

### 13. Invertebrate-covered Soft Bottom Communities

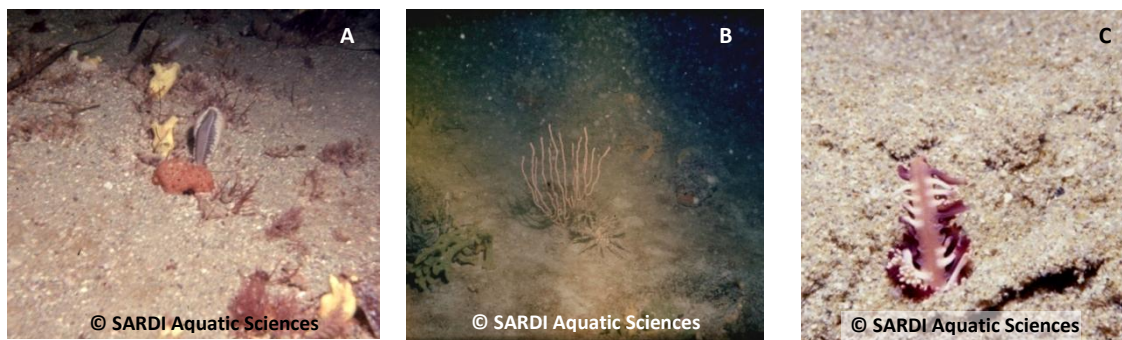


Figure 13.1: (A) Redcliff area, northern Spencer Gulf, May 1975, showing sea pen coral and *Polycarpa* ascidians (“sea squirts”), sponges and red sea weed; (B) soft bottom habitat in northern SG, dominated by gorgonian coral, sponges, and other invertebrates; (C) *Virgularia* sea pen from northern SG, November 1980. Photos by the late K. Branden, courtesy of SARDI Aquatic Sciences.

Asset	Invertebrate-covered Soft Bottom Communities
Description	Sandy, muddy or shell-sand sea floor covered with assemblages of attached invertebrates in various densities. Main species in the sand include razorfish and hammer oyster shells, sponges, solitary sea squirts, and bryozoans. In one area (northern Spencer Gulf), soft corals also occur, and in another (Gulf St Vincent) the attached assemblages also support large densities of mobile invertebrates such as sea cucumbers, featherstars and brittlestars.
Examples of Main Species	<p><u>Northern Spencer Gulf</u></p> <ul style="list-style-type: none"> <li>the soft coral <i>Carijoa multiflora</i>, and strap-like gorgonian corals with tropical affinities (species in <i>Euplexaura</i> and <i>Echinogorgia</i>)</li> <li>sea pens (<i>Virgularia</i> species)</li> <li>sponges, in genera <i>Clathria</i>, <i>Thorectandra</i>, <i>Echinodictyum</i> and others bryozoa (e.g. species of <i>Celleporaria</i> and <i>Amanthia</i>, and stalked bryozoans in genus <i>Parmularia</i>)</li> <li>Hammer Oysters (<i>Malleus meridianus</i>)</li> <li>Razorfish Shell <i>Pinna bicolor</i></li> <li>solitary ascidians (sea squirts), such as <i>Polycarpa viridis</i>; the tropical Indo-Pacific species <i>Halocynthia dumosa</i>; the “nodding head” ascidian <i>Sycozoa pulchra</i>, and the white solitary sea squirt <i>Cnemidocarpa radicata</i>)</li> </ul> <p><u>Central Northern Gulf St Vincent</u></p> <ul style="list-style-type: none"> <li>Razorfish shell (<i>Pinna</i>)</li> <li>burrowing cucumbers (<i>Stichopus</i> and <i>Holothuria</i>)</li> <li>king scallops and doughboy scallops</li> <li>brittlestars</li> </ul> <p><u>Central Gulf St Vincent (previous assemblage, prior to impacts):</u></p> <ul style="list-style-type: none"> <li>bryozoans e.g. basket bryozoan <i>Adeona grisea</i> , and <i>Petralia undata</i> (unverified), and various species of <i>Triphylozoon</i></li> <li>sponges</li> <li>hammer oysters (<i>Malleus</i> sp.)</li> <li>feather stars</li> </ul>

