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Summer 2026

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Completed by: H. Cromie, R. O'Loughlin, Heather Moore, Elizabeth Watt

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Approved by: Matthew Service

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Further information

Agri-Food and Biosciences Institute (AFBI), Fisheries & Aquatic Ecosystems Branch
Coastal Zone Science Group, Newforge Lane, Belfast, BT9 5PX, Tel: 028-90255472

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Summary

AFBI undertook an integrated stock assessment programme during summer 2026 to determine the distribution, abundance and biomass of mussel stocks within the Outer Ards area, focusing on Burial Island, Skullmartin and The Feathers. The survey combined towed video, RoxAnn acoustic ground discrimination and targeted dredge sampling to define mussel bed extent, assess stock structure and estimate standing biomass. The results confirm that mussels remain present at all three grounds.

Estimated Mussel Biomass

Site	Estimated Biomass (t)	Key Findings
Burial Island	361	Established bed with seed, overwintered and adult mussels present.
Skullmartin	704	Largest stock recorded; evidence of strong recruitment and multiple year classes.
The Feathers	367	Predominantly adult mussels with no seed detected.
Total	1,432	Combined estimated biomass across surveyed grounds.

The most significant finding was at Skullmartin, where an estimated biomass of approximately 704 tonnes was recorded. Mussels were identified across multiple acoustic facies, and length-frequency analyses demonstrated the presence of both juvenile and adult cohorts. Several dredge tows contained distinct seed and adult size classes, indicating successful recruitment over successive years and suggesting that the bed is showing signs of recovery. Given that the site has remained closed following historical overexploitation and surveys since 2019 have reported only limited mussel occurrence, the 2026 survey represents the strongest evidence in recent years of a potentially sustainable stock developing at this location.

Burial Island supported an estimated biomass of 361 tonnes. Video and dredge surveys identified an established mussel bed associated with two acoustically distinct seabed facies. Mussels ranged from recently settled seed to large adults exceeding 55 mm shell length, confirming an actively recruiting population. While biomass estimates are modest compared with some historical assessments, the presence of multiple year classes demonstrates continued productivity and the maintenance of a viable stock. Distribution was patchy, with the highest densities associated with a limited area of suitable habitat.

At The Feathers, mussel biomass was estimated at 367 tonnes. Unlike the other sites, sampling identified a predominantly adult stock with a mean shell length of over 63 mm and no evidence of recent recruitment. Although biomass estimates are comparable to Burial Island, the absence of juvenile mussels suggests limited recent settlement and raises uncertainty regarding long-term sustainability if recruitment does not improve. Survey operations were partially constrained by the presence of fishing gear, which restricted access to some planned sampling locations.

The survey also recorded three individuals of the invasive non-native slipper limpet (*Crepidula fornicata*) at Burial Island, attached to live mussels. No specimens were observed at Skullmartin or The Feathers during 2026.

Introduction

Interdisciplinary survey methodologies were executed by the Agri-Food and Biosciences Institute (AFBI) on board both the RV *Corystes* and the DAERA vessel *Joe Breen* to establish the extent and quantity of mussel within the areas of Burial Island, Skullmartin and The Feathers off the Outer Ards peninsula.

Methodology

The distribution, extent and abundance of mussel stock was assessed using an integrated programme of acoustic ground discrimination (RoxAnn AGDS), towed video and dredge surveys.

Initial underwater video survey data were collected via Cathx R300 camera mounted on epibenthic video sled towed by the RV *Corystes* in June 2026. Seabed imagery enabled mussel bed identification to direct subsequent survey planning following NMBAQC Guidelines (Turner *et al.*, 2016).

Acoustic surveys employing a 200 kHz RoxAnn system were conducted on the DAERA vessel *Joe Breen* in July 2026. Acoustic data was processed, interpolated and classified to delineate potential mussel beds.

In August and September 2026, dredge surveys using a 1.5m wide dredge were undertaken. This provided validation of acoustic and video observations, enabling assessment of mussel abundance and collection of samples for laboratory analysis, including biomass estimation and mussel size measurements.

Additional sub sampling and screening of by catch was undertaken for the presence of invasive non-native species (INNS) as per the terms of the Section 14 Permit MLAAQ2026053.

Results and Discussion

Burial Island

Video tow surveys identified a small mussel bed comprising a range of size classes, from seed mussels to large adults. Mussels were observed in three of the five video tows, with the highest coverage recorded during Tow BI_3, where mussels covered up to 80% of the seabed and showed limited evidence of predation (Fig. 1). The densest aggregation of mussels was associated with two distinct acoustic classification areas outlined during the AGDS survey.

A total of 17 dredge tows were completed, of which four (BI_10, BI_11, BI_12 and BI_15) contained notable quantities of mussel or mussel seed (Fig. 2). Photographs of the dredge tow contents are provided in Annex A. Waste levels were relatively low in three of these tows, ranging from 28% to 43%, while BI_10 recorded a substantially higher waste content of 80%.

Tow BI_10 contained two distinct mussel size classes, with mean shell lengths of 20.8 mm and 40.9 mm. Tow BI_11, located within the same acoustic area, contained the largest mussels recorded during the survey, with a mean shell length of 55.9 mm. Tows BI_12 and BI_15, situated within the second acoustically distinct area, were dominated by overwintered mussels, with mean shell lengths of 41.7 mm and 39.7 mm, respectively (Table 1; Fig. 3).

As indicated by these results, a mussel bed was identified in the vicinity of Burial Island, within two distinct acoustic facies. An occurrence of a range of size classes from seed to large adulted confirmed this bed as small but established. The predominance of mussels greater than 40 mm shell length suggests that the bed is largely composed of mature and overwintered stock, although the presence of smaller mussels in Tow BI_10 provides evidence of recent recruitment. The variation in size structure between dredge tows indicates spatial heterogeneity within the bed, with some areas supporting mixed-age populations while others are dominated by older mussels.

Biomass

To estimate the mussel stock present in this area, calculations were carried out following the methodology of Strong and Service (2011). Five dredge tows were conducted within the relevant acoustic facies (Fig. 2); four tows (BI_10, BI_11, BI_12 and BI_15) contained sufficient mussels for sampling and biomass estimation. The gridcode boundaries were subsequently refined to exclude areas overlapping *Modiolus modiolus* bed and its associated buffer zone, as well as locations where mussels were absent (Fig. 4). Based on these calculations, the mussel bed was estimated to contain approximately **361 tonnes** of mussels.

This tonnage estimation represents a relatively modest resource compared with historical biomass estimates for Burial Island and other mussel beds within the Outer Ards area. Mussel distribution varied across the survey area, with the greatest and most continuous coverage associated with a single acoustic facies. In contrast, mussels within other seabed types occurred at lower densities and exhibited a patchier distribution

Skullmartin

Video tow surveys identified a small mussel bed primarily associated with two distinct acoustic facies (Fig. 5), comprising of a range of size classes, from seed mussels to large adults. Mussels were observed in five of the six video tows, with the highest coverage recorded in tows SK_3, SK_4 and SK_5, where mussels covered up to 80% of the seabed. There was some evidence of predation noted in SK_6 and SK_7.

