Addendum to the 2014 ESD risk assessment of the South Australian Spencer Gulf Prawn Fishery

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Government of South Australia
Department of Primary Industries and Regions

Addendum to the 2014 ESD risk assessment of the South Australian Spencer Gulf Prawn Fishery

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Disclaimer

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Background

Section 43 (2) of the *Fisheries Management Act 2007* requires that a management plan for a fishery:

1. identify the impacts or potential impacts of the fishery on its associated ecosystem or ecosystems, including impacts on non-target species of fish or other aquatic resources; and

2. identify any ecological factors that could have an impact on the performance of the fishery.

Following the identification of the ecological impacts and ecological factors Section 43 (2) of the Act also requires that for the most serious risks strategies for addressing these risks be developed.

The '2014 ESD risk assessment of the South Australian Spencer Gulf Prawn Fishery' provided a comprehensive analysis of the impacts and potential impacts of the fishing activity, as well as identifying ecological factors that could impact on the performance of the fishery. This document updates the work undertaken in the 2014 ESD risk assessment.

Method

The ecological risk assessment of the effects of fishing (ERAEF) framework process, developed by Hobday et al (2011) undertaken in 2014, has been updated in this document. The ERAEF has two components a Productivity Susceptibility Analysis (PSA) of species and a Consequence Spatial Analysis (CSA) of habitat. The 2014 ESD risk assessment only undertook the PSA. The CSA methodology has been developed to address PI 2.4.1 of the Marine Stewardship Council (MSC) certification. The CSA is the 'PSA Habitat' component of the ERAEF.

The 2014 PSA was updated (from a previous assessment of 195 species caught on a bycatch survey in 2007) to assess an additional 18 species. These included 16 species identified on a 2013 bycatch survey (including 1 EPBC Act-listed species), and another 1 listed species and 1 cetacean species of conservation interest reported to have been involved in an interaction with the SGPF based on logbook data. Based on the PSA of the additional 17 species, 1 was assessed as high risk, 12 as moderate risk and 4 as low risk.

The CSA used the spatial analysis of trawl footprint of the SGPF, combined with habitat and sediment maps were used to identify the main habitat that the fishery commonly encounters. The main habitat was identified as 'Fine-Flat-Small encrusting' habitat which is characterised as being a flat surface structure of fine sand/mud sediment, with biota predominantly comprising of mixed small/low-encrusting invertebrate communities. Based on scores of consequence and spatial attributes against predetermined criteria, this Fine-Flat-Small encrusting habitat was assessed as medium risk.

The second component of the ESD risk assessment is the '*National ESD Reporting Framework for Fisheries*' developed by Fletcher et al. (2002). The initial steps of this analysis involved identifying the issues relevant to the fishery and then prioritising these issues (Fletcher et al. 2005). The Fletcher model has traditionally included target and non-target species. However, the risk analysis of non-target species is undertaken through the PSA and the assessment of the target species in the fishery, Western King Prawn (*Penaeous (Melicertus) latisulcatus*), is undertaken annually in the stock status advice note prepared by SARDI. While the impact of the fishing gear on the ecosystem is now assessed by the CSA. Given the risk assessment of the fishing activity on the target species, bycatch and habitat is undertaken through other processes the Fletcher model has been used just to assess the risk of general ecosystem impacts and external impacts on the fishery through component trees.

National ESD Reporting Framework for Fisheries

The '*National ESD Reporting Framework for Fisheries*' developed by Fletcher et al. (2002) has been used to assess the risks for general ecosystem impacts and external impacts on industry. The '*National ESD Reporting Framework for Fisheries*' is described in pages 22 to 26 of the '2014 ESD Risk Assessment of the Spencer Gulf Prawn Fishery'.

The '2014 ESD Risk Assessment of the Spencer Gulf Prawn Fishery' also developed component trees for Non-retained species, Community Wellbeing and Goverance. A non-retained species component tree was not developed for this document, as the PSA assesses the risk of non-retained species. A new component tree was not developed for Community wellbeing as Community Wellbeing issues were considered (by the Research Sub-committee) facets of the fishery that could not be controlled. While a component tree was not developed for Governance as governance around the management of the fishery is considered to be of an extremely high standard.

Productivity Susceptibility Analysis (PSA)

The 2016 risk assessment for the GSVPF utilized outcomes for the species components for the Spencer Gulf Prawn Fishery (SGPF) in the absence of specific by-catch survey information from the GSVPF. The risk outcomes for these components were informed from a PSA report of individual target, by-product, discard and TEP species recorded from a 2007 SGPF trawl by-catch survey (Currie et al. 2009).
The PSA approach assumes the risk to an ecological component will depend on:

1. the productivity of the species, which will determine the rate at which it can recover after potential depletion or damage by fishing activity; and
2. the extent of the impact due to the fishing activity, which will be determined by the susceptibility of the species to the fishing operations of the fishery.

An updated Productivity Susceptibility Analysis (PSA) of all species was undertaken by the SGWCPFA Research Sub Committee on 20 May 2019. Present at this meeting was James Brook (Conservation Council SA), Simon Clark (EO SGWCPFA), Chay Haldane, Ashley Lukin, Tony Lukin, Craig Noell (SARDI), Greg Palmer (Chair) and Steve Shanks (PIRSA). This updated PSA included:

- Species identified on the 2013 bycatch survey (Burnell et al. 2015);
- EPBC Act-listed and cetacean species that were not identified on the 2007 or 2013 bycatch survey but are reported to have been involved in an interaction with the SGPF within the last five years;
- Revised PSA scores, where applicable, for 2007 bycatch survey species previously assessed as high or medium risk (Currie et al. 2009; PIRSA 2014b).

For specific information on the PSA method applied, refer to pages 28 to 31 of the '2014 ESD risk assessment for the Spencer Gulf Prawn Fishery' (PIRSA 2014).

The 2014 PSA was updated (from a previous assessment of 195 species caught on a SGPF by-catch survey in 2007) to assess an additional 18 species including 16 species identified on a 2013 SGPF by-catch survey (including 1 EPBC Act-listed species), and another 1 listed species and 1 cetacean species of conservation interest reported to have been involved in an interaction with the SGPF based on logbook data. PSA of the additional 17 species identified 1 species assessed as high risk, 12 species as moderate risk and 4 species as low risk.

Consequence Spatial Analysis (CSA) of habitat

The MSC assessment and certification of a fishery includes a requirement that 'the Unit of Assessment (UoA) (i.e. the fishery) does not cause serious and irreversible harm to habitat structure and function' (referred to as the Habitats outcome indicator, PI 2.4.1, MSC 2018a). To enable assessment of PI 2.4.1 the MSC subsequently developed the Consequence Spatial Analysis (CSA) methodology, based on the 'habitat PSA' component of the ERAEF (Hobday et al. 2007, 2011; Williams et al. 2011). The CSA was structured around a set of attributes that describe fishing gear impacts (**consequence**) and the habitat (**spatial**) for each habitat being affected by the gear type(s) (Table 1).

Table 1. Consequence and spatial attributes for the CSA.

Consequence attributes	Spatial attributes
Habitat productivity 1. Regeneration of biota 2. Natural disturbance	1 . Gear footprint 2 . Spatial overlap 3 . Encounterability
Gear-habitat interaction 3. Removability of biota 4. Removability of substratum 5. Substratum hardness 6. Substratum ruggedness 7. Seabed slope	

The CSA methodology was applied to the SGPF as described in the MSC Fisheries Certification Process v2.1 (MSC 2018b). It comprises four main steps:

1. Define the habitat;
2. Score the consequence attributes;
3. Score the spatial attributes; and
4. Determine the CSA score and equivalent MSC score.

Details of each step, including rationale for justification of the proposed scores, are provided in Appendix 1.

Research sub-committee consultation on ESD risk assessment

A Spencer Gulf and West Coast Prawn Fishermen's Association (SGWCPFA) Research Sub-committee meeting was held on 20 May 2019 to consult on the PSA, CSA and the component trees under the Fletcher model.

Consultation on the PSA involved going through the PSA undertaken by SARDI (See Table 6) and determining if the scoring provided under the PSA model headings (i.e. Availability, Encounterability, Selectivity and Post-capture mortality) accurately reflected the status of each of the species.

Based on this analysis the Research sub-committee developed a list of species they considered to be high risk (Table 2). Snapper and King George Whiting were ranked as high risk under the PSA analysis, they were excluded from further management arrangements as management of these stocks in Spencer Gulf are undertaken regularly through the Marine Scalefish Fishery. No performance report for these species was required. A non designated holothurian species was also considered not to require a performance reports as it was considered an anomaly as it did not reference a specific species.

Table 2: Species ranked as a high risk under the PSA analysis (species with blue font contributed to more than 2% of the by-catch composition).

Scientific name	Common name
Repomucenus calcaratus	Spotted Dragonet
Thamnaconus degeni	**Bluefin Leatherjacket**
Lepidotrigla papilio	Spiny Gurnard
Pseudocaranx wrighti	**Skipjack Trevally**
Parequula melbournensis	Silverbelly
Foetorepus calauropomus	Common Stinkfish
Pseudorhombus jenynsii	Smalltooth Flounder
Scobinichthys granulatus	**Rough Leatherjacket**
Diodon nicthemerus	Globefish
Acanthaluteres vittiger	Toothbrush Leatherjacket
Sardinops sagax	Australian Sardine
Gonorynchus greyi	Beaked Salmon
Neoplatycephalus richardsoni	Tiger Flathead
Sepioteuthis australis	Southern Calamari
Neosebastes bougainvillii	Gulf Gurnard Perch
Upeneichthys vlamingii	**Bluespotted Goatfish**
Parapriacanthus elongatus	Elongate Bullseye
Sepia novaehollandae	a cuttlefish (not designated)
Cynoglossus broadhursti	Southern Tongue Sole
*Sillaginodes punctata**	King George Whiting
*Pagrus auratus**	Snapper
*Holothuria (Thymiosycia)hartmeyeri**	a holothurian (not designated)
TEPS	
Tursiops truncatus	Common Bottlenose Dolphin

* These species were considered not to require a performance report due to existing management arrangements and, in the case of the holothurian species, the consideration of it being an anomaly.

Following the development of the list of high risk species by the research sub-committee, additional species were also identified as species of interest, that were not classified as high risk but due to either the fact they make up more than 5% of the total catch, are a species from a commercial fishery or meet the criteria of a Threatened, Endangered or Protected species (TEPs), would require consideration of management arrangements. It was also viewed that these criteria for listing species as 'species of interest' were consistent with Sections SA 3.4.2.1 and SA 3.4.2.2 of the Marine Stewardship Council (MSC) Fisheries Standard 2.01.

Table 3: Species of interest for consideration of management arrangements.

Scientific name	Common name	Family name
Filicampus tigris	Tiger Pipefish	Syngnathidae
Histiogamphelus cristatus	Rhino Pipefish	Syngnathidae
Leptoichthys fistularius	Brushtail Pipefish	Syngnathidae
Phycodurus eques	Leafy Seadragon	Syngnathidae
Phyllopteryx taeniolatus	Common Seadragon	Syngnathidae
Stigmatopora argus	Spotted Pipefish	Syngnathidae
Hyporhamphus melanochir	Southern Garfish	Hemiramphidae
Ibacus peronii	Eastern Balmain Bug	Scyllaridae
Portunus armatus	**Blue Swimmer Crab**	Portunidae

The committee also considered the CSA report for habitats prepared by SARDI (see Table 7). No alterations to the CSA report for habitats provided by SARDI were made by the Research sub-committee.

The committee analysed the component trees for general ecosystems and external impacts on industry provided in the '2014 ESD Risk Assessment for the Spencer Gulf Prawn Fishery'. The subject matter and the scores for each subject matter in the component trees were reassessed and where appropriate modifications were made. Figures 1 and 2 in the results show the new component trees developed for

General ecosystem and External impact on Industry developed through the consultation undertaken on 20 May 2019 through the Research sub-committee.

Risk Ratings

Several risk ratings have been updated from the '2014 ESD Risk Assessment for the Spencer Gulf Prawn Fishery'. Further, the component trees for Community Wellbeing and Governance have been removed as they are not required to meet the requirements for the Act and haven't been used in making management decisions in the fishery. Additionally, the 'economic' component of the 'External Impacts on the Fishery' has been removed as the risks are not ecological in nature.

For those ratings that were updated risk was calculated in accordance with Fletcher et al. 2002.

From the consequence and likelihood scores, the overall risk value was calculated (i.e. risk = consequence x likelihood). The calculated risk values were then linked to one of the colour-coded risk categories, the relationship for which is illustrated by a risk matrix (Table 4).