<i>Main Locations</i>	<ul style="list-style-type: none"> <li>• Deeper waters off Blanche Harbour - Douglas Bank Aquatic Reserve (including Two Hummock Point - Mangrove Point)</li> <li>• Middle Bank and other central channels in the northern part of SG</li> <li>• Channels off Point Paterson, northwards to Snapper Point</li> <li>• Deeper waters between Black Point and Port Clinton</li> <li>• Deepest waters of central Gulf St Vincent, between Black Point and Heel of Yorke Peninsula</li> </ul>
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One of the less common types of marine habitats in NY NRM region comprises sea floor of sand / silt and shell, dominated by various marine invertebrates. The types of animals which are common on and in the substrate differ according to location, and some of the major assemblages are described below.

**Spencer Gulf (western side of NY NRM Region):** Within the region, invertebrate-dominated soft bottom habitats exist in areas with an unusual combination of environmental conditions. This includes, in northern Spencer Gulf, large temperature range over the seasons (e.g. 13 to 29 degrees at the top of the gulf towards Port Augusta), high summer sea surface temperatures, high salinity (~ 40 to 47ppt), and strong tidal currents (up to 0.75 m / second) (Noye 1984, Nunes and Lennon 1986; Johnson 1981; Harris and O'Brien 1998, cited by Baker 2004).

Off the Port Pirie / Germein Bay area on the eastern side, in the sea floor channels between 10m and 15m deep, the Razorfish *Pinna bicolor* dominates the benthic community and was previously reported to occur at densities of up to 5/m<sup>2</sup>. This community includes other molluscs, bryozoa, soft corals, ascidians (sea squirts) and sponges (McLaren and Wiltshire 1984). Towards the top of Spencer Gulf, north of Port Germein, the significant areas of sandy, muddy and shelly habitats are in many places populated with various assemblages of attached invertebrates, including Razorfish (*Pinna bicolor*) and other bivalve molluscs such as hammer oysters, gorgonian corals, soft corals, ascidians, sponges, bryozoa, and burrowing invertebrates).

On the western side, off the Blanche Harbour to Douglas Point area, in the section between Two Hummock Point and Mangrove Point, there are deeper sandy, invertebrate-dominated channels and banks, in waters deeper than the extent of the shallow seagrass beds. This is the northern edge of the NY NRM region. Shepherd and Branden (1974) recorded deeper channel floor areas (10m - 15m) in this location to be characterised by migrating "sand waves" more than 15m high, and "mega-ripples" less than 1.5m high, with fauna that tolerate the mobile sediment (Shepherd 1983b). A SARDI survey in 1995 recorded *Posidonia sinuosa* seagrass beds at 8m in the eastern channel area of Two Hummock Point - Middle Bank, with 5% - 20% cover of Razorfish *Pinna bicolor* and hammer oyster *Malleus meridianus*; 5% - 10% cover of mixed sponge species, and a sparse coverage of ascidians (Edyvane and Baker 1996c, and unpublished data). At 8m - 9m depth, animal assemblages dominated the western side of the channel in the Two Hummock Point - Middle Bank area, comprising mainly mixed sponges and ascidians (up to 50% cover) on a substrate covered with *Pinna* razorfish and *Malleus* hammer oysters. Species of brown, green and red seaweed were also present, but the coverage was minor.

