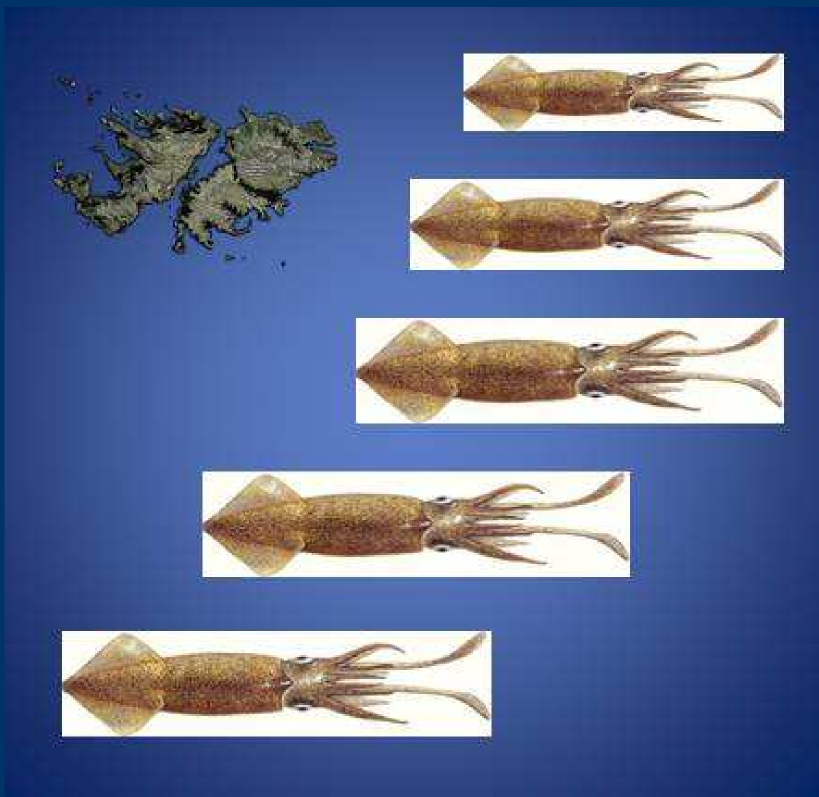
2020 1st Season Assessment Survey

Falkland calamari

(*Doryteuthis gahi*)



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Index

Summary

1) A stock assessment survey for *Doryteuthis gahi* (Falkland calamari) was conducted in the 'Loligo Box' from 8th to 22nd February 2020. Fifty-nine scientific trawls were taken during the survey; 39 fixed-station and 20 adaptive-station trawls. The scientific catch of the survey was 268.39 tonnes *D. gahi*.
2) An estimate of 27,991 tonnes *D. gahi* (95% confidence interval: 20,882 to 44,753 t) was calculated for the fishing zone by inverse distance weighting. This estimate represents the third-lowest 1st-season survey biomass in the past 10 years. Of the total, 7306 t were estimated north of 52 ºS, and 20,685 t were estimated south of 52 ºS.
3) Male and female *D. gahi* had significantly greater average mantle lengths north of 52 ºS than south of 52 ºS. Maturities were not significantly different between north and south. Males north: mean mantle length 11.08 cm; mean maturity stage 2.14, males south: mean mantle length 10.56 cm; mean maturity stage 2.15. Females north: mean mantle length 10.92 cm; mean maturity stage 2.04, females south: mean mantle length 10.44 cm; mean maturity stage 2.04.
4) 85 taxa were identified in the catches. *D. gahi* was the largest species group at 93.2% of total catch by weight, followed by rock cod (3.2%) and blue whiting (1.8%) as the only two other taxa comprising >0.5% of total catch. This represented the 'cleanest' *D. gahi* survey catch since at least 2011. Biological measurements and samples were taken from *D. gahi*, rock cod, toothfish, kingclip, hake, grenadier, and hoki.

Introduction

A stock assessment survey for *Doryteuthis gahi* (Falkland calamari – Patagonian longfin squid – colloquially *Loligo*) was carried out by FIFD personnel on-board the fishing vessel *Argos Cíes* from the 8th to 22nd February 2020; experimental license FK030E20. This survey continues the series of surveys that have, since February 2006, been conducted immediately prior to season openings to estimate the *D. gahi* stock available to commercial fishing at the start of the season, and to initiate the in-season management model based on depletion time series of the stock.

Objectives of the survey were to:

1) Estimate the biomass and spatial distribution of *D. gahi* on the fishing grounds at the onset of the 1st fishing season, 2020.
2) Estimate the biomass and distribution of common rock cod (*Patagonotothen ramsayi*) and other commercial species in the 'Loligo Box', for continued monitoring of these stocks in parallel to the finfish research survey.
3) Estimate the bycatch of toothfish (*Dissostichus eleginoides*) in *D. gahi* trawls.
4) Collect biological information on *D. gahi*, rock cod, toothfish and opportunistically other fish and invertebrates taken in the trawls.
5) Monitor the presence of seals and their interactions with trawls.

The survey was designed to cover the 'Loligo Box' fishing zone (Arkhipkin et al. 2008, 2013) that extends along the shelf break across the southern and eastern part of the Falkland Islands Interim Conservation Zone (Figure 1). The delineation of the Loligo Box represents an area of approximately 31,517.9 km^2, subtracting the exclusion zone around Beauchêne Island.

