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South Australian Charter Boat Fishery 2020/21



Durante, L. M., Smart, J. J. and Tsolos, A.

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> SARDI Aquatics Sciences PO Box 120 Henley Beach SA 5022

> > May 2022



Final Report to PIRSA Fisheries and Aquaculture



Department of Primary Industries and Regions

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South Australian Research and Development Institute (SARDI) acknowledges and appreciates the efforts of the licence holders that submitted logbook data.

This report was internally reviewed by Drs Adrian Linnane and Owen Burnell (SARDI), Jordan Lear (PIRSA Fisheries and Aquaculture) and formally released by SARDI Science Leader, Fisheries, Dr Stephen Mayfield.

EXECUTIVE SUMMARY

This report summarises information on spatial and temporal patterns in nominal catch and effort, client dynamics, fishing activities, and wildlife interactions in the South Australian Charter Boat Fishery (SACBF) between 07/08 and 20/21. Nominal catch and estimated weight data for Snapper and King George Whiting collected in the SACBF in 20/21 are considered with information from recreational fishery surveys in relation to allocation of the resources.

The number of active licences in the SACBF ranged from 74 to 79 between 07/08 and 13/14, 58 in 17/18, and was 47 in 20/21, representing a 40% decline since the commencement of the fishery. A total of 12,088 clients participated in trips in the SACBF during 20/21, representing a 45% decline since 07/08. However, annual client participation rates had stabilised since 13/14 at between 227 and 260 clients per active licence but were reduced (*c.f.* 159) in 19/20. In 20/21, the participation rate was 257 clients per active licence, with a 58% increase in clients participated in trips from 19/20 and a 10% reduction (c.f. 13,394) from 18/19.

In 20/21, chartered fishing activities were mostly concentrated in Gulf St. Vincent (GSV) and Kangaroo Island (54.3% of the catch) and Spencer Gulf (36.9% of the catch), with the West Coast (6.3% of the catch), Victor Harbor and the South-east (2.5% of the catch), and Other (offshore and shelf) regions (0.1% of the catch) comprising the remainder of the spatial area.

King George Whiting (42.2%), Bight Redfish (18.7%), Silver Trevally (7.2%), Southern Calamari (5.2%), Swallowtail (3.9%) and Southern Bluefin Tuna (3.0%) comprised 80% of the catch in 20/21. Other species harvested included Western Australian (WA) Salmon (2.7%), Snook (2.4%), Southern Garfish (2.1%), Leatherjacket (2%), and Blue Crab (1.4%). The remainder of the catch comprised of 41 different species.

King George Whiting comprised 36.4% of the total nominal catch in the SACBF in all years combined, with annual catches ranging between 19,249 and 54,563 fish since 07/08. A total of 27,556 King George Whiting were retained in 20/21 during targeted fishing. Estimated retained annual catches by weight of King George Whiting (10.7 t; catch = 31,614 fish) taken by clients in the SACBF during 20/21 were equivalent to ~5.6% of the total retained catches by weight of these species across the Marine Scalefish and Charter Boat fisheries.

Snapper comprised 18.5% of the total nominal catch in the SACBF in all years combined, with annual catches peaking at 34,450 fish in 07/08 before declining to 178 fish in 20/21. A total of 61 Snapper were retained in 20/21 during targeted fishing. Estimated retained annual catches by

weight of Snapper (0.4 t; catch = 178 fish) taken by clients in the SACBF during 20/21 were equivalent to \sim 0.9% of the total retained catches by weight of these species across the Marine Scalefish and Charter Boat fisheries.

There were 16 interactions with Threatened Endangered and Protected Species (TEPS) in the SACBF between 07/08 and 18/19, including four with marine mammals, eleven with protected fish species, and two with birds. No wildlife interactions were reported in the fishery in 19/20 or 20/21.

Downward trends in client numbers, fleet size (licences and vessels), and annual numbers of trip days may be partly explained by 1) the impact of COVID-19, and 2) the reduced access to Snapper due to fishing closures that limited fishing to areas south of Kangaroo Island and the South-east region.

Keywords: Recreational Fishing, Commercial Tourism, Participation, Snapper, King George Whiting, South Australia.

1. BACKGROUND

1.1. Overview

This report provides a summary of logbook data, collected by the South Australian Charter Boat Fishery (SACBF) between 1 July 2007 and 30 June 2021. Species-specific summaries are provided for the most commonly taken species in the fishery.

1.2. Description of the fishery

The SACBF is a commercial operation that provides recreational fishers (referred to as clients) with access to South Australia's fisheries resources, through the provision of purpose-built vessels, experienced operators and modernised technology. The SACBF contributed \$10.6 M to South Australia's Gross State Product, and \$6.9 M to household income (136 full-time equivalent jobs) in 19/20 (Dix *et al.* 2021). Economic performance indicators driven by some of the fishery performance metrics provided in this report were last summarised for 19/20, and suggested the value of the fishery in terms of gross value of production was following a decreasing trend since 12/13 (Dix *et al.* 2021).

Clients in the SACBF mostly use rod and lines but are also permitted to use bait pumps, cockle and crab rakes, crab nets and lobster pots. Operators can extend their service beyond fishing activities to include diving expeditions, ecotours and passenger trips. Diversification of services in the Charter Boat sector has been supported by the Fishing for Tourism - Charter Boat Diversification Program since 2019 (PIRSA 2019b), funding 17 projects to date. Charter trips may vary from multiple trips in one day to multiple day trips. The SACBF can operate in all coastal waters, including the gulfs and bays from the state borders of South Australia (SA) and Western Australia (WA) to SA - Victoria (VIC). The SACBF comprises Marine Fishing Areas (MFAs) in five key regions of SA (Fig. 1). These include the West Coast, Spencer Gulf, Gulf St. Vincent/Kangaroo Island, Victor Harbor/South-east and 'Other'. The 'Other' region includes eastern and central Great Australian Bight (GAB) from near Cape Catastrophe, Eyre Peninsula out to the continental shelf slope to the SA - WA border, and offshore areas to the south of Kangaroo Island (Fig. 1). The main species targeted by clients of the SACBF include Snapper (Chyrsophyrs auratus), King George Whiting (Sillaginodes punctatus), Bight Redfish (Centroberyx gerrardi), WA Salmon (Arripis truttaceus), Snook (Sphyraena novaehollandiae), Silver Trevally (Pseudocaranx dentex), Southern Bluefin Tuna (Thunnus maccoyii), Southern Calamari (Sepioteuthis australis) and Southern Garfish (Hypohamphus melanochir).



Figure 1. The Charter Boat Fishery reporting regions within the South Australian MFAs.

1.3. Management arrangements

PIRSA Fisheries and Aquaculture manages operations of the SACBF under provisions of theFisheriesManagement(CharterBoatFishery)Regulations2016(https://www.legislation.sa.gov.au)and section 44 of the South Australian Fisheries ManagementAct 2007. The current Management Plan for the South Australian Charter Boat Fishery is effectivefrom 1 April 2019 to 30 June 2022 (PIRSA 2019a).

The SACBF is a limited entry fishery with 82 licence holders of which 47 were active in 20/21. Management arrangements include both input and output controls. Input controls include gear limits per passenger, limited number of qualified registered masters per vessel, seasonal/area closures, and the prohibition of licence holders or crew undertaking fishing activities whilst

operating a charter (other than assisting clients). Output controls include minimum legal-size limits for permitted species, and bag and boat restrictions for retained species (Appendix 1).

1.4. Information sources used for assessment

A total of 58 Marine Fishing Areas (MFAs) are used by PIRSA Fisheries and Aquaculture and SARDI Aquatic Sciences for the purpose of statistical reporting and monitoring of commercial fishing activities (Fig. 1). Charter boat operators are required to provide data describing their fishing activities, daily catch and effort, clients, and interactions with TEPS as defined in the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). The logbook records must be submitted to SARDI Aquatic Sciences within 15 days of the end of each month (Appendix 2). Logbook information is entered into a database that is routinely reviewed to ensure the data satisfy research and management needs (Vainickis, 2010). Data used in this assessment were collected and submitted for the period between 1 July 2007 and 30 June 2021.

