Cruise Report ZDLT1-2022-02

Demersal survey

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Falkland Islands Government
Stanley, Falkland Islands

June 2022

ZDLT1-2022-02

For citation purposes this publication should be referenced as follows:

Trevizan T, Evans D, Büring T, Ramos JE, Santana- Hernandez N, Sadd D, Copping EA, Piontek R, Blake A (2022) Cruise Report ZDLT1-2022-02. Demersal survey. Fisheries Department, Directorate of Natural Resources, Falkland Islands Government. Stanley, Falkland Islands. 34 pp.

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Acknowledgements

We thank Captain Jose Maria Martinez Sotelo, the officers and crew of the F/V Castelo for their assistance during the cruise.

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1. Introduction

The Falkland Islands shelf is located within the Patagonian large marine ecosystem, one of the most productive areas in the world (Arkhipkin et al. 2012). The Patagonian large marine ecosystem is comprised of a southern temperate ecosystem in the north and a sub-Antarctic ecosystem in the south, divided by a boundary that runs from the southwest to the north-east through the Falkland Islands (Boltovskoy 1999). The ecosystem lies within waters of subtropical origin, transported onto the shelf by the Brazil Current and mixed with temperate shelf waters. Several productive zones are revealed in this ecosystem, mainly due to the existence of tidal mixing oceanographic fronts, as well as seasonal fronts originating from cold fresh water inflows into the Strait of Magellan. The sub-Antarctic ecosystem lies within waters of sub-Antarctic origin transported onto the shelf by the Falkland Current (Peterson & Whitworth 1989). The Falkland Current diverges from the main stream of the Antarctic Circumpolar Current in the Drake Passage and turns northwards. The Falkland Current splits at the continental slope south of the Falkland Islands into a weak branch and a stronger branch that flow around the west and east of the Islands, respectively (Bianchi et al. 1982). These oceanographic features affect the distribution and abundance of marine species; for instance, Argentine shortfin squid (*Illex argentinus*) and hoki (*Macruronus magellanicus*) migrate to frontal zones for feeding and back to non-frontal zones for spawning (Agnew 2002). In contrast, migrations of deep-water fish such as toothfish (*Dissostichus eleginoides*) into the shelf are favoured by intrusions of sub-Antarctic waters (Laptikhovsky et al. 2008; Arkhipkin & Laptikhovsky 2010).

Since 2010, the Falkland Islands Fisheries Department (FIFD) has been carrying out annual demersal surveys. Eight surveys have been conducted consistently in February 2010, 2011, and 2015–2022 to estimate the biomass of the index species (i.e., rock cod) to the west and north of the Falkland Islands. In recent years, the aim of the February demersal survey extended to other commercial and bycatch species. Biomass estimates from demersal surveys conducted in parallel with calamari pre-season surveys in the *'Loligo Box'* revealed the decrease of the abundance of rock cod, red cod and Southern hake abundances over the last decade (Ramos & Winter 2022).

The distribution and abundance of juvenile toothfish in nursery grounds is poorly understood. In addition, the small number of juveniles (0+) collected during the 2017 and 2018 juvenile toothfish surveys (Arkhipkin et al. 2017; unpublished data), as well as during the 2019 and 2020 demersal surveys (Arkhipkin et al. 2019; Randhawa et al. 2020, Trevizan et al. 2021) suggest that recruitment has failed over the last few years. In this sense, the February demersal survey allows continuing monitoring juvenile toothfish. However, as the cruise was shortened this year, shallow and nearshore water stations targeting juvenile toothfish were excluded from the cruise plan. Therefore, the aims of the February 2022 demersal survey were:

1.1. Cruise objectives

1. To examine the abundance, distribution, and biology of demersal fish and squid species in the western, northern and north-eastern parts of the Falkland Shelf.
2. To carry out an oceanographic survey of the studied area.

1.2. Vessel

The survey was conducted aboard the F/V *Castelo* (ZDLT1), registered in the Falkland Islands.

1.3. Personnel and responsibilities

The following personnel participated in the cruise:

Toni Trevizan	(Chief scientist, biological sampling, text)
Dale Evans	(Factory coordinator, biological sampling)
Tobias Buring	(Factory coordinator, biological sampling)
Rebecca Piontek	(CTD, biological sampling)
Daniel Sadd	(Biological sampling)
Elisabeth Anne Copping	(Biological sampling)
Nestor Santana Hernandez	(Biological sampling)

1.4. Cruise plan and key dates

The cruise was shortened as the crew of the F/V Castelo was required to quarantine in route from Vigo to the Falkland Islands due to COVID19 cases on board. The projected number of survey days available were reduced from 21 to 11. The survey plan for February 2022 has therefore been adjusted to occupy 42 of the statutory 84 trawl stations over the available days. The 42 retained survey stations were arranged in area blocks that previous surveys have found to comprise the most important concentrations of commercially important finfish. The vessel departed from Stanley at 19:00 on February 10th, and proceeded overnight to the first station located to the north of East Falkland in order to start fishing early in the morning. Every day, four one-hour trawls were conducted in adjacent grid squares; each trawl was preceded or succeeded by oceanographic station (Figure 1). On February 19th, due to suspected large catch and concern of breaking the net, one station was shortened to 52 minutes (station 3483) but was considered a valid trawl. Two trawls were conducted the last day of fishing. The ship was back in port at 07:00 on February 22nd.

2. Material and Methods

2.1. Trawling

A bottom trawl net owned by the FIFD was used; the net was equipped with rockhopper gear fitted with Morgère V3 (1800 kg, 3180 cm x 2480 cm) bottom doors. The duration of each trawl was 60 min on the bottom, except for one trawl with large catch that was hauled after 52 minutes (station 3483). Trawling speed varied between 3.9 and 4.9 knots. The cod-end had a 90 mm mesh size fitted with a 40 mm cod-end liner. The MarPort Net Monitoring System was used to monitor the net geometry. The system was not able to provide data on net horizontal opening for 24 stations. All readings from other measurements were successfully obtained for all stations. Four trawls were made every day during the survey, except the last day of fishing (21/02/2022) when two trawls were conducted.

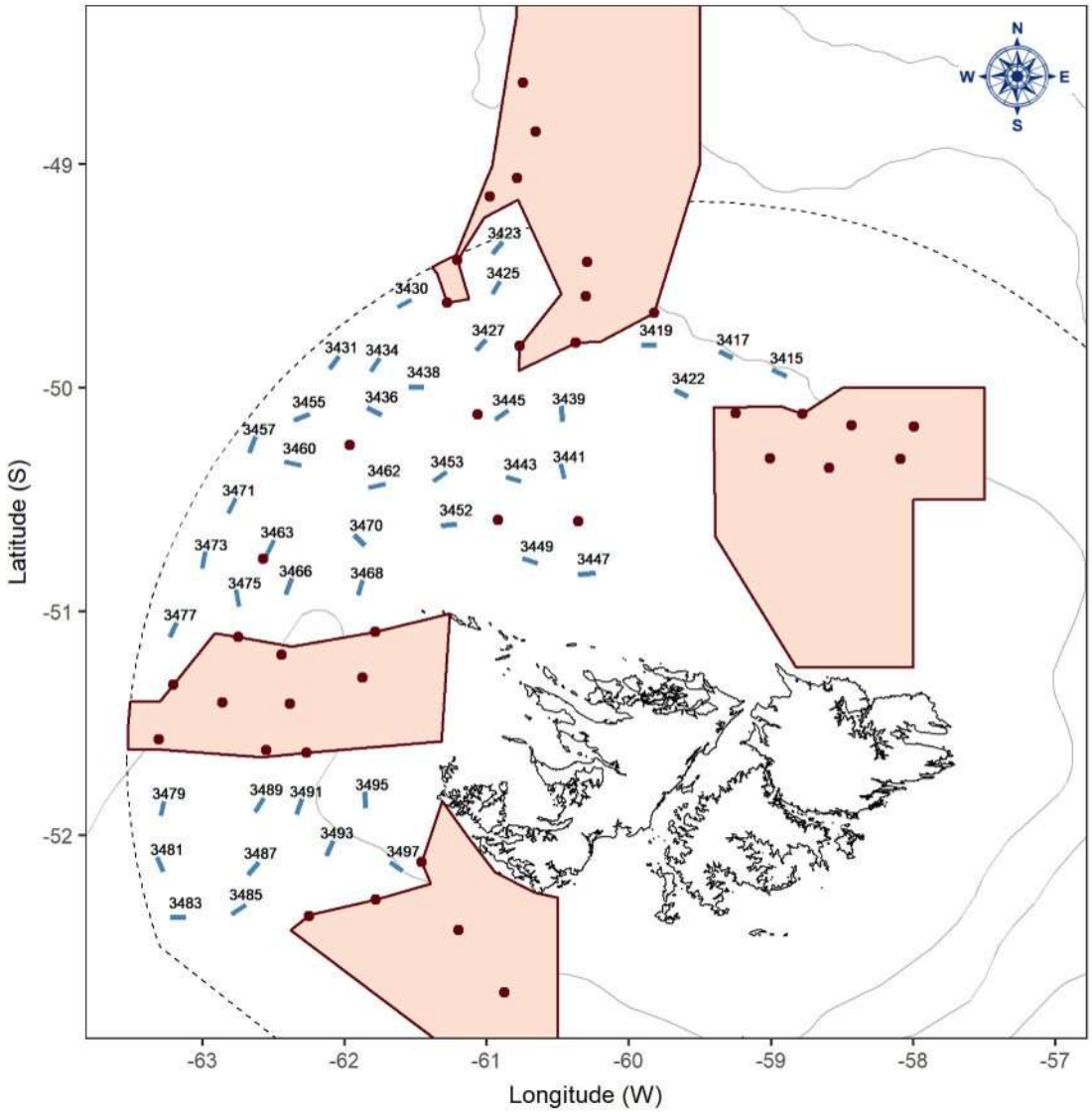

Figure 1. Trawl tracks with station numbers performed during the demersal survey ZDLT1-2022-02 in February 2022. The red dots are the stations excluded from the survey; excluded areas are shaded in red.

2.2. Trawl stations and biological sampling

During the ZDLT1-2022-02 demersal survey, a total of 42 trawls were conducted with corresponding station numbers ranging from 3415 to 3497 (Table I). At each station, all species from the catch were sorted and the total catch was weighed by species with an electronic Marel balance (80 kg capacity). All commercial species and most of the bycatch species were sampled (random samples of up to 100 individuals). Biological sampling of finfish included measurement of total or pre-anal length to the lower cm, as well as assignation of sex and maturity (eight-stage maturity scale). For skates, in addition with total length, disc width was measured to the lower cm; weight, sex, and maturity (six-stage maturity scale). For squid, the sampling included measurement of dorsal mantle length to the lower 0.5 cm, sex and maturity (six-stage maturity scale). Otoliths were taken from large number of fish according to sampling scheme of 2 to 5 specimens per 1 cm length class and per sex. During otolith collection, individual total body weights were measured to the nearest gram. Statoliths were not taken during the cruise but samples of *Illex argentinus* and *Doryteuthis gahi* were frozen for statolith extraction at the FIFD laboratory. In addition, a number of fish and squid specimens were frozen for further analysis ashore.

Table I. Station data during the demersal survey ZDLT1-2022-02 in February 2022 (Section 3.6).

Station	Date	Latitude start	Longitude start	Latitude finish	Longitude finish	Mean depth
3415	11/02/2022	-49.9493	-58.8923	-49.9172	-58.9935	196
3417	11/02/2022	-49.8673	-59.2723	-49.8352	-59.3662	190
3419	11/02/2022	-49.8063	-59.8035	-49.8095	-59.9127	168
3422	11/02/2022	-50.0077	-59.6803	-50.0408	-59.5838	162
3423	12/02/2022	-49.3477	-60.8900	-49.4013	-60.9623	168
3425	12/02/2022	-49.5240	-60.9067	-49.5802	-60.9617	166
3427	12/02/2022	-49.7842	-61.0043	-49.8313	-61.0747	164
3430	12/02/2022	-49.6050	-61.5280	-49.6400	-61.6263	158
3431	13/02/2022	-49.9148	-62.1047	-49.8587	-62.0392	147
3434	13/02/2022	-49.8653	-61.7537	-49.9270	-61.8153	157
3436	13/02/2022	-50.0882	-61.8405	-50.1238	-61.7397	158
3438	13/02/2022	-49.9978	-61.4380	-49.9942	-61.5487	156
3439	14/02/2022	-50.0797	-60.4780	-50.1522	-60.4688	158
3441	14/02/2022	-50.3378	-60.4815	-50.4080	-60.4547	154
3443	14/02/2022	-50.4177	-60.7577	-50.3988	-60.8677	152
3445	14/02/2022	-50.1423	-60.9413	-50.1005	-60.8492	159
3447	15/02/2022	-50.8285	-60.2368	-50.8357	-60.3595	136
3449	15/02/2022	-50.7858	-60.6415	-50.7620	-60.7508	134
3452	15/02/2022	-50.6097	-61.2117	-50.6167	-61.3242	150
3453	15/02/2022	-50.4193	-61.3787	-50.3750	-61.2822	160
3455	16/02/2022	-50.1163	-62.2467	-50.1442	-62.3562	148
3457	16/02/2022	-50.2175	-62.6280	-50.2890	-62.6732	148
3460	16/02/2022	-50.3295	-62.4267	-50.3475	-62.3055	152
3462	16/02/2022	-50.4475	-61.8323	-50.4280	-61.7142	165
3463	17/02/2022	-50.6785	-62.4978	-50.7492	-62.5493	164
3466	17/02/2022	-50.8492	-62.3718	-50.9247	-62.4142	183
3468	17/02/2022	-50.9282	-61.9072	-50.8588	-61.8748	176

Station	Date	Latitude start	Longitude start	Latitude finish	Longitude finish	Mean depth
3470	17/02/2022	-50.7063	-61.8563	-50.6555	-61.9335	177
3471	18/02/2022	-50.4907	-62.7658	-50.5603	-62.8168	148
3473	18/02/2022	-50.7295	-62.9817	-50.8075	-63.0023	152
3475	18/02/2022	-50.9020	-62.7663	-50.9780	-62.7415	166
3477	18/02/2022	-51.0487	-63.1820	-51.1158	-63.2302	156
3479	19/02/2022	-51.8485	-63.2733	-51.9142	-63.2952	202
3481	19/02/2022	-52.0983	-63.3188	-52.1623	-63.2767	226
3483	19/02/2022	-52.3693	-63.2243	-52.3678	-63.1142	259
3485	19/02/2022	-52.3527	-62.7970	-52.3110	-62.6940	268
3487	20/02/2022	-52.1763	-62.6798	-52.1213	-62.6022	254
3489	20/02/2022	-51.8958	-62.6305	-51.8325	-62.5678	230
3491	20/02/2022	-51.8368	-62.2978	-51.9078	-62.3390	261
3493	20/02/2022	-52.0252	-62.0778	-52.0915	-62.1287	288
3495	21/02/2022	-51.8042	-61.8585	-51.8780	-61.8520	187
3497	21/02/2022	-52.1207	-61.6825	-52.1610	-61.5910	248

3. Results

3.1. Catch composition

Catch volume and composition of squid, finfish, skate and other demersal and pelagic species are presented in Table II. The most abundant species (in terms of catch weight) were rock cod *Patagonotothen ramsayi,* red cod *Salilota australis*, and hoki *Macruronus magellanicus*.

Table II. Catch composition and weight of species caught during the demersal survey ZDLT1-2022-02 in February 2022.

