FALKLAND ISLANDS FISHERIES DEPARTMENT

Doryteuthis gahi Stock Assessment Survey, 2nd Season 2017

Vessel	**Igueldo (ZDLE1)**
	Falkland Islands
Dates	**13/07/2017 – 28/07/2017**
Survey Team	**Andreas Winter** **Zhanna Shcherbich** **Verónica Iriarte** **Cian Derbyshire**

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Summary

1) A stock assessment survey for *Doryteuthis gahi* was conducted in the 'Loligo Box' from 13th to 28th July 2017. Sixty-three scientific trawls were taken during the survey, including four dedicated trawls to cover a juvenile toothfish transect on one day. The scientific catch of the survey was 313.70 tonnes *D. gahi*.
2) A geostatistical estimate of 56,807 tonnes *D. gahi* (95% confidence interval: 48,383 to 73,012 t) was calculated for the fishing zone. This represents the highest 2nd-season survey biomass estimate since at least 2006. Of the total, 11,375 t were estimated north of 52 ºS, and 45,432 t were estimated south of 52 ºS.
3) Male and female *D. gahi* had significantly greater average mantle lengths, and average maturities, south of 52 ºS than north of 52 ºS. Males north: mean mantle length 12.11 cm; mean maturity stage 3.48, males south: mean mantle length 14.44 cm; mean maturity 4.13. Females north: mean mantle length 10.89 cm; mean maturity 2.33, females south: mean mantle length 13.23 cm; mean maturity 2.84.
4) One hundred and three taxa were identified in the catches. *D. gahi* was the largest species group at 64.0% of total catch by weight, followed by hoki (22.1%), rock cod (6.3%), and lobster krill (3.3%). Biological measurements and samples were taken from *D. gahi*, rock cod, toothfish, and opportunistic specimens of various other species.

Introduction

A stock assessment survey for *Doryteuthis gahi* (Patagonian squid – colloquially *Loligo*) was carried out by FIFD personnel on-board the fishing vessel *Igueldo* from the 13th to 28th July 2017; experimental license FK049E17. The survey was extended one day longer than usual to accommodate a day for sampling an inshore-offshore transect of juvenile toothfish trawls (Figures 1, 2). 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 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 2nd fishing season, 2017.
2) Continue a series of experimental trawls for studying the recruitment and movement of juvenile toothfish (*Dissostichus eleginoides*).
3) Estimate the biomass and distribution of rock cod (*Patagonotothen ramsayi*) in the 'Loligo Box', for continued monitoring of this stock and in parallel to the finfish research survey being conducted by the FV *Castelo*.
4) Collect biological information on *D. gahi*, rock cod, toothfish (*Dissostichus eleginoides*) and opportunistically other commercially important fish and squid taken in the trawls.

The survey was designed to cover the 'Loligo Box' fishing zone (Arkhipkin et al. 2008, 2013) that extends across the southern and eastern part of the Falkland Islands Interim Conservation Zone (Figure 1). The current delineation of the Loligo Box represents an area of approximately 31,118 km^2.

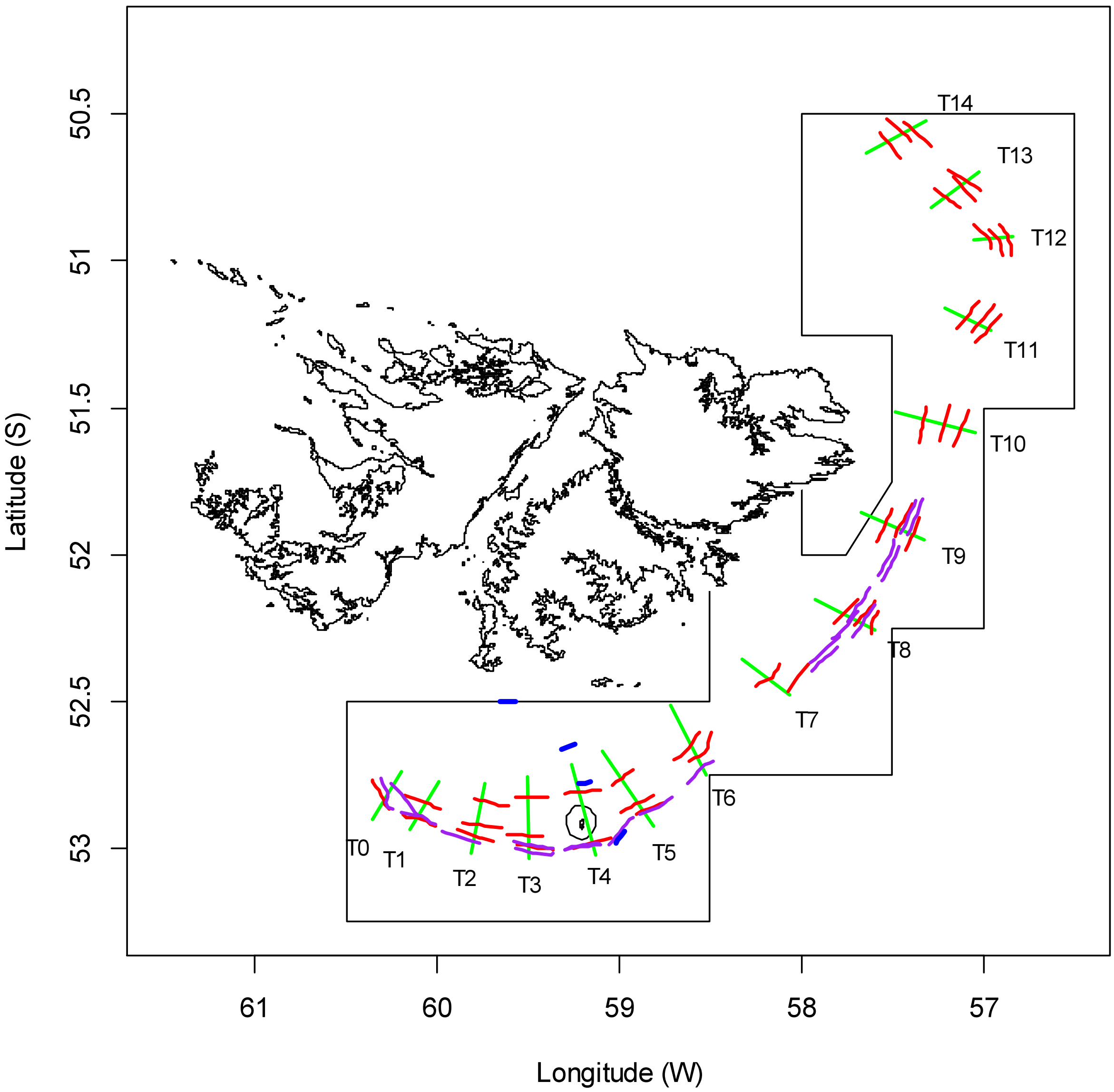

Figure 1. Survey transects (green lines), fixed-station trawls (red lines), adaptive-station trawls (purple lines), and toothfish transect trawls (blue lines) sampled during the 2nd pre-season 2017 survey. Boundaries of the 'Loligo Box' fishing zone and the Beauchêne Island exclusion zone are in black.

The F/V *Igueldo* is a Falkland Islands - registered stern trawler of 83.40 m length, 2305 gross tonnage, and 3000 main engine bhp. *Igueldo* was previously employed for the 2nd pre-season 2011 survey (Winter et al. 2011) and for a trawl comparison study in 2012 (Arkhipkin et al. 2012). Like all vessels employed for pre-season surveys, *Igueldo* operates regularly in the *D. gahi* fishery and used its commercial trawl gear for survey catches. The following FIFD personnel participated in the 2nd pre-season 2017 survey:

Andreas Winter	lead scientist
Zhanna Shcherbich	fisheries biologist
Verónica Iriarte	fisheries observer
Cian Derbyshire	fisheries observer

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Figure 2. *Igueldo* crew and FIFD scientists intensively sorting a toothfish transect catch. Note the large quantities of lobster krill (*Munida* spp.) in the catch.

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. Trawls were designed for an expected duration of 2 hours each, and ranged in distance from 10.9 to 17.8 km (mean 15.6 km).The toothfish trawls were taken on one day as part of an ongoing study to characterize shelf out-migration of juvenile toothfish (A. Arkhipkin, FIFD, pers. comm.). These four trawls were designed for an expected duration of 1 hour each and ranged in distance from 6.6 to 7.8 km (mean 7.2 km). All trawls were bottom trawls. During the progress of each trawl, GPS latitude, GPS longitude, bottom depth, bottom temperature, net height, trawl door spread, and trawl speed were recorded on the ship's bridge in 15-minute intervals, and a visual assessment was made 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 separately by the factory crew and retained catch weight of *D. gahi*, by size category, was estimated from the number of standard-weight blocks of frozen *D. gahi* recorded by the factory supervisor. Catch weights of commercially valued fish species were recorded in the same way, but without size categorization. Processed product weights were scaled to whole weights using standard conversion factors (FIG, 2011). 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. Between 2 and 10 observer baskets of unsorted catch were collected at intervals from each survey trawl, depending on its 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 species 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. Uncertainty in catch weight per species per trawl was estimated by randomly re-sampling, with replacement, the baskets per trawl and calculating the variability. The variability was applied to only the discard portion of each species per trawl, as the commercially retained portion was quantified deterministically.

Biomass calculations

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. 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 derived from the distance between trawl doors (determined per interval) according to the equation (Seafish, 2010):

$$\text{trawl width} = (\text{door distance} \times \text{footrope length}) / (\text{footrope} + \text{sweep} + \text{bridle})$$

Measurements of *Igueldo*'s trawl, provided by the vessel master, were: footrope = 120 m, sweep = 20 m, bridle = 125 m.

As for prior 2nd seasons (winter seasons), a daylight effect was examined because the diel migratory behaviour of *D. gahi* (Roper and Young 1975) is likely to make the squid less available to trawls during darkness at the start and end of the survey day. Each 15-minute trawl interval (and its corresponding apportioned *D. gahi* catch density) was assigned a 0 / 1 index of completion within the period of daylight, from sunrise to sunset. Sunrise and sunset times at each trawl location were calculated using the algorithms of the NOAA Earth System Research Laboratory[1]. Two sets of survey biomass density estimates were then calculated according to the methods described below; one using all trawl intervals, and the other using

[1] www.esrl.noaa.gov/gmd/grad/solcalc/calcdetails.html

only trawl intervals completed during daylight. That set of intervals (all or daylight only) which resulted in better fit computational models was then retained for calculating the survey estimates.

