8. Seagrass Beds

Figure 8.1: (A) Amphibolis seagrass in Sturt Bay, with a healthy cover calcareous algae on the stems. These algae contribute to sediment production. Photo (c) J. Baker. (B) Seagrass bed with Pinna razorfish, at Edithburgh. Photo (c) H. Crawford.

<table>
<thead>
<tr>
<th>Asset</th>
<th>Seagrass Beds</th>
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</thead>
<tbody>
<tr>
<td>Description</td>
<td>Vegetated areas in the intertidal and shallow subtidal beds made up of one or more species of seagrass. Common examples in NY NRM include several Posidonia strapweed species, 2 Amphibolis wireweed species, grass-wrack Heterozostera nigricaulis, eelgrass Zostera, and paddleweed Halophila.</td>
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</tbody>
</table>
| Examples of Key Species | • Juvenile King George Whiting and Yellowfin Whiting, and numerous other fish species which utilise seagrass beds as nursery areas.  
  • pipefishes, weedfishes and other small seagrass-dwelling fishes  
  • Blue Swimmer Crab  
  • Western King Prawn  
  • Southern Calamari  
  • Razorfish  
  • Many small invertebrates which live in seagrasses and provide food sources for larger animals. Examples include worms (polychaete worms, ribbon worms, flatworms etc); small crab species; small prawns, sand shrimps and mysids; other small crustaceans such as isopods and amphipods; small snails / gastropod shells and bivalve shells; small echinoderms (e.g. urchins and brittlestars); and small sponges. |
| Main Locations | • Northern Gulf St Vincent  
  • Parts of eastern and south-eastern (“heel”) of Yorke Peninsula  
  • Parts of northern Investigator Strait  
  • Parts of Hardwicke Bay and south-eastern Spencer Gulf  
  • Bays of eastern Spencer Gulf  
  • Parts of northern and north-eastern Spencer Gulf |
Map 8.1: Seagrass coverage in the shallows of northern Gulf St Vincent. Light green shading = sparse seagrass cover; medium green shading = medium density seagrass cover; and dark green shading = dense seagrass cover. Green cross-hatched sections represent the same gradation in seagrass density according to colour, but show locations of seagrass patches instead of continuous stands. Map © DEWNR.

Map 8.2: Seagrass coverage in western Gulf St Vincent, Investigator Strait, and south-eastern Spencer Gulf. Seagrass colour codes (green) as for Map 8.1. Map © DEWNR.
Map 8.3: Seagrass coverage in eastern Spencer Gulf. Seagrass colour codes (green) as for Map 8.1. Map © DEWNR.

Map 8.4 and 8.5: Seagrass coverage in north-eastern and northern Spencer Gulf. Seagrass colour codes (green) as for Map 8.1. Map © DEWNR.
All sections of the NY NRM region (north, west, south, and east) contain significant areas of seagrasses (Maps 8.1 - 8.5). In the north-eastern part of the Region, between Black Point in the west and Port Gawler in the east, there are extensive seagrass meadows in the shallow waters of northern Gulf St Vincent.

Around the top of the gulf, at the north-eastern edge of the NY NRM Region, fine seagrasses occur in the lower intertidal, seaward of the mangroves, and in tidal channels. The Eelgrass Zostera, also known as Dwarf Grass-wrack, is abundant in the area, and in some areas, forms dense, pure stands. Australian Grass-wrack Heterozostera nigricaulis grows at slightly lower depths. The larger seagrass Strapweed (Posidonia australis) is the most common seagrass in the subtidal area, but Wireweed Amphibolis antarctica also occurs (Womersley and Thomas 1976; Connolly 1986; Morelli and de Jong 1995).

Between Sandy Point and Parham, in the Prohibited Area used for weapons proofing, dense seagrass has been recorded in the shallow subtidal in this area (seagrass mapping by CSIRO and SARDI 1995, and DEH, in DEWNR Naturemaps 2014). In the Parham area, dense seagrass has been recorded in the shallow subtidal, with bare sand and patchy seagrass in the intertidal. Further south, towards Great Sandy Point, there is bare sand and patchy seagrass in the intertidal, and denser seagrass below the tide line. In the Thompson's Beach and Port Prime area, there are several seagrass-lined channels, surrounded by patches of dense and patchy intertidal seagrass, and bare sand.

