Cruise report
Irish Anglerfish & Megrim Survey 2016

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Contents

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Introduction

The 2016 Irish Anglerfish and Megrim Survey (IAMS) took place from 4-24th January and 25th February to 6th March 2016 on RV *Celtic Explorer*.

The main objective of the survey is to obtain biomass estimates for anglerfish (*Lophius piscatorius* and *L. budegassa*) in and establish an abundance index for megrim (*Lepidorhombus whiffiagonis* and *L. boscii*) in VIa (south of 58°N) and VII (west of 8°W).

Secondary objectives are to collect data on the distribution and relative abundance of anglerfish, megrim and other commercially exploited species. The survey also collects maturity and other biological information for commercial fish species.

The IAMS survey is coordinated with the Scottish Anglerfish and Megrim survey (SIAMISS) and uses the same gear and fishing practices.

Methods

Stratification

The stratification is based on the following considerations:

- Depth: 0-200m; 200-500m and 500-1000m.
- Clearly defined fishing grounds (from VMS-logbook data: Gerritsen and Lordan, 2011; Gerritsen *et al*., 2012) were identified as separate strata; an area with high fishing intensity surrounded by low fishing intensity signify that the bottom type and ecology on the fishing ground is different from that of the surrounding area. Examples include the Porcupine, Aran and Labadie *Nephrops* grounds, the Stanton Banks and Stags grounds.
- Catch rates of the target species (anglerfish and megrim) from VMS-logbook data as well as IBTS and previous Anglerfish & Megrim surveys were also taken into account in determining the boundaries of the strata.
- Rocky bottom types are excluded from the survey area which implies an assumption that the densities of the target species are zero those areas.
- Regions VIa and VII are treated separately because they are comprise different assessment and TAC areas.

The density of sampling stations in each stratum was either low, medium (twice the low density) or high (four times the low density). These station densities were assigned to each stratum so that the number of stations in each stratum would be roughly proportional to the expected standard deviation of the biomass estimate in the stratum.

Three strata with expected low abundance of the target species (Aran and Porcupine *Nephrops* grounds and the area of coarse sediment on the Porcupine Bank) were combined into a single stratum (VII_Shelf_L) despite the differences in depth and bottom type.

The strata are shown in Figure 1 and summary statistics are provided in Table 1. The naming of the strata reflects the region (VIa or VII), area (continental shelf or slope) and density of stations (Low, Medium, High).

Station selection

Sampling stations were selected at random in the following way: Firstly a dummy stratum was created around the survey area by adding a 50km buffer. The first station position was chosen at random. The next positions were then sequentially chosen to be the furthest away from the stations

that were already selected (but within the buffered survey area). This process was repeated until 200 station positions were selected, resulting in a pattern that is approximately evenly distributed. The sequence in which the station is selected will be considered the priority of the station; so if the target number of stations in a stratum is 5, then only the first 5 randomly selected stations would be sampled. If, during the survey, it becomes clear that the targets will not be met (e.g. due to bad weather) then the stations with the highest sequence numbers will be dropped first. For example in a stratum with 5 stations, only the first 4 will be sampled.

A tow track was picked to go through the randomly selected points. Where it was impossible to do so (e.g. underwater cables, passive gear, unsuitable bottom) it was attempted to find a tow track that came within 1nm of the selected point.

Four to six weeks prior to the departure a Marine Notice was issued (www.dttas.ie) to advise seafarers and fishermen about the proposed work. This document included a brief description of the survey methods and objectives including a list and map location of the proposed stations.

Fishing operations

The trawl is based on a standard commercial otter trawl used in the anglerfish fishery and is described in detail in Reid *et al*. (2007). The mesh size varies from 200mm in the wings gradually reducing to 100mm in the cod-end. The ground gear is fitted with 16'' rock hopper disks and a 19mm tickler chain is mounted between the wings, rigged to run ahead of the ground gear. The trawl doors were 5.25m^2 Thyboron Type 16 straight oval doors.

The gear was trawled at 3kn for one hour at each station. The warp to depth ratio was 3/1 for depths up to 200m, and 2/1 plus 200m in deeper water.

Door spread, wing spread, headline height and bottom contact were monitored using Scanmar and Marport trawl sensors (distance sensors in the doors and wing-ends, headline sensor and a trawl-eye sensor positioned on the top sheet directly over the footrope).

Wetlab protocol

All fish and invertebrate species were sorted and weighed. On the first leg, only the species listed below were measured but on the rest of the survey all fish and squid species and *Nephrops* were measured. Biological data are collected for the species listed in the table below. Occurrence of the following vulnerable or sentinel invertebrate species was noted if present: sea pen, fan mussel and ocean quahog.

	Species[1]	Sex[2]	LiveWt[3]	GuttedWt[4]	Sex/Mat[5]	Age[6]
Aged demersal species	COD	U	1pcm	-	1pcm	1pcm
	HAD	U	1p2cm	-	1p2cm	1p2cm
	LIN	U	1pcm	-	1pcm	1pcm
	MEG	F/M	1pcm	-	1pcm	1pcm
	MON	U	all	all	all	all
	WAF	U	all	all	all	all
	PLE	F/M	1pcm	-	1pcm	1pcm
	POK	U	1pcm	-	1pcm	1pcm
	POL	U	1pcm	-	1pcm	1pcm
	SOL	F/M	1pcm	-	1pcm	1pcm
	WHG	U	1p2cm	-	1p2cm	1p2cm
Biological teleo	BLL	F/M	1pcm	-	1pcm	-
	HKE	U	1pcm	-	1pcm	-
	JOD	U	1pcm	-	1pcm	-
	LBI	F/M	1pcm	-	1pcm	-
	LEM	F/M	1pcm	-	1pcm	-
	TUR	F/M	1pcm	-	1pcm	-
	WIT	F/M	1pcm	-	1pcm	-
Bio elasmo	BLR	F/M	1pcm	-	1pcm	-
	CUR	F/M	1pcm	-	1pcm	-
	DGS	F/M	1pcm	-	1pcm	-
	DFL	F/M	1pcm	-	1pcm	-
	DII	F/M	1pcm	-	1pcm	-
	SDR	F/M	1pcm	-	1pcm	-
	THR	F/M	1pcm	-	1pcm	-

[1] 3-letter MAFF species code
[2] Length sample sorted by sex (F/M) or both sexes combined (U)
[3] Sampling targets for live weight of individual fish (number of fish per 1cm size class per station)
[4] Sampling targets for gutted weight
[5] Sampling targets for sex and maturity stage
[6] Sampling targets for collecting otoliths/illicia

Data collection and storage

Station positions, heading and bottom depth were recorded at the moment the gear settled on the bottom and when the gear was hauled back. Tide and wind direction and speed, barometric pressure, heave, pitch and roll were recorded at the mid-point in the tow. The median values of the door spread, wing spread and headline height were recorded at the end of the tow. These measurement as well as bottom depth and GPS position are recorded in a SQL database at intervals of approximately 1 per second.