Biomass density estimates were extrapolated to the survey area using geostatistical methods (Petitgas 2001). The delineated survey area for 2nd season was standardized to the same as 1st season: 20,000 km^2, partitioned for analysis as 800 area units of 5×5 km. A delta approach was used of fitting geostatistic variograms separately to positive (non-zero) *D. gahi* catch densities, and to the probability of occurrence (presence/absence) of the positive catch densities (Pennington 1983, Maunder and Punt 2004). Positive catch densities were normalized with Box-Cox transformations (MacLennan and MacKenzie 1988). Presence/absence data were modelled on a binomial distribution and without normalization, as appropriate for count data (O'Hara and Kotze 2010).

Uncertainty of the geostatistical model of biomass density was estimated by conditional simulation (Woillez et al., 2009), performed in the R software package 'geoR' (Ribeiro and Diggle, 2001). Conditional simulations of positive catch densities and presence / absence were randomly drawn and multiplied together 250000× for a combined variability distribution. To this uncertainty was added a measure of error of the acoustic apportionment of the *D. gahi* catch data. Assessing the acoustic marks (Sampling Procedures; above) is a visual judgement, and does not objectively differentiate *D. gahi* from other echo targets entering the net. A surrogate measure was instead calculated using the linear coefficient of determination (R^2) between total acoustic score per trawl (Σ (acoustic mark quantity × quality)$_{trawl}$) and total *D. gahi* catch per trawl. Acoustic scores are relative values referenced to each individual trawl, but as all were assigned by the same survey scientist, their absolute values should also be consistent across all trawls. To estimate error of acoustic apportionment the unexplained error of the linear relationship ($1 - R^2$) was multiplied by each interval catch of each trawl and randomly either added to or subtracted from the interval catch:

$$r\,C_{interval} = C_{interval} + (C_{interval} \times (1 - R^2) \times \sim r[-1 \mid 1])$$

Thus, if the relationship was perfect ($R^2 = 1$) there would be no random effect, and if the relationship was null ($R^2 = 0$) each interval would be randomly either doubled or set to zero (a negative slope is for this purpose considered equivalent to null). The set of $r\,C_{interval}$ for each trawl was re-standardized to the total *D. gahi* catch weight of that trawl, then processed through the same algorithms of density distribution and geostatistic extrapolation as the empirical results. In a change from the previous procedure, iterative aggregations of small catches (< 100 kg) were summed towards intervals randomly selected within each trawl, not automatically the middle interval. The full randomization was repeated 10000× and the coefficient of variation of the mean geostatistic density retained as the measure of error of acoustic apportionment[2].

Biological analyses

Random samples of *D. gahi* (target n = 200, as far as available) were collected from the factory at all trawl stations. Of these samples, n = 100 were sub-set for statolith extraction.

[2] The actual randomization outcomes were not interpretable as true estimates of geostatistic density. Because randomization blurs stretches of high acoustic backscatter vs. low acoustic backscatter (i.e., the original patterns are not random), spatial correlation is typically weaker, and given the distribution skewness resulting from a small number of high density data, the randomized geostatistic estimates are biased lower. Thus only the relative value of the coefficient of variation is used.

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* (FIFD code LOL) were collected according to area stratification (north, central, south) and depth (shallow, medium, deep), and frozen for statolith extraction and age analysis (Arkhipkin, 2005). A sample of 100 common rock cod (PAR) was taken at every trawl station. All catches of toothfish (TOO) were collected from all trawl stations to maximize the time series catch and biological information base for juvenile toothfish, in addition to the samples from the dedicated one-day toothfish transect. Specimens of crocodile fish (AGO; *Agonopsis chilensis*), bream (BDU; *Brama dussumieri*), southern blue whiting (BLU; *Micromesistius australis*), frogmouth (CGO; *Cottoperca gobio*), ridge-scaled grenadier (GRC; *Macrourus carinatus*), common hake (HAK; *Merluccius hubbsi*), Falkland mullet (MUL; *Eleginops maclovinus*), yellowbelly (NOW; *Paranotothenia magellanica*), Patagonian hake (PAT; *Merluccius australis*), flat nose rock cod (PSI; *Patagonotothen sima*), marbled rock cod (PTE; *Patagonotothen tessellata*), redfish (RED; *Sebastes oculatus*), driftfish (SEP; *Seriolella porosa*), small flounder (THN; *Thysanopsetta naresi*), and hoki (WHI; *Macruronus magellanicus*) were taken opportunistically for length-frequency measurement and / or otolith analysis.

Results

Catch rates and distribution

The survey started as usual with fixed-station trawls in the north and proceeded to the south-west end of the Loligo Box. Adaptive trawls were taken mostly in the south, where the highest concentrations of *D. gahi* biomass were found (Figures 1 and 3, Appendix Summary Table A1). The same delineation of the survey area as first season (Winter et al. 2017) was used, for comparability. A schedule of 4 survey trawls per day was maintained except for July 25th, when the fourth survey trawl was cancelled because the factory had reached capacity limit for processing. In total 63 scientific trawls were recorded during the survey: 39 fixed station trawls catching 145.00 t *D. gahi*, 20 adaptive trawls catching 166.04 t *D. gahi*, and 4 toothfish trawls catching 2.65 t *D. gahi*. Sixteen optional trawls (made after survey hrs) yielded an additional 130.05 t *D. gahi*, bringing the total catch for the survey to 443.74 t. The scientific survey catch of 313.70 t is the highest for a 2nd season since at least 2006 and the highest for any season since 1st season 2010 (Table 1).

Average *D. gahi* catch density among fixed-station trawls was 0.94 t km^{-2} north of 52° S and 7.15 t km^{-2} south of 52° S. These average fixed-station catch densities were respectively the lowest (north) and highest (south) for a 2nd season since at least 2011. Average *D. gahi* catch density among adaptive-station trawls was 3.36 t km^{-2} north of 52° S and 9.39 t km^{-2} south of 52° S. The average adaptive-station *D. gahi* catch density south was also the highest for a 2nd season since at least 2011.

Figure 3 [below]. *D. gahi* CPUE (t km^{-2}) of fixed-station trawls (red), adaptive trawls (purple), and toothfish trawls (blue) per 15-minute trawl interval. Boundaries of the 'Loligo Box' fishing zone and the Beauchêne Island exclusion zone are traced in black.

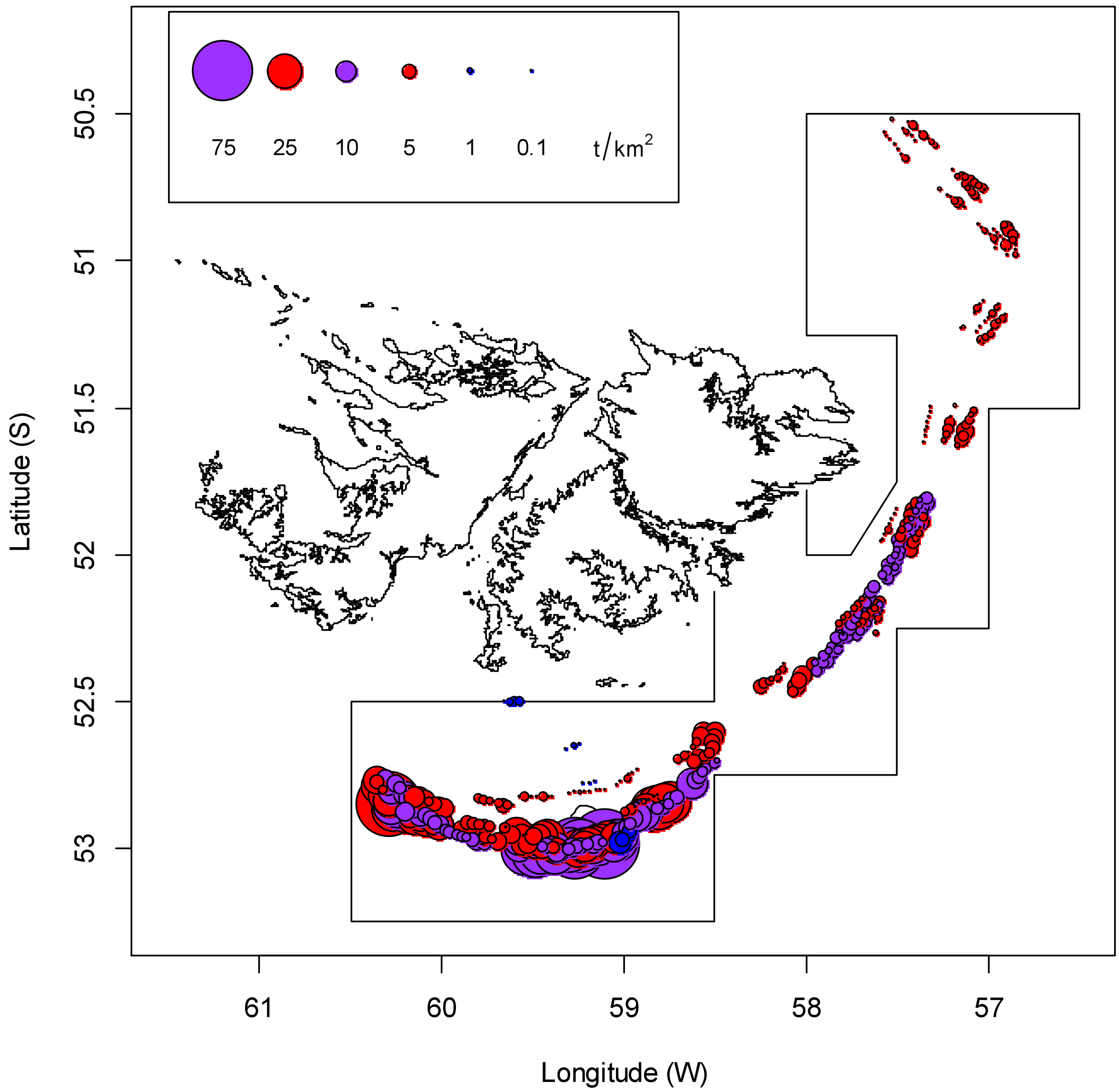


Table 1. *D. gahi* pre-season survey scientific catches and biomass estimates (in metric tonnes). Before 2006, surveys were not conducted immediately prior to season opening.