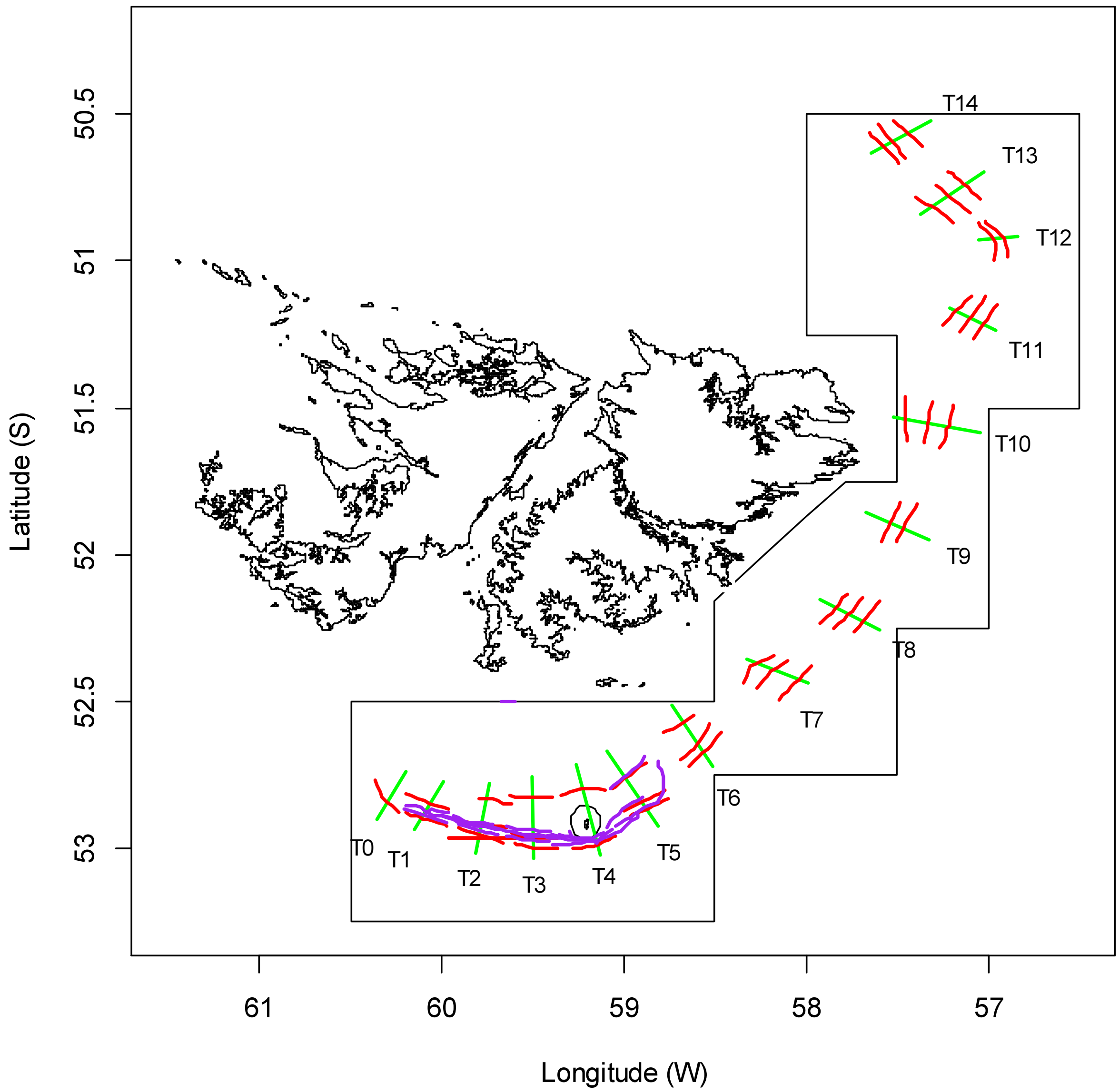


Figure 1. Survey transects (green lines), fixed-station trawls (red lines), and adaptive-station trawls (purple lines) sampled during the 1st pre-season 2020 survey. Boundaries of the 'Loligo Box' fishing zone and the Beauchêne Island exclusion zone are in black.

The F/V *Argos Cíes* is a Falkland Islands - registered stern trawler of 75 m length, 1999 gross tonnage, and 3000 main engine bhp. Like all vessels employed for these pre-season surveys, *Argos Cíes* operates regularly in the Falkland calamari fishery and used its commercial trawl gear for the survey catches. *Argos Cíes* has previously been used for the preseason survey of the 1st season 2019 (Winter et al. 2019). The following personnel from the FIFD participated in the 1st pre-season 2020 survey:

Brendon Lee	lead scientist	(February 8 to 14)
Alexander Arkhipkin	lead scientist	(February 15 to 22)
Vasana Tutjavi	fisheries observer	
Tobias Büring	fisheries scientist	

Methods

Sampling procedures

The survey plan included 39 fixed-station trawls located on a series of 15 transects perpendicular to the shelf break around the Loligo Box (Figure 1), followed by up to 21 adaptive-station trawls selected to increase the precision of *D. gahi* biomass estimates in high-density or high-variability locations. This dual approach ensures that the scientific requirements of randomization and repeatability are met (via fixed stations) and the spatiotemporal variability of the *D. gahi* population is captured (via adaptive stations) (Gawarkiewicz and Malek Mercer 2018). Trawl tracks were designed for an expected duration of 2 hours each, and ranged in distance from 12.2 to 17.6 km (median 15.9 km). All trawls were bottom trawls. During the progress of each trawl, GPS latitude, GPS longitude, bottom depth, bottom temperature, net height, trawl width, trawl door spread, and trawl speed were recorded on the ship's bridge in 15-minute intervals, and a visual score was assessed of the quantity and quality of acoustic marks observed on the net-sounder. Following the procedure described in Roa-Ureta and Arkhipkin (2007), the acoustic marks were used to apportion the *D. gahi* catch of each trawl to the 15-minute intervals and increase spatial resolution of the catches. For small catches acoustic apportioning cannot be assessed with accuracy, and any *D. gahi* amounts <100 kg were iteratively aggregated by adjacent intervals (if the total *D. gahi* catch in a trawl was <100 kg it was assigned to one interval; the middle one).

Catch estimation

The catch of every trawl was processed by the factory crew and retained catch weight of *D. gahi*, by size category, was calculated from the number of standard-weight blocks of frozen squid recorded by the factory supervisor. Catch weights of commercially valued fish species were also recorded from the number of blocks of frozen product, but without size categorization. Processed product weights were scaled to whole weights using standard conversion factors (FIG 2016). Total catch composition per trawl, including commercially unvalued species, damaged fish, and undersized fish, was estimated using a combination of visual assessment and basket data. One or two observer baskets of unsorted catch were collected at intervals from most survey trawls[a], depending on their volume and the sampling schedule. These baskets were hand-sorted by the FIFD survey personnel and species weighed separately. The aggregate quantities of bycatch species in baskets were proportioned to the *D. gahi* catch of the whole trawl. Scarce bycatch species, and all toothfish, were collected and weighed entirely from each trawl. Non-commercial bycatches were then added to the factory production weights (as applicable) to give total catch weights of all fish and squid.

Biomass calculation

Biomass density estimates of *D. gahi* per trawl were calculated as catch weight divided by swept-area; which is the product of trawl distance × trawl width. The calculation thus assumed a catchability coefficient = 1, as commonly used in fishery surveys (Somerton et al. 1999). Trawl distance was defined as the sum of distance measurements from the start GPS position to the end GPS position of each 15-minute interval. Trawl width was measured by fitted sensors. The trawl width sensors were inoperative for two 15-minute intervals of one

[a] Trawls were not basket-sampled if visual inspection showed almost pure squid catch, or if the catches were very small.

trawl; these two intervals were approximated by a linear function of the door width, which correlated to $R^2 = 95.4\%$[b].