Seaward of the shallow seagrasses in the northern part of Gulf St Vincent, are sediments colonised by Pinna "Razorfish" shells (covered with small sponges, sea squirts and bryozoans); burrowing sea cucumbers; and large solitary sea squirts (Phallusia sp.) (Shepherd and Sprigg 1976; Tanner 2005) (see section on Invertebrate-dominated Soft Bottom Communities).

Seagrasses are a major part of the sea floor cover in shallow waters (10m) along the eastern side of Yorke Peninsula (Maps 8.1 and 8.2), from the head of the gulf southwards to the heel, and beds are particularly well-developed off the middle of the Peninsula. Off mid-eastern Yorke Peninsula and extending southwards, is the Orontes Bank (Orontes Shelf), comprising 10km - 20km wide sand-covered, calcreted shell beds, mostly in waters deeper than 10m, but in some areas shallower, where strong currents pass through, parallel to the coast. In the inner parts of the Orontes Bank, there are seagrass-covered flat reef banks, off Klein Point, Stansbury). Seagrasses (particularly Posidonia) partly cover the Orontes Banks bank from close to shore to approximately 10-15m deep (Shepherd and Sprigg 1976; SARDI S.A. Benthic Survey data 1997, unpublished; DEH 1: 10 000 and 1:25,000 aerial photographs; Tanner 2005). Video transects by the Environmental Authority of SA in 2009, 2010 and 2011 showed dense seagrasses (Posidonia, Heterozostera and Amphibolis) in the shallow waters of Orontes Bank, with naturally abundant fluffy red seaweed epiphytes on the seagrass blades.

Around southern Yorke Peninsula, the most extensive stretches of seagrass are found around the “heel” of the peninsula, and further west into Foul Bay, Waterloo Bay, Sturt Bay and Marion Bay (Edyvane 1999; Baker 2004; (Map 8.3). Several species of Posidonia, including the wide-bladed Posidonia australis occur in the southern Yorke Peninsula bays, and there are also stands of Wireweed Amphibolis, sometimes mixed with Posidonia. (J. Baker, pers. obs. 2009, 2012, 2014). Seagrass beds are also major feature of outer Hardwicke Bay, north of Corny Point (Map 8.3).

On the mid eastern side of the peninsula, significant seagrass areas include the eastern side of Wardang Island (see section on Rock Islands), between the island and Port Victoria, also from Moonta Bay all the way up the coast to Port Pirie. Offshore from Port Hughes is Tiparra Reef, a high relief calcareous reef, with isolated calcareous outcrops / blocks at the edge of the main reef strip, interspersed with sparse Heterozostera seagrass cover on sand; with seagrass communities of Amphibolis and Posidonia species to the west of the main reef strip. Amphibolis beds in the area are covered with naturally abundant epiphytes, particularly species of red seaweeds, which colonise the Amphibolis in prolific quantities during in late winter to spring, as shown in surveys in 1970 (Shepherd 1973) and 1995 (Edyvane and Baker 1996).

Further north of Moonta Bay, seagrasses occur in shallow waters along the long coastal section from Wallaroo, to Fisherman Bay (Port Broughton) and further north to Port Davis and the southern part of Germeine Bay (Port Pirie) (Map 8.4). In the Port Pirie area, subtidal Posidonia seagrass habitat was previously reported to extend over about 18% of the subtidal channel area to a depth of about 6 m (Gostin et al. 1984). Recorded density of small marine invertebrate animals in the unvegetated intertidal flat area of Germein Bay was >280 / m² and was as great as 2,612 / m² in the intertidal seagrass habitat (Hutchings et al. 1993).
In northern Spencer Gulf, in sheltered areas, the seagrasses *Zostera muelleri* and *Heterozostera nigricaulis* and *Posidonia australis* are common in shallow areas, and deeper waters are characterised by extensive sandy substrates and seagrass meadows, comprising other strapweed species (*Posidonia sinuosa* and *P. angustifolia*) and wireweed *Amphibolis antarctica*.