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

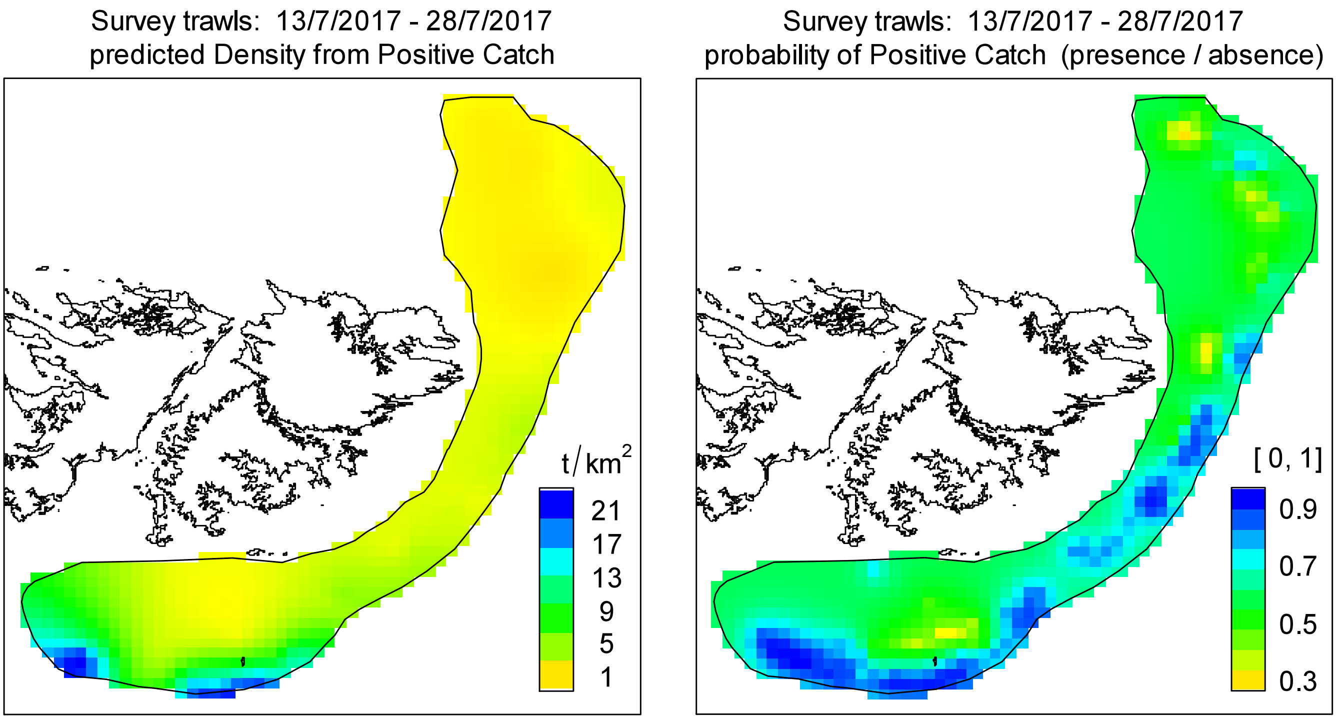
* Includes four juvenile toothfish transect trawls.

Biomass estimation

Survey trawl intervals completed during daylight comprised 76.0% of the total survey trawl intervals. Positive catch densities were assigned to 76.9% of all trawl intervals, and to 79.3% of trawl intervals during daylight hours only. Thus, the delta approach was applicable for modelling biomass density estimates from both the sets of all trawl intervals and daylight intervals.

Model versions with all trawl intervals, rather than daylight trawls only, were used for the final biomass estimation (see Appendix – Geostatistic models). The coefficient of variation for acoustic apportionment derived with the randomization algorithm was = 0.164, based on R^2 = 0.450 of total acoustic score per trawl vs. total *D. gahi* catch per trawl (Figure A3). The R^2 would have been = 0.725 with the exclusion of one trawl (Figure A3) that filled with hoki.

From the combined geostatistic models and variation calculations, total *D. gahi* biomass in the fishing area was estimated at 56,807 tonnes, with a 95% confidence interval of [48,383 to 73,012 t]. Distribution of the estimated biomass was strongly preponderant towards the south (Figure 4), with positive catch projections from 1.54 to 3.45 t km^{-2} in 95% of area units north of 52 ºS, and 2.16 to 18.83 t km^{-2} in 95% of area units south of 52 ºS (Figure 4, top left). Presence probabilities were comparatively evener with 0.42 to 0.80 in 95% of area units north of 52 ºS and 0.46 to 0.90 in 95% of area units south of 52 ºS (Figure 4, top right). Of the estimated total biomass, 11,375 t [8,528 to 16,964 t] were north of 52 ºS, and 45,432 t [37,306 to 60,189 t] were south of 52 ºS. The survey biomass estimate of 56,807 t was the highest reported estimate for a 2nd season since at least 2006 and the highest reported estimate for either season since 2010 (Table 1)[3].



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

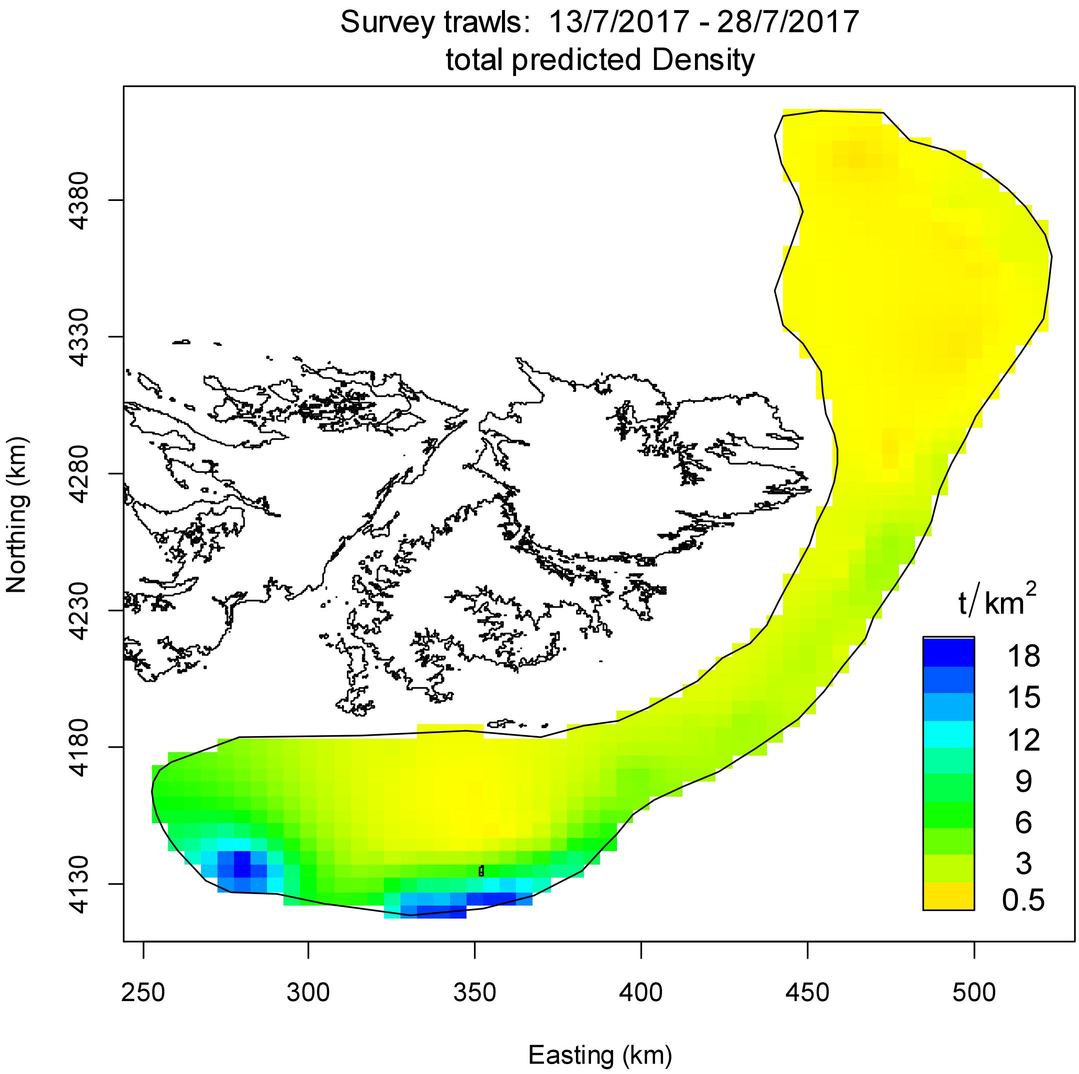


Figure 4. *D. gahi* predicted density estimates per 5 km^2 area units. Top left: catch density distribution from variogram model of positive catches. Top right: probability of positive catch modelled from MCMC of presence/absence. Main plot: Predicted density = positive catch × probability of positive catch. Coordinates were converted to WGS 84 projection in UTM sector 21F using the R library rgdal (proj.maptools.org).

Biological data

One hundred and three taxa were identified in the catches (Appendix Summary Table A2), of which *D. gahi* made up 64.0% by weight, the lowest proportion in a 2nd season since at least 2011. Hoki made up the second-highest catch proportion at 22.1%, by far the highest proportion on record. However, 99.9% of the estimated hoki catch was obtained in just 2 trawls, and the basket sampling procedure is relatively inaccurate when a bycatch quantity greatly exceeds the *D. gahi* to which it is apportioned (Table A3). Lobster krill (*Munida* spp.) bycatch was also highly concentrated with 5 trawls accounting for 88.4% of the total, including the shallowest of the toothfish transect trawls (Figure 2) and several trawls in which lobster krill was the highest catch by weight (Table A3).