Species Code	Latin name	Total caught (kg)	Total sampled (kg)	Total discarded (kg)	%
PAR	*Patagonotothen ramsayi*	10993.687	429.645	10993.687	22.803
BAC	*Salilota australis*	9595.826	1239.233	2.340	19.904
WHI	*Macruronus magellanicus*	9507.120	417.456	2.020	19.720
HAK	*Merluccius hubbsi*	5650.242	1340.188	14.890	11.720
GRF	*Coelorinchus fasciatus*	4128.867	147.626	4128.867	8.564
KIN	*Genypterus blacodes*	2678.920	1866.912	0.000	5.557
LOL	*Doryteuthis gahi*	2071.578	101.660	1.800	4.297
ILL	*Illex argentinus*	521.990	389.132	93.400	1.083
ING	*Onykia ingens*	292.512	25.770	292.512	0.607
BUT	*Stromateus brasiliensis*	263.680	254.800	263.680	0.547
CGO	*Cottoperca gobio*	214.224	205.180	214.224	0.444
TOO	*Dissostichus eleginoides*	206.292	206.292	0.000	0.428
SPN	Porifera	205.549	0.000	205.549	0.426
MED	*Medusa* sp.	174.972	0.000	174.972	0.363
BLU	*Micromesistius australis*	159.522	45.890	136.788	0.331
DGH	*Schroederichthys bivius*	155.755	155.552	155.755	0.323
RBR	*Bathyraja brachyurops*	141.788	141.788	23.608	0.294
SEP	*Seriolella porosa*	119.265	118.805	0.000	0.247
RGR	*Bathyraja griseocauda*	118.753	118.753	1.620	0.246
PYM	*Notophycis marginata*	110.900	4.476	110.900	0.230
ALG	Algae	105.195	0.000	105.195	0.218
RFL	*Dipturus lamillai*	98.280	98.280	1.500	0.204
PAT	*Merluccius australis*	95.140	95.140	0.000	0.197
SHT	Mixed invertebrates	89.772	0.000	89.772	0.186
DGS	*Squalus acanthias*	82.406	73.636	82.406	0.171
COP	*Congiopodus peruvianus*	67.040	9.980	67.040	0.139
RED	*Sebastes oculatus*	58.880	58.880	0.000	0.122
SQT	Ascidiacea	57.393	0.000	57.393	0.119
RMU	*Bathyraja multispinis*	41.620	41.620	0.000	0.086
RAL	*Bathyraja albomaculata*	24.468	24.468	6.420	0.051
RMC	*Bathyraja macloviana*	23.756	23.756	18.760	0.049

Species Code	Latin name	Total caught (kg)	Total sampled (kg)	Total discarded (kg)	%
RBZ	*Bathyraja cousseauae*	16.740	16.740	0.000	0.035
EEL	*Iluocoetes/Patagolycus* mix	13.522	0.000	13.522	0.028
NEM	*Psychrolutes marmoratus*	10.986	9.072	10.986	0.023
STA	*Sterechinus agassizii*	9.584	0.000	9.584	0.020
RPX	*Psammobatis* spp.	7.936	7.928	7.936	0.016
GOC	*Gorgonocephalus chilensis*	7.728	0.000	7.728	0.016
OCM	*Enteroctopus megalocyathus*	6.329	3.789	6.329	0.013
OPV	*Ophiacantha vivipara*	5.306	0.000	5.306	0.011
RDO	*Amblyraja doellojuradoi*	5.252	5.252	5.252	0.011
RDA	*Dipturus argentinensis*	4.260	4.260	0.000	0.009
HYD	Hydrozoa	4.212	0.000	4.212	0.009
CTA	*Ctenodiscus australis*	4.184	0.000	4.184	0.009
MLA	*Muusoctopus longibrachus akambei*	4.019	1.499	4.019	0.008
ANM	*Anemonia* spp.	3.876	0.000	3.876	0.008
ROC	Rock	3.324	0.000	3.324	0.007
MUG	*Munida gregaria*	3.004	0.000	3.004	0.006
ZYP	*Zygochlamys patagonica*	2.943	0.000	2.943	0.006
CIR	*Cirripedia*	2.797	0.000	2.797	0.006
TRP	*Tripylaster philippi*	2.780	0.000	2.780	0.006
MUN	*Munida* spp.	2.772	0.000	2.772	0.006
POA	*Glabraster antarctica*	2.658	0.000	2.658	0.006
BRY	Bryozoa	2.347	0.000	2.347	0.005
FUM	*Fusitriton m. magellanicus*	2.135	0.000	2.135	0.004
THO	Thouarellinae	1.676	0.000	1.676	0.003
SRP	*Semirossia patagonica*	1.543	0.000	1.543	0.003
MUE	*Muusoctopus eureka*	1.540	0.000	1.540	0.003
COL	*Cosmasterias lurida*	1.224	0.000	1.224	0.003
ALC	Alcyoniina	1.077	0.000	1.077	0.002
GYN	*Gymnoscopelus nicholsi*	1.047	0.000	1.047	0.002
CAZ	*Calyptraster* sp.	1.013	0.000	1.013	0.002
LIS	*Lithodes santolla*	0.996	0.000	0.996	0.002
AUC	*Austrocidaris canaliculata*	0.893	0.000	0.893	0.002
ZYX	*Zygochlamys* (dead)	0.858	0.000	0.858	0.002
EGG	Eggmass	0.856	0.000	0.856	0.002
PAG	*Paralomis granulosa*	0.752	0.000	0.752	0.002
POL	Polychaeta	0.746	0.000	0.746	0.002
BAL	*Americominella longisetosus*	0.714	0.000	0.714	0.001
MIR	*Mirostenella* sp.	0.684	0.000	0.684	0.001
SAR	*Sprattus fuegensis*	0.675	0.000	0.368	0.001
MAY	Malacosteinae	0.660	0.000	0.660	0.001
PES	*Peltarion spinulosum*	0.634	0.000	0.634	0.001
CEX	*Ceramaster* sp.	0.608	0.000	0.608	0.001

Species Code	Latin name	Total caught (kg)	Total sampled (kg)	Total discarded (kg)	%
OCT	*Octopus* spp.	0.600	0.000	0.600	0.001
OPL	*Ophiura lymani*	0.590	0.000	0.590	0.001
FLX	*Flabellum* spp.	0.583	0.000	0.583	0.001
CHE	*Champsocephalus esox*	0.540	0.540	0.540	0.001
SEC	*Seriolella caerulea*	0.449	0.449	0.000	0.001
PMB	*Protomyctophum bolini*	0.446	0.000	0.446	0.001
BAO	*Bathybiaster loripes*	0.426	0.000	0.426	0.001
ASA	*Astrotoma agassizii*	0.394	0.000	0.394	0.001
MAV	*Magellania venosa*	0.390	0.000	0.390	0.001
EUO	*Eurypodius longirostris*	0.367	0.000	0.367	0.001
CRY	*Crossaster* sp.	0.363	0.000	0.363	0.001
ODM	*Odontocymbiola magellanica*	0.352	0.000	0.352	0.001
ANN	Annelida	0.340	0.000	0.340	0.001
AST	Asteroidea	0.340	0.000	0.340	0.001
CYX	*Cycethra* sp.	0.328	0.000	0.328	0.001
ADA	*Adelomelon ancilla*	0.320	0.000	0.320	0.001
SUN	*Labidiaster radiosus*	0.295	0.000	0.295	0.001
PYX	Pycnogonida	0.210	0.000	0.210	0.000
TED	*Terebratella dorsata*	0.200	0.000	0.200	0.000
STE	*Sterechinus* sp.	0.182	0.000	0.182	0.000
LIR	*Limopsis marionensis*	0.178	0.000	0.178	0.000
CAS	*Campylonotus semistriatus*	0.154	0.000	0.154	0.000
COT	*Cottunculus granulosus*	0.140	0.140	0.140	0.000
THB	*Thymops birsteini*	0.118	0.000	0.118	0.000
THN	*Thysanopsetta naresi*	0.115	0.060	0.115	0.000
DDT	*Desmophyllum dianthus*	0.112	0.000	0.112	0.000
LOS	*Lophaster stellans*	0.109	0.000	0.109	0.000
HEX	*Henricia* sp.	0.092	0.000	0.092	0.000
OPD	*Ophiacantha densispina*	0.082	0.000	0.082	0.000
ACS	*Acanthoserolis schythei*	0.060	0.000	0.060	0.000
SOR	*Solaster regularis*	0.060	0.000	0.060	0.000
NUD	Nudibranchia	0.059	0.000	0.059	0.000
EUL	*Eurypodius latreillii*	0.056	0.000	0.056	0.000
TRX	*Trophon* sp.	0.048	0.000	0.048	0.000
GAY	Gastropoda	0.032	0.000	0.032	0.000
ODP	*Odontaster pencillatus*	0.030	0.000	0.030	0.000
UHH	*Tripilaster* sp.	0.030	0.000	0.030	0.000
WRM	Polychaeta	0.030	0.000	0.030	0.000
OPS	*Ophiactis asperula*	0.026	0.000	0.026	0.000
SYB	*Symbolophorus boops*	0.026	0.026	0.026	0.000
MUU	*Munida subrugosa*	0.024	0.000	0.024	0.000
UCH	Echinoidea	0.014	0.000	0.014	0.000

Species Code	Latin name	Total caught (kg)	Total sampled (kg)	Total discarded (kg)	%
PAE	*Patagonotothen elegans*	0.012	0.012	0.000	0.000
BUC	*Falsilunatia carcellesi*	0.010	0.000	0.010	0.000
ASF	*Asterina fimbriata*	0.008	0.000	0.008	0.000
GOR	Gorgonacea	0.006	0.000	0.006	0.000
LIG	*Libidoclaea granaria*	0.006	0.000	0.006	0.000
PRD	Primnoidae	0.006	0.000	0.006	0.000
LAP	*Lamellaria patagonica*	0.004	0.000	0.004	0.000
OIB	*Oidiphorus brevis*	0.003	0.003	0.003	0.000
HCR	Paguroidea	0.002	0.000	0.002	0.000
ICA	*Icichthys australis*	0.002	0.002	0.002	0.000
BRM	*Brucerolis macdonnellae*	0.001	0.000	0.001	0.000
ISI	Isididae	0.001	0.000	0.001	0.000

3.2. Biological information of finfish species

3.2.1. *Salilota australis* – Red cod

The total catch of red cod was 9,596 kg. This species was caught at 38 of the 42 trawl stations sampled throughout the research cruise. Catches ranged from 0.06 to 4,618 kg, densities were 0.3 to 21,143 kg/km^2, and CPUE ranged from 0.06 to 4,618 kg/h. Catches of red cod occurred mostly along the west and north west of the Falkland Islands (Figure 2A). Most females and males were resting (maturity stage II), with minor frequencies of spent individuals (maturity stages ≥ VII) and immature (maturity stage I; Figure 2B). Females were 16–78 cm total length, and males were 10–77 cm total length. The length frequency histogram allowed identifying three length-groups for females, with length modes at 19 cm, 35 cm, and 43 cm total length, respectively (Figure 2C). Length-groups of males were identified at 18 cm, 28 cm, and 46 cm total length (Figure 2D). Overlap of lengths did not allow identifying all the cohorts present.

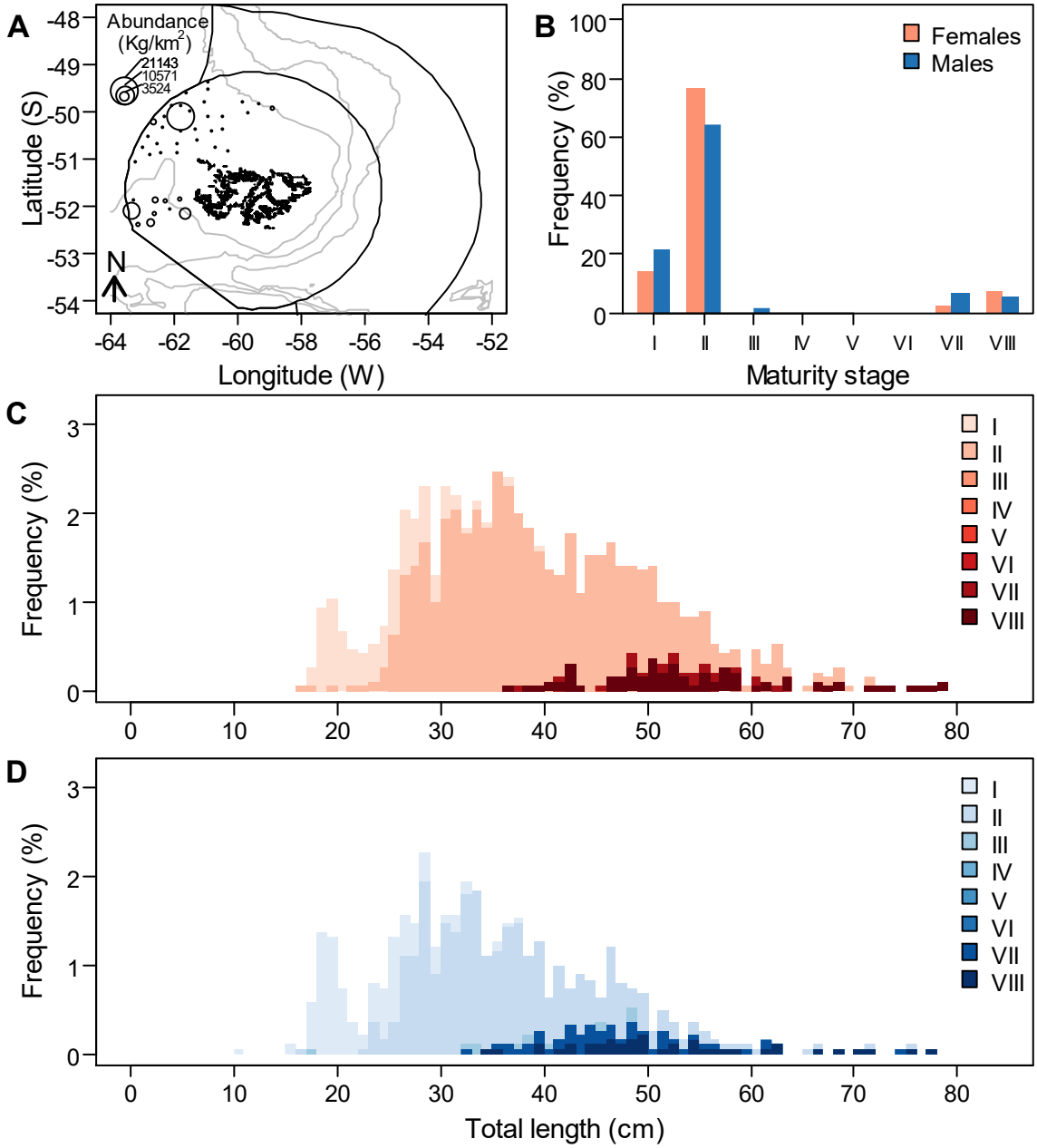

Figure 2. Biological data of *Salilota australis* (Red cod; BAC). A) Map of the densities in kg/km^2; B) relative frequency (%) of specimens of each sex per maturity stage (I, immature; II, resting; III, early developing; IV, late developing; V, ripe; VI, running; VII, spent; VIII, recovering spent); length frequencies (%) of C) females (n = 1,161) and D) males (n = 770) with 1 cm size class.

3.2.2. *Micromesistius australis* – Southern blue whiting

The total catch of Southern blue whiting was 159 kg. This species was caught at 17 of the 42 trawl stations sampled throughout the research cruise. Catches ranged from 0.01 to 119 kg, densities ranged from 0.01 to 589 kg/km^2, and CPUE ranged from 0.01–119 kg/h. Southern blue whiting were caught in the south-west of West Falkland (Figure 3A). A total of 580 fish were sampled for length frequency (2 juveniles, 191 females, 387 males). Individuals were mainly immature (Figure 3B). Females were 21–51 cm total length (Figure 3C) and males were 12–47 cm total length (Figure 3D). The limited number of individuals caught during the survey allowed identifying one length-group with mode at 24 cm total length, for both females and males, likely corresponding to one cohort. There may be more cohorts with modal lengths > 30 cm total length.