Further north of Port Pirie, from the Redcliff Point to Yatala Harbour area (including Winninowie Conservation Park - see Map 8.5), seaward of the mangroves, mudflats and sandflats, there is a band of the intertidal fine “garweed”, the seagrass *Zostera mucronata* (Shepherd 1983a). Successive depth-related seagrass communities comprise meadows of the strapweed seagrasses *Posidonia australis* and *Posidonia sinuosa*, Australian Grass-wrack *Heterozostera nigricaulis* and/or Paddleweed *Halophila ovalis* (mixed in some areas). During the 1970’s, Shepherd and Branden (1974) recorded mixed beds of *Posidonia australis*, *P. sinuosa*, and Wireweed *Amphibolis antarctica* (with *A. antarctica* mainly confined to the shallow areas, in less than 5m of water); *Heterozostera nigricaulis* in troughs, mainly below 5m; and Paddleweed *Halophila* between approximately 8m – 10m. McLaren and Wiltshire (1984) also described the distribution of seagrasses offshore from Redcliff in upper Spencer Gulf, which they considered to be representative of the upper gulf. They also recorded a succession of seagrass species with increasing depth and distance from the intertidal zone. The most extensive and widespread was *Posidonia australis* seagrass, beds of which were distributed over about 18% of the subtidal channel area to a depth of about 6 m (Gostin et al. 1984 cited by Harris and O’Brien 1998).

A benthic survey in 1995 recorded both strapweed seagrasses *Posidonia sinuosa* and *Posidonia angustifolia* at 6m to 7m in the Middle Bank area (SARDI S.A. Benthic Survey, unpublished data 1995; see also Edyvane and Baker 1996). The green macroalgae *Caulerpa cactoides* is also present in the subtidal area, on the edges of channels (Shepherd, 1983a; Morelli and de Jong, 1995; DEH, 2000A). The fauna in this region comprises mainly articulated bryozoans (“lace corals”), sea pens, and solitary sea squirts, which are usually found attached to shell fragments (see section on Invertebrate-dominated soft Bottom Communities).

**Ecological Functions of Major Species in this Habitat:**

The ecological significance of seagrass beds cannot be understated. This type of marine habitat has a very large variety of physical and ecological support functions. In Australia, dozens of studies during the past two decades have indicated the critical importance of seagrass beds to coastal marine ecosystem functioning. Some of the key references on the ecological significance of seagrasses include the book by Larkum et al (1989), and papers by Keough and Jenkins (1995) and Walker and McComb (1992). Summaries of the abundant literature on the environmental values of seagrasses are available in reports by Baker (2000, Appendix 2, and 2004), and a brief summary is provided here. Generally, like terrestrial plant assemblages, stands of seagrass are important for maintaining the biodiversity of the areas in which they are situated, as well as maintaining the ‘health’ of the nearshore marine environment.

Various physical and chemical functions of seagrass beds include:
- protection of coasts from excess wave energy and erosion;
- nutrient sources for mineral-poor marine waters, following break-down and recycling of marine plant matter;
- water purification (i.e. seagrass take up nutrients)
- water clarification (e.g. rhizomes at the base of seagrasses trap sediments and prevent their release into nearshore waters)
- sediment sources - e.g. dead coralline algae and small calcareous animals such as bryozoans which are attached to seagrass blades, forms sand in some areas.

Some of the many ecological functions of seagrass beds include:
- both direct and indirect food sources for a large variety of commercial and non-commercial fish and invertebrates;
- shelter for fish and invertebrates from currents and storms; (iii) protection of marine biota from predators;
- sites for courting, mating and egg-laying;
- areas for fish and invertebrate larvae to settle, because the structure of the vegetation assists settlement;
- nursery areas for many species of juvenile fish and invertebrates;
- substrate and “micro-habitat” for attached animals and small plants which live on the seagrass blades, and both of these are also important food sources for larger marine animals;
- feeding areas for coastal birds and other fauna (such as invertebrates and insects) when seagrass breaks down and washes up on beaches, as “beachwrack”;
- protective ‘rafts’ for larvae and small fish (which hide in detached floating seagrass;
The extensive seagrass meadows of northern Gulf St Vincent (GSV), northern Investigator Strait, “heel” of Yorke Peninsula, and eastern and northern Spencer Gulf, are a significant contributor to the total primary productivity of the NY NRM region, in terms of plant biomass production and trapping and recycling nutrients. In northern Spencer Gulf, growth of strapweed *Posidonia* species is vigorous, with high rates of leaf blade production (e.g. in excess of 9kg per square metre in shallow water) and turnover rates (West and Larkum 1979, cited by Shepherd 1983a).