1.5. Objective

This report summarises information on fishing activities, client participation, spatial dynamics, patterns in nominal catch and effort and TEPS interactions in the SACBF between 07/08 and 20/21.

2. METHODS

2.1. Catch and effort statistics

The report constitutes a public-access document and summarises non-confidential data in accordance with the *Fisheries Management Act (2007)*, as provided by licence holders to SARDI Aquatic Sciences in the SACBF Logbook (Appendix 2) and TEPS logbook. For each trip, the operators are required to report a suite of information describing the activities. Logbook information collected includes the master and vessel names, licence number, port of operation, time and date of trip start and end, number of clients and their details, including postal code, state, territory or country. Activities described in entries include instances where clients were game fishing, fishing in inshore (0–50 m in depth), offshore (50–250 m in depth), or deep-water areas (>250 m in depth), using lobster pots, drop-nets and diving. Other information recorded includes whether the charter constitutes an eco-tour, its passenger numbers, number of fishers, area code (MFA), total fishing time (hours: minutes), amount of gear used, target species, and catch in number (not weight; i.e., nominal catch). Additional data collected for King George Whiting and Snapper include numbers of under-size released, legal-sized released, retained numbers within size grades, and total estimated weights of the catch of each of the two species during each trip.

Metrics used to assess the performance of the fishery in this report include:

- *Client dynamics*: Annual patterns in numbers of clients, and participation rates, and relative contribution to the client base (local by state and territory, and overseas).
- *Activity patterns*: Number of licences, active licences, active vessels, and fishing activities (e.g. inshore, offshore, deepsea, game fishing and eco-tours).
- Spatial and temporal patterns in nominal catch and fishing effort: All catch data mentioned in this report represent nominal catches (e.g., fish count data) unless otherwise indicated. Nominal catches were aggregated across financial years and species, region or MFA. Annual aggregated nominal catches of individuals of each species (or in some cases, species are grouped for logbook reporting purposes, e.g. 'Leatherjackets'). Annual and regional trends in fishing effort were expressed as hours fished as a product of the number of clients fishing.

2.2. Wildlife interactions

Interactions with TEPS reported in the Wildlife Interactions Logbook were summarised from data provided in Mackay (2018) and updated to include data from 17/18 to 20/21 seasons. Interactions with TEPS include physical contact between an individual, vessel, or the fishing gear with a protected species.

2.3. Data validation

Validation measures undertaken on the SACBF logbook data include code-driven queries activated during data-entry and reporting stages cross-checking during the collation and processing phases. Regular, random checks of data are undertaken as standard procedure (see Vainickis 2010). Catch and effort data were aggregated, tabulated and cross-checked with previous reports (Steer and Tsolos 2016, Rogers *et al.* 2017). Authors also discussed data-handling and quality assurance procedures, to confirm that interpretation of the data was consistent with the structure of the logbook reporting system and the activities in the fishery.

3. RESULTS

3.1. Client dynamics

Client participation rate was highest during the first six years of operation of the SACBF. The annual number of clients that participated in the fishery ranged from 7,616 to 23,710 between 07/08 and 20/21 (Table 1), with the lowest number of participants recorded in 19/20, increasing to 12,081 in 20/21. Patterns in participation rate closely correlated with the number of active licences operating in the fishery, which ranged from 47 to 79 between 07/08 and 20/21 (Table 1).

Annual participation rates ranged from 159 to 314 clients-per-active licence, with the lowest number recorded in 19/20, increasing to 257 in 20/21 (Table 1). A total of 92.2% of clients participating in the SACBF between 07/08 and 20/21 were from Australian states and territories; 5.3% of which had no recorded details identifying their state or country of origin (Fig. 2A). The overseas component of the client-base comprised of people from China (0.7%), Great Britain (0.4%), New Zealand (0.2%) and the United States (0.2%). The remaining 0.9% of overseas clients were from seventy-one other countries. Of the clients participating in the SACBF between 07/08 and 20/21 that provided Australian postal codes, 72.9% were South Australian, 14.6% were Victorian, 8.4% were from New South Wales, 1.9% were from Queensland, 1.0% were from Western Australia, 0.5% were from the Northern Territory, 0.3% were from Tasmania, and 0.5% were from the Australian Capital Territory (Fig. 2B).

<u>Fin Year</u>	Number of Clients	Number of Trips	Active_licences	Participation rate per active licence
2007/08	21,960	3,640	78	282
2008/09	21,431	3,561	79	271
2009/10	21,846	3,552	77	284
2010/11	20,095	3,322	77	261
2011/12	23,710	3,566	77	308
2012/13	23,532	3,391	75	314
2013/14	19,227	2,830	74	260
2014/15	15,136	2,389	61	248
2015/16	15,646	2,607	61	256
2016/17	14,461	2,393	59	245
2017/18	14,382	2,412	58	248
2018/19	13,364	2,238	59	227
2019/20	7,616	1,361	48	159
2020/21	12,081	2,054	47	257

 Table 1. Number of clients, number of trips, active licences and participation rate in the SACBF.



Figure 2. Annual patterns in client origin in the SACBF between 07/08 and 20/21. (A) Inclusive of overseas guests and those of unidentified origin and (B) Australian clients from each state and territory. UNK = unknown.

3.2. Fleet dynamics

Licences

The total number of licences in the SACBF ranged from 85 to 109 between 07/08 and 19/20 and was 82 licences in 20/21. The number of active licences in the fishery ranged from 47 to 79 between 07/08 and 20/21 (Table 1), with the lowest number in 20/21.

Spatial dynamics of operations by licences and vessels

The spatial dynamics of the SACBF is characterised by the highest proportion of operators and vessels being located near the main population centres of Adelaide and Port Lincoln (Fig. 3). Key ports where vessels operated from were Port Lincoln (6 licences), Marion Bay (6 licences), Cape Jervis (5 licences) and Port MacDonnell (5 licences). The fishery comprised 47 vessels in 20/21. Twenty-eight licences (60%) operated vessels in Gulf St. Vincent and Kangaroo Island and 12 operated in Spencer Gulf in 20/21. Regional centres along the South-east, from Victor Harbor to Port MacDonnell, had 13 licenced operators and vessels (28% of vessels). Only seven vessels or 15% of licence holders operated off the West Coast. Two vessels and licence holders or 4% of the fleet operated in offshore waters of the 'Other' region located in shelf waters of the GAB.



Figure 3. Spatial dynamics of active charter vessels during 20/21.

Activities during charter trips

Fishing in inshore regions where depths were ≤ 50 m was the most frequent activity in the SACBF and comprised 63–80% (Ave ± SD = 75 ± 4.9%) of fishing effort between 07/08 and 20/21 (Fig. 4). Fishing effort during these activities ranged between 29,103 and 105,935 hours (hrs) (Ave = 76,184 ± 24,553), with peaks in 07/08 and 11/12. In 20/21, trips in inshore regions comprised 76% of charter activities.

Fishing in offshore regions 50–250 m in depth comprised 12–28% (Ave = $18 \pm 3.8\%$) of fishing effort between 07/08 and 20/21. Effort during these activities ranged between 8,736 and 22,843 hrs (Ave = $17,038 \pm 4,019$) between 07/08 and 20/21.

In 20/21, trips in offshore waters comprised 28% of activities. Ecotourism activities and deepsea fishing in water depths \geq 250 m comprised the smallest percentage of activities (only 1.5 and 0.63% of mean annual effort, respectively).



Figure 4. Proportional distribution of activity type in the SACBF between 07/08 and 20/21.

3.3. Catch and effort

Seventy-eight species (or species groups) of fish, shark, mollusc, cephalopods and crustaceans were caught by clients of the SACBF between 07/08 and 20/21 (Table 2). These included a combined total of ~1,527,783 individuals. Annual trends in total nominal catches are provided in Fig. 5A.