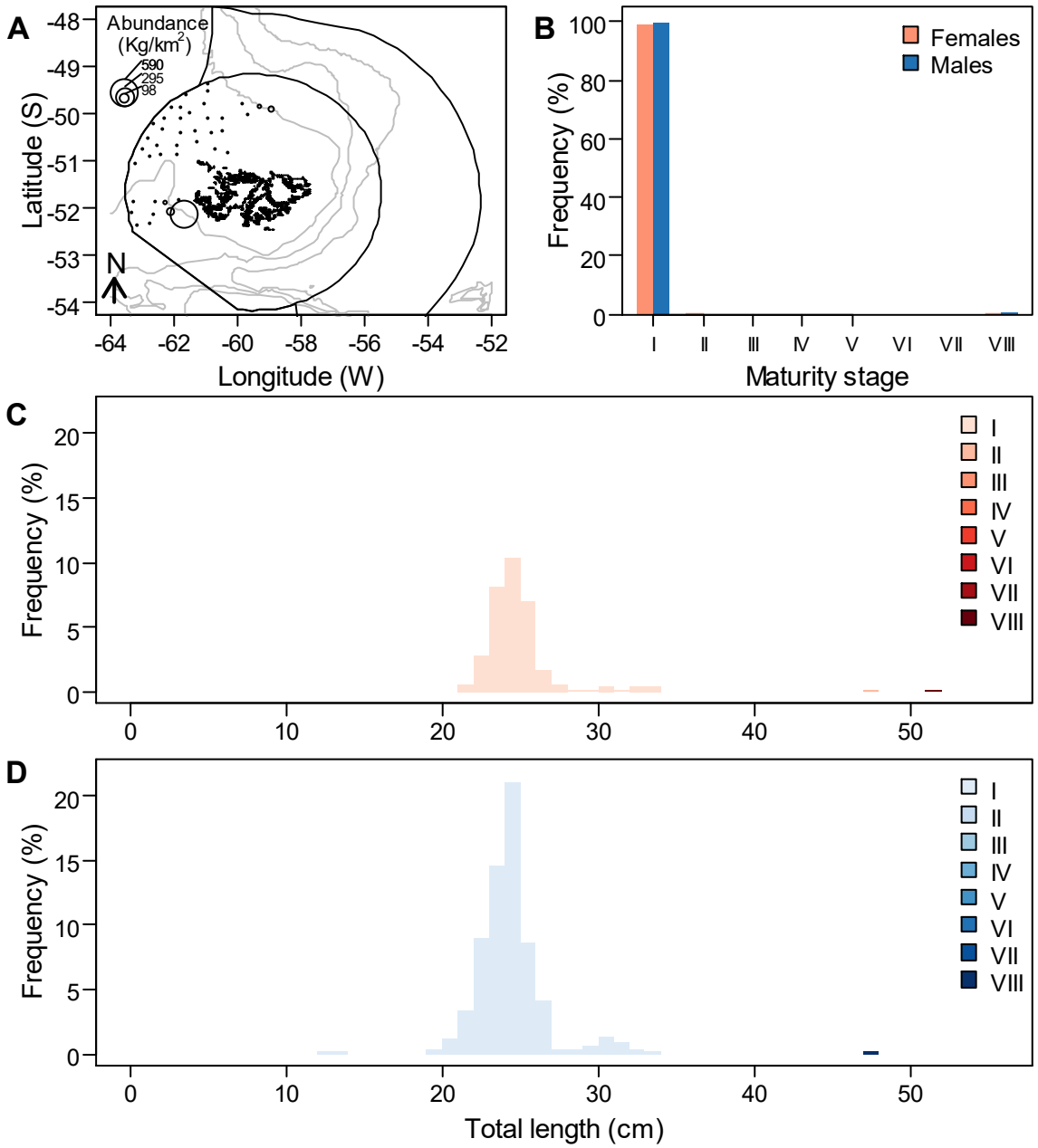

Figure 3. Biological data of *Micromesistius australis* (Southern blue whiting; BLU). A) Map of the densities in kg/km^2; B) relative frequency (%) of specimens of each sex per maturity stage (I, immature; II, resting; III, early developing; IV, late developing; V, ripe; VI, running; VII, spent; VIII, recovering spent); length frequencies (%) of C) females (n = 191) and D) males (n = 387) with 1 cm size class.

3.2.3. *Merluccius hubbsi* – Common hake

The total catch of common hake was 8,145 kg. This species was caught at 37 of the 42 trawl stations sampled throughout the research cruise. Catches ranged from 0.64 to 662 kg, densities ranged from 3.1 to 2,974 kg/km^2, and CPUE ranged from 0.7 to 662 kg/h. Common hake was observed to the north-west near the limit of the FICZ, an area where common hake has historically been observed during February (Figure 4A). Most females were spent or recovering spent (maturity stages ≥ VII), or resting (maturity stage II). Most males were spent or recovering spent (maturity stages ≥ VII) (Figure 4B). Females were 27–82 cm total length and males were 29–51 cm total length. The length frequency distribution showed modal lengths of 41 cm total length for females (Figure 4C) and 36 cm total length for males (Figure 4D).

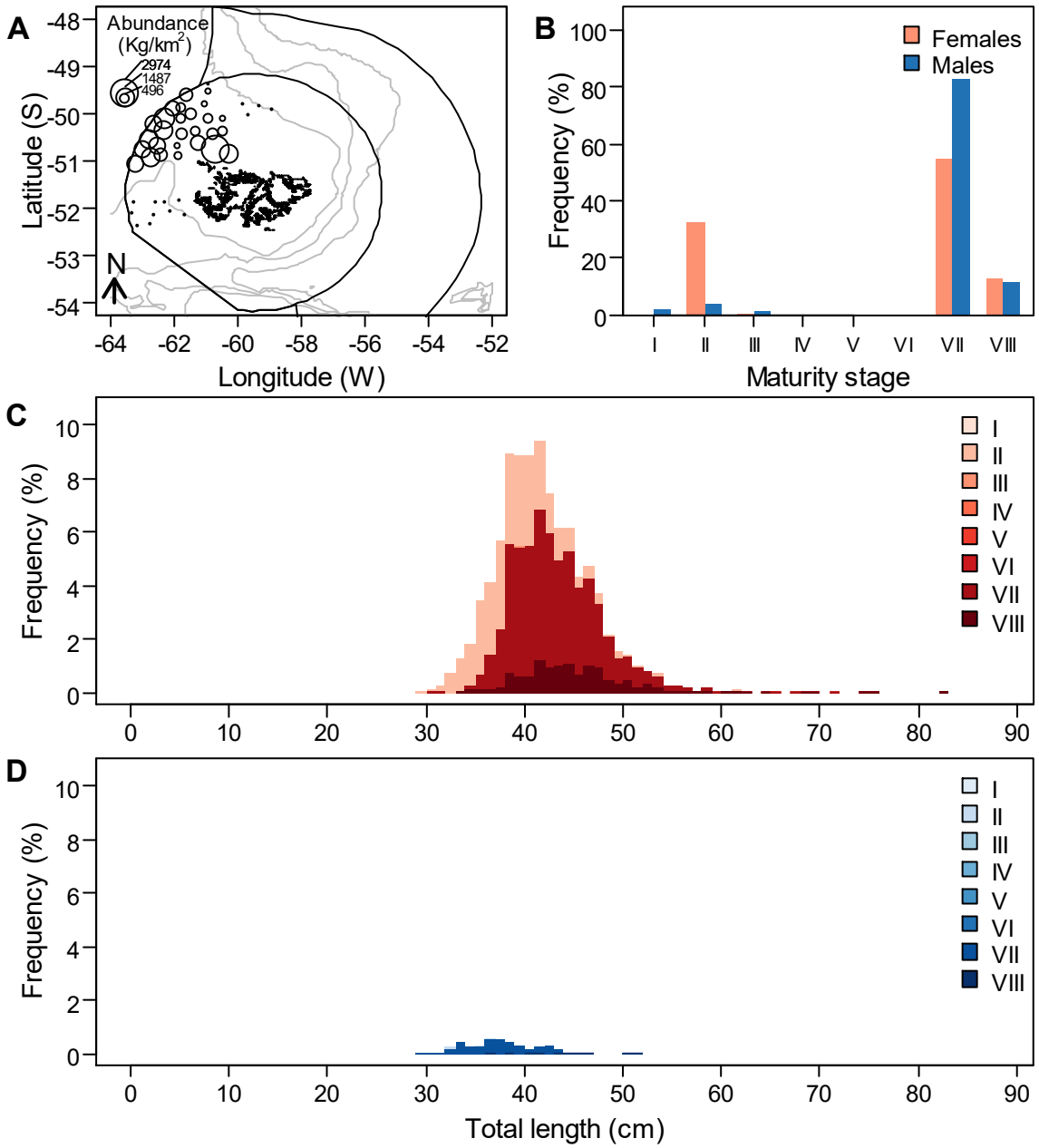

Figure 4. Biological data of *Merluccius hubbsi* (Common hake; HAK). A) Map of the densities in kg/km^2; B) relative frequency (%) of specimens of each sex per maturity stage (I, immature; II, resting; III, early developing; IV, late developing; V, ripe; VI, running; VII, spent; VIII, recovering spent); length frequencies (%) of C) females (n = 2,504) and D) males (n = 117) with 1 cm size class.

3.2.4. *Genypterus blacodes* – Kingclip

The total catch of kingclip was 2,678 kg. This species was caught at 40 of the 42 trawl stations sampled throughout the research cruise. Catches ranged from 0.54 to 960 kg, densities ranged from 1 to 960 kg/km^2, and CPUE ranged from 2.42 to 4,734 kg/h. Catches occurred along the west, with highest densities to the north-west and to the south-west in the FICZ (Figure 5A). Most females and males were at resting maturity stage (maturity stage II) (Figure 5B). Females were 36–121 cm total length, and males were 39–114 cm total length. The overlap of sizes allowed identifying only one length-group with modal lengths at 73 cm total length for females and at 67 cm total length for males (Figure 5C); however, it's likely that more length-groups occurred given the wide range of sizes detected.

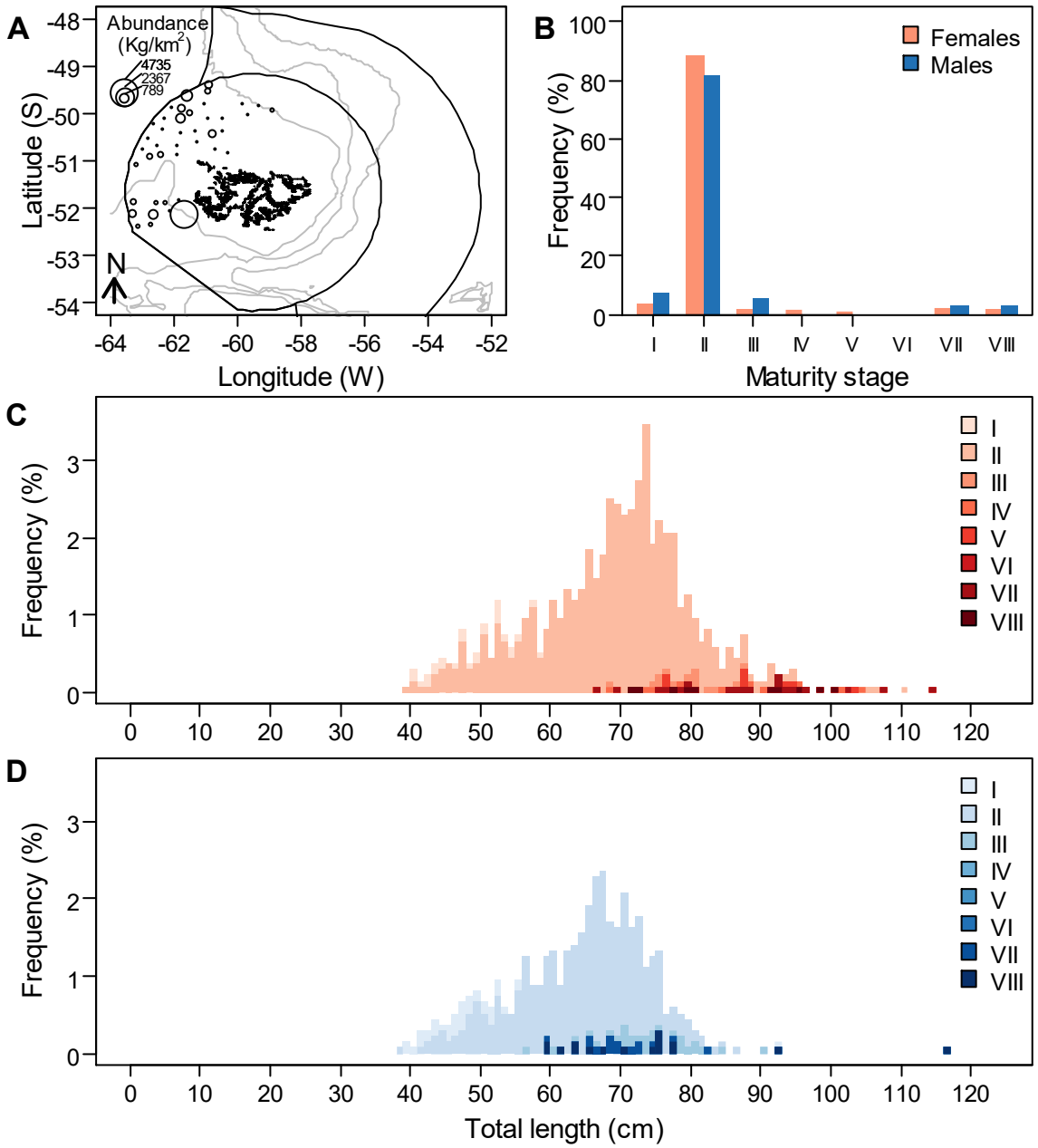

Figure 5. Biological data of *Genypterus blacodes* (Kingclip; KIN). A) Map of densities in kg/km^2; B) relative frequency (%) of specimens of each sex per maturity stage (I, immature; II, resting; III, early developing; IV, late developing; V, ripe; VI, running; VII, spent; VIII, recovering spent); length frequencies (%) of C) females (n = 1,199) and D) males (n = 978) with 1 cm size class.

3.2.5. *Patagonotothen ramsayi* – Common rock cod

The total catch of rock cod was 10,993 kg. This species was caught at every station with catches ranging from 15.3 to 3,639 kg, densities ranged from 74.2 to 15,878 kg/km^2, and CPUE ranged from 15.3 to 3,639 kg/h. Higher densities were observed along the northwest in the FICZ (Figure 6A). Most females and males were immature (maturity stages ≤ III), with resting individuals being predominant (Figure 6B). Females were 11–38 cm total length, and males were 10–38 cm total length. Two length-groups were identified; modal lengths of females were 15 cm and at 21 cm total length (Figure 6C), whereas modal lengths of males were 14 cm and at 21 cm total length (Figure 6D). More than two length-groups may exist but these were not detected because of the overlap of size.

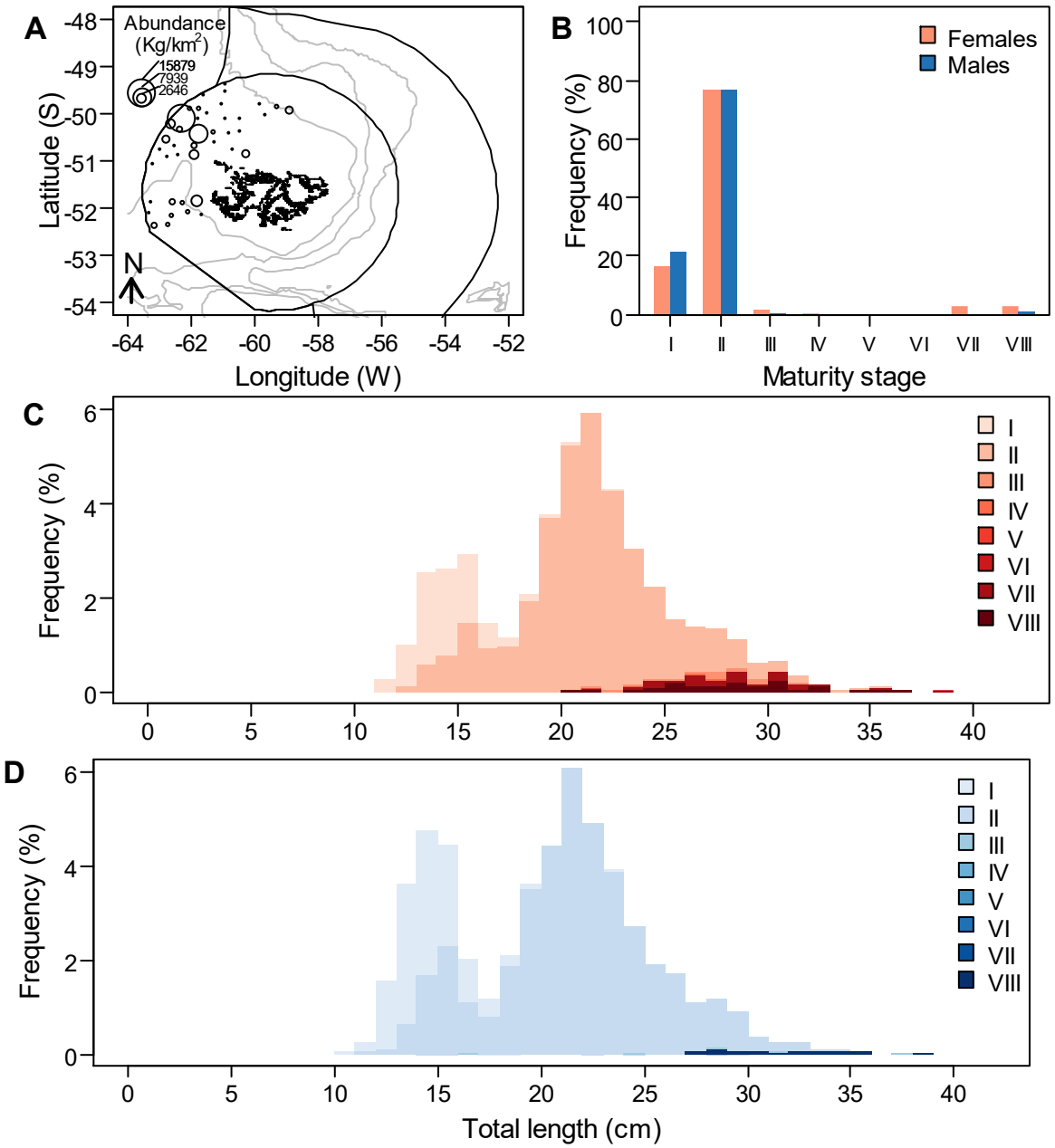

Figure 6. Biological data for *Patagonotothen ramsayi* (Common rock cod; PAR). A) Map of the densities in kg/km^2; B) relative frequency (%)of specimens of each sex per maturity stage (I, immature; II, resting; III, early developing; IV, late developing; V, ripe; VI, running; VII, spent; VIII, recovering spent); length frequencies (%) of C) females (n = 1,937) and D) males (n = 2,260) with 1 cm size class.