In their role as a major “carbonate factory”, these seagrasses provide habitat for the small calcareous organisms that produce shelly sands (Davies 1970; Patiriqin 1972; Gostin et al. 1994; Ward et al. 1993). The sediments associated with the NY NRM seagrass meadows consist of carbonate skeleton debris from small coralline algae which live on seagrasses, bryozoa (“lace corals”), molluscs, diatoms, foraminifera (small shelled animals), echinoderms, and aggregates of minerals, such as quartz grains (Shepherd and Sprigg 1976).

As well as having an important role promoting new sediment production, seagrasses trap and stabilise existing sediments, from both the land and the sea. The seagrass blades baffle wave action, and reduce water movement, so that fine suspended particles settle out, and are trapped by the root mesh of the seagrass (Shepherd and Sprigg, 1976). By trapping sediments, seagrasses also promote water clarity.

Seagrass stems, blades and roots provide also micro-habitat for a variety of small plants and animals (many of which contribute to sand production), and a feeding area for grazers. Johnson (1981c) recorded 48 species of small, red and brown seaweeds growing on *Posidonia* seagrass leaves in upper Spencer Gulf.

The seagrasses of NY NRM region, particularly those of northern Gulf St Vincent and northern Spencer Gulf, are a very important link to the continued productivity of fish and crustaceans (prawns, crabs) that are heavily utilised by both commercial and recreational fishers in the gulfs (Jones 1984; Jones et al. 1990; Edyvane 1996; Dalgetty 1997; Zacharin 1997; DENR 1997), and the shallow seagrass beds of the area are one of the key habitats types (along with mangroves and mudflats / sand flats) which support that productivity. The seagrass beds are a larval settlement area, and both a nursery area for juvenile fishes and crustaceans, and a feeding area for many fish and crustacean species. *Figure 8.2* shows some examples of fish and invertebrate species which utilise seagrass habitats in NY NRM region.

**Fishes:** Some of the fishes which utilise the seagrass beds of the NY NRM region include the following (see *Table 8.1*):

- Southern Sea Garfish, Australian Herring (Tommy Ruff), Snook, King George Whiting, Yellow-fin Whiting (mainly in the northern part of the Region), Yellow-eye Mullet, Snapper, Sand Whiting, Leatherjacket species, Australian Salmon, Striped Trumpeter (mainly in the north), species of Flathead and Flounder, species of Weed Whiting, Red “Mullet”, Soldierfish, estuarine species such as Mulloway and Black Bream (especially adjacent to tidal creeks and estuaries), and wide-ranging pelagic species such as Yellow-tail Kingfish, Trevally, Blue Mackerel and Barracouta.

The seagrass meadows of far northern Gulf St Vincent also provide nursery areas for some of these species, including King George Whiting, Snapper, West Australian Salmon, Australian Herring (Tommy Ruff), Southern Sea Garfish, Red “Mullet”, Leatherjacket species, Trevally, and flathead species (Bryars 2003).

The seagrass beds in parts of the NMY NRM area (including northern GSV) are important for Garfish reproduction during the spawning season, and northern GSV is also an important area for larval Garfish, which are retained in the area due to oceanographic patterns. During one study in Gulf St Vincent and Investigator Strait in 1998 and 2000, larval Garfish were found in greatest abundance in northern GSV (Jones et al. 2002).