Catch weights, length frequency distributions and biological data were captured using the CEFAS Electronic Data Capture (EDC) system and stored into local Access '97 databases before being imported into a central SQL database. The CEFAS software FSS (Fishing Survey System) was used to enter station data and import catch data.

Estimation

Catchability corrections for the two anglerfish species were applied following the methods described by the ICES working group WKAGME (2009). The equations were re-written to express the estimates in terms of capture probabilities (see also Yuan, 2012).

Footrope selectivity at length l, ($\hat{e}_{1l}$) was estimated using a 3-parameter logistic model:

$$\hat{e}_{1l} = \frac{1}{1 + \exp(-\beta_0 - \beta_1(l - \beta_2))}$$

$\beta_0 = 0.82257$, $\beta_1 = 0.11386$ and $\beta_2 = 35.5$

A herding coefficient ($\hat{h} = 0.017$) was applied to estimate herding in the area between the doors and wings (sweeps). The herding selectivity ($\hat{e}_{2li}$) was estimated as follows:

$$\hat{e}_{2l} = \frac{v_{1i} + \hat{h} v_{2i}}{v_{1i} + v_{2i}}$$

v_{1i} is the area swept by the footrope on tow i.
v_{2i} is the area covered by the sweeps on tow i.

The capture probability for a fish at length l in tow i in stratum s, (p_{lis}) is then given as:

$$p_{lis} = \hat{e}_{1l}\, \hat{e}_{2li} \frac{(v_{1i} + v_{2i})\, I_s}{A_s}$$

I_s is the number of hauls in stratum s.
A_s is the surface area of stratum s.

For megrim, no catchability correction is applied, so the capture probability is simply:

$$p_{is} = \frac{v_i\, I_s}{A_s}$$

The estimated number of fish ($\hat{N}$) or biomass (B) in the survey area are then:

$$\hat{N} = \sum_{i \in I} \frac{n_i}{p_{lis}} \qquad \hat{B} = \sum_{i \in I} \frac{n_i w_i}{p_{lis}}$$

n_l is the catch numbers-at-length in tow i

w_l is the mean weight-at-length, obtained from the length-weight relationship for the whole survey.

Because the gear does not capture small anglerfish very well, fish below 500g (around 33cm) are excluded from the biomass and population number estimates. This coincides with the minimum landings weight observed by the industry.

Changes in gear, protocols or estimation

- The tickler chain was fitted with a weak link that broke regularly. It was replaced with a G13 connector (not-so-weak link) at the end of the first leg.

Results

Cruise narrative

Date	Comments
Thu 17/12/15	Fishing gear loaded onto the vessel in Galway harbour.
Mon 04/01/16	Finished mobilisation, planned to leave on midnight tide but departure delayed due to a problem with one of the engines. Scientific staff on board at 16:30 and remain on standby.
Tue 05/01/16	Parts ordered from Finland Engineer from Netherlands arrived in the evening. Scientific staff remain on standby.
Wed 06/01/16	Parts arrived but more spare parts needed. At lunchtime departure was delayed until at least Friday. Scientific staff dismissed.
Thurs 07/01/16	Departure time changed again to Thursday 3pm. Successful test tow in Galway Bay.
Fri 08/01/16	4 valid tows. Good sea conditions.

Sat 09/01/16	4 valid and 1 invalid tow (door came fast – no damage)
Sun 10/01/16	5 valid tows. Freshening to around 30kn
Mon 11/01/16	3 valid tows, 1 invalid tow. Slow going in heavy swell.
Tue 12/01/16	4 valid tows, 2 invalid tows (broken tickler chain). Swell decreasing.
Wed 13/01/16	6 valid tows. Good sea conditions.
Thu 14/01/16	4 valid tows, into Cobh 18:00 for staff changeover, departed 19:00
Fri 15/01/16	5 valid tows. Good sea conditions.
Sat 16/01/16	5 valid tows, 1 invalid tow (snag at start of tow – hard ground)
Sun 17/01/16	5 valid tows and 1 invalid (caught approx. 6 ton of boarfish in 10min so hauled & slipped). Working in canyons so ground and warp ratios tricky.
Mon 18/01/16	4 valid tows. Hove to for three hours in the morning - NW force 9.
Tues 19/01/16	6 valid tows.
Wed 20/01/16	4 valid tows.
Thu 21/01/16	5 Valid tows. Weather building. Came fast on last tow (haul 71) winches paid out but no damage. Ground was flat and level, didn't seem particularly hard.
Fri 22/01/16	2 valid tows. Started steaming to Galway at 1200h. Swell increasing.
Sat 23/01/16	Returned to Galway on 15:00 tide.
Sun 24/01/16	Demob P&O
Mon 25/01/16	Demob Scientific gear, samples etc.

- **Break between legs 2 and 3 –**

Thurs 25/02/16	Vessel departed Galway at 17.30 hrs. 13 hours steam to first station.
Fri 26/02/16	First station at 08:00h, 4 valid stations done. Wind around 30kn but not much swell.
Sat 27/02/16	6 valid stations done, 1 invalid (doors didn't spread well, mud and stones in cod end, some damage to wing). Lost scanmar display, rebooted and sensors signal returned. Good sea conditions.
Sun 28/02/16	7 valid stations done. Haul 85: headline bust but reading good throughout tow so treated it as valid. Wind picking up but swell still small.
Mon 29/02/16	6 valid stations done, Had to reset scanmar a few times. Realised second hydrophone on port side was connected and that was interfering with signal. Once it was disconnected, no scanmar problems. Sea conditions good.
Tue 01/03/16	3 valid stations. Haul 98: wing readings changed at 54mins, hauled up but treated as valid, small damage to wing end. Steamed south to next tow but weather too bad to fish, steamed for Shelter off Barra Island south of Outer Hebrides.
Wed 02/03/16	Sheltering off Barra Island
Thu 03/03/16	Sailed at 0200 hrs, shot at 0400hrs. Hauled up tow 105 had after 30mins to avoid pots. Treated as valid, total of 6 valid tows completed. Moderate wind and swell.
Fri 04/03/16	Cancelled Haul 110 due to pots in area. Haul 112, hauled up after 12 mins, wings and doors giving dodgy readings. Steamed south, pots in area. In total 6 stations-4 valid, 2 invalid
Sat 05/03/16	5 valid stations. Haul 115: discarded net caught in haul. Haul 116: hopper belt stopped working, fish went in underneath belt. Also on haul 16: net and rope brought up in trawl. 4 CTD stations done out to 200m contour.
Sun 06/03/16	Docked at 14.30 hrs

Downtime, damage

Weather downtime	2 days
Technical downtime	3 days at start of survey
Gear damage	Minor repairs only. Headline broke one on one haul. The floats often damaged the wings on hauling. Weak link in the tickler broke a few times at the start of the survey, replaced weak link with a G13 connector.