A total of 11 dredge tows were completed, of which 6 tows (SK_2, SK_5, SK_6, SK_7, SK_8 and SK_11) contained notable quantities of mussel or mussel seed (Fig. 6). Photographs of the dredge tow contents are provided in Annex B. Waste levels were low in four of these tows, ranging from 28% to 43% (SK_5, SK_6, SK_7 and SK_8), while SK_2 and SK_11 recorded a substantially higher waste content of 86 and 88% respectively. Lower waste percentages in Tows SK_5 to SK_8 indicate these areas represent the core of the bed.

Three tows contained two distinct mussel size classes, with mean shell lengths of 19.67mm and 39.81mm in Tow SK_6, 20.28mm and 36.78mm in Tow SK_7 and 17.84mm and 40.59 in Tow SK_8. SK_2 contained small seed only with a mean shell length of 19.6mm, SK_5 contained mussel with a mean shell length of 38.55 mm and SK_11 contained the largest mussels recorded during the survey, with a mean shell length of 59.16 mm (Table 2; Fig. 7).

The length-frequency analysis revealed both juvenile and adult mussels, with several tows containing distinct seed and older mussel size classes. This mixed population structure is encouraging and indicates successful recruitment over successive years.

Biomass

Based on the findings described above, a small mussel bed was identified in the vicinity of Skullmartin, within RoxAnn gridcode areas 4 and 5 (Fig. 8).

Applying the methodology of Strong and Service (2011), estimations of mussel stock were calculated. Of the five, four of the tows conducted within the relevant acoustic area contained sufficient mussel for biomass estimation; SK_5, SK_6, SK_7 and SK_8. Based on these calculations, the mussel bed was estimated to contain approximately **704 tonnes** of mussels.

Although 704 tonnes is modest in size compared with larger commercial beds, the presence of multiple year classes, recent recruitment, and a measurable standing stock suggest that the bed is showing signs of recovery. Continued monitoring will be important to determine whether this recruitment is sustained. The Skullmartin bed has remained closed for many years following historical overexploitation, and surveys conducted since 2019 have identified only limited quantities of mussel. In contrast, the current survey recorded a more extensive and structured aggregation, representing the first evidence in recent years of a potentially sustainable mussel bed at this site.

The Feathers

No mussels were observed in the four video tows recorded over the Feathers ground (Fig. 9). The presence of inshore fishing gear forced alterations to planned survey operations which may account for the lack of *Mytilus edulis* occurrence.

A total of 6 dredge tows were undertaken within the acoustically classified area, of which one contained notable quantities of mussel, TF_5, with waste level low at 20% (Fig.10). Photographs of the dredge contents are provided in Annex C. Laboratory analysis revealed a single size class of mean shell length 63.35mm (Table 3, Fig. 11), suggesting that recent recruitment is unlikely.

Biomass

The findings described above indicate the presence of a small mussel bed in the vicinity of the Feathers, consisting principally of adult mussel.

Using the shellfish sample collected from the singular tow of TF_5, tonnage calculations laid out in Strong and Service (2011) were applied. Thus, within the acoustic facies of TF_5, mussel biomass was estimated to be **367 tonnes**. It should again be highlighted that this represents a primarily adult population, with no seed detected or collected during the length-frequency classifications.

NB: The calculations as per Strong and Service (2011) utilise percentage waste which is based on the weight of the mussels subtracted from the total weight of the sample. If very small mussels are present within the beds the overall biomass of these mussels will be small in relation to the weight of the sample waste i.e. everything that wasn't mussels (predominately pebbles and cobbles).

By Catch including INNS

Screening of by catch was conducted on the deck of the survey vessel by trained AFBI staff and a third-party INNS observer. Further samples were returned to the AFBI laboratory for processing as per the terms of the section 14 permit. A full by catch species list for each of the three surveys sites are appended (Tables 4, 5 and 6). By catch was typical of the substrate, depth and hydrographic regime.

Three individuals of *C. fornicata* were recorded within the Burial Island survey area, the only INNS found during the survey. Two specimens were recovered from dredge tow BI_11 (specimens A and B) and one specimen from BI_12 (specimen C). All *C. fornicata* individuals occurred as single specimens attached to live mussels. *C. fornicata* shell length ranged from 14.8 mm to 20.7 mm (Table 7). Photographs of the *C. fornicata* specimens are provided in Annex D. This record is of particular interest as continued detection of this invasive non-native species confirms its presence in the Burial Island area.

Although two juvenile *C. fornicata* were recorded in the vicinity of Skullmartin during the 2025 survey, none were observed during dredge surveys undertaken in 2026. This absence in the current survey is encouraging, as it suggests that the species has not established a detectable population within the survey area. However, given the isolated record from the previous year and the known invasive potential of the species further

consideration of management strategies should be investigated, however, this is out of the scope of this report. Encouragingly, no individuals of the slipper limpet were recorded within the survey areas of the Feathers.

C. fornicata is a high-risk species listed on Schedule 9 of the Wildlife (Northern Ireland) Order 1985 (as amended). Under the Water Environment Regulations, it is also classified as a high-impact species for Northern Ireland. Its presence in a waterbody prevents a 'high' ecological status from being achieved.

Conclusions and further work

- Continue to conduct biomass assessments of the named mussel at regular intervals to quantify temporal changes in stock size and support evidence-based management decisions.
- Continue to record and monitor juvenile mussel abundance to improve understanding of recruitment success and the long-term sustainability of identified beds.
- Consider targeted surveillance for *C. fornicata* during future surveys to establish whether the species remains at low abundance at Burial Island or is becoming established locally, and for continued monitoring of Skullmartin and the Feathers allowing for future introductions or occurrence of the non-native to be detected.
- Maintain exclusion of sensitive habitats, including adjacent *M. modiolus* areas and associated buffer zones, during any future assessment or management activities.
- The use of Multi-beam Sonar rather than the Single beam Acoustic Ground Discrimination Systems as a mapping technique has shown promise and further work will be initiated to ascertain its utility.

Tables

Table 1: Burial Island: Mussel sample summary data, 24th August 2026

Tow No.		% Waste	Pieces per kilo	Median	Mean	SD	min	max
BI_10_0826	Total	8.66	639	38.09	34.02	10.24	12.77	50.81
	Seed		1525	20.66	20.79	4.01	12.77	29.49
	Adult		200	40.5	40.63	4.04	29.15	50.81
BI_11_0826	Total	8.09	75	55.68	55.89	4.97	39.79	66.00
BI_12_0826	Total	11.145	178	41.2	41.74	4.17	34.07	62.16
BI_15_0826	Total	10.085	227	39.76	39.66	2.83	34.71	46.91

Table 2: Skullmartin: Mussel sample summary data, 9th September 2026

Tow No.		% Waste	Pieces per kilo	Median	Mean	SD	min	max
SK_2_0926	Total	86.237	1832	19.66	19.60	3.12	10.71	27.39
SK_5_0926	Total	56.131	250	38.91	38.55	3.96	20.66	48.09
SK_6_0926	Total	59.389	233	38.99	37.12	7.4	17.56	45.49
	Seed		1571	19.82	19.67	1.98	17.56	22.96
	Adult		207	39.92	39.81	2.78	34.11	45.49
SK_7_0926	Total	74.174	522	31.64	28.8	8.82	13.2	43.07
	Seed		1596	20.08	20.28	3.24	13.2	25.89
	Adult		324	36.77	36.66	2.51	31.48	40.28
SK_8_0926	Total	72.776	297	38.78	33.39	11.23	10.53	47.7
	Seed		1492	18.49	17.84	4.094	10.53	23.14
	Adult		217	40.19	40.59	3.264	34.16	47.7
SK_11_0926	Total	88.249	60	59.47	59.16	5.07	45.4	70.19

