

***Musculista senhousia* (Benson, 1842); a mussel recently introduced into the Swan River estuary, Western Australia. (Mollusca: Mytilidae)**

S.M. Slack-Smith* and A. Brearley†

Abstract

Introduction of the east Asian bag mussel *Musculista senhousia* to the Swan River estuary in 1982 is reported. A description of its subsequent spread in the estuary and some preliminary comments on its ecology are given.

Introduction

The fauna of the Swan River estuary and adjacent coastal water is well documented and represented in the collections of the Western Australian Museum. The benthic invertebrates of the estuary, particularly the molluscs, were examined by Chalmer *et al.* (1976) and a summary of this work and of previous studies on the fauna of the Swan and other Western Australian estuaries and embayments was compiled by Hodgkin and Majer (1976).

Extension of the geographic range of the mactrid bivalve *Spisula* (*Notospisula*) *trigonella* (Lamarck, 1819) into the Swan estuary in about 1964 was documented by Wilson and Kendrick (1968). The nassariid gastropod *Nassarius* (*Plicarcularia*) *burchardi* (Dunker, 1849) exhibited a similar extension of range from the southern Australian coast, this having been first recorded in 1965. The east Asian semelid bivalve *Theora* (*Endopleura*) *lubrica* Gould, 1861 arrived in Cockburn Sound in about 1971 and in the estuary in about 1973, almost coincidentally with its arrival in California and New Zealand. These last three species still form a significant part of the molluscan biota of the estuary.

The most recent arrival of an exotic molluscan species into the estuary appears to be the bag mussel *Musculista senhousia* (Benson, 1842). Its presence was first recognized when large specimens of about 2.5 cm in length were collected by one of us (A.B.) in 1983 at Chidley Point, Middle Estuary (terminology of Chalmer *et al.* 1976, see Figure 1). Examination of Western Australian Museum records revealed that two very small juveniles had been taken during benthic surveys carried out by the Western Australian Department of Fisheries in February and May, 1982 in Melville Water, Middle Estuary. However these had, at that time,

* Western Australian Museum, Francis Street, Perth, Western Australia 6000.

† 31 Clement Street, Swanbourne, Western Australia.