Table 4. Risk matrix of consequence and likelihood. The numbers in the cells indicate the risk value, and the colours indicate risk categories (see Appendix 2for more details) (source: Fletcher et al. 2002).

	Consequence					
Likelihood	Negligible (0)	Minor (1)	Moderate (2)	Severe (3)	Major (4)	Catastrophic (5)
Remote (1)	0	1	2	3	4	5
Rare (2)	0	2	4	6	8	10
Unlikely (3)	0	3	6	9	12	15
Possible (4)	0	4	8	12	16	20
Occasional (5)	0	5	10	15	20	25
Likely (6)	0	6	12	18	24	30

Table 5. Relationship between risk value, risk category, management response and reporting requirements (source: Fletcher et al. 2002).

Risk category	Risk values	Likely management response	Likely reporting requirements
Negligible	0	Nil	Short justification only
Low	1-6	None specific	Full justification needed
Moderate	7-12	Specific management needed	Full performance report
High	13-18	Possible increase in management activities needed	Full performance report
Extreme	>18	Likely additional management activities needed	Full performance report

Results

Table 6: Updated PSA undertaken by SARDI. Highlighted cells indicate revised scores (green = -1, red = +1). Revised scores that resulted in a different combined score and risk are indicated with arrows (red = increased risk, green = reduced risk).

						Productivity Scores [1-3]								Susceptibility Scores [1-3]								
ERA Species ID	Species type	Scientific name	Common name	Family name	Role in fishery	Average age at maturity	Average max age	Fecundity	Average max size	Average size at maturity	Reproductive strategy	Trophic level	Total Productivity (average)	Availability	Encounterability	Selectivity	Post-capture mortality	Total (multiplicative)	PSA Score	MSC PSA-derived score	Risk Category Name	MSC scoring guidepost	Change in risk
6	Teleost	*Neoplatycephalus aurimaculatus*	Toothy Flathead	Platycephalidae	DI	1	2	1	1	1	1	3	1.43	2	3	3	3	2.33	2.73	77	Med	60-79	
11	Invertebrate	*Nototodarus gouldi*	Gould's Squid	Ommastrephidae	DI	1	1	2	1	1	2	2	1.43	2	3	3	3	2.33	2.73	77	Med	60-79	
13	Teleost	*Repomucenus calcaratus*	Spotted Dragonet	Callionymidae	DI	1	1	3	1	1	1	3	1.57	3	3	3	3	3.00	3.39	50	High	<60	
18	Teleost	*Thamnaconus degeni*	Bluefin Leatherjacket	Monacanthidae	DI	1	1	1	1	1	2	3	1.43	3	3	3	3	3.00	3.32	53	High	<60	
22	Chondrichthyan	*Urolophus gigas*	Spotted Stingaree	Urolophidae	DI	1	2	3	1	2	3	2	2.00	1	3	3	1	1.20	2.33	88	Low	≥80	
26	Teleost	*Zebrias scalaris*	Manyband Sole	Soleidae	DI	1	2	1	1	1	1	3	1.43	2	3	3	3	2.33	2.73	77	Med	60-79	
30	Invertebrate	*Portunus armatus*	Blue Swimmer Crab	Portunidae	DI	1	1	1	1	1	2	2	1.29	3	3	2	3	2.33	2.66	80	Low	≥80	↓
94	Teleost	*Neosebastes pandus*	Bighead Gurnard Perch	Neosebastidae	DI	3	3	3	1	1	1	3	2.14	2	3	3	3	2.33	3.16	61	Med	60-79	
99	Teleost	*Gymnapistes marmoratus*	Soldier	Tetrarogidae	DI	1	2	3	1	1	1	2	1.57	1	3	3	3	1.65	2.28	90	Low	≥80	
100	Teleost	*Glyptauchen panduratus*	Goblinfish	Tetrarogidae	DI	1	2	3	1	1	1	2	1.57	1	3	3	3	1.65	2.28	90	Low	≥80	
104	Teleost	*Lepidotrigla papilio*	Spiny Gurnard	Triglidae	DI	1	2	1	1	1	1	3	1.43	3	3	3	3	3.00	3.32	53	High	<60	
109	Teleost	*Pterygotrigla polyommata*	Latchet	Triglidae	DI	1	2	1	1	1	1	2	1.29	1	3	3	3	1.65	2.09	93	Low	≥80	
118	Teleost	*Platycephalus speculator*	Southern Bluespotted Flathead	Platycephalidae	DI	1	2	1	1	1	1	3	1.43	2	3	3	3	2.33	2.73	77	Med	60-79	
122	Teleost	*Pegasus lancifer*	Sculptured Seamoth	Pegasidae	DI	3	3	3	1	1	1	3	2.14	2	3	2	3	1.88	2.85	73	Med	60-79	
124	Teleost	*Caesioperca lepidoptera*	Butterfly Perch	Serranidae	DI	1	1	1	1	1	1	2	1.14	1	3	3	3	1.65	2.01	95	Low	≥80	
125	Teleost	*Caesioperca rasor*	Barber Perch	Serranidae	DI	1	1	1	1	1	1	2	1.14	1	3	3	3	1.65	2.01	95	Low	≥80	
142	Teleost	*Sillaginodes punctata*	King George Whiting	Sillaginidae	DI	1	1	1	1	1	1	3	1.29	3	3	3	3	3.00	3.26	56	High	<60	
151	Teleost	*Pseudocaranx wrighti*	Skipjack Trevally	Carangidae	DI	1	2	1	1	1	1	3	1.43	3	3	3	3	3.00	3.32	53	High	<60	
156	Teleost	*Parequula melbournensis*	Silverbelly	Gerreidae	DI	1	1	3	1	1	1	3	1.57	3	3	3	3	3.00	3.39	50	High	<60	
158	Teleost	*Pagrus auratus*	Snapper	Sparidae	DI	1	2	2	2	1	1	3	1.71	3	3	3	3	3.00	3.46	47	High	<60	
166	Teleost	*Pempheris multiradiata*	Bigscale Bullseye	Pempheridae	DI	1	1	3	1	1	1	2	1.43	1	3	3	3	1.65	2.18	92	Low	≥80	
168	Teleost	*Enoplosus armatus*	Old Wife	Enoplosidae	DI	3	3	3	1	1	1	2	2.00	1	3	3	3	1.65	2.59	82	Low	≥80	
170	Teleost	*Pentaceropsis recurvirostris*	Longsnout Boarfish	Pentacerotidae	DI	1	1	3	1	1	1	1	1.29	1	3	3	3	1.65	2.09	93	Low	≥80	
174	Teleost	*Parazanclistius hutchinsi*	Short Boarfish	Pentacerotidae	DI	1	1	3	1	1	1	2	1.43	1	3	3	3	1.65	2.18	92	Low	≥80	
175	Teleost	*Oplegnathus woodwardi*	Knifejaw	Oplegnathidae	DI	1	1	3	1	1	1	2	1.43	1	3	3	3	1.65	2.18	92	Low	≥80	
177	Teleost	*Nemadactylus douglasii*	Grey Morwong	Cheilodactylidae	DI	1	2	1	1	1	1	2	1.29	1	3	3	3	1.65	2.09	93	Low	≥80	
183	Teleost	*Sphyraena obtusata*	Striped Barracuda	Sphyraenidae	DI	1	1	1	1	1	1	3	1.29	1	3	3	3	1.65	2.09	93	Low	≥80	
184	Teleost	*Sphyraena novaehollandiae*	Snook	Sphyraenidae	DI	1	2	1	2	2	1	3	1.71	1	3	3	3	1.65	2.38	87	Low	≥80	
193	Teleost	*Ichthyscopus barbatus*	Fringe Stargazer	Uranoscopidae	DI	1	2	3	1	1	1	3	1.71	1	3	3	3	1.65	2.38	87	Low	≥80	
194	Teleost	*Kathetostoma laeve*	Common Stargazer	Uranoscopidae	DI	1	2	3	1	2	1	3	1.86	2	3	3	3	2.33	2.98	68	Med	60-79	
201	Teleost	*Foetorepus calauropomus*	Common Stinkfish	Callionymidae	DI	1	1	3	1	1	1	3	1.57	3	3	3	3	3.00	3.39	50	High	<60	
221	Teleost	*Pseudorhombus jenynsii*	Smalltooth Flounder	Paralichthyidae	DI	1	1	1	1	1	1	3	1.29	3	3	3	3	3.00	3.26	56	High	<60	
225	Teleost	*Ammotretis lituratus*	Spotted Flounder	Pleuronectidae	DI	1	2	1	1	1	1	2	1.29	1	3	3	3	1.65	2.09	93	Low	≥80	
231	Teleost	*Eubalichthys mosaicus*	Mosaic Leatherjacket	Monacanthidae	DI	1	2	1	1	1	2	2	1.43	2	3	3	3	2.33	2.73	77	Med	60-79	
232	Teleost	*Meuschenia scaber*	Velvet Leatherjacket	Monacanthidae	DI	1	2	1	1	1	2	2	1.43	1	3	3	3	1.65	2.18	92	Low	≥80	
233	Teleost	*Nelusetta ayraudi*	Ocean Jacket	Monacanthidae	DI	1	2	1	2	2	1	2	1.57	1	3	3	3	1.65	2.28	90	Low	≥80	
234	Teleost	*Scobinichthys granulatus*	Rough Leatherjacket	Monacanthidae	DI	1	1	1	1	1	2	2	1.29	3	3	3	3	3.00	3.26	56	High	<60	
236	Teleost	*Eubalichthys gunnii*	Gunn's Leatherjacket	Monacanthidae	DI	1	2	1	1	1	1	1	1.14	1	3	3	3	1.65	2.01	95	Low	≥80	
237	Teleost	*Meuschenia freycineti*	Sixspine Leatherjacket	Monacanthidae	DI	1	2	1	1	1	2	1	1.29	1	3	3	3	1.65	2.09	93	Low	≥80	
239	Teleost	*Aracana ornata*	Ornate Cowfish	Ostraciidae	DI	3	3	3	1	1	1	3	2.14	2	3	3	3	2.33	3.16	61	Med	60-79	
241	Teleost	*Aracana aurita*	Shaw's Cowfish	Ostraciidae	DI	3	3	3	1	1	1	3	2.14	2	3	3	3	2.33	3.16	61	Med	60-79	
243	Teleost	*Omegophora armilla*	Ringed Toadfish	Tetraodontidae	DI	1	1	2	1	1	2	2	1.43	1	3	3	3	1.65	2.18	92	Low	≥80	
244	Teleost	*Tetractenos glaber*	Smooth Toadfish	Tetraodontidae	DI	1	1	2	1	1	2	3	1.57	2	3	2	3	1.88	2.45	86	Low	≥80	↓
248	Teleost	*Contusus brevicaudus*	Prickly Toadfish	Tetraodontidae	DI	1	1	2	1	1	2	3	1.57	2	3	2	3	1.88	2.45	86	Low	≥80	↓
249	Teleost	*Diodon nicthemerus*	Globefish	Diodontidae	DI	2	2	2	1	1	1	3	1.71	3	3	3	3	3.00	3.46	47	High	<60	
260	Chondrichthyan	*Heterodontus portusjacksoni*	Port Jackson Shark	Heterodontidae	DI	2	3	3	2	2	2	2	2.29	3	3	3	1	1.65	2.82	74	Med	60-79	
286	Chondrichthyan	*Callorhinchus milii*	Elephantfish	Callorhinchidae	DI	1	1	3	1	2	2	2	1.71	1	3	3	3	1.65	2.38	87	Low	≥80	
307	Teleost	*Lophonectes gallus*	Crested Flounder	Bothidae	DI	1	1	2	1	1	1	3	1.43	2	3	3	3	2.33	2.73	77	Med	60-79	
310	Teleost	*Acanthaluteres spilomelanurus*	Bridled Leatherjacket	Monacanthidae	DI	1	1	1	1	1	1	1	1.00	2	3	3	3	2.33	2.53	83	Low	≥80	
311	Teleost	*Acanthaluteres vittiger*	Toothbrush Leatherjacket	Monacanthidae	DI	1	2	1	1	1	1	1	1.14	3	3	3	3	3.00	3.21	59	High	<60	
332	Teleost	*Centroberyx affinis*	Redfish	Berycidae	DI	1	3	3	1	1	1	2	1.71	1	3	3	3	1.65	2.38	87	Low	≥80	
369	Chondrichthyan	*Parascyllium ferrugineum*	Rusty Carpetshark	Parascylliidae	DI	3	3	3	1	2	2	2	2.29	1	3	3	3	1.65	2.82	74	Med	60-79	
391	Chondrichthyan	*Asymbolus vincenti*	Gulf Catshark	Scyliorhinidae	DI	1	1	3	1	2	2	3	1.86	1	3	3	3	1.65	2.48	85	Low	≥80	
511	Teleost	*Arripis georgianus*	Australian Herring	Arripidae	DI	2	2	1	1	1	1	3	1.57	1	3	3	3	1.65	2.28	90	Low	≥80	
539	Teleost	*Chelidonichthys kumu*	Red Gurnard	Triglidae	DI	1	2	1	1	1	1	2	1.29	1	3	3	3	1.65	2.09	93	Low	≥80	
608	Teleost	*Cheilodactylus nigripes*	Magpie Perch	Cheilodactylidae	DI	1	3	1	1	1	1	1	1.29	1	3	3	3	1.65	2.09	93	Low	≥80	
656	Chondrichthyan	*Pristiophorus nudipinnis*	Southern Sawshark	Pristiophoridae	DI	2	1	3	2	2	3	2	2.14	1	3	3	3	1.65	2.70	78	Med	60-79	
660	Chondrichthyan	*Squatina australis*	Australian Angelshark	Squatinidae	DI	2	3	3	2	2	3	3	2.57	2	3	3	1	1.43	2.94	70	Med	60-79	
669	Chondrichthyan	*Aptychotrema vincentiana*	Western Shovelnose Ray	Rhinobatidae	DI	1	1	3	1	2	3	2	1.86	2	3	3	3	2.33	2.98	68	Med	60-79	