Across both sides of Yorke Peninsula, and in northern Spencer Gulf and northern GSV, there is a close association of juvenile King George Whiting with shallow tidal creeks, and nearshore *Zostera* and *Posidonia* seagrass beds in wave-protected bays (for location details, see Jones 1980; Jones et al. 1990, Bryars 2003 and Baker 2004). Examples of nursery areas for King George Whiting in the NY NRM region include Price Creek, Port Arthur and Wakefield Creek in northern GSV; Sultana Point; Salt Creek at Coobowie; Stansbury and Port Vincent on the eastern side of the peninsula, the western side of Sturt Bay on southern Yorke Peninsula, and Port Victoria, in eastern Spencer gulf, and several shallow creeks and bays in northeastern Spencer Gulf, at the northern end of the NY NRM region, such as Chinaman Creek, Yatala Harbour, Port Pirie Creek and First to Seventh Creeks near Port Davis (Jones et al. 1990). The smallest juveniles (post-larvae) arrive during winter and spring each year. They feed (e.g. on small crustaceans, and polychaete worms) and grow for about 1-2 years in the shallow, seagrass-lined habitats before moving out into deeper waters (Fowler et al. 2003), which includes both seagrass beds (e.g. *strapweed Posidonia*) and also low profile “patch” calcareous reef.
Yellow-fin Whiting (*Sillago schomburgkii*) is more abundant in the seagrass and subtidal sand habitats of warmer waters of the upper gulf, than any other part of South Australia. Ferguson (1999 and 2000) provided a detailed overview of Yellow-fin Whiting in South Australia, and the commercial fishery for this species. Spawning of Yellow-fin Whiting occurs in the northern part of both gulf’s from October to January, and peaks in November and December. The small post-larvae being moving into shallow sandy bays in late autumn, and are most abundant in autumn. Recruitment and abundance of juveniles is highly variable over space and time, likely due to oceanographic factors. Examples of areas which are important for juveniles include Chinaman Creek and Yatala Harbour in north-eastern Spencer Gulf, and Port Arthur and Port Clinton in northern GSV (Ferguson 2000).

Young adults are common in both gulls, but older age classes are not common, and have been found mainly in parts of Spencer Gulf.
Table 8.1: Examples of fish species which are common in seagrass beds of the NY NRM region.

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<thead>
<tr>
<th>Common Name and Latin Name</th>
<th>Representative Image</th>
<th>Common Name and Latin Name</th>
<th>Representative Image</th>
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</thead>
<tbody>
<tr>
<td>Southern Sea Garfish Hyporhamphus melanochir</td>
<td>© D. Muirhead</td>
<td>Yellow-eye Mullet Aldrichetta forsteri</td>
<td>© Auckland Council</td>
</tr>
<tr>
<td>Australian Herring (Tommy Ruff) Arripsis georgianus</td>
<td>© R. Stuart-Smith, RLS</td>
<td>Australian Salmon Arripis truttaceus</td>
<td>© A. King</td>
</tr>
<tr>
<td>King George Whiting Sillaginodes punctatus</td>
<td>© Reef Life Survey</td>
<td>Yellow-fin Whiting Sillago schomburgkii</td>
<td>© D. Muirhead, MLSSA</td>
</tr>
<tr>
<td>Snook Sphyraena novaehollandiae</td>
<td>© R. Stuart-Smith, RLS</td>
<td>juvenile Snapper Chrysophrys auratus (Pagrus auratus)</td>
<td>© B. Gratwicke / Flickr</td>
</tr>
<tr>
<td>Western Striped Grunter Pelates octolineatus</td>
<td>© R. Stuart-Smith, RLS</td>
<td>Bridled Leatherjacket Acanthaluteres spilomelanurus</td>
<td>© J. Finn, Museum Victoria</td>
</tr>
<tr>
<td>Rough Leatherjacket Scobinichthys granulatus</td>
<td>© M. Norman, Museum Victoria</td>
<td>Castelnau’s Wrasse Dotalabrus aurantiacus</td>
<td>© D. Muirhead, MLSSA</td>
</tr>
</tbody>
</table>

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© J. Finn, Museum Victoria
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© M. Norman, Museum Victoria
Table 8.1 (continued): Examples of fish species which are common in seagrass beds of the NY NRM region.