Summary statistics

Table 1. Summary statistics by stratum. Stratum area is given in Km^2, Num hauls is the is the number of valid hauls in each stratum and Swept area is the total area swept between the doors in each stratum (in Km^2), catch numbers are given for L. piscatorius (MON), L. budegassa (WAF) and L. whiffiagonis (MEG).

Stratum	Stratum area	Num hauls	Swept area	Catch num MON	Catch num WAF	Catch num MEG
VIa_Shelf_L	38424	15	6.479	122	18	38
VIa_Shelf_M	4441	8	3.716	213	60	23
VIa_Slope_H	3114	7	3.670	430	78	345
VIa_Slope_M	3044	11	6.468	208	0	237
VII_Shelf_H	50764	27	12.597	137	428	345
VII_Shelf_L	42034	5	2.557	55	9	41
VII_Shelf_M	14621	6	2.769	91	101	87
VII_Slope_H	35768	19	9.896	189	173	257
VII_Slope_M	29406	9	5.416	64	1	7
Total	221616	107	53.568	1509	868	1380

Biomass estimates

Estimated numbers and biomass for the survey area are given in Table 2. It is likely that the selectivity correction does not account for all the fish encountered by the gear, therefore these values should not be treated as absolute.

Table 2. Estimated numbers (millions) and biomass (kT) in the survey area, with CV (relative se). Only fish >500g live weight (approximately 32cm) were included in the estimate.

	L. piscatorius		***L. budegassa***	
	VIa	**VII**	**VIa**	**VII**
NumMln	4.67	8.56	0.48	5.24
NumCV	19.9%	28.5%	29.7%	13.7%
BiomKT	6.37	22.58	0.58	8.92
BiomCV	18.8%	12.3%	34.9%	14.3%

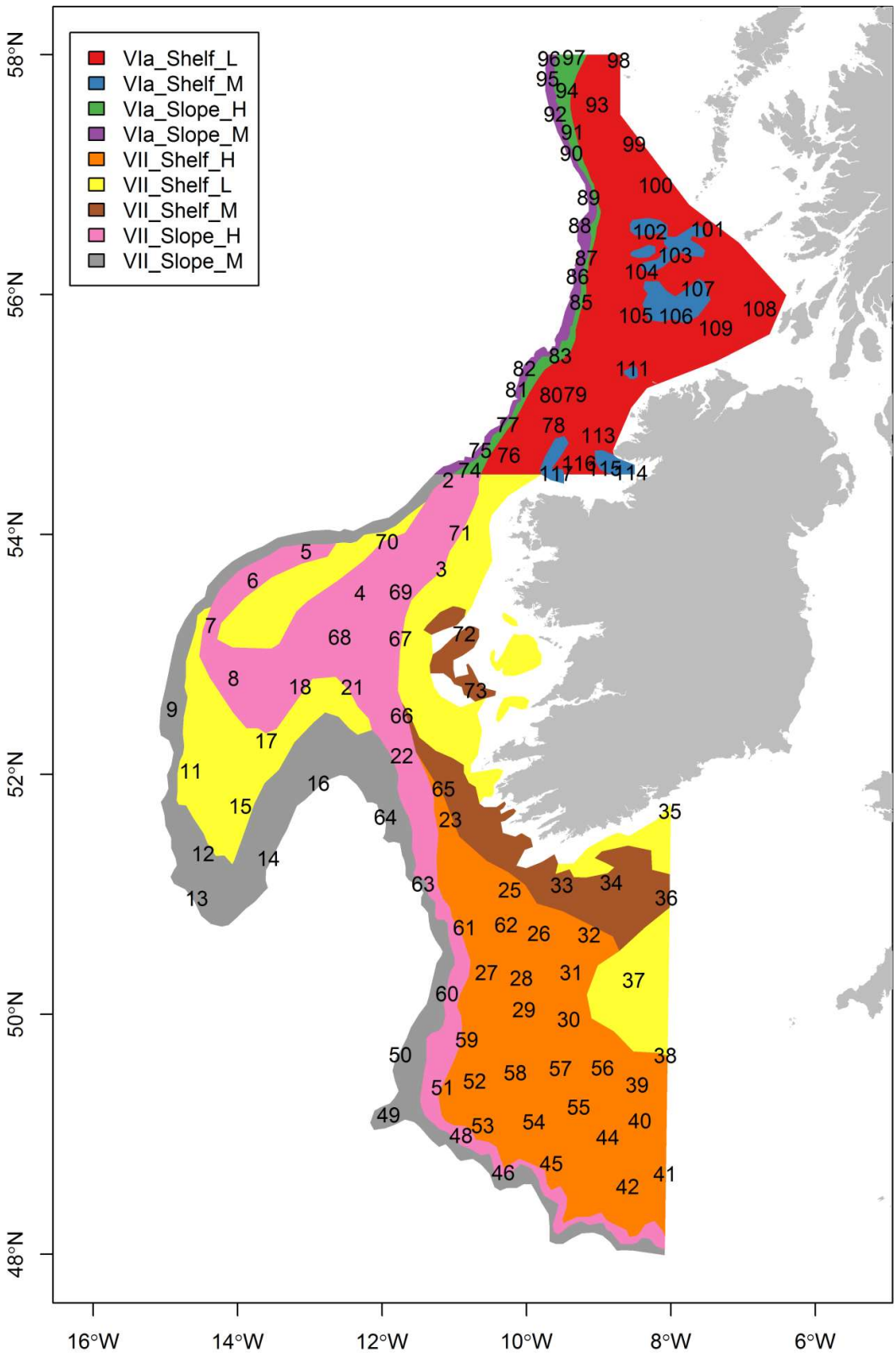

Figure 1. Valid tow positions, the numbers refer to the haul number.