						Productivity Scores [1-3]								Susceptibility Scores [1-3]								
ERA Species ID	Species type	Scientific name	Common name	Family name	Role in fishery	Average age at maturity	Average max age	Fecundity	Average max size	Average size at maturity	Reproductive strategy	Trophic level	Total Productivity (average)	Availability	Encounterability	Selectivity	Post-capture mortality	Total (multiplicative)	PSA Score	MSC PSA-derived score	Risk Category Name	MSC scoring guidepost	Change in risk
687	Chondrichthyan	*Trygonorrhina fasciata*	Southern Fiddler Ray	Rhinobatidae	DI	2	2	3	2	2	3	2	2.29	2	3	3	2	1.88	2.96	69	Med	60-79	
714	Chondrichthyan	*Hypnos monopterygium*	Coffin Ray	Torpedinidae	DI	2	3	3	1	1	3	2	2.14	1	3	3	3	1.65	2.70	78	Med	60-79	
757	Teleost	*Lepidotrigla spinosa*	Shortfish Gurnard	Triglidae	DI	1	2	1	1	1	1	3	1.43	2	3	3	3	2.33	2.73	77	Med	60-79	
764	Chondrichthyan	*Dasyatis brevicaudata*	Smooth Stingray	Dasyatidae	DI	2	2	3	2	2	3	3	2.43	2	3	3	2	1.88	3.07	65	Med	60-79	
767	Chondrichthyan	*Dasyatis thetidis*	Black Stingray	Dasyatidae	DI	2	2	3	2	2	3	2	2.29	1	3	3	3	1.65	2.82	74	Med	60-79	
772	Chondrichthyan	*Urolophus cruciatus*	Banded Stingaree	Urolophidae	DI	2	1	3	1	1	3	2	1.86	1	3	3	1	1.20	2.21	91	Low	≥80	
774	Chondrichthyan	*Urolophus paucimaculatus*	Sparsely-spotted Stingaree	Urolophidae	DI	1	2	3	1	1	3	2	1.86	2	3	3	1	1.43	2.34	88	Low	≥80	↓
784	Chondrichthyan	*Myliobatis australis*	Southern Eagle Ray	Myliobatidae	DI	2	2	3	2	2	3	2	2.29	1	3	3	3	1.65	2.82	74	Med	60-79	
812	Chondrichthyan	*Dipturus cerva*	Whitespotted Skate	Rajidae	DI	1	1	3	1	2	2	2	1.71	3	3	3	1	1.65	2.38	87	Low	≥80	
825	Teleost	*Sardinops sagax*	Australian Sardine	Clupeidae	DI	1	1	1	1	1	1	2	1.14	3	3	3	3	3.00	3.21	59	High	<60	↑
831	Teleost	*Engraulis australis*	Australian Anchovy	Engraulidae	DI	1	1	2	1	1	1	2	1.29	2	3	2	3	1.88	2.27	90	Low	≥80	
874	Teleost	*Gonorynchus greyi*	Beaked Salmon	Gonorynchidae	DI	3	3	3	1	1	1	1	1.86	3	3	3	3	3.00	3.53	43	High	<60	
887	Teleost	*Paratrachichthys macleayi*	Sandpaper Fish	Trachichthyidae	DI	2	2	1	1	1	2	3	1.71	1	3	3	3	1.65	2.38	87	Low	≥80	
900	Teleost	*Hyporhamphus melanochir*	Southern Garfish	Hemiramphidae	DI	1	2	3	1	1	1	1	1.43	2	2	3	3	1.88	2.36	88	Low	≥80	
903	Teleost	*Sorosichthys ananassa*	Little Pineapplefish	Trachichthyidae	DI	1	2	1	1	1	2	3	1.57	1	3	3	3	1.65	2.28	90	Low	≥80	
914	Teleost	*Filicampus tigris*	Tiger Pipefish	Syngnathidae	TEP	1	1	2	1	1	2	3	1.57	2	3	3	3	2.33	2.81	75	Med	60-79	
916	Teleost	*Pseudophycis bachus*	Red Cod	Moridae	DI	1	1	3	1	1	1	3	1.57	1	3	3	3	1.65	2.28	90	Low	≥80	
921	Teleost	*Genypterus tigerinus*	Rock Ling	Ophidiidae	DI	1	3	3	2	2	1	3	2.14	2	3	3	3	2.33	3.16	61	Med	60-79	
954	Teleost	*Histiogamphelus cristatus*	Rhino Pipefish	Syngnathidae	TEP	1	1	2	1	1	2	2	1.43	1	3	3	3	1.65	2.18	92	Low	≥80	
978	Teleost	*Leptoichthys fistularius*	Brushtail Pipefish	Syngnathidae	TEP	1	2	2	1	1	2	2	1.57	1	3	3	3	1.65	2.28	90	Low	≥80	
999	Chondrichthyan	*Mustelus antarcticus*	Gummy Shark	Triakidae	DI	1	2	3	1	2	3	3	2.14	1	3	3	3	1.65	2.70	78	Med	60-79	
1010	Teleost	*Phycodurus eques*	Leafy Seadragon	Syngnathidae	TEP	1	2	2	1	1	2	2	1.57	1	3	3	3	1.65	2.28	90	Low	≥80	
1011	Teleost	*Phyllopteryx taeniolatus*	Common Seadragon	Syngnathidae	TEP	1	2	2	1	1	2	2	1.57	1	3	3	3	1.65	2.28	90	Low	≥80	
1026	Teleost	*Stigmatopora argus*	Spotted Pipefish	Syngnathidae	TEP	1	1	2	1	1	2	2	1.43	1	3	3	3	1.65	2.18	92	Low	≥80	
1037	Teleost	*Neoplatycephalus richardsoni*	Tiger Flathead	Platycephalidae	DI	1	2	1	1	1	1	2	1.29	3	3	3	3	3.00	3.26	56	High	<60	
1040	Chondrichthyan	*Pristiophorus cirratus*	Common Sawshark	Pristiophoridae	DI	1	2	3	2	2	3	3	2.29	1	3	3	3	1.65	2.82	74	Med	60-79	
1065	Chondrichthyan	*Dipturus whitleyi*	Melbourne Skate	Rajidae	DI	2	3	3	2	2	2	3	2.43	1	3	3	3	1.65	2.94	70	Med	60-79	
1078	Chondrichthyan	*Squalus megalops*	Spikey Dogfish	Squalidae	DI	2	3	3	1	2	3	3	2.43	1	3	3	3	1.65	2.94	70	Med	60-79	
1087	Teleost	*Thyrsites atun*	Barracouta	Gempylidae	DI	1	2	1	2	2	1	3	1.71	2	3	3	3	2.33	2.89	72	Med	60-79	
1088	Teleost	*Trachurus declivis*	Common Jack Mackerel	Carangidae	DI	1	2	1	1	1	1	3	1.43	2	3	3	3	2.33	2.73	77	Med	60-79	
1197	Chondrichthyan	*Orectolobus maculatus*	Spotted Wobbegong	Orectolobidae	DI	2	3	3	3	2	3	3	2.71	1	3	3	3	1.65	3.18	60	Med	60-79	
1267	Invertebrate	*Glycymeris (Glycymeris) striatularis*	a dog cockle (not designated)	Glycymerididae	DI	1	2	3	1	1	1	1	1.43	1	3	1	3	1.20	1.87	97	Low	≥80	
1269	Invertebrate	*Atrina (Atrina) tasmanica*	a razor clam (not designated)	Pinnidae	DI	3	3	3	1	1	1	1	1.86	1	3	3	3	1.65	2.48	85	Low	≥80	
1270	Invertebrate	*Ostrea angasi*	Native Oyster	Ostreidae	DI	3	3	3	1	1	1	1	1.86	1	3	2	3	1.43	2.34	88	Low	≥80	
1271	Invertebrate	*Mimachlamys asperrima*	Doughboy Scallop	Pectinidae	DI	3	3	1	1	1	1	1	1.57	1	3	1	3	1.20	1.98	95	Low	≥80	
1272	Invertebrate	*Pecten fumatus*	Commercial Scallop	Pectinidae	DI	1	2	1	1	1	1	1	1.14	2	3	1	3	1.43	1.83	97	Low	≥80	
1274	Invertebrate	*Eucrassatella kingicola*	a cockle (not designated)	Crassatellidae	DI	3	3	3	1	1	1	1	1.86	2	3	2	3	1.88	2.64	80	Low	≥80	
1280	Invertebrate	*Sepioteuthis australis*	Southern Calamari	Loliginidae	BP	1	1	2	1	1	2	2	1.43	3	3	3	3	3.00	3.32	53	High	<60	
1285	Invertebrate	*Octopus berrima*	an octopus (not designated)	Octopodidae	DI	1	1	3	1	2	2	3	1.86	1	3	3	3	1.65	2.48	85	Low	≥80	
1297	Invertebrate	*Amoria (Amoria) undulata*	Wavy Volute	Volutidae	DI	3	3	3	1	1	2	1	2.00	1	3	3	3	1.65	2.59	82	Low	≥80	
1298	Invertebrate	*Ceratosoma brevicaudatum*	a nudibranch (not designated)	Chromodoridae	DI	3	3	3	1	1	2	3	2.29	1	3	3	3	1.65	2.82	74	Med	60-79	
1304	Invertebrate	*Ophionereis schayeri*	a brittlestar (not designated)	Ophionereididae	DI	3	3	2	1	1	2	3	2.14	1	3	3	3	1.65	2.70	78	Med	60-79	
1306	Invertebrate	*Ophiothrix (Ophiothrix) caespitosa*	a brittlestar (not designated)	Ophiotrichidae	DI	2	1	3	1	2	2	3	2.00	1	3	3	3	1.65	2.59	82	Low	≥80	
1342	Invertebrate	*Lamarckdromia globosa*	Fringed Sponge Crab	Dromiidae	DI	3	3	3	1	1	2	1	2.00	1	3	1	3	1.20	2.33	88	Low	≥80	
1348	Invertebrate	*Ovalipes australiensis*	Common Sand Crab	Portunidae	DI	3	3	3	1	1	2	1	2.00	1	3	3	3	1.65	2.59	82	Low	≥80	
1367	Teleost	*Neosebastes bougainvillii*	Gulf Gurnard Perch	Neosebastidae	DI	3	3	3	1	1	1	3	2.14	3	3	3	3	3.00	3.69	35	High	<60	
1401	Teleost	*Eubalichthys quadrispinis*	Fourspine Leatherjacket	Monacanthidae	DI	1	2	1	1	1	2	2	1.43	1	3	3	3	1.65	2.18	92	Low	≥80	
1523	Invertebrate	*Leptomithrax gaimardii*	Great Spider Crab	Majidae	DI	3	3	3	1	1	2	1	2.00	2	3	3	3	2.33	3.07	65	Med	60-79	
1537	Invertebrate	*Melicertus latisulcatus*	Western King Prawn	Penaeidae	TA	1	1	1	1	1	1	1	1.00	3	3	3	3	3.00	3.16	61	Med	60-79	
1664	Teleost	*Hippocampus abdominalis*	Bigbelly Seahorse	Syngnathidae	TEP	1	1	2	1	1	2	2	1.43	1	3	3	3	1.65	2.18	92	Low	≥80	
1806	Invertebrate	*Ibacus peronii*	Eastern Balmain Bug	Scyllaridae	BP	1	3	2	1	1	2	1	1.57	3	3	2	3	2.33	2.81	75	Med	60-79	
1808	Invertebrate	*Luidia australiae*	a seastar (not designated)	Luidiidae	DI	3	3	3	1	1	1	3	2.14	1	3	3	3	1.65	2.70	78	Med	60-79	
1822	Teleost	*Sillago bassensis*	School Whiting	Sillaginidae	DI	1	1	1	1	1	1	2	1.14	2	3	3	3	2.33	2.59	82	Low	≥80	
2495	Teleost	*Kanekonia queenslandica*	Deep Velvetfish	Aploactinidae	DI	3	3	3	1	1	3	2	2.29	1	3	2	3	1.43	2.69	78	Med	60-79	
2721	Invertebrate	*Erugosquilla grahami*	a mantis shrimp (not designated)	Squillidae	DI	1	1	3	1	1	2	3	1.71	3	3	3	2	2.33	2.89	72	Med	60-79	
7620	Teleost	*Trachichthys australis*	Southern Roughy	Trachichthyidae	DI	1	2	3	1	1	1	2	1.57	1	3	3	3	1.65	2.28	90	Low	≥80	
7644	Teleost	*Optivus agrammus*	Western Roughy	Trachichthyidae	DI	1	2	3	1	1	1	3	1.71	1	3	2	3	1.43	2.23	91	Low	≥80	
7761	Teleost	*Pelates octolineatus*	Western Striped Grunter	Terapontidae	DI	1	1	1	1	1	2	2	1.29	2	3	3	3	2.33	2.66	80	Low	≥80	↓
7771	Teleost	*Maxillicosta scabriceps*	Little Gurnard Perch	Neosebastidae	DI	3	3	3	1	1	1	3	2.14	3	3	2	3	2.33	3.16	61	Med	60-79	
7849	Teleost	*Neopataecus waterhousii*	Whiskered Prowfish	Pataecidae	DI	3	3	3	1	1	3	3	2.43	1	3	3	3	1.65	2.94	70	Med	60-79	
7915	Teleost	*Cnidoglanis macrocephalus*	Estuary Cobbler	Plotosidae	DI	1	2	2	1	2	3	1	1.71	1	3	3	3	1.65	2.38	87	Low	≥80	
7947	Teleost	*Rhycherus filamentosus*	Tasselled Anglerfish	Antennariidae	DI	3	3	3	1	1	3	3	2.43	1	3	3	3	1.65	2.94	70	Med	60-79	
7948	Teleost	*Phyllophryne scortea*	Whitespotted Anglerfish	Antennariidae	DI	3	3	3	1	1	3	3	2.43	1	3	2	3	1.43	2.82	74	Med	60-79	