Off Two Hummock Point and the Blanche Harbour - Douglas Bank Aquatic Reserve, waters extend to about 20m deep (Shepherd 1983a), and animal assemblages in the coarse sand and shell channel areas have been recognised to contain endemic fauna, and also fauna with tropical affinities. In these areas, there are unusual sand waves and "mega-ripples" habitat, with a characteristic fauna that is unique to the upper Spencer Gulf region (Shepherd 1983a, 1983b; Shepherd and Hails 1984). In the Middle Bank area between Two Hummock Point in the west and Redcliff Point in the east, a benthic survey in 1995 recorded a mixed seagrass and attached animal community, comprising *Posidonia sinuosa* and *P. angustifolia* seagrasses at 6m to 7m deep (SARDI S.A. Benthic Survey, unpublished data 1995; see also Edyvane and Baker 1996), interspersed with articulated bryozoa (lace "corals"), sea pens (a type of coral - see **Figure 13.1 C**), and solitary ascidians (sea squirts), which are usually found attached to shell fragments. The succulent green seaweed *Caulerpa cactoides* is also present in the area, on the edges of channels (Shepherd, 1983a; Morelli and de Jong 1995). In this bank and channel area, Shepherd (1983a) recorded a patchily distributed community of red seaweeds, mainly attached to shell fragments.

Hard shelly substrates in the channels and banks area generally support mixed invertebrates, apart from the mixed red turfing macroalgae. At deeper depths, Middle Bank grades into a sandy and shelly channel, with sand waves and “mega-ripples”. Shepherd and Hails (1984, cited by Harris and O’Brien, 1998) reported that the mega-ripples in the Middle Bank area of the Flinders Channel, comprised medium to coarse sand, 30-95% calcium carbonate. The mega-ripples are located on a sandy mid-channel area adjacent to one side of the Middle Bank sandbank, and range in size from smaller forms (20-30cm in height and 5-6m in wavelength), to larger forms (up to 3m height and 18m wavelength). The mega-ripples (“dunes”) migrate seasonally, giving rise to curved dune crests and other forms. Migration rates during winter are up to 6 times larger than in summer (Shepherd and Hails 1984, cited by Harris and O’Brien 1998).











Invertebrate animal assemblages recorded by Shepherd (1983a) in the channel / banks area include the following, some of which are depicted in **Table 13.1**:

- a sponge, gorgonian and soft coral community, on shell-rock surfaces covered with sediment, with many species of sponge; the soft coral *Telesto* (now called *Carijoa multiflora*); two species of gorgonians with tropical affinities (*Euplexaura* and *Echinogorgia* species), as well as bryozoa (e.g. species of *Celleporaria* and *Amanthia*), Hammer Oysters (*Malleus meridianus*) and solitary ascidians (e.g. *Polycarpa viridis* – formerly *P. pedunculata*, and the tropical Indo-Pacific species *Halocynthia dumosa* – formerly *H. hispida*) being common components of the sea floor fauna. Sponges which dominate such habitats have an important role in stabilising soft bottom sediments;
- a solitary ascidian and gorgonian coral assemblage was recorded in the channel basin, between 10m - 20m, on shelly or sandy bottom, with sea pens, hammer oysters and echinoderms; and
- a “sandwave” community of invertebrates which can tolerate the mobile conditions, including the stalked bryozoan *Lanceopora obliqua* (now called *Parmularia obliqua*) the sea pen *Virgularia gustaviana*, and two species of solitary ascidian, as dominant components. *Virgularia gustaviana* is a tropical Indo-Pacific species, and its known occurrence within S.A. is restricted to upper Spencer Gulf, on silty bottom substrate (Utinomi and Shepherd 1982).

There are abundant solitary ascidians in some parts of Northern Spencer Gulf, including the shallow, sparse seagrass beds. Shepherd (1974) recorded densities of up to 20 – 40 / m<sup>2</sup> of *Polycarpa* species (e.g. *P. viridis*) in the Crag Point area and sand wave / mega-ripple channel areas of Middle Bank, where this species can tolerate the mobility of sediments (Shepherd 1983b). Other ascidians of interest include *Sycozoa pulchra*, a stalked ascidian found in southern States, which has a head (sometimes two) that seasonally detaches, and another regenerates. *S. pulchra* has been recorded (as *S. pedunculata*) in high densities in parts of Northern Spencer Gulf (Shepherd 1974; Shepherd 1983b). The white solitary ascidian *Cnemidocarpa radicata* (formerly *C. etheridgii*) has also been recorded in high densities in some areas, such as the western side of Middle Bank (Two Hummock Point to Mangrove Point) (see Shepherd and Branden 1974).