Table 3: Skullmartin: Mussel sample summary data, 24th August 2026

Tow No.		% Waste	Pieces per kilo	Median	Mean	SD	min	max
SK_5_0826	Total	20.372	47	63.5	63.35	4.02	54.17	72.39

Table 4: Burial Island by catch

Key: Number = where count was possible; P = Present; SACFOR = Superabundant, Abundant, Common, Frequent, Occasional, Rare

Phylum	Species	BI_1	BI_2	BI_3	BI_4	BI_5	BI_6	BI_7	BI_8	BI_9	BI_10	BI_11	BI_12	BI_13	BI_14	BI_15	BI_16	BI_17
Annelida	<i>Polychaeta</i> sp.															2		
	Polynoidae								1									
Arthropoda	Balanidae		C							C	F		F	F		O		O
	<i>Ebalia</i> sp.									1				1				
	<i>Galathea</i> sp.							1		1								
	<i>Hyas</i> spp.		1					3		1								
	<i>Inachus</i> spp.															2		
	<i>Macropodia</i> spp.		1							1						1		
	<i>Necora puber</i>								2			1	1					
	<i>Pagurus</i> sp.	3	1	1	1	1	1	1		1	1	1	1					
	<i>Palaemon</i> sp.							3	1			1	2			1		
	<i>Pisidia longicornis</i>										1	3				1		
	<i>Polybius depurator</i>	3		1	1				1	1			2		2	1		1
	<i>Polybius</i> sp.												1					
Bryozoa	Bryozoa encrusting						1					P						P
	<i>Bryozoa</i> sp.							P										
	<i>Flustra foliacea</i>								P									
	<i>Securiflustra securifrons</i>			P			P	P	P	P			1					
Chordata	<i>Ammodytes tobianus</i>	5		1					1				1	1				
	<i>Ciona intestinalis</i>						1											
	<i>Scorpaena porcus</i>			1						1								
	<i>Pholis gunnellus</i>											1	1					
Cnidaria	<i>Adamsia palliata</i>						1	1		1				1				
	<i>Alcyonium digitatum</i>		P															
	Hydroid		P	P	P		1	P	P	P				P				
	<i>Nemertesia antennina</i>						P	P		P	P		P	P	P			
	<i>Nemertesia ramosa</i>		P	P														
Echinodermata	<i>Asterias rubens</i>			1						1								1
	<i>Crossaster papposus</i>						1					1	1					

Phylum	Species	BI_1	BI_2	BI_3	BI_4	BI_5	BI_6	BI_7	BI_8	BI_9	BI_10	BI_11	BI_12	BI_13	BI_14	BI_15	BI_16	BI_17
	<i>Echinus esculentus</i>							6	3	1	1	2	1			1		
	<i>Henricia oculata</i>						1			1			2					
	<i>Marthasterias glacialis</i>						1				1							
	<i>Ophiocomina nigra</i>		A				A			1								
	<i>Ophiopholis aculeata</i>																	
	<i>Ophiothrix fragilis</i>		A				A			1						1	1	
	<i>Psammechinus</i> sp.		3				2	1										
Mollusca	<i>Aequipecten opercularis</i>							1		1								
	Anomiidae		1				1			3		2	4					
	<i>Buccinum undatum</i>	1					1				1	1						
	<i>Crepidula fornicata</i>											1						
	<i>Ensis</i> sp.			1														
	<i>Glycymeris glycymeris</i>				1										1			
	<i>Mytilus edulis</i>								O		C	A		2		A		
	<i>Pecten maximus</i>									1								
	Tellinidae															1		
	<i>Trivia</i> sp.																	
	Veneridae			1					1							1		
Ochrophyta	<i>Laminaria digitata</i>																	1

Table 5: Skullmartin by catch

Key: Number = where count was possible; P = Present; SACFOR = Superabundant, Abundant, Common, Frequent, Occasional, Rare

Phylum	Species	SK_1	SK_2	SK_3	SK_4	SK_5	SK_6	SK_7	SK_8	SK_9	SK_10	SK_11
Annelida	<i>Aphrodite aculeata</i>			1								
	<i>Lanice conchilega</i>						1					
	Polynoidae		1									
Arthropoda	<i>Atelecyclus rotundatus</i>										1	
	Balanidae	O	O				A					
	<i>Cancer pagurus</i>							1				
	<i>Carcinus maenas</i>				1							
	<i>Ebalia</i> sp.			1							1	
	<i>Galathea</i> sp.			1		1	1	1	P			
	<i>Hyas</i> spp.				1	1		1			1	
	<i>Inachus</i> spp.	1									1	
	<i>Macropodia</i> spp.					1						
	<i>Necora puber</i>					1			1			
	<i>Pagurus</i> sp.	1				2	1	F		O		P
	<i>Pandalus montagui</i>					1	1	2				P
	<i>Pisidia longicornis</i>					1						
	<i>Polybius</i> sp.				1	O	1		1		R	
	<i>Flustra foliacea</i>					O			P		O	
	<i>Securiflustra securifrons</i>	1	1	O	O	0	O	O	F	O	O	
Chordata	<i>Ammodytes tobianus</i>	1			3						1	
	<i>Ascidella aspersa</i>								1			
	<i>Callionymus lyra</i>		1									
	<i>Molva molva</i>										1	
	<i>Alcyonium digitatum</i>							P				
	Hydroid			R			R	R				P
	<i>Nemertesia antennina</i>		P	R	O	O	O		P	R	R	
	<i>Nemertesia ramosa</i>								P			
Echino-dermata	<i>Asterias rubens</i>	2	1		1		1		1			
	<i>Crossaster papposus</i>	1				1		2	1	1	1	P
	<i>Echinus esculentus</i>		2		1	5	1	F	P	O	P	
	<i>Henricia oculata</i>		1	1					1			
	<i>Marthasterias glacialis</i>				1	1		5		2		P
	<i>Ophiocomina nigra</i>							F				

Phylum	Species	SK_1	SK_2	SK_3	SK_4	SK_5	SK_6	SK_7	SK_8	SK_9	SK_10	SK_11
	<i>Ophiothrix fragilis</i>							F		R		A
	<i>Ophiura albida</i>							2			P	
	<i>Ophiura</i> spp.			1		1	1					
	<i>Psammechinus</i> sp.					1	1	O	P		R	
Mollusca	<i>Aequipecten opercularis</i>			1		1		2	P		1	
	<i>Astarte sulcata</i>			1								
	<i>Buccinum undatum</i>				2		3	O				7
	Chiton			1		1						
	<i>Eledone</i> sp.									1	1	1
	<i>Gibbula</i> sp.											P
	<i>Glycymeris glycymeris</i>		1									
	<i>Mytilus edulis</i>		C	R						R		
	<i>Pecten maximus</i>									1		P
	Tellinidae	1	2									
	<i>Tritia reticulata</i>							1				
	<i>Trivia</i> sp.								P			
	Veneridae		3					1				