						Productivity Scores [1-3]								Susceptibility Scores [1-3]									
ERA Species ID	Species type	Scientific name	Common name	Family name	Role in fishery	Average age at maturity	Average max age	Fecundity	Average max size	Average size at maturity	Reproductive strategy	Trophic level	Total Productivity (average)	Availability	Encounterability	Selectivity	Post-capture mortality	Total (multiplicative)	PSA Score	MSC PSA-derived score	Risk Category Name	MSC scoring guidepost	Change in risk
8003	Chondrichthyan	*Sutorectus tentaculatus*	Cobbler Wobbegong	Orectolobidae	DI	3	3	3	1	2	3	2	2.43	2	3	3	1	1.43	2.82	74	Med	60-79	
8164	Teleost	*Spratelloides robustus*	Blue Sprat	Clupeidae	DI	1	1	1	1	1	2	2	1.29	1	3	3	3	1.65	2.09	93	Low	≥80	
8166	Teleost	*Hyperlophus vittatus*	Sandy Sprat	Clupeidae	DI	1	1	1	1	1	1	2	1.14	1	2	2	3	1.28	1.71	98	Low	≥80	
8258	Chondrichthyan	*Urolophus orarius*	Coastal Stingaree	Urolophidae	DI	1	2	3	1	1	3	2	1.86	1	3	3	1	1.20	2.21	91	Low	≥80	
8303	Teleost	*Austrolabrus maculatus*	Blackspotted Wrasse	Labridae	DI	1	1	3	1	1	1	2	1.43	1	3	2	3	1.43	2.02	95	Low	≥80	
8326	Teleost	*Pictilabrus laticlavius*	Senator Wrasse	Labridae	DI	1	2	3	1	1	1	2	1.57	1	3	3	3	1.65	2.28	90	Low	≥80	
8333	Teleost	*Brachaluteres jacksonianus*	Southern Pygmy Leatherjacket	Monacanthidae	DI	1	1	3	1	1	2	2	1.57	3	3	2	3	2.33	2.81	75	Med	60-79	
8341	Teleost	*Cantheschenia longipinnis*	Smoothspine Leatherjacket	Monacanthidae	DI	1	1	3	1	1	2	1	1.43	1	3	3	3	1.65	2.18	92	Low	≥80	
8362	Teleost	*Taratretis derwentensis*	Derwent Flounder	Pleuronectidae	DI	1	2	1	1	1	3	2	1.57	1	3	3	3	1.65	2.28	90	Low	≥80	
8413	Teleost	*Chelmonops curiosus*	Western Talma	Chaetodontidae	DI	1	1	3	1	1	1	2	1.43	1	3	3	3	1.65	2.18	92	Low	≥80	
8597	Teleost	*Polyspina piosae*	Orangebarred Puffer	Tetraodontidae	DI	1	1	3	1	1	2	3	1.71	2	3	2	3	1.88	2.54	83	Low	≥80	↓
8642	Teleost	*Cristiceps australis*	Southern Crested Weedfish	Clinidae	DI	1	1	3	1	1	1	3	1.57	1	3	3	3	1.65	2.28	90	Low	≥80	
8677	Teleost	*Upeneichthys vlamingii*	Bluespotted Goatfish	Mullidae	DI	1	1	1	1	1	1	3	1.29	3	3	3	3	3.00	3.26	56	High	<60	
8682	Teleost	*Parapriacanthus elongatus*	Elongate Bullseye	Pempheridae	DI	1	1	3	1	1	1	3	1.57	3	3	3	3	3.00	3.39	50	High	<60	
8683	Teleost	*Pempheris klunzingeri*	Rough Bullseye	Pempheridae	DI	1	1	3	1	1	1	2	1.43	2	2	3	3	1.88	2.36	88	Low	≥80	
8719	Teleost	*Vincentia conspersa*	Southern Cardinalfish	Apogonidae	DI	1	1	3	1	1	3	2	1.71	1	3	3	3	1.65	2.38	87	Low	≥80	
8863	Teleost	*Parapercis ramsayi*	Spotted Grubfish	Pinguipedidae	DI	1	1	3	1	1	1	3	1.57	2	3	3	3	2.33	2.81	75	Med	60-79	
8875	Teleost	*Siphonognathus attenuatus*	Slender Weed Whiting	Odacidae	DI	1	1	3	1	1	3	2	1.71	1	3	2	3	1.43	2.23	91	Low	≥80	
8880	Teleost	*Siphonognathus radiatus*	Longray Weed Whiting	Odacidae	DI	1	1	3	1	1	3	2	1.71	1	2	3	3	1.43	2.23	91	Low	≥80	
8881	Teleost	*Siphonognathus argyrophanes*	Tubemouth	Odacidae	DI	1	2	3	1	1	3	2	1.86	1	3	3	3	1.65	2.48	85	Low	≥80	
8883	Teleost	*Odax acroptilus*	Rainbow Cale	Odacidae	DI	1	1	3	1	1	3	1	1.57	1	3	3	3	1.65	2.28	90	Low	≥80	
8884	Teleost	*Siphonognathus caninis*	Sharpnose Weed Whiting	Odacidae	DI	1	1	3	1	1	3	2	1.71	1	3	2	3	1.43	2.23	91	Low	≥80	
8887	Teleost	*Parapercis haackei*	Wavy Grubfish	Pinguipedidae	DI	1	1	3	1	1	1	3	1.57	3	3	2	3	2.33	2.81	75	Med	60-79	
8971	Teleost	*Neoodax balteatus*	Little Weed Whiting	Odacidae	DI	1	1	3	1	1	3	2	1.71	1	3	3	3	1.65	2.38	87	Low	≥80	
8988	Teleost	*Vincentia badia*	Scarlet Cardinalfish	Apogonidae	DI	1	1	3	1	1	3	3	1.86	3	3	2	3	2.33	2.98	68	Med	60-79	
8989	Teleost	*Vincentia macrocauda*	Smooth Cardinalfish	Apogonidae	DI	1	1	3	1	1	3	2	1.71	1	3	2	3	1.43	2.23	91	Low	≥80	
9240	Invertebrate	*Ischnochiton (Heterozona) cariosus*	a chiton (not designated)	Ischnochitonidae	DI	3	3	3	1	1	1	2	2.00	1	3	2	3	1.43	2.46	85	Low	≥80	
9241	Invertebrate	*Pinna bicolor*	Razor Clam	Pinnidae	DI	1	3	3	1	1	1	1	1.57	1	3	3	3	1.65	2.28	90	Low	≥80	
9242	Invertebrate	*Equichlamys bifrons*	Queen Scallop	Pectinidae	DI	2	2	3	1	1	1	1	1.57	2	3	2	3	1.88	2.45	86	Low	≥80	↓
9243	Invertebrate	*Acrosterigma cygnorum*	Heart Cockle	Cardiidae	DI	3	3	3	1	1	1	1	1.86	1	3	2	3	1.43	2.34	88	Low	≥80	
9244	Invertebrate	*Dosinia victoriae*	a venus cockle (not designated)	Veneridae	DI	3	3	3	1	1	1	1	1.86	2	3	2	3	1.88	2.64	80	Low	≥80	
9245	Invertebrate	*Cleidothaerus albidus*	a rock shell (not designated)	Cleidothaeridae	DI	3	3	3	1	1	1	1	1.86	2	2	2	3	1.58	2.44	86	Low	≥80	
9246	Invertebrate	*Sepia apama*	Giant Cuttlefish	Sepiidae	DI	1	1	2	1	2	2	3	1.71	2	3	3	3	2.33	2.89	72	Med	60-79	
9247	Invertebrate	*Sepia novaehollandae*	a cuttlefish (not designated)	Sepiidae	DI	1	1	3	1	1	2	3	1.71	3	3	3	3	3.00	3.46	47	High	<60	
9248	Invertebrate	*Sepioloidea lineolata*	Pinstripe Bottle-Tailed Squid	Sepiadariidae	DI	3	3	3	1	1	2	3	2.29	2	3	2	3	1.88	2.96	69	Med	60-79	
9249	Invertebrate	*Sepiadarium austrinum*	Southern Bottletail Squid	Sepiadariidae	DI	3	3	3	1	1	2	3	2.29	2	3	1	3	1.43	2.69	78	Med	60-79	
9250	Invertebrate	*Octopus australis*	Southern Octopus	Octopodidae	DI	3	3	3	1	1	2	3	2.29	3	3	3	1	1.65	2.82	74	Med	60-79	
9251	Invertebrate	*Diodora lincolnensis*	a keyhole limpet (not designated)	Fissurellidae	DI	3	3	3	1	1	3	1	2.14	1	3	2	3	1.43	2.57	82	Low	≥80	
9252	Invertebrate	*Tugali cicatricosa*	a shield limpet (not designated)	Fissurellidae	DI	3	3	3	1	1	3	1	2.14	1	2	1	3	1.13	2.42	86	Low	≥80	
9253	Invertebrate	*Clanculus flagellatus*	a topshell (not designated)	Trochidae	DI	3	3	3	1	1	3	2	2.29	1	2	1	3	1.13	2.55	83	Low	≥80	
9254	Invertebrate	*Astele (Astele) armillatum*	a topshell (not designated)	Calliostomatidae	DI	3	3	3	1	1	2	2	2.14	2	3	1	3	1.43	2.57	82	Low	≥80	
9255	Invertebrate	*Zoila friendii thersites*	Black Cowry	Cypraeidae	DI	3	3	3	1	1	2	2	2.14	1	3	3	3	1.65	2.70	78	Med	60-79	
9256	Invertebrate	*Cymatiella verrucosa*	a triton shell (not designated)	Ranellidae	DI	3	3	3	1	1	3	2	2.29	1	2	1	3	1.13	2.55	83	Low	≥80	
9257	Invertebrate	*Fusinus australis*	a spindle shell (not designated)	Buccinidae	DI	3	3	3	1	1	1	2	2.00	1	3	3	3	1.65	2.59	82	Low	≥80	
9258	Invertebrate	*Ptilometra macronema*	a crinoid (not designated)	Ptilometridae	DI	3	3	3	1	1	3	1	2.14	2	3	2	3	1.88	2.85	73	Med	60-79	
9259	Invertebrate	*Astropecten triseriatus*	a seastar (not designated)	Astropectinidae	DI	3	3	3	1	1	1	3	2.14	1	3	3	3	1.65	2.70	78	Med	60-79	
9260	Invertebrate	*Goniodiscaster seriatus*	a seastar (not designated)	Oreasteridae	DI	3	3	3	1	1	1	3	2.14	1	3	2	3	1.43	2.57	82	Low	≥80	
9261	Invertebrate	*Conocladus australis*	Southern Basketstar	Gorgonocephalidae	DI	3	3	3	1	1	1	1	1.86	1	3	3	3	1.65	2.48	85	Low	≥80	
9262	Invertebrate	*Goniocidaris tubaria*	a sea urchin (not designated)	Cidaridae	DI	3	2	3	1	1	1	1	1.71	1	3	2	3	1.43	2.23	91	Low	≥80	
9263	Invertebrate	*Centrostephanus rodgersii*	Longspine Sea Urchin	Diadematidae	DI	1	2	3	1	1	1	1	1.43	1	3	1	3	1.20	1.87	97	Low	≥80	
9264	Invertebrate	*Amblypneustes pallidus*	a sea urchin (not designated)	Temnopleuridae	DI	3	2	3	1	1	1	1	1.71	1	3	1	3	1.20	2.09	93	Low	≥80	
9265	Invertebrate	*Ceto cuvieria*	a holothurian (not designated)	Psolidae	DI	3	3	3	1	1	1	1	1.86	1	3	3	3	1.65	2.48	85	Low	≥80	
9266	Invertebrate	*Holothuria (Thymiosycia) hartmeyeri*	a holothurian (not designated)	Holothuriidae	DI	3	3	3	1	1	1	1	1.86	3	3	3	3	3.00	3.53	43	High	<60	
9267	Invertebrate	*Nerocila serra*	an isopod (not designated)	Cymothoidae	DI	3	3	3	1	1	3	2	2.29	1	3	1	3	1.20	2.58	82	Low	≥80	
9268	Invertebrate	*Metapenaeopsis sp.*	Velvet Prawn	Penaeidae	DI	3	3	3	1	1	1	3	2.14	3	3	1	3	1.65	2.70	78	Med	60-79	
9269	Invertebrate	*Alpheus villosus*	Hairy Pistol Prawn	Alpheidae	DI	3	3	3	1	1	2	2	2.14	1	3	1	3	1.20	2.46	85	Low	≥80	
9270	Invertebrate	*Alpheus lottini*	Coral Snapping Shrimp	Alpheidae	DI	3	3	3	1	1	2	2	2.14	1	3	1	3	1.20	2.46	85	Low	≥80	
9271	Invertebrate	*Processa gracilis*	Long-Wristed Shrimp	Processidae	DI	3	3	3	1	1	1	1	1.86	1	3	1	3	1.20	2.21	91	Low	≥80	
9272	Invertebrate	*Paguristes frontalis*	Common Hermit crab	Diogenidae	DI	3	3	3	1	1	3	1	2.14	1	2	2	3	1.28	2.49	84	Low	≥80	
9273	Invertebrate	*Austrodromidia octodentata*	Bristled Sponge Crab	Dromiidae	DI	1	1	3	1	1	3	1	1.57	1	3	1	3	1.20	1.98	95	Low	≥80	
9274	Invertebrate	*Austrodromidia australis*	Southern Sponge Crab	Dromiidae	DI	1	1	3	1	1	3	1	1.57	2	3	1	3	1.43	2.12	93	Low	≥80	
9275	Invertebrate	*Naxia aurita*	Golden Decorator Crab	Majidae	DI	3	3	3	1	1	3	1	2.14	1	3	1	3	1.20	2.46	85	Low	≥80	
9276	Invertebrate	*Naxia aries*	Ramshorn Crab	Majidae	DI	3	3	3	1	1	3	1	2.14	1	3	1	3	1.20	2.46	85	Low	≥80	