In the far northern Spencer Gulf area, aggregations of razorfish shell *Pinna bicolor* and hammer oyster *Malleus meridianus* are dominant features, recorded from the intertidal to 20m deep, and most commonly found on the edges of the channel basin from 8m to 15m. The brown seaweed “Neptune’s Necklace” *Hormosira banksii* is often found growing on intertidal aggregations of *P. bicolor* and *M. meridianus* in the region (Shepherd 1983a). The bay south of Point Paterson, northwards to Snapper Point, is generally an area of low wave energy and low water circulation. Seaward of the large intertidal sand and mud flats and mangroves lining the majority of the coast, are sandy and shelly substrates in the central water, including channels. These habitats are dominated by invertebrate assemblages, particularly molluscs), and there are also limited areas of seagrass (mainly *Posidonia* species). Hails et al. (1984, cited by Harris and O’Brien, 1998) described the bottom sediments as a poorly sorted mixture of shell sand and gravel, quartzose sand and mud, with variable amounts of seagrass fibre. This sediment type forms a layer up to 10 m thick near Point Paterson and is associated with the linear sandbanks which occupy the upper reaches of Spencer Gulf (Hails et al. 1984; Harris and O’Brien 1998).

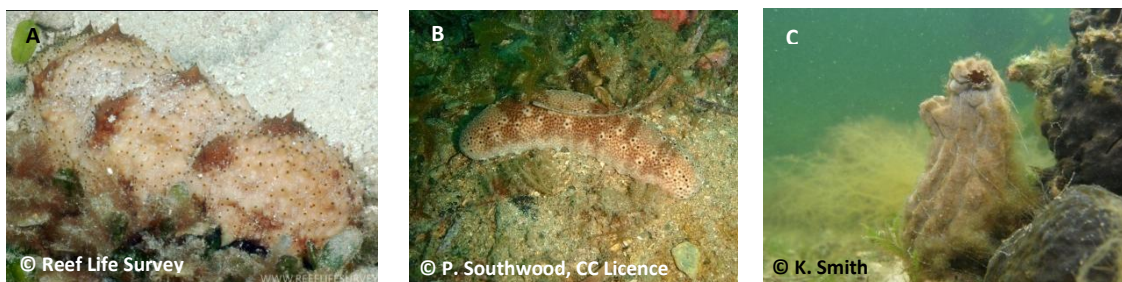
**Table 13.1: Some of the invertebrates which dominate the various soft bottom communities in northern Spencer Gulf.**

Species Name	Representative Image	Species Name	Representative Image
soft coral <i>Carijoa multiflora</i>	 © D. Muirhead	soft corals (gorgonian coral) with tropical affinities - e.g. species in <i>Euplexaura</i> and <i>Echinogorgia</i>	 © SARDI Aquatic Sciences. Photo by the late K. Branden
sea pens ( <i>Virgularia</i> species)	 © SARDI Aquatic Sciences. Photo by the late K. Branden	sponges - e.g. species in <i>Clathria</i> , <i>Thorectandra</i> , <i>Echinodictyum</i> and other genera	 © Howies SCUBA
Razorfish shell ( <i>Pinna bicolor</i> )	 © H. Crawford	Hammer Oyster <i>Malleus meridianus</i>	 © Howies SCUBA
stalked bryozoans e.g. <i>Parmularia</i>	 © J. Brook	bryozoans e.g. <i>Celleporaria</i> sp.	 © H. Crawford
solitary ascidian <i>Polycarpa viridis</i>	 © H. Crawford	Nodding Head Ascidian <i>Sycozoa pulchra</i>	 © J. Finn, Museum Victoria