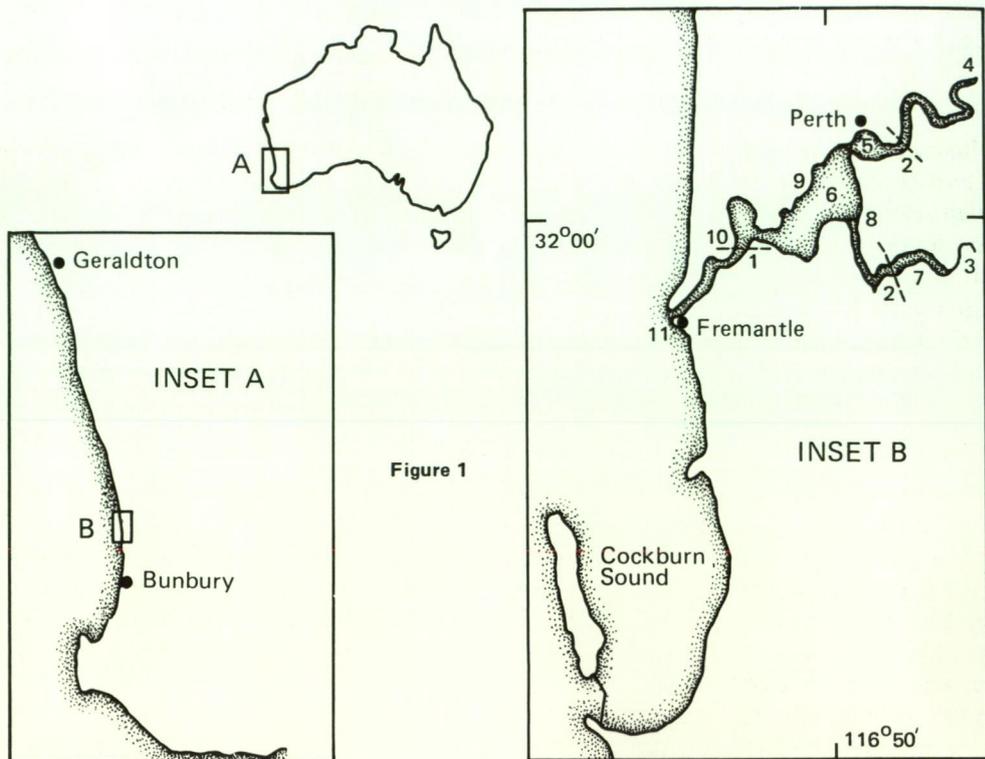


Figure 1

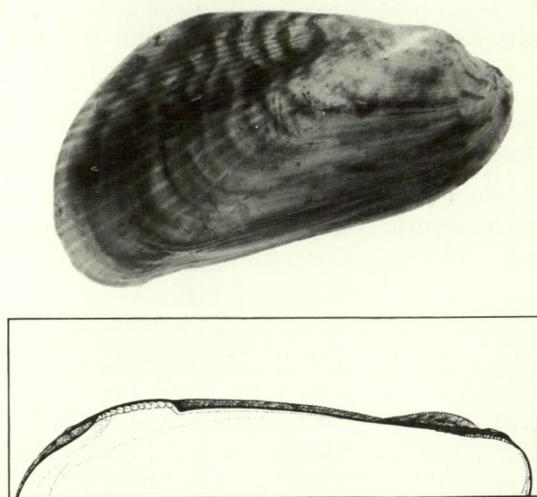
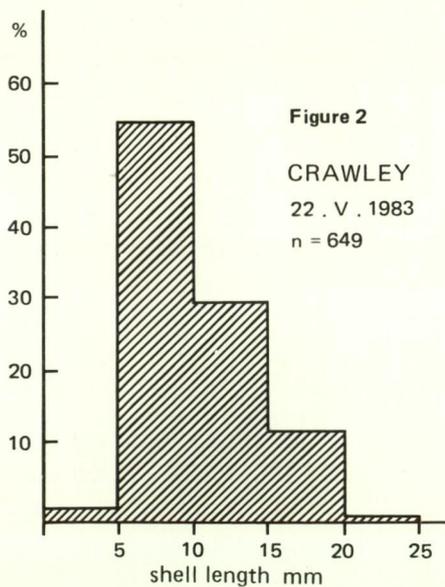


Figure 3

been identified tentatively as belonging to the endemic marine species *Musculista glaberrima* (Dunker, 1856).

Identification

Musculista senhousia can be distinguished from the other Swan estuary mussels *Xenostrobus securis* (Lamarck, 1819), *X. pulex* (Lamarck, 1819) *Mytilus edulis planulatus* Lamarck, 1819 and *Brachidontes* sp. cf. *B. variabilis* Krauss, 1848 by the greenish colour of the outer periostracal layer, by the radiating reddish lines on the posterior area and by the small internal teeth on the dorsal edge just posterior to the ligament of the shell. It can be distinguished from *Musculista glaberrima* by its darker, less glossy, more inflated shell with its curved ventral margin, and by the few, small but definite ribs anterior to the umbones (Figure 3).

Distribution

Musculista senhousia is native to the western Pacific coasts from Siberia and the Kuril Islands (Kuroda, Habe and Oyama 1971) south to Singapore (Chuang 1961 *vide* Morton 1974), with its type locality being Chusan, China. Introduction of this species to the west coast of the United States of America was first reported by Smith (1944). Dr R. Willan (pers. comm.) reports that it has been present in Auckland Harbour, New Zealand since 1980, noting that it was not taken during surveys he conducted in the late 1970's.

Following the recognition of this species in the Swan estuary in early 1983, surveys in mid-1983 revealed that it was abundant as far upstream as Canning Bridge and Perth Water. Sampling in mid-1984 showed that it had spread to Shelley, further upstream on the Canning River. In early 1984 a juvenile specimen was taken just outside the estuary at Bathers' Bay, Fremantle. We have failed to find this species elsewhere in the south of Western Australia.