Total catches during all years combined included King George Whiting (556,466; 36.4% of catch), Snapper (283,101; 18.5% of catch), and Bight Redfish (185,955; 12.2% of catch) (Table 2). A multitude of other species taken in the SACBF each comprised <5% of the total catch. This included WA Salmon (61,870; 4.1%), Swallowtail (54,612; 3.6%), Silver Trevally (57,430; 3.8%), Southern Garfish (50,354; 3.3%), Southern Calamari (45,821; 3.0%), Snook (43,487; 2.9%), Australian Herring (22,938; 1.5%), Leatherjacket spp. (20,921; 1.4%), Southern Bluefin Tuna (22,804; 1.5%), Blue Crab (16,294; 1.1%) and Red Mullet (16,080; 1.1%) (Table 2).

Spatial patterns in annual effort indicated that the highest percentages (49–64%; Ave = $57 \pm 5\%$) of fishing activity consistently occurred in GSV and Kangaroo Island, with between 23,412–72,442 hrs reported per year (Fig. 5B). The peak in annual effort in GSV and Kangaroo Island occurred in 07/08. Spencer Gulf supported between 20% and 36% (Ave = $26 \pm 6\%$) of annual fishing effort, with between 8,868 and 47,457 hrs recorded in the region per year. The peak in annual effort in Spencer Gulf occurred in 11/12.

In the remaining three regions, the annual average effort (% of total effort) across the fishery was 6% in both the Victor Harbor and South-east, and 8% in the West Coast regions, with 3% of the total effort in the Other (offshore) region. Effort peaked in 11/12 in the Victor Harbor and South-east, 17/18 in the West Coast regions, and during 14/15 in the Other (offshore) region. The seasonal signal in the SACBF based on average monthly effort showed consistent peaks between December and April (summer-autumn), and a secondary peak in October (Fig. 5C). Effort was relatively high and had the highest variability between December and April. Mean monthly effort was lowest in June, July, August and September.

A total of 74,964 fish, shark, mollusc, cephalopods and crustaceans were taken in the SACBF in 20/21. The total catch of all species was 30% higher than for the previous financial year ($n_{19/20}$ = 45,090) (Table 2). Four species comprised ~75% of the catch in 20/21 (Table 2), including King George Whiting (31,614; 42.2%), Bight Redfish (14,043; 18.7%), Silver Trevally (5,418; 7.2%), Southern Calamari (3,901; 5.2%). Other target species that supported minor components of catches were Swallowtail (2,915; 3.9%), Southern Bluefin Tuna (2,224; 3.0%), WA Salmon

(1,988; 2.7%), Snook (1,824; 2.4%), Southern Garfish (1,557; 2.1%), Leatherjacket (1,468; 2%), and Blue Crab (1,039; 1.4%) (Table 2). During 20/21, total effort was 67,818 hrs across the fishery, with 39,273 hrs fished in GSV and Kangaroo Island (58%), 14,042 hrs (21%) fished in Spencer Gulf, 8,601 hrs (13%) fished off the West Coast, 5,741 hrs (9%) fished in the Victor Harbor and South-east region, and 161 hrs (0.2%) fished in the Other (offshore) region.



Figure 5. (A) Annual total catch (number) of all species, (B) Effort as a percentage by geographic region, (C) monthly averaged daily effort for all species taken in the SACBF between 07/08 and 20/21.

Species	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	All years	20/21 %	All years %
All other species	4994	5794	5039	3673	7005	5515	5290	2891	2043	2776	1961	1653	1145	2728	52507	3.64	3.44
Australian Herring	2718	2864	3240	1658	1259	2120	2312	2050	1314	923	854	436	300	890	22938	1.19	1.5
WA Salmon	6732	7051	6075	1954	4815	5694	7112	4556	5657	3566	2524	2969	1177	1988	61870	2.65	4.05
Bight Redfish	14903	15624	17872	14034	16922	17397	14454	11746	12557	8970	10604	9830	6999	14043	185955	18.73	12.17
Blue Crab	1424	1497	1383	761	1112	677	1018	434	1612	1514	945	986	1892	1039	16294	1.39	1.07
Blue Morwong	101	Conf.	86	61	Conf.	37	45	66	Conf.	83	66	44	25	Conf.	813	0.05	0.05
Flathead	1120	1260	930	657	766	531	420	400	431	755	527	547	195	459	8998	0.61	0.59
Garfish	1365	6259	6327	6710	7117	2310	4450	3958	3143	1620	1707	1533	2298	1557	50354	2.08	3.3
Gummy Shark	248	292	460	293	453	656	446	556	414	316	414	367	259	375	5549	0.5	0.36
King George Whiting	52531	54563	49788	54327	54563	42289	35526	29469	35424	34125	34109	28889	19249	31614	556466	42.17	36.42
Leather Jacket	1932	1969	1850	1711	2342	2016	1901	973	1159	1107	964	963	566	1468	20921	1.96	1.37
Morwong	686	576	637	574	747	780	550	571	715	452	304	441	220	500	7753	0.67	0.51
Parrotfish	608	717	1059	584	830	949	632	638	667	716	534	236	84	442	8696	0.59	0.57
Red Mullet	2373	2059	1770	1263	888	1270	1367	913	1053	972	531	429	432	760	16080	1.01	1.05
Samsonfish	97	71	144	107	168	242	110	92	144	30	106	48	9	32	1400	0.04	0.09
School Shark	83	76	93	45	133	101	256	119	83	79	178	137	140	259	1782	0.35	0.12
Snapper	34450	30830	31828	28562	28865	25569	22233	20071	16801	14946	13127	13854	1787	178	283101	0.24	18.53
Snook	5376	3406	4260	5280	4861	3575	1726	2501	2340	3841	1515	1510	1472	1824	43487	2.43	2.85
Southern Bluefin Tuna	554	736	1035	1144	1552	1739	1824	2320	2393	1866	1962	1849	1606	2224	22804	2.97	1.49
Southern Calamari	2137	2244	3348	2307	7401	6571	4572	3167	2816	2364	2257	1371	1365	3901	45821	5.2	3
Swallowtail	4930	6509	5952	5306	6971	7919	3766	2795	1933	1372	1491	1519	1234	2915	54612	3.89	3.57
Trevally	3796	3476	4693	5479	4529	4540	3700	4466	5326	3933	3053	2566	2455	5418	57430	7.23	3.76
Yellowtail Kingfish	118	55	115	121	142	224	132	139	229	138	119	126	181	313	2152	0.42	0.14

Table 2. Annual catch (nominal; number of individuals) by species in the SACBF between 07/08and 20/21. Confidential data not shown (Conf.).

King George Whiting

Eight MFAs in Spencer Gulf (19, 30, 32 and 33; 229,526 fish), Investigator Strait (40 and 42; 146,178 fish), GSV and Backstairs Passage (36 and 44; 69,375 fish) supported ~80% of the catch of King George Whiting between 07/08 and 20/21 (Fig. 6A). A total of 19 of the MFAs comprised confidential data across the time-series. At the regional scale, catches of King George Whiting were taken in Gulf St. Vincent and Kangaroo Island (48.4%), Spencer Gulf (46.1%), and West Coast (4.7%) (Fig. 6B).

King George Whiting comprised 36.4% of the total nominal catch in the SACBF in all years combined, and 42.1% of the total catch in 20/21 (Table 2). Total annual catches of King George Whiting ranged between 19,249 and 54,563 fish between 07/08 and 20/21 (Fig. 6C). Total annual catch of King George Whiting was 31,614 fish in 20/21. Annual targeted numbers of King George Whiting retained ranged between 15,813 and 48,498 fish, with the peak occurring in 11/12. Targeted catches of King George Whiting retained in 20/21 was 27,556 fish. Trends in catches were relatively stable between 07/08 and 11/12, declined between 12/13 and 14/15, and stabilised thereafter (Fig. 6C), falling again in 18/19 and 19/20, with an increase in the most recent year. Estimated weight of the nominal catch of King George Whiting ranged between 6.6 t in 19/20 and 19.1 t in 08/09, and was 10.7 t in 20/21. Mean estimated annual weight of the nominal catch of King George Whiting was 13.6 \pm 4.1 t.