Table 6: The Feathers by catch

Key: Number = where count was possible; P = Present; SACFOR = Superabundant, Abundant, Common, Frequent, Occasional, Rare

Phylum	Species	TF_1	TF_2	TF_3	TF_4	TF_5	TF_6
Annelida	<i>Lanice conchilega</i>		1				
	Polynoidae					1	
Arthropoda	<i>Carcinus maenas</i>	1					
	<i>Macropodia</i> spp.						1
	<i>Necora puber</i>			2	1	2	
	<i>Palaemon</i> sp.	1					
	<i>Pisidia longicornis</i>			2			
	<i>Polybius</i> sp.			2			1
	<i>Porcellana platycheles</i>						1
	<i>Securiflustra securifrons</i>						P
Chordata	<i>Ammodytes tobianus</i>		5	1	1		
	<i>Molva molva</i>					1	
	<i>Scorpaena porcus</i>	P					
	<i>Nemertesia antennina</i>	P					
	<i>Nemertesia ramosa</i>						P
	<i>Marthasterias glacialis</i>	3					
Mollusca	<i>Mytilus edulis</i>					2	
Ochrophyta	<i>Desmarestia</i> sp.				P		
	<i>Laminaria digitata</i>	P				P	P
	<i>Saccharina latissima</i>	P	P		1		
Rhodophyta	Rhodophyta	P	P				P

Table 7: Burial Island: *C. fornicata* specimens, description and biometrics

ID	Location	Description	Mussel Length (mm)	<i>C. fornicata</i> Length (mm)
A	BI_11	Single <i>C. fornicata</i> on live mussel	63	14.8
B	BI_11	Single <i>C. fornicata</i> on live mussel	62	18.5
C	BI_12	Single <i>C. fornicata</i> on live mussel	74	20.7

ID's A, B and C relate to photographs in Annex D

Figures

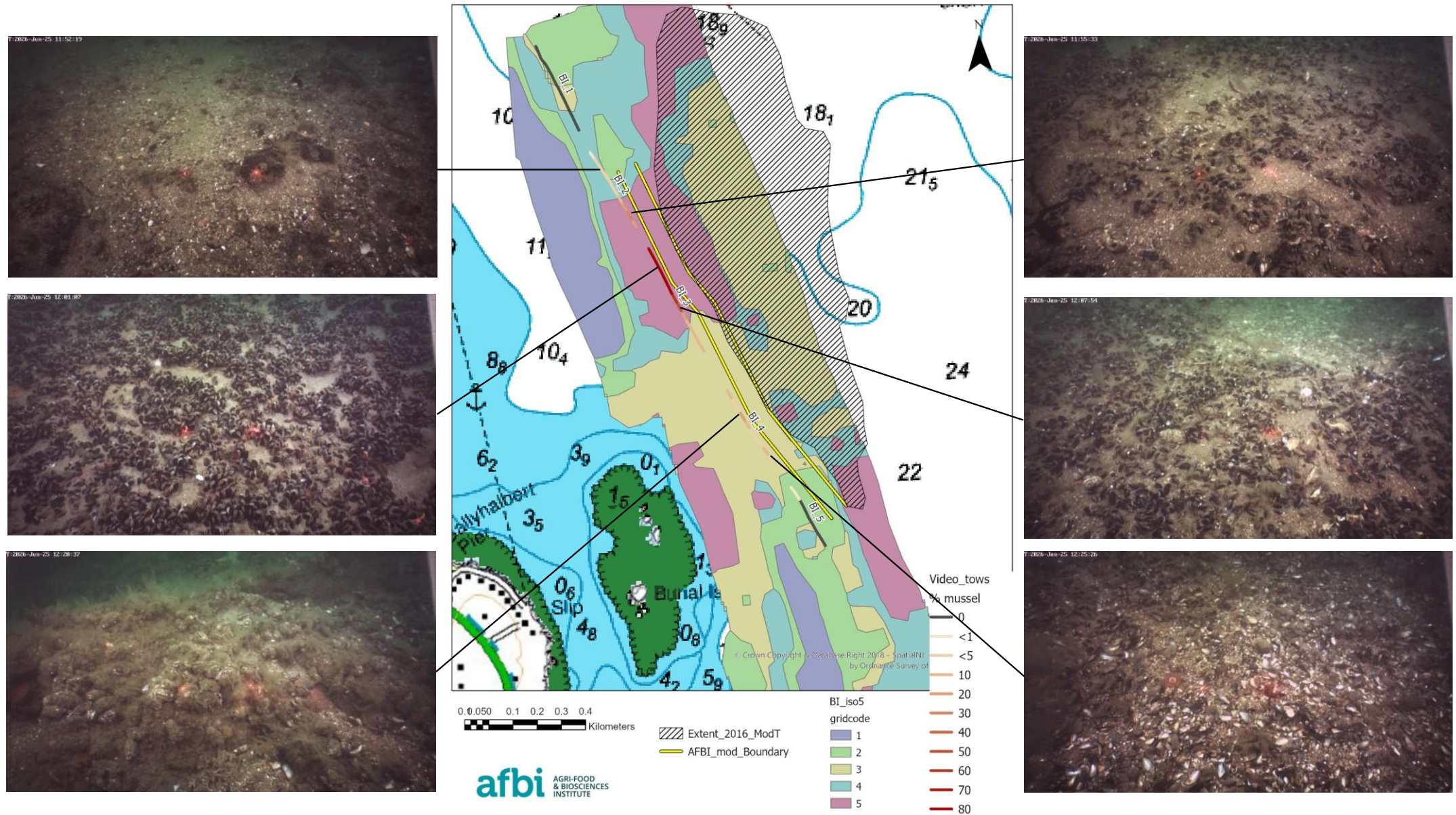


Figure 1: Burial Island: Video tows showing estimated percentage coverage of mussel, snapshot of imagery data for each line

