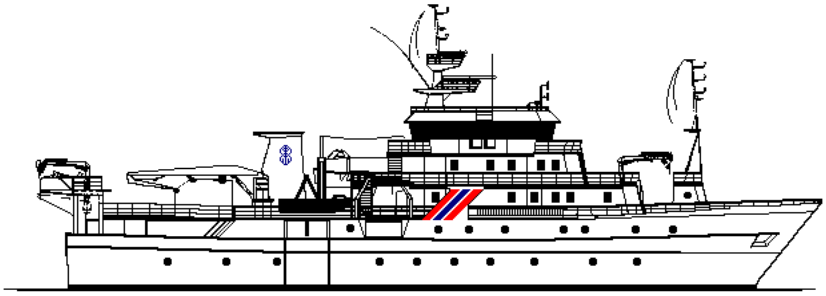
CRUISE REPORTS "DR. FRIDTJOF NANSEN"



BENEFIT SURVEYS

Preliminary Cruise report No 6/2003

ESCAPEMENT OF HAKE UNDER THE FISHING LINE OF A DEMERSAL SAMPLING TRAWL

6 – 16 October 2003

by

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1. INTRODUCTION

Objective

Collect information about the hake escapement under the fishing line of a demersal sampling trawl and to record fish behaviour in the net mouth area using cameras.

Swept area surveys conducted in South Africa and Namibia provide input data to the hake stock assessment models used in both countries. The hake abundance and length distribution estimates from the surveys are used in the models, in addition to fishery dependent data, to calculate the age structure and abundance of the hake stocks.

The abundance estimates from the surveys are used as relative indices of the hake biomass, while the length frequencies estimated are assumed to reflect the underlying population characteristic. This assumption is invalid if the efficiency of the trawl differs between length groups. If the efficiency of the trawl is length dependent, the estimated length distribution of the stock will be biased and hence also bias the abundance indices if the length structure of the stock changes between years.

This survey with R/V *Dr. Fridtjof Nansen* is the fourth experiment within the BENEFIT project "Effects of Environmental Factors on Availability and Catching Efficiency of the Demersal Sampling Trawl" where the main objective is to investigate factors that affect the catchability of hake. During the experiments conducted in 2000 and 2001 the herding effects of the bridles were investigated. The results showed that large hake seem to be herded into the net. The experiment in 2002 had the same objective as this year's survey, i.e. to establish whether hake escape under the fishing line and to investigate any species and length dependent escapement. The 2002 survey showed clear differences in escapement between the two hake species, with 10-20% escapement of *M. paradoxus* and less than 5% escapement for *M. capensis*. However, the density of fish was low during the 2002 survey and the size range narrow. It was therefore considered necessary to collect additional data in 2003.

Participation

The scientific staff consisted of the following:

From Namibia:
Titus Iilende, Vicky Herbert, Achilles Ipangelwa, Paul Kainge, Peter Schneider, and Malakia Shimhanda

From Norway:
Arill Engås, Terje Jørgensen, Frode Wilhelsen, and Jan Tore Øvredal

Narrative

6 October	Departure Cape Town
16October	Arrival Walvis Bay

2. MATERIAL & METHODS

The bag experiment

The experiment was carried out off the coast of Namibia (Fig. 1). Three experimental fishing areas were selected ad hoc based on depth and fish abundance and species and fish size composition. The water depth ranged between 300 and 580. Exploratory hauls in search of large M. paradoxus were also made at depths up to 660 m, but catches was too low to provide quantitative information about escapement.

The vessel's standard sampling trawl for hake, the Gisund super (Fig. 2a, b), equipped with 40 m bridles and 7.9 m^2 Thyborøn doors were used. The trawl was fished with door-spread restriction consisting of a 10 m rope between the warps 140 m in front of the doors to ensure stable door and wing spreads and to prevent the trawl from being overspread. A similar technique is used during the standard hake surveys in Namibian waters.

A collection bag was used to catch fish escaping below the fishing line of the trawl (Figure 3). This bag covers the bosom section of the trawl. To collect fish escaping below the remaining of the fishing line of the trawl, the wing sections were fitted to the collection bag. Fish escaping in the wing sections are "guided" into the collection bag.

The headline of the collection bag and top part of the wings was attached to the fishing line of the trawl, while the front parts of the fishing line of the collection bag and/or wings were attached to the ground gear (Figure 4). A footrope was attached to the bag and the wings (44 mm PE and 36 mm PE, respectively) to protect the net from ripping on the bottom. In order to keep proper bottom contact for the main bag, 12 and 16 mm chains were mounted to the rope of the bag, while 13 mm chain was used on the wing part. Scratch marks on the chains showed that both wings and the main bag had proper bottom contact during the experiment.

The fishing experiments were carried out during daytime only (08 – 17 hrs). The duration of a tow varied between 15 and 30 minutes and the towing speed was 3 knots (1.5 m/s). All trawl hauls were monitored by Scanmar trawl sensors (door spread, vertical opening, symmetry of the trawl, and depth of the restriction rope). A total of 40 hauls were carried out, of which 31 measured the escapement below the trawl, and the remaining were used for camera observations.

Camera studies
The camera system used consisted of two Nikon Coolpix 4500 digital camera with Nikon wide angle converters (0.63x) and three flashlights (Nikon SB28). The cameras and the flashlights were each enclosed in separate underwater housings and installed into steel frames attached to the trawl. The frames were mounted on the top panel and orientated so that the cameras and flashes were pointing down towards the ground gear. The flashlight frames were attached 1.35 m behind the leading edge of the float line, one at the centre and the other two 2.6 m to each side of the centre line. The two camera frames were attached 0.7 m behind the flashlight frames, one on each side of the centre line and at a distance of 1.5 m.

The camera and flashlights were used in conjunction with a Harbortronics DigiSnap 2100 electronic shutter release. This allowed for pre-programming of the initial delay time and the time interval between pictures. The time interval between each picture taken was set at 30 seconds. The trawl speed was around 1.5 m/s, which meant that photos were taken at about 45m intervals along the trawl track. All the three flashes were controlled by one of the cameras. The second camera was set with an exposure time of 2 seconds and the DigiSnap programmed so that the shutter was open when the flashes connected to the other camera fired.

A RS-600 underwater video system was used to assess the near-bottom visibility in areas A and B. It was used with an artificial light source (11 W light tube). Altogether nine hauls were done using the photo cameras of which two also included the use of the video camera.

Hydrography and meteorology
Two CTD stations were carried every day, one in the morning and one in the late afternoon. Temperature, salinity, oxygen and light were measured. Wind speed and direction, air and sea surface (5m depth) temperatures were logged automatically throughout the cruise using an Aanderaa meteorological station.

3. RESULTS

Bag experiments
Station information and catch composition are given in the Appendix. For all hauls hake was the dominant species. *M. capensis* was only caught in significant numbers in area A and mainly consisted of fish in the size range 20-60 cm. (Figs. 5a). The size of *M. paradoxus* caught in areas A and B ranged between 15 and 40 cm (Figs. 5b and 6a), while fish caught in area C ranged between 20 and 50 cm (Fig. 7a).

Escapement of hake below the fishing line was found to vary by species and area (Figs. 5c, 6b, and 7b). For *M. capensis* escapement was generally below 10% for all length classes (Fig. 5c). For *M. paradoxus* escapement in area A was on average 50% with an

indication of increasing escapement with increasing fish size (Fig. 5c). In area B and C the escapement was markedly lower, 15-25% depending on fish size (Figs. 6b and 7b).

Camera studies

The video camera observations and the light meter measurements showed that there is considerable bioluminescence present in the water. This indicates that fish could probably easily detect the approaching trawl. Visibility was poor in area A, affecting the quality of the photos taken here.

The photo observations showed clearly that fish do react to the approaching trawl. This can be deducted from the orientation of the fish relative to the trawl. Between 50 and 60% of the fish seen on the pictures show an avoidance reaction pattern. Only in few cases were fish seen close the trawl gear pointing towards the trawl. However, no photographs showed collisions of fish with the ground gear. The photos also clearly showed that the fish reacted to the approaching trawl. In many cases the sand cloud stirred up by the escaping fish was visible. This sand cloud, however, is often some distance away from the fish on the photo. This indicates that the fish was stirred up and started reacting before the photo was taken and it was thus reacting to the trawl.

It was difficult to distinguish different types of fish on the pictures especially smaller fish but since all fish showed a similar pattern of behaviour this is not of great concern. In some cases the species could be identified clearly.

Hydrography, meteorology and light measurement

Temperature, salinity and oxygen levels within 10 m from the seabed are given in Table 1. The environmental factors were stable throughout the cruise. The underwater light profiles taken showed light level to decrease linearly with increasing depth down to 200 m. The variation in light intensity below 200 m depth is attributed to bioluminescence.

4. CONCLUDING REMARKS

This year's experiments mainly confirmed the observations made during the 2002 experiments. The results indicated clear differences between the two hake species, with approximately 10% escapement of *M. capensis*, while the escapement of M. paradoxus was markedly higher and varied considerably between areas (50% in area A, 15-25% in area B and xx in area C). Overall, fish density of both hake species was low in the study areas and the size range of fish narrow. It is uncertain what caused the species differences in escapement. It is hypothesized that species-specific differences in the escape behaviour to the approaching trawl or differences in the near-bottom vertical distribution are likely explanations. The latter can be studied by installing horizontal separator panels into the trawl and will be included in the proposed study of the dynamics of vertical migration of hake scheduled for next year.

Table 1. Temperature, salinity and oxygen levels within ten meters from the bottom

DATE	TIME	STATION NUMBER	Area	Temperature (°C)	Salinity	Oxygen (ml/l)
09.10.2003	06:07	1078	A	10.41	34.93	0.84
09.10.2003	15:49	1079	A	1034	34.92	0.84
10.10.2003	06:00	1080	A	10.33	34.92	0.82
10.10.2003	14:15	1081	A	10.28	34.92	0.83
11.10.2003	04:28	1082	A	10.30	34.92	0.85
11.10.2003	12:43	1083	A	10.32	34.92	0.78
12.10.2003	06:15	1084	B	9.04	34.79	0.88
12.10.2003	15:25	1085	B	8.99	34.80	0.79
13.10.2003	04:17	1086	B	8.93	34.79	0.84
13.10.2003	14:52	1087	B	9.06	34.81	0.75
14.10.2003	09:19	1089	C	8.59	34.76	0.83
14.10.2003	15:18	1090	C	8.73	34.78	0.87
15.10.2003	04:33	1091	C	8.41	34.74	0.87
15.10.2003	12:40	1092	C	8.68	34.77	0.81

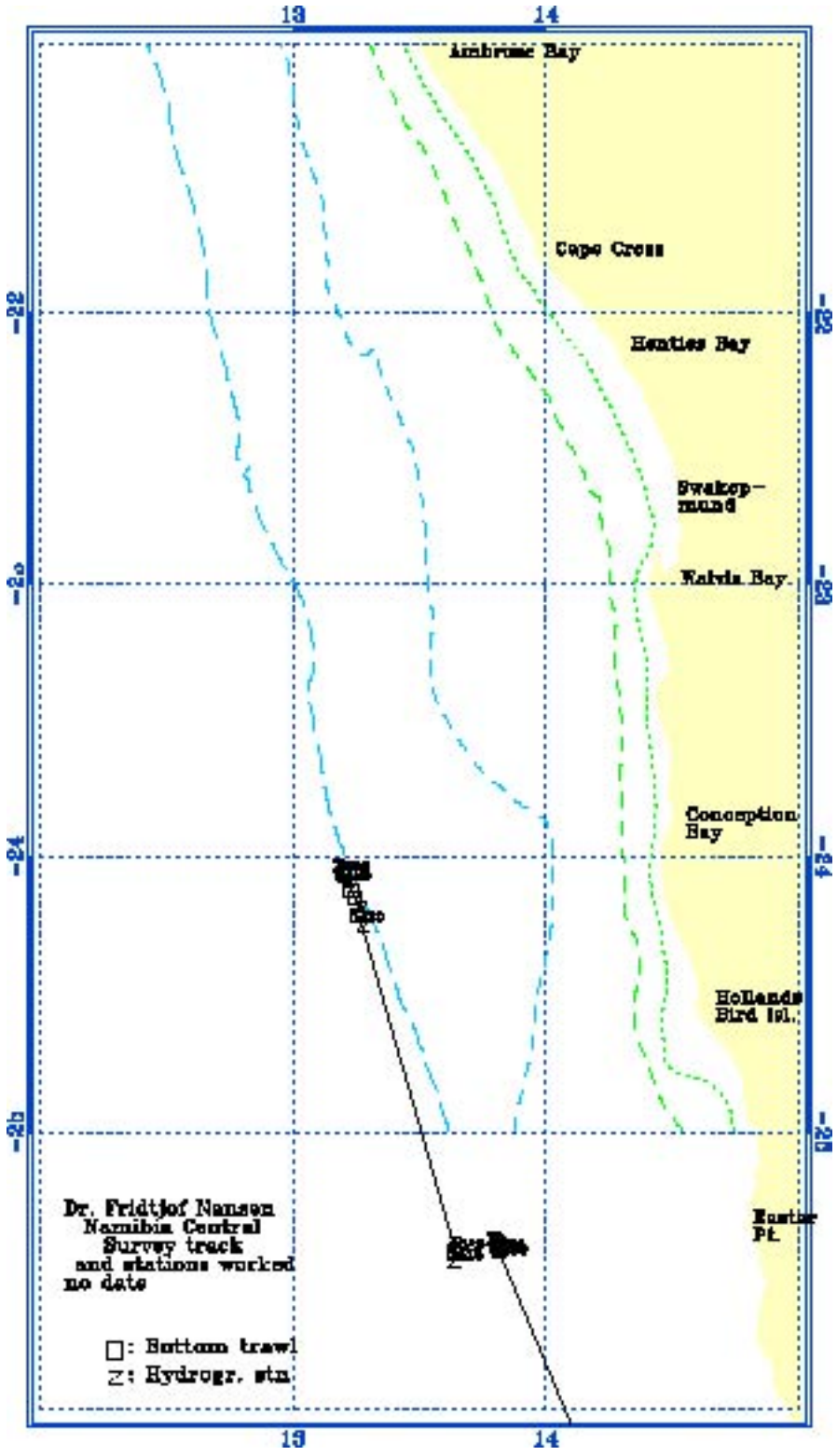


Fig. 1. The fishing area showing the three experimental locations A to C.