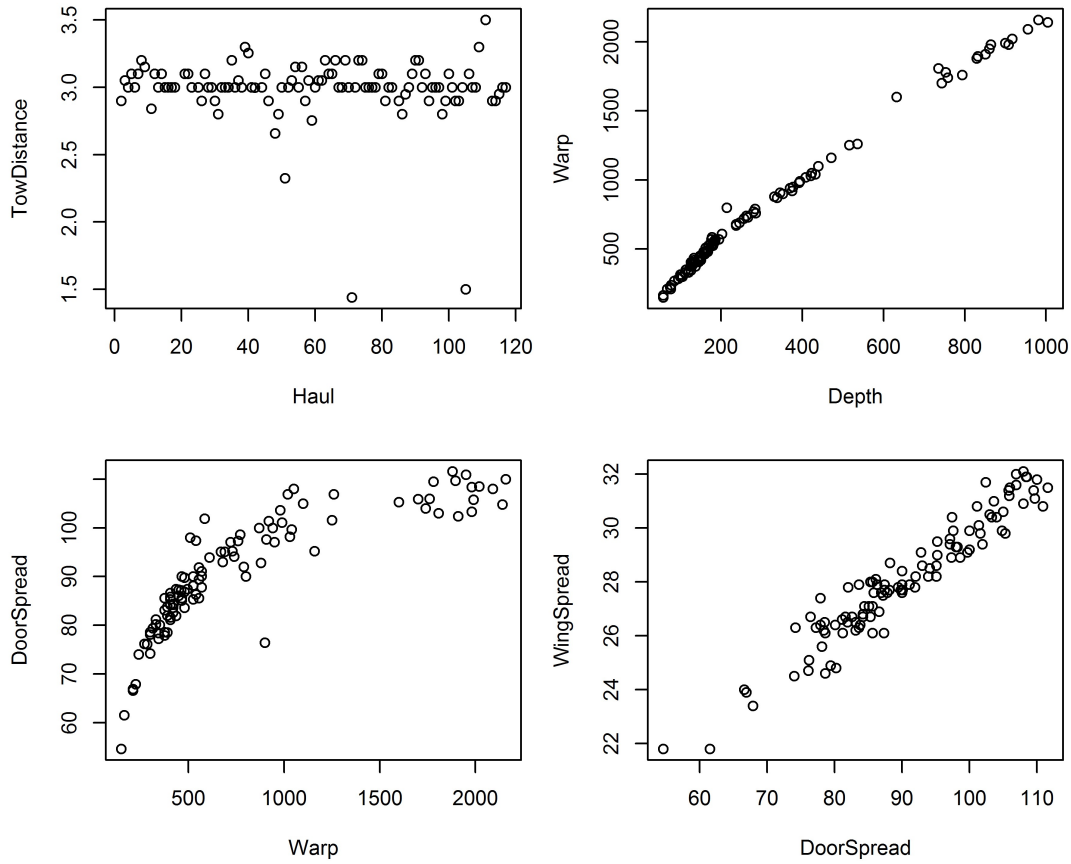

Figure2. Gear parameters for the valid hauls

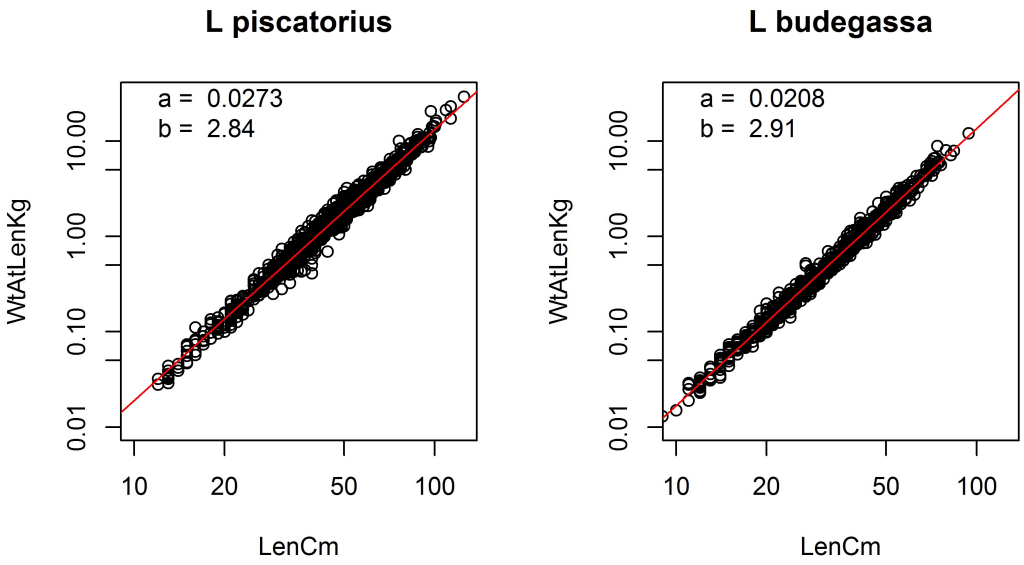

Figure 3. Length-weight parameters

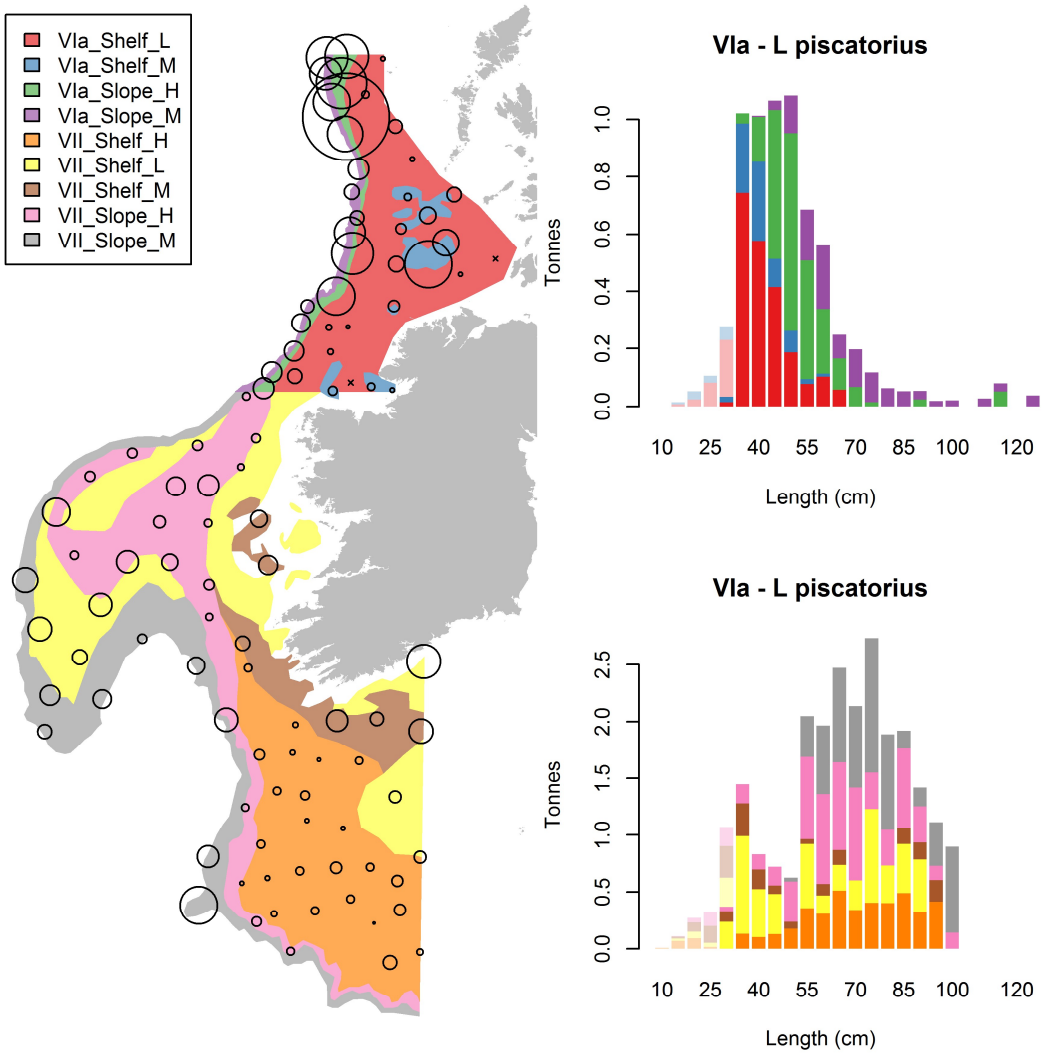

Figure 4. Bubble size is proportional to the biomass of L. piscatorius *per swept area at each sampling station (left; >500g fish