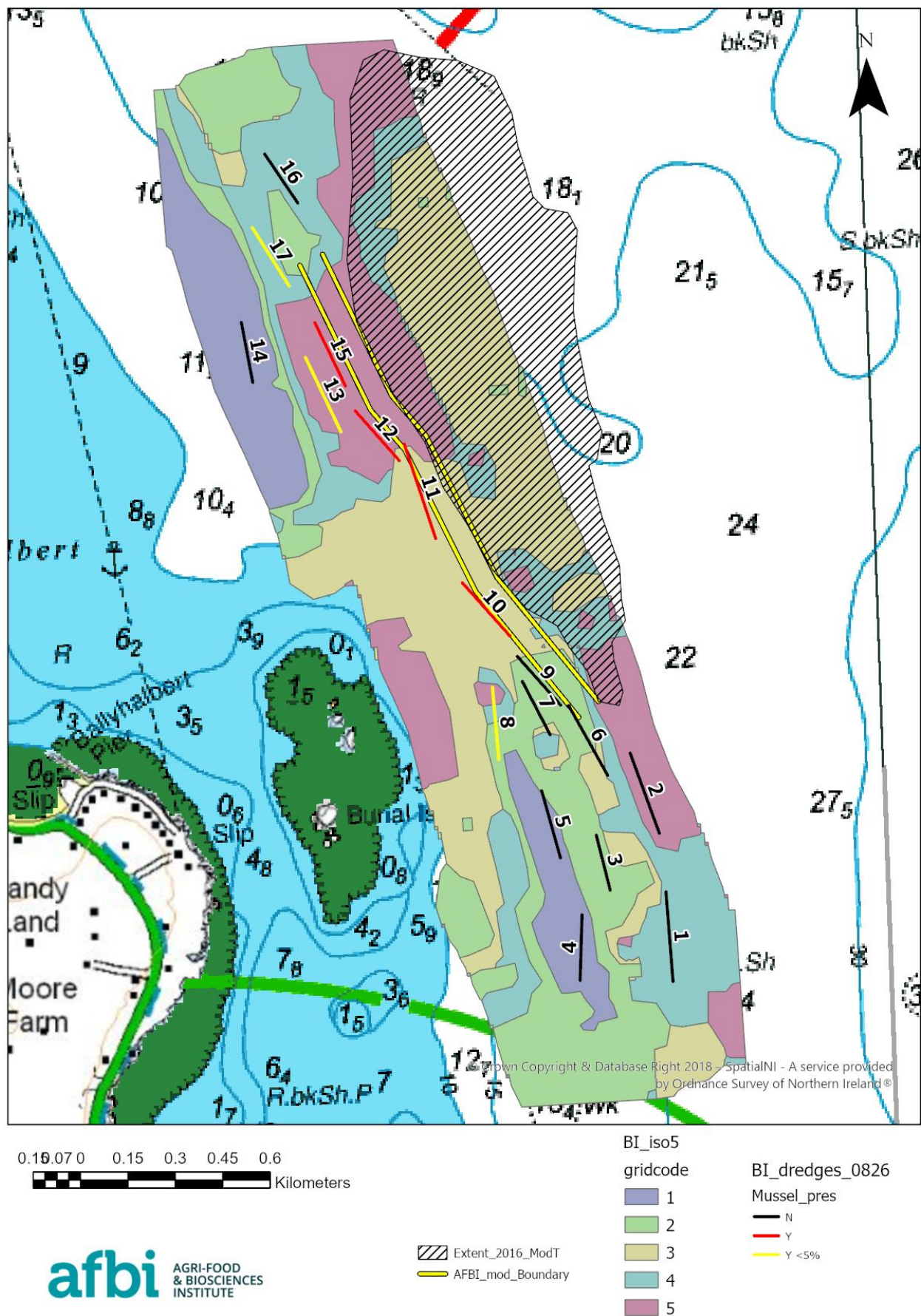


Figure 2: Burial Island: RoxAnn cluster map, dredge tows showing mussel presence overlaid

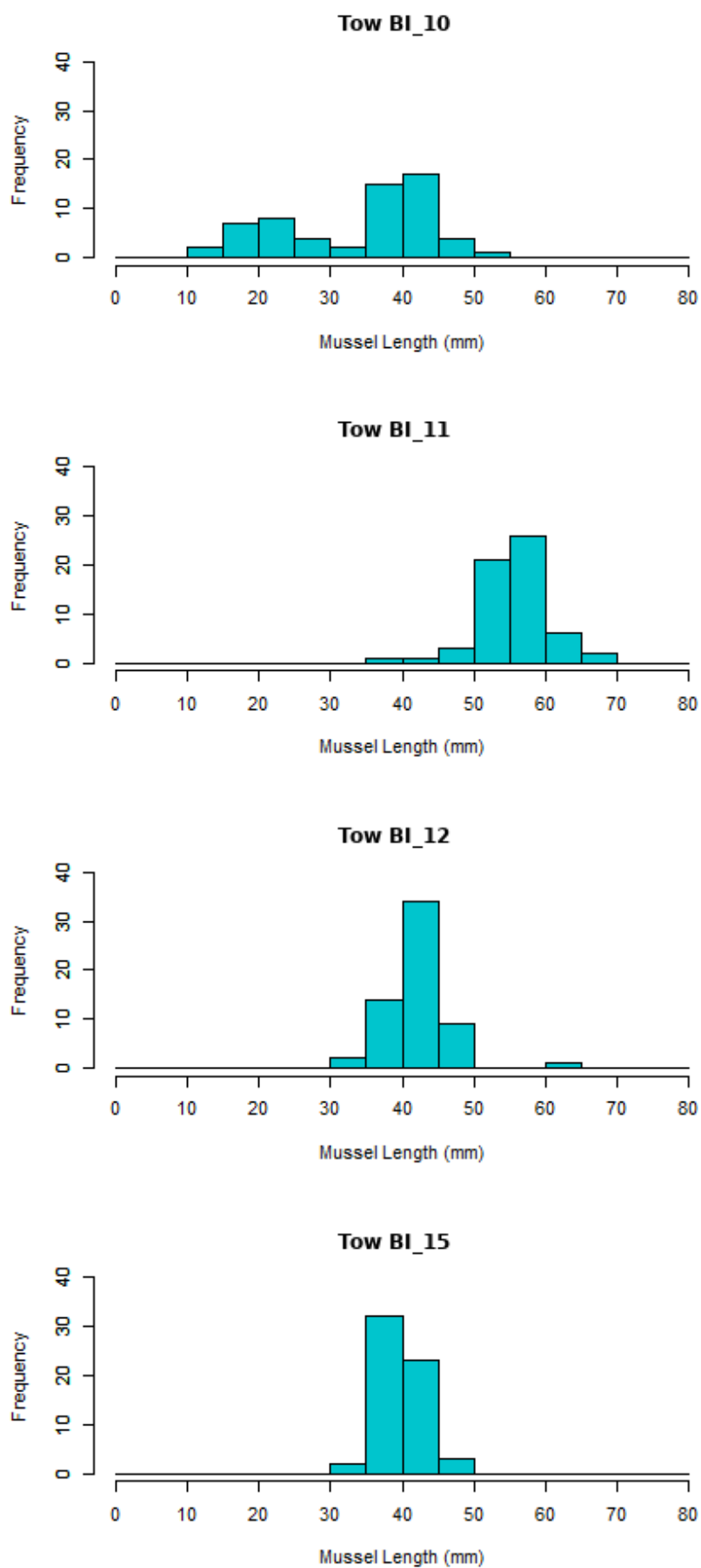


Figure 3: Burial Island: Length class distribution histogram of mussels found within the dredge tows.