						Productivity Scores [1-3]								Susceptibility Scores [1-3]								
ERA Species ID	Species type	Scientific name	Common name	Family name	Role in fishery	Average age at maturity	Average max age	Fecundity	Average max size	Average size at maturity	Reproductive strategy	Trophic level	Total Productivity (average)	Availability	Encounterability	Selectivity	Post-capture mortality	Total (multiplicative)	PSA Score	MSC PSA-derived score	Risk Category Name	MSC scoring guidepost	Change in risk
9277	Invertebrate	*Gomeza bicornis*	Masked Burrowing Crab	Corystidae	DI	3	3	3	1	1	3	1	2.14	3	3	1	3	1.65	2.70	78	Med	60-79	↑
9278	Invertebrate	*Nectocarcinus integrifrons*	Rough Rock Crab	Portunidae	DI	3	3	3	1	1	3	3	2.43	2	3	2	3	1.88	3.07	65	Med	60-79	
9279	Invertebrate	*Actaea calculosa*	Facetted Crab	Xanthidae	DI	3	3	3	1	1	3	1	2.14	1	3	1	3	1.20	2.46	85	Low	≥80	
9280	Invertebrate	Pilumnidae - undifferentiated	HAIRY CRAB	Pilumnidae	DI	3	3	3	1	1	3	1	2.14	2	3	1	3	1.43	2.57	82	Low	≥80	
9281	Teleost	*Aulopus purpurissatus*	Sergeant Baker	Aulopidae	DI	3	3	3	1	1	1	3	2.14	1	3	3	3	1.65	2.70	78	Med	60-79	
9282	Teleost	*Histiophryne cryptacanthus*	Rodless Anglerfish	Antennariidae	DI	3	3	3	1	1	3	3	2.43	1	3	2	3	1.43	2.82	74	Med	60-79	
9283	Teleost	*Leviprora inops*	Longhead Flathead	Platycephalidae	DI	1	1	1	1	1	1	2	1.14	1	3	3	3	1.65	2.01	95	Low	≥80	
9284	Teleost	*Thysanophrys cirronasa*	Tasselsnout Flathead	Platycephalidae	DI	1	2	1	1	1	1	3	1.43	2	3	3	3	2.33	2.73	77	Med	60-79	
9285	Teleost	*Cynoglossus broadhursti*	Southern Tongue Sole	Cynoglossidae	DI	1	1	3	1	1	3	3	1.86	3	3	3	3	3.00	3.53	43	High	<60	
9286	Chondrichthyan	*Asymbolus submaculatus*	Variegated Catshark	Scyliorhinidae	DI	1	1	3	1	2	2	3	1.86	1	3	3	3	1.65	2.48	85	Low	≥80	
90001	Invertebrate	Lepadidae - undifferentiated	a goose barnacle (not designated)	Lepadidae	DI	3	3	3	1	1	3	3	2.43	1	3	1	3	1.20	2.71	78	Med	60-79	
90002	Invertebrate	*Coscinasterias muricata*	Eleven-arm Seastar	Asteriidae	DI	3	3	3	1	2	1	3	2.29	1	3	3	3	1.65	2.82	74	Med	60-79	
90003	Invertebrate	*Tosia magnifica*	Biscuit Seastar	Goniasteridae	DI	3	3	3	1	1	3	3	2.43	1	3	3	3	1.65	2.94	70	Med	60-79	
90004	Teleost	*Seriolella brama*	Blue Warehou	Centrolophidae	TEP	1	2	3	1	1	1	3	1.71	1	3	3	3	1.65	2.38	87	Low	≥80	
90005	Teleost	*Ammotretis rostratus*	Longsnout Flounder	Pleuronectidae	DI	1	2	3	1	1	1	2	1.57	1	3	3	3	1.65	2.28	90	Low	≥80	
90006	Teleost	*Heteroclinus heptaeolus*	Ogilby's Weedfish	Clinidae	DI	3	3	3	1	1	3	3	2.43	1	3	3	3	1.65	2.94	70	Med	60-79	
90007	Teleost	*Torquigener pleurogramma*	Weeping Toadfish	Tetraodontidae	DI	2	1	3	1	1	3	3	2.00	1	3	3	3	1.65	2.59	82	Low	≥80	
90008	Chondrichthyan	*Trygonoptera mucosa*	Western Shovelnose Stingaree	Urolophidae	DI	3	3	3	1	1	3	3	2.43	2	3	3	1	1.43	2.82	74	Med	60-79	
90009	Teleost	*Hypselognathus rostratus*	Kinfesnout Pipefish	Syngnathidae	DI	1	1	3	1	1	2	3	1.71	1	3	3	3	1.65	2.38	87	Low	≥80	
90010	Chondrichthyan	*Trygonoptera imitata*	Eastern Shovelnose Stingaree	Urolophidae	DI	3	3	3	1	2	3	2	2.43	1	3	3	1	1.20	2.71	78	Med	60-79	
90011	Chondrichthyan	*Furgaleus macki*	Whiskery Shark	Triakidae	DI	3	2	3	2	2	3	3	2.57	1	3	3	3	1.65	3.06	65	Med	60-79	
90012	Chondrichthyan	*Orectolobus halei*	Gulf Wobbegong	Orectolobidae	DI	3	2	3	2	2	3	3	2.57	1	3	3	3	1.65	3.06	65	Med	60-79	
90013	Teleost	*Neosebastes scorpaenoides*	Common Gurnard Perch	Neosebastidae	DI	3	3	3	1	2	1	3	2.29	1	3	3	3	1.65	2.82	74	Med	60-79	
90014	Invertebrate	*Sepia braggi*	Bragg's Cuttlefish	Sepiidae	DI	3	3	3	1	1	3	3	2.43	1	3	2	3	1.43	2.82	74	Med	60-79	
90015	Invertebrate	*Octopus kaurna*	Southern Sand Octopus	Octopodidae	DI	3	3	3	1	2	3	3	2.57	1	3	3	3	1.65	3.06	65	Med	60-79	
90016	Invertebrate	*Octopus pallidus*	Pale Octopus	Octopodidae	DI	3	3	3	1	1	2	3	2.29	1	3	3	3	1.65	2.82	74	Med	60-79	
90024	Mammal	*Tursiops truncatus*	Common Bottlenose Dolphin	Delphinidae	TEP	2	3	3	3	3	3	3	2.86	1	3	3	3	1.65	3.30	55	High	<60	

Table 7: Additions in species classified as high risk or 'species of interest' from assessment reported in '2014 ESD risk assessment of the Spencer Gulf Prawn Fishery' (pp 78-82) compared to updated assessment. (NOTE: no species classified as high risk in the '2014 ESD risk assessment of the Spencer Gulf Prawn Fishery' dropped to a lower category in the updated PSA)

Scientific name	Common name	Classification Change
Sardinops sagax	Australian Sardine	Risk increased to High
Leptoichthys fistularius	Brushtail Pipefish	Added to species of interest
Phycodurus eques	Leafy Seadragon	Added to species of interest
Phyllopteryx taeniolatus	Common Seadragon	Added to species of interest
Stigmatopora argus	Spotted Pipefish	Added to species of interest
Hyporhamphus melanochir	Southern Garfish	Added to species of interest
Portunus armatus	Blue Swimmer Crab	Added to species of interest*
Sillaginodes punctata	King George Whiting	Removed as separate management programs
Pagrus auratus	Snapper	Removed as separate management programs

*Blue Swimmer Crab was recognised as a species of interest in the '2014 ESD risk assessment of the Spencer Gulf Prawn Fishery' but not included in the table of species of high risk or interest.

Table 8: CSA undertaken by SARDI.