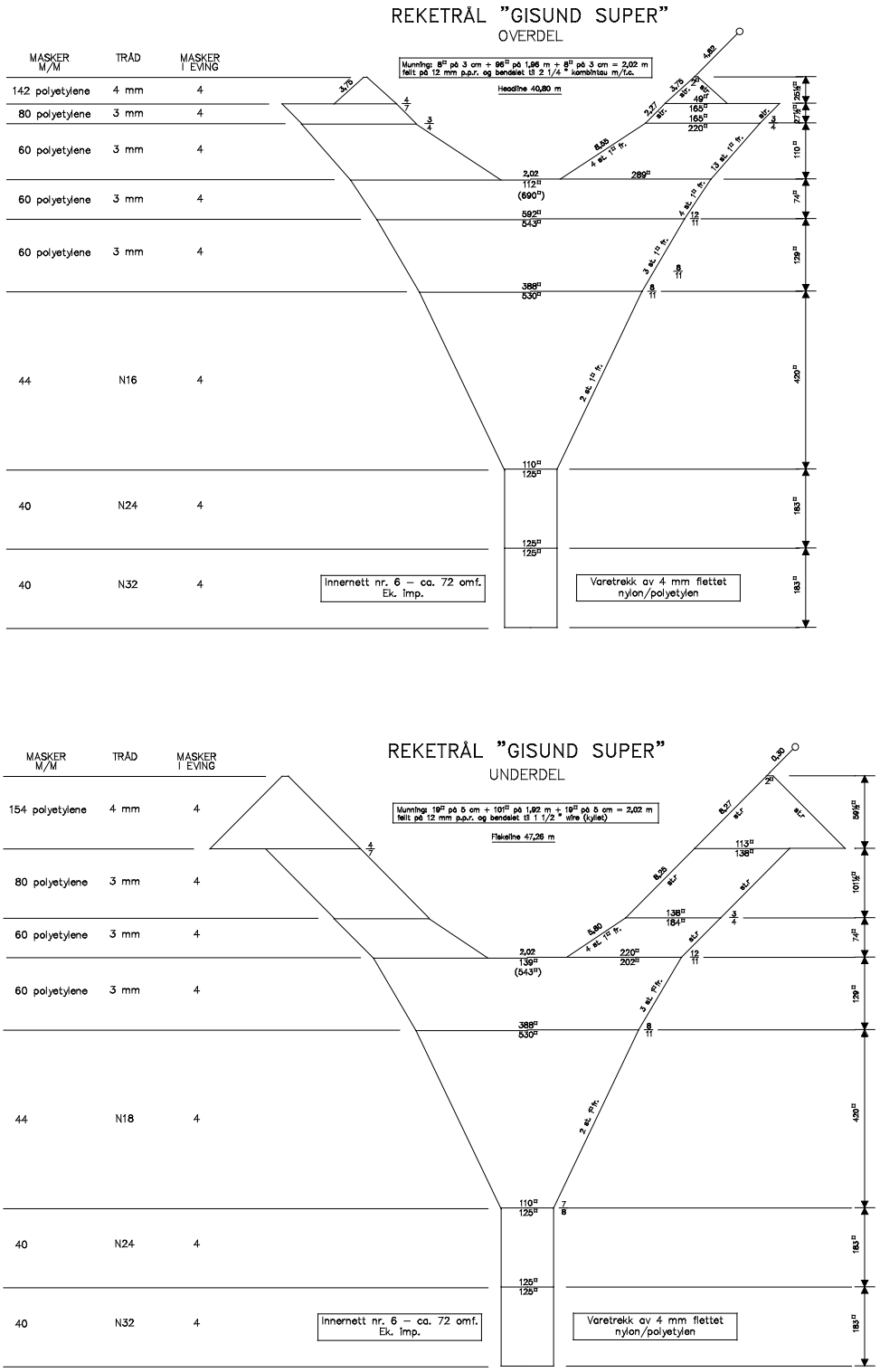


Figure 2a. Design of the trawl used.

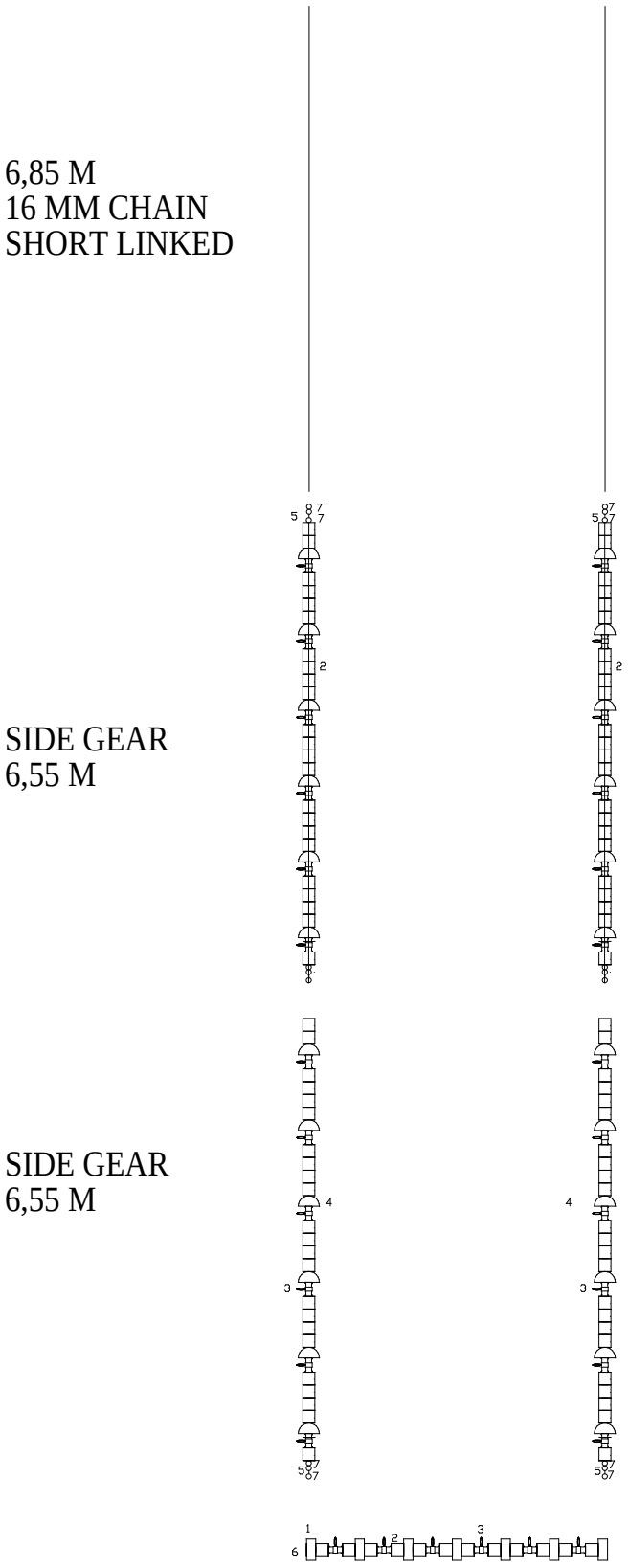


Fig. 2b. Schematic drawing of the ground gear used in the experiments.

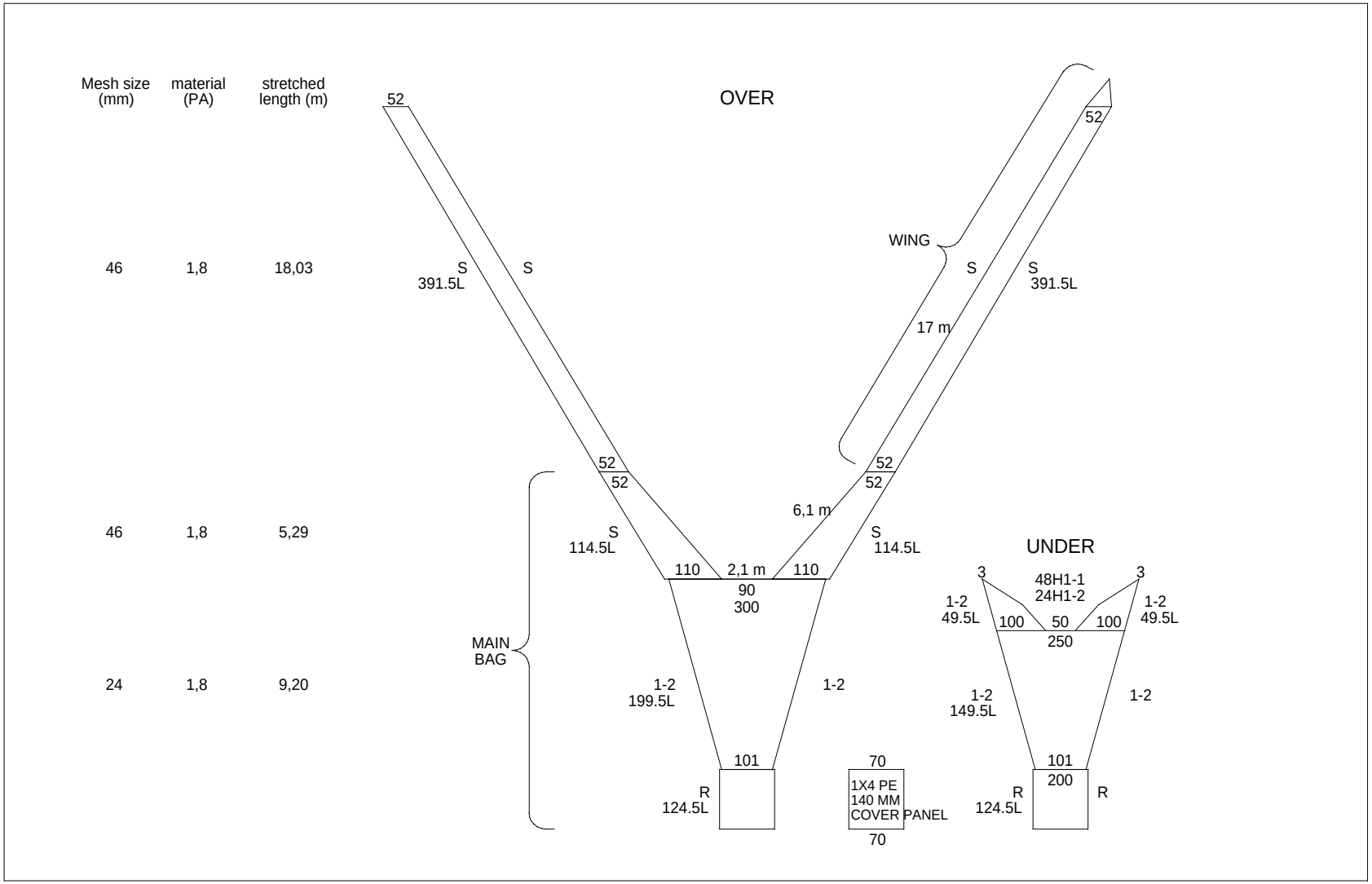


Fig. 3. Design of the collection bag.