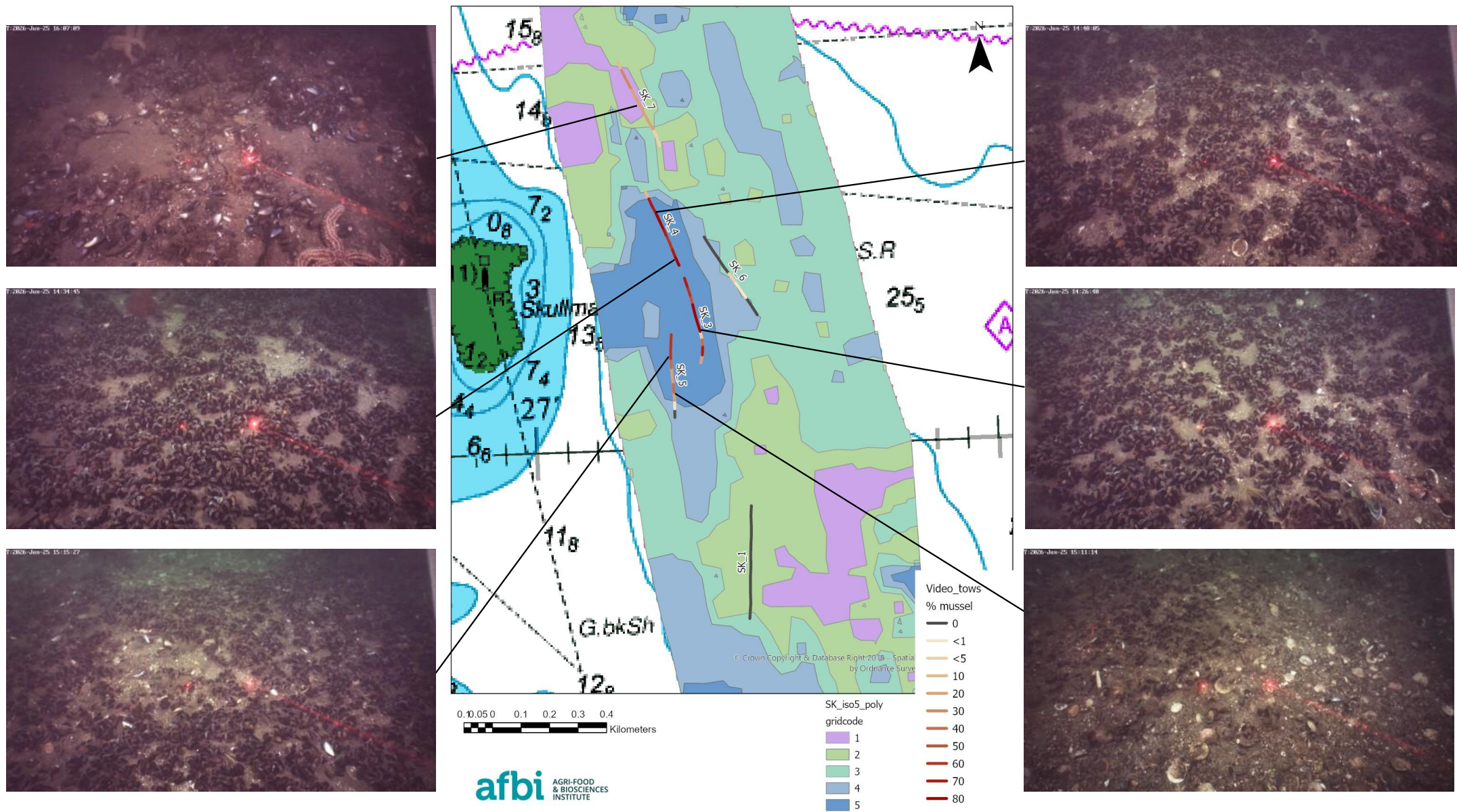


Figure 5: Skullmartin: Video tows showing estimated percentage coverage of mussel, snapshot of imagery data for each line

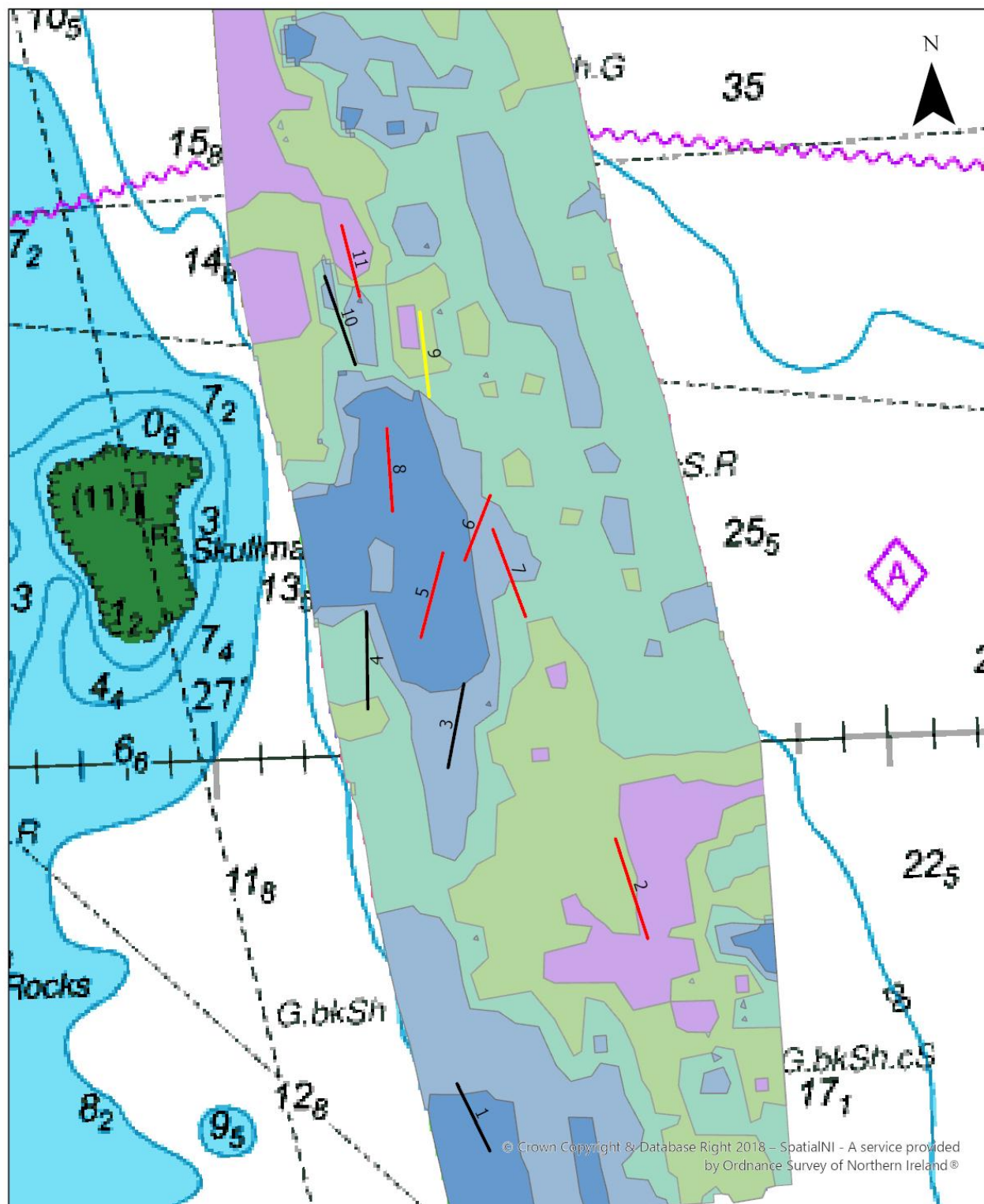


Figure 6: Skullmartin: RoxAnn cluster map, dredge tows showing mussel presence overlaid