3.2.6. *Merluccius australis* – Southern hake

The total catch of Southern hake was 95 kg. This species was caught at 8 of the 42 trawl stations sampled throughout the research cruise. Catches ranged from 2.3 to 25 kg, densities ranged from 10.7 to 131 kg/km^2, and CPUE ranged from 2.3 to 29 kg/h. Southern hake were observed to the south-west of the survey zone near the limit of the FICZ (Figure 7A); this area is in deeper waters where Southern hake are most abundant. Most animals were resting (maturity stage II), spent (maturity stage VII), or recovering spent (maturity stage VIII) (Figure 7B). The small number of Southern hake caught and the wide range of sizes did not enable identifying length-groups on the length-frequency histograms (Figures 7C–7D).

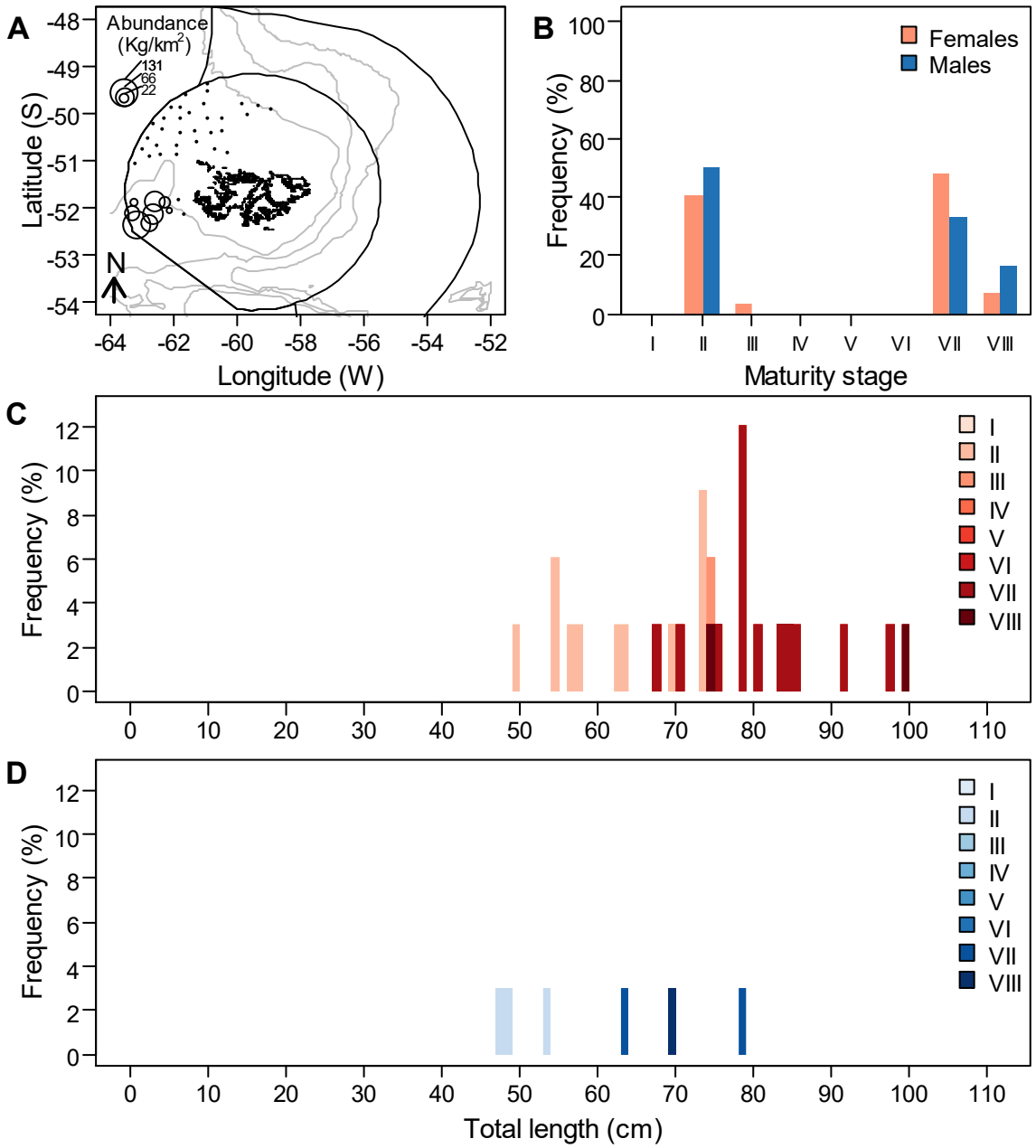

Figure 7. Biological data of *Merluccius australis* (Southern hake; PAT). A) Map of the densities in kg/km^2; B) relative frequency (%) of specimens of each sex per maturity stage (I, immature; II, resting; III, early developing; IV, late developing; V, ripe; VI, running; VII, spent; VIII, recovering spent); length frequencies (%) of C) females (n = 27) and D) males (n = 6) with 1 cm size class.

3.2.7. *Dissostichus eleginoides* – Patagonian toothfish

The total catch of Patagonian toothfish was 206 kg. This species was caught at 18 of the 42 trawl stations sampled throughout the research cruise. Catches ranged from 0.4 to 38 kg, densities ranged from 1.9 to 175 kg/km^2, and CPUE ranged from 0.4 to 38 kg/h. Highest densities were observed in the south-west of the survey zone at stations deeper than 200 m (Figure 8A). Most individuals were immature or resting (maturity stages ≤ II) (Figure 8B). Females were 32–88 cm total length, males were 33–73 cm total length. One length-group was identified with a modal length at 35 cm total length for females (Figure 8C) and at 35–36 cm total length for males (Figure 8D). There may be more cohorts with modal lengths > 40 cm.

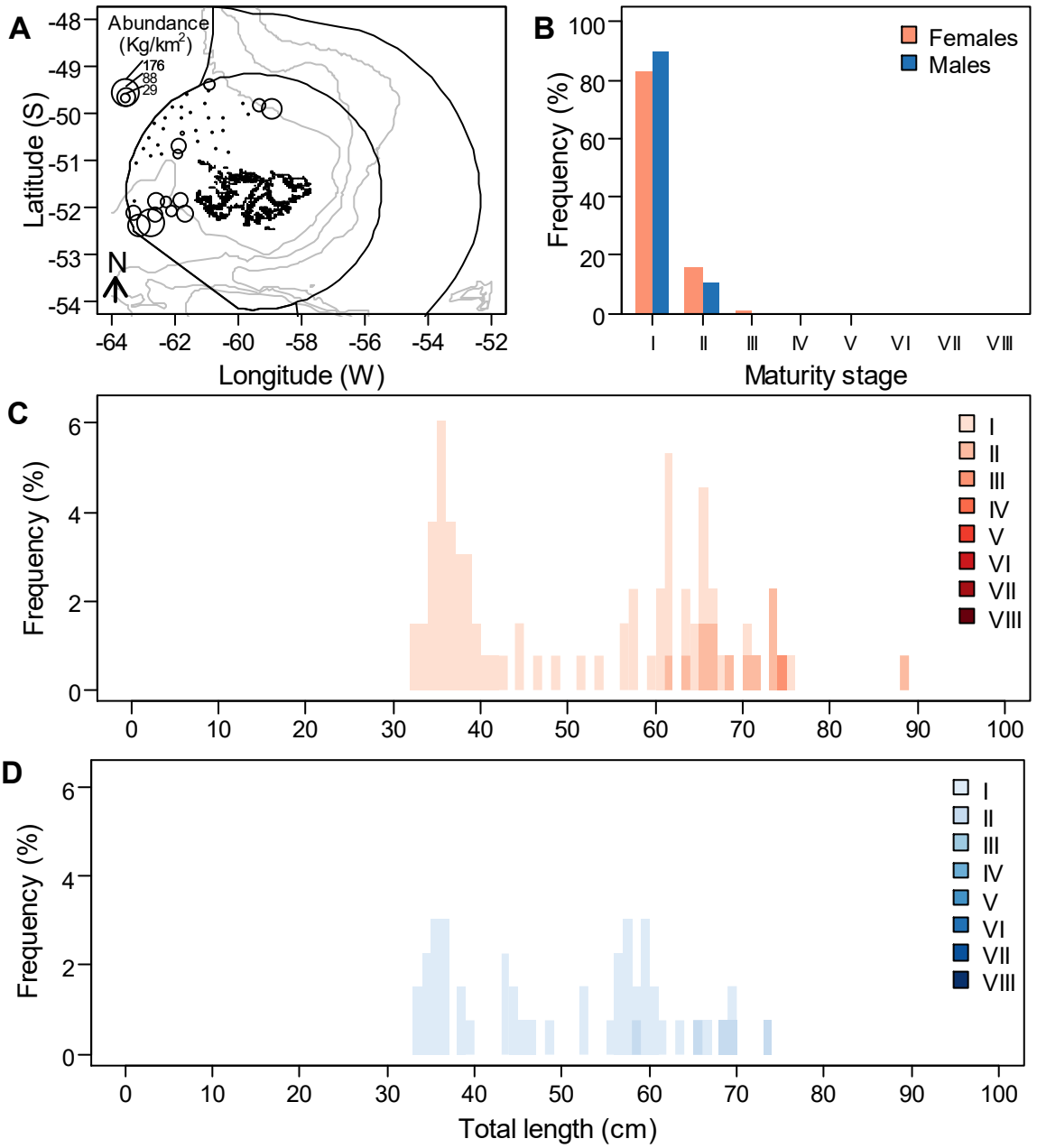

Figure 8. Biological data of *Dissostichus eleginoides* (Patagonian toothfish; TOO). A) Map of the densities in kg/km^2; B) relative frequency (%) of specimens of each sex per maturity stage (I, immature; II, resting; III, early developing; IV, late developing; V, ripe; VI, running; VII, spent; VIII, recovering spent); length frequencies (%) of C) females (n = 82) and D) males (n = 50) with 1 cm size class.

3.2.8. *Macruronus magellanicus* – Hoki

The total catch of hoki was 9,507 kg. This species was caught at 16 of the 42 stations sampled throughout the research cruise. Catches ranged from 0.1 to 5,607 kg, densities ranged from 0.36 to 25,342 kg/km^2, and CPUE ranged from 0.1 to 5,607 kg/h. Highest densities were observed in the south-west of the survey area near the limit of the FICZ (Figure 9A), with more than half of the total hoki catch caught in one single station (station 3485). Most females and males were immature, resting or early developing (maturity stages ≤ III). A minor proportion of individuals were spent or recovering spent (maturity stages > VII; Figure 9B). Females were 14–39 cm pre-anal length (Figure 9C), and males were 14–32 cm pre-anal length (Figure 9D). The length frequency histograms exhibit one length-group with modal length at 25 cm pre-anal length for females and males.

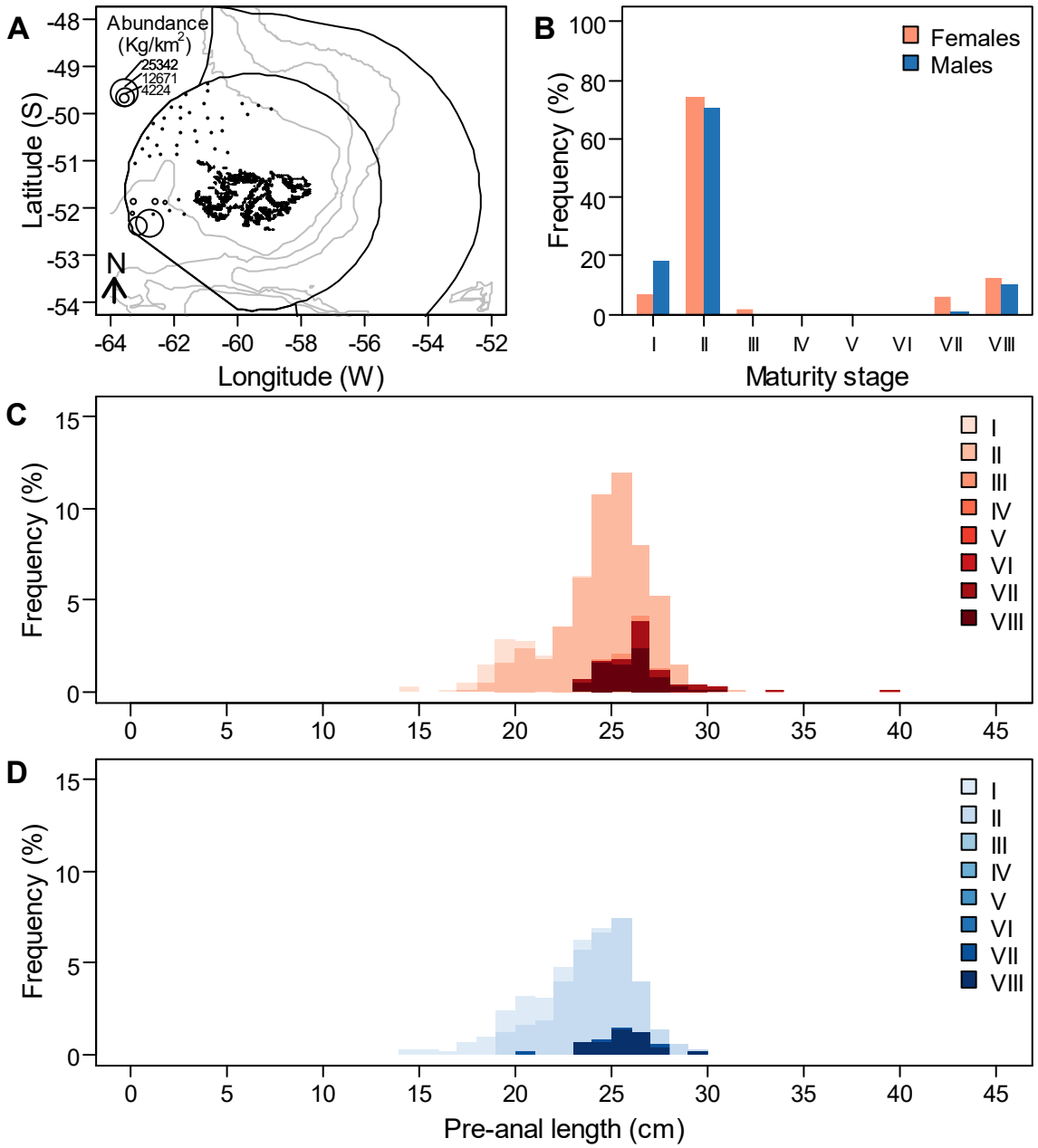

Figure 9. Biological data of *Macruronus magellanicus* (Hoki; WHI). A) Map of the densities in kg/km^2; B) relative frequency (%) of specimens of each sex per maturity stage (I, immature; II, resting; III, early developing; IV, late developing; V, ripe; VI, running; VII, spent; VIII, recovering spent); length frequencies (%) of C) females (n = 450) and D) males (n = 324) with 1 cm size class.