Biomass density estimates were extrapolated to the fishing area using the updated version of the inverse distance weighting algorithm (Ramos and Winter 2019), which was also implemented for the previous calamari survey (Goyot et al. 2019). As previously, the fishing area was delineated to 20,062.8 km^2, partitioned for analysis into 800 area units of 5×5 km. Forty area units with average depth either <90 m or >400 m, where calamari trawlers do not work, were assumed for this analysis to comprise zero *D. gahi*. Biomass densities from all 800 area units were averaged and multiplied by the total fishing area for total biomass, as well as separately north and south of 52 °S; the standard sub-area demarcation (Winter and Arkhipkin 2015).

Uncertainty of the biomass density extrapolation was estimated by hierarchical bootstrapping. For 30,000 iterations a number of survey trawls equivalent to the total number were randomly selected with replacement, and within each selected survey trawl its 15-minute intervals were randomly selected with replacement. The trawl's catch was re-proportioned according to the selected intervals' acoustic scores, thus varying the spatial distribution of the catch over that trawl track. When applicable, the aggregation of *D. gahi* amounts <100 kg (see Sampling procedures) was summed to an interval of the trawl also chosen randomly; not necessarily the middle interval. At each of the 25,000 iterations, the inverse distance weighting algorithm was re-calculated over the 5 × 5 km area units.

Biological analyses

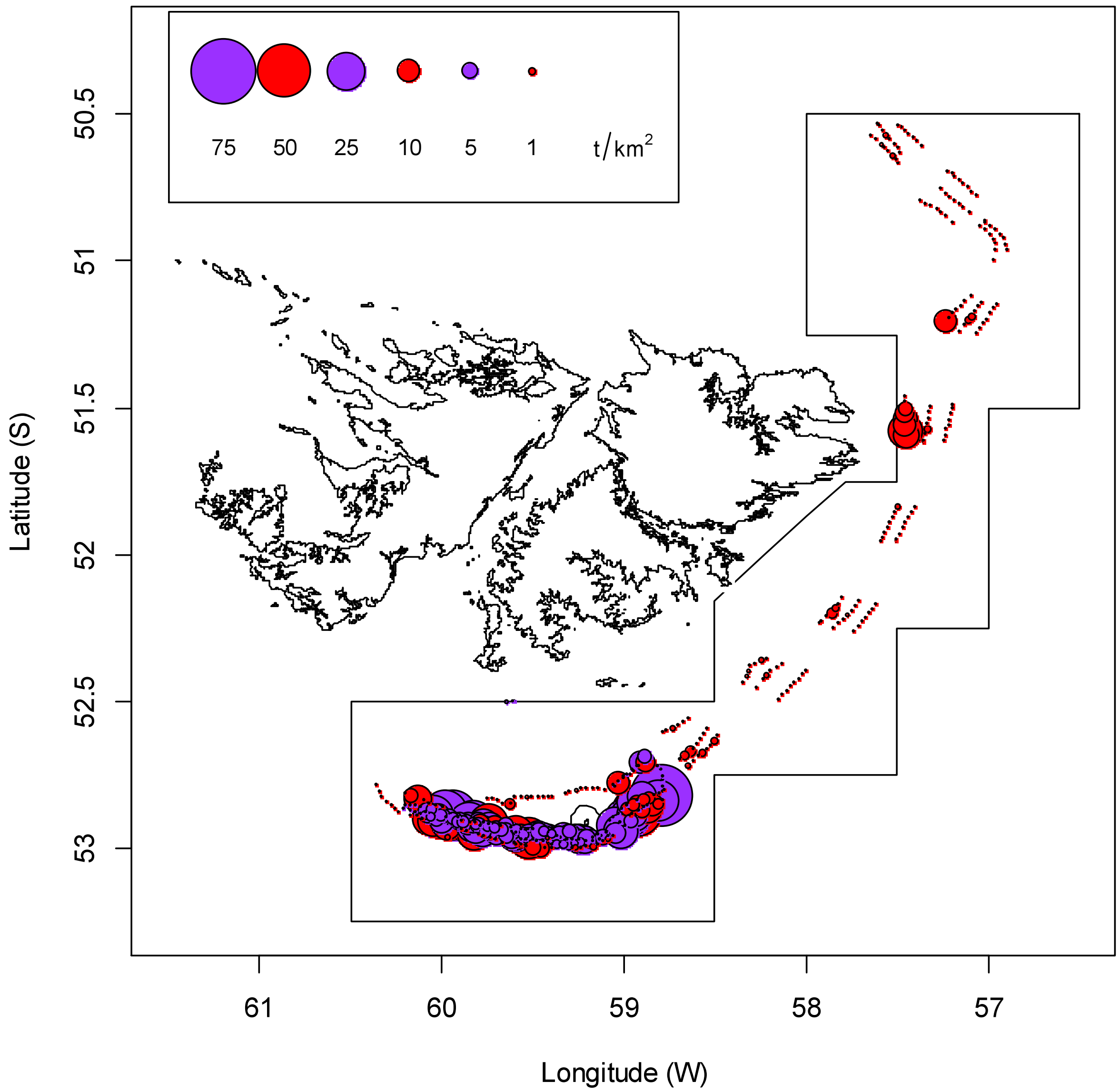
Random samples of *D. gahi* (target n = 150, as far as available) were collected from the factory at all trawl stations. Biological analysis at sea included measurements of the dorsal mantle length rounded down to the nearest half-centimetre, sex, and maturity stage. Additional specimens of *D. gahi* were collected according to area stratification (north, central, south) and depth (shallow, medium, deep), and frozen for statolith extraction and age analysis (Arkhipkin 2005), as well as calculation of the length-weight relationship $W = \alpha \cdot L^{\beta}$ (Froese 2006). A sample of 100 rock cod was taken at every trawl station, as far as available. All catches of toothfish were collected from trawl stations to maximize the time series catch and biological information base for juvenile toothfish. Otoliths were taken from toothfish that corresponded to required size categories, and other commercial fish species as available.

Seal monitoring

The haul of every fixed-station and adaptive-station survey trawl was observed from the vessel gantry by a dedicated observer – Argos representative Mr. Jano van Heerden. Presence of seals and their possible interaction with fishing gear was noted.

Figure 2 [next page]. *D. gahi* CPUE (t km^{-2}) of fixed-station (red) and adaptive-station (purple) trawls per 15-minute trawl interval. Boundaries of the 'Loligo Box' fishing zone and the Beauchêne Island exclusion zone are traced in black.