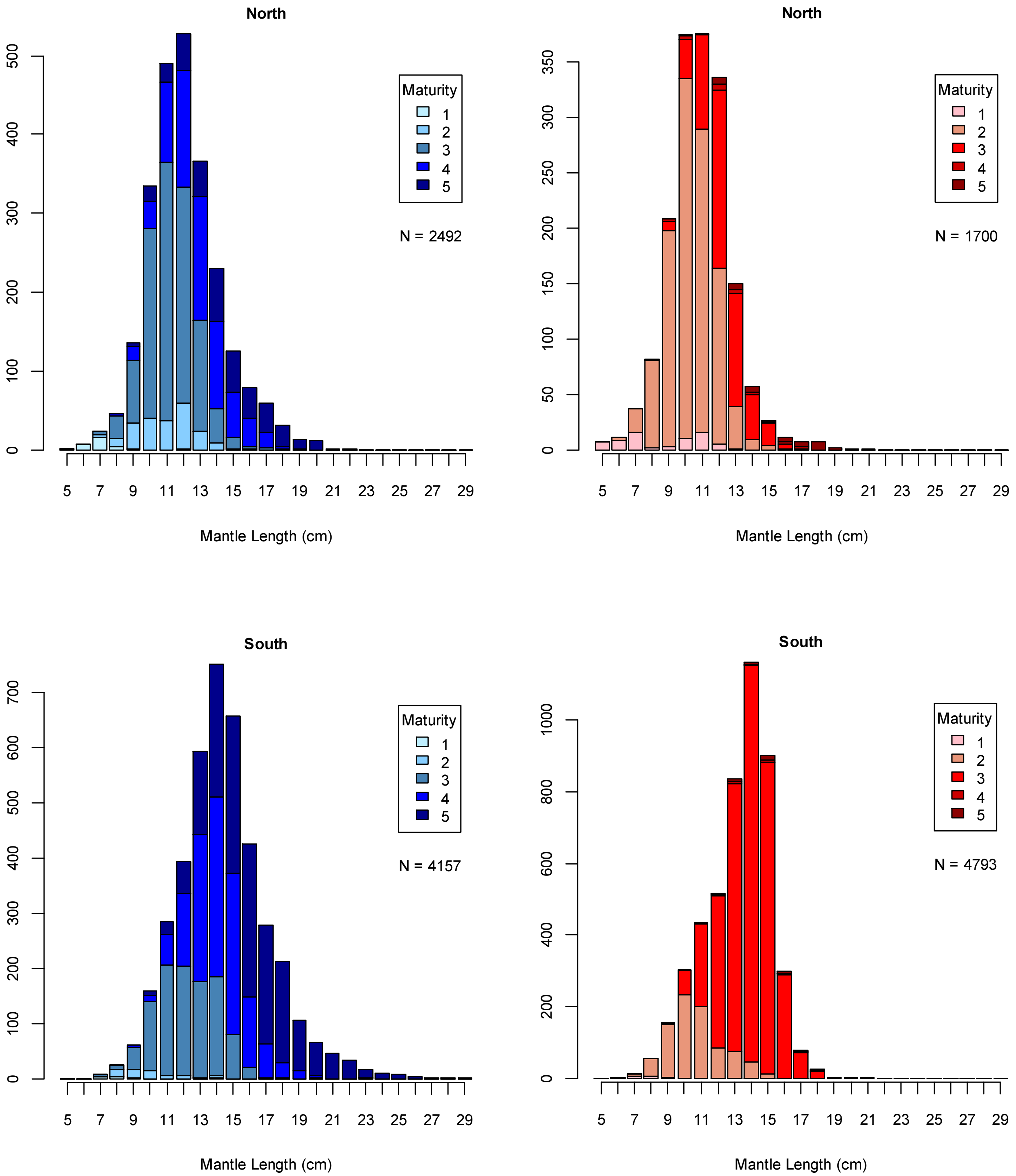


Figure 5. Length-frequency distributions by maturity stage of male (blue) and female (red) *D. gahi* from trawls north (top) and south (bottom) of latitude 52 ºS.

D. gahi mantle length and maturity distributions north and south of 52° S are plotted in Figure 5. For both males and females, size and maturity distributions were significantly different between north and south (Kruskal-Wallis test, $p < 0.001$ all comparisons). For males north: mean mantle length 12.11 cm; mean maturity stage 3.48 (on a scale of 1 to 5), males south: mean mantle length 14.44 cm; mean maturity stage 4.13. Females north: mean mantle length 10.89 cm; mean maturity stage 2.33, females south: mean mantle length 13.23 cm; mean maturity stage 2.84.

Pinniped bycatch

Incidental catches of pinnipeds (primarily *Arctocephalus australis* and *Otaria flavescens*) have been increasing in Falkland Islands trawl fisheries over the past few years (Iriarte and Pompert 2016). In the 2nd pre-season 2017 survey, 17 pinnipeds were retrieved from trawls, of which 10 presumed killed in the trawls and 1 presumed previously dead (Table 2). Areal distributions of the pinniped catches are shown in Figure 6.

Table 2. Pinniped bycatches in the *D. gahi* pre-season survey, 13/07/2017 to 28/07/2017. Species ARA = South American fur seal (*Arctocephalus australis*), MIL = Southern elephant seal (*Mirounga leonina*), OTB = Southern sea lion (*Otaria flavescens*).

Date	Time* (Stanley)	Position*	Obs. Stat. / Trawl	Species	Number of animals	Mortality
15/07	06:57	50.87 S 57.00 W	906	OTB	2	dead
18/07	15:00	52.18 S 57.67 W	921	OTB	1	dead
21/07	15:12	52.98 S 59.01 W	933	ARA	1	alive
23/07	17:30	52.77 S 60.36 W	941	ARA	2	alive
24/07	09:00	52.94 S 59.97 W	942	MIL	1	dead**
25/07	12:41	53.01 S 59.33 W	948	ARA	1	dead
25/07	14:25	52.99 S 59.10 W	948	ARA	1	alive
26/07	07:02	52.69 S 58.46 W	949	ARA	1	dead
26/07	12:25	52.88 S 58.90 W	951	ARA	4	dead
26/07	18:05	53.01 S 59.29 W	Commercial	ARA	1	dead
28/07	17:07	51.81 S 57.33 W	960	ARA	1	alive
28/07	23:55	51.41 S 57.07 W	Commercial	OTB	1	alive

* Times and positions are either the start or end of a trawl, as dead animals are assumed caught in the shoot (start) of the trawl and live animals are assumed caught in the haul (end)of the trawl.
** Injuries indicated collision with a ship, not killed in trawl.

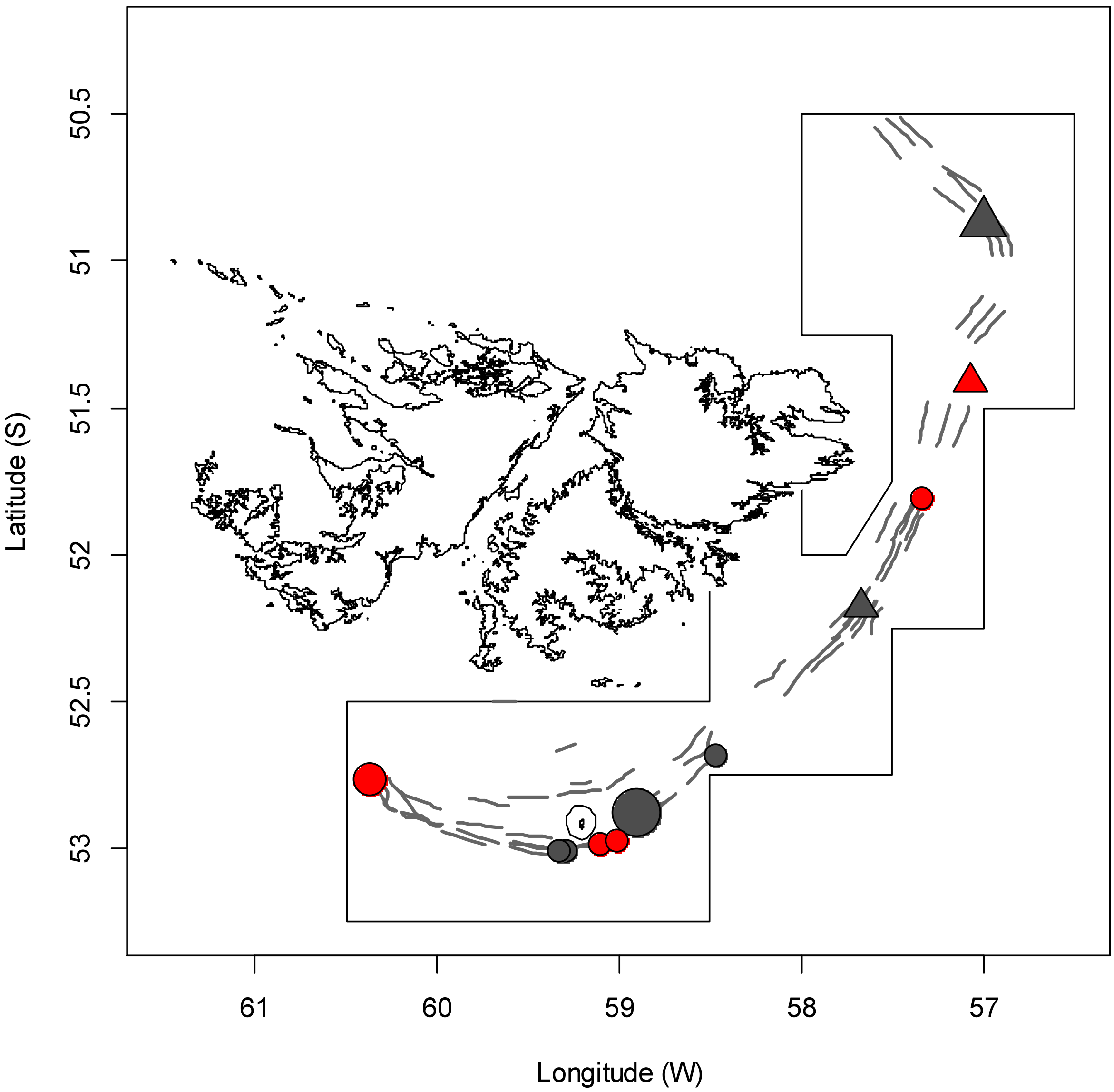


Figure 6. Trawl-caught pinnipeds during the 2nd pre-season survey. Triangles: *Otaria flavescens*, circles: *Arctocephalus australis*. Black: dead animals, red: live animals. Grey lines: survey trawl tracks.