Released catches of sub-legal King George Whiting ranged between 2,202 and 8,848 fish (Ave = 4,609 ± 1,853) between 07/08 and 20/21 (Fig. 6D). This was the equivalent of 6.9 and 14.1% (Ave = 10.1 ± 1.9%) of the total catch, with the lowest percentage in 14/15 and the highest in 07/08. A total of 3,480 fish that were less than or equal to the minimum legal length (MLL) were released in 20/21. Catches of King George Whiting \geq MLL that were released ranged between 156 and 1,170 fish (Ave = 558 ± 272). This was the equivalent of 0.7–1.9% (Ave = 1.2 ± 0.4 %) of the total catch, with the lowest percentage occurring in 19/20 and the highest in 07/08. A total of 258 King George Whiting that were \geq MLL were released in 20/21.

Client numbers targeting King George Whiting ranged between 2,611 and 8,465 between 07/08 and 20/21 (Fig. 6E). The mean annual number of clients participating in trips targeting King George Whiting across all years was $5,852 \pm 1,899$ (Ave \pm SD). Downward trends in annual King George Whiting catches corresponded with declining effort and the number of clients targeting the species, with an increase in the most recent year. Target effort ranged between 12,429 and 36,574 hrs between 07/08 and 20/21, with the peak in 11/12 (Fig. 6E). In 20/21, effort targeted at King George Whiting recorded by 33 licence holders across the fishery was 21,634 hrs (Fig. 6E).

Seasonal patterns of proportional catches pooled across all years and regions indicated the peak months were in autumn, spring and summer. Winter months had the lowest catches (Fig. 6F).



Figure 6. King George Whiting. A. Spatial patterns in percentage catches in MFAs between 07/08 and 20/21. B. Annual catch by region. C. Annual patterns in target and non-target nominal catch, D. Numbers of legal-and under-size fish released. E. Target effort and number of clients targeting the species, and F. Seasonality of catches between 07/08 and 20/21.

Snapper

Seven MFAs in southern GSV and the Backstairs Passage (44; 76,770 fish), inner (19 and 21; 42,519 fish), central (23 and 32; 64,403) and southern Spencer Gulf (39; 26,363 fish), and Investigator Strait (40; 27,250 fish) supported >80% of the catch of Snapper between 07/08 and 20/21 (Fig. 7A). Data from 13 MFAs were confidential. Catches of Snapper were mainly taken in the regions of GSV and Kangaroo Island (51.4%) and Spencer Gulf (43.0%) (Fig. 7B).

Snapper comprised 18.5% of the total nominal catch in the SACBF in all years combined, and 0.2% of the total nominal catch in 20/21 (Table 2). Total annual catches of Snapper peaked at 34,450 fish in 07/08 and declined thereafter to 178 fish in 20/21 (Fig. 7C). The number of Snapper specifically targeted and subsequently retained was 61 fish in 20/21 (Fig. 7C). Catches underwent a step-wise decline, ranging from 31,127 to 25,341 fish between 07/08 and 11/12, and then declined to 10,919 fish in 18/19 and 61 in 20/21 (Fig. 7C). Estimated annual catch by weight ranged between 0.4 t in 20/21 and 92.9 t in 09/10. Mean estimated annual catch by weight of Snapper was 56.5 ± 29.5 tonnes.

Released catches of sub-legal Snapper between 07/08 and 20/21 ranged between 4,334 and 22,269 fish (Ave = 12,903 ± 5,357). This was the equivalent of 56.1 and 39.3% (Ave = 39.8 ± 9.9%) of the total catch, with the lowest percentage occurring in 14/15, and the highest percentage (n = 6,587; 65.6%) in 20/21 (Fig. 7D). Catches of Snapper that were \geq MLL and were released each season ranged between 668 and 3,275 fish (Ave = 1,778 ± 920). This was the equivalent of 2.5 and 32.6% (Ave = 7.3 ± 8.6%) of the total catch with the lowest percentage occurring in 15/16 and highest percentage in 20/21. A total of 3,275 Snapper \geq MLL were released in 20/21.

Client numbers targeting Snapper were lowest in 20/21 (128 clients) and peaked in 09/10 (13,230 clients) (Fig. 7E). The average annual number of clients targeting Snapper across all years was 7,563 ± 4,195. There was a 61.1% reduction in the numbers of clients targeting Snapper on trips between 09/10 and 18/19, with a steeper decline in 19/20 (95.5%) and 20/21 (99.8%). Target effort ranged between 387 and 66,453 hrs between 07/08 and 20/21, with the peak in 09/10 (Fig. 7E). In 20/21, effort targeted at Snapper recorded by 5 licence holders across the fishery was 387 hrs.

Seasonal patterns of proportional catches pooled across all years and regions indicated the peak months for catching Snapper in the SACBF were in December and January (summer), March (autumn), April (autumn) and October (spring). Lowest nominal catches occurred during winter (Fig. 7F).



Figure 7. Snapper. A. Spatial patterns in percentage catches in MFAs between 07/08 and 20/21.
 B. Annual catch by region. C. Annual patterns in target and non-target nominal catch, D. Numbers of legal-and under-size fish released. E. Target effort and number of clients targeting the species, and F. Seasonality of catches between 07/08 and 20/21.

Bight Redfish

MFAs 39 and 40 in southern Spencer Gulf and Investigator Strait supported >60% of the catch of Bight Redfish (125,446 fish). MFA 27 in Coffin Bay (11,866 fish), and 44 in Backstairs Passage (15,359 fish) supported 6% and 8% of the nominal catches of Bight Redfish, respectively (Fig. 8A). Data from 21 MFAs were confidential between 07/08 and 20/21. At the broader regional scale, catches of Bight Redfish were predominantly taken in Gulf St. Vincent and Kangaroo Island (80.5%) and along the West Coast (12.0%) regions (Fig 8B).

Bight Redfish comprised 12.2% of the total nominal catch in the SACBF in all years combined, and 18.7% of the total nominal catch in 20/21 (Table 2). Total annual catches of Bight Redfish ranged between 6,999 and 17,872 fish between 07/08 and 20/21 (Fig. 8C). Total annual catches of Bight Redfish peaked in 09/10 and 12/13, declined thereafter to 6,999 fish in 19/20 and increased to 14,043 fish in 20/21. The number of Bight Redfish targeted and retained was 4,628 fish in 20/21. Targeted catches peaked at 8,860 fish in 08/09, and ranged between 2,842 and 8,860 fish between 07/08 and 20/21. Non-target catches of this species where higher than target catches in most years with the exceptions of 07/08 and 08/09.

Client numbers targeting Bight Redfish during trips in the SACBF ranged between 784 in 19/20 and 2,123 in 12/13 (Fig. 8D). The mean annual number of clients participating in charter trips taking Bight Redfish across all years was $1,447 \pm 461$.

Effort targeted at Bight Redfish ranged between 3,542 and 12,706 hrs between 07/08 and 20/21, with peaks in 08/09, 11/12 and 12/13 (Fig. 8D). In 20/21, effort targeted at Bight Redfish was recorded by 17 licence holders across the fishery and was 5,754 hrs. Effort targeting the species declined by 52% over the ten-year period between 11/12 and 20/21.

Seasonal patterns of proportional nominal catches of Bight Redfish pooled across all years and regions indicated the peak periods for catching Bight Redfish in the SACBF occurred between December and April (summer and autumn) and October (spring) (Fig. 8E). Lowest nominal catches occurred during winter.



Figure 8. Bight Redfish. A. Spatial patterns in percentage catches in MFAs between 07/08 and 20/21. B. Annual catch by region. C. Annual patterns in target and non-target nominal catch, D. Target effort and number of clients targeting the species, and E. Seasonality of catches between 07/08 and 20/21.