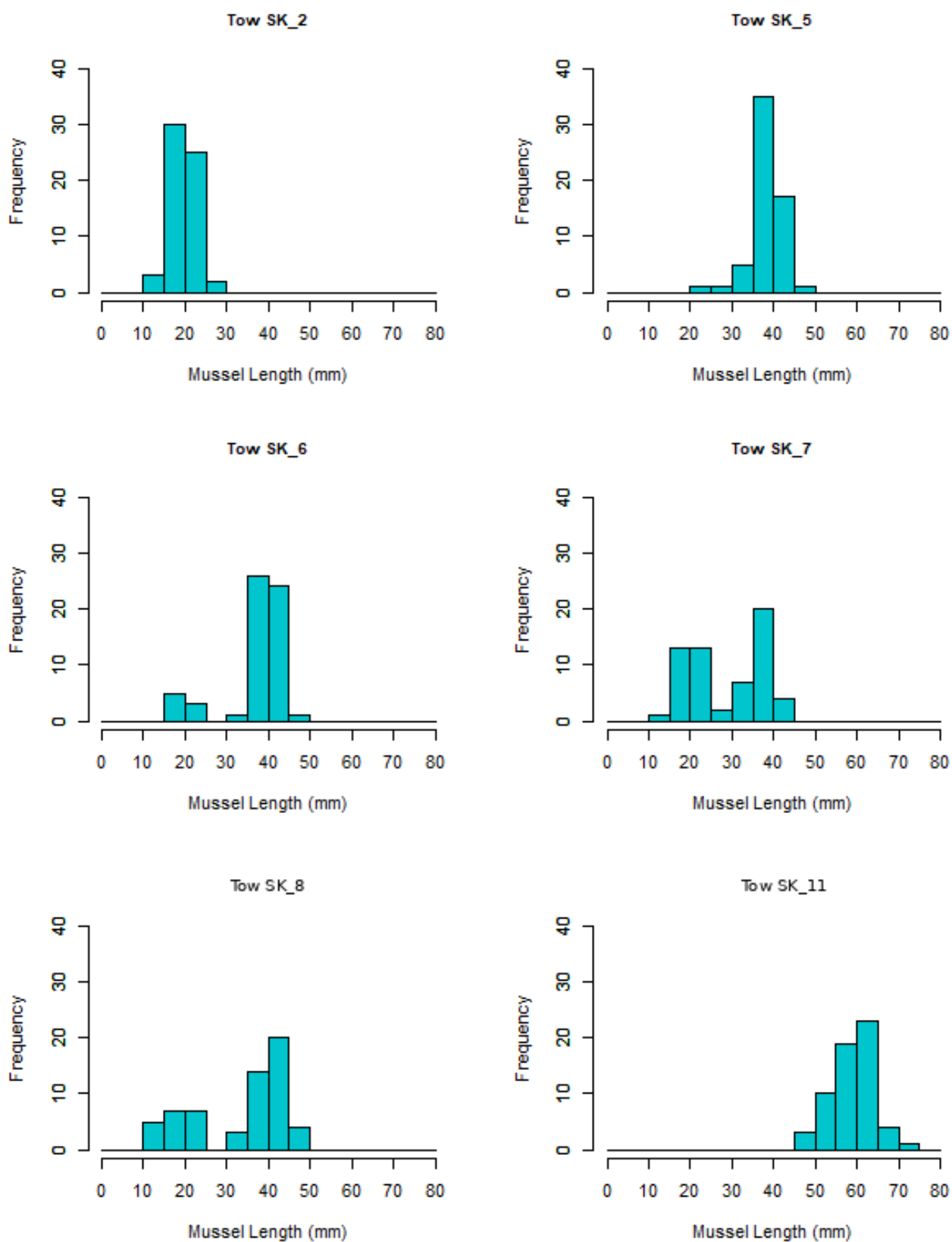


Figure 7: Skullmartin: Length class distribution histogram of mussels found within the dredge tows.

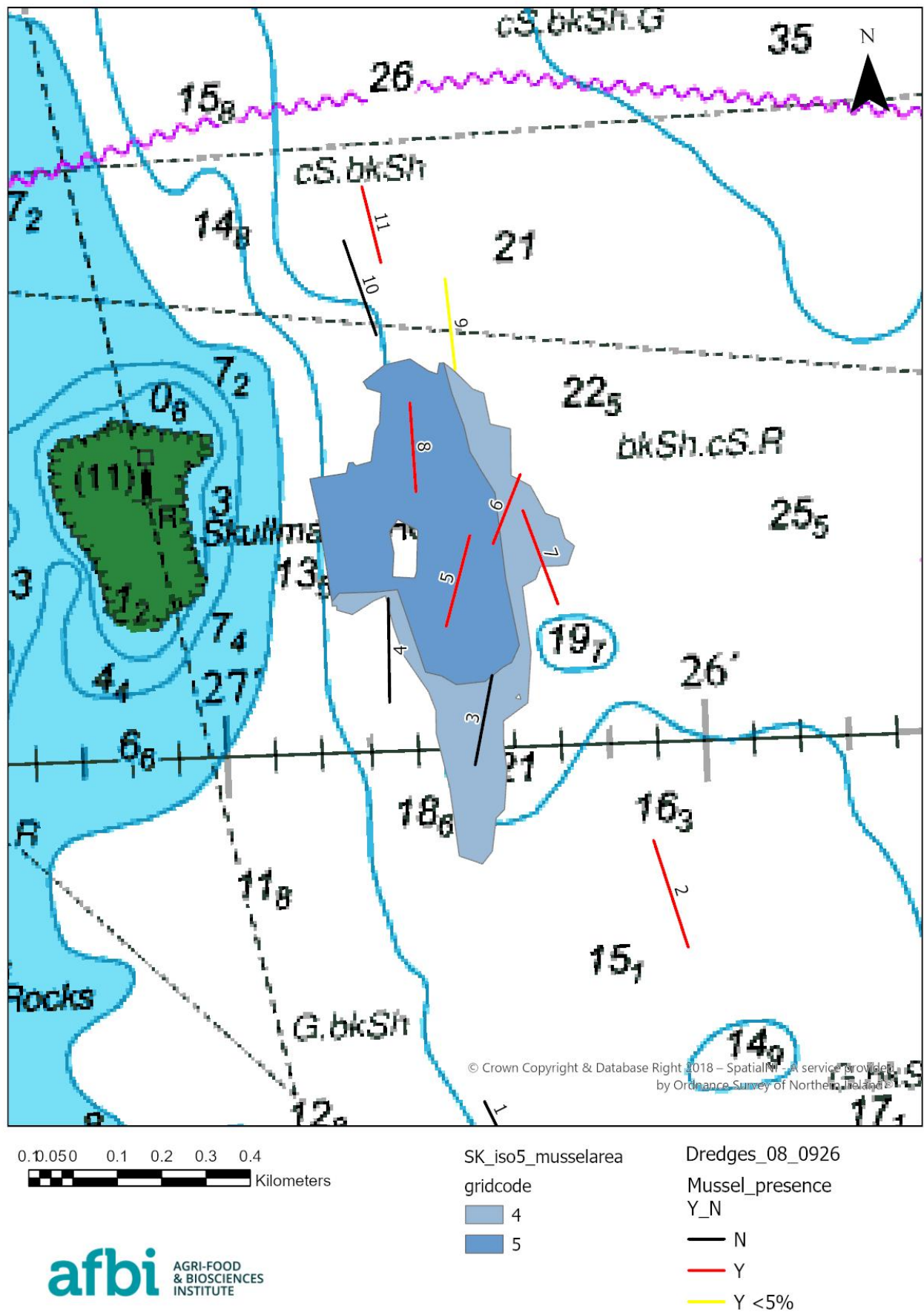


Figure 8: Skullmartin: Mussel presence, gridcode areas used in biomass calculations.