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Appendix

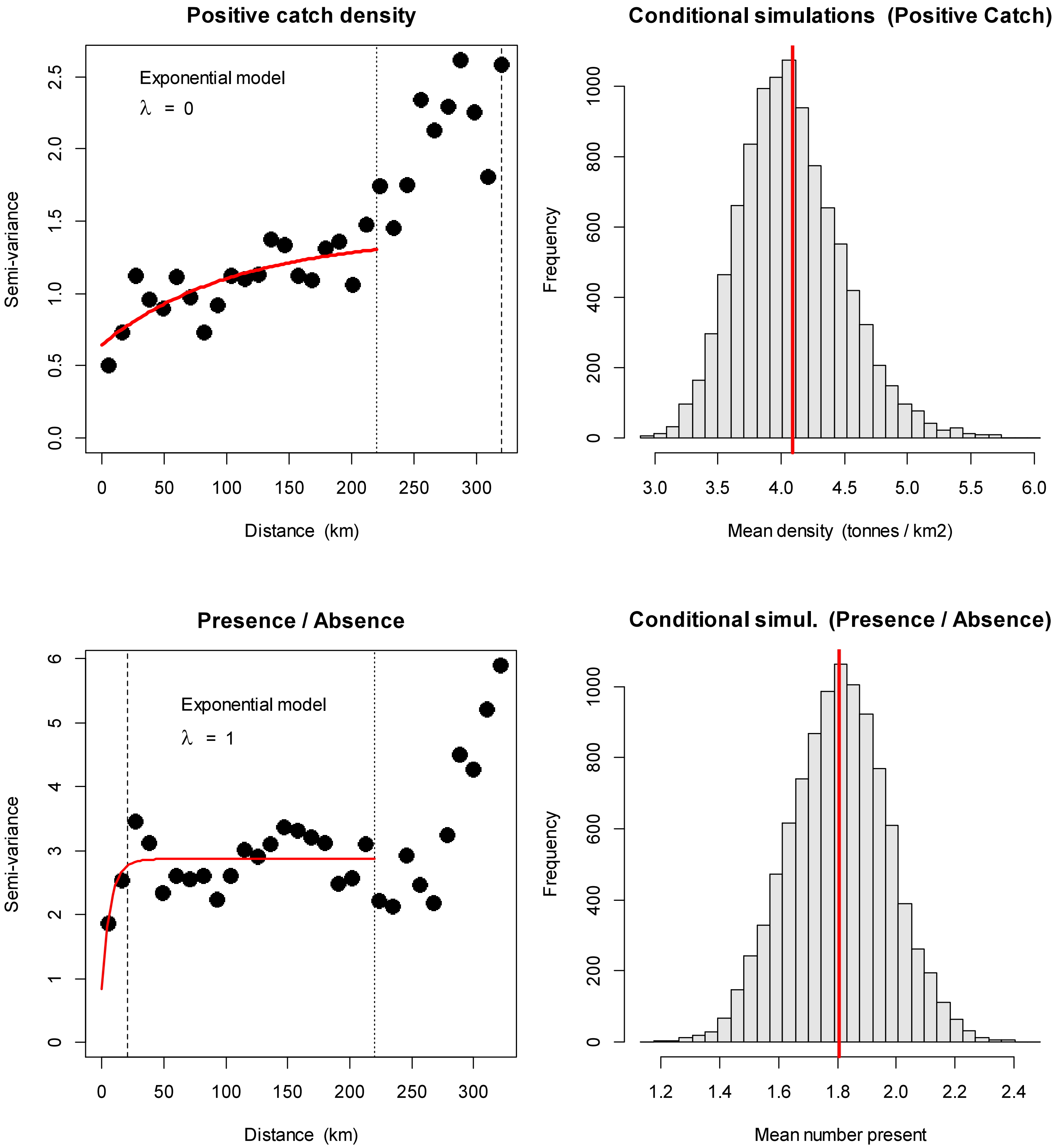
Geostatistic models

For all trawl intervals, density estimates from positive catch trawl intervals were modelled with an exponential covariance function, λ = 0 (logarithmic) Box-Cox transformation, and maximum lag distance of 220 km. The variogram fit resulted in a practical range of 319.7 km, i.e. *D. gahi* densities were found to spatially correlate up to a maximum separation distance of 319.7 km (Figure A1-top left). The mean *D. gahi* biomass density estimate of this variogram model was 4.09 t km^{-2}, equivalent to the modal value of its distribution of conditional simulations (Figure A1-top right). Presence / absence of catch in all trawl intervals was modelled with an exponential covariance function, λ = 1 (no transformation), and maximum lag distance of 220 km, giving a practical range of 20.5 km (Figure A1-bottom left). The mean number of positive catch intervals estimated per 5×5 km area unit was 1.80 (Figure A2-bottom right).

For daylight trawl intervals only, density estimates from positive catch trawl intervals were also modelled with an exponential covariance function, λ = 0, and maximum lag distance of 220 km. the variogram fit gave a practical range of 103.7 km (Figure A2-top left), and mean *D. gahi* biomass density estimate of this variogram model was 4.18 t km^{-2} (Figure A2-top right). Presence / absence of catch in daylight trawl intervals was modelled with an exponential covariance function, λ = 1, and maximum lag distance of 190 km, giving a practical range of 4724.5 km (Figure A2-bottom left). The mean number of positive catch intervals estimated per 5×5 km area unit was 1.61 (Figure A2-right).

All geostatistic mean estimates centred closely on the modes of their simulation distributions (Figures A1-right and A2-right). Positive catch geostatistic distributions differed little between data sets of all trawl intervals or daylight trawl intervals only. 95% confidence intervals of mean positive *D. gahi* density were respectively 3.36 to 4.99 t km^{-2} and 3.31 to 5.35 t km^{-2}. Presence / absence distributions diverged more strongly between all trawl intervals and daylight trawl intervals only, with 95% confidence intervals of respectively 1.47 to 2.14 and 1.30 to 1.92 positive catch intervals per 5×5 km. The variogram fit for presence / absence was poorer with daylight trawl intervals only, having a practical range that exceeded not only the lag distance by a wide margin (Figure A2-bottom left), but at 4724.5 km the extent of the entire survey area. Accordingly, the better fit model with all trawl intervals was used, as it has in most recent 2^{nd} season biomass estimates (Jones et al. 2015, Winter et al. 2016).

Figure A1 [below]. Top: Empirical (black circles) and model variogram (red line) of *D. gahi* biomass density distributions from positive catch trawl intervals (left), and histogram of mean density conditional simulations (right). Bottom: Variogram and histogram of conditional simulations for numbers of positive catch intervals per 5 × 5 km area unit.


Positive catch density
Exponential model
λ = 0
Semi-variance
Distance (km)
Conditional simulations (Positive Catch)
Frequency
Mean density (tonnes / km2)
Presence / Absence
Exponential model
λ = 1
Semi-variance
Distance (km)
Conditional simul. (Presence / Absence)
Frequency
Mean number present

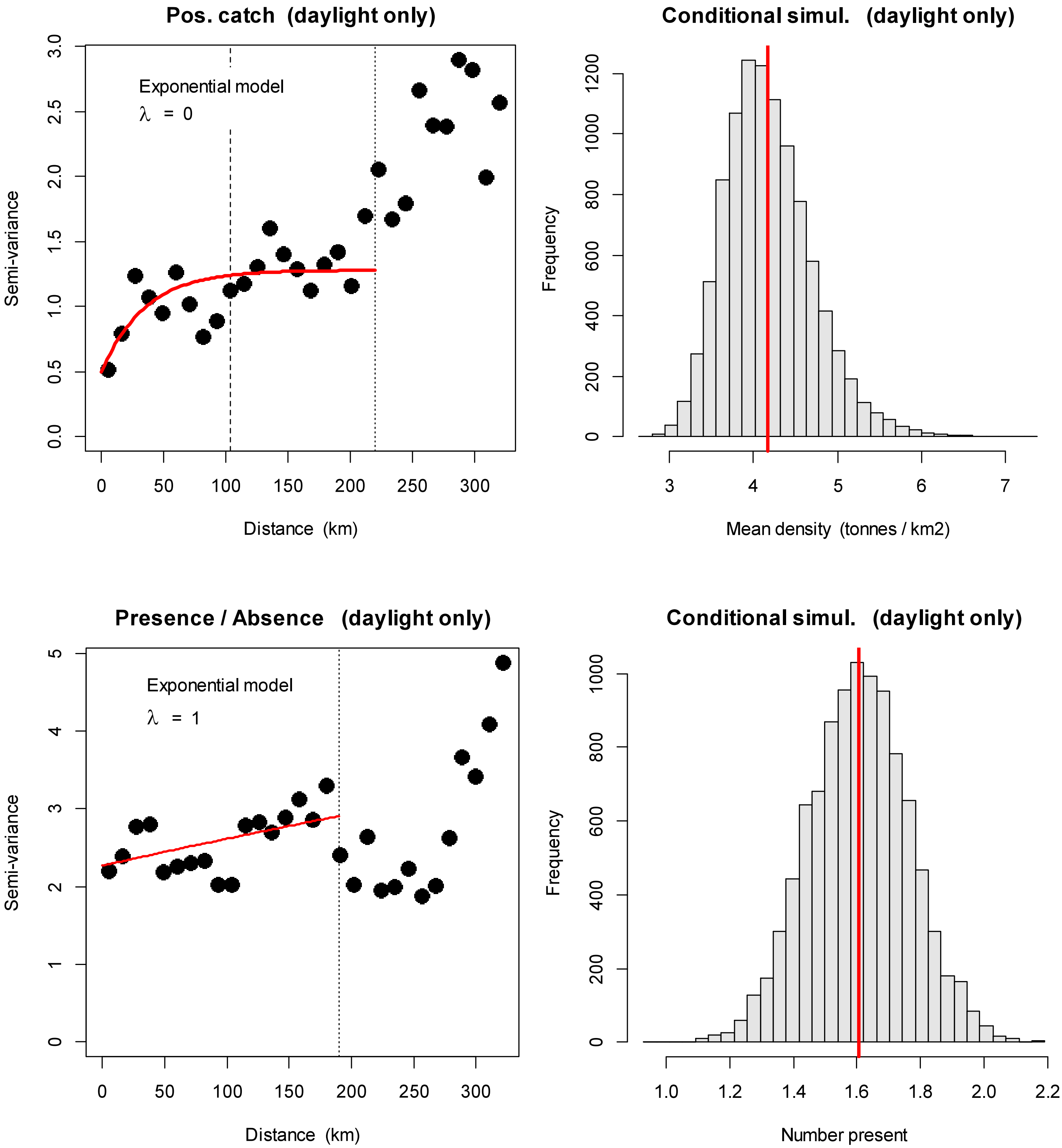


Figure A2. Equivalent to Figure A1, but geostatistic calculations including only data taken during daylight hours, between sunrise and sunset.