[b] This means that sensor trawl width also had a correlation of $R^2 = 95.4\%$ with the geometric calculation of trawl width = (door distance × footrope length)/(footrope length + bridle length) (Seafish 2010), as footrope length and bridle length are fixed parameters. Measurements of *Argos Cíes*' trawl, provided by the vessel master, were footrope = 180 m and bridle = 170 m. Linear regression between sensor trawl width and geometric trawl width gave a slope parameter = 0.959 ± 0.010 (1 std. error), thus very slightly different from 1.



Results

Catch rates and distribution

The survey started as usual with fixed-station trawls in the north and proceeded throughout the Loligo Box. Adaptive-station trawls were concentrated in the south as this corresponded to the indications of *D. gahi* biomass distribution (Figures 1 and 2). A schedule of 4 survey trawls per day was maintained except for February 22nd, when the scheduled return to port required shortening the scientific work program, at that point being conducted in the south. In total 59 scientific trawls were recorded during the survey: 39 fixed station trawls catching 94.45 t *D. gahi*, and 20 adaptive-station trawls catching 173.94 t *D. gahi*. Fourteen optional trawls (made after survey hours) yielded an additional 230.30 t *D. gahi*, bringing the total catch for the survey to 498.69 t. The scientific survey catch of 268.39 t is the second-highest for a 1st season in the past ten years (Table 1).

Average *D. gahi* catch density among fixed-station trawls north of 52° S was 0.67 t km^{-2}, and south of 52° S was 2.18 t km^{-2}. The north fixed-station density was the second-highest for a 1st season of the past 10 years, after 2016, and the south fixed-station density was median among the past 10 years. Average *D. gahi* catch density among adaptive-station trawls south of 52° S was 6.11 t km^{-2}; also approximately median among the past 10 years. No adaptive-station trawls were taken north of 52° S.

Table 1. *D. gahi* pre-season survey scientific catches and biomass estimates (in metric tonnes). Before 2006, surveys were not conducted immediately prior to season opening.

Year	First season			Second season		
	No. trawls	Catch	Biomass	No. trawls	Catch	Biomass
2006	70	376	10213	52	240	22632
2007	65	100	2684	52	131	19198
2008	60	130	8709	52	123	14453
2009	59	187	21636	51	113	22830
2010	55	361	60500	57	123	51754
2011	59	50	16095	59	276	51562
2012	56	128	30706	59	178	28998
2013	60	52	5333	54	164	36283
2014	60	124	34673	58	207	40090
2015	57	184	36424	53	137	25422
2016	57	65	21729	58	225	43580
2017	59	180	48785	63*	314	56807
2018	59*	115	32194	53	510	183593
2019	55	382	49618	51	298	50880
2020	59	268	27991			

* Includes four juvenile toothfish transect trawls.

Biomass estimation

Total *D. gahi* biomass in the fishing area was estimated at 27,991 tonnes, with a 95% confidence interval of [20,882 to 44,753 t]. Distribution of the estimated biomass was as usual preponderant towards the south: 20,685 tonnes with a 95% c.i. of [14,754 to 31,618 t], vs. the north: 7306 tonnes with a 95% c.i. of [6129 to 13,134 t]. Thus 26.1% of the biomass was north, the evenest north/south 1st season distribution since 2016 (Winter et al. 2016). Within the south sub-area 50% of *D. gahi* density was aggregated in 46 of 392 5×5 km area units[c], and 95% of density was aggregated in 184 of the 392 5×5 km area units (Figure 3). Within the north sub-area 50% of *D. gahi* density was aggregated in 14 of 368 5×5 km area units, and 95% of density was aggregated in 104 of the 368 5×5 km area units (Figure 3). The total estimate of 27,991 t was the third-lowest for a 1st season in the past ten years[d] (Table 1).

Biological data

Eighty-five taxa were identified in the survey catches (Appendix Table A2). *D. gahi* was the predominant catch with the highest proportion for a first season since at least 2011 (93.2%, Table A2). Second- and third-highest catch species were rock cod and southern blue whiting *Micromesistius australis*, as typical from previous years (e.g., Winter et al. 2017, 2019), but in this survey both rock cod and blue whiting obtained the lowest total catches for a 1st season

[c] Excluding depths <90 m or >400 m.

[d] However, note that biomass estimates from previous years may not be explicitly equivalent because the definition of the fishing area over which the geostatistic algorithm is applied has been revised several times.

since at least 2011. No other species attained as much as 500 kg catch or 0.5% of the total (Table A2).