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<th>Representative Image</th>
<th>Common Name and Latin Name</th>
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<td>juvenile Dusky Morwong</td>
<td><img src="image1" alt="Image" /></td>
<td>Flounder - e.g.</td>
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<td></td>
<td>© S. Speight. CC licence</td>
<td>Elongate Flounder</td>
<td>© R. Stuart-Smith, RLS</td>
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<tr>
<td></td>
<td></td>
<td>Ammotretis elongatus,</td>
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<td></td>
<td></td>
<td>Greenback Flounder</td>
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<td></td>
<td></td>
<td>Rhombosolea tapirina</td>
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<tr>
<td></td>
<td></td>
<td>and other flounder species</td>
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<td>species of Flathead (e.g.</td>
<td><img src="image3" alt="Image" /></td>
<td>species of Weed Whiting (e.g. Long-ray Siphonognathus radiatus)</td>
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</tr>
<tr>
<td>Rock / Grass Flathead</td>
<td>© A. Pearson, CC licence</td>
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<td>Platycephalus laevigatus</td>
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<td>pipeline e.g.</td>
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<td>Soldierfish</td>
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<td>Stigmatopora argus</td>
<td>© J. Lewis</td>
<td>Gymnapistes marmoratus</td>
<td>© J. Finn, Museum Victoria</td>
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The shallow seagrasses of NY NRM region are important habitat for a number of other strongly site-associated small fishes which have localised breeding, including various species of pipefish (Syngnathidae family), and some of the species in the weedfish (Clinidae) and snake-blenny (Ophiclinidae) families and the cardinalfish (Apogonidae) family (Baker 2004, 2013 and references therein). One of the most common pipefishes in seagrass beds in the region is Spotted Pipefish Stigmatopora argus, which is well camouflaged in seagrass. Previously, Weedy Seadragons were recorded along the stretch of coast from the Ardrossan - Parham latitude southward, during surveys from 1965 to 1971. Numerous Weedy Seadragons were observed during this period, usually in waters 5m – 15m depth, in Posidonia and Amphibolis seagrass (S. Shepherd, SARDI, pers. comm. to Dragon Search program 2001). Both leafy and weedy seadragons have been recorded in and near seagrass beds further south in the NY NRM region (Dragon Search data, cited in Baker 2005). The Deep-bodied (Deepbody) Pipefish Kaupus costatus occurs in seagrass beds in northern GSV, and in parts of Spencer Gulf. The species belongs to an endemic Australian genus with only one species, known from isolated populations in Victoria, Flinders Island (Tasmania), and several places in South Australia (e.g. Spencer Gulf, upper Gulf St Vincent, and Kangaroo Island) (Kuiter 1996; Kuiter 2000; B. McDonald, unpublished survey data; Browne 2004). Deep-bodied Pipefish has a very specific habitat: low energy, shallow (usually 3m or less, but see below) seagrass beds in silty bottom yet clear-water environments. It is usually only seen when dragnet samples are taken. The species often occurs in small aggregations, in the intertidal zone (Kuiter 1996). In NY NRM region, this species has been reported from Port Gawler to Middle Beach (R. Browne, pers. comm., 2003), and Port Broughton. The abundance of K. costatus along the north-eastern coast of GSV (e.g. Port Gawler to Middle Beach, and possibly further north), makes that area the site of the greatest known population of K. costatus in Australia (R. Browne, pers. comm. 2003). In comparison, the species is not common on the north-western side of Gulf St Vincent (R. Browne, pers. comm. 2003).

Some of the shallow seagrass-lined bays and tidal inlets around NY NRM support large numbers of small fishes, such as Small-mouthed Hardyhead Atherinosoma microstoma, Glass Goby Gobioperca semivestitus, Blue-spotted Goby Pseudogobius olorum and Bridled Goby Bridled Goby Arenigobius bifrenatus amongst others, which are a food source for other estuarine and marine fauna.
Seagrass beds in NY NRM region also provide habitat for juveniles of the Rock Ling, *Genypterus tigerinus*. The species is long-lived, strongly site-associated, and susceptible to population decline from spear fishing and angling. Juveniles inhabit seagrass-lined estuaries, and are often found under objects or small reef patches within the seagrass beds (Kuiter 1993, 1996a; Gomon, in Gomon et al. 1994; Edgar 2000). Adults inhabit shallow, rocky reef areas, and are often found under ledges, and in caves and rocky recesses, where they often remain during the day. Also found around jetties, shipwrecks, artificial reefs (including tyre, concrete cubes, pipes and other structures (Baker 2012 and references therein).

**Sharks and Rays:** Seagrass beds in the region provide important habitat for rays (such as stingrays, and fiddler rays, skate species, and stingarees). There may be a comparatively high number of ray species (Capel 1994) in the seagrass beds of northern Gulf St Vincent, including large rays such as Smooth Stingray. Northern Gulf St Vincent provides habitat for the uncommon and endemic Magpie Fiddler Ray (South Australian Museum 2001). The species has rarely been recorded to date in SA, with few specimens known, and all of those are from Gulf St Vincent and Kangaroo Island. It is uncertain whether this species is a colour variant of the Fiddler Ray (*Trygonorrhina dumerillii*) or a separate species. Seagrass beds in NY NRM region also provide habitat for benthic shark species such as Cobbler Wobbegong (*Cobbler Carpetshark*). Northern Gulf St Vincent is a nursery area for Bronze Whaler sharks, and Gummy Sharks and other sharks also occur in the area. This is a particularly important nursery and feeding area for Bronze Whaler Shark pups, observed in summer (Cappo 1992; Jones 2008).