3.2.9. *Stromateus brasiliensis* – Butterfish

The total catch of butterfish was 263 kg. This species was caught at 29 of the 42 trawl stations sampled throughout the research cruise. Catches ranged from 0.3 to 49 kg, densities ranged from 1.2 to 222 kg/km^2, and CPUE ranged from 0.3 to 49 kg/h. Butterfish was caught along the north of West Falkland at nearshore stations (Figure 10A). Females were mostly early developing (maturity stage III) whereas males were mainly resting (maturity stage II); few individuals were spent or recovering spent (maturity stages ≥ VII; Figure 10B). Females were 27–43 cm total length and males were 18–36 cm total length. One length-group was detected with modal lengths at 31 cm total length for females (Figure 10C) and at 30 cm total length for males (Figure 10D).

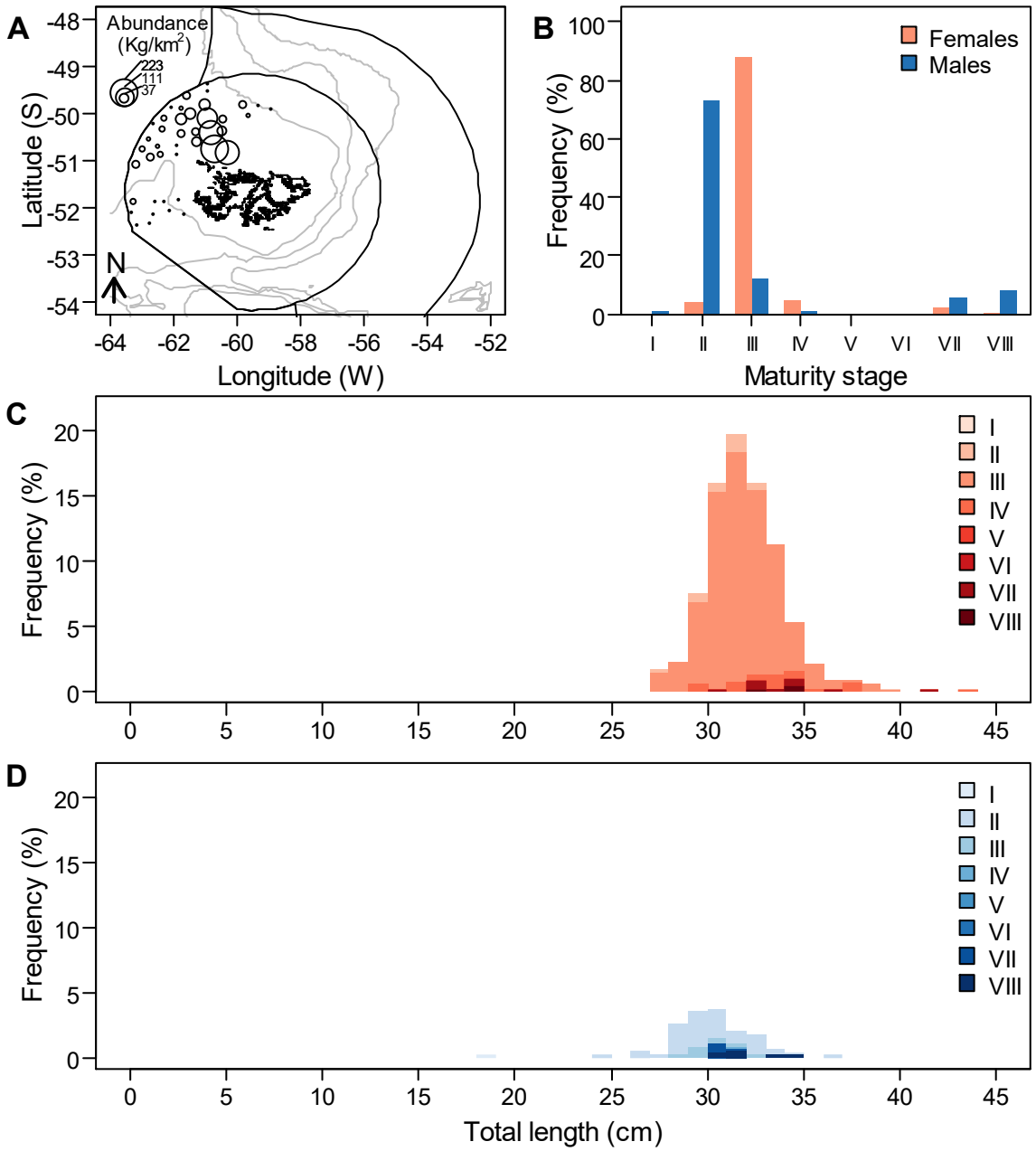

Figure 10. Biological data of *Stromateus brasiliensis* (Butterfish; BUT). A) Map of the densities in kg/km^2; B) relative frequency (%) of specimens of each sex per maturity stage (I, immature; II, resting; III, early developing; IV, late developing; V, ripe; VI, running; VII, spent; VIII, recovering spent); length frequencies (%) of C) females (n = 496) and D) males (n = 93) with 1 cm size class.

3.2.10. *Coelorinchus fasciatus* – Banded whiptail grenadier

The total catch of banded whiptail grenadier was 4,128 kg. This species was caught at 9 of the 42 trawl stations sampled throughout the research cruise. Catches ranged from 156 to 805 kg, densities ranged from 707 to 3,970 kg/km^2, and CPUE ranged from 156 to 805 kg/h. Highest densities were observed in the south-west of the FICZ (Figure 11A). Females were mostly resting (maturity stage II), spent or recovering spent (maturity stages ≥ VII) while males were mostly resting or developing (maturity stages ≤ II); smaller proportions of males were recovering spent (maturity stage VIII; Figure 11B). Females were 5–14 cm pre–anal length; males were 3–11 cm pre–anal length, two sampled juveniles were 3 cm pre-anal length (n = 2). The length-frequency histogram allowed detecting a single length-group with modal lengths at 10 cm pre–anal length for females (Figure 11C) and at 9 cm pre-anal length for males (Figure 11D).

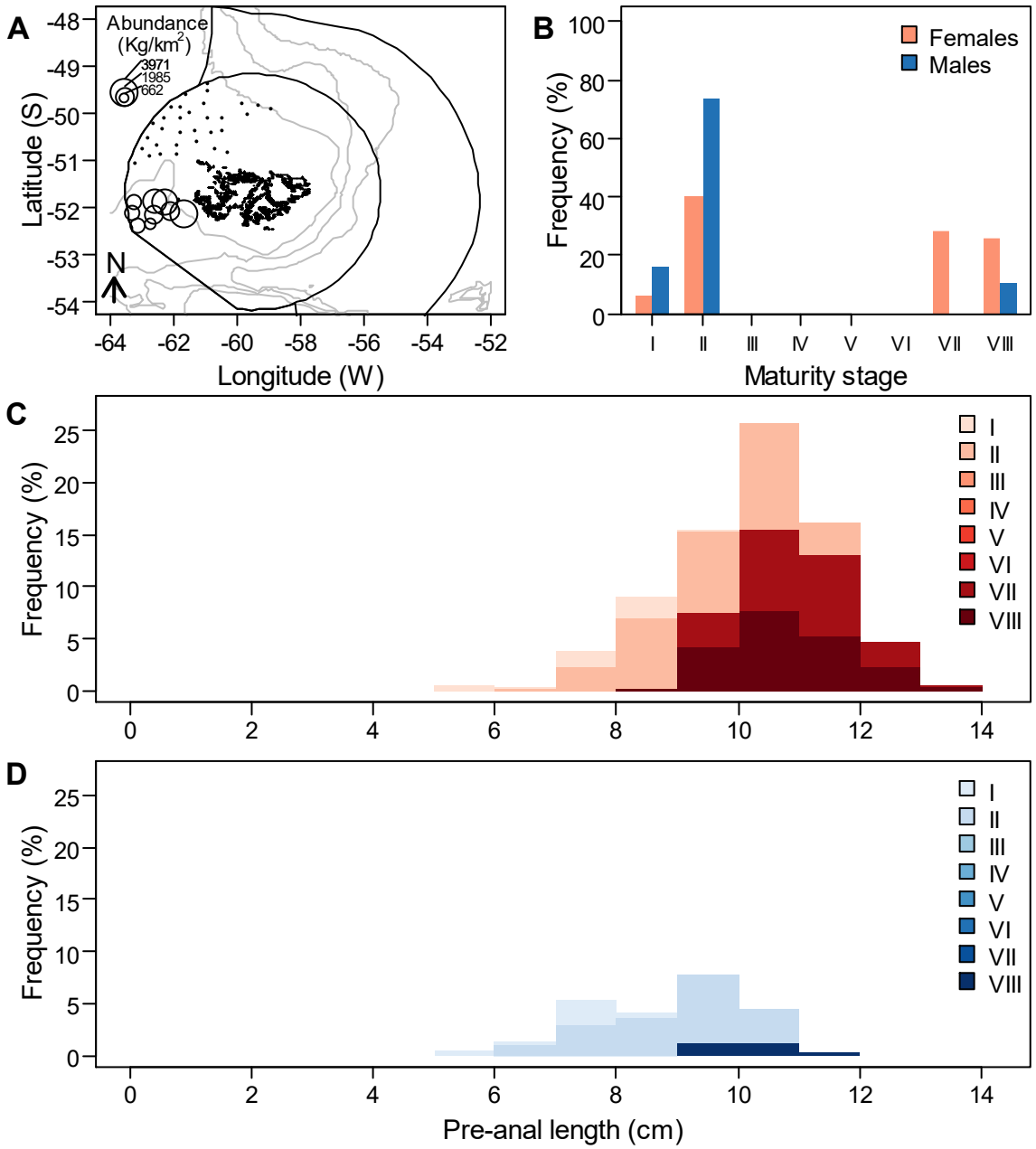

Figure 11. Biological data of *Coelorinchus fasciatus* (Banded whiptail grenadier; GRF). A) Map of the densities in kg/km^2; B) relative frequency (%) of specimens of each sex per maturity stage (I, immature; II, resting; III, early developing; IV, late developing; V, ripe; VI, running; VII, spent; VIII, recovering spent); length frequencies (%) of C) females (n = 687) and D) males (n = 408) with 1 cm size class.

3.2.11. *Seriolella porosa* – Driftfish

The total catch of driftfish was 119 kg. This species was caught at 8 of the 42 trawl stations sampled throughout the research cruise. Catches ranged from 0.4 to 46 kg, densities ranged from 2 to 225 kg/km^2, and CPUE ranged from 0.4 to 46 kg/h. Highest densities were observed to the south-west in the FICZ (Figure 12A). Females were mainly spent or recovering spent (maturity stages ≥ VII); males were mostly recovering spent (maturity stage VIII) (Figure 12B). Females were 41–57 cm total length and males were 42–54 cm total length. Length-groups were detected at modal lengths of 53 cm total length for females and males (Figure 12C-12D).

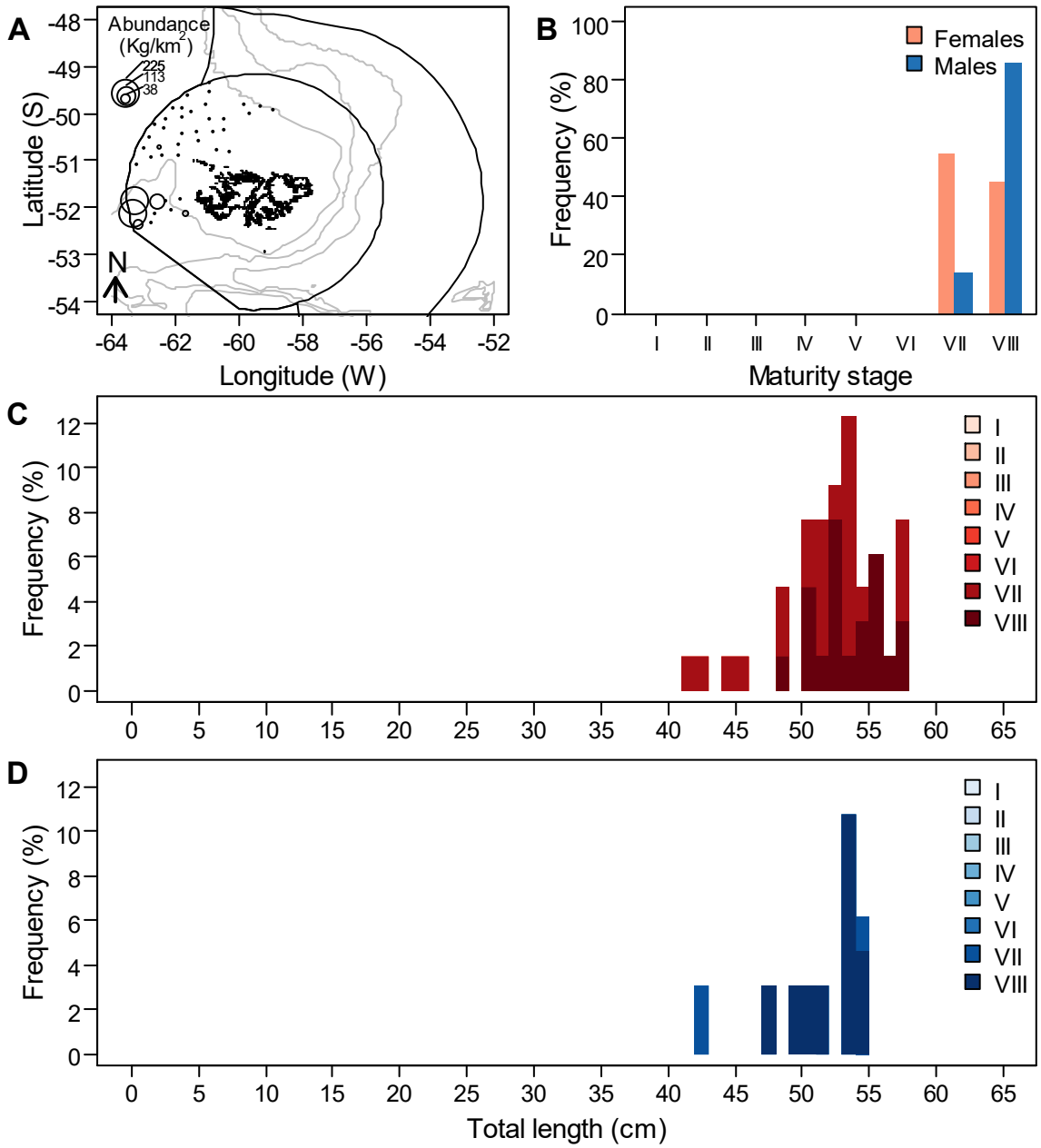

Figure 12. Biological data of *Seriolella porosa* (Driftfish; SEP). A) Map of the densities in kg/km^2; B) relative frequency (%) of specimens of each sex per maturity stage (I, immature; II, resting; III, early developing; IV, late developing; V, ripe; VI, running; VII, spent; VIII, recovering spent); length frequencies (%) of C) females (n = 44) and D) males (n = 21) with 1 cm size class.

3.3. Biological information of squid species

3.3.1. Illex argentinus – Argentine shortfin squid

The total catch of Argentine shortfin squid was 522 kg. This species was caught at 35 of the 42 trawl stations sampled throughout the research cruise. Catches ranged from 0.3 to 108 kg, densities ranged from 1.8 to 540 kg/km^2, and CPUE ranged from 0.3 to 108 kg/h. Highest densities occurred mainly in the north-west of the FICZ (Figure 13A). Most females were immature (maturity stages ≤ II). Most males were maturing or mature (maturity stages ≥ IV), or immature (maturity stage I; Figure 13B). Juveniles (n = 63) were 7.5–13.5 cm dorsal mantle length. Females size ranged between 7.5 cm and 36.5 cm dorsal mantle length, with length-groups being identified at modal lengths of 11.0 cm and at 27.0 cm dorsal mantle length (Figure 13C). Males size ranged between 7.0 cm and 29.5 cm, with modes at 11.0 cm and 25.0 cm dorsal mantle length (Figure 13D).

