Molluscan death assemblages on St. Kilda Beach, Melbourne, Australia

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Abstract

A death assemblage of molluscs that had washed up on St. Kilda Beach in Melbourne, Australia was sampled by beachcombing the strandline in 2012. A total of 20 species consisting of ten bivalves and ten gastropods were identified. Faunal analysis revealed that 75% of the specimens were rocky and sandy species, and the remaining 25% were muddy-sand and muddy species. From the viewpoint of habitat preference, exposed shore species were generally more abundant than sheltered shore species, suggesting that the observed species composition resulted from variations in coastal geomorphology.

Key words: Australia, beach mollusca, death assemblage, Melbourne, taphonomy

Introduction

Mollusc shells are a common and important component of modern beach deposits (Davis 1985). Studies on beach mollusc death assemblages of washed up shells are very common because the results can be used by paleontologists for paleoenvironmental reconstruction. While most such studies focus on the taphonomic processes such as transportation, breakage, sorting, erosion, dissolution, etc. (Lever 1958; Trewin and Welsh 1972; Lutaenko 1994), more integrative approaches involve preserving the observed structure of these molluscan death assemblages (Kowalewski et al. 1994; Martin 1999).

In 2012, I conducted random sampling of stranded shells on a sandy beach in Melbourne and along the neighboring coastline. Of the sites examined, St. Kilda Beach to the south of Central Melbourne was considered to be a typical sandy beach with numerous stranded shells. This study was undertaken to examine the occurrence of stranding of shells on the beach and to perform a faunal analysis of the molluscan death assemblage. In addition, the relationship between the species composition of the molluscan death assemblage and the characteristics of the coastal environment were also considered.

Materials and Methods

The study site, St. Kilda Beach, was located on the

Fig.1 Map showing the study site along the Melbourne coastline in Australia.

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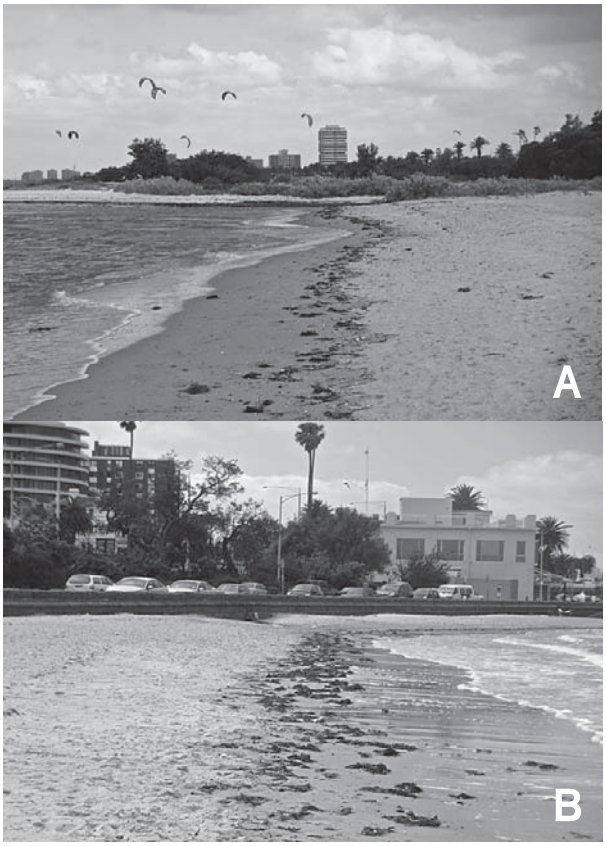

Fig.2 Photograph of St. Kilda Beach.
A. View of the beach in early December 2012.
B. Strand line with seaweed washed up on the beach.

Fig.3 Shells washed up on St. Kilda Beach.
A. Mussel shell and bivalve fragments.
B. Moon snail and gastropod shell fragments.

southern Melbourne coast in Victoria, Australia (Fig. 1). The beach is a popular with tourists and is composed mainly of fine- to medium-grained sands. The site consists of a sandy beach with small rocky shore and an estuary at one end (Fig. 2). Mollusc shells were collected on 7 December 2012 (Fig. 3). In addition, shells that washed up associated with floatsam were also collected and any other marine organisms were also recorded.

The collected molluscs were identified based on published taxonomic literature (Macpherson and Gabriel 1962; Macpherson 1966; Wells 1984; Lamprell and Healy 1992, 1998), and their ecological characteristics such as substrate and habitat were inferred based on previous studies (O'Hara and Barmby 2000; Department for Victorian Communities 2007; Wilson et al. 2010).

Results

The death assemblage consisted of a total of 20 species belonging to 15 genera in 12 families. Ten of the species were bivalves and ten were gastropods (Table 1). The most abundant species were King's Cockle, *Callista kingii*, and Lineated Whelk, *Cominella lineolata.*

The bivalves were dominated by species such as *Callista kingii, Anadara trapezia, Mytilus galloprovincialis planulatus, Ostrea angasi, Katelysia rhytiphora, Anapella cycladea*, while the gastropod species were dominated by *Cominella lineolata, Chlorodiloma odonte, Turbo undulates, Polinices conica, Cominella eburnean, Nassarius pyrrhus*.

Specimens in the death assemblage comprised species from rocky, sandy, muddy-sand and muddy substrate types (Fig. 4). Faunal analysis revealed that 75% of the species in the assemblage were rocky and sandy species, and that the remaining 25% were muddy-sand and muddy species.