only) and biomass per size class and stratum (right; fish <500g in pale shades).*

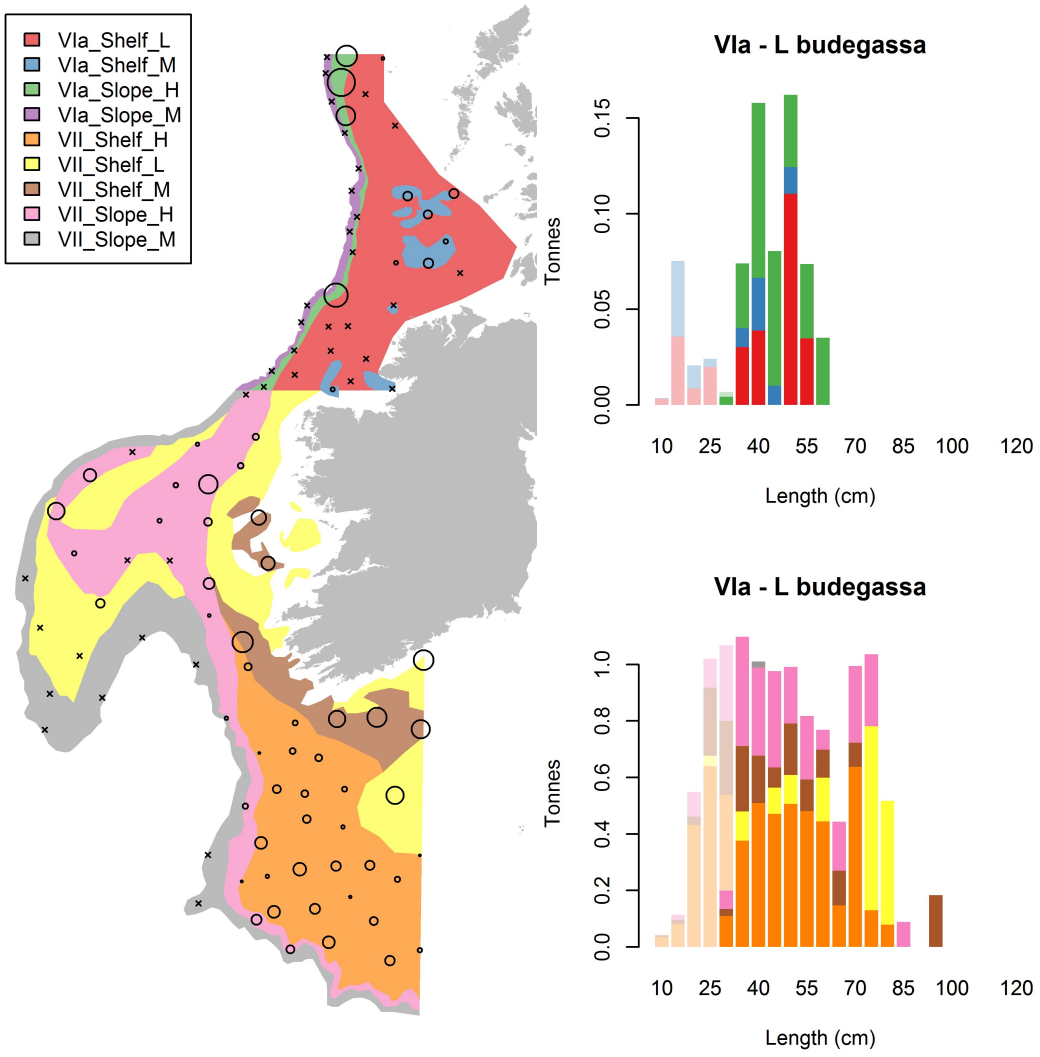

Figure 5. Bubble size is proportional to the biomass of L. budegassa *per swept area at each sampling station (left; >500g fish only) and biomass per size class and stratum (right; fish <500g in pale shades).*