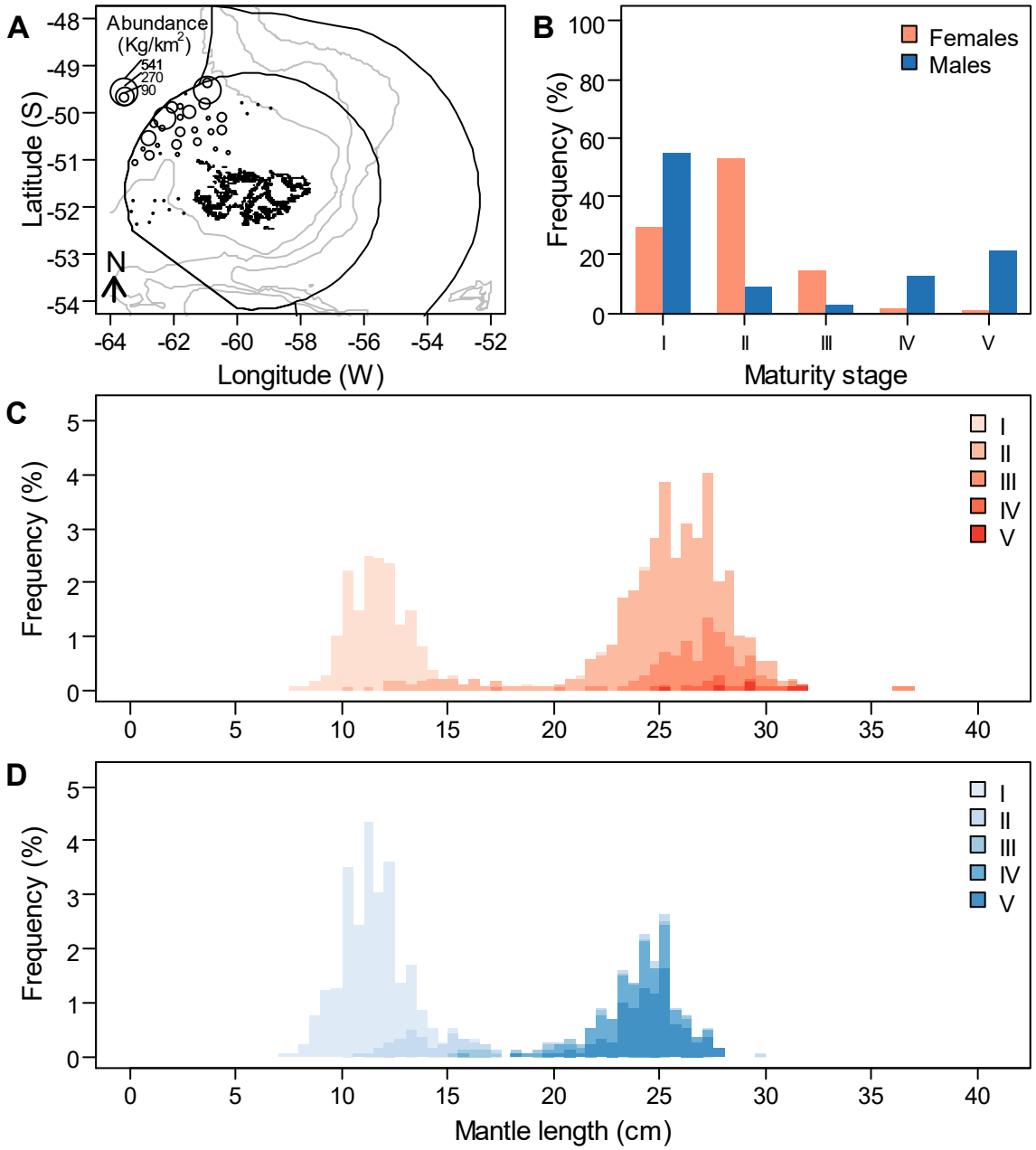

Figure 13. Biological data of *Illex argentinus* (Argentine shortfin squid; ILL). A) Map of the densities in kg/km^2; B) relative frequency (%) of specimens of each sex per maturity stage (I, immature; II, resting; III, early developing; IV, late developing; V, ripe; VI, running; VII, spent; VIII, recovering spent); length frequencies (%) of C) females (n = 1,002) and D) males (n = 802) with 0.5 cm size class.

3.3.2. *Doryteuthis gahi* – Falkland calamari

The total catch of Falkland calamari was 2,071 kg. This species was caught at 42 of the 42 trawl stations sampled throughout the research cruise. Catches ranged from 1.9 to 201 kg, densities ranged from 8.7 to 934 kg/km^2, and CPUE ranged from 1.9 to 201 kg/h. Falkland calamari were caught throughout the survey zone (Figure 14A). Most females and males were immature (maturity stage II) (Figure 14B). Juveniles were 4.5–10.0 cm dorsal mantle length, females were 5.0–18.5 cm dorsal mantle length (Figure 14C), and males were 5.0–22.0 cm dorsal mantle length (Figure 14D). One length-group was detected, with modal length of females and males at 8.0 cm dorsal mantle length, respectively.

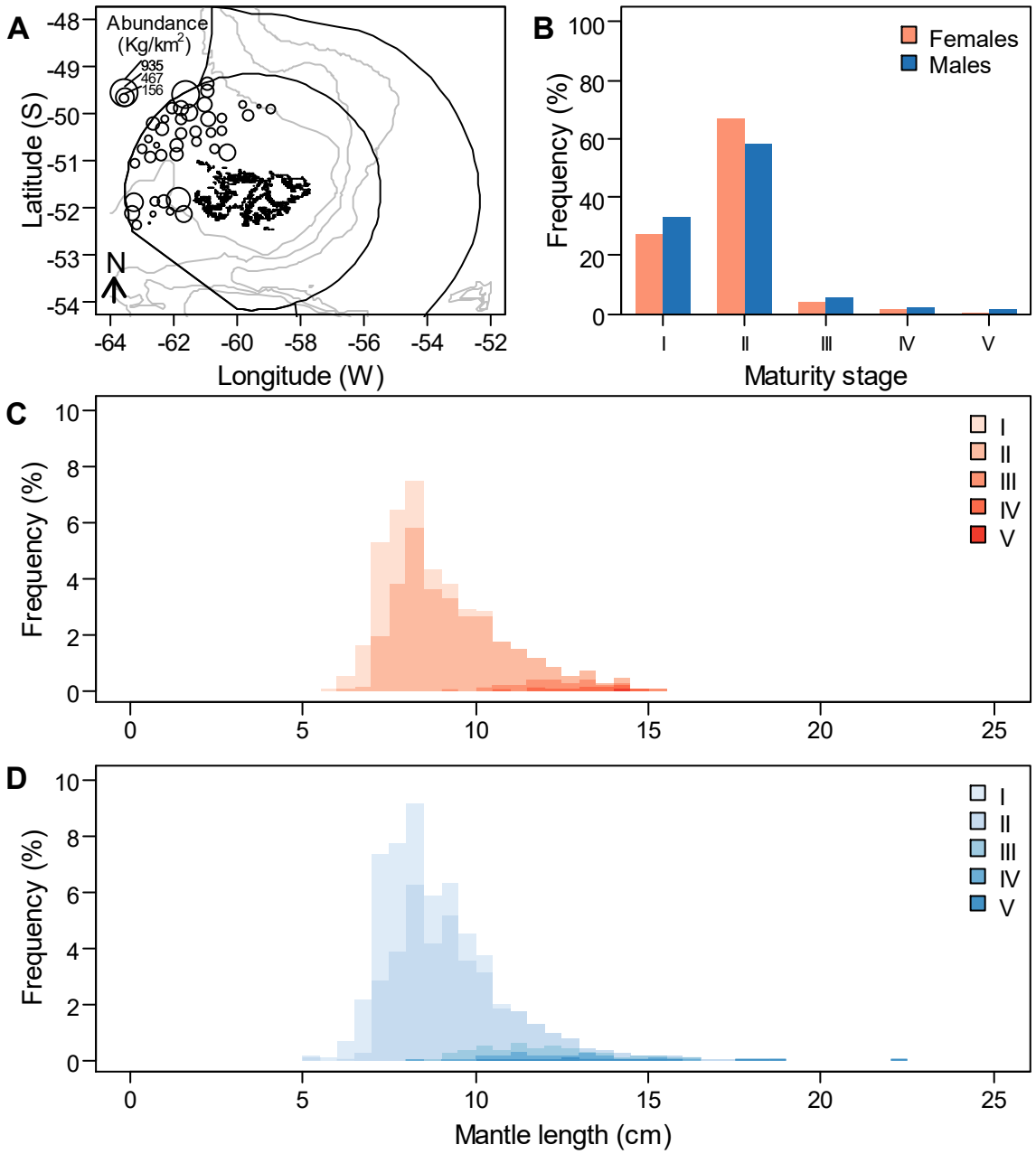

Figure 14. Biological data of *Doryteuthis gahi* (Falkland calamari; LOL). A) Map of the densities in kg/km²; B) relative frequency (%) of specimens of each sex per maturity stage (I, immature; II, resting; III, early developing; IV, late developing; V, ripe; VI, running; VII, spent; VIII, recovering spent); length frequencies (%) of C) females (n = 1,859) and D) males (n = 2,449) with 0.5 cm size class.

3.4. Biological information of skate species

3.4.1. *Bathyraja albomaculata* – White spotted skate

The total catch of white spotted skate was 24 kg. This species was caught at 9 of the 42 trawl stations sampled through the research cruise. Catches ranged from 0.6 to 5 kg, densities ranged from 2.7 to 24 kg/km^2, and CPUE ranged from 0.6 to 5 kg/h. Higher densities were observed in the north west of the survey zone (Figure 15A). Most females were maturing or developing (maturity stages II and III), although also mature (maturity stage IV) and spent females were reported (maturity stage VI). Maturing males were more common (maturity stage II), followed by running individuals (maturity stage V; Figure 15B). Females were 37–48 cm disc width (Figure 15C). Males were 30–43 cm disc width (Figure 15D).

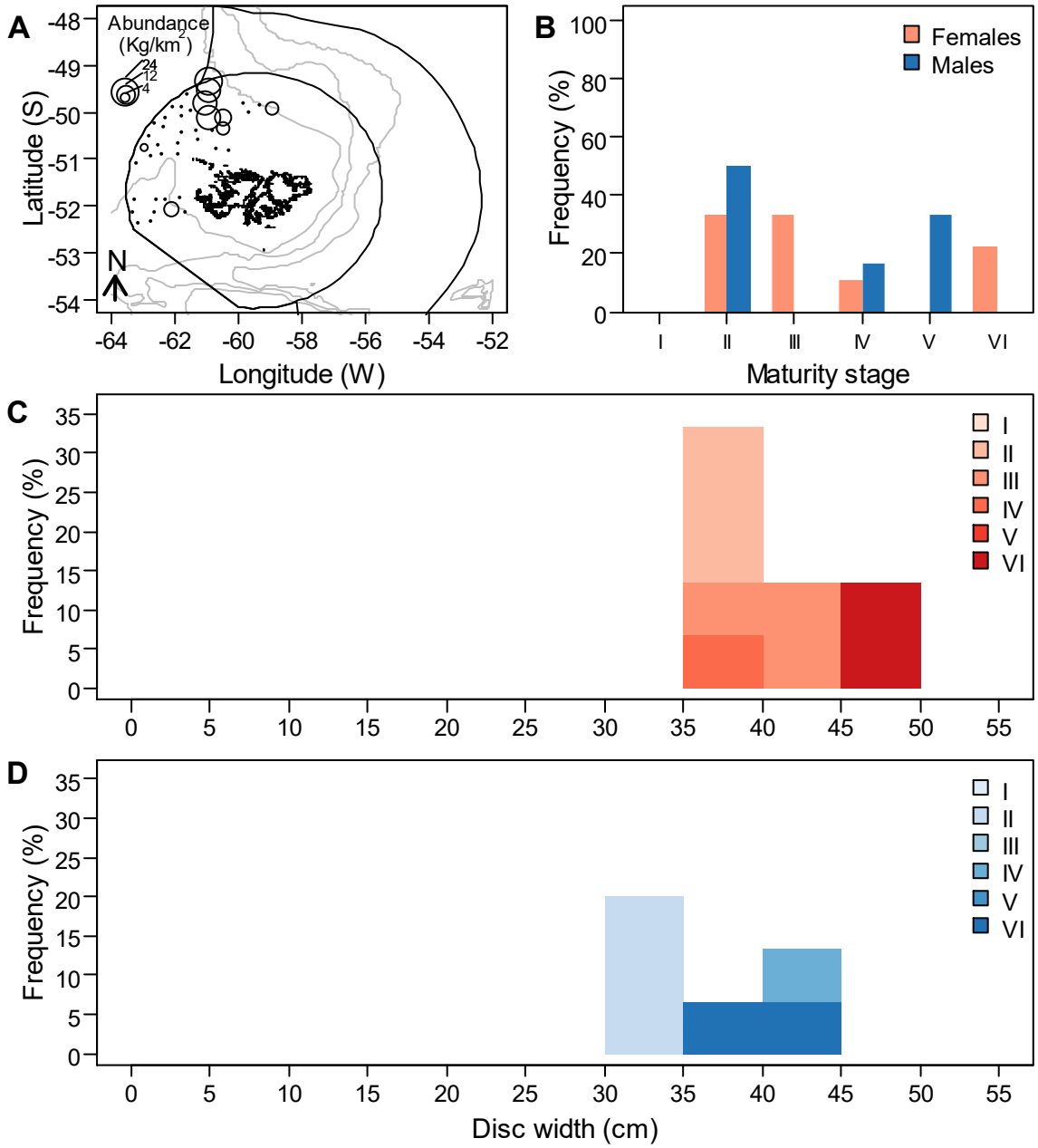

Figure 15. Biological data of *Bathyraja albomaculata* (White spotted skate; RAL). A) Map of the densities in kg/km^2; B) relative frequency (%) of specimens of each sex per maturity stage (I, juvenile; II, adolescent maturing; III, adult developing; IV, adult mature; V, adult laying/running; VI, adult resting); length frequencies (%) of C) females (n = 9) and D) males (n = 6) with 5 cm size class.

3.4.2. *Bathyraja brachyurops* – Blonde skate

The total catch of blonde skate was 141 kg. This species was caught at 27 of the 42 trawl stations sampled through the research cruise. Catches ranged from 0.6 to 20 kg, densities ranged from 2.4 to 98 kg/km^2, and CPUE ranged from 0.6 to 20 kg/h. Highest densities were observed along the north and south west of West Falkland (Figure 16A). Most females and males were maturing (maturity stage II) (Figure 16B). Females were 13–61 cm disc width and males were 13–63 cm disc width. The length-frequency histograms show one length-group with modal lengths of females and males at 30-34 cm disc width size classes. There may be more length-groups with modal lengths > 45 cm (Figure 16C–16D).

