Sphaeromatid isopods (Crustacea: Isopoda) from the Leschenault estuary, Collie River and Bunbury Harbour

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Abstract

Seven species of sphaeromatid isopod were collected from the Leschenault area between 1995 and 1997. The Leschenault Estuary and the Collie River contain clearly estuarine species while Bunbury Harbour is dominated by introduced species. Changes in species diversity between 1995 and 1997 are documented. This is the first record of *Paracerceis sculpta* (Holmes 1904) for Western Australia. The most likely vectors of isopod introduction are recreational boats. It is suggested that sphaeromatid isopods can be used in estimating the frequency of introduction events.

Keywords: sphaeromatid isopods, crustaceans, estuary, Leschenault, Bunbury, south-western Australia.

Introduction

Sphaeromatid isopods lend themselves particularly well to describe and compare estuaries because their diversity and distribution reflect variations in hydrology and habitat (Hass & Knott 1998). Members of the benthic fauna, they have been generally neglected in estuarine studies and faunal surveys of the area (*e.g.* Chalmer & Scott 1984; Halse *et al.* 1989). It is therefore not surprising that, to date, only one study has recorded sphaeromatid isopods from the Leschenault system (Hass & Knott 1998). This investigation reveals that at least five species of sphaeromatid isopods colonize the area, with an additional two introduced species from Bunbury Harbour. The sampling area comprises three distinct sections: the Leschenault Estuary, a long shallow lagoon with a cut opening to the ocean; the mouth of the Collie River emptying into the estuary; and Bunbury Harbour, a small port with international and national shipping. It can be shown that these distinctions are again reflected in the sphaeromatid fauna. Moreover, the results presented here, combined with previous studies of the Swan River and other south-western estuaries, provide insights into the processes of introduction and spread of benthic fauna.

Materials and Methods

The Leschenault system was sampled on the 7 December 1995 and on the 1 and 2 October 1997. Ten sampling sites were chosen; two in the Leschenault Estuary, two in the Collie River (Fig 1, Table 1), and six in Bunbury Harbour (Fig 2, Table 1). All sphaeromatids were collected from hard substrate such as rocks, empty barnacle tests and dead wood within a vertical range of 5 cm below, to 1 m below, mean high tide level. Material from jetty piles was obtained using a pile scraper. For identification the specimens were preserved in 3.6% formalin/seawater mixture. Voucher specimens of *Paradella dianae* (Menzies 1962) (WAM C. 23302) and *Paracerceis sculpta* (Holmes 1904) (WAM C. 2303) have been deposited in the Western Australian Museum.

Results

Five species of sphaeromatid isopod were collected from the Leschenault area in 1997 but seven species colonized it in 1995. These species are; *Cymodetta gambosa* (Bowman & Kühne, 1974), *Exosphaeroma* sp, *Isocladus excavatus* Baker, 1910, *Sphaeroma quoyanum* (H Milne-