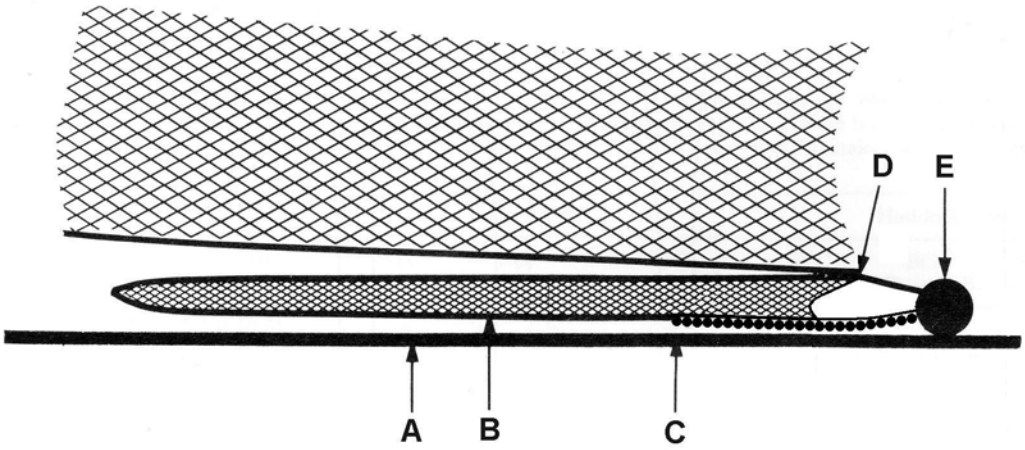


Fig. 4. Schematic presentation of the collection bag under the trawl (seen from the side). A – bottom; B – collection bag; C – footrope with chain; D – headline of the collection bag/ fishing line of the trawl; E – bobbins gear

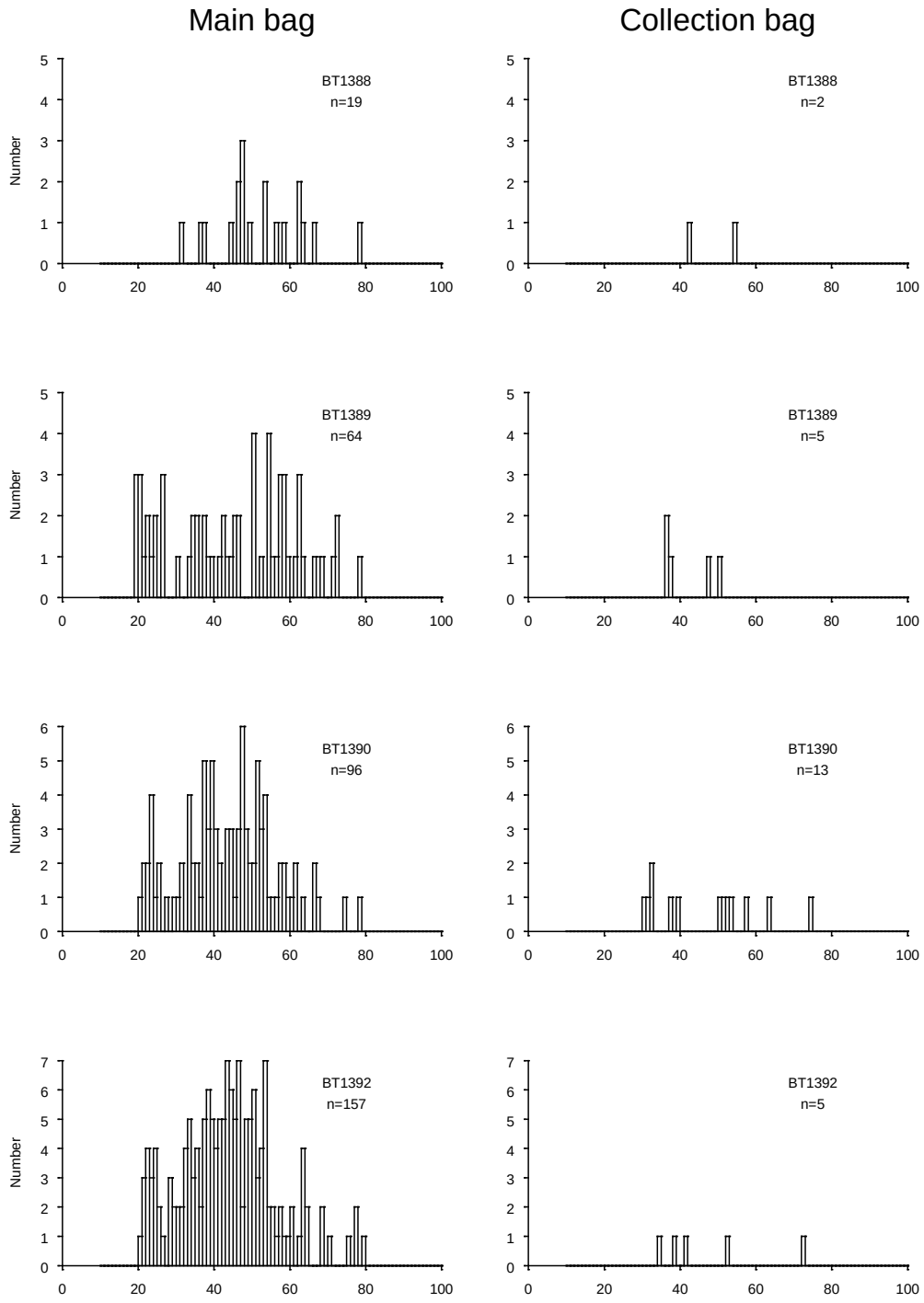


Figure 5a. Area A. Length distribution of M. capensis caught in the main bag (left panel) and in the collection bag (right panel) for each of the hauls in this area.

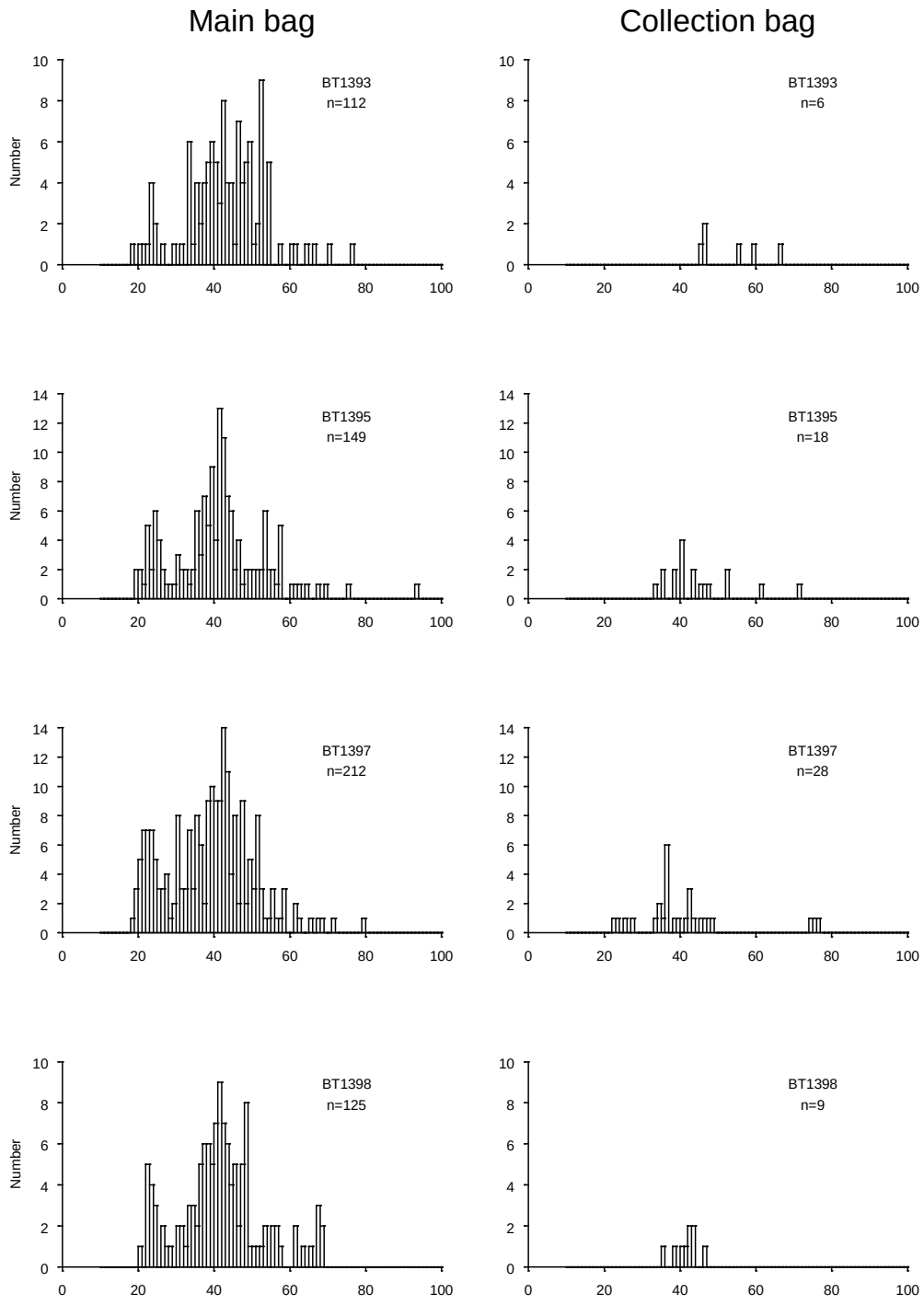


Figure 5a. Continued.

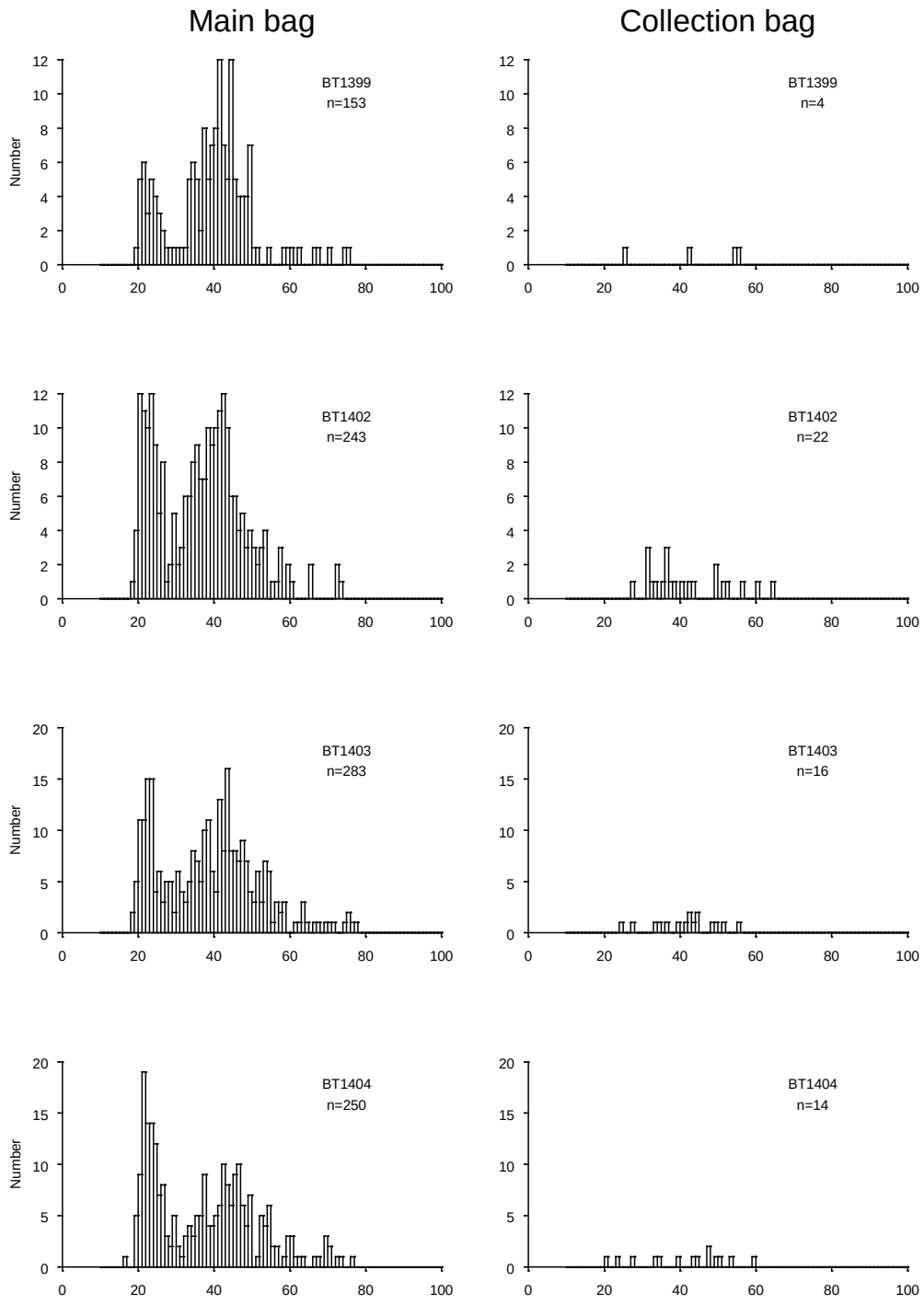


Figure 5a. Continued.