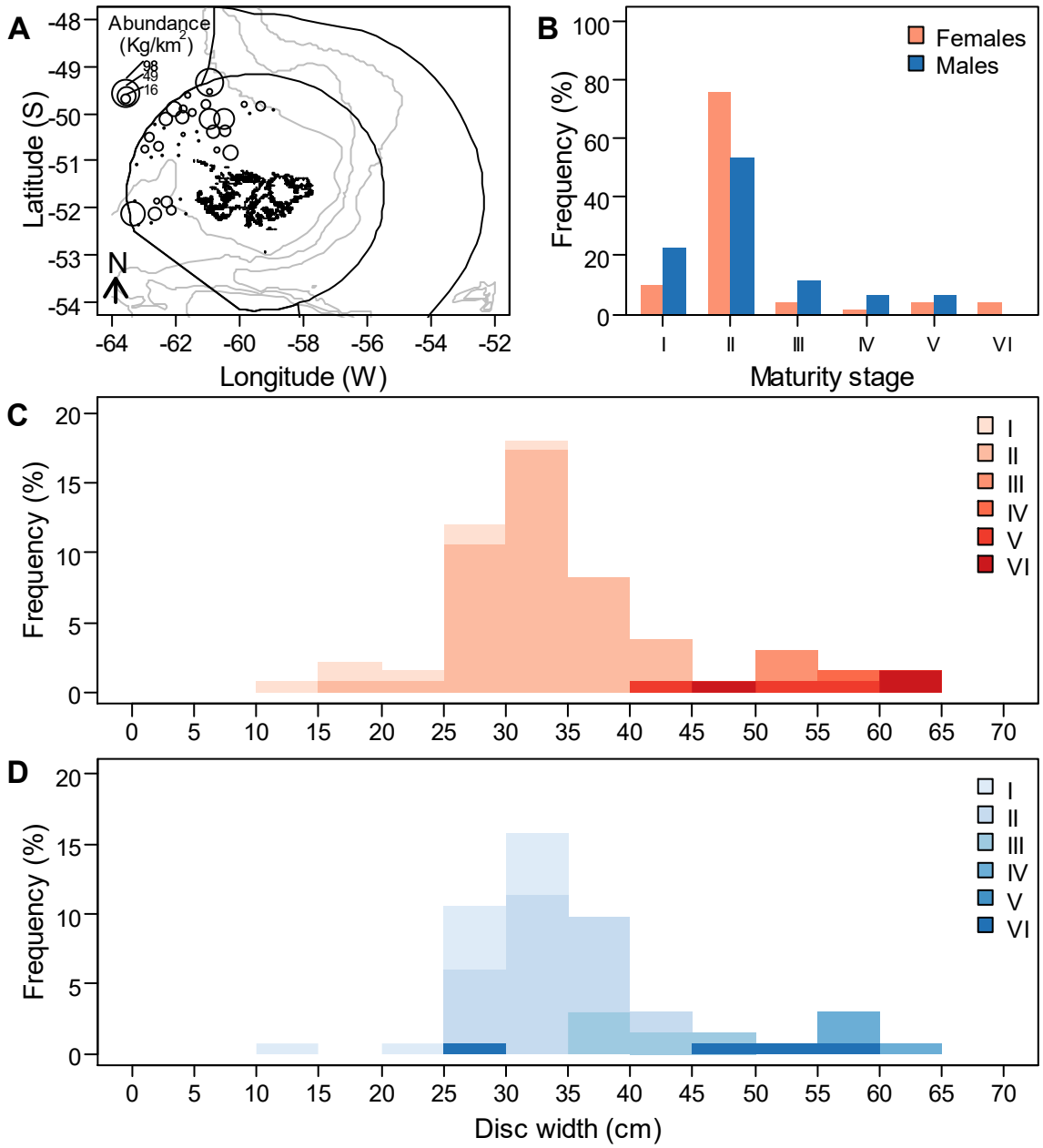

Figure 16. Biological data of *Bathyraja brachyurops* (Blonde skate; RBR). A) Map of the densities in kg/km^2; B) relative frequency (%) of specimens of each sex per maturity stage (I, juvenile; II, adolescent maturing; III, adult developing; IV, adult mature; V, adult laying/running; VI, adult resting); length frequencies (%) of C) females (n = 71) and D) males (n = 62) with 5 cm size class.

3.4.3. *Dipturus lamillai* – Yellow nose skate

The total catch of the yellow nose skate was 98 kg. This species was caught at 18 of the 42 trawl stations sampled through the research cruise. Catches ranged from 1.3 to 20 kg, densities ranged from 5.6 to 90 kg/km^2, and CPUE ranged from 1.3 to 20 kg/h. Higher densities were observed to the north west of the FICZ (Figure 17A). Most females were maturing (maturity stage II), while males were juvenile (maturity stage I) and adult developing (maturity stage III; Figure 17B). Females were 44–71 cm disc width and modal disc width was identified at the 50–59 cm size class (Figure 17C). Males were 35–60 cm disc width; the small number of males sampled does not allow identifying the modal length of male individuals (Figure 17D).

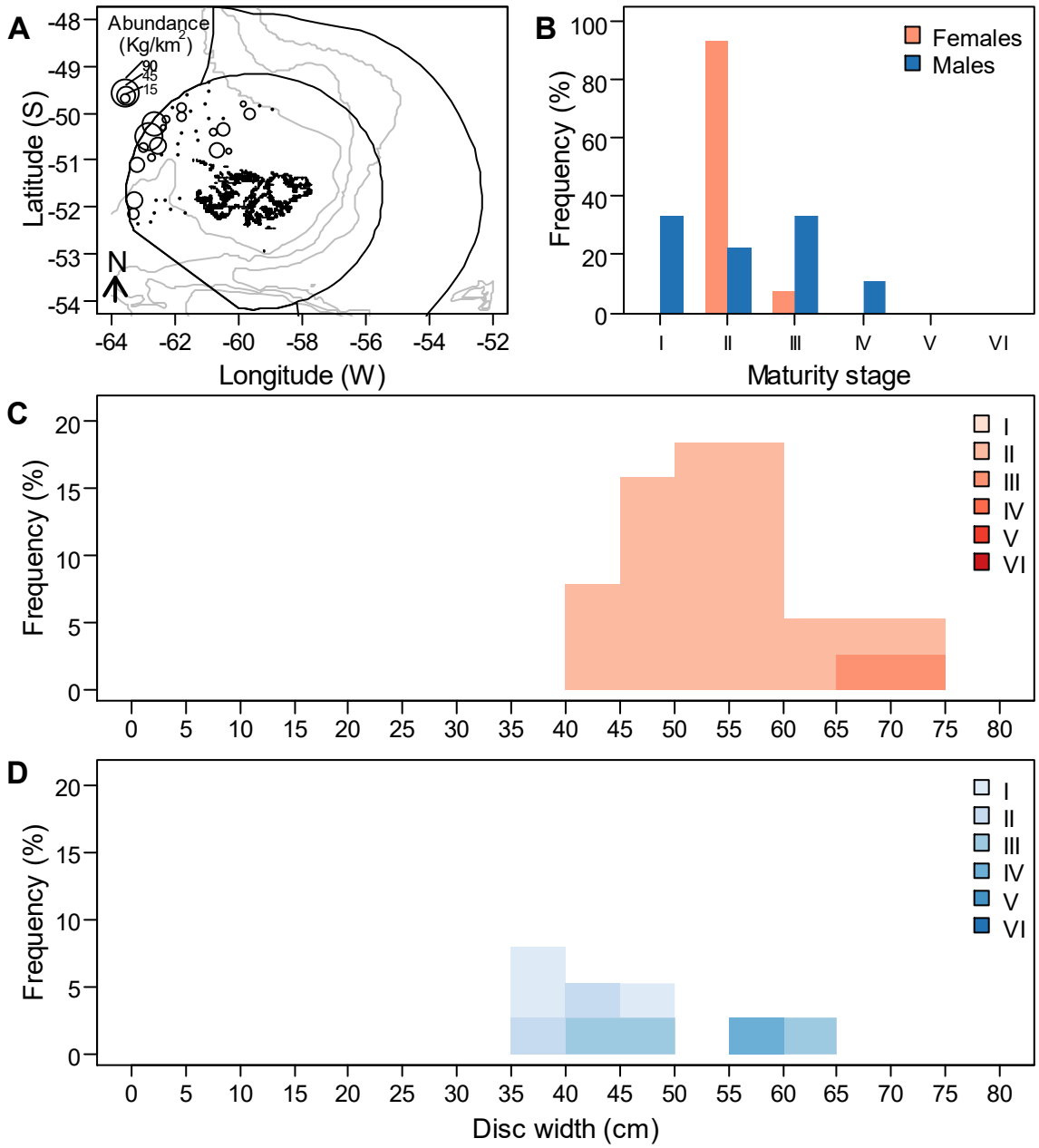

Figure 17. Biological data of *Dipturus lamillai* (Yellow nose skate; RFL). A) Map of the densities in kg/km²; B) relative frequency (%) of specimens of each sex per maturity stage (I, juvenile; II, adolescent maturing; III, adult developing; IV, adult mature; V, adult laying/running; VI, adult resting); length frequencies (%) of C) females (n = 29) and D) males (n = 9) with 5 cm size class.

3.4.4. *Bathyraja griseocauda* – Grey tailed skate

The total catch of the grey tailed skate was 118 kg. This species was caught at 12 of the 42 trawl stations sampled through the research cruise. Catches ranged from 0.1 to 61 kg, densities ranged from 0.1 to 61 kg/km^2, and CPUE ranged from 0.2 to 219 kg/h. Highest densities were observed to the south-west of the FICZ (Figure 18A). A total of 26 individuals (16 females, 10 males) were sampled; most females were juveniles (maturity stage I), whereas males were mainly maturing individuals (maturity stage II; Figure 18B). The size of females ranged between 18 cm and 95 cm disc width (Figure 18C). Males size ranged between 36 cm and 87 cm disc width (Figure 18D).

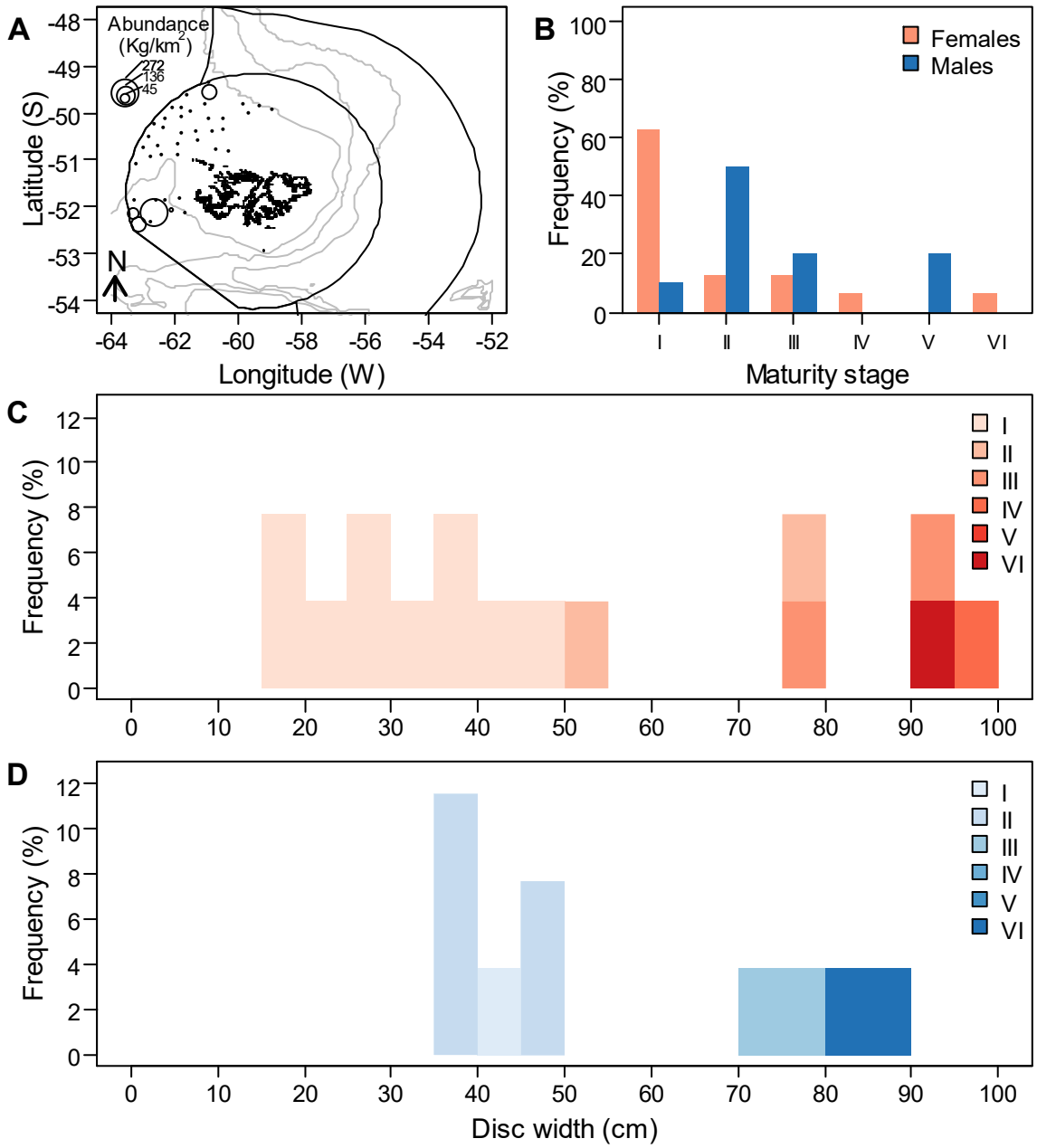

Figure 18. Biological data of *Bathyraja griseocauda* (Grey tailed skate; RGR). A) Map of the densities in kg/km^2; B) relative frequency (%) of specimens of each sex per maturity stage (I, juvenile; II, adolescent maturing; III, adult developing; IV, adult mature; V, adult laying/running; VI, adult resting); length frequencies (%) of C) females (n = 16) and D) males (n = 10) with 5 cm size class.

3.4.5. *Bathyraja macloviana* – Falkland skate

The total catch of the Falkland skate was 23 kg. This species was caught at 14 of the 42 trawl stations sampled through the research cruise. Catches ranged from 0.3 to 5 kg, densities ranged from 1.5 to 25 kg/km^2, and CPUE ranged from 0.3 to 5 kg/h. Highest densities were observed to the north-west of the FICZ (Figure 19A). Most females were maturing (maturity stage II) and mature (maturity stage IV), and most males were running (maturity stages V; Figure 19B). Females were 22–35 cm disc width (Figure 19C), and males were 23–37 cm disc width (Figure 19D).

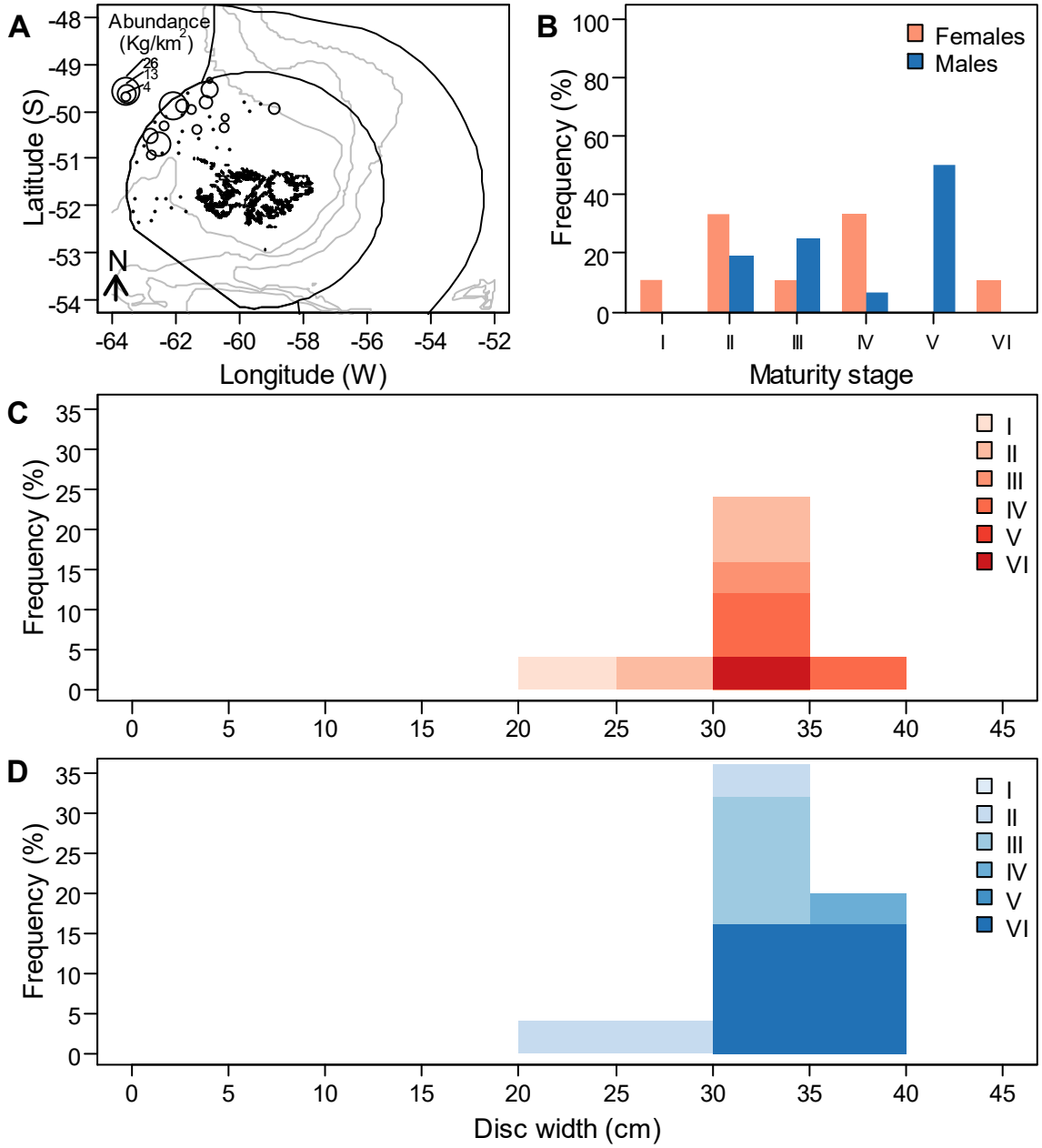

Figure 19. Biological data of *Bathyraja macloviana* (Falkland skate; RMC). A) Map of the densities in kg/km^2; B) relative frequency (%) of specimens of each sex per maturity stage (I, juvenile; II, adolescent maturing; III, adult developing; IV, adult mature; V, adult laying/running; VI, adult resting); length frequencies (%) of C) females (n = 9) and D) males (n = 16) with 5 cm size class.