Some other shark and ray species which occur in seagrass beds around eastern, southern and western NY NRM region include Shovelnose Ray, Shovelnose Stingaree, Southern Fiddler Ray, Gulf Catshark, and skates (e.g. Melbourne Skate).

**Marine Invertebrates:** Some of the significant marine invertebrates whose populations are supported by seagrasses within the NY NRM region are discussed below, with notes from Baker (2004). The entire northern area of Gulf St Vincent, stretching from Ardrossan on the western side through to Sandy Point on the eastern side, is a significant one for large marine invertebrates, including commercially and recreationally significant species, such as king prawns, blue swimmer crabs and razorfish. Some of the common large invertebrates in seagrass beds in the NY NRM Region are shown in Table 8.2.

Shallow bays with seagrasses in northern Gulf St Vincent (GSV) and northern Spencer Gulf are important settlement areas for the commercially significant species Western King Prawn larvae (Kangas and Jackson 1997; Zacharin 1997; Carrick 2003). The Ardrossan – Price area is considered to be one of the several nursery areas in GSV for Western King Prawn, where high concentrations of juvenile prawns are recorded (Kangas and Jackson 1997; South Australian Government, submission to Parliament of South Australia’s Senate Inquiry into Gulf St Vincent 2000). Kangas and Jackson (1997) showed that the Port Clinton, Port Arthur and Port Wakefield areas were the most important in Gulf St Vincent in terms of numbers of post larval and juvenile prawns settling into the shallows. In Spencer Gulf, Carrick (2003, Figure 16 and 17) showed in the waters between Whyalla and Port Pirie, the abundance of prawn larvae was higher than that in any other part of Spencer Gulf sampled during 1993 and 1994. Within the NY NRM region, the Port Pirie area on the eastern side is a major nursery area (Carrick 2003). Other shallow coastal areas within the NY NRM region in northern Spencer Gulf, such as Yatala Harbour and the Winninowie / Chinaman Creek area also provide important habitat for larval and juvenile prawns (Carrick 2003).

Also in the shallow seagrass beds of the northern gulfs, there is an abundance of smaller prawn species, such as Strawberry Prawns. Small prawn species are utilised as a major seasonal food source by a number of fish species (such as Snook, in GSV) (Bertoni 1995).

The seagrasses of the upper gulfs are important feeding, breeding and nursery habitat for Blue Swimmer Crab *Portunus armatus*, which is fished commercially and recreationally in the northern part of both gulfs. Juveniles of this species utilise mangrove creeks and mudflats of the upper gulfs for the first 12 months of life (Smith 1982, cited by Baker and Kumar 1994 and Dixon et al. 2013), then move into deeper waters, such as sandy and muddy bays lined with seagrass. The Blue Swimmer Crab is a tropical species known mainly from the eastern Pacific and western Indian Ocean, and has a very restricted distribution in the cooler waters of southern Australia. The abundance of Blue Swimmer Crab in northern GSV and Spencer Gulf is higher than in any other part of southern Australia. Figure 8.3 shows the life cycle of the Blue Swimmer Crab, and some of the ecological relations of this species in the northern gulfs. Blue Swimmer crabs eat various invertebrates which are abundant in the upper gulfs, such as *Pinna* “razorfish”, hermit crabs, segmented...
worms and hermit crabs. The swimmer crabs are an important prey item for Pink Snapper Chrysophorus auratus, and are also eaten by gummy sharks, stingrays, fiddler rays and other large fauna in the gulfs.