Silver Trevally

The MFAs 30, 33 and 39 in southern Spencer Gulf (24,207 fish), 40 and 42 in Investigator Strait (13,179 fish), 44 in Backstairs Passage (7,558), and 49 in South of Kangaroo Island (2,798 fish) supported >80% of the catch of Silver Trevally (Figure 9A). Data from 19 MFAs were confidential across all years. Silver Trevally were mostly taken from Gulf St. Vincent and Kangaroo Island (78.0%) and Spencer Gulf (15.3%) (Fig. 9B). The West Coast, Victor Harbor and South-east supported the remaining 5.5% of catches.

Silver Trevally comprised only 3.8% of the total nominal catch in the SACBF in all years combined, and 7.2% of the total nominal catch in 20/21 (Table 2). The targeted nominal catch of Silver Trevally was 656 fish in 20/21. Nominal total annual catches of Silver Trevally ranged between 2,455 and 5,479 fish between 07/08 and 20/21. Nominal total annual catches of Silver Trevally peaked in 10/11 and 15/16 at 5,479 and 5,326 fish, respectively. The number of Silver Trevally retained was 5,418 in 20/21 (Fig. 9C).

Client numbers targeting Silver Trevally during trips in the SACBF ranged between 6 in 16/17 and 784 in 12/13 (Fig. 9D). The mean annual number of clients participating in charter trips taking Silver Trevally across all years was 211 ± 279 .

Effort targeted at Silver Trevally ranged between 17 and 857 hrs between 07/08 and 20/21, with peaks in 13/14 and 20/21 (Fig. 9D). In 20/21, effort targeted at Silver Trevally was recorded by 6 licence holders across the fishery and was 857 hrs. Effort targeting the species increased 283% over the ten-year period between 11/12 and 20/21, being the highest in the time series.

Seasonal patterns of proportional nominal catches of Silver Trevally pooled across all years and regions indicated the peak months for catching Silver Trevally in the SACBF were between December and March (summer and autumn) and October (spring) (Fig. 9E). Lowest nominal catches occurred during winter.



Figure 9. Silver Trevally. A. Spatial patterns in percentage catches in MFAs between 07/08 and 20/21. B. Annual catch by region. C. Annual patterns in target and non-target nominal catch, D. Target effort and number of clients targeting the species, and E. Seasonality of catches between 07/08 and 20/21.

Western Australian Salmon

The MFAs 44 and 42 in Backstairs Passage (53,303 fish) and Investigator Strait (2,067 fish) supported ~90% of the nominal catches of WA Salmon (Fig. 10A). A total of 28 of the MFAs comprised confidential data across the time-series. At the broader regional level, catches of WA Salmon were mostly taken from Gulf St. Vincent and adjacent to Kangaroo Island (92.6%) (Fig. 10B). Totals of 5.3% and 1.2%, respectively, were taken in Spencer Gulf and along the West Coast.

WA Salmon comprised only 4.1% of the total nominal catch in the SACBF in all years combined, and 2.7% of the total catch in 20/21 (Table 2). Annual patterns in catches of WA Salmon were multi-modal and highly variable over time, with peaks between 07/09 and 09/10, 13/14 and 15/16 (Fig. 10C). Annual catches declined from 7,112 to 1,988 fish between 13/14 and 20/21, despite a modal peak in 15/16. Targeted catches of WA Salmon ranged from 573 to 5,818 fish between 07/08 and 20/21. Targeted catches were also multi-modal with peaks at 5,818 fish in 07/08, and 4,008 fish in 13/14.

Client numbers targeting WA Salmon during trips in the SACBF ranged between 160 in 19/20 and 1,614 in 07/08 (Fig. 10D). The mean annual number of clients participating in charter trips targeting WA Salmon across all years was 799 ± 429 .

Effort targeted at WA Salmon by clients in the fishery ranged between 212 and 3,272 hrs from 07/08 to 20/21, with peaks in 09/10 and 14/15 (Fig. 10D). In 20/21, effort targeted at WA Salmon recorded by seven licence holders was 661 hrs.

Seasonal patterns of proportional catches of WA Salmon pooled across all years and regions indicated the peak months for catching WA Salmon in the SACBF were December and January (summer) (Fig. 10E). Lowest catches occurred during winter and early spring.



Figure 10. WA Salmon. A. Spatial patterns in percentage catches in MFAs between 07/08 and 20/21. B. Annual catch by region. C. Annual patterns in target and non-target nominal catch, D. Target effort and number of clients targeting the species, and E. Seasonality of catches between 07/08 and 20/21.

Snook

The MFAs 44, 32 and 36 in Backstairs Passage (20,210 fish), central Spencer Gulf (9,920 fish), and central Gulf Saint Vincent (4,230 fish) supported ~80% of the nominal catches of Snook between 07/08 and 20/21 (Fig. 11A). A total of 26 of the MFAs comprised confidential data. Snook were predominantly taken by clients on charters in Gulf St. Vincent and off Kangaroo Island (65.4%) and Spencer Gulf (31.0%) (Fig. 11B). Small proportions of annual catches were taken off the West Coast (2.0%) and off Victor Harbor and the South-east (1.1%).

Snook comprised only 2.9% of the total nominal catch in the SACBF in all years combined, and 2.4% of the total nominal catch in 20/21 (Table 2). Catches were highly variable between years and ranged between 1,472 and 5,376 fish with a declining overall trend over time (Fig. 11C). Mean annual nominal catch was 3,106 \pm 1,452. Peak catches occurred in 07/08, 10/11 and 16/17. The total catch was 1,824 fish in 20/21. Targeted catches of Snook ranged from 537 to 3,673 fish between 07/08 and 20/21. Targeted catches were multi-modal with peaks in 07/08, 10/11, 11/12 and 16/17.

Client numbers targeting Snook during trips in the SACBF ranged between 189 in 13/14 and 1,129 in 10/11 (Fig.11D). The mean annual number of clients participating in charter trips targeting Snook across all years was 553 ± 345 .

Effort targeted at Snook ranged between 187 and 2,125 hrs between 07/08 and 20/21 (Fig. 11D), with modal peaks occurring in 07/08, 10/11 and 11/12.

Seasonal patterns of proportional nominal catches of Snook pooled across all years and regions indicated the peak months for catching Snook in the SACBF were October (spring) to January (summer) (Fig. 11E).



Figure 11. Snook. A. Spatial patterns in percentage catches in MFAs between 07/08 and 20/21. B. Annual catch by region. C. Annual patterns in target and non-target nominal catch, D. Target effort and number of clients targeting the species, and E. Seasonality of catches between 07/08 and 20/21.

Southern Bluefin Tuna

Approximately 70% of Southern Bluefin Tuna were taken in MFAs 44 (29%; 6,522 fish) in Backstairs Passage, 39 (25%; 5,679 fish) in the approach to southern Spencer Gulf west and NW Kangaroo Island and Western Investigator Strait, and MFA 58 (15%; 3,479 fish) in the South-east adjacent to the SA-VIC border (Fig. 12A). A total of 12 of the MFAs comprised confidential data across the time-series. At the broader regional scale, Southern Bluefin Tuna were predominantly taken by clients on charters in Gulf St. Vincent and off Kangaroo Island (61.6%), Victor Harbor and the South-east (19.4%), and West Coast (13.5%) (Fig. 12B).

Southern Bluefin Tuna comprised 1.5% of the total nominal catch in the SACBF in all years combined and comprised 3.0% of the total catch in 20/21 (Table 2). Total catches of Southern Bluefin Tuna increased annually between 07/08 and 15/16 from 554 to 2,393 fish per annum (Fig.12C). The total catch of Southern Bluefin Tuna decreased to 1,606 fish in 19/20, increasing to 2,224 in 20/21. Mean annual catch of Southern Bluefin Tuna was 1,629 ± 570 fish.