3.5. Biological information of sharks species

3.5.1. *Schroederichthys bivius* – Catshark

The total catch of catshark was 155 kg. This species was caught at 32 of the 42 trawl stations sampled through the research cruise. Catches ranged from 0.1 to 37 kg, densities ranged from 0.6 to 168 kg/km^2, and CPUE ranged from 0.1 to 37 kg/h. High densities were observed to the north-west near West Falkland (Figure 20A). Most females found alive were released as soon as possible without assessing maturity stages, and their maturity stage was recorded as zero. Most males were juvenile (maturity stage I), or mature (maturity stage IV; Figure 20B). Females were 21–58 cm total length (Figure 20C). Males were 26–75 cm total length (Figure 20D).

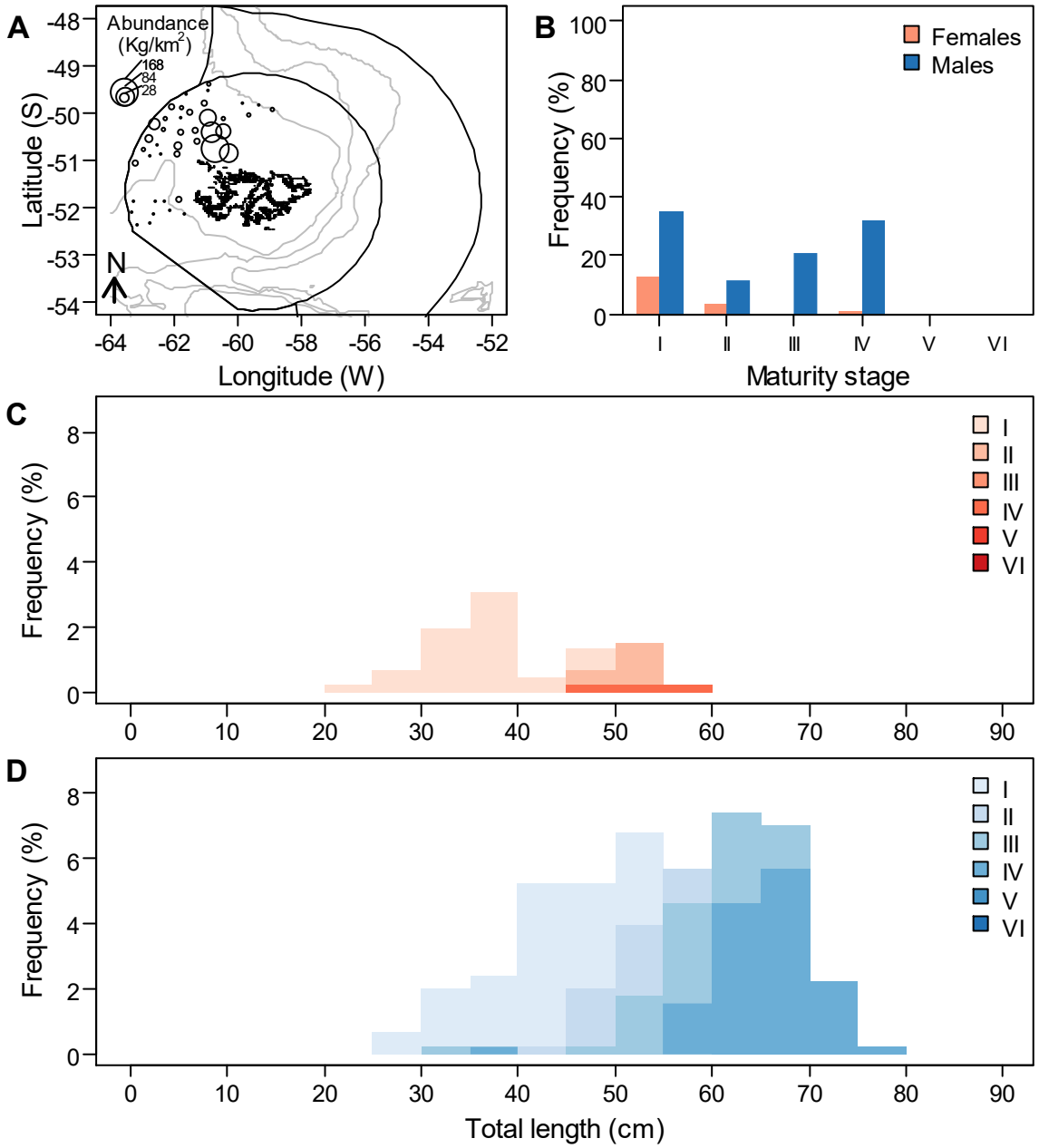

Figure 20. Biological data of *Schroederichthys bivius* (Catshark; DGH); A) Map of the densities in kg/km^2; B) relative frequency (%) of specimens of each sex per maturity stage (I, juvenile; II, adolescent maturing; III, adult developing; IV, adult mature; V, adult laying/running; VI, adult resting); length frequencies (%) of C) females (n = 43 + n = 210 with maturity 0) and D) males (n = 205) with 5 cm size class.

3.5.2. *Squalus acanthias* – Dogfish

The total catch of dogfish was 82 kg. This species was caught at 14 of the 42 trawl stations sampled through the research cruise. Catches ranged from 0.9 to 22 kg, densities ranged from 4.1 to 111 kg/km^2, and CPUE ranged from 0.9 to 22 kg/h. High densities were observed to the north and north-west of the FICZ (Figure 21A). Most females were maturing (maturity stage II). Most males were mature (maturity stage IV; Figure 21B). Females were 46–76 cm total length, with modal length at 55-59 cm total length (Figure 21C). Males were 54–73 cm total length (Figure 21D).

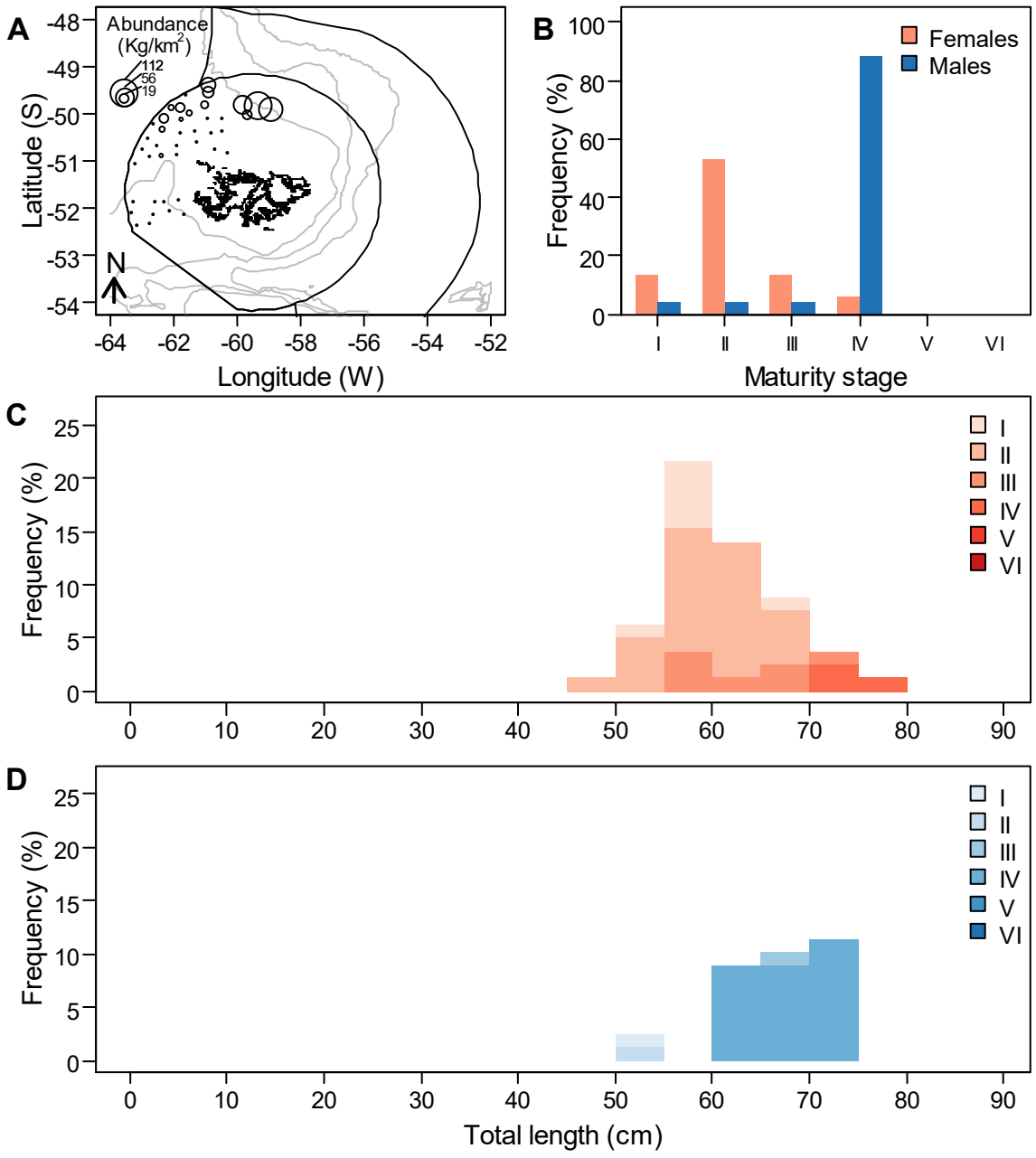

Figure 21. Biological data of *Squalus acanthias* (Dogfish; DGS); A) Map of the densities in kg/km^2; B) relative frequency (%) of specimens of each sex per maturity stage (I, juvenile; II, adolescent maturing; III, adult developing; IV, adult mature; V, adult laying/running; VI, adult resting); length frequencies (%) of C) females (n = 45) and D) males (n = 26) with 5 cm size class.

3.6. Inshore survey

Inshore stations were usually conducted at the beginning of the demersal surveys, i.e., February 2019 and 2020 demersal surveys. Those stations were re-scheduled for the end of the February 2021 demersal survey due to bad weather in the south of Falkland Islands waters during early February. Inshore stations were not conducted in the February 2022 demersal survey due to the research survey being shortened.

3.7. Oceanography

An issue with the CTD caused temperature readings spiking at 26 of 42 stations, resulting in insufficient data to describe temperature in the area of study during the survey. Good data were processed and can be used as part of the historical dataset.

4. Discussion and Conclusions

1. Red cod (*Salilota australis*) highest density occurred to the north-west of the FICZ, with secondary aggregations to the Southwest. This year, red cod was the second most abundant species in terms of weight caught, and comprised 19.9% of the total survey catch. Biomass in February 2022 was significantly higher than in February 2020 and 2021 (Ramos & Winter 2022).
2. Common hake (*Merluccius hubbsi*) started to migrate to Falkland Islands waters with the Argentine inflow. This species comprised 11.7% of the total survey catch, and was the fourth highest catch in the survey. The highest biomass (42,421 t) of common hake in Falkland waters was calculated for February 2022. The majority of fish migrated to Falkland Islands waters straight after spawning, as suggested by the higher frequency of adult males at maturity stages VII and VIII, and adult females at maturity stages II, VII and VIII.
3. The highest densities of kingclip (*Genypterus blacodes*) occurred to the southwest of the FICZ. In February 2022, the biomass was calculated to be 43,437 t. The second highest biomass (43,437 t) in the time series was calculated for 2022, with the highest biomass calculated for 2015 (Ramos & Winter 2022). Kingclip modal length was at 73 cm total length for females and at 67 cm total length for males. Modal lengths are higher than those reported during the February 2018–2021 demersal surveys.
4. Rock cod (*Patagonotothen ramsayi*) occurred throughout the survey area, with denser concentrations to the Northwest of the FICZ. This year, rock cod was the most abundant species in terms of weight caught, and comprised 22.8% of the total survey catch. The estimated biomass of rock cod was 93,177 t, which is the highest since 2018 but still significantly lower than in 2010 and 2011 (Ramos & Winter 2022).
5. Hoki (*Macruronus magellanicus*) denser aggregations occurred to the southwest of the FICZ. This year, hoki was the third most abundant species in terms of weight caught, and comprised 19.7% of the total survey catch. The estimated biomass of hoki was 144,783 t (Ramos & Winter 2022).
6. Catches of other important species (i.e., Patagonian toothfish, Southern blue whiting, and Southern hake) and species with increasing presence (i.e., butterfish, and driftfish) in Falkland Islands waters were relatively low during the survey (< 300 kg).
7. Banded whiptail grenadier (*Coelorinchus fasciatus*) denser aggregations occurred to the Southwest of the FICZ. This year, banded whiptail grenadier was the fifth most abundant species in terms of weight caught, and comprised 8.6% of the total survey catch. The estimated biomass of *C. fasciatus* was 49,559 t (Ramos & Winter 2022).
8. Ridge scaled grenadier (*Macrourus carinatus*) was not caught during this research cruise, most likely due to the removal of some of the deep-water stations in the south of the FICZ.
9. This year did not see the early migration of the squid *Illex argentinus* to the north-west of the FICZ like in February 2021. The pattern of the catch is consistent with biomass estimates from February research surveys (including demersal and calamari pre-season surveys). In February 2022, a total of 5,824 t of *I. argentinus* were estimated in Falkland Islands waters (Ramos & Winter 2022); this is second lowest calculated biomass since 2010. Two cohorts were detected, squids were quite large and mainly at advanced maturity stages.
10. Falkland calamari (*Doryteuthis gahi*) was quite abundant everywhere on the shelf, with largest densities to the north-west and west of the FICZ. Based on demersal and calamari pre-season surveys, the fourth highest biomass of this species was reported for February 2022 since 2010 (Ramos & Winter 2022). Sizes (mode at 8 cm mantle length) and sexual maturity (mainly stage II) corresponded to the average values characteristic for this species at this time of the year. All squid belonged to the Autumn Spawning Cohort (ASC).

5. Recommendations

1. The number of stations should be consistent across demersal surveys. The inclusion or omission of stations from one year to the next may bias biomass estimates and prevent examination of biomass trends through time. This year saw a reduced number of stations due to the vessel being held in quarantine for COVID19.
2. Intrusion of driftfish (*S. porosa*) and butterfish (*S. brasiliensis*) into the FICZ should be further investigated. Collection of driftfish samples should be continued in order to understand their role in the Falkland Islands marine ecosystem and its commercial potential. Conversion factor research should be conducted in upcoming years.
3. Similar to the 2021 survey, the MarPort Net Monitoring system did not provide net horizontal opening data on more than half (n = 24) of the trawls. This information is essential to calculate biomass; failure to acquire net data may bias biomass estimates and affect the examination of biomass trends through time. This issue should be investigated and corrected immediately after first notice during the surveys.

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