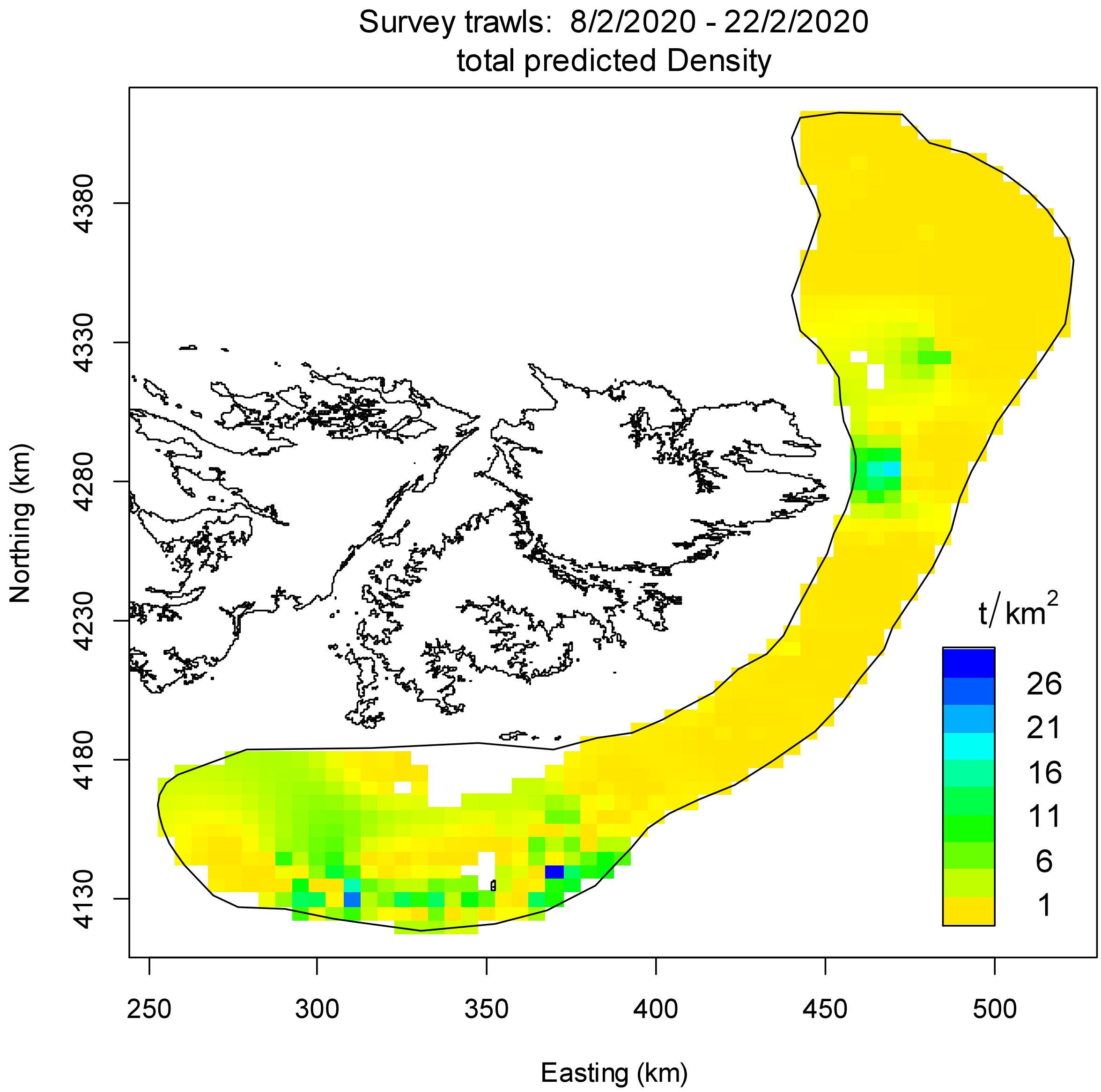


Figure 3. *D. gahi* predicted density estimates per 5 km^2 area units. Blank area units within the perimeter are either <90 or >400 m average depth. Coordinates were converted to WGS 84 projection in UTM sector 21F using the R library rgdal (proj.maptools.org).

The last adaptive-station trawl of the survey was carried out in shallow water (110 m depth) south of Speedwell Island (Figure 1) in an area where large numbers of juvenile toothfish had been caught in January 2017 (Arkhipkin et al. 2017). The duration of this trawl had been planned for one hour, but was shortened to 45 min on the bottom after decreasing spread of the trawl doors indicated that large quantities of lobster krill (*Munida*) were entering the net. No juvenile toothfish were caught in this trawl.

Several sea lions and fur seals were sighted by the observer during the survey; usually one or two at some hauls mainly in the southern area. No pinniped interactions or incidental catches occurred. Correspondingly, no seal exclusion device (SED) was used in the trawl gear throughout the survey.

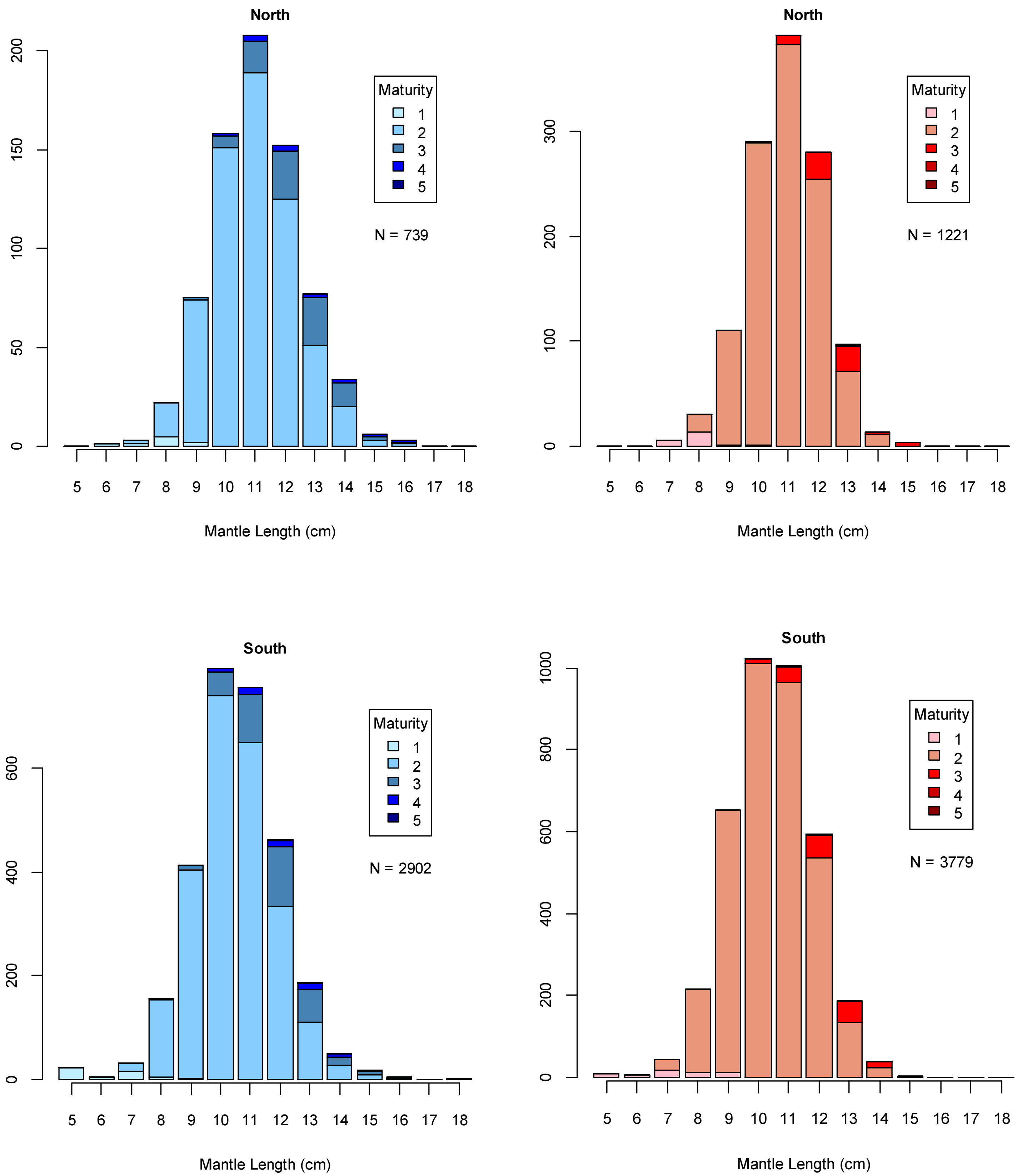


Figure 4 [previous page]. Length-frequency distributions by maturity stage of male (blue) and female (red) *D. gahi* from trawls north (top) and south (bottom) of latitude 52 °S.