Figure 8.3: Life cycle and main interactions of Blue swimmer Crab in the northern parts of the NY NRM region. © J. Baker, for DEH 2001

Southern Calamari Sepioteuthis australis, a commercially and recreationally significant squid species is abundant in the seagrass beds of the NY NRM region, particularly on the eastern and western side of Yorke Peninsula, in deeper seagrass beds. There is evidence to suggest that adult calamari preferentially attach their eggs to seagrass (e.g. Wireweed Amphibolis species) and seaweeds such as Cystophora and Sargassum), although they also utilise rocks and sand for egg-laying (Triantafillos 2001, cited by Steer et al. 2005). When the eggs hatch, the older larvae (“paralarve”, about 7mm mantle length), feed on mysid shrimp and other zooplankton associated with low relief seagrass beds (Smith 1983, cited by Steer et al. 2005). Approximately 90% of the Southern Calamari catch in S.A. waters comes from the gulfs (Steer et la. 2005), indicating the importance of seagrass habitats around the NY NRM region for this species.

Razorfish shells (Pinna bicolor) are abundant in northern part of the NY NYM region, on both sides of the peninsula, and the northern seagrass beds and sand habitats provide important areas for feeding and breeding (Bryars 2003). Razorfish are considered to provide “micro-reef” habitat, by housing a rich assemblage of small animals which attach to the shells, including mall sponges, ascidians (sea squirts), bryozoans, and tube worms (Shepherd and Sprigg, 1976), and provide the hard substrate required for some species to settle, in areas of limited hard bottom (e.g. muddy and sandy sediments, with seagrasses). The large “milk bottle” ascidian Phallusia obesa is abundant in parts of the area (e.g. amongst Pinna Razorfish beds) (Shepherd and Sprigg 1976). Both the seagrass meadows and subtidal sand habitats of GSV and Spencer Gulf provide important habitat for King Scallops Pecten fumatus and Queen Scallops Equichlamys bifrons (Bryars 2003). King Scallop is a relatively long-lived species, to at least 10 years (Boyd 2011). Scallops are a food source for sea stars, whelk shells and octopus (Kailola et. al. 1993, cited by Mavrakis and Sullivan 2006). There is a commercial fishery for this species in Hardwicke Bay, extending from the Corny Point area northwards to Wardang Island (Mavrakis and Sullivan 2006).
There is also a high abundance of some other invertebrate groups in the shallow seagrass beds, such as:

- foraminifera, bryozoans and hydroids on the seaweed blades
- many kinds of worms (polychaete worms, ribbon worms, flatworms etc),
- small crab species, small prawns, sand shrimps and mysids
- other small crustaceans such as isopods and amphipods
- small snails (such as trochid, diala and mitrella shells) and bivalve shells
- sponges (on the seagrass blades)
- pygmy squid
- small echinoderms, such as urchins, brittle stars and sea stars
- seaweed worms, in areas where dead seagrass is washed up, and have a role in nutrient recycling, and as a food source for birds and other fauna.

Table 8.2: Some examples of invertebrate species which are common in seagrass beds of the NY NRM region.

<table>
<thead>
<tr>
<th>Common Name and Latin Name</th>
<th>Representative Image</th>
<th>Common Name and Latin Name</th>
<th>Representative Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue Swimmer Crab <em>Portunus armatus</em></td>
<td>© J. Lewis</td>
<td>Western King Prawn <em>Penaeus (Melicertus) latisulcatus</em></td>
<td>© Museum Victoria</td>
</tr>
<tr>
<td>Decorator Crab <em>Naxia aurita</em></td>
<td>© S. Speight @ Flickr</td>
<td>Sea Centipede <em>Crabyzos longicaudatus</em></td>
<td>© KI NRM</td>
</tr>
<tr>
<td>Southern Calamari <em>Sepioteuthis australis</em></td>
<td>© J. Finn, Museum Victoria</td>
<td>Razorfish shell (Pinna bicolor)</td>
<td>© H. Crawford</td>
</tr>
<tr>
<td>King Scallop <em>Pecten fumatus</em> and Queen Scallop <em>Equichlamys bifrons</em></td>
<td>© Museum Victoria</td>
<td>small gastropod shells e.g. Lincoln Dove Shell <em>Mitrella lincolnensis</em></td>
<td>© D. Beechey, Seashells of NSW</td>
</tr>
<tr>
<td>Southern Pygmy Squid <em>Idiosepius notoides</em></td>
<td>© P. Mercurio</td>
<td>Compound Ascidian <em>Botrylloides perspicuum</em></td>
<td>© M. Norman, Museum Victoria</td>
</tr>
</tbody>
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