



Cromer Shoals Chalk Beds MCZ Chalk Impact Assessment

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Imagery Analysis and Impact Assessment Report

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Cromer Shoals Chalk Beds MCZ

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NOTES

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1. Introduction

The Cromer Shoal Chalk Beds Marine Conservation Zone (CSCB MCZ) along the north Norfolk coast is one of the most ecologically significant Marine Protected Areas for chalk habitats in the UK and Europe. The MCZ was designated for nine chalk, rock, and sedimentary habitats, and one geological feature, for which the conservation objectives were set as ‘maintain in favourable condition’ based on best available evidence at the time.

The Eastern Inshore Fisheries and Conservation Authority (EIFCA) are undertaking a Natural Disturbance Study over three years to better understand the level of natural degradation of exposed rugged chalk features of the MCZ and compare it to degradation caused by static fishing gear (e.g. pots or creels).

Six experimental areas have been established in areas with rugged chalk features, three where fishing with static gear (hereafter known as potting) is prevented (closed treatment) and three which are open to potting (open treatment). Change will be monitored by completing annual ROV camera surveys and high resolution multibeam bathymetric surveys in each of the six experimental areas.

Previously, ROV surveys were undertaken in July 2024 and analysed by ENVISION in 2025¹. This report focusses on the second year of the study, with ROV surveys having been conducted in July and August 2025. ROV surveys collected three tows in each experimental area, collecting seabed video footage using a downward facing camera, to observe and quantify chalk impacts.

2. Methodology

The objectives of the current study were to analyse the ROV imagery collected by EIFCA, comprising three ROV transects at each station. Three stations are in areas closed to potting (closed treatment), and three stations are in areas open to potting (open treatment).

Imagery was reviewed, processed and analysed as specified by EIFCA, with reference to the specified guidance (Tibbitt *et al.*, 2020²), and chalk impact categories were recorded as described in guidance provided (EIFCA, 2025³). Annotations were added to video imagery in BIIGLE annotation software⁴ to identify areas of rugged chalk and to identify and quantify all observed chalk impacts.

Imagery was assessed using the NMBAQC image quality categories, presented in Table I, as described in Turner *et al* (2016⁵).

¹ ENVISION. (2025). *Cromer Shoals Chalk Beds MCZ Chalk Impact Assessment: Imagery Analysis and Impact Assessment Report*

² Tibbitt, F., Love, J., Wright, J., Chamberlain, J. 2020. *Human Impacts on Cromer Shoal Chalk Beds MCZ: Chalk complexity and population dynamics of commercial crustaceans*. Natural England Research Report number 04412

³ EIFCA, 2025. *Cromer Shoal Chalk Beds MCZ Natural Disturbance Study ROV Analysis guidance*.

⁴ <https://biigle.de/>

⁵ Turner, J.A., Hitchin, R., Verling, E., van Rein, H. 2016. *Epibiota remote monitoring from digital imagery: Interpretation guidelines*.

Table 1 NMBAQC image quality categories (Turner et al., 2016).

Quality Category	Proportion of Tow Negatively Affected	Organism Enumeration	Biotopes
Excellent	<5%	Quantitative	Level 5
Good	5-20%	Quantitative	Level 5
Poor	20-50%	Qualitative	Level 3
Very Poor	50-80%	Not recommended	Level 2/3
Zero	>80%	Data not usable	Data not usable

2.1. Chalk Impacts Imagery Analysis

For the purpose of the analysis, impacts were defined as visible areas/patches of outcropping/exposed chalk which are white and fit into one of the eleven categories described in Tibbitt et al., (2020), shown in Table 2, or the broad impact categories (shown in Table 3).