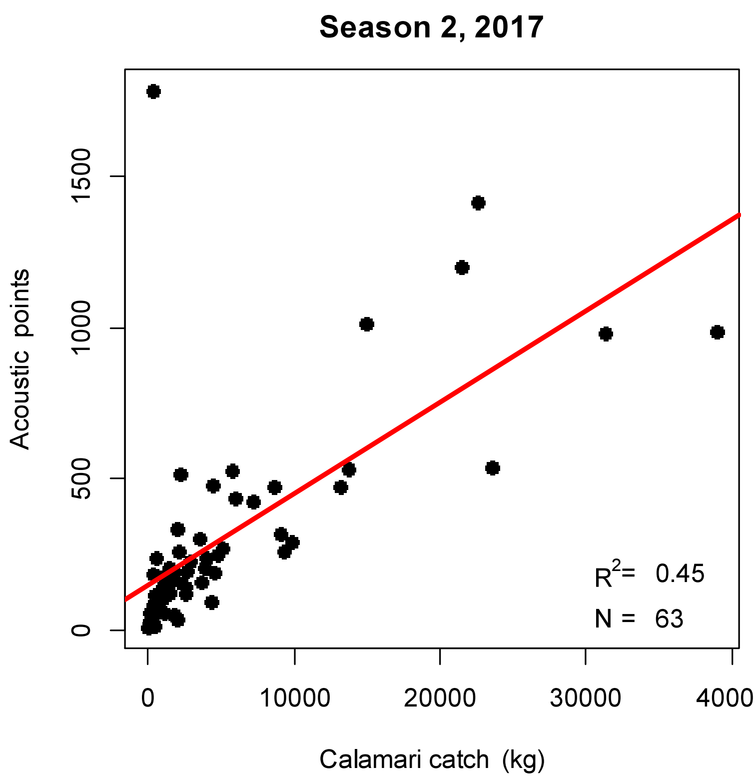


Figure A3. *D. gahi* catch vs. total acoustic score per trawl during the 2nd preseason 2017 survey, with linear regression slope (red line).

Summary tables

Table A1. Survey stations with total *D. gahi* catch. Time: local (Stanley, F.I.), latitude: °S, longitude: °W. Transects labelled A were adaptive trawls; transects labelled T were toothfish trawls.

Transect Station	Obs Code	Date	Start			End			Depth (m)	*D. gahi* (kg)
			Time	Lat	Lon	Time	Lat	Lon		
14 - 37	898	13/07/2017	7:25	50.56	57.57	8:51	50.65	57.46	149	131.3
14 - 38	899	13/07/2017	10:00	50.59	57.40	11:30	50.51	57.53	260	369.6
14 - 39	900	13/07/2017	12:35	50.53	57.43	14:18	50.61	57.29	299	678.5
13 - 35	901	13/07/2017	15:37	50.71	57.16	17:13	50.79	57.04	271	944.7
12 - 31	902	14/07/2017	7:15	50.96	56.96	8:50	50.88	57.05	127	262.2
13 - 34	903	14/07/2017	9:50	50.82	57.13	11:44	50.75	57.27	140	477.3
13 - 36	904	14/07/2017	13:01	50.69	57.19	14:51	50.76	57.01	308	1360.0
12 - 33	905	14/07/2017	16:15	50.87	56.91	18:05	50.98	56.84	244	1392.4
12 - 32	906	15/07/2017	7:15	50.89	56.97	8:46	50.98	56.90	123	297.2
11 - 28	907	15/07/2017	10:15	51.14	57.02	11:59	51.23	57.14	136	352.3
11 - 29	908	15/07/2017	12:50	51.24	57.06	14:15	51.15	56.94	162	349.4
11 - 30	909	15/07/2017	15:10	51.18	56.90	17:04	51.28	57.04	282	963.0
10 - 25	910	16/07/2017	7:10	51.50	57.31	9:00	51.62	57.35	156	0.0
10 - 26	911	16/07/2017	9:57	51.61	57.24	11:29	51.49	57.18	233	1159.6
10 - 27	912	16/07/2017	12:32	51.51	57.08	14:20	51.63	57.16	296	2496.3
9 - 24	913	16/07/2017	16:25	51.88	57.35	18:00	51.98	57.42	290	2225.2
8 - 21	914	17/07/2017	7:17	52.19	57.57	8:23	52.27	57.61	324	338.6
8 - 20	915	17/07/2017	9:45	52.24	57.70	11:10	52.16	57.59	272	1365.9
9 - 23	916	17/07/2017	12:51	51.94	57.49	14:23	51.83	57.39	230	2656.4
9 - 22	917	17/07/2017	15:24	51.85	57.50	17:03	51.96	57.58	170	149.2
7 - 17	918	18/07/2017	7:14	52.38	58.12	8:59	52.45	58.25	197	1252.5

7 - 18	919	18/07/2017	10:10	52.46	58.08	11:40	52.37	57.96	265	4484.5
8 - 19	920	18/07/2017	12:58	52.23	57.82	14:25	52.15	57.69	201	1070.4
A - 1	921	18/07/2017	15:16	52.19	57.69	16:59	52.28	57.83	248	3951.1
5 - 13	922	19/07/2017	7:10	52.82	58.81	8:54	52.88	58.99	153	516.9
5 - 14	923	19/07/2017	9:43	52.88	58.91	10:59	52.84	58.75	234	23522.1
6 - 16	924	19/07/2017	12:21	52.71	58.61	14:05	52.61	58.50	248	4744.6
6 - 15	925	19/07/2017	15:02	52.60	58.55	16:44	52.70	58.69	164	2875.6
3 - 8	926	20/07/2017	7:13	52.96	59.41	8:55	52.95	59.61	182	9013.9
3 - 9	927	20/07/2017	9:53	52.99	59.56	11:19	53.01	59.36	237	7115.4
4 - 11	928	20/07/2017	12:13	53.00	59.25	13:48	52.96	59.04	224	21380.8
5 - 12	929	20/07/2017	15:13	52.79	59.04	16:30	52.73	58.93	127	172.8
T - 1	930	21/07/2017	8:17	52.50	59.66	9:00	52.50	59.57	110	443.7
T - 2	931	21/07/2017	10:38	52.66	59.31	11:11	52.65	59.24	129	100.7
T - 3	932	21/07/2017	12:33	52.78	59.22	12:59	52.78	59.16	119	27.2
T - 4	933	21/07/2017	14:34	52.94	58.97	15:12	52.98	59.01	347	2077.5
1 - 2	934	22/07/2017	7:12	52.82	60.17	9:00	52.87	59.99	202	5666.9
2 - 5	935	22/07/2017	10:02	52.91	59.86	11:47	52.93	59.65	178	1923.8
3 - 7	936	22/07/2017	13:08	52.83	59.57	14:33	52.83	59.39	153	376.1
4 - 10	937	22/07/2017	15:23	52.81	59.30	17:08	52.80	59.10	111	48.6
2 - 4	938	23/07/2017	7:14	52.83	59.79	8:59	52.86	59.61	164	1059.3
2 - 6	939	23/07/2017	10:21	52.98	59.69	12:03	52.94	59.89	246	4410.8
1 - 3	940	23/07/2017	13:04	52.92	60.01	14:50	52.89	60.19	246	14883.7
0 - 1	941	23/07/2017	15:50	52.87	60.26	17:30	52.77	60.36	257	22515.9
A - 2	942	24/07/2017	7:16	52.98	59.77	9:00	52.94	59.97	282	3453.4
A - 3	943	24/07/2017	10:02	52.92	60.01	11:46	52.88	60.20	228	5938.5
A - 4	944	24/07/2017	12:37	52.87	60.24	14:25	52.76	60.31	242	13624.4
A - 5	945	24/07/2017	15:27	52.78	60.25	17:11	52.89	60.10	219	9230.1
A - 6	946	25/07/2017	7:12	53.00	59.36	9:00	52.98	59.58	223	9769.9
A - 7	947	25/07/2017	10:05	53.00	59.57	11:50	53.02	59.36	274	31245.5
A - 8	948	25/07/2017	*12:56	53.01	59.30	*14:25	52.99	59.10	268	38932.8
A - 9	949	26/07/2017	7:17	52.70	58.48	9:01	52.78	58.62	299	4307.8
A - 10	950	26/07/2017	10:00	52.82	58.71	11:42	52.89	58.89	278	8566.3
A - 11	951	26/07/2017	12:40	52.89	58.92	14:27	52.99	59.06	258	13120.0
A - 12	952	26/07/2017	15:35	52.98	59.11	17:20	53.00	59.30	229	3792.5
A - 13	953	27/07/2017	7:13	52.31	57.80	8:59	52.40	57.94	286	1686.5
A - 14	954	27/07/2017	10:00	52.37	57.95	11:43	52.28	57.79	263	1397.1
A - 15	955	27/07/2017	12:37	52.23	57.75	14:22	52.11	57.62	232	3576.4
A - 16	956	27/07/2017	15:22	52.17	57.60	17:09	52.28	57.71	288	1766.3
A - 17	957	28/07/2017	7:13	51.82	57.37	8:58	51.93	57.45	243	1959.4
A - 18	958	28/07/2017	9:54	51.98	57.46	11:42	52.09	57.55	259	2483.2
A - 19	959	28/07/2017	12:38	52.07	57.57	14:22	51.95	57.49	233	2243.3
A - 20	960	28/07/2017	15:20	51.93	57.42	17:07	51.81	57.33	271	4999.8

* The trawl was stopped early as the net was filling too much.

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*	313697	64.0	800	82
WHI	*Macruronus magellanicus*	108267	22.1	39	98908
PAR	*Patagonotothen ramsayi*	31018	6.3	405	31017
MUN	*Munida* spp.	16202	3.3	0	16202
HAK	*Merluccius hubbsi*	8336	1.7	0	1
DGH	*Schroederichthys bivius*	2579	0.5	0	2579
CGO	*Cottoperca gobio*	2062	0.4	0	2062
GRC	*Macrourus carinatus*	1280	0.3	41	309