Ecology

In China and Japan *Musculista senhousia* is found on mud in byssal-thread and mud 'nests' which are fastened together (Kira 1962). Kuroda, Habe and Oyama

◀ **Figure 1** Localities mentioned in text. Inset B. (1) Upstream limit of Lower Swan Estuary (2) Upstream limits of Middle Swan Estuary (3) Canning River (4) Swan River (5) Perth Water (6) Melville Water (7) Shelley (8) Canning Bridge (9) Crawley (10) Chidley Point (11) Bathers' Bay.

Figure 2 Size frequency histogram of sample from Crawley, Swan Estuary. 22 May 1983.

Figure 3 *Musculista senhousia* (Benson, 1842) WAM 1416.83. Photograph of exterior of right valve and drawing of interior dorsal margin of left valve showing diagnostic features.

(1971) record this mussel from the intertidal zone to depths of 20 m, while Morton (1974) records its occurrence in large colonies of byssal nests in mud at mid-tide level, with densities of up to 2500/m². However Hanna (1966) and Morton (1974) recorded it as also attached by byssal threads to piling without forming nests.

In the Swan estuary the habitat of this epifaunal mussel is mainly soft substrates at approximately 0.5 to 4 m below low water level. Here it is abundant, with up to 2,600 individuals/m² forming large dense mats of conjoined byssal bags unlike any other molluscan species in this area. The fine mud upon and within the meshes of this mat is composed of trapped silt and, at least partly, of mucus-bound faeces and pseudofaeces as observed by Morton (1974). The alternative habitat on hard substrates has been observed, again below water level, in Melville Water on boat hulls and at Bathers' Bay on settlement plates.

In the dry season of summer and autumn the estuary is effectively a marine embayment with no river discharge and with salinities close to that of seawater. In winter/spring the rainfall causes river discharge to resume, and salinity to drop markedly (Spencer 1956; Seddon 1972). Though this pattern is constant, the size, timing and duration of these hydrological changes varies from year to year. Molluscs inhabiting the Swan estuary respond variously to the seasonality of the hydrological conditions.

In the late autumn to early winter *Musculista senhousia* exhibits high mortality. This could be due to decreasing salinity as with *Mytilus edulis planulatus* (Wilson and Hodgkin 1967). However this mass mortality in *Musculista senhousia* could be post-reproductive and unrelated to salinity as in the euryhaline *X. securis* (Wilson 1969) and the marine *Musculista glaberrima* (Wilson and Hodgkin 1967). Morton (1974) reported the disappearance of his study population of *Musculista senhousia* at Tai Tam Bay, Hong Kong in Autumn 1972, when juveniles died before reaching sexual maturity.

A minor cause of mortality in the Swan estuary population is predation by boring carnivorous gastropods, either *N. burchardi* and/or *Bedevea paivae* (Crosse, 1864).

The size frequency distribution of a single sample of 649 individuals of *Musculista senhousia* taken in Crawley Bay in May, 1983 forms a unimodal curve over a large size range (2.8 to 27.5 mm) (Figure 2). The age component of this population is not known. Factors which alone or in combination might have contributed to the size frequency observed in this population could be a lengthy breeding period and a variation in growth rates between individuals.

Discussion

The mode of introduction of *Musculista senhousia* into the Swan estuary is not known. This species was introduced to the west coast of the United States of

America, apparently with shipments of Japanese oysters (Soot-Ryen 1955). Bysally-attached animals could have been transported on the hulls, or more likely in the water intake chambers and ducts of ships entering Fremantle Harbour. Although the duration of the larval life of *Musculista senhousia* is unknown it is also possible that planktonic larvae could have been carried in the ballast water of bulk-cargo vessels. However shipping regulations prohibiting the dumping of ballast water inside the harbour reduce the possibility of introduction by this means.

The persistence of a large population of this species in the estuary since 1982 indicates that it is successfully breeding in the area. Its presence appears to have caused an increase in the biomass of benthic macro-organisms which is particularly significant in some areas of soft substrate in the Middle Estuary.

Acknowledgements

We wish to thank Dr B.R. Wilson, Western Australian Department of Conservation and Land Management for confirmation of the identity of this mussel, and Dr R. Willan, University of Queensland for information on its occurrence in New Zealand. We are grateful for comments and information given to us by Mr G.W. Kendrick of the Western Australian Museum.

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