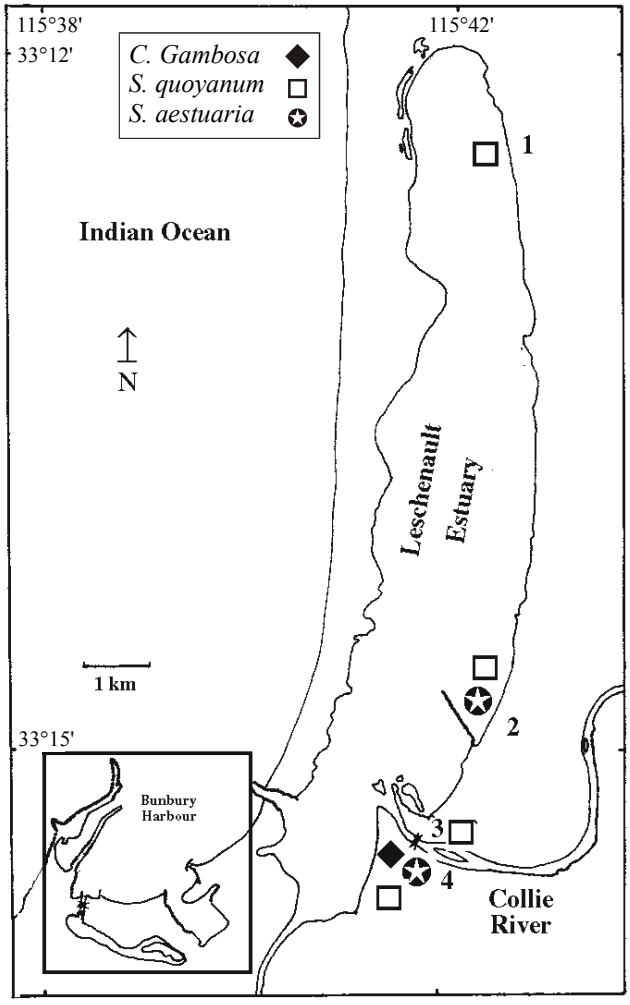

Figure 1. Distribution of sphaeromatid isopods in Leschenault Estuary and Collie River.

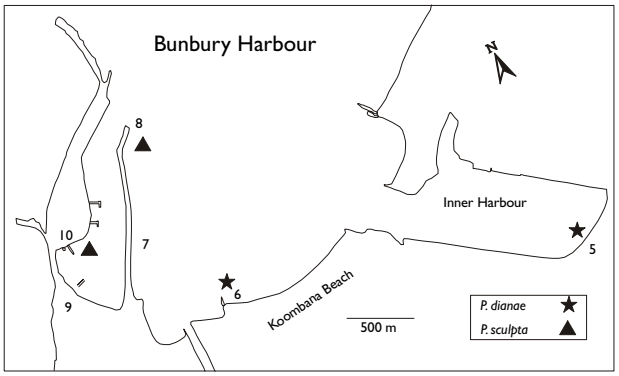

Figure 2. Distribution of sphaeromatid isopods in Bunbury Harbour.

Edwards 1840), *Syncassidina aestuaria* Baker, 1928, *Paracerceis sculpta* (Holmes 1904) and *Paradella dianae* (Menzies 1962). *Sphaeroma quoyanum*, *S. aestuaria* and *C. gambosa* define an estuarine environment. We found their occurrence restricted to the Leschenault Estuary and the Collie River, with *C. gambosa* occurring exclusively in the Collie River (Fig 1). Collecting in the estuary yielded only a few specimens while particularly *S. quoyanum* was found in great abundance on bridge piles in the Collie river. Overall, the species diversity and the availability of hard substrates as habitat is higher in the Collie River than the estuary. Bunbury Harbour, on the other hand, offers a great number of colonizable hard substrates mainly in the form of man-made constructions such as jetties and groynes. Two species, *P. dianae* and *P. sculpta*, were collected from these habitats (Fig 2). *P. sculpta* usually resides among algae, barnacles, ascidians and fanworms while *P. dianae* also colonizes the underside of rocks. Both species are known to be introduced to harbours around the world, but *P. sculpta* has not been reported before from Western Australia. The occurrence of *I. excavatus, Exosphaeroma sp* and *C. trilobita* in 1995 could not be confirmed in 1997 (Table 1).

Discussion

The results show that the sphaeromatid fauna clearly reflects its environment. The Leschenault Estuary and the Collie River harbour the estuarine species *S. quoyanum, S. aestuaria* and *C. gambosa*. These are known from the Swan River Estuary and *S. quoyanum* and *S. aestuaria* also occur in the Vasse and Hardy estuaries, with *S. quoyanum* being found in the Harvey Estuary as well (Hass & Knott 1998). This distribution indicates that they can all tolerate significant salinity changes. *Sphaeroma quoyanum* is the most widespread among them with the highest adaptability to the demanding estuarine environment. It is the only species that has been found in the Leschenault Estuary on both sampling occasions. *Syncassidina aestuaria,* only collected in 1997 when the salinity was 30 g L^{-1} as opposed to 40 g L^{-1} in 1995, can probably not persist in high salinities. As a lagoon with shallow muddy margins, high salinities in an estuarine context, temperature fluctuations in summer and limited amount of hard substrate, the Leschenault Estuary can only be inhabited by the most robust organisms.

Proceeding from the estuary into the Collie River, *C. gambosa* is added to the species list. In Western Australia it has been recorded from only one other site, the Swan River Estuary (Hass & Knott 1998). In both cases the populations are restricted to defined locations indicating that this species has quite rigid niche limitations or can be easily replaced by more dominant species. The extremely disjunct distribution, as well as no sightings in the Harvey, Vasse and Hardy estuaries, poses the question of its origin and history of spread.