RBR	*Bathyraja brachyurops*	1100	0.2	0	227
BAC	*Salilota australis*	817	0.2	0	400
BLU	*Micromesistius australis*	594	0.1	9	587
ZYP	*Zygochlamys patagonica*	565	0.1	0	565
TOO	*Dissostichus eleginoides*	547	0.1	526	24
ALG	Algae	457	0.1	0	457
SPN	Porifera	346	0.1	0	346
EEL	*Iluocoetes / Patagolycus*	273	0.1	0	273
STA	*Sterechinus agassizi*	263	0.1	0	263
ANM	Anemone	226	<0.1	0	226
RAL	*Bathyraja albomaculata*	187	<0.1	0	26
RGR	*Bathyraja griseocauda*	177	<0.1	12	31
PTE	*Patagonotothen tessellata*	159	<0.1	1	159
FUM	*Fusitriton m. magellanicus*	100	<0.1	0	100
SQT	Ascidiacea	97	<0.1	0	67
RFL	*Zearaja chilensis*	95	<0.1	0	5
RMG	*Bathyraja magellanica*	92	<0.1	0	50
KIN	*Genypterus blacodes*	71	<0.1	1	0
GOC	*Gorgonocephalus chilensis*	71	<0.1	0	71
CHE	*Champsocephalus esox*	68	<0.1	20	8
GRF	*Coelorhynchus fasciatus*	60	<0.1	0	60
RSC	*Bathyraja scaphiops*	48	<0.1	0	5
RMC	*Bathyraja macloviana*	48	<0.1	0	22
COL	*Cosmasterias lurida*	48	<0.1	0	48
SUN	*Labidaster radiosus*	40	<0.1	0	40
OPV	*Ophiacanta vivipara*	36	<0.1	0	36
ODM	*Odontocymbiola magellanica*	32	<0.1	0	32
RDO	*Amblyraja doellojuradoi*	29	<0.1	0	25
SAR	*Sprattus fuegensis*	26	<0.1	15	10
ING	*Moroteuthis ingens*	26	<0.1	0	26
PAT	*Merluccius australis*	25	<0.1	25	0
POA	*Porania antarctica*	21	<0.1	0	21
RPX	*Psammobatis* spp.	16	<0.1	0	16
COG	*Patagonotothen guntheri*	15	<0.1	0	15
AST	Asteroidea	14	<0.1	0	14
WRM	*Chaetopterus variopedatus*	11	<0.1	0	11
OPL	*Ophiuroglypha lymanii*	11	<0.1	0	11
MUL	*Eleginops maclovinus*	11	<0.1	11	1
ODP	*Odontaster pencillatus*	10	<0.1	0	10
EGG	Eggmass	10	<0.1	0	10
BAO	*Bathybiaster loripes*	10	<0.1	0	10
BDU	*Brama dussumieri*	9	<0.1	9	0
HYD	Hydrozoa	7	<0.1	0	7
HEX	*Henricia* sp.	7	<0.1	0	7
NEM	*Neophyrnichthys marmoratus*	6	<0.1	0	6
CAZ	*Calyptraster* sp.	6	<0.1	0	6
SOR	*Solaster regularis*	5	<0.1	0	5
LIS	*Lithodes santolla*	5	<0.1	4	0
CEX	*Ceramaster* sp.	5	<0.1	0	5
NOW	*Paranotothenia magellanica*	4	<0.1	4	3
ILL	*Illex argentinus*	4	<0.1	0	4
CTA	*Ctenodiscus australis*	4	<0.1	0	4
COT	*Cottunculus granulosus*	4	<0.1	0	4
AUC	*Austrocidaris canaliculata*	4	<0.1	0	4
ALC	Alcyoniina	4	<0.1	0	4
RBZ	*Bathyraja cousseauae*	3	<0.1	0	3
PES	*Peltarion spinosulum*	3	<0.1	0	3
LUX	*Luidia* spp.	3	<0.1	0	3
EUL	*Eurypodius latreillei*	3	<0.1	0	3

STE	*Sterechinus* sp.	2	<0.1	0	2
SMT	*Smilasterias triremis*	2	<0.1	0	2
SEP	*Seriolella porosa*	2	<0.1	2	0
OCM	*Octopus megalocyathus*	2	<0.1	0	2
NUD	Nudibranchia	2	<0.1	0	2
MLA	*Muusoctopus longibrachus akambei*	2	<0.1	0	2
GOR	Gorgonacea	2	<0.1	0	2
RED	*Sebastes oculatus*	1	<0.1	1	1
OPH	Ophiuroidea	1	<0.1	0	1
MYX	*Myxine* spp.	1	<0.1	0	1
MAV	*Magellania venosa*	1	<0.1	1	0
MAR	*Martialia hyadesi*	1	<0.1	1	0
COX	*Notothenid* spp.	1	<0.1	1	0
BRY	Bryozoa	1	<0.1	0	1
ASA	*Astrotoma agassizii*	1	<0.1	0	1
ANT	Anthozoa	1	<0.1	0	1
UHH	Spatangoida	<1	<0.1	0	0
THN	*Thysanopsetta naresi*	<1	<0.1	0	0
SRP	*Semirossia patagonica*	<1	<0.1	0	0
SER	*Serolis* spp.	<1	<0.1	0	0
PYX	Pycnogonida	<1	<0.1	0	0
PSI	*Patagonotothen sima*	<1	<0.1	0	0
POL	Polychaeta	<1	<0.1	0	0
PLU	Primnoellinae	<1	<0.1	0	0
PLB	Primnoellinae branched	<1	<0.1	0	0
OPD	*Ophiacantha densispina*	<1	<0.1	0	0
MUG	*Munida gregaria*	<1	<0.1	0	0
MUE	*Muusoctopus eureka*	<1	<0.1	0	0
HOL	Holothuroidea	<1	<0.1	0	0
GYN	*Gymnoscopelus nicholsi*	<1	<0.1	0	0
GYM	*Gymnoscopelus* spp.	<1	<0.1	0	0
FLX	*Flabellum* spp.	<1	<0.1	0	0
EUO	*Eurypodius longirostris*	<1	<0.1	0	0
BOA	*Borostomias antarcticus*	<1	<0.1	0	0
AGO	*Agonopsis chilensis*	<1	<0.1	0	0
ACA	*Acesta patagonica*	<1	<0.1	0	0
		490,404		1,926	155,561

Table A3. Catches by survey trawl (observer station = Stat) of principal species, together with 95% confidence intervals (L95, U95) as determined from basket samples. N = number of basket samples per trawl. Species that had no discard in a trawl were quantified entirely from the factory production and therefore had no confidence interval estimation ("-").

Stat	N	Species	Catch	L95	U95	Stat	N	Species	Catch	L95	U95
		LOL	131.3	130.9	131.7			LOL	21380.8	-	-
898	2	PAR	145.3	117.5	175.1	928	2	PAR	937.8	874.4	1003.5
		RAY	12.6	0.0	24.3			TOO	3.5	-	-
		HAK	3.8	-	-			HAK	4.0	-	-
		CGO	4.0	1.5	6.7			CGO	3.0	2.2	3.8
		LOL	369.6	369.0	370.0			LOL	172.8	-	-
899	3	PAR	70.6	40.5	112.4	929	4	PAR	1.4	0.0	3.1
		RAY	15.7	7.0	32.6			CGO	0.3	0.2	0.4
		HAK	361.0	-	-			ILL	0.1	0.0	0.2
		BAC	3.0	0.0	5.3			MUN	5240.8	2014.2	7959.2
		WHI	0.3	0.1	0.6						
		BLU	12.0	2.6	16.8						

		CGO	1.2	0.9	1.5						
		ILL	0.4	0.0	1.2						
		KIN	15.0	-	-						
		LOL	678.5	675.4	681.2			LOL	5666.9	-	-
900	4	PAR	45.3	38.1	50.9	934	4	PAR	1351.8	1017.2	1682.4
		TOO	1.2	-	-			TOO	2.0	-	-
		RAY	24.2	22.1	29.6			RAY	73.9	34.1	138.3
		HAK	912.0	-	-			HAK	1.0	0.5	1.7
		BAC	10.0	0.0	25.0			BAC	0.5	0.3	0.8
		WHI	30.0	12.5	54.8			CGO	18.6	0.0	58.6
		BLU	4.2	3.5	5.5			MUN	223.7	94.6	500.1
		ILL	0.6	0.1	1.2						
		KIN	3.0	-	-						
		LOL	944.7	-	-			LOL	1923.8	-	-
901	2	PAR	89.1	86.9	91.2	935	4	PAR	108.2	53.2	145.3
		TOO	14.4	-	-			TOO	1.8	-	-
		RAY	29.7	13.5	45.3			RAY	51.2	37.0	69.3
		HAK	228	-	-			BAC	0.2	0.1	0.3
		BAC	8.0	6.1	10.0			CGO	1.0	0.0	2.6
		WHI	3.5	3.2	3.9			MUN	5105.4	3943.9	7010.3
		BLU	31.8	30.5	33.1						
		CGO	2.0	0.0	3.9						
		KIN	0.8	-	-						
		LOL	262.2	-	-			LOL	376.1	374.3	377.9
902	3	PAR	1.1	0.8	1.5	936	2	PAR	17.5	9.9	25.3
		RAY	69.3	53.8	95.1			TOO	0.8	-	-
		BAC	0.1	0.1	0.2			RAY	8.9	6.3	12.2
		CGO	5.0	0.7	11.6			BAC	0.2	0.1	0.3
								CGO	18.0	0.0	36.6
								MUN	2041.8	2036.4	2047.3
		LOL	477.3	-	-			LOL	48.6	-	-
903	3	PAR	1.0	0.3	2.6	937	2	PAR	0.1	0.1	0.1
		RAY	10.5	6.9	13.4			RAY	19.0	0.0	40.3
		CGO	3.0	0.6	5.8			CGO	30.0	22.4	38.4
		ILL	0.3	0.1	0.6			MUN	969.8	958.2	982.8
		LOL	1360.0	-	-			LOL	1059.3	-	-
904	6	PAR	54.9	44.0	67.9	938	2	PAR	37.1	32.9	40.9
		TOO	4.8	-	-			TOO	5.9	5.5	6.4
		RAY	6.5	4.5	9.6			RAY	18.2	11.5	24.2
		HAK	399.0	-	-			BAC	0.6	0.3	0.9
		BAC	10.0	7.0	16.0			CGO	45.0	0.0	95.1
		WHI	1.0	0.5	1.9			MUN	386.7	276.7	509.3
		BLU	48.5	32.0	62.5						
		CGO	1.1	0.8	1.4						
		ILL	0.0	0.0	0.2						
		LOL	1392.4	-	-			LOL	4410.8	-	-
905	4	PAR	247.0	177.5	315.9	939	3	PAR	259.0	193.2	351.9
		TOO	2.1	-	-			TOO	3.3	-	-
		RAY	2.9	0.8	5.8			RAY	30.5	-	-
		CGO	6.0	1.5	11.8			HAK	2.5	-	-
								BAC	2.5	-	-
								CGO	98.4	0.0	163.6
		LOL	297.2	-	-			LOL	14883.7	-	-
906	3	PAR	0.6	0.4	1.0	940	3	PAR	493.4	312.8	751.0
		RAY	14.6	8.0	26.0			TOO	3.7	-	-
		HAK	1.2	-	-			RAY	6.0	0.0	18.6
		CGO	5.0	1.6	11.4			HAK	15.0	-	-
		ILL	0.3	0.1	0.6			BLU	0.6	0.5	0.8
								ILL	0.6	0.1	1.1
		LOL	352.3	-	-			LOL	22515.9	-	-