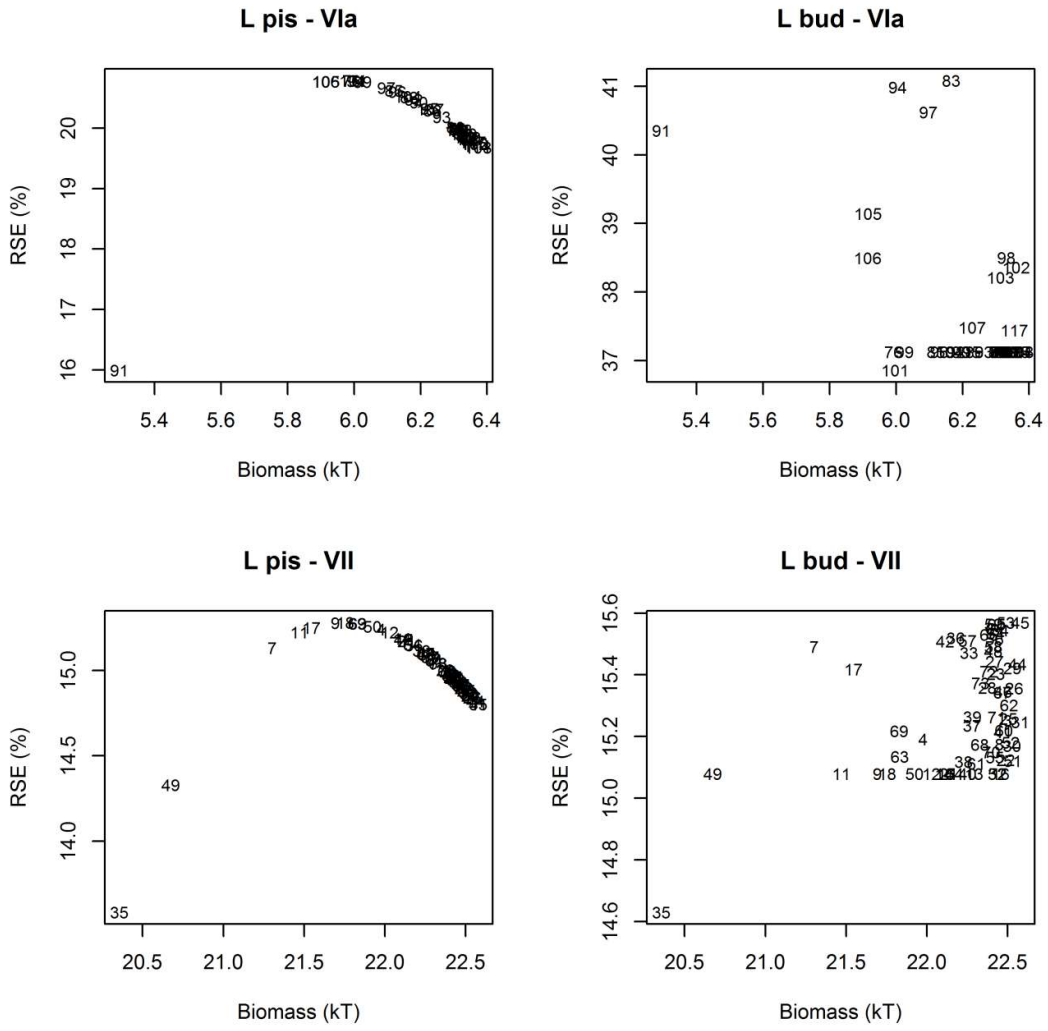

Figure 6. Influence that each tow had on the final biomass estimate. Estimates were obtained by sequentially removing each of the tows from the analysis. The top left figure shows that without station 91 the biomass estimate of L. piscatorius*. In VIa would have been considerably lower. In VII, stations 35 and 49 were strongly influential.*

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List of survey staff

Name	Organisation	Role
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Dylan Barrett	Survey Contractor	Wetlab Assistant
Eoghan Kelly	Marine Institute	Scientist In Charge
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Meadhbh Quinn	Unaffiliated	Wetlab Assistant
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Turloch Smith	Marine Institute	Wetlab Deckmaster

Summary of station location, gear geometry and catch

Haul	Stratum	Lon DegW	Lat DegN	Depth mtr	Dist nm	Door mtr	Wing mtr	Mon Num	Waf Num	Mon Kg	Waf Kg	Mon $KgKm^{-2}$	Waf $KgKm^{-2}$	Mon Tonnes	Waf Tonnes
2	VII_Slope_H	11.086	54.457	471	2.90	95.2	29.50	3	0	8.1	0.0	3.1	0.0	111	0
3	VII_Slope_H	11.179	53.715	181	3.05	86.3	27.90	6	9	5.8	5.2	2.1	1.7	84	93
4	VII_Slope_H	12.303	53.515	338	3.00	100.0	29.20	10	2	54.5	4.2	16.8	1.2	600	43
5	VII_Slope_H	13.051	53.861	370	3.10	100.0	29.90	3	0	17.8	0.0	4.8	0.0	171	0
6	VII_Slope_H	13.788	53.618	285	3.00	97.3	28.90	8	10	17.4	24.7	5.1	7.7	217	274
7	VII_Slope_H	14.368	53.244	284	3.10	92.0	28.20	47	23	109.4	43.5	35.7	13.3	1364	499
8	VII_Slope_H	14.056	52.804	237	3.20	93.0	28.60	3	4	9.6	3.6	3.6	1.0	128	50
9	VII_Slope_M	14.906	52.545	743	3.15	105.9	31.20	8	0	46.1	0.0	30.0	0.0	883	0
11	VII_Shelf_L	14.648	52.031	394	2.84	101.1	30.80	4	0	22.1	0.0	26.4	0.0	1108	0
12	VII_Slope_M	14.479	51.343	536	3.10	106.9	31.60	6	0	29.6	0.0	18.7	0.0	551	0
13	VII_Slope_M	14.567	50.969	917	3.00	108.5	31.90	2	0	15.2	0.0	9.7	0.0	286	0
14	VII_Slope_M	13.572	51.302	908	3.10	108.4	31.90	5	0	27.8	0.0	16.0	0.0	472	0
15	VII_Shelf_L	13.965	51.738	408	3.00	106.9	32.00	1	0	9.0	0.0	10.9	0.0	459	0
16	VII_Slope_M	12.882	51.928	955	3.00	108.0	32.10	1	0	8.3	0.0	4.2	0.0	124	0
17	VII_Shelf_L	13.605	52.283	392	3.00	103.6	31.00	6	1	20.2	3.1	24.6	3.7	1033	155
18	VII_Slope_H	13.137	52.734	423	3.00	108.0	30.90	12	0	79.4	0.0	23.0	0.0	831	0
21	VII_Slope_H	12.407	52.731	439	3.10	105.0	30.60	12	0	41.3	0.0	12.4	0.0	451	0
22	VII_Slope_H	11.724	52.158	331	3.10	92.8	29.10	4	2	7.6	1.8	2.5	0.5	90	24
23	VII_Shelf_H	11.052	51.626	182	3.00	85.6	28.00	6	18	11.1	12.7	3.0	2.7	152	212
25	VII_Shelf_H	10.234	51.039	132	3.00	81.6	26.70	10	21	6.6	8.1	1.5	1.4	117	168
26	VII_Shelf_H	9.828	50.676	136	2.90	84.2	26.70	4	8	2.7	11.2	0.7	2.3	48	146
27	VII_Shelf_H	10.553	50.351	168	3.10	87.4	27.70	5	11	12.3	15.8	3.1	3.2	158	188
28	VII_Shelf_H	10.070	50.304	136	3.00	85.3	26.70	6	9	15.8	10.5	4.0	2.4	203	147