Targeted catches of Southern Bluefin Tuna ranged from 494 to 1,995 fish between 07/08 and 20/21. Targeted catches were multi-modal with peaks in 14/15, 15/16, 17/18 and 20/21. The total catch was 1,995 fish in 20/21 (Fig. 12C).

The number of clients targeting Southern Bluefin Tuna during trips in the SACBF ranged from 777 in 07/08 to 3,211 in 14/15. A total of 2,732 clients participated in charter trips targeting Southern Bluefin Tuna in 20/21 (Fig. 12D). The mean annual number of clients participating in charter trips targeting Southern Bluefin Tuna across all years was 2,113 \pm 780.

Targeted effort for Southern Bluefin Tuna ranged between 4,637 and 13,494 hrs between 07/08 and 20/21, with the highest catches occurring in 09/10, 14/15, 15/16 and 20/21 (Fig. 12D). A total of 11,969 hrs of effort targeting the species occurred during 20/21.

Seasonal patterns of proportional nominal catches of Southern Bluefin Tuna pooled across all years and regions indicated that summer and autumn months had a higher percentage of catch than the winter and spring months (Fig. 12E).



Figure 12. Southern Bluefin Tuna. A. Spatial patterns in percentage catches in MFAs between 07/08 and 20/21. B. Annual catch by region. C. Annual patterns in target and non-target nominal catch, D. Target effort and number of clients targeting the species, and E. Seasonality of catches between 07/08 and 20/21.

Southern Calamari

The spatial distribution of the catch of Southern Calamari was characterised by the highest catches taken from MFAs in central Spencer Gulf (MFA 32; 34% of catch; 15,412 fish), MFA 36 in central GSV (14% of catch; 6,326 fish), MFA 33 (11% of catch; 4,911 fish) in southern Spencer Gulf, and MFA 21 (9% of catch; 4,124 fish) in northern Spencer Gulf (Fig. 13A). MFAs 43 and 44 along the eastern side of the Fleurieu Peninsula comprised 8% (3,646 fish) and 7% (3,295 fish) of the catch, respectively. Data from 19 MFAs were confidential between 07/08 and 20/21. At the regional level, Southern Calamari were mostly taken by clients in Spencer Gulf (64.4%) and Gulf St. Vincent and off Kangaroo Island (33.7%) (Figs 13A and B).

Southern Calamari comprised 3.0% of the total nominal catch in the SACBF in all years combined, and 5.2% of the total nominal catch in 20/21 (Table 2). Annual patterns in catches of Southern Calamari ranged between 1,365 and 7,401 individuals between 07/08 and 20/21, and peaked at 7,401 in 11/12 (Fig. 13C). Catches decreased between 14/15 and 19/20, in-line with reduced targeting of the species. Targeted catches have increased since 19/20, ranging from 560 to 1,910 between 07/08 and 20/21 (Fig. 13C). Targeted catch of Southern Calamari peaked at 1,910 in 09/10 and 1,748 in 13/14 and was 1,328 in 20/21.

Client numbers targeting Southern Calamari during trips in the SACBF ranged between 120 in 19/20 and 555 in 09/10 (Fig. 13D). The mean annual number of clients participating in charter trips targeting Southern Calamari across all years was 309 ± 112 .

Effort targeted at Southern Calamari ranged between 257 and 1,202 hrs between 07/08 and 20/21, with peaks in 09/10 and 13/14 (Fig.13D). In 20/21, effort targeted at Southern Calamari recorded by eight licence holders was 676 hrs. Effort targeting Southern Calamari peaked in 13/14 (Fig. 13D).

Seasonal patterns of proportional nominal catches of Southern Calamari pooled across all years and regions indicated the peak months for taking the species were October (spring), November to January (summer) and May (autumn) (Fig. 13E). Lowest nominal catches occurred during months of July and August (winter).



Figure 13. Southern Calamari. A. Spatial patterns in percentage catches in MFAs between 07/08 and 20/21. B. Annual catch by region. C. Annual patterns in target and non-target nominal catch, D. Target effort and number of clients targeting the species, and E. Seasonality of catches between 07/08 and 20/21.

Southern Garfish

The spatial distribution of landings of Southern Garfish was characterised by high catches in MFA 32 in central Spencer Gulf (41% of the catch; 20,592 fish), and MFA 36 in central GSV that comprised 31% (15,640 fish) of the catch (Fig 14A). Locations in MFA 43 in central eastern GSV supported 5% (2,572 fish) of the catch of Southern Garfish (Fig. 14A). A total of 17 of the MFAs comprised confidential data. Catches of Southern Garfish in the SACBF were taken in Spencer Gulf (58.3%) and Gulf St. Vincent and Kangaroo Island (41.2%) (Fig. 14B).

Garfish comprised 3.3% of the total nominal catch in the SACBF in all years combined, and 2.1% of the total catch in 20/21 (Table 2). Total annual catches ranged between 1,365 and 7,117 fish between 07/08 and 20/21 (Fig. 14C). Annual patterns in catches were bi-modal with peaks in 11/12 and 13/14. The total catch of Southern Garfish was 1,557 in 20/21. Targeted catches ranged from 370 to 5,176 between 07/08 and 20/21 (Fig. 14C). Targeted catches peaked at in 08/19, 09/10 and 10/11, with a mean of 2,132 \pm 1,735 across all years.

Client numbers targeting Southern Garfish during trips in the SACBF ranged between 24 in 07/08 and 323 in 09/10 (Fig. 14D). The mean annual number of clients participating in charter trips targeting Southern Garfish across all years was 141 ± 93 .

Effort targeted at Southern Garfish ranged between 133 and 755 hrs between 07/08 and 20/21, with peaks in 08/10 and 09/10 (Fig.14D). In 20/21, effort targeted at Southern Garfish recorded by five licence holders was 226 hrs.

Seasonal patterns of proportional nominal catches of Southern Garfish pooled across all years and regions indicated the peak months for catching the species in the SACBF were in December and January (summer) (Fig. 14E).



Figure 14. Southern Garfish. A. Spatial patterns in percentage catches in MFAs between 07/08 and 20/21. B. Annual catch by region. C. Annual patterns in target and non-target nominal catch. D. Target effort and number of clients targeting the species, and E. Seasonality of catches between 07/08 and 20/21.

Swallowtail

The spatial distribution of the catch of Swallowtail was characterised by the highest catch (~90%) taken from MFA 39 (41,214 fish) adjacent to the entrance to Spencer Gulf, and MFA 40 (7,233 fish) located in Investigator Strait along the southern coastline and SW corner of southern Yorke Peninsula (Fig. 15A). A total of 19 of the MFAs comprised confidential data across the time-series. At the broader regional spatial scale, catches of Swallowtail were taken in Gulf St. Vincent and Kangaroo Island (96.8%) and Other (offshore and shelf) regions (2.0%) (Fig. 15B).

Swallowtail comprised only 3.6% of the total nominal catch in the SACBF in all years combined, and 3.9% of the total catch in 20/21 (Table 2). Total annual catches ranged between 1,234 and 7,919 fish between 07/08 and 20/21 (Fig.15C). Catches of Swallowtail peaked in 08/09 and 12/13 and were 2,915 in 20/21 (Fig. 15C). The catch was taken by between 10 and 25 licence holders (Ave = 18 ± 4). Targeted catches ranged from 0 to 72 fish between 07/08 and 20/21 (Fig. 15C), with a mean of 16 across all years.

Client numbers targeting Swallowtail during trips in the SACBF ranged between 1 in 15/16 and 32 in 11/12 (Fig. 15D). The mean annual number of clients participating in charter trips targeting Swallowtail across all years was 12 ± 11 .

Effort targeted at Swallowtail ranged between 4 and 171 hrs between 07/08 and 20/21, with peaks in 09/10 and 15/16 (Fig.15D). In 20/21, effort targeted at Swallowtail recorded by two licence holders was 22 hrs.

