<sup>nd</sup> edition of the Singapore Red Data Book (Davison et al. , 2008) was a landmark effort by local workers to inform on Singapore's imperiled biodiversity. However, there is insufficient data for many local mollusc species as there are few ecological studies done, compounded by the fact that it is very difficult to establish a species' conservation status accurately without a population census.

This note is part of the ongoing process to revise and to understand our local malacofauna better. As we have shown here, *Verpa penis* is not extinct in Singapore. It is probable that healthy populations still exist in Singapore waters, particularly around the eastern and southeastern coast of Singapore where empty shells and fragments are most often found. Pending studies to properly assess the population sizes and distribution of *Verpa penis* in Singapore, this species should probably be reclassified as 'data deficient' sensu Davison (2008: 2) if a category has to be assigned to it.

Although the coastline of Singapore has been dramatically altered by reclamation over the past few decades, *Verpa penis* has survived and does not appear to be under imminent threat at the moment. Future coastal development and pollution resulting in habitat alteration or destruction remain the most likely threats.

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