**Gulf St Vincent (eastern side of NY NRM Region):** Between Port Clinton and Black Point, Shepherd and Sprigg (1976) previously reported a razorfish shell (*Pinna*) and sea burrowing cucumber (holothurian) assemblage on soft sediments. This sea floor community was broadest in extent off Ardrossan. From the southern extent to the northern end of Gulf St Vincent, it covered an area of more than 500 square kilometres at the time of surveys during the 1960s (Shepherd, in SWG 2011). In this *Pinna* - holothurian community, razorfish shells formed the substrate for a rich attached assemblage of sponges to 0.5 m high. In this assemblage razorfish shells reach densities of 5 per metre square or more, and each shell formed a “micro-reef”, supporting a rich assemblage of small sponges, ascidians and bryozoans (Shepherd and Sprigg 1976; Shepherd, in SWG 2011). Species of sea cucumber in the genera *Stichopus* and *Holothuria* (Figure 13.2) were common on the silty sea floor of this habitat, as well king scallops, doughboy scallops, brittlestars, sea urchins, and the large milk bottom ascidian *Phallusia* (Figure 13.2) (Shepherd and Sprigg 1976). A more recent survey during the early 2000s, showed that elements of this assemblage are still present in the area.



Of 18 samples taken in the habitat north of Black Point that was originally described by Shepherd and Sprigg as the “razorfish shell - sea cucumber” community, around one third of the samples indicated the same habitat type (razorfish shell-dominated), and one sixth of the habitat was recorded as being bryozoan-dominated (Tanner 2005). However, it is noteworthy that one third of the original *Pinna*-rich habitat was recorded to be barren sand in 2000 and 2001.



**Figure 13.2: Examples of animals which were previously recorded by Shepherd and Sprigg (1976) as being abundant on sand in a Razorfish and Sea Cucumber assemblage in the northern waters of Gulf St Vincent. This assemblage has been considerably altered over several decades (see Tanner 2005). (A and B): Sea cucumbers *Stichopus* and *Holothuria*; (C) solitary sea squirt *Phallusia*.**

In the deepest central waters of Gulf St Vincent at the eastern edge of the NY NRM Region, between the coastal strip from Black Point to the “heel” of the Peninsula, underwater mapping by Shepherd and Sprigg during the 1960s recorded a dense assemblage of bryozoans on silty calcareous sand, at about 25 - 35m deep. At that time, bryozoans dominated a substantial part of the central gulf waters, including the basket bryozoan *Adeona grisea* (Figure 13.3), the south-eastern Australian species *Petralia undata* (unverified), and various species of *Triphyllozoon*. Bryozoans such as *Adeona grisea* can occur on reefs, but also in sand, attached to hard surfaces. The large colonies are often attached to the sea floor by a complex articulated stem, made of calcareous segments joined by cuticular tubes, forming a stout trunk (Bock and Cook 2004). Other species which were common in the bryozoan-dominated assemblage included sponges, hammer oysters (*Malleus* sp.), and feather stars (Shepherd and Sprigg 1976). However, during a survey around thirty years later, in 2000-01 (Tanner 2005), it was found that bryozoans now occur only in low abundance in that area of the central gulf. During the more recent survey, only 12 of 294 surveyed sites in Gulf St Vincent had more than 5% bryozoan cover, and none greater than 25% (Tanner 2005). The survey results indicate an approximately 80% decrease in the area covered by bryozoans in the central part of the gulf, compared with the 1960s (Tanner 2005).



**Figure 13.3: Examples of bryozoans which were dominant in the bryozoan assemblage of central Gulf St Vincent, a habitat which no longer exists. (A): *Adeona grisea*; (B) *Celleporaria* species; (C) *Triphyllozoon* species.**