8641 *D. gahi* were measured for length and maturity in the survey (3641 males, 5000 females, from 57 of the trawls). The total sex ratio was significantly ($p < 0.001$) majority female. Thirty individual trawls had a significant preponderance of females, but two trawls in the south, at average depths of 130.7 m and 157.1 m, had a significant preponderance of males.

D. gahi mantle length and maturity distributions north and south of 52° S are plotted in Figure 4. Mantle length distributions were significantly different between north and south for both males and females (Kruskal-Wallis test, $p < 0.01$). However, mantle lengths were significantly correlated (GLM, $p < 0.01$) with catch day; the distributions thus depended to some extent on when the vessel was fishing where. Gonad maturity distributions were not significantly different between north and south for either males or females ($p > 0.10$). For males north: mean mantle length 11.08 cm; mean maturity stage 2.14 (on a scale of 1 to 5), males south: mean mantle length 10.56 cm; mean maturity stage 2.15. Females north: mean mantle length 10.92 cm; mean maturity stage 2.04, females south: mean mantle length 10.44 cm; mean maturity stage 2.04.

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Appendix

Table A1. Survey stations with total *Doryteuthis gahi* catch. Time: Stanley FI time. Latitude: °S, longitude: °W. Transects labelled A were adaptive-station trawls.

Transect Station	Obs Code	Date	Start			End			Depth (m)	*D. gahi* (kg)
			Time	Lat	Lon	Time	Lat	Lon		
14 - 39	100	08/02/2019	05:00	50.52	57.52	06:49	50.61	57.36	249	2
14 - 38	101	08/02/2019	07:40	50.65	57.46	09:35	50.53	57.60	142	118
14 - 37	102	08/02/2019	11:15	50.56	57.65	13:10	50.66	57.49	135	211
13 - 34	103	08/02/2019	14:10	50.78	57.40	16:05	50.87	57.20	129	61
12 - 33	104	09/02/2019	04:55	50.98	56.89	06:45	50.87	57.01	120	0
12 - 36	105	09/02/2019	07:25	50.79	57.04	09:25	50.70	57.22	254	6
13 - 35	106	09/02/2019	10:05	50.74	57.29	11:55	50.83	57.10	130	6
12 - 32	107	09/02/2019	12:30	50.87	57.05	14:15	51.00	56.97	115	2
9 - 25	108	10/02/2019	04:55	51.83	57.39	06:50	51.96	57.51	220	45
8 - 22	109	10/02/2019	08:05	52.15	57.68	09:51	52.25	57.85	198	62
7 - 19	110	10/02/2019	11:05	52.36	58.10	12:45	52.45	58.27	183	138
6 - 16	111	10/02/2019	14:00	52.58	58.53	15:55	52.70	58.69	164	852
9 - 24	112	11/02/2020	04:40	51.82	57.48	06:30	51.95	57.58	161	138
8 - 21	113	11/02/2020	07:45	52.13	57.78	09:25	52.23	57.92	137	762
7 - 18	114	11/02/2020	10:35	52.35	58.18	12:19	52.44	58.34	142	366
6 - 15	115	11/02/2020	13:30	52.55	58.61	15:00	52.61	58.79	131	153
2 - 4	116	12/02/2020	04:45	52.83	59.79	06:10	52.85	59.62	157	509
3 - 7	117	12/02/2020	06:45	52.82	59.62	08:40	52.83	59.39	147	78
4 - 10	118	12/02/2020	09:20	52.82	59.35	11:20	52.80	59.10	109	81
5 - 13	119	12/02/2020	12:15	52.88	59.00	14:15	52.80	58.77	144	3145
0 - 1	120	13/02/2020	04:40	52.77	60.37	06:20	52.88	60.23	242	44
1 - 3	121	13/02/2020	07:15	52.88	60.20	09:10	52.92	59.97	225	13785
2 - 6	122	13/02/2020	09:45	52.93	59.91	11:50	52.98	59.66	239	4368
3 - 8	123	13/02/2020	12:30	52.95	59.62	14:25	52.97	59.37	178	20008
4 - 11	124	14/02/2020	04:45	52.96	59.04	06:55	53.00	59.28	229	608
3 - 9	125	14/02/2020	07:40	53.00	59.36	09:30	52.98	59.60	236	2200
2 - 5	126	14/02/2020	10:20	52.93	59.65	12:10	52.91	59.88	168	9668
1 - 2	127	14/02/2020	12:55	52.87	59.96	14:45	52.81	60.19	195	3879
10 - 26	128	15/02/2020	05:35	51.62	57.44	07:35	51.46	57.46	126	11893
11 - 28	129	15/02/2020	09:05	51.22	57.25	10:55	51.12	57.09	112	1232
11 - 30	130	15/02/2020	11:35	51.12	57.01	13:20	51.24	57.16	127	438
11 - 31	131	15/02/2020	14:00	51.26	57.08	15:40	51.15	56.95	140	19
10 - 28	132	16/02/2020	04:45	51.63	57.26	06:38	51.49	57.19	224	15
10 - 27	133	16/02/2020	07:30	51.48	57.30	09:23	51.62	57.35	148	270
8 - 23	134	16/02/2020	12:35	52.16	57.59	14:20	52.26	57.73	261	26
7 - 20	135	16/02/2020	15:45	52.38	57.97	17:45	52.50	58.15	260	44
6 - 17	136	17/02/2020	04:45	52.60	58.47	06:48	52.72	58.65	232	685
5 - 14	137	17/02/2020	07:45	52.84	58.76	09:35	52.89	58.96	161	14653
5 - 12	138	17/02/2020	10:30	52.80	59.06	12:20	52.71	58.88	119	3885
A - 1	139	17/02/2020	13:25	52.88	58.92	15:25	52.97	59.13	156	8755
A - 2	140	18/02/2020	04:45	52.97	59.13	06:45	52.99	59.39	176	1770
A - 3	141	18/02/2020	07:20	52.98	59.41	09:20	52.96	59.65	192	5030
A - 4	142	18/02/2020	09:55	52.96	59.69	11:55	52.92	59.90	194	10869
A - 5	143	18/02/2020	12:45	52.91	59.97	15:45	52.87	60.20	201	2897
A - 6	144	19/02/2020	04:45	52.95	59.11	06:45	52.95	59.36	164	10015
A - 7	145	19/02/2020	07:25	52.95	59.40	09:25	52.93	59.64	162	2954
A - 8	146	19/02/2020	10:00	52.92	59.72	12:00	52.89	59.94	168	20472
A - 9	147	19/02/2020	12:50	52.88	59.97	14:50	52.85	60.20	187	5476
A - 10	148	20/02/2020	04:45	52.80	59.07	06:45	52.69	58.88	119	2469
A - 11	149	20/02/2020	07:30	52.71	58.81	09:30	52.84	58.81	143	16671
A - 12	150	20/02/2020	10:20	52.84	58.81	12:20	52.93	59.05	148	18125
A - 13	151	20/02/2020	13:00	52.93	59.09	15:00	52.83	58.89	140	7218