Seasonal patterns of proportional catches of Swallowtail pooled across all years and regions indicated the peak months for catching the species in the SACBF were in April (autumn), October (spring) and December (summer) (Fig. 15E).



Figure 15. Swallowtail. A. Spatial patterns in percentage catches in MFAs between 07/08 and 20/21. B. Annual catch by region. C. Annual patterns in nominal catch, D. Target effort and number of clients targeting the species, and E. Seasonality of catches between 07/08 and 20/21.

3.4. Wildlife Interactions

There were 17 threatened, endangered or protected species (TEPS) interactions in the SACBF between 07/08 and 20/21 (Table 3). These included four interactions with marine mammals, eleven with protected fish species (White Sharks and Sygnathids), two with birds, and none with reptiles (e.g., marine turtles) (Mackay 2018). No wildlife interactions were reported in the fishery in 19/20 or 20/21. (Table 3).

Table 3. Summary of interactions with TEPS in the SACBF sourced from Wildlife Interactionlogbooks.

TEPS	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
Pinnipeds	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Cetaceans	2	1	0	0	0	0	0	0	0	0	0	0	0	0
Fishes	1	7	1	0	0	0	0	0	1	0	0	1	0	0
Reptiles	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Birds	1	0	0	1	0	0	0	0	0	0	0	0	0	0

4. DISCUSSION

This report synthesises information sourced from the SACBF logbook describing the seasonal, spatial and temporal patterns of fleet and activity dynamics, client participation, catch and effort, and interactions with TEPS. It also provides information on catches of King George Whiting and Snapper in the SACBF in relation to total catches of these species in SA waters.

The size of the active component of the SACBF fleet reduced considerably (~39%) over the past decade from 77 to 47 active licences. However, the client participation rate remained relatively stable at between 227 and 260 clients per active licence since 13/14, except in 19/20 (159 clients per active licence). The stable participation rate suggests there is adequate client demand to support the remaining charter businesses, which was dominated by clients from SA (84%), Victoria (9%) and NSW (2%) in 20/21. Broader information describing the origin of the client-base showed that the overseas tourism component was insignificant when compared to the Australian component, with the former accounting for <1% of the total clientele.

The SACBF operates out of several ports in Spencer Gulf, GSV, Kangaroo Island and Investigator Strait and targets Snapper, King George Whiting, WA Salmon, Silver Trevally, Southern Calamari and a wide range of other species. The remainder of the fleet accesses a mix of demersal and pelagic species in exposed shelf waters in the South-east, the West Coast of Eyre Peninsula, and Other (offshore and shelf) regions of the state. Fishing in inshore areas where bottom depths are generally ≤50 m contributed to 76% of the effort in the SACBF. By comparison, fishing activities in offshore regions where bottom depths are 50–250 m comprised ~17% of the fishing effort. High powered vessels, modern fish-finding and navigation technology allows operators to consistently return to known areas, search for target species, and operate where they experienced previous success. Online remote-sensing information is also used to locate productive surface patches and temperature 'breaks' when targeting pelagic species, such as tunas.

Consistent with the previous assessment of the SACBF (Rogers, *et al.* 2019), King George Whiting and Bight Redfish continued to comprise a substantial percentage of annual catches in the most recent assessment year, as well as across the 14-year time-series between 07/08 and 20/21. Snapper displayed an 98.7% decrease in nominal catch between 18/19 and 20/21, and although it contributed to ~19% of the catch for all years combined, this value was less than 1% in 20/21. The remainder of the landings include species with increasing nominal catches since 18/19, such as Leatherjackets, Southern Calamari, Swallowtail, Silver Trevally, as well as comparatively smaller catches of over 70 different species, most of which individually comprise \leq 3% of total annual catches.

Patterns in total annual catches of King George Whiting and Snapper reflect a combination of stock-specific, fishery, and management-related factors, some of which include reduced numbers of licensed operators and clients participating in the fishery and corresponding declines in annual effort. Historically, seasonal trends in Snapper and King George Whiting catch and effort were responsive to management measures aimed at maintaining the sustainability of the stock, such as the implementation of seasonal and spatial closures during spawning periods (Rogers *et al.* 2019). Fishing closures for Snapper in the West Coast, Spencer Gulf and Gulf St Vincent were implemented in October 2019, interrupting the 19/20 and 20/21 fishing seasons. These closures were implemented following recent stock assessments which demonstrated that these Snapper stocks were depleted (Fowler *et al.* 2019; 2020). The closures have contributed to reduced nominal catches of Snapper and increased catches of other species, coupled with a higher proportion of game, deepsea and offshore fishing, compared to inshore activities. Expansion of ecotourism activities was also observed in the most recent years, likely a result of the Snapper closure and the Fishing for tourism – Charter Boat Diversification Program (PIRSA 2019b).

Numbers of undersized King George Whiting and Snapper that were released declined and then stabilised in-line with overall patterns in catches and effort throughout the time-series. The percentage of Snapper released compared to the nominal catch increased due to total closures established in 19/20. Clients' motivations for catching these species vary and are predominantly for consumption purposes in the case of King George Whiting of all sizes, whereas clients tend to target small to medium Snapper for consumption, but the larger fish for sport-fishing purposes. Release of Snapper that have been brought to the surface can lead to barotrauma (Conron et al. 2010; Hughes and Stewart 2013), but survival probability increases if repressurized quickly (Hughes et al. 2019). As part of the Snapper fishing restrictions, a release weight should be used by both recreational fishers and charter boat operators. Impacts of different fishing practices, gear types, fight times and barotrauma on the fate of fish following their release, and the efficacy of handling practices and release devices requires further assessment and research. Post release survival of Snapper and identification of practices to minimize barotrauma are currently being investigated by SARDI Aquatic Sciences (FRDC Project 2019-044). The project is also engaging with the community and the fishing sector to create a code of practice for responsible handling of Snapper, which aims to increase release survival rates, contributing to the stock size of this iconic species.

The suite of species that support the catch composition in the SACBF exhibits complex regional and spatial patterns (Appendix 3) that are not necessarily apparent at the scale of individual or

grouped MFAs. Operators in the fleet are limited by their ability to access some isolated areas and are responsive to changes in availability and encounter rates of different stocks, as well as preferences of clients for targeting species found in offshore shelf waters. For example, the Bight Redfish is a long-lived, slow-growing species of high eating quality. The species is targeted around deep reef edges and drop-offs in depths of ~70 m that are mostly located in isolated, offshore southern gulf and shelf waters. Historically, this species was mostly targeted in Commonwealth managed commercial fisheries; however, catches of Bight Redfish in the SACBF peaked in 09/10, 12/13 and 20/21, comprising 18.7% of the catch. Catches of Bight Redfish followed a similar pattern to the trajectories for King George Whiting in regions with offshore access (mostly outside the gulfs).

Charter boat fisheries have been globally impacted by COVID-19 (Pita *et al.* 2021), which resulted in response measures from local governments (Ogier *et al.* 2021). Locally, a fee relief program was implemented for the SACBF in 20/21. The SACBF was notably impacted by COVID-19 mitigation measures (e.g., lockdowns and social distancing), which contributed to the large decrease in number of fishing trips, participation rates, and total fish retained in 19/20. Fishing effort for individual species tended to decrease in 19/20, however Southern Garfish and Silver Trevally have shown an increase in targeted effort in the last two years, probably due to the recent Snapper closures. The number of trips and clients increased during 20/21 from 19/20, reflecting a recovery of the fishery after the first year of the pandemic. However, due to COVID-19 border restrictions, clients from overseas were effectively absent in 20/21 compared to previous years, while the proportion of clients from South Australia increased by ~15%. This represented a lack of clients from interstate due to border restrictions but also an increase in local participation in charter boat fishing.