907	3	PAR	0.0	0.0	0.0	941	4	PAR	3228.7	2914.9	3524.4
		RAY	2.2	0.0	3.3			TOO	26.1	-	-
		CGO	1.8	0.0	5.6			BAC	36.2	0.0	109.0
		LOL	349.4	-	-			LOL	3453.4	-	-
908	3	PAR	1.1	0.6	1.8	942	4	PAR	262.2	161.8	364.7
		RAY	0.4	0.0	1.4			TOO	46.4	-	-
		BAC	0.2	0.1	0.3			RAY	525.9	525.3	526.8
		BLU	0.0	0.0	0.0			HAK	38.0	-	-
		CGO	1.0	0.0	3.1			BAC	190.1	144.0	241.0
								WHI	0.3	0.1	0.6
								BLU	0.5	0.0	1.3
								CGO	84.2	35.6	127.0
		LOL	963.0	-	-			LOL	5938.5	-	-
909	4	PAR	104.0	84.7	123.8	943	3	PAR	643.3	530.5	792.2
		TOO	1.7	-	-			TOO	12.5	-	-
		RAY	26.9	26.5	27.7			RAY	153.6	-	-
		HAK	7.0	-	-			HAK	15.0	-	-
		BAC	0.0	0.0	0.0			BAC	72.9	62.9	78.9
		WHI	0.3	0.1	0.6			CGO	60.0	44.8	76.8
		BLU	35.8	27.5	44.4			KIN	20.0	-	-
		CGO	3.2	0.0	9.6						
		ILL	0.0	0.0	0.0						
		RAY	14.1	7.3	21.7			LOL	13624.4	-	-
910	2	BAC	0.2	0.1	0.3	944	4	PAR	4361.2	2826.5	6979.5
		BLU	0.8	0.6	1.1			TOO	8.5	-	-
		CGO	12.0	3.0	22.1			RAY	15.4	13.0	19.8
		ILL	0.2	0.0	0.5			CGO	30.0	22.4	38.4
								MUN	219.2	92.8	490.1
		LOL	1159.6	-	-			LOL	9230.1	-	-
911	3	PAR	26.7	15.7	35.4	945	2	PAR	1993.5	1688.1	2308.9
		RAY	3.8	3.4	4.1			TOO	3.8	-	-
		CGO	2.0	0.0	6.3			BAC	13.4	0.0	27.3
		LOL	2496.3	-	-			LOL	9769.9	-	-
912	4	PAR	54.0	40.3	74.1	946	2	PAR	421.0	311.0	528.0
		TOO	5.8	-	-			TOO	9.3	-	-
		RAY	26.9	14.0	45.7			CGO	60.0	44.8	76.8
		HAK	532.0	-	-			ILL	0.2	0.0	0.4
		BAC	1.2	0.7	1.8						
		WHI	3.0	0.0	8.9						
		BLU	103.5	73.4	133.2						
		CGO	1.2	0.9	1.5						
		ILL	0.2	0.0	0.8						
		KIN	0.4	0.0	1.7						
		LOL	2225.2	-	-			LOL	31245.5	-	-
913	8	PAR	66.8	10.8	144.9	947	3	PAR	668.3	0.0	1018.1
		TOO	2.8	-	-			TOO	4.9	-	-
		RAY	7.8	4.6	11.7			HAK	6.0	-	-
		HAK	380.0	-	-			BAC	45.0	-	-
		WHI	52840.0	42515.4	68380.1			CGO	300.0	0.0	912.3
		BLU	111.3	48.4	202.2						
		CGO	5.0	3.7	6.4						
		LOL	338.6	-	-			LOL	38932.8	-	-
914	10	PAR	124.4	21.1	290.4	948	2	PAR	823.8	450.2	1214.9
		TOO	29.3	-	-			CGO	60.0	44.8	76.8
		RAY	56.2	51.4	65.6						
		HAK	418.0	-	-						
		WHI	55298.1	39079.4	84829.8						
		CGO	0.2	0.2	0.3						
		LOL	1365.9	-	-			LOL	4307.8	-	-
915	2	PAR	415.0	373.5	458.7	949	2	PAR	160.7	130.0	191.7

		TOO	35.4	-	-			TOO	27.3	-	-
		RAY	10.5	6.3	15.9			RAY	62.1	60.4	64.2
		HAK	646.0	-	-			HAK	36.0	-	-
		BAC	1.2	1.1	1.4			BAC	120.2	75.3	165.5
		WHI	85.4	66.8	104.8			BLU	17.0	16.9	17.1
		BLU	42.7	37.5	47.6			CGO	28.0	20.9	35.8
		CGO	36.3	31.6	40.7			KIN	8.0	-	-
		ILL	0.3	0.0	0.5						
		LOL	2656.4	-	-			LOL	8566.3	-	-
916	3	PAR	39.6	38.0	42.4	950	3	PAR	408.2	236.8	724.7
		TOO	0.2	-	-			TOO	25.9	-	-
		HAK	3.0	-	-			RAY	23.0	18.2	29.2
		BAC	24.0	-	-			HAK	17.0	-	-
		WHI	5.0	2.4	9.4			BAC	7.3	0.0	24.0
		BLU	0.0	0.0	0.0			BLU	56.8	5.0	147.0
		CGO	9.0	0.0	27.2			CGO	199.2	45.8	357.8
								ILL	0.2	0.0	0.3
		LOL	149.2	-	-			LOL	13120.0	-	-
917	2	PAR	5.2	5.1	5.3	951	3	PAR	423.1	261.5	608.7
		RAY	52.1	49.7	54.4			RAY	6.0	-	-
		HAK	57.0	-	-			CGO	60.0	44.8	76.8
		BAC	0.5	0.3	0.8			ILL	0.2	0.1	0.5
		CGO	2.6	0.7	4.6						
		LOL	1252.5	-	-			LOL	3792.5	-	-
918	3	PAR	125.5	112.5	133.1	952	2	PAR	1568.6	1479.6	1658.8
		TOO	21.2	7.4	34.1			TOO	16.7	-	-
		RAY	150.9	110.9	231.4			MUN	3.0	1.3	6.7
		CGO	36.5	25.2	44.3						
		ILL	0.0	0.0	0.0						
		LOL	4484.5	-	-			LOL	1686.5	-	-
919	6	PAR	1309.0	1028.2	1691.8	953	2	PAR	161.3	112.6	212.8
		TOO	46.8	-	-			TOO	12.9	-	-
		RAY	2.0	-	-			RAY	17.9	17.3	18.4
		HAK	627.0	-	-			HAK	399.0	-	-
		BAC	44.0	28.8	61.2			BAC	20.0	13.4	27.5
		BLU	23.6	12.1	35.6			BLU	22.8	9.3	35.6
		CGO	36.5	14.1	63.4			CGO	50.0	0.0	102.8
		KIN	15.0	-	-			KIN	8.0	-	-
		LOL	1070.4	-	-			LOL	1397.1	-	-
920	4	PAR	52.9	46.0	59.9	954	2	PAR	343.9	327.6	359.5
		TOO	2.4	2.1	2.8			TOO	10.1	-	-
		RAY	8.8	6.9	11.3			RAY	33.5	26.4	40.9
		HAK	19.0	-	-			HAK	60.0	-	-
		BAC	24.0	-	-			BAC	25.0	22.8	27.5
		WHI	0.2	0.1	0.4			WHI	0.4	0.2	0.8
		CGO	24.9	2.4	63.7			BLU	5.7	3.2	8.3
								CGO	27.6	0.0	54.0
		LOL	3951.1	-	-			LOL	3576.4	-	-
921	8	PAR	2272.2	2182.5	2380.2	955	4	PAR	1245.4	985.7	1538.6
		TOO	6.9	5.1	8.7			TOO	7.4	-	-
		RAY	10.0	6.0	15.1			RAY	7.0	-	-
		HAK	50.0	-	-			HAK	19.0	-	-
		BLU	6.5	0.0	14.5			CGO	60.0	16.5	102.7
		CGO	91.9	30.1	162.2						
		LOL	516.9	-	-			LOL	1766.3	-	-
922	2	PAR	22.9	22.5	23.3	956	2	PAR	599.7	573.2	625.7
		TOO	4.0	-	-			TOO	45.8	-	-
		RAY	10.0	0.0	19.4			RAY	10.0	9.8	10.3
		BAC	20.7	11.8	29.0			HAK	703.0	-	-
		CGO	48.2	32.4	65.0			BAC	90.0	63.5	120.2

								BLU	16.5	13.4	19.5
								CGO	235.4	61.3	412.2
		LOL	23522.1	-	-			LOL	1959.4	-	-
923	3	PAR	388.8	279.0	523.9	957	4	PAR	208.9	139.2	281.7
		TOO	5.0	-	-			TOO	4.7	-	-
		CGO	6.0	4.5	7.7			RAY	2.5	-	-
								HAK	60.0	-	-
								BLU	4.0	0.0	12.3
								CGO	20.0	0.0	52.5
		LOL	4744.6	-	-			LOL	2483.2	-	-
924	2	PAR	3167.8	3062.0	3272.4	958	3	PAR	662.7	642.1	678.7
		TOO	21.5	-	-			TOO	22.1	-	-
		RAY	33.0	-	-			RAY	4.0	-	-
		BLU	2.3	0.0	4.6			HAK	1500.0	-	-
		CGO	5.0	3.7	6.4			BAC	8.0	4.5	12.0
								BLU	18.0	14.2	25.7
								CGO	30.0	20.7	43.5
		LOL	2875.6	-	-			LOL	2243.3	-	-
925	2	PAR	5.4	4.8	6.0	959	3	PAR	327.4	287.1	396.1
		TOO	0.6	-	-			TOO	4.3	-	-
		HAK	38.0	-	-			HAK	209.0	-	-
		ILL	0.2	0.0	0.4			BLU	6.4	4.7	8.1
								CGO	41.8	24.4	73.0
		LOL	9013.9	-	-			LOL	4999.8	4999.8	4999.8
926	2	PAR	80.2	79.5	80.9	960	2	PAR	65.5	57.4	73.5
		TOO	0.9	-	-			TOO	4.4	-	-
		RAY	20.2	-	-			RAY	1.5	1.5	1.5
		CGO	6.1	4.5	7.8			HAK	551.0	-	-
		MUN	709.0	300.0	1584.9			BLU	3.0	2.9	3.0
								CGO	10.0	7.5	12.8
		LOL	7115.4	-	-						
927	2	PAR	205.3	200.6	209.9						
		HAK	12.0	-	-						
		CGO	68.0	0.0	138.2						
		MUN	33.7	14.2	75.2						