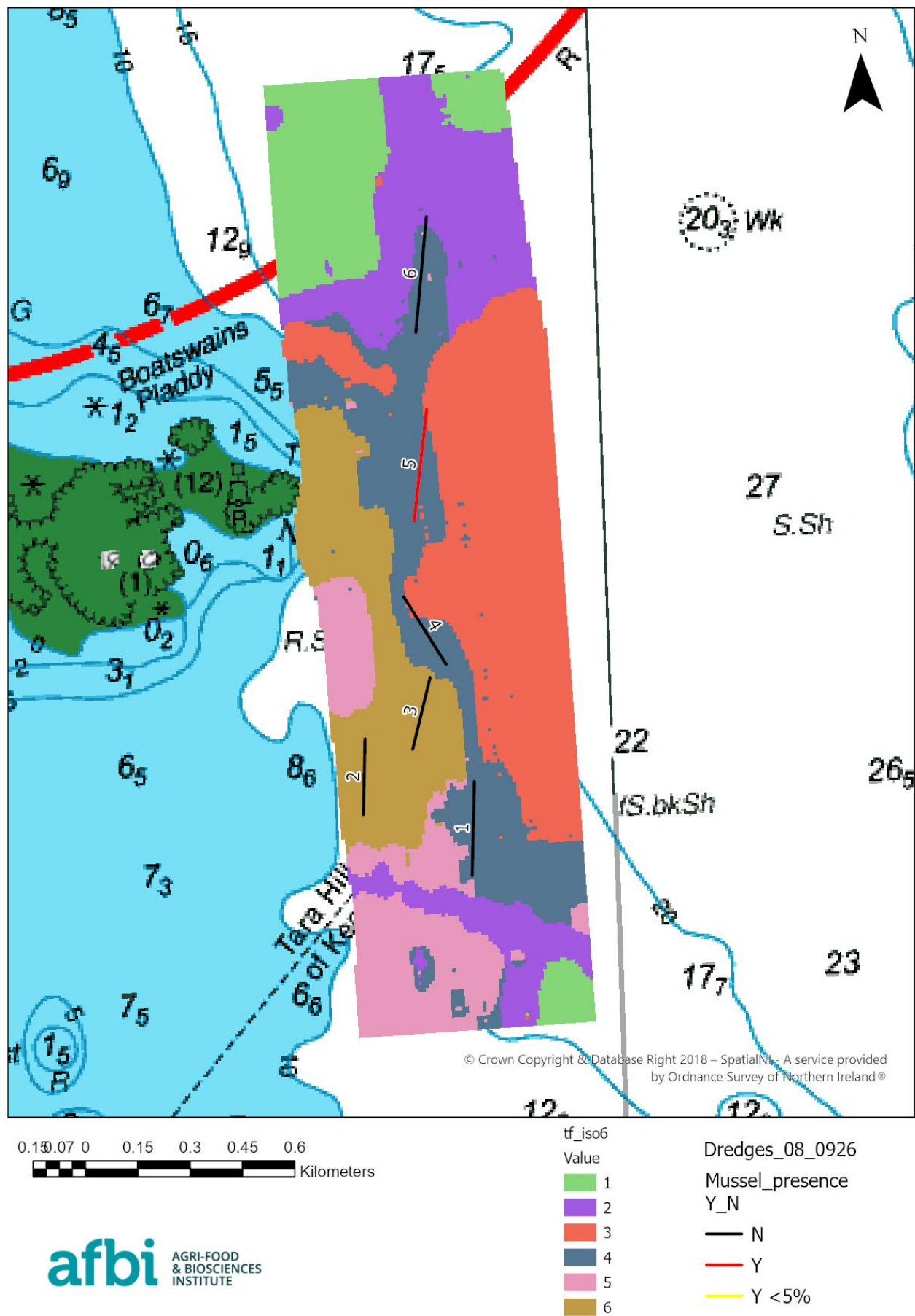


Figure 10: The Feathers: Dredge tows with mussel presence/absence denoted

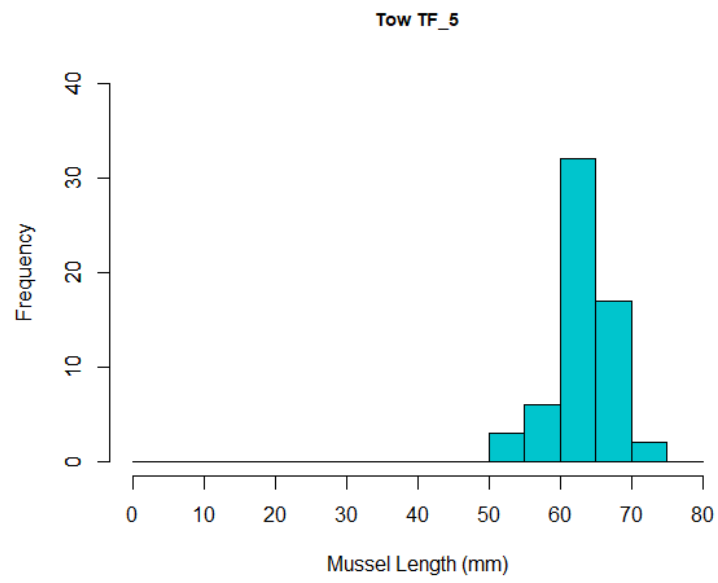


Figure 11: The Feathers: Length class distribution histogram of mussels found within tow TF_5

Annexes

Annex A: Burial Island: Photographs of dredge contents



Tow BI_10



Tow BI_11



Tow BI_12



Tow BI_15

Annex B: Skullmartin: Photographs of dredge contents



Tow SK_2



Tow SK_5



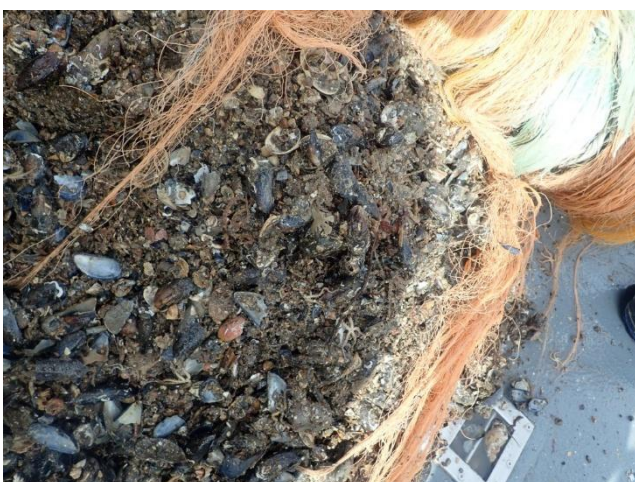
Tow SK_6



Tow SK_ 7



Tow SK_ 8



Tow SK_ 11

Annex C: The Feathers: Photographs of dredge contents



Tow TF_5

Annex D: Photographs of *C. fornicata* found in dredge

A



B



C



References

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Turner, J. A., Hitchin, R., Verling, E., van Rein, H. 2016. Epibiota remote monitoring from digital imagery: Interpretation guidelines.