29	VII_Shelf_H	10.037	50.040	145	3.00	81.1	26.60	2	11	3.5	13.5	0.9	3.1	48	185
30	VII_Shelf_H	9.415	49.960	125	2.90	77.9	26.40	1	5	3.7	2.3	1.0	0.7	51	55
31	VII_Shelf_H	9.379	50.350	129	2.80	82.0	27.80	1	1	0.1	5.7	0.0	1.3	5	66
32	VII_Shelf_H	9.133	50.665	120	3.00	77.2	26.30	6	3	10.6	0.2	2.8	0.0	152	12
33	VII_Shelf_M	9.509	51.079	126	3.00	78.6	26.10	20	22	19.5	14.3	21.7	13.2	408	338
34	VII_Shelf_M	8.824	51.099	113	3.00	80.1	26.40	12	31	7.8	16.7	8.7	17.4	189	437
35	VII_Shelf_L	8.015	51.695	76	3.20	66.9	23.90	42	3	31.3	13.5	52.9	18.5	2653	815
36	VII_Shelf_M	8.065	50.972	105	3.00	74.2	26.30	7	4	26.7	15.9	27.3	16.1	438	255
37	VII_Shelf_L	8.514	50.286	120	3.05	81.2	26.10	2	5	6.4	14.0	7.1	14.5	299	611
38	VII_Shelf_H	8.078	49.660	125	3.00	77.9	27.40	6	1	31.8	0.8	6.9	0.3	350	14
39	VII_Shelf_H	8.468	49.414	146	3.30	82.6	26.70	5	4	25.1	5.2	5.9	1.5	298	77
40	VII_Shelf_H	8.430	49.116	137	3.25	83.1	26.50	6	3	26.6	0.5	6.4	0.0	326	18
41	VII_Shelf_H	8.080	48.674	167	3.00	83.6	27.90	2	3	10.3	4.8	2.1	1.0	106	63
42	VII_Shelf_H	8.600	48.566	180	3.00	88.2	28.70	8	10	37.5	19.9	9.1	4.4	464	240
44	VII_Shelf_H	8.874	48.977	160	3.00	87.2	27.50	1	7	1.1	13.2	0.3	3.3	17	180
45	VII_Shelf_H	9.657	48.757	178	3.10	85.3	28.00	1	22	0.4	31.3	0.0	7.1	8	385
46	VII_Slope_H	10.321	48.684	214	2.90	90.0	27.60	3	11	7.6	9.2	3.0	3.2	106	148
48	VII_Slope_H	10.905	48.992	176	2.66	87.8	27.60	2	19	12.6	15.1	4.7	5.2	167	253
49	VII_Slope_M	11.909	49.163	832	2.80	109.7	31.10	16	0	102.0	0.0	64.7	0.0	1903	0
50	VII_Slope_M	11.745	49.666	981	3.00	110.0	31.80	8	0	37.9	0.0	22.2	0.0	654	0
51	VII_Shelf_H	11.161	49.392	202	2.33	93.9	28.20	2	3	2.8	1.4	0.9	0.3	51	36
52	VII_Shelf_H	10.718	49.446	163	3.00	86.9	27.60	4	16	4.1	4.7	1.2	0.8	71	113
53	VII_Shelf_H	10.606	49.075	157	3.05	85.6	27.10	6	50	7.4	31.3	1.8	7.2	105	557
54	VII_Shelf_H	9.895	49.105	159	3.15	85.1	27.10	2	11	16.0	22.6	3.0	5.0	152	264
55	VII_Shelf_H	9.280	49.227	149	3.00	86.1	28.10	2	2	13.6	1.8	3.1	0.4	156	26
56	VII_Shelf_H	8.946	49.556	126	3.15	78.4	26.20	3	15	15.3	18.4	3.1	4.4	169	261
57	VII_Shelf_H	9.530	49.551	158	2.90	90.0	28.40	9	12	25.1	18.9	6.4	4.5	351	241
58	VII_Shelf_H	10.157	49.516	131	3.05	78.5	26.50	21	110	14.4	53.3	3.3	8.2	259	1047
59	VII_Shelf_H	10.829	49.792	169	2.75	88.1	27.70	5	42	11.7	34.4	3.3	7.1	170	574