Targeting of pelagic species, including WA Salmon and Snook was highly variable, while effort targeting Southern Bluefin Tuna increased steadily until 15/16, before peaking and stabilising in recent years. A total of 2,224 Southern Bluefin Tuna were taken in 20/21 and this popular game-fishing target species comprised 16.6% of the total catch in the Victor Harbor and South-east, despite only comprising 3.0% of the total annual catch during the most recent assessment year. This highly migratory species aggregates to feed in the eastern Great Australian Bight and South-east (Bonney Upwelling Region) between summer and mid-winter, and is mostly targeted by clients using trolling lures. Whilst targeting of pelagic species does not constitute a high percentage of total annual catches across the fleet, access to these species provides a diversity of potential targets, whilst reducing targeting of primary target species (Steer *et al.* 2018a, b). This

is especially important when facing fishing closures like in the case of Snapper. Diversification of potential target species also allows operators to satisfy client demands across a range of weather conditions in inshore and offshore areas, and to provide a range of game fishing experiences.

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Appendix 1. Summary of SACBF bag and boat limits and closures (PIRSA 2019a).

COMMONWEALTH MANAGED SPECIES	Individual passenger catch limit (per person, per day) Up to 3 passengers	Charter boat limit More than 3 passengers		
Blue Warehou	10	30		
Rock Ling	3	18		
Silver Warehou	10	30		

IMPORTANT INFORMATION

- 1. Individual passenger catch limits are the number of fish permitted per person, per day.
- 2. On multi-day charters, the catch limit for Commonwealth-managed species is restricted to one
- Orman by ensures, the catch limit to orman the memory in an appropriate point or an appropriate point or an even il limit, regardless of the number of days fished.
 On multi-day charters, the catch limit for Multoway, Samsonfish, Southern Bluefin Tuna, Western Blue Groper, Whaler Shark (Bronze/Dusky), and Yellowtail Kingfish is restricted to one per person, regardless of the number of days fished.
- On multi-day charters being more than 3, the catch limit for State-managed species is restricted to 3 times the individual daily catch limit.
- 5. It is an offence to cut up, fillet or otherwise mutilate fish in a boat (except for scaling and gutting) unless the fish are to be eaten on board. This applies to all species subject to minimum legal lengths.
- 6. All undersize fish must be carefully returned to the water immediately.
- 7. Charter boat operators and recreational fishers are not permitted to sell their catch.
- Once a passenger has caught their individual catch limit they are not permitted to catch any more of that species during that 24 hour period (applies from midnight to midnight).
- A number of closures are in place in South Australia at certain times of years or in certain areas to
 protect key species. Charter operators and passengers must comply with closure rules at all times.
- 10. Some species are totally protected in South Australian waters and penalties may apply to anyone who takes or causes them harm. Protected species include; all marine mammals (including whales, seals, sea lions and dolphins): leafy sea dragon; Western Blue Groper in Gulf waters, Investigator Strait and Backstairs Passage; White Shark and all Southern Rock Lobster, Blue Swimmer Crab, Sand Crab and Giant Crab with eggs attached.
- 11. Charter boat operators are not permitted to undertake personal fishing while conducting a chartered fishing trip.

Penalties may apply for non-compliance with these regulation

NOTE: These limits specifically apply to recreational fishers participating in charter fishing activities. Information in this brochure is a guide only and should not be relied on as a legal document. For the latest information on recreational fishing generally, visit pir.sa.gov.au/fishing, download the free SA Fishing app from your app store or contact Fishwatch on 1800 065 522.



SPECIES	Size (cm)	Individual passenger catch limit (per person, per day)
Abalone		
Greenlip (western zone)	14.5	3
Greenlip (all other waters)	13	3
Blacklip (all waters)	13	3
All other species	13	3
Albacore	-	1
Australian Herring (Tommy Ruff)	-	40
Barracouta	-	5
Bight Redfish	30	5*
Bloodworm	-	4 litres
Blue Morwong (Queen Snapper)	38	3
Blue Swimmer Crab	11	20*
Bream	30	5
Cockle (other than Pipi)	3	150*
Congolli	-	2
Cuttlefish (Sepia species)	-	8*
Flathead	30	5
Flounder	-	10
Garfish	23	30
Gemfish	-	5
Giant Crab	15	2
Gummy Shark	45	1*
Harlequin Fish	8	2
King George Whiting		
East of 136°E	32	10
West of 136°E	30	10
Morwong (Jackass)	-	5
Mullet (all species)	21	30
Mulloway (outside Coorong)	>82	1
Pipi		
East of 136°E	3.5	300
West of 136°E	3.5	100
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Note: A closure applies statewide from 1 June to Younghushand Peninsula between the Murray M	31 Uctober. No recreation outh and 28 Mile Crossing	nai fishing for Pipi is permitted on the n. This is a commercial fishing zone only



SPECIES	Size (cm)	Individual passenger catch limit (per person, per day)
Razorfish	-	13
Salmon (Western Australian)	21-35	10
	>35	5
Samsonfish	88	1
Sand Crab	10	20*
Scallops	6.5	50
School Shark	45	1*
School Whiting	-	10
Sea Urchin	-	20
Southern Bluefin Tuna		1 (per trip)
Southern Calamari		8
Southern Rock Lobster		
Southern Zone	9.85	2
Northern Zone	10.5	2
Note: A closure applies in the Southern Zone fro from 6pm 31 May to 12pm 1 November.	m 6pm 31 May to 6am 1 Oct	ober and in the Northern Zone
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*The daily individual catch limit is a combined limit of two or more species. Combined limits apply to Blue Swimmer Crab/Sand Crab, Bight Redfish/Yelloweye Redfish, Cutterlish/Southern Catamari, Gummy Shark/School Shark, Vongole/Cockle (other than Pipi).

Appendix 2. Example of logbook entry for a si	ingle trip by an operator in the SACBF.
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Appendix 3. Regional patterns in catches of key species in 20/21.

Victor Harbor and South-east

In the Victor Harbor and South-east regions, catches were dominated by Southern Bluefin Tuna (n = 312; 16.6%), Leatherjacket (n = 237; 12.6%), Morwong (Jackass / Teraki) (n = 203; 10.8%), Silver Trevally (n = 173; 9.2%), Bight Redfish (n = 170; 9.1%), Gummy Shark (n = 124; 6.6%), and Flathead (n= 116; 6.2%) during 20/21 (Table 2). The remaining 28.9% of the catch comprised 22 other species.

GSV and Kangaroo Island

In the GSV and Kangaroo Island regions, catches comprised Bight Redfish (n = 11,536; 28.4%),

King George Whiting (n = 10,879; 26.7%), Silver Trevally (n = 3,142; 7.7%), Swallowtail (n = 2,880; 7.1%), and WA Salmon (n = 1,785; 4.4%) (Table 2) during 20/21. The remaining 25.7% of the catch comprised 36 other species.

West Coast

In the West Coast region, catch compositions largely comprised Bight Redfish (n = 2,331; 49.6%), King George Whiting (n = 1,092; 23.2%), and Southern Bluefin Tuna (372; 7.9%). The remaining 19.2% of the catch comprised 22 species.

Other

In the 'Other' (offshore) region, catch compositions were mostly supported by King George Whiting (n = 43; 65.2%), Leatherjacket (n = 9; 13.6%), and Bight Redfish (n = 6; 9.1%) during 20/21 (Table 2). The remaining 12.2% of the catch comprised 4 species.

Spencer Gulf

In the Spencer Gulf region, the catch compositions were dominated by King George Whiting (n = 19,547; 70.7%), Southern Calamari (n = 2,533; 9.2%), and Silver Trevally (n = 2,091; 7.6%) in 20/21 (Table 2). The remaining 12.6% of the catch comprised 31 species.

Durante, L.M. et al. (2022)

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Appendix 3 - Fig 1. Spatial dynamics of catches of key species taken in the SACBF from Victor Harbor and the South-east, GSV and Kangaroo Island in 20/21.

Durante, L.M. et al. (2022)

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Appendix 3 - Fig 2. Spatial dynamics of catches of key species taken in the SABCF from the West Coast, 'Other' (Offshore), and Spencer Gulf regions in 20/21.