A - 14	152	21/02/2020	04:42	52.94	59.06	06:42	52.94	59.3	163	10190
A - 15	153	21/02/2020	07:20	52.96	59.34	09:20	52.95	59.58	170	8638
A - 16	154	21/02/2020	10:00	52.95	59.59	12:00	52.92	59.82	173	11839
A - 17	155	21/02/2020	12:40	52.92	59.84	14:40	52.88	60.08	181	13411
A - 18	156	22/02/2020	04:45	52.97	59.21	07:15	52.96	59.55	172	11074
A - 19	157	22/02/2020	08:05	52.94	59.67	10:35	52.89	60.00	176	6000
A - 20	158	22/02/2020	12:50	52.50	59.67	13:25	52.50	59.59	103	61

Table A2. Empirical estimates of survey total catches by species / taxon.

Species Code	Species / Taxon	Total catch (kg)	Total catch (%)	Sample (kg)	Discard (kg)
LOL	*Doryteuthis gahi*	268385	93.2	303	124
PAR	*Patagonotothen ramsayi*	9204	3.2	171	9174
BLU	*Micromesistius australis*	5075	1.8	54	1030
MUG	*Munida gregaria*	459	0.2	0	459
BAC	*Salilota australis*	373	0.1	0	153
ING	*Moroteuthis ingens*	334	0.1	0	334
CGO	*Cottoperca gobio*	334	0.1	0	334
RFL	*Zearaja chilensis*	272	0.1	0	55
SPN	Porifera	268	0.1	0	268
GOC	*Gorgonocephalus chilensis*	265	0.1	0	265
RBR	*Bathyraja brachyurops*	240	0.1	0	233
SQT	Ascidiacea	228	0.1	0	228
TOO	*Dissostichus eleginoides*	224	0.1	202	11
KIN	*Genypterus blacodes*	223	0.1	0	51
ALG	Algae	222	0.1	0	222
GRF	*Coelorinchus fasciatus*	204	0.1	19	204
CHE	*Champsocephalus esox*	159	0.1	0	159
ANM	Anemone	159	0.1	0	159
MED	Medusae	132	<0.1	0	132
ZYP	*Zygochlamys patagonica*	120	<0.1	0	120
PTE	*Patagonotothen tessellata*	93	<0.1	0	93
GRC	*Macrourus carinatus*	86	<0.1	40	86
RMC	*Bathyraja macloviana*	76	<0.1	0	76
BUT	*Stromateus brasiliensis*	73	<0.1	5	73
ILL	*Illex argentinus*	62	<0.1	1	60
WHI	*Macruronus magellanicus*	59	<0.1	1	59
PAU	*Patagolycus melastomus*	48	<0.1	0	48
LIS	*Lithodes santolla*	42	<0.1	38	37
SUN	*Labidaster radiosus*	41	<0.1	0	41
RAL	*Bathyraja albomaculata*	40	<0.1	0	34
NEM	*Neophyrnichthys marmoratus*	39	<0.1	0	39
RPX	*Psammobatis* spp.	38	<0.1	0	38
DGH	*Schroederichthys bivius*	37	<0.1	0	37
RSC	*Bathyraja scaphiops*	35	<0.1	0	25
WRM	*Chaetopterus variopedatus*	27	<0.1	0	27
SHT	Mixed invertebrates	26	<0.1	0	26
CAZ	*Calyptraster* sp.	23	<0.1	0	23

SAL	*Salpa* sp.	21	<0.1	0	21
POA	*Porania antarctica*	19	<0.1	0	19
STA	*Sterechinus agassizi*	18	<0.1	0	18
OCT	*Octopus* spp.	16	<0.1	0	16
COL	*Cosmasterias lurida*	16	<0.1	0	16
AUL	*Austrolycus laticinctus*	14	<0.1	0	14
ODM	*Odontocymbiola magellanica*	13	<0.1	0	13
NED	*Neolithodes diomedeae*	12	<0.1	0	1
HAK	*Merluccius hubbsi*	11	<0.1	0	11
FUM	*Fusitriton m. magellanicus*	11	<0.1	0	11
AUC	*Austrocidaris canaliculata*	8	<0.1	0	8
RPR	*Psammobatis rudis*	6	<0.1	0	6
PAT	*Merluccius australis*	6	<0.1	0	6
OCC	Octocoralia	6	<0.1	0	6
EEL	*Iluocoetes/Patagolycus* mix	6	<0.1	0	6
MUN	*Munida* spp.	4	<0.1	0	4
EUL	*Eurypodius latreillei*	4	<0.1	0	4
EGG	Eggmass	3	<0.1	0	3
CYX	*Cycethra* sp.	3	<0.1	0	3
RGR	*Bathyraja griseocauda*	2	<0.1	0	2
PES	*Peltarion spinosulum*	2	<0.1	0	2
HYD	Hydrozoa	2	<0.1	0	2
CRY	*Crossaster* sp.	2	<0.1	0	2
BAO	*Bathybiaster loripes*	2	<0.1	0	2
OPV	*Ophiacanta vivipara*	1	<0.1	0	1
OPS	*Ophiactis asperula*	1	<0.1	0	1
GAF	*Ganaria falklandica*	1	<0.1	0	1
CTA	*Ctenodiscus australis*	1	<0.1	0	1
COT	*Cottunculus granulosus*	1	<0.1	0	1
CEX	*Ceramaster* sp.	1	<0.1	0	1
UHH	Heart urchin	<1	<0.1	0	0
SRP	*Semirossia patagonica*	<1	<0.1	0	0
SOR	*Solaster regularis*	<1	<0.1	0	0
SEX	Sepiolidae sp.	<1	<0.1	0	0
RBZ	*Bathyraja cousseauae*	<1	<0.1	0	0
PYX	Pycnogonida	<1	<0.1	0	0
POL	Polychaeta	<1	<0.1	0	0
OPL	*Ophiuroglypha lymanii*	<1	<0.1	0	0
NUD	Nudibranchia	<1	<0.1	0	0
MYX	*Myxine* spp.	<1	<0.1	0	0
MXX	Myctophid spp.	<1	<0.1	0	0
ISO	Isopoda	<1	<0.1	0	0
EUO	*Eurypodius longirostris*	<1	<0.1	0	0
COG	*Patagonotothen guntheri*	<1	<0.1	0	0
BRY	Bryozoa	<1	<0.1	0	0
AST	Asteroidea	<1	<0.1	0	0
ANT	Anthozoa	<1	<0.1	0	0
AGO	*Agonopsis chilensis*	<1	<0.1	0	0
		287,941.6		835.9	14,742.1

Table A3. Basket samples per station, in kg, with minor species summarized in the 'other' species category.