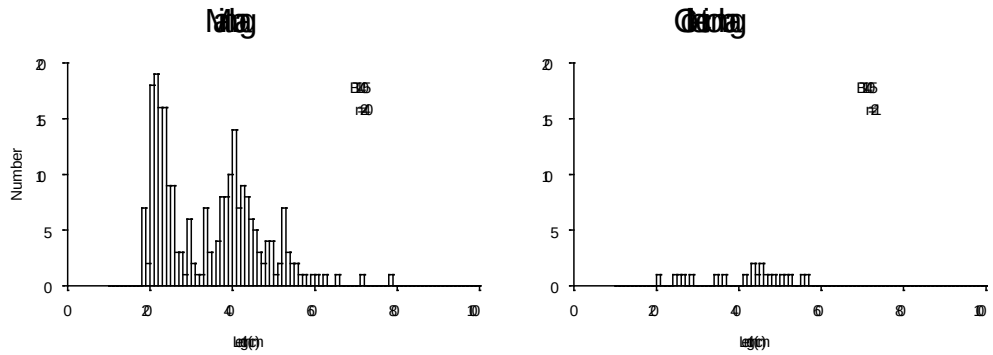


Figure 5a. Continued.

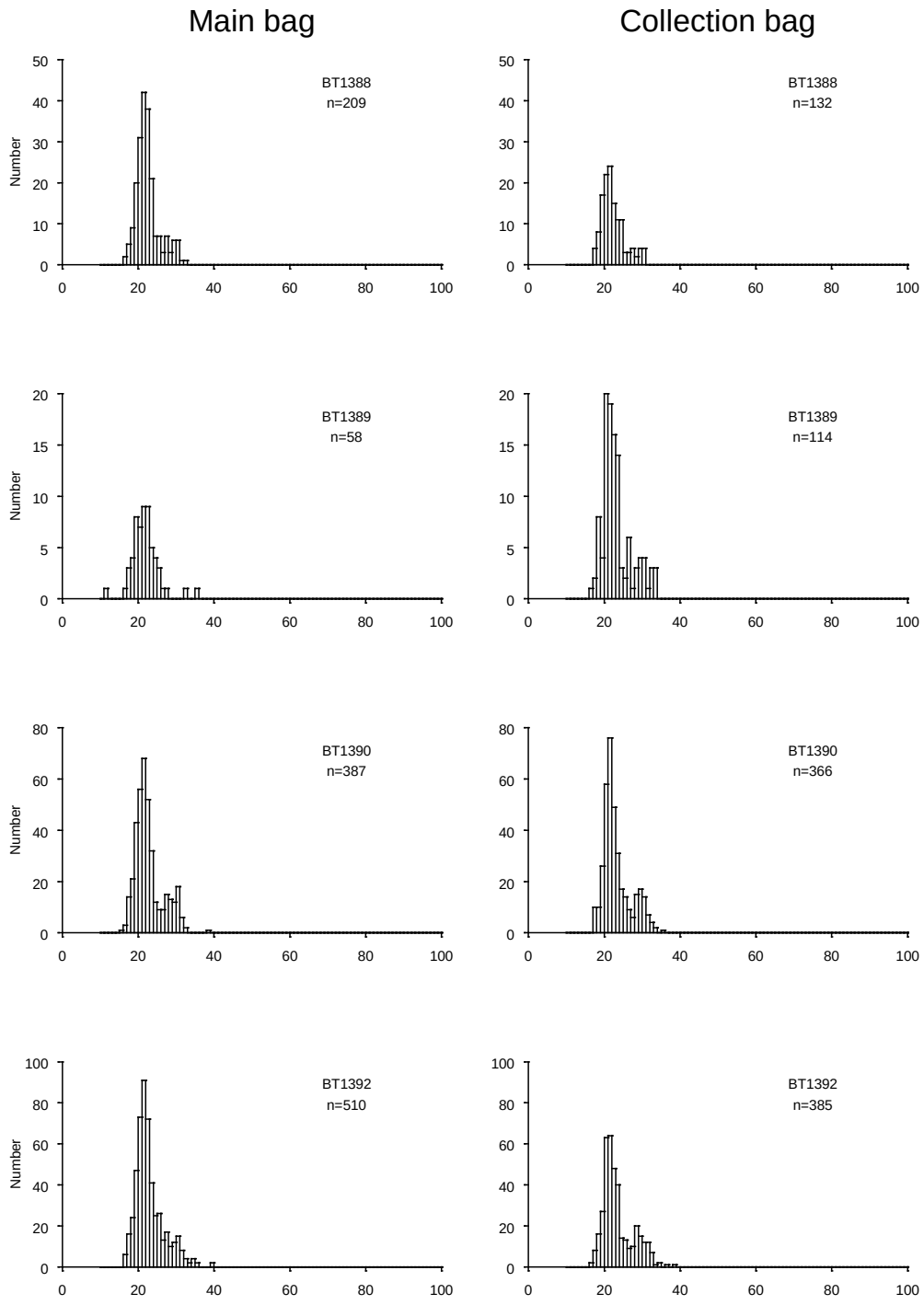


Figure 5b. Area A. Length distribution of M. paradoxus caught in the main bag (left panel) and in the collection bag (right panel) for each of the hauls in this area.

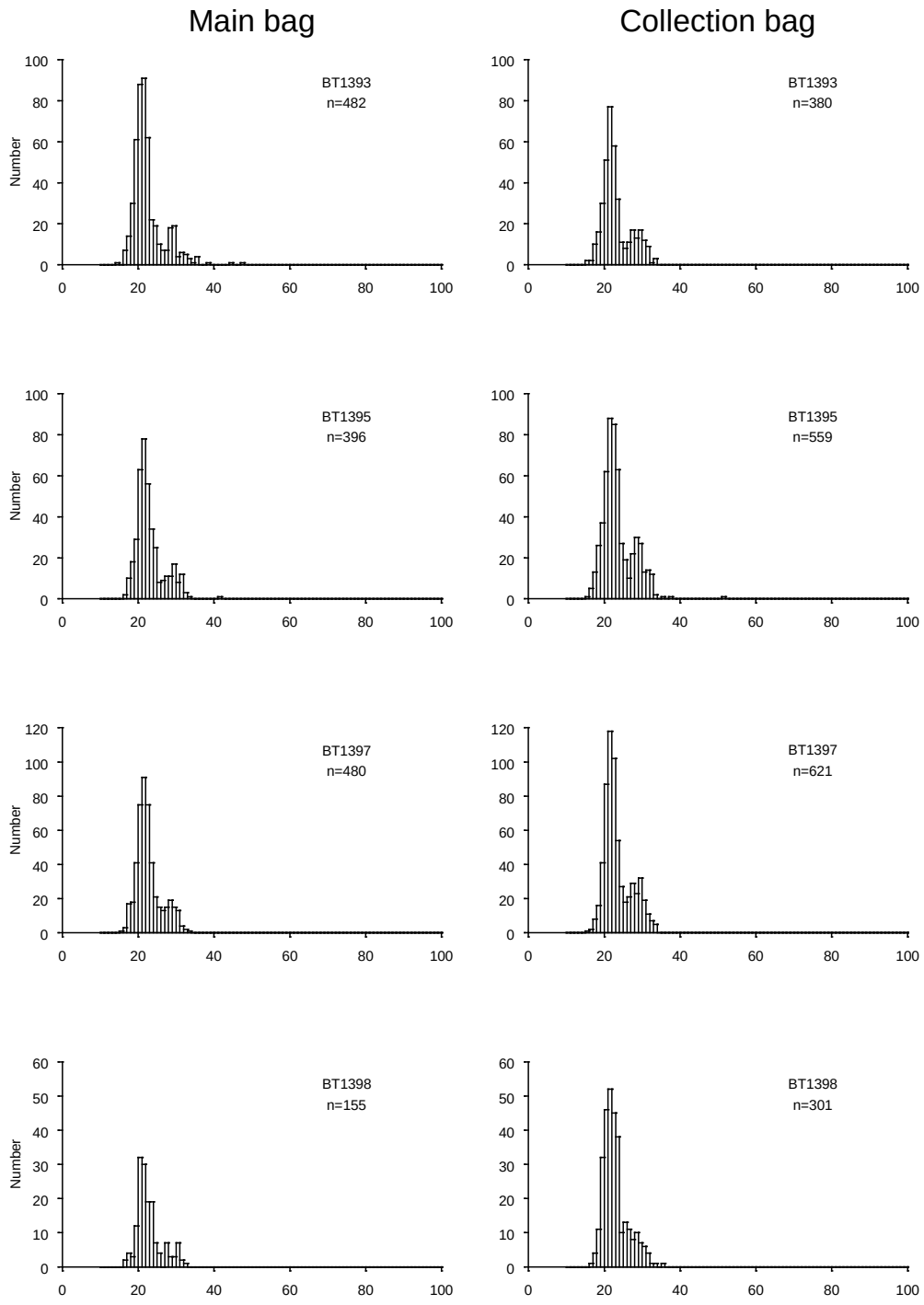


Figure 5b. Continued.

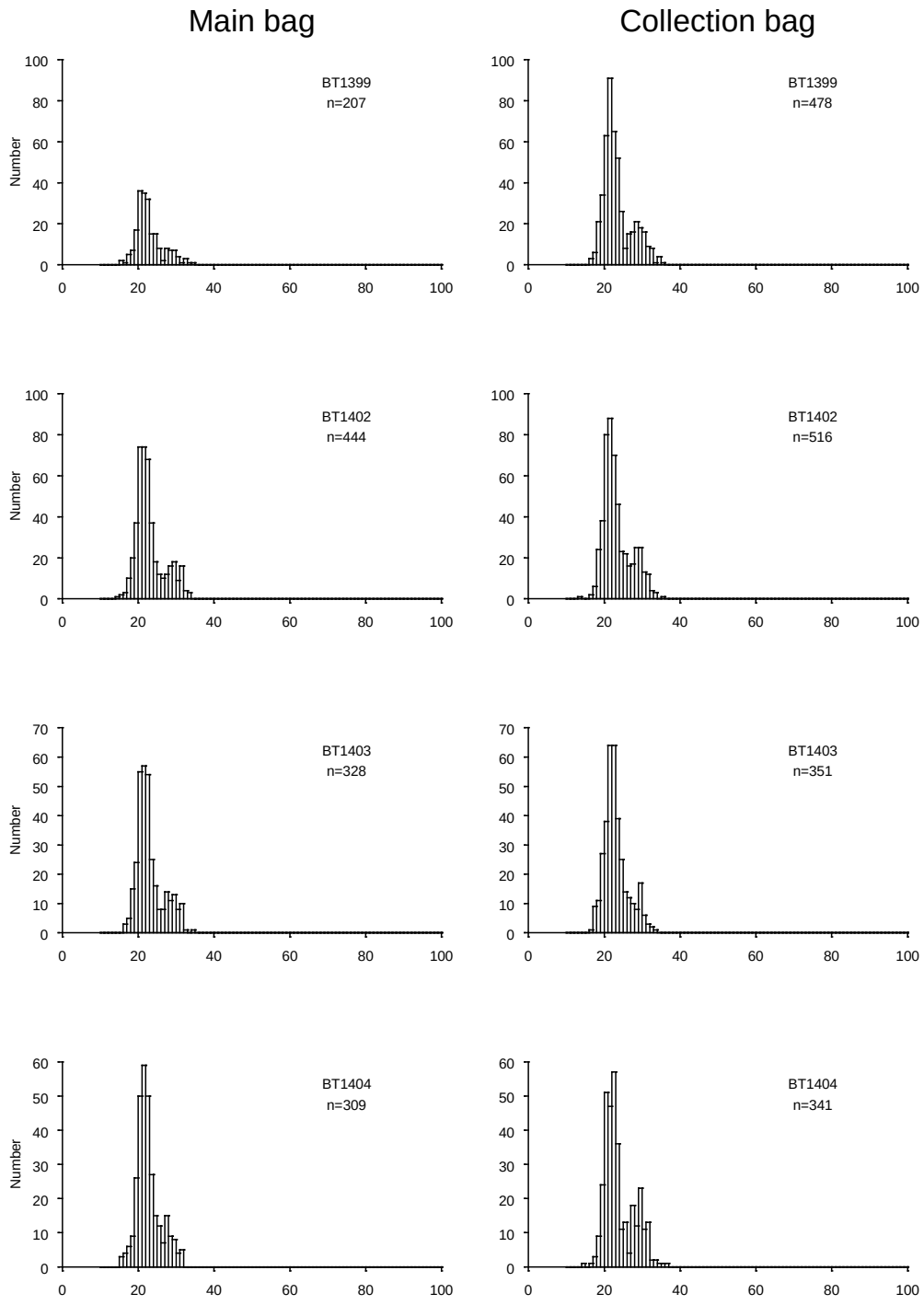


Figure 5b Continued.

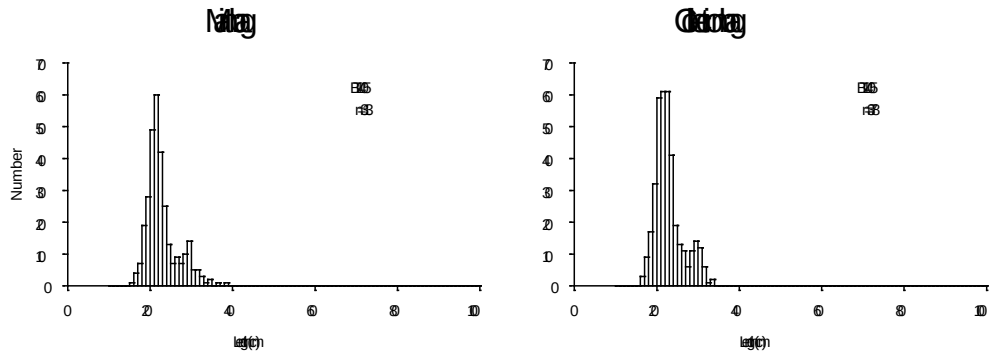


Figure 5b. Continued.