60	VII_Slope_H	11.100	50.175	421	3.00	98.2	29.30	2	8	9.3	4.7	2.8	1.5	101	79
61	VII_Shelf_H	10.855	50.725	186	3.05	90.1	27.70	6	12	22.2	2.9	5.4	0.2	280	72
62	VII_Shelf_H	10.282	50.748	146	3.05	81.9	26.50	7	18	5.5	8.3	1.3	1.8	84	155
63	VII_Slope_M	11.430	51.090	432	3.20	99.7	29.10	10	1	47.4	1.1	25.4	0.7	745	21
64	VII_Slope_M	11.950	51.647	851	3.10	102.4	31.70	8	0	22.7	0.0	13.9	0.0	408	0
65	VII_Shelf_M	11.148	51.881	177	3.10	90.0	27.90	9	20	7.3	22.0	10.1	20.1	155	386
66	VII_Slope_H	11.727	52.492	185	3.20	91.9	27.80	11	41	20.0	25.6	5.4	6.2	227	393
67	VII_Slope_H	11.744	53.134	185	3.00	89.4	27.80	10	9	9.3	10.0	3.1	3.1	139	145
68	VII_Slope_H	12.583	53.147	375	3.00	101.4	30.10	10	3	22.7	2.8	7.0	1.0	275	36
69	VII_Slope_H	11.738	53.523	237	3.20	95.1	28.20	29	26	77.1	52.7	20.9	16.8	772	642
70	VII_Slope_H	11.930	53.943	377	3.00	97.1	29.60	6	1	17.1	2.0	5.0	0.7	187	26
71	VII_Slope_H	10.917	54.016	195	1.44	91.1	27.90	8	5	5.1	2.5	4.1	2.0	176	98
72	VII_Shelf_M	10.864	53.175	130	3.00	83.8	26.40	21	8	14.5	9.2	13.3	10.3	329	176
73	VII_Shelf_M	10.704	52.701	125	3.20	83.1	26.20	22	16	16.9	9.5	16.9	8.8	346	216
74	VIa_Slope_H	10.780	54.538	345	3.20	97.6	29.90	9	0	25.2	0.0	20.3	0.0	63	0
75	VIa_Slope_M	10.642	54.703	735	3.00	103.0	30.50	9	0	44.1	0.0	19.0	0.0	58	0
76	VIa_Shelf_L	10.244	54.664	127	3.00	85.6	26.10	28	0	19.6	0.0	9.9	0.0	468	0
77	VIa_Slope_H	10.256	54.918	352	3.00	76.4	26.70	9	0	20.5	0.0	18.0	0.0	56	0
78	VIa_Shelf_L	9.624	54.913	103	3.00	78.6	24.60	7	0	3.9	0.0	1.7	0.0	107	0
79	VIa_Shelf_L	9.323	55.169	100	3.10	79.4	24.90	4	0	2.0	0.0	0.8	0.0	51	0
80	VIa_Shelf_L	9.659	55.166	112	3.10	80.2	24.80	4	0	4.3	0.0	1.8	0.0	82	0
81	VIa_Slope_M	10.134	55.211	900	2.90	105.8	31.40	7	0	29.2	0.0	16.1	0.0	49	0
82	VIa_Slope_M	10.029	55.385	864	3.00	103.3	30.40	5	0	16.9	0.0	8.4	0.0	26	0
83	VIa_Slope_H	9.532	55.492	266	3.00	95.2	29.00	47	25	65.7	23.4	66.6	26.0	208	83
85	VIa_Slope_H	9.244	55.939	256	2.90	97.1	29.40	38	0	84.2	0.0	81.5	0.0	254	0
86	VIa_Slope_M	9.292	56.154	794	2.80	106.0	31.50	27	0	82.7	0.0	45.4	0.0	138	0
87	VIa_Slope_M	9.168	56.308	516	2.95	101.6	29.80	8	0	16.9	0.0	9.6	0.0	29	0
88	VIa_Slope_M	9.261	56.578	1004	3.00	104.8	29.90	4	0	21.1	0.0	10.8	0.0	33	0
89	VIa_Slope_M	9.143	56.811	860	3.10	110.9	30.80	14	0	41.2	0.0	20.4	0.0	62	0

90	VIa_Slope_M	9.377	57.180	632	3.20	105.3	29.80	43	0	112.6	0.0	58.6	0.0	178	0
91	VIa_Slope_H	9.362	57.357	245	3.20	95.1	28.60	224	15	443.5	18.9	346.8	17.1	1080	55
92	VIa_Slope_M	9.604	57.507	758	3.00	104.0	30.40	30	0	126.9	0.0	63.8	0.0	194	0
93	VIa_Shelf_L	9.022	57.585	150	3.10	84.4	27.10	7	0	5.9	0.0	2.9	0.0	117	0
94	VIa_Slope_H	9.436	57.704	262	2.90	94.1	28.50	62	22	138.7	42.2	118.4	35.4	369	110
95	VIa_Slope_M	9.709	57.802	829	3.00	111.6	31.50	21	0	99.7	0.0	48.3	0.0	147	0
96	VIa_Slope_M	9.688	57.970	753	3.00	109.5	31.40	40	0	165.8	0.0	80.2	0.0	244	0
97	VIa_Slope_H	9.343	57.980	280	3.00	98.6	28.90	41	16	102.7	19.9	88.7	20.2	276	63
98	VIa_Shelf_L	8.721	57.955	148	2.80	87.3	26.10	2	1	2.4	0.8	1.1	0.5	54	20
99	VIa_Shelf_L	8.508	57.257	134	2.90	84.2	26.80	24	0	18.3	0.0	9.1	0.0	432	0
100	VIa_Shelf_L	8.217	56.915	130	3.10	86.6	26.90	4	2	3.7	0.2	1.2	0.0	69	12
101	VIa_Shelf_L	7.489	56.550	173	3.00	97.4	30.40	19	10	22.0	10.6	9.8	4.3	388	183
102	VIa_Shelf_M	8.292	56.525	162	2.90	98.0	29.30	4	10	2.9	5.3	2.6	3.9	14	27
103	VIa_Shelf_M	7.943	56.332	178	2.90	101.9	29.40	18	21	14.9	6.0	13.3	3.4	66	34
104	VIa_Shelf_L	8.408	56.193	133	3.00	87.4	27.90	10	2	11.0	0.5	5.5	0.0	212	20
105	VIa_Shelf_L	8.489	55.828	126	1.50	85.8	27.60	9	2	12.7	0.7	11.9	0.8	457	39
106	VIa_Shelf_M	7.932	55.824	142	3.10	83.6	26.30	113	18	113.3	5.5	103.3	4.4	479	38
107	VIa_Shelf_M	7.631	56.052	157	3.00	89.8	27.70	38	6	33.5	1.5	32.5	1.1	148	11
108	VIa_Shelf_L	6.775	55.883	58	3.00	54.6	21.80	0	1	0.0	0.1	0.0	0.0	0	9
109	VIa_Shelf_L	7.384	55.723	67	3.30	66.6	24.00	2	0	1.5	0.0	0.9	0.0	34	0
111	VIa_Shelf_M	8.534	55.388	99	3.50	78.1	25.60	9	0	8.1	0.0	6.2	0.0	32	0
113	VIa_Shelf_L	9.011	54.829	75	2.90	67.9	23.40	2	0	0.6	0.0	0.0	0.0	27	0
114	VIa_Shelf_M	8.558	54.518	58	2.90	61.5	21.80	5	0	1.2	0.0	1.1	0.0	14	0
115	VIa_Shelf_M	8.923	54.553	77	2.95	74.0	24.50	9	4	3.4	0.4	2.8	0.0	26	6
116	VIa_Shelf_L	9.276	54.596	85	3.00	76.2	25.10	0	0	0.0	0.0	0.0	0.0	0	0
117	VIa_Shelf_M	9.590	54.512	95	3.00	76.1	24.70	17	1	6.5	0.8	4.0	1.0	47	4