Only main habitats scored?			Yes																				
Habitat details							Consequence score [1-3]								Spatial score [0.5-3]				CSA score			
							Habitat productivity		Gear-habitat interaction														
Scoring element	UoA/Gear type	Biome	Sub-biome	Feature	Habitat type	Depth (m)	Regeneration of biota	Natural disturbance	Removability of biota	Removability of substratum	Substratum hardness	Substratum ruggedness	Seabed slope	Consequence score	Gear footprint	Spatial overlap	Encounterability	Spatial score		MSC CSA-derived score	Risk category	MSC scoring guidepost
1	SGPF/Demersal trawl	Coast/ Shelf	Coastal margin/ Inner shelf	Sediment plains	Fine (mud, sand); flat (simple surface structure); biota dominated by mixed small/low-encrusting invertebrate communities	10-60 m	1	1	1	3	3	3	1	1.67	3	3	2.5	2.82	3.28	62	Med	60-79

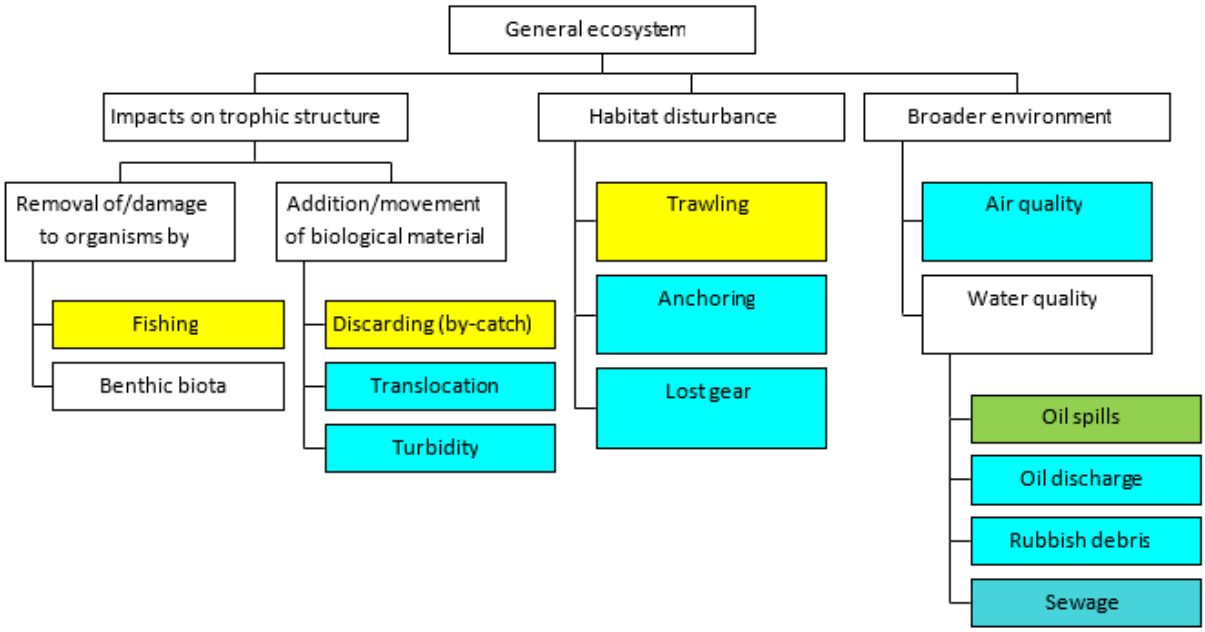

Fig. 1: General ecosystem component tree for the Spencer Gulf Prawn Fishery. For explanation of colour-coded risk categories see page 28 of the '2014 ESD risk assessment of the Spencer Gulf Prawn Fishery'.

- The only component changed from the '2014 ESD Risk Assessment of the Spencer Gulf Prawn Fishery' was the score in the component tree for "Oil Spills", which is changed from 'moderate' to 'low'.
  Consequence: 3, Likelihood: 1, Risk rating 3 (Low)
  - Consequence of an oil spill occurring were considered less severe, as prawn vessels generally carry low volumes of oil.
  - Likelihood of an oil spill was considered low given measures and procedures in place to prevent event and there has been no record of an oil spill from a prawn vessel.

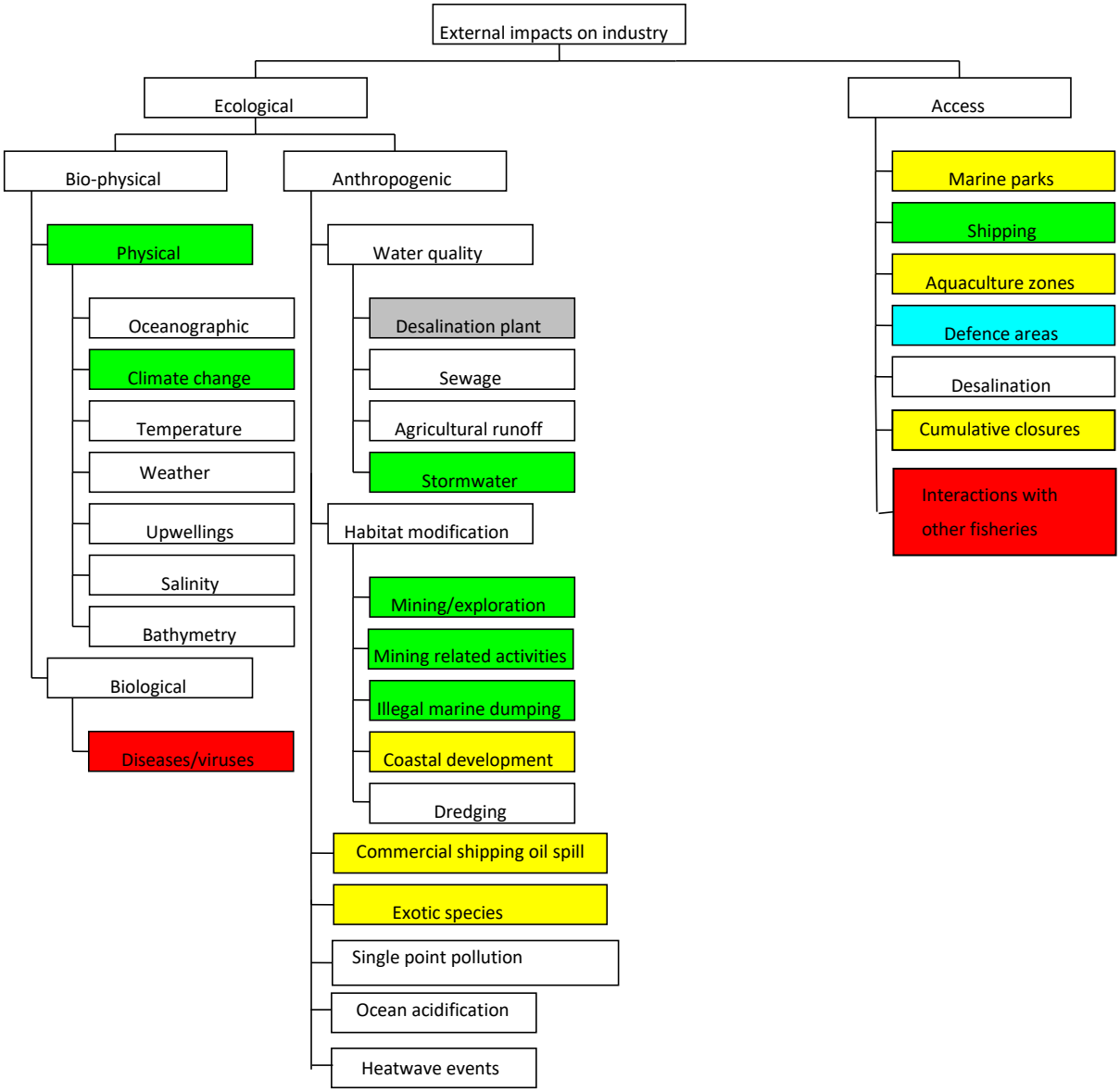

Fig: 2. External impacts component tree for the Spencer Gulf Prawn Fishery.

The following changes to the 'external impacts on industry' component tree were made from the component tree in the '2014 ESD Risk Assessment of the Spencer Gulf Prawn Fishery'.

Under the subheading of access, the following issues were added:

Cumulative closures

Consequence: 3, Likelihood: 5, Risk Rating (Low)

- Cumulative impact of closures on the fishery's operations (economic and ecological). Closures include self-imposed closures, marine parks, aquaculture zoning, defense areas and fisheries closures for other species.
- Due to the increasing number of closures there is a risk the cumulative effect reduces the fishing area available to operate in, which either reduces harvestable areas or displaces the fleet to currently low fished areas.
- Identification of the cumulative impact identifies the financial and ecological risks to the fishery.

Interactions with other fisheries' management strategies

Consequence: 3, Likelihood: 6, Risk Rating (High)

- As the prawn fishery overlaps with other fisheries, the management strategies and arrangements applied in other fisheries may impact on the prawn fishery.
- Closures can have an impact on fishing operations.
- It is likely spatial closures are used to manage other fisheries.
- The consequence on the prawn fishery are both financial and subsequently the impacts of the fishery on the ecosystem.

Under the subheading of anthropogenic following issues were added:

Single point pollution

No consequence or likelihood rating provided

- A single pollution source could impact juvenile habitat and affect recruitment, either through direct acute toxic impacts or indirectly though habitat modification.

Ocean acidification

No consequence or likelihood rating provided

- Can have an impact on juveniles or morphology of adults, impacting on their mortality.

Heat wave events

No consequence or likelihood rating provided

- Fish die off events are increasing in frequency, extended periods of hot weather may have direct impacts on species or indirectly through algal blooms.
- The impact of heat waves or resultant algae blooms on prawn species is unknown.

Under the subheading of anthropogenic following issues were modified:

Sewage

Consequence: 2, Likelihood: 4, Risk Rating (Moderate)

- In 2014 ESD Risk Assessment sewage was not rated.
- Identified through EPA habitat assessment reports sewage is a cause of habitat decline in some areas
- Concern was related to habitat quality for juvenile prawns in the littoral zone.

Agricultural runoff

Consequence: 2, Likelihood: 4, Risk Rating (Moderate)

- In 2014 ESD Risk Assessment agricultural runoff was not rated.
- Identified through EPA habitat assessment reports
- Concern was related to habitat quality for juvenile prawns in the littoral zone.

Stormwater

Consequence: 2, Likelihood: 4, Risk Rating (Moderate)

- Large single event may have a significant impact on ecosystem/ juvenile prawn recruitment.

Illegal marine dumping

Consequence: 2, Likelihood: 4, Risk Rating (Moderate)

- Illegally dumped gear can impact directly on the safety of vessels, given the risk of hookups.
- While consequence is minor likelihood is possible.
- Risk categorization as moderate needs to be identified.
- Reefs alter the ecosystems diversity in a given area.

Coastal development/ habitat impact

Consequence 3, Likelihood 3, Risk Rating (Low)

- Habitat modification may impact on recruitment to the fishery and ecosystem.

Dredging

Consequence: 3, Likelihood: 3, Risk Rating (Low)

- Impact on habitat and species directly.

Commercial shipping oil spill

Consequence: 3, Likelihood: 1, Risk Rating (Low)

- Impact of commercial shipping oil spill has occurred in the past, will lasting impact on recruitment to the fishery.
- The likelihood is low due to no recorded spills and the consequence is high (3) reflective of the potential volume that could be lost from a boat having lower consequences than previously assessed.
- Consequence changed from moderate to low

Exotic Species

Consequence 3, Likelihood 3, Risk Rating (Moderate)

- Increased from low to moderate.
- Exotic species can impact on the marine ecosystem and its ecosystem services, affecting the fishery.

Performance reports

PSA Analysis

Where a target, by-product or by-catch species was classified in the review of the 2014 as a high risk species or a species of interest unique to the 2014 assessment, performance reports were developed to address this risk. All other target, by-product or by-catch species classified as a high risk species, or species of interest, the previous performance report (PIRSA 2014) is considered to still apply.

Table 9: Performance Report for new High risk and 'species of interest' species

Species scientific name	Common name	Risk/ Importance	Notes
Sardinops sagax	Australian Sardine	High risk	Stock assessment program for Australian Sardine – consistent with discussions around King George Whiting and Snapper, no additional management actions required.
Leptoichthys fistularius	Brushtail Pipefish	Species of interest	TEPS species – by-catch program in place for TEPS species, both through survey and commercial fishing – industry is proactive in voluntarily closing areas known or likely to include preferred habitat of sygnathids.
Phycodurus eques	Leafy Seadragon	Species of interest	
Phyllopteryx taeniolatus	Common Seadragon	Species of interest	
Stigmatopora argus	Spotted Pipefish	Species of interest	
Hyporhamphus melanochir	Southern Garfish	Species of interest	
Tursiops truncatus	Common Bottlenose Dolphin	High	Monitor interactions with TEPS through Wildlife Interaction Logbooks annually

Table 10: Performance Report for other High and Moderate Risks

Component	Risk/Issue	Description	Risk/ Importance	Objective	Strategies
External Impacts on industry	Interactions with other fisheries management strategies	The risk of external factors impacting on the fishery	High	Sufficient biological and environmental information exists to inform management decisions	Collect fishery-dependent information through commercial logbooks. Maintain the fishery-independent prawn survey program. Assess the status of the stock through the quantitative stock assessment. Collect appropriate environmental data to aid assessment.
	Anthropogenic, water quality, sewage		Moderate		Collect appropriate environmental data to aid assessment.
	Anthropogenic, water quality, Agricultural run-off		Moderate		Collect appropriate environmental data to aid assessment.
	Anthropogenic, water quality, storm water		Moderate		Collect appropriate environmental data to aid assessment.
	Illegal marine dumping		Moderate		Collect appropriate environmental data to aid assessment.
	Exotic species		Moderate		Collect fishery-dependent information through commercial logbooks. Maintain the fishery-independent prawn survey program. Assess the status of the stock through the quantitative stock assessment. Collect appropriate environmental data to aid assessment.