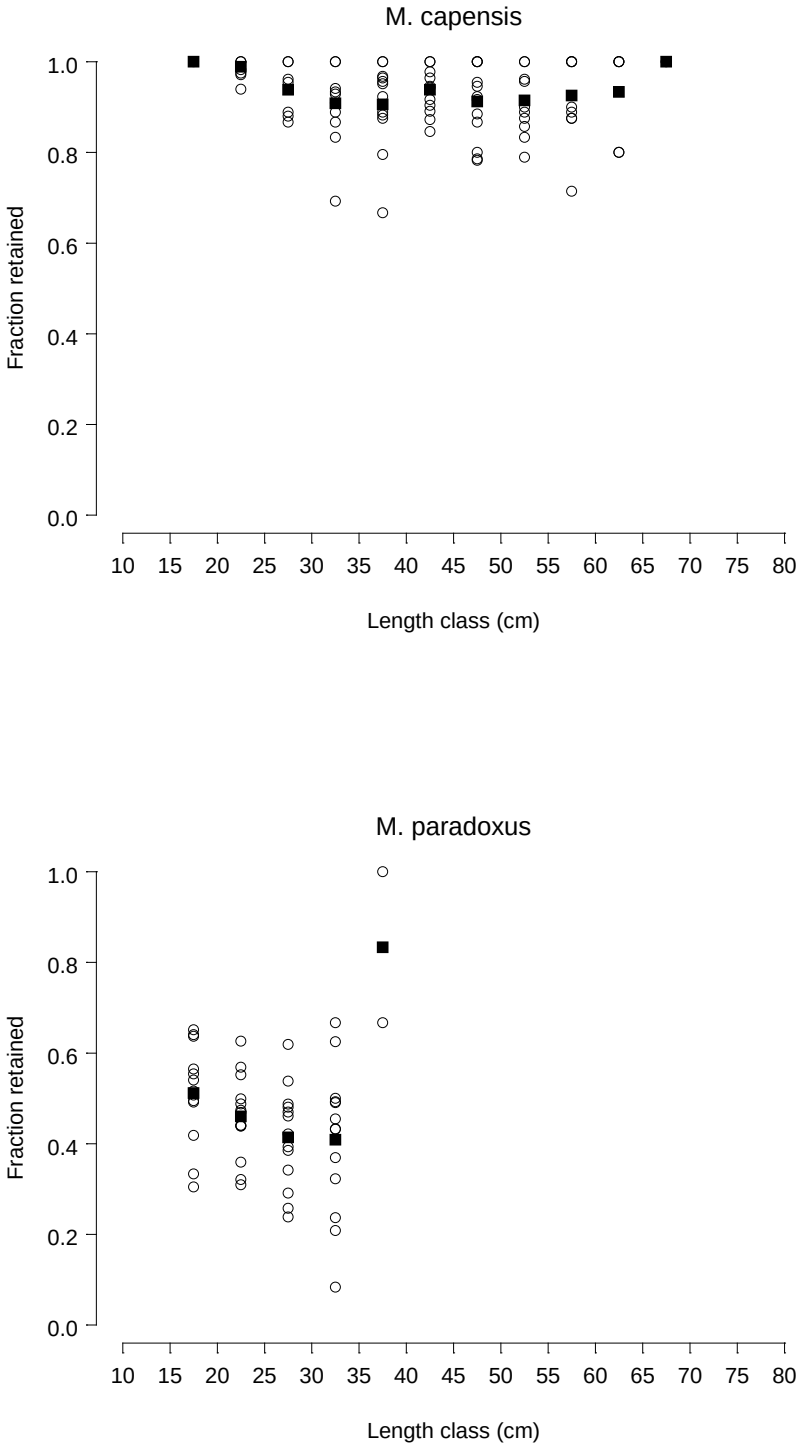


Figure 5c. Area A. Fraction of the total catch (by number) that was retained in the main bag. Calculations were made for each 5 cm length interval. Only hauls with at least 5 fish in a length class are plotted. Open circles are individual haul observations, filled squares are mean values.

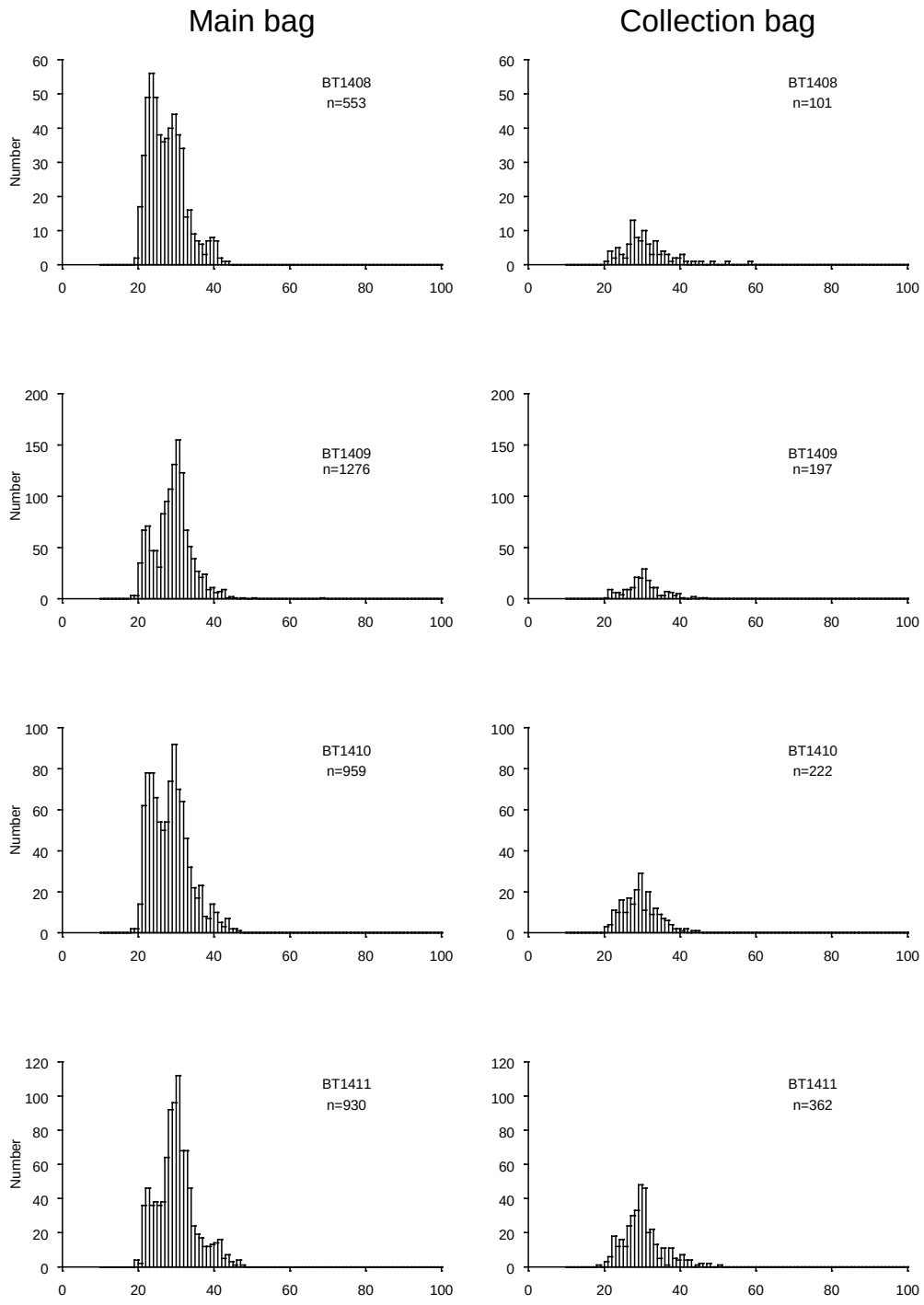
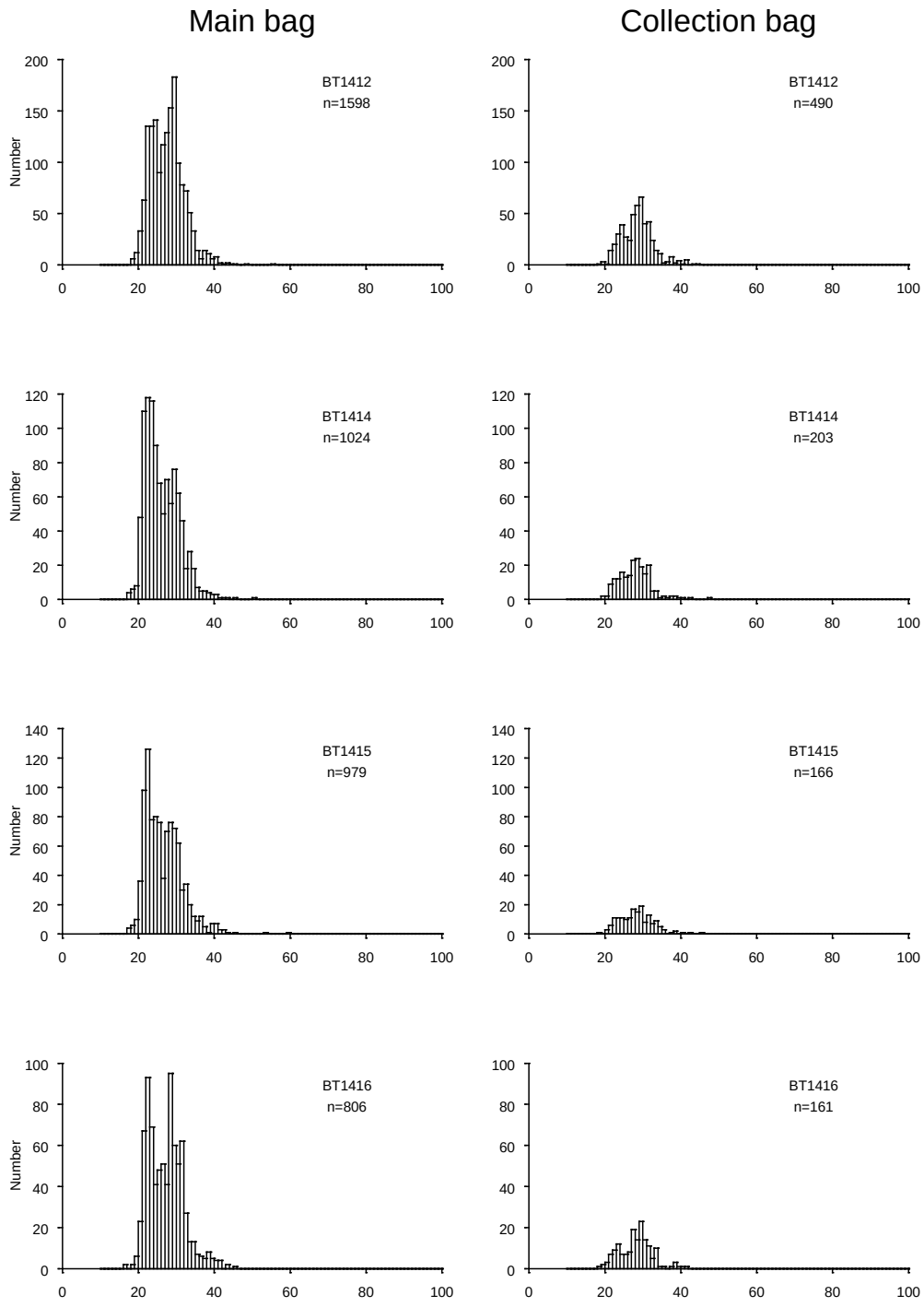


Figure 6a. Area B. Length distribution of *M. paradoxus* caught in the main bag (left panel) and in the collection bag (right panel) for each of the hauls in this area.