Station - Basket	Total	LOL	PAR	RAY	BAC	WHI	BLU	CGO	ILL	KIN	Other
100 - 1	21.26	0	0.46	2.72	1.87	0.34	0.72	0	0	13.50	1.33
100 - 2	27.79	0	3.92	4.11	1.48	0.96	0	0	0.29	14.98	1.44
101 - 1	29.39	12.30	0.22	7.42	1.86	0	0	0.11	0.36	2.60	3.20
101 - 2	28.39	0.38	0	13.30	0	1.72	0	0	0	8.98	1.26
102 - 1	29.20	1.93	0.33	20.75	0	0	0	0	0	1.56	4.18
102 - 2	31.68	5.08	0.15	18.15	0	0	0	0	0	1.76	6.37
103 - 1	25.80	5.52	1.55	3.19	0.12	0	0	0.22	0	0	14.97
103 - 2	20.81	3.03	0.54	4.37	0	0	0	0	0	0	12.31
104 - 1	25.59	0	0	1.53	0.41	0	0	5.78	0	0	17.87
105 - 1	16.08	0	1.41	0.74	3.40	1.66	0	0	0	4.93	3.94
106 - 1	31.76	0.06	1.52	11.84	0	0.71	0	3.56	0.03	0	14.04
107 - 1	19.69	0	0.09	3.98	0.49	0	0	0	0	0	14.53
108 - 1	32.42	6.58	14.03	1.70	0	0	0	0.97	0	0	9.14
109 - 1	36.90	6.58	25.16	0.38	0	0	0	0.72	0	0	4.06
110 - 1	32.80	4.32	22.54	2.85	0	0	0	0.66	0	0	2.42
111 - 1	31.44	28.67	0.75	0	0	0	0	0	0	0	2.02
112 - 1	29.33	17.34	0.54	0.52	0	0	0.08	2.32	0.07	0	8.46
113 - 1	34.49	21.24	0	0	0	0	0.04	0	0	0	12.72
114 - 1	23.27	12.26	0	0.26	0	0	0	0.04	0	0	10.97
115 - 1	30.86	22.68	0.17	0.80	0	0	0.01	0	0	0	7.20
116 - 1	29.24	15.05	4.63	4.09	0	0	0	1.05	0	0	8.51
117 - 1	25.76	5.02	8.91	0.25	0	0	0	0	0	0	11.58
118 - 1	24.06	4.99	0.70	0.49	0	0	0	0	0.09	0	17.79
119 - 1	27.90	24.62	0	0	0	0	0	0	0	0	3.28
120 - 1	61.44	0	0.55	1.77	3.82	0.42	53.23	1.58	0	0	0.07
121 - 1	27.08	26.50	0.08	0	0	0	0	0	0.07	0	0
122 - 1	33.06	29.11	2.95	0	0	0	0	0	0	0	0.01
123 - 1	32.66	29.33	0.60	0	0	0	0	0	0	0	0.01
124 - 1	35.32	26.85	4.03	0	1.00	0.75	0.95	0	0	0	1.74
125 - 1	35.80	32.14	2.85	0	0	0.08	0	0	0	0	0.73
126 - 1	35.38	32.84	0.67	0	0	0	0	0	0.06	0	1.81
127 - 1	37.22	22.12	12.19	0	0	0	0	0	0	0	2.91
128 - 1	36.46	32.42	0	1.38	0	0	0.01	0	0.10	0	2.64
128 - 2	28.33	25.84	0	0.52	0	0	0	0	0.07	0	1.90
129 - 1	35.26	31.54	0	0	0	0	0	0	0.17	0	3.55
129 - 2	32.18	27.09	0	0	0	0	0	0	0	0	5.09
130 - 1	39.96	23.33	0.11	1.58	0	0	0	0	0	0	14.94
131 - 1	28.78	8.78	0.34	1.93	0.19	0	0	1.10	0	0	16.44
132 - 1	29.70	6.34	14.65	0	0.43	0.60	0	0	0	0	7.68
133 - 1	35.44	27.12	0.58	0	0	0	0	0	0.12	0	7.62
134 - 1	27.33	0.41	25.02	0	0	0	0	0	0	0	1.90
135 - 1	27.69	0.16	25.03	1.70	0	0	0	0	0	0	0.70
136 - 1	32.86	12.97	10.49	6.29	0.66	0	0	1.17	0	0	1.29
137 - 1	30.00	29.03	0.97	0	0	0	0	0	0	0	0
138 - 1	32.24	27.51	0.04	0	0	0	0	0	0	0	4.69
139 - 1											
140 - 1	37.36	32.64	1.93	0	0	0	0	0	0	0	2.79

141 - 1	35.98	33.28	0.82	0	0	0	0	0	0	0	1.88
142 - 1	32.84	31.12	1.72	0	0	0	0	0	0	0	0
143 - 1	35.34	27.96	6.02	1.36	0	0	0	0	0	0	0
144 - 1	39.30	36.71	0.02	1.10	0	0	0	0	0	0	1.47
145 - 0											
146 - 0											
147 - 1	37.02	19.03	13.47	0	3.85	0	0	0.67	0	0	0
148 - 1	31.32	27.03	0.08	0.20	0	0	0	0	0	0	3.72
149 - 0											
150 - 0											
151 - 1	32.58	31.88	0.08	0	0	0	0	0	0	0	0.62
152 - 0											
153 - 0											
154 - 0											
155 - 0											
156 - 1	33.52	31.82	0.15	0	0	0	0	0	0	0	1.55
157 - 1	32.30	32.02	0.24	0	0	0	0	0	0.03	0	0.01
158 - 1	20.42	3.10	0.23	0.16	0	0	0	0	0	0	16.93