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Appendices

APPENDIX 1: CONDUCTING THE CONSEQUENCE SPATIAL ANALYSIS (CSA)

DEFINING THE HABITAT (STEP 1)

The main habitat type(s) commonly encountered by the SGPF was determined by examining the spatial overlap between: (1) broad-scale marine benthic habitats (Suppl. Fig. S1 in Jones et al. 2018); (2) sedimentary facies (Fig. 8 in O'Connell et al. 2016) in Spencer Gulf; and (3) each trawl intensity category within the fishery's trawl footprint (based on effort from 2001/02–2018/19 using the density-derived method described in Noell 2017) (Fig. A1). Areas of low (0.5–1 h km^{-2} yr^{-1}) and medium (1–10 h km^{-2} yr^{-1}) trawl intensity predominantly comprises subtidal soft habitat (87% and 76%, respectively), which mostly consists of mixed skeletal sand (69% and 64%) (Table A1). The area of high trawl intensity (>10 h km^{-2} yr^{-1}) comprises subtidal soft (60%) and seagrass habitat (32%), each of which consist mostly of rhodolith [1]gravelly sand (74% and 93%, respectively) (Table A1). When compared to the trawl footprint total area, most of the area is occupied by subtidal soft habitat (77%), the proportion of seagrass diminishes (to 16%), and the sedimentary facies consists of either mixed skeletal sand (49%) or rhodolith gravelly sand (26%) (Table A1).

Although the overlap between the benthic habitat map and the trawl footprint has been quantified, the values are not absolute. The benthic habitat map represents the collation of available spatial data from several sources; however, these data varied in resolution and collection method, which can introduce uncertainty into the resulting map (Jones et al. 2018). Nevertheless, the overlap of the benthic habitat map and the trawl footprint is considered appropriate for broadly identifying the main habitat trawled by the SGPF and conducting the CSA.

Based on the predominant habitat and sedimentary characteristics, and when matched to nomenclature used by the MSC to define habitat in terms of substratum, geomorphology and characteristic biota, one main habitat type was identified. The SGPF operates in the benthic zone with substrate consisting of fine sandy or muddy sediment (Table A2). The geomorphology of this environment is generally flat, with simple surface structure and mixed small/low-encrusting invertebrate communities (Table A2). The main habitat type commonly encountered by the SGPF can therefore be abbreviated as 'Fine-Flat-Small encrusting'.

[1] Rhodolith beds are made up of both living and dead unattached nodules of crustose coralline algae, which are sometimes called 'popcorn' by fishers. Rhodolith beds have important ecological roles as they often host a high biodiversity of organisms through attachment or providing spaces to live in (Baker 2015).

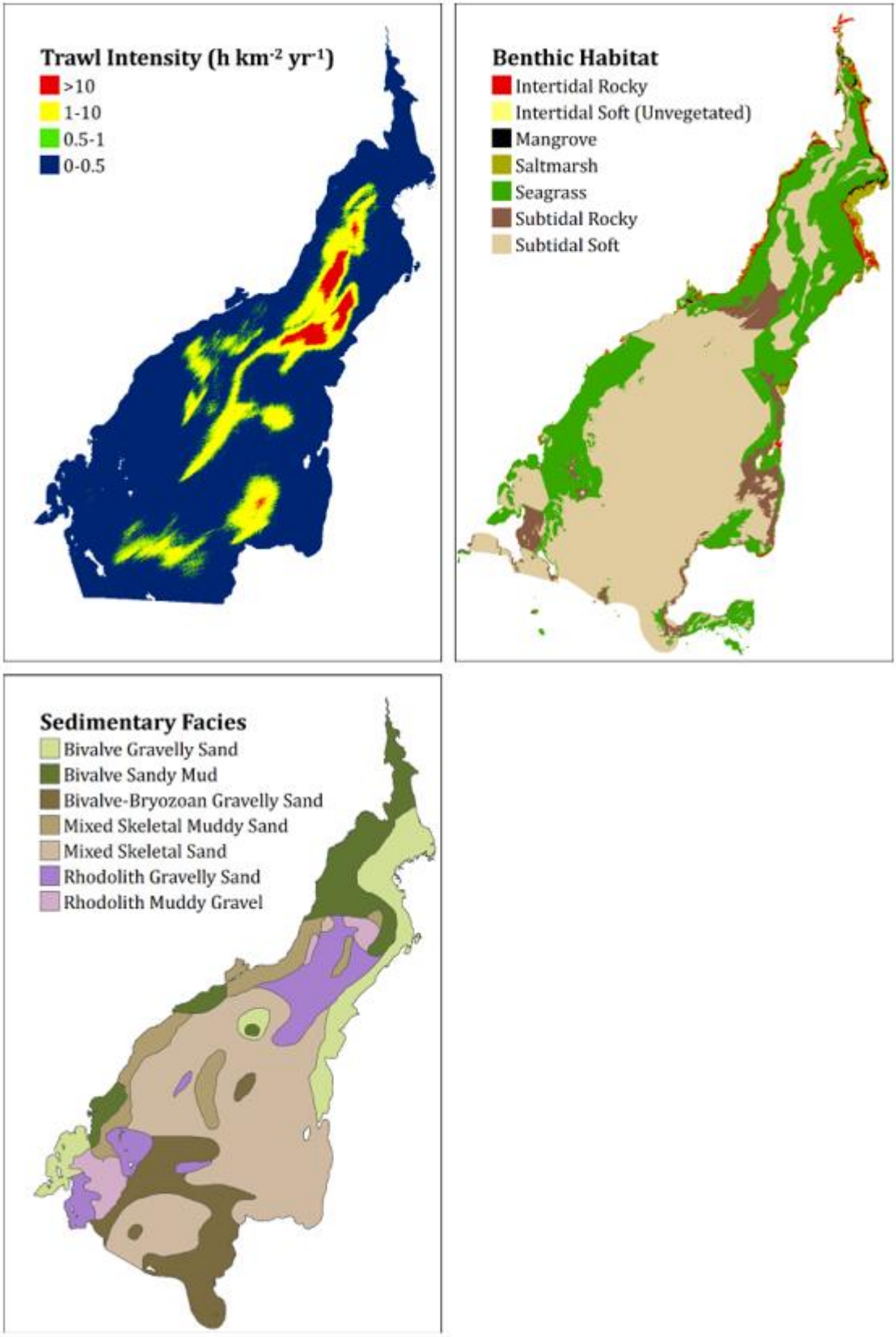

Fig. A1. Average trawl intensity of the SGPF from 2001/02–2018/19, and benthic habitat (Jones et al. 2018) and sedimentary facies (O'Connell et al. 2016) of Spencer Gulf.

Intensity	Benthic Habitat	Sedimentary Facies							*Total*
		Mixed Skeletal Sand	Bivalve/Bryozoan Gravelly Sand	Mixed Skeletal Muddy Sand	Rhodolith Gravelly Sand	Rhodolith Muddy Gravel	Bivalve Gravelly Sand	Bivalve Sandy Mud	
High	Seagrass	2	0	2	139	3	2	2	*150*
	Subtidal Rocky	0	0	0	39	0	0	0	*39*
	Subtidal Soft	43	0	0	212	0	15	16	*287*
Moderate	Seagrass	46	0	33	167	15	89	84	*433*
	Subtidal Rocky	4	0	0	258	0	0	0	*262*
	Subtidal Soft	1450	150	75	263	28	108	177	*2250*
Low	Seagrass	23	0	18	20	4	38	17	*119*
	Subtidal Rocky	2	0	0	21	0	0	0	*23*
	Subtidal Soft	660	96	60	42	10	31	61	*960*
Negligible	Intertidal Soft (Unvegetated)	7	0	1	0	0	6	0	*14*
	Intertidal Rocky	13	0	26	0	0	119	96	*254*
	Mangrove	0	0	9	0	0	36	32	*77*
	Saltmarsh	2	0	7	0	0	20	10	*37*
	Seagrass	1054	57	1235	502	367	1579	1318	*6113*
	Subtidal Rocky	483	61	35	337	17	103	9	*1044*
	Subtidal Soft	5549	2135	364	377	384	536	781	*10125*
	Total	*9337*	*2498*	*1864*	*2377*	*827*	*2681*	*2602*	*22184*
High	Seagrass	2	0	2	139	3	2	2	*150*
	Subtidal Rocky	0	0	0	39	0	0	0	*39*
	Subtidal Soft	43	0	0	212	0	15	16	*287*
Moderate	Seagrass	46	0	33	167	15	89	84	*433*
	Subtidal Rocky	4	0	0	258	0	0	0	*262*
	Subtidal Soft	**1450**	150	75	263	28	108	177	*2250*
Low	Seagrass	23	0	18	20	4	38	17	*119*
	Subtidal Rocky	2	0	0	21	0	0	0	*23*
	Subtidal Soft	660	96	60	42	10	31	61	*960*
	Total	*2229*	*246*	*187*	*1161*	*60*	*283*	*356*	*4521*

Table A1. Area of overlap (km^2) between benthic habitat and sedimentary facies for each trawl intensity category of the SGPF. Shaded bars indicate the predominance of habitat-sediment combination by trawl intensity category (colour) and total trawl footprint (i.e. sum of low, moderate and high intensity) (black).

Table A2. Habitat nomenclature (Table PF9, MSC 2018b). Shaded text indicate characteristics of the main habitat type within the trawl footprint of the SGPF.

Substratum	Geomorphology	Biota
Fine (mud, sand) • Mud (0.1 mm) • Fine sediments(0.1–1 mm) • Coarse sediments (1–4 mm)	Flat • Simple surface structure • Unrippled/flat • Current rippled/directed scour • Wave rippled	Large erect Dominated by: • Large and/or erect sponges • Solitary large sponges • Solitary sedentary/sessile epifauna (e.g. ascidians/ bryozoans) • Crinoids • Corals • Mixed large or erect communities
Medium • Gravel/pebble (4-60 mm)	Low relief • Irregular topography with mounds and depressions • Rough surface structure • Debris flow/rubble banks	Small erect/encrusting/burrowing Dominated by: • Small, low-encrusting sponges • Small, low-standing sponges • Consolidated (e.g. mussels) and unconsolidated bivalve beds (e.g. scallops) • Mixed small/low-encrusting invertebrate communities • Infaunal bioturbators
Large • Cobble/boulders (60 mm–3 m) • Igneous, metamorphic, or sedimentary bedrock (>3 m)	Outcrop • Subcrop (rock protrusions from surrounding sediment <1 m) • Low-relief outcrop (<1 m)	No fauna or flora • No apparent epifauna, infauna, or flora
Solid reef of biogenic origin • Biogenic (substratum of biogenic calcium carbonate) • Depositions of skeletal material forming coral reef base	High relief • High outcrop (protrusion of consolidated substrate >1 m) • Rugged surface structure	Flora Dominated by: • Seagrass species

Classifying the biome, sub-biome and their features

The biomes, sub-biomes, features and their associated depths emphasis the differences that exist in the fauna and life-history characteristics between depth zones and provide a way to estimate the spatial extent of the habitat(s) (MSC 2018c). The spatial overlap between the trawl footprint and bathymetry of the gulf indicate that half of the footprint is within the coastal margin (in depths 10–25 m), while the other half is on the inner shelf (in depths 25–60 m) (Table A3). The features of these sub-biomes are of the sediment plains type (Table A3).

Table A3. List of biomes, sub-biomes and features (Table PF10, MSC 2018b). Shaded text indicate characteristics relevant to the trawl footprint of the SGPF.