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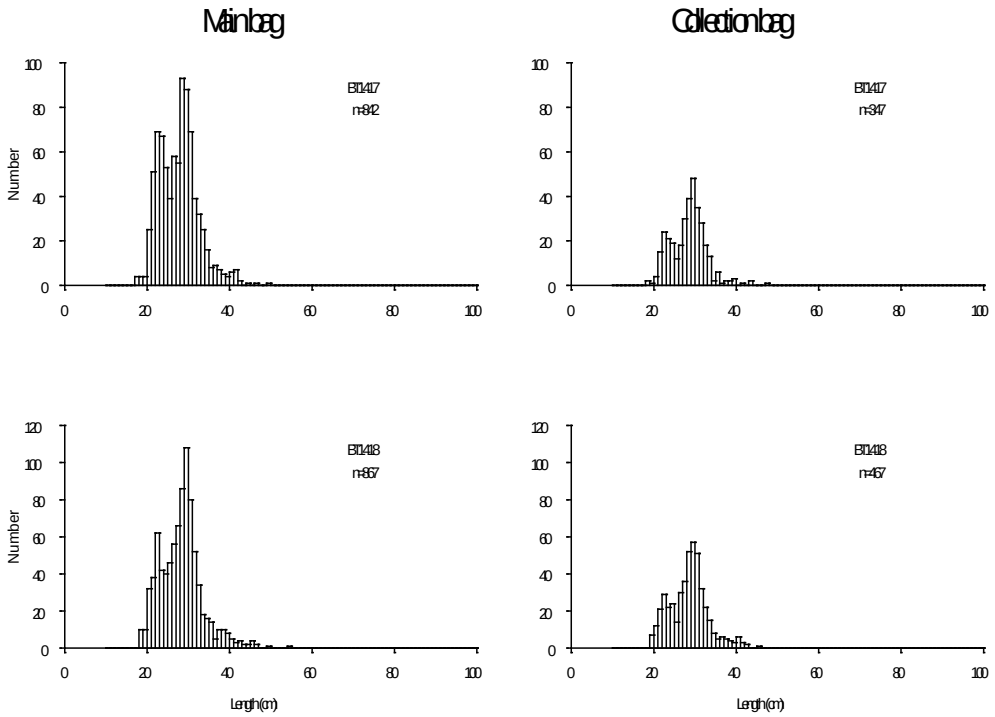


Figure 6a. Continued.

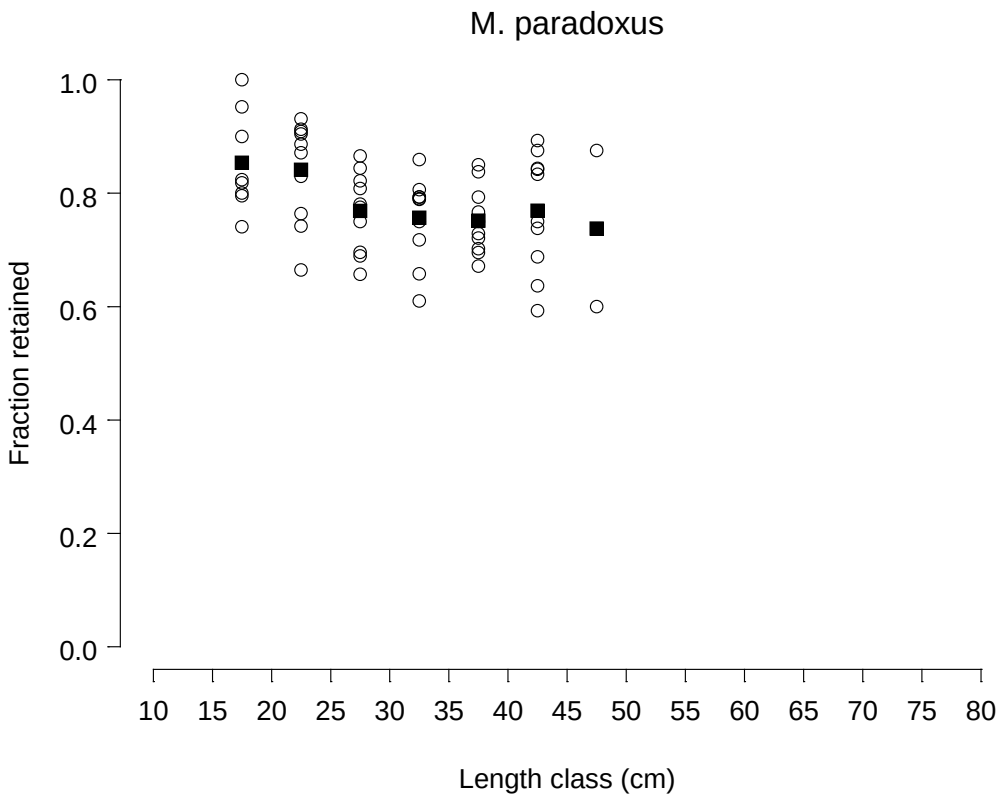


Figure 6b. Area B. Fraction of the total catch (by number) that was retained in the main bag. Calculations were made for each 5 cm length interval. Only hauls with at least 5 fish in a length class are plotted. Open circles are individual haul observations, filled squares are mean values.

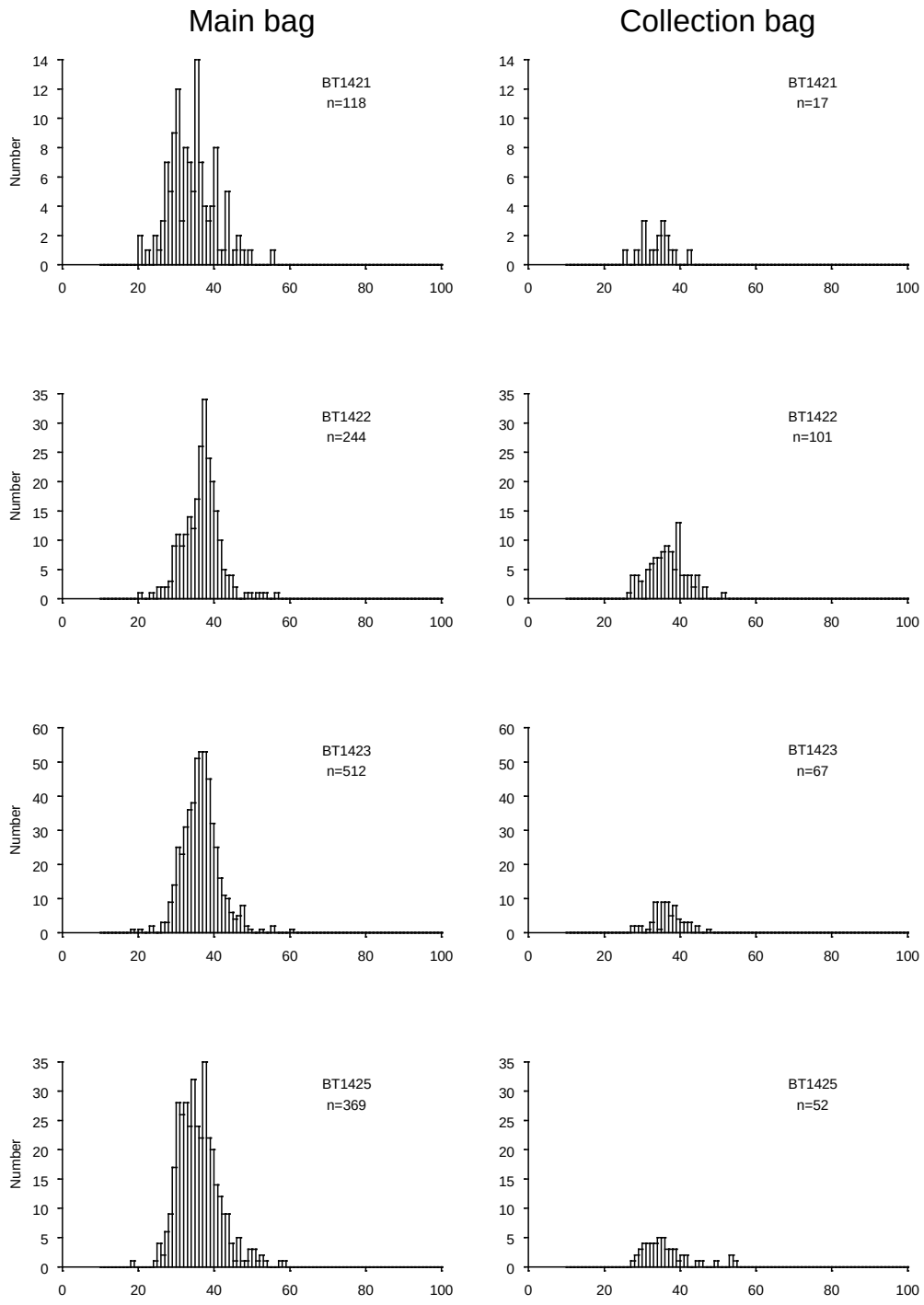


Figure 7a. Area C. Length distribution of *M. paradoxus* caught in the main bag (left panel) and in the collection bag (right panel) for each of the hauls in this area.

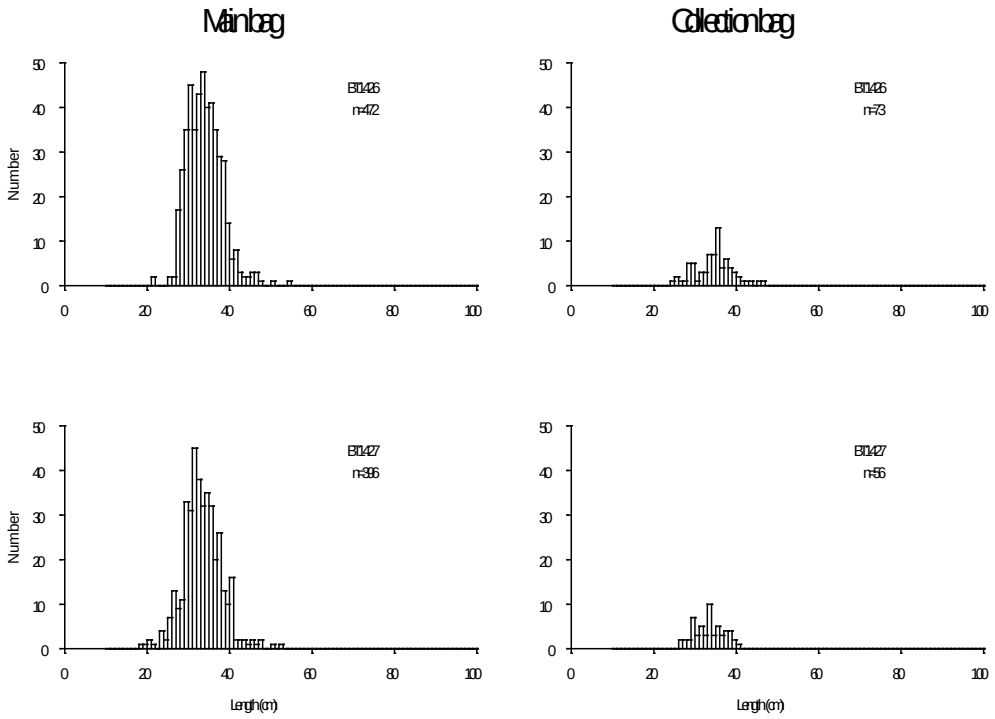


Figure 7a. Continued.

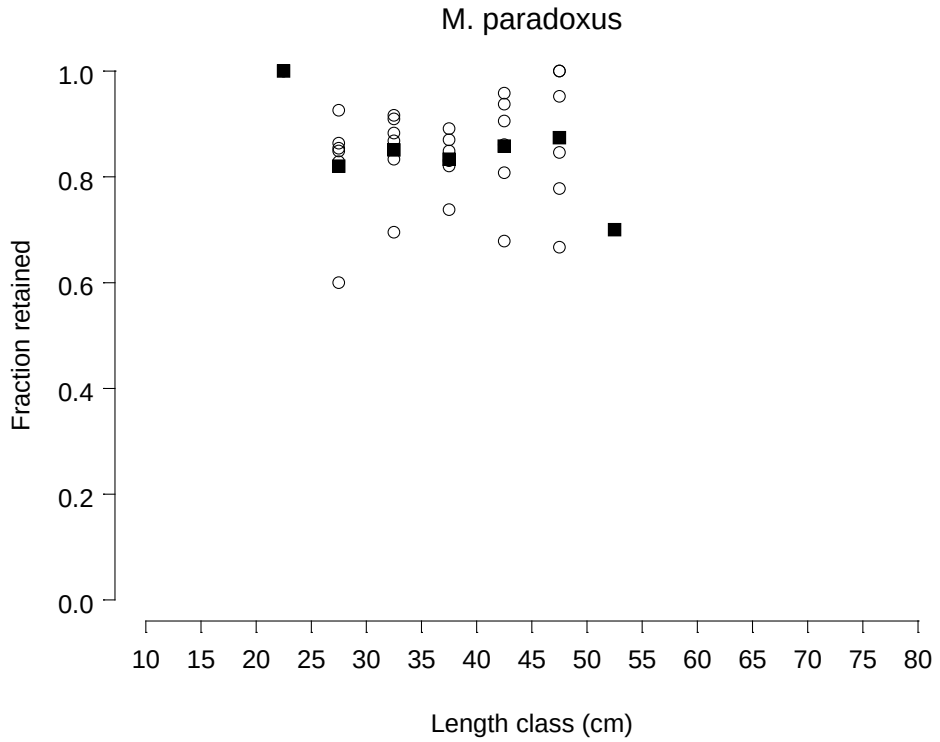


Figure 7b. Area C. Fraction of the total catch (by number) that was retained in the main bag. Calculations were made for each 5 cm length interval. Only hauls with at least 5 fish in a length class are plotted. Open circles are individual haul observations, filled squares are mean values.