The habitat preference of the species in the molluscan death assemblage could be characterized as one of three categories: exposed shore environments, sheltered shore environments, not specified exposed or sheltered environments (Fig. 5). Within the context of habitat preference, exposed shore species were generally

Table 1. Faunal list of molluscan death assemblage in the study site

Specific name	Substrate	Habitat	Abundance
(Bivalvia)			
Anadara trapezia	M	S	F
Barbatia pistachia	R	E	R
Mytilus galloprovicialis planulatus	R	E	F
Ostrea angasi	M	S	F
Pecten alba	S	-	R
Paphies elongata	S	E	R
Callista kingii	S	E	A
C. diemenensis	S	E	R
Katelysia rhytiphora	M	S	C
Anapella cycladea	SM	S	F
(Gastropoda)			
Cellana tramoserica	R	E	R
Chlorodiloma odonte	R	-	F
Turbo undulatus	R	E	F
Polinices conica	S	-	F
P. incei	S	-	R
P. sp.	S	-	R
Cominella eburnea	R	S	C
C. lineolata	R	E	A
Nassarius burchardi	SM	S	R
N. pyrrhus	S	-	F

Substrate; R: Rock, S: Sand, SM: Sandy mud, M: Mud.
Habitat; E: Exposed shore, S: Sheltered shore, -: Not specified
Abundance; A: Abundant, C: Common, F: Few, R: Rare.

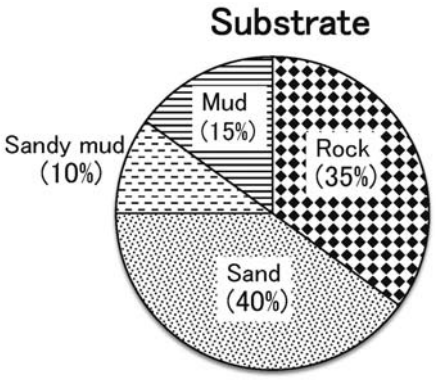

Fig.4 Proportion of substrate types associated with the molluscan death assemblage.

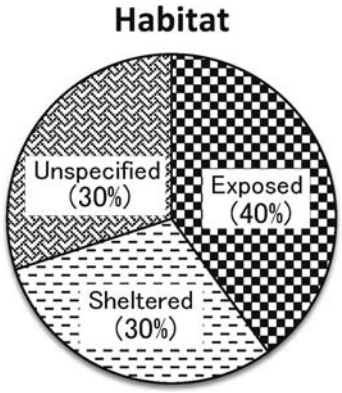

Fig.5 Proportion of habitat types associated with the molluscan death assemblage.

more abundant than species from sheltered shore environments with the molluscan death assemblage. The exposed shore species, *C. kingii* and *C. lineolata*, were the most abundant species with the molluscan death assemblage.

Discussion

Figure 4 shows the different substrates associated with the mollusc death assemblage at the study site. Faunal analysis revealed that 75% of species in the assemblage consisted of rocky and sandy species, and that the remaining 25% consisted of muddy-sand and muddy species. Sandy bottom species were well represented in the death assemblage because sandy beaches, such as the beach in the study, typically have high species diversity (Macpherson 1966; Macpherson and Gabriel 1962). The presence of rocky species in the mollusc death assemblage could be attributed to a small rocky shore, and muddy and muddy-sand species to a small estuary at the

study site, respectively.

Figure 5 shows the relative proportion of the habitat types associated with the molluscan death assemblage in the study site. Exposed shore species were generally more abundant in the death assemblage than sheltered shore species. Exposed shore species were well represented in the death assemblage because sandy beaches, such as the beach in the study, typically have high species diversity (Macpherson 1966; Macpherson and Gabriel 1962). The presence of sheltered shore species could be attributed to a small estuary located at the northern end of the embayment.

Based on the presence of both cold- and warm-water species at the site, the mollusc death assemblage at St. Kilda Beach in Melbourne can be considered typical of a temperate region (Macpherson and Gabriel 1962; Macpherson 1966). Recently, however, the incidence of endemic species in the Port Phillip Bay area has been decreasing (O'Hara and Barmby 2000; Boyd 2012). It is possible that an increase in numbers of *Mytilus galloprovincialis planulatus* and other exotic species along Port Phillip Bay could be due to an increase in sea surface temperatures and marine pollution along the Victoria coast (O'Hara and Barmby 2000; Wilson et al. 2010).

From the viewpoint of habitat, exposed shore species were generally generally more abundant than sheltered shore species in the death assemblage. The molluscan death assemblage of St. Kilda Beach is composed of species associated with sandy beaches, rocky shores and estuaries. Long-term records of the faunal components of molluscan death assemblages are considered important for monitoring increases in sea surface temperatures and marine pollution.

As the coastal marine environment is subjected to extensive anthropogenic changes, such as global warming and marine pollution, conducting long-term surveys of species diversity and species composition in marine environments is considered very important. Although beachcombing shells that have washed up on the shore is considered to be a novel method of conducting such long-term surveys, clarifying the relationship between death assemblages that have been washed up on the shore and the extant molluscan populations in the shallow sea environment is considered necessary.

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オーストラリア，メルボルン，セントキルダビーチの貝類遺骸群集

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要　約

2012年，オーストラリア，メルボルン，セントキルダビーチの貝類遺骸群集を，汀線におけるビーチコーミングにより採集した．本群集は，二枚貝10種，巻貝10種の計20種から構成されていた．群集解析に基づくと，岩礁種，砂底種が合計75％で卓越しており，残りの25％が砂泥底種，泥底種であった．また，生息域に注目すると，波浪の強い海岸の種の方が波浪の弱い海岸の種よりもやや多かった．これは，貝類遺骸群集の種構成が海岸の地形の多様性に由来することを示している．