Biome	Sub-biome	Feature
Coast (0-25 m) Shelf (25-200 m) Slope (200-2,000 m) Abyss (>2,000 m)	Coastal margin (<25 m) Inner shelf (25-100 m) Outer shelf (100-200 m) Upper slope (200-700 m) Mid-slope (700-1,500 m)	Seamounts Canyons Abyss Shelf break (~150–300 m) Sediment plains Sediment terraces Escarpments Plains of scattered reef Large rocky banks

SCORING THE CONSEQUENCE ATTRIBUTES (STEP 2)

The seven consequence attributes are divided into two groups: habitat-productivity attributes (2) and gear-habitat interaction attributes (5) (Table A4). The overall consequence score is the weighted arithmetic mean of all seven attributes, with individual scores for the habitat-productivity attributes multiplied by 2 to reflect their increased importance.

Table A4. Consequence and spatial attributes for the CSA.

Consequence attributes	Spatial attributes
Habitat productivity 1. Regeneration of biota 2. Natural disturbance	1 . Gear footprint 2 . Spatial overlap 3 . Encounterability
Gear-habitat interaction 3. Removability of biota 4. Removability of substratum 5. Substratum hardness 6. Substratum ruggedness 7. Seabed slope	

Habitat productivity

Regeneration of biota

Biotas have different intrinsic rates of growth, reproduction and regeneration, which are also variable in different conditions of temperature, nutrients and productivity. Because habitat depth has an influence on these conditions, it is considered an appropriate proxy for regeneration of biota (MSC 2018c). Further, the type of biota is relevant due to different growth rates. In the absence of specific data on biota regeneration, as is the case for the SGPF, the predominance of small encrusting biota throughout the trawl footprint indicates that a score of **1** should be assigned to this attribute (Table A5).

Table A5. Scoring regeneration of biota based on age, growth and recolonization of biota (Table PF12, MSC 2018b).

Sub-biome			**Using available data**			**Using surrogate when data are not available**		
Annual	Less than decadal	More than decadal	No epifauna	Small erect/ encrusting	Large erect (sponges)	Large erect (ascidians and bryozoans)	Seagrass communities/ mixed faunal communities/ hard corals	Crinoids/ solitary/mixed communities/ hard and soft corals
Coastal margin (<25 m)	1	2	3	1	1	1	1	2	1
Inner shelf (25-100 m)	1	2	3	1	1	2	2	2	2
Outer shelf (100-200 m)	1	2	3	1	1	3	2	3	3
Upper slope (200- 700 m)	1	2	3	1	1	3	3	3	3
Mid-slope (700-1,500 m)	1	2	3	1	2	3	3	3	3

increase towards the head of the gulf (Nunes and Lennon 1986). Inverse estuaries are characterised by an outflow of dense, saline water in bottom layers and an inflow of oceanic water in surface layers. In Spencer Gulf, this density-driven circulation is influenced by the earth's rotation, such that the dense

saline outflows occur along the eastern side, whereas surface inflows occur along the western side (Kämpf et al. 2009).
Although the maximum depth of Spencer Gulf is 87 m (at its entrance in the south), the entire trawl footprint occurs in depths 10–60 m. Therefore, a score of **1** is assigned to this attribute (Table A6).

Table A6. Scoring natural disturbance (Table PF13, MSC 2018b).

Attribute		**Score**	
1	**2**	**3**	
Natural disturbance	Regular or severe natural disturbance	Irregular or moderate natural disturbance	No natural disturbance
Natural disturbance (in absence of information)	Coastal margin and shallow inner shelf (<60 m)	Deep inner shelf and outer shelf (60-200 m)	Slope (>200 m)

Gear-habitat interaction

Removability of biota

Removability of biota is influenced by the size, height, robustness, flexibility and structural complexity of the biota. Large, erect, inflexible or delicate biota are more susceptible to physical damage than small, low, flexible, robust or deep-burrowing biota (MSC 2018c). Given that the biota associated with the trawl footprint predominantly consists of mixed small/low-encrusting invertebrate communities, and that demersal trawl is exclusively used by the SGPF, a score of **1** is assigned to this attribute (Table A7).

Removability of substratum

This attribute relates to how susceptible the substratum is to removal by the fishing gear. For example, substrata that comprise large bedrock and boulders are highly resistant to impact. Although soft sediment is less resistant to impact, it is generally more resilient because it accumulates relatively rapidly and is altered by burrowing fauna (MSC 2018c). Nevertheless, given the high likelihood of removability, it is considered high risk. Since the substratum of the Fine-Flat-Small encrusting habitat encountered by the SGPF predominantly comprises fine sandy or muddy sediment, and that this substratum is exposed to demersal trawling throughout the trawl footprint, a score of **3** is assigned to this attribute (Table A7).

Table A7. Scoring the removability of biota and substratum attributes (Table PF14, MSC 2018b).

Gear type	**Removability of biota**	**Removability of substratum**

	Low, robust, small (<5 cm), smooth, or flexible biota OR robust, deep-burrowing biota	Erect, medium (<30 cm), moderately rugose, or inflexible biota OR moderately robust, shallow-burrowing biota	Tall, delicate, large (>30 cm high), rugose, or inflexible biota OR delicate, shallow-burrowing biota	Immovable (bedrock and boulders >3 m)	<6 cm (transferable)	6 cm–3 m (removable)
Hand collection	1	1	1	1	1	2
Demersal longline	1	1	2	1	1	1
Handline	1	1	2	1	1	1
Trap	1	2	2	1	1	1
Bottom gill net or other entangling net	1	2	3	1	1	1
Danish seine	1	2	3	1	2	3
Demersal trawl (including pair, otter twin-rig, and otter multi-rig)	1	3	3	1	3	3
Dredge	3	3	3	1	3	3

Substratum hardness

Substratum hardness considers whether the seabed is likely to degrade when it is interacted by the fishing gear (MSC 2018c). Unlike hard rocky substratum, which is intrinsically more resistant to impact, the fine sandy and muddy sediment throughout the trawl footprint of the SGPF is less resistant to impact. Therefore, a score of **3** is assigned to this attribute (Table A8).

Substratum ruggedness

Substratum ruggedness is based on the concept that accessibility of the fishing gear to the habitat is related to the ruggedness of the substratum (MSC 2018c). The geomorphology of the seabed throughout the trawl footprint of the SGPF is considered to primarily flat with simple surface structure, making it highly accessible. Therefore, a score of **3** is assigned to this attribute (Table A8).

Table A8. Scoring the substratum hardness and ruggedness attributes (Table PF15, MSC 2018b).

Gear type		**Substratum hardness**		**Substratum ruggedness**	
Hard (igneous, sedimentary, or heavily consolidated rock types)	Soft (lightly consolidated, weathered, or biogenic)	Sediments (unconsoli-dated)	High relief (>1 m), high outcrop, or rugged surface structure (cracks, crevices,	Low relief (<1.0 m), rough surface structure (rubble, small boulders, rock edges),	Flat, simple surface structure (mounds, undulations, ripples), current rippled, wave

			overhangs, large boulders, rock walls)	subcrop, or low outcrop	rippled, or irregular
Hand collection	1	2	3	3	3	1
Demersal longline	1	2	3	2	3	3
Handline	1	2	3	2	3	3
Trap	1	2	3	2	3	3
Bottom gill net or other entangling net	1	2	3	2	3	3
Danish seine	1	2	3	1	1	3
Demersal trawl (including, pair, otter twin-rig, and otter multi-rig)	1	2	3	1	3	3
Dredge	1	2	3	1	1	3

Seabed slope

The seabed slope attribute considers that the impact of the fishing gear on the habitat concerning mobilisation of the substratum is influenced by slope (MSC 2018c). The seabed of the coastal margin and inner shelf waters in which the SGPF operates (depths of 10–60 m) is largely characterised as flat, low-degree (<1) plains with simple, homogeneous surface structure. Due to these characteristics of the seabed slope, a score of **1** is assigned to this attribute (Table A9).

Table A9. Scoring the seabed slope attributes (Table PF15, MSC 2018b).

Gear type	**Seabed slope**		
	Low degree (<1): Plains in coastal margin, inner or outer shelf or mid-slope OR terraces in mid-slope OR rocky banks/fringing reefs in coastal margin, inner or outer shelf, or upper or mid-slope	Medium degree (1- 10): Terraces in outer shelf or upper slope	High degree (>10): Canyons in outer shelf, or upper or mid-slope OR seamounts/bioherms in coastal margin, inner shelf, or upper or mid- slope
Hand collection	1	2	3
Demersal longline	1	2	3
Handline	1	2	3

Trap	1	2	3
Bottom gill net or other entangling net	1	2	3
Danish seine	1	2	3
Demersal trawl (including, pair, otter twin-rig, and otter multi-rig)	1	2	3
Dredge	1	2	3

SCORING THE SPATIAL ATTRIBUTES (STEP 3)

The spatial score is the geometric mean of the three spatial attributes (Table A4).

Fishing gear footprint

Interpretation of fishing gear footprint, as one of the three spatial attributes for the CSA, differs to that for trawl footprint. The trawl footprint of the SGPF is a cumulative estimate of total area impacted by trawling over a specified timeframe, whereas the fishing gear footprint reflects the relative impact of the gear on the habitat it encounters, and is considered in terms of gear size, weight and mobility (MSC 2018c). According to the MSC Standard (2018a), only a single encounter is needed using a demersal trawl to cause an impact. Therefore, a score of **3** is assigned to this attribute (Table A10).

Table A10. Scoring the gear footprint attributes (Table PF16, MSC 2018b).

Gear type	**Gear footprint score**
Hand collection	1
Handline	1
Trap	1
Demersal longline	2
Bottom gill net or other entangling net	2
Danish seine	2
Demersal trawl (including pair, otter twin-rig, and otter multi-rig)	3
Dredge	3

Spatial overlap

Spatial overlap is defined as the overlap between a habitat's range and the UoA's fishing area within the 'managed area' (MSC 2018c). In this case, the Fine-Flat-Small encrusting habitat (≈ subtidal soft habitat) occupies 77% of the SGPF's trawl footprint. Therefore, a score of **3** is assigned to this attribute (Table A11).

Encounterability

Encounterability is a measure of the likelihood of the fishing gear encountering the main habitat. In the absence of a specific measure, encounterability was estimated as the mean spatial overlap within the trawl footprint, weighted by the proportion of effort across the trawl intensity categories. Accordingly, spatial overlaps between Fine-Flat-Small encrusting habitat and high, moderate and low intensity areas of 60%, 76% and 87%, respectively (Table 1), were weighted by factors of 0.49, 0.48 and 0.03 to yield an overall encounterability of 69%. Based on this proxy measure of encounterability, a score of **2.5** is assigned to this attribute (Table A11).

Table A11. Scoring spatial attributes (Table PF17, MSC 2018b).

Spatial attribute	**Score**					
	0.5	**1**	**1.5**	**2**	**2.5**	**3**
Spatial overlap	UoA overlap with a habitat is ≤15%	UoA overlap with a habitat is ≤30%	UoA overlap with a habitat is ≤45%	UoA overlap with a habitat is ≤60%	UoA overlap with a habitat is ≤75%	UoA overlap with a habitat is >75%
Encounterability	Likelihood of	Likelihood of	Likelihood of	Likelihood of	Likelihood of	Likelihood of

encounter-ability is ≤15%	encounter-ability is ≤30%	encounter-ability is ≤45%	encounter-ability is ≤60%	encounter-ability is ≤75%	encounter-ability is >75%

DETERMINING THE CSA AND MSC SCORES (STEP 4)

Using the MSC RBF Worksheets, aggregated consequence and spatial scores were combined into a CSA score, which was then converted into an equivalent MSC score. As a result, an MSC score of 62 was obtained for Fine-Flat-Small encrusting habitat. This falls within the **Medium** risk category and scoring guidepost of 60–79 (Table 6).

APPENDIX 2: CONSEQUENCE AND LIKELIHOOD TABLES

Consequence

Level	Ecological
Negligible (0)	Very insignificant impacts – unlikely to be even measurable at the scale of the stock/ecosystem/ community against natural background variability
Minor (1)	Possibly detectable but minimal impact on structure/function or dynamics
Moderate (2)	Maximum appropriate/acceptable level of impact (e.g. full exploitation rate for a target species)
Severe (3)	This level will result in wider and longer term impacts now occurring (e.g. recruitment overfishing)
Major (4)	Very serious impacts now occurring with relatively long timeframe likely to be needed to restore to an acceptable level
Catastrophic (5)	Widespread and permanent/irreversible damage or loss will occur – unlikely to ever be fixed (e.g. extinctions)

Likelihood

Level	Descriptor
Likely (6)	It is expected to occur
Occasional (5)	May occur
Possible (4)	Some evidence to suggest this is possible here
Unlikely (3)	Uncommon, but has been known to occur elsewhere
Rare (2)	May occur in exceptional circumstances
Remote (1)	Never heard of, but not impossible