Whenever harbours are included in faunal studies the identification of introduced species plays an important role because of their potential negative impact on native fauna and humans through reduction in diversity of indigenous species, release of poisonous metabolites, and damage to man-made structures such as jetties. Two of the species collected in Bunbury Harbour have been classified as introduced (Hutchings *et al.* 1987) but none has previously been recorded from this port in publications listing exotic species (Furlani 1996). *Paradella dianae,* first collected from Western Australia in Fremantle in 1978 (Harrison & Holdich 1982a), is known from the Arabian and Mediterranean Seas, California, Florida, Puerto Rico, Brazil and the east coast of Australia (Queensland). *Paracerceis sculpta* is similarly widespread. Its distribution includes the North American Pacific coast, the Mediterranean Sea and the east coast of Australia where it was collected from Townsville (Queensland) in 1975 (Harrison & Holdich 1982b). This is the first record of *P. sculpta* for Western Australia. Both *P. dianae* and *P. sculpta* are considered to travel in fouling communities on ship hulls which explains their occurrence in harbours around the world. There are two possible ways of introduction to Bunbury Harbour: organisms are carried by large vessels involved in either national or international trade, or by small recreational boats transferring the species from the port of first introduction to other locations. The fact that both species have been collected from small boat jetties indicates that recreational boating is a likely mechanism of spread between estuaries and harbours. Unpublished data by C Hass recording the presence of *P. sculpta* in a small boat harbour in Fremantle and on bridge piles in Mandurah, an estuary without commercial shipping south of Perth, support this argument. *Paradella dianae* is also reported from Fremantle but although still collected in 1995 its occurrence could not be confirmed in 1997 (C Hass, unpublished data), making Bunbury Harbour the only known location in Western Australia where this species is still abundant. However, a decline in numbers of *P. dianae* was noticed in 1997 after the remains of a small timber jetty with prolific marine growth had been removed from the harbour. It can be predicted that *P. sculpta* will also show a decline in numbers for the same reason. Aging timber constructions are probably the most important substrates for benthic organisms, both introduced and native, in harbours.

Movement of species between widely disjunct locations on the globe is a biological issue now well recognized as deserving careful attention (Vitousek *et al.* 1997). The potential impact of these species on Australian waters is not easily assessed because of the lack of previous documentation of isopod fauna. One effect may be that these introductions replace native species in the harbour environment. The disappearance of *C. trilobita, Exosphaeroma* sp and *I. excavatus*, species commonly occurring in the shallow littoral zone of

Table 1. Comparison of habitats, salinity and occurrence of Sphaeromatid isopods in the Leschenault Inlet area, 1995-1997

Station	Habitat	Salinity 1995 g L^{-1}	Salinity 1997 g L^{-1}	Species 1995 Data from Hass & Knott (1998)	Species 1997
Leschenault Estuary					
1	under rocks in empty barnacle tests	40	23	*S. quoyanum*	*S. quoyanum*
2	under rocks of retaining wall		30	not present	*S. quoyanum, S. aestuaria*
Collie River					
3	in empty barnacle tests on piles of bridge	16	10	*S. quoyanum, S. aestuaria*	*S. quoyanum*
4	under rocks, on dead wood	16	10	*S. quoyanum, S. aestuaria, C. gambos*a	*S. quoyanum, S. aestuaria, C. gambosa*
Bunbury Harbour					
5	under rocks on sandy beach		35	not present	*P. dianae*
6	under rocks of groyne		35	not present	*P. dianae*
7	under rocks of groyne	36		*I. excavatus, Exosphaeroma* sp	not present
8	from jetty piles among barnacles and ascidians		35	not sampled	*P. sculpta*
9	from jetty piles among fanworms, barnacles and ascidians	36		*P. dianae, C. trilobita*	not sampled
10	from jetty piles among fanworms, barnacles and ascidians		35	not sampled	*P. sculpta*

south-western Western Australia, from Bunbury Harbour and the absence of any of the native species in Fremantle Harbour provide strong support for this notion. Unlike the introduced fanworm *Sabella spallanzanii* (Gmelin 1791) with which the isopods co-occur, they have not been detected from any other environment indicating that their competitive advantage is restricted to ports. Whenever these sphaeromatids are found in harbours they most likely indicate other introductions such as algae, barnacles, bivalves and worms which may be more harmful and difficult to control. Since sphaeromatids show a decline in some places while other species persist and spread, their numbers may be able to reflect the frequency of introduction events and successful efforts to reduce introductions.

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