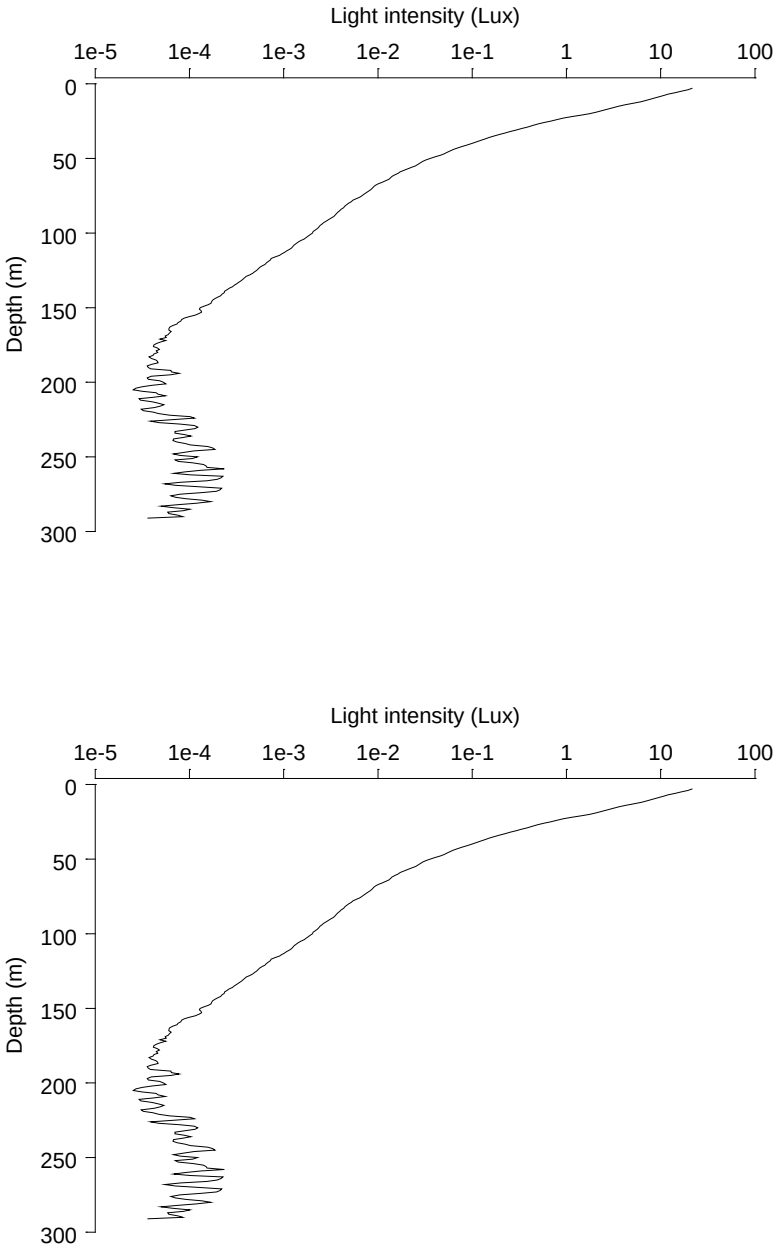
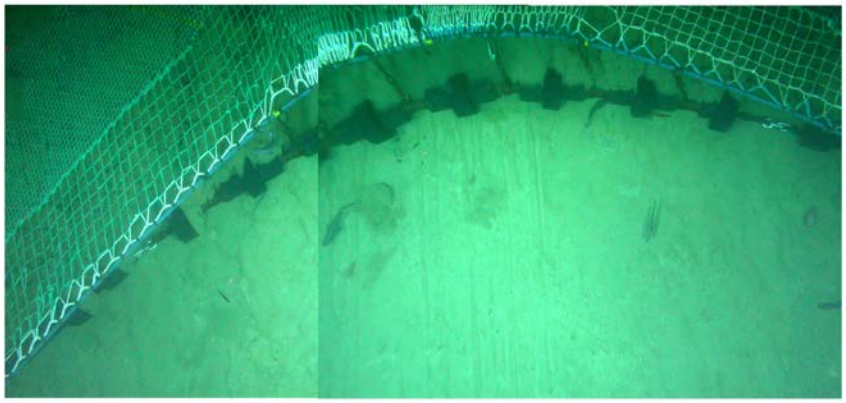


Figure 8. Light intensity profile from surface to bottom as measured in area A. Upper graph refers to CTD station number 1082 and lower to station number 1083 (see Table 1).



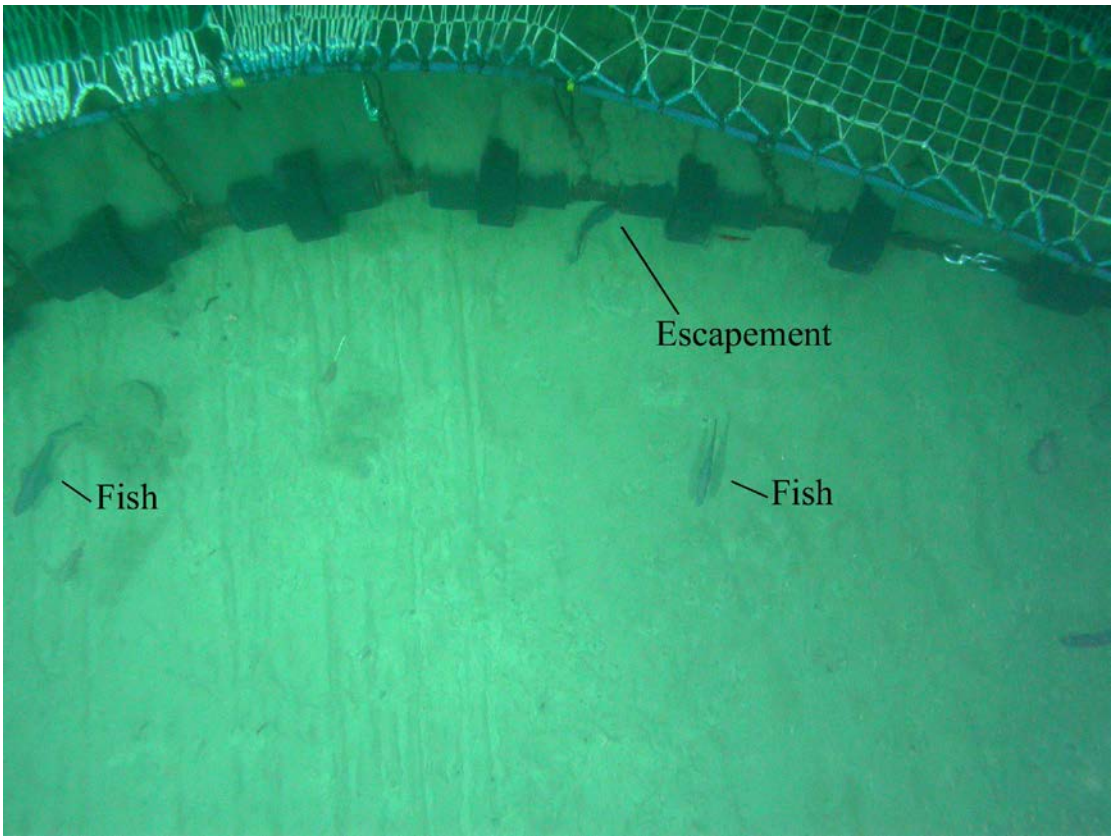


Figure 9.Images showing fish's reaction in front of the trawl gear.

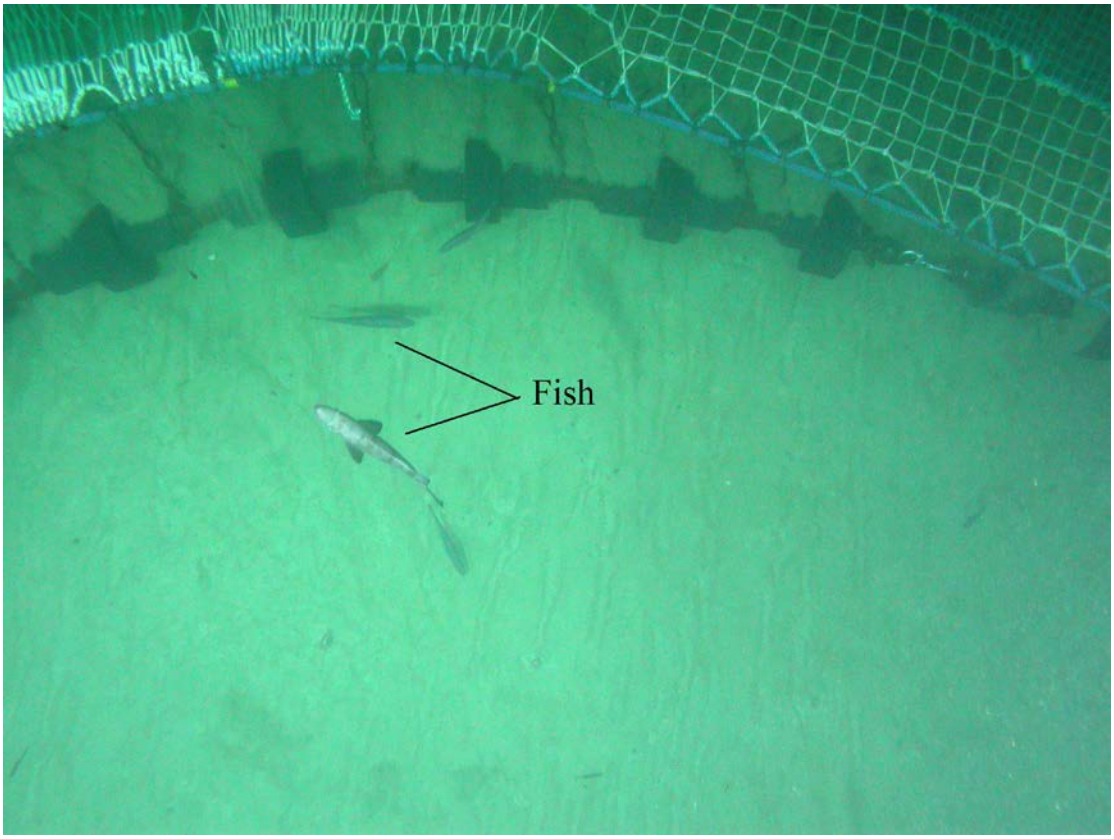


Figure 9. Continued.

Summary of trawl station information as well as Kgs of various species caught																		
Station	1388		1389		1390		1392		1393		1395		1396		1397		1398	
Date	09.10.03		09.10.03		09.10.03		09.10.03		09.10.03		10.10.03		10.10.03		10.10.03		11.10.03	
Start time (GMT)	05:17		07:02		08:28		13:09		14:42		06:34		08:15		09:50		11:33	
Start depth (m)	302		300		299		298		300		298		298		299		299	
Duration (min)	14		20		30		29		32		30		30		30		30	
Type of bag	main	coll.	main	coll.	main	coll.	main	coll.	main	coll.	main	coll.	main	coll.	main	coll.	main	coll.
Merluccius paradoxus	15.1	10.1	4.14	9.7	30.85	30.8	41.7	33.45	37.85	31.9	80.70	49.15	30.15	28.95	37.30	52.80	12.2	23.20
Merluccius capensis	19.7		51.6	2.66	64.4	10.9	103.50	4.15	66.15	6.1	32.50	11.59	77.65	5.56	101.20	17.75	67.55	4.40
Lophius vomerinus		1.6		2.78	1.52	13.25	1.85	0.003	6.11	7.41	5.45	10.30	5.3	2.10		12.50	8.65	6.69
Genypterus capensis	0.68		0.7	0.93	1.87	1.94	2.2	2.3	1.85		0.93	0.66	0.72		0.75		1.05	1.55
Chloroph. atlanticus	o,08						0.1	0.03			0.21	0.03	0.03		0.07		0.18	
Helicol. dactylopterus	12.25	2.8	4.59	3.1	27.95	4.15	10.48	2.16	12.69	1.4	10.83	1.77	8.06	1.88	10.43	2.86	4.72	0.30
Galeus polli	0.06	0.64	0.06	0.24	0.07	0.41	0.04	0.3	0.12	0.25	0.12	0.06	0.03	0.05	0.04	0.08		
Lepidopus caudatus	0.31			5.25							0.32				0.07			
Schedophilus huttoni	4.25		2.17		5.37						2.70							
Todarodes sagittatus	4.99	1.8	2.51		6.38	0.55	4.45	3.11	8.38	2.54	0.74	0.60	7.95	2.80		2.86	5.25	1.25
Squilla acu. Calamani	15.05		6.85	6.15	40.2	30.05	28.00	63.3	43.95	20.63	24.90	29.55	35.6	21.25	56.35	23.70	35.3	37.35
Sufflogob. bibabartus	0.23	0.21	0.12	0.07		0.15	2.66	0.63	0.42	0.33		0.54	0.15	0.55	0.25	0.20	0.28	0.24
Myctophidae	0.07		0.05	0.05			0.98	0.24	0.06			0.03	0.12	0.05	0.07	0.20	0.32	0.06
Krill	0.45		0.49	0.2			1.87											
Deepwater fish mix	0.29	6.4	16.35		16.6	20.75	8.5		9.3	6.1	1.50	17.58	5.94		5.49		2.08	14.37
Squalus megalops		1.22																
Caelo. simorhynchus		6.33	1.03	4.01	4.1	13.8	1.82	5.91	1.5	5.55	2.46	7.68	0.87	2.20	2.35	7.72	1.22	1.68
Bathynectus piperitus		0.39	0.08	0.11	0.09	0.28		0.36	0.12	0.5	0.42	0.03	0.06		0.04	0.32	0.12	0.30
Manthis shrimp		10.7																
Todaropsis eblinae				0.05			0.98		0.03				0.03					
sponges							5.38				5.97		0.32	13.80		13.92	0.32	6.21
Trachipt. trachypterus									2.04									
Trachurus capensis													0.43					
Epigonus telescopus														0.03				
Ebinania cost.																	0.08	

Station	1399		1402		1403		11404		1405		Station	1408		1409		1410	
Date	10.10.03		11.10.03		11.10.03		11.10.03		11.10.03		Date	12.10.03		12.10.03		12.10.03	
Start time (GMT)	13:13		06:31		08:02		09:38		11:14		Start time (GMT)	07:18		08:41		10:28	
Start depth (m)	299		298		297		298		298		Start depth (m)	447		447		448	
Duration (min)	30		30		30		30		30		Duration (min)	15		30		30	
Type of bag	main	coll.	main	coll.	main	coll.	main	coll.	main	coll.	Type of bag	main	coll.	main	coll.	main	coll.
Merluccius paradoxus	16.50	40.60	36.35	43.70	26.50	38.95	24.20	39.50	25.40	29.60	Merluccius paradoxus	79.5	21.1	227.00	37.75	154.10	39.85
Merluccius capensis	71.30	3.15	94.38	10.95	142.80	7.95	119.45	7.65	80.35	11.70	Merluccius capensis	1.04					
Lophius vomerinus		6.80	6.45	4.62	2.14		3.10		4.60	1.59	Lophius vomerinus		0.65	1.46	2.55		3.65
Genypterus capensis			0.64				0.85			0.03	Genypterus capensis		2.29	3.45			5.05
Chlorophthalmus atlanticus		0.03	0.03	0.21	0.14	0.09	0.12				Selacophidium guentheri	1.68	4.41	1.16	11.04	2.26	8.45
Helicolenus dactylopterus	14.16	1.15	3.08	4.76	88.62	1.41	5.76	2.25	2.25	1.15	Helicolenus dactylopterus	0.9	0.11	1.39	1.44	2.08	0.78
Galeus polli	0.04	0.03			0.21	0.57	0.30	0.09		0.05	Galeus polli	0.5	0.2	2.44	3.15	4.60	5.88
Lepidopus caudatus											Epigonus dactylopterus		1.1				
Schedophilus huttoni					2.18		1.45		2.75		Nezumia micronychodon	1.82	5.25	2.72		2.72	6.75
Todarodes sagittatus	6.45	1.66	4.95	5.25	7.99	2.54	2.95	2.03	2.90	3.86	Todarodes sagittatus	5.18	2.08	9.13	3.41	2.84	
Squilla acu. Calamari	30.50	23.13	12.35	27.65	65.45	38.70	52.05	28.41	14.35	28.63	Hoplostethus candenati	13.97	0.75	22.65	16.59	15.90	6.8
Sufflogobius bibabartus	0.20	0.30	1.39	0.49	3.39	0.42	0.51	0.66	0.10	2.73	Trachyrinchus scabrus	0.07	0.1		10.77		0.08
Myctophidae	0.20	0.05	0.26	0.32	0.21	0.09		0.18		0.23	RAJIDAE	2.24	24.8	10.15	21.20	16.00	24.25
Krill									0.08		Deepwater fish mix	4.49	8.45	3.49	39.00	5.82	24.25
Deepwater fish mix									6.48		Trachipterus Trachypterus	3.65					
Squalus megalops											Schedophilus huttoni	2.3		2.00	4.20		
Caelorinchus spp.									0.71		Epigonus telescopus	0.26		0.52	7.53	0.48	3.45
Bathynectus piperitus			0.07	0.35		0.21				0.18	MYCTOPHIDAE	0.14		0.04			
Manthis shrimp											Symboborus boops	0.1		0.09		0.14	
Sponges	9.20	19.85		56.77	1.72	18.72	7.20	12.12		11.70	Stomias boaboa	0.1		0.07	0.09	0.10	
Caelo. simorhynchus	0.92	4.50	0.54	7.07	1.58	4.41	1.08	5.64		3.45	Trychianidae	0.07					
Ebinania costaecanari											Caelo. simorhynchus	0.73		0.68		0.48	1.48
Chrysora spp.										1.00	Bathynectes piperitus	0.05		0.02	0.24	0.02	0.58
											OMMASTREPHIDAE	1.96					
											Myxine (hagfish)				0.18		0.48
											Maulisi microlepis			0.03			0.1
											Phot. Argentis			0.05		0.08	0.08
											Ebinania cost.			0.26		0.30	0.85
											OTOPODIDAE					0.20	
											Nemitchys scolo.			0.01		0.10	
											Bathy vicinus					0.02	
											Mandi capensis					0.06	
											Chloroph. atlanticus					0.02	
											HISTIOTEUTHIDAE					0.38	
											Notacanthus sexipinis			0.03			
											Narke capensis			0.76			
											squids (small)			0.35			
											squids			0.13			
											Octopus			0.02			
											Centrophorus granulosus						
											Yarella blackfordi						
											Epigonus denticulatus						
											Caelo. Matamua						

Station	1411		1412		1414		1415		1416		1417		1418		1421		1422		1423		1425	
Date	12.10.03		12.10.03		13.10.03		13.10.03		13.10.03		13.10.03		13.10.03		14.10.03		14.10.03		14.10.03		15.10.03	
Start time (GMT)	12:16		14:06		06:47		08:26		10:11		11:59		13:40		10:03		12:19		14:06		07:22	
Start depth (m)	449		448		451		445		452		446		445		564		572		577		577	
Duration (min)	30		30		30		30		31		30		30		30		30		30		30	
Type of bag	main	coll.	main	coll.	main	coll.	main	coll.	main	coll.	main	coll.	main	coll.	main	coll.	main	coll.	main	coll.	main	coll.
Merluccius paradoxus	175.93	68.4	235.10	78	128.85	30.55	132.60	26.50	115.18	24.70	126.36	54.95	145.40	75.45	34.00	4.80	83.35	34.45	169.30	22.40	120.25	18.20
Merluccius capensis								3.00			1.80											
Lophius vomerinus						9.10		1.50	1.75	20.75	3.75			5.55		16.35				3.17		
Genypterus capensis	2.42			1.95	2.60				0.80	1.63	2.70			2.1								
Selacophidium guentheri	5.02	14.5	2.76	8.62	1.94	15.65	1.18	19.14	9.02	20.76	4.09	9.20	3.22	10.06	2.56	12.14	3.33	11.43	6.72	27.51	7.44	35.25
Helicolenus dactylopterus	3.46	0.23	2.04	0.74	1.90	0.39	3.34	0.84	2.55	0.32	3.50	0.12	2.28	0.24								
Galeus polli	11.76	8.9	14.76	12.94	3.50	6.65	4.42	9.99	11.94	5.36	14.44	7.22	8.42	4.4	0.20	2.31	0.30	0.60	0.15	0.42	0.24	0.18
Epigonus dactylopterus																						
Nezumia micronychodon	1.94	3.75		6.64	4.92	15.89	1.66	12.18	17.62	15.79	10.56	9.48	9.12	9.8	4.48	10.26	5.79	19.86	5.27	12.18	11.28	24.78
Todarodes sagittatus	4.34	1.63	8.20	5.29	10.85	24.01	11.45	3.26		1.39	4.08	2.06	2.40	1.26				0.79			0.88	0.88
Hoplostethus candenati	9.54	1.95	3.42	1.42	17.38	7.28	22.17	9.00	13.04	4.69	19.46	1.98	9.30	0.96	13.66	6.21	43.23	10.95	13.64	1.54	8.16	33.36
Trachyrinchus scabrus	0.14	0.15		0.02				0.15	0.12	0.32	0.14	0.14		0.12	2.08	6.87	0.30	1.20	0.30	1.37	0.99	1.77
RAJIDAE	10.92	46.25	14.22	23.7	10.45	28.40	26.80	20.95	12.95	55.60	6.15	10.30	20.80	14.95	3.22	0.54	0.69	2.92	0.69		0.10	0.83
Deepwater fish mix	4.32	16.83	2.25	14.8	2.16	27.76	0.70	20.88	3.47	24.99	5.06	16.02	3.14	15.54	27.46	23.40	29.67	21.09	14.04	20.09	13.44	7.56
Trachipterus Trachypterus																					3.50	
Schedophilus huttoni			2.32	2.65			10.14		1.89			3.90	5.30									
Epigonus telescopus	0.16	0.43	0.18	3.1	0.80	6.44	0.30	5.46	0.74	3.50	0.46		0.52	0.9	0.14	1.23	0.21	0.27	0.02	1.26		0.12
MYCTOPHIDAE	0.14																					
Symboborus boops			0.03	0.02																		
Stomias boaboa	0.06	0.03			0.10				0.07						0.46	0.03	0.27	0.06			0.30	
Trychianidae																						
Caelo. simorhynchus		0.38	3.09	0.76	0.52	2.45	0.80	1.20	0.67	0.28	0.69	0.58	0.38	0.56			0.48					
Bathynectes piperitus		0.55		0.22	0.20	0.18		0.03		0.25		0.36		0.3								
OMMASTREPHIDAE																						
Myxine (hagfish)	0.28	0.25		0.74		3.15		2.11		0.84		0.40		1.34								
Maulisi microlepis	0.02	0.13	3.03	0.48										0.04								
Phot. Argentis	0.02												0.12									
Ebinania cost.	0.04	0.03	0.15	0.96	0.12	2.10		1.47	0.02	0.28	0.02		0.56	0.5	0.92	2.97	0.24	4.47		3.92		
OTOPODIDAE																						
Nemitchys scolo.															0.08		0.03		1.13		0.09	
Bathy vicinus																					0.24	
Mandi capensis																					0.69	
Chloroph. atlanticus																					14.00	
HISTIOTEUTHIDAE	0.06				0.28										1.66	0.12	0.45					
Notacanthus sexipinis											0.14				1.10	3.00	0.33	4.98	1.5	5.01	4.35	8.52
Narke capensis																						
squids (small)																						
squids																						
Octopus								0.03														
Centrophorus granulosus	3.03																					
Yarella blackfordi	0.06	0.03		0.12												1.77	1.11	0.18	0.26		4.05	0.39
Epigonus denticulatus												0.84										
Caelo. Matamua															1.22	1.28		0.57				
Lithodex ferox																		2.10		1.93		0.90
OPSTOMIDAE																		0.63	0.44		1.53	0.41

Bassanago albescence																		0.03					
Chaceon marita																				1.35			
Tetrag. Cuvier																					23.64		
PARALEPIDIDAE																					0.24		
Lampanyctodes australis																					0.69		
Chrysora spp.																					14.13		
Lampr. Exutus																							

Station	1426		1427	
Date	15.10.03		15.10.03	
Start time (GMT)	07:22		07:22	
Start depth (m)	577		577	
Duration (min)	30		30	
Type of bag	main	coll.	main	coll.
Merluccius paradoxus	123.7	20.5	100.10	13.8
Merluccius capensis				
Lophius vomerinus		1.83	7.16	2.38
Genypterus capensis				
Selacophidium guentheri	6.38	31.13	5.74	25.3
Helicolenus dactylopterus				
Galeus polli	0.32	0.55	0.32	
Epigonus dactylopterus				
Nezumia micronychodon	7.26	15.17	6.22	14.13
Todarodes sagittatus		0.56	2.00	
Hoplostethus candenati	7.3	0.35	3.98	1.2
Trachyrinchus scabrus		1.15	0.22	0.45
RAJIDAE			1.01	
Deepwater fish mix	31.68	3.88	13.84	10.28
Trachipterus Trachypterus			2.80	
Schedophilus huttoni			6.75	1.96
Epigonus telescopus		0.10	2.12	1.38
MYCTOPHIDAE				
Symboborus boops				
Stomias boaboa	0.36		0.32	
Trychianidae				
Caelo. simorhynchus				
Bathynectes piperitus				
OMMASTREPHIDAE				
Myxine (hagfish)		0.47		
Maulisi microlepis				0.03
Phot. Argentis				
Ebinania cost.	0.44	3.80	1.04	0.78
OTOPODIDAE				
Nemitchys scolo.	0.18	0.03	0.18	
Bathy vicinus				

Mandi capensis				
Chloroph. atlanticus				
HISTIOTEUTHIDAE			0.06	
Notacanthus sexipinis	1.26	5.68	0.82	3.65
Narke capensis				
squids (small)				
squids				
Octopus				
Centrophorus granulosus				
Yarella blackfordi	1.36	0.73	0.20	
Epigonus denticulatus				
Caelo. Matamua		1.23		
Lithodex ferox	0.14	5.97		0.71
OPSTOMIDAE	0.78			0.25
Bassanago albescence			0.04	
Chaceon marita				
Tetrag. Cuvier	0.52			
PARALEPIDIDAE				
Lampanyctodes australis	0.18		0.06	
Chrysora spp.				
Lampr. Exutus	0.02		0.10	