Where a specific Impact Category from Tibbitt et al., 2020² could be assigned (Table 2), only that Impact Category was recorded. If a specific Impact Category could not be assigned, both a Broad Impact Category (Table 3) AND a Severity (Table 4) was recorded. For each impact, the following metrics were recorded:

- Chalk impacts, as described in 'EIFCA, 2025³' and Table 3 to Table 6 below, including:
 - Frequency
 - Type
 - Severity
 - Extent
 - Position
- 'Rugged Chalk' was defined as '*elevated and complex chalk features formed by outcropping bedrock*', based on the habitat categories adapted from O'Dell & Dewey (2022)⁶. Areas of rugged chalk were identified by adding a label to sections of the video footage (multi-frame annotation) and impacts were only recorded within these segments of rugged chalk (including narrow gullies).
- The videos analysed as Year 1 of the project also went through an additional data extraction process to only use the impacts within rugged chalk segments, whereas previously the proportion of rugged chalk areas were calculated and used within the statistical analysis.
- The frequency of impacts was standardised by distance surveyed (per 100m of rugged chalk in tow) and tested for statistical differences between closed and open areas, and between years.

⁶ O'Dell, J. and Dewey, S. 2022. *Cromer Shoal Chalk Beds MCZ Imagery Analysis Final report. A report to Natural England by Seastar Survey Ltd. 63 pages.*

Details of the impacts recorded include the video timestamp, the corresponding time (BST) and position (WGS84) (taken from the track plot data and ROV position corrected for layback), and the impact category, severity, position, extent, as well as presence of gear.

Table 2 Impact Categories from Tibbitt et al., (2020), with associated severity and Corresponding broad impact category.

Impact category (Tibbitt et al 2020)	Associated severity (Tibbitt et al 2020)	Corresponding broad impact category
Abrasion	Low	Grates
Drag	Low	Grates
Burn	Low	Cuts
Strike	Medium	Strikes
Cut	Medium	Cuts
Lift	High	Strikes
Grating	High	Grates
Angular rubble	High	Rubble
Saw	High	Cuts
Level shear	High	Cuts
Unlevel shear	High	Cuts

Table 3 Broad Chalk Impact Categories

Broad impact category	Description
Strikes	Areas of localised impact
Grates	Less localised damage or abrasion
Cuts	Impacts caused by ropes cutting into chalk
Rubble	Areas of spread chalk fragments

Table 4 Severity of Impact from Tibbitt et al., (2020)

Severity	Definition
Low	Surface layer of chalk removed
Medium	Chalk structure broken but not removed
High	Chalk structure is broken and removed

Table 5 Impact Extent from Tibbitt et al., (2020)

Impact extent	Description
Multiple small	Multiple small impacts in an area smaller than 2x2m
Hand	Area of impact estimated to be similar to the area of a hand (roughly <150mm in diameter)
Head	Area of impact estimated to be similar to the area of a head (roughly <200mm in diameter)
Arm	Area of impact estimated to be similar to the area of an arm (roughly <500mm in diameter)
Torso	Area of impact estimated to be similar to the area of a torso (roughly <1m in diameter)
Body	Area of impact estimated to be similar to the area of a body (roughly <2m in diameter)
Severe	Area of impact estimated to be larger than the area of a body (roughly >2m)

Table 6 Impact Position from Tibbitt et al., (2020)

Impact position	Description
Seabed	On the seabed (for example if impact is to exposed flat chalk pavement)
Face (Bottom)	Bottom third of the face (generally vertical edge) of an outcropping feature
Face (Middle)	Middle third of the face (generally vertical edge) of an outcropping feature
Face (Top)	Top third of the face (generally vertical edge) of an outcropping feature
Top	On top of an outcropping feature
Multiple (Seabed and bottom)	Impact extends across multiple positions across seabed and bottom of outcropping feature
Multiple (Middle and top)	Impact extends across multiple positions across middle and top of outcropping feature
Multiple (whole face)	Impact extends across the whole face (generally vertical edge) (top, middle and bottom) of outcropping feature

2.2. Quality Controls

Imagery analysis underwent internal quality assurance with a minimum of 10% of underwater imagery reviewed by a second analyst that had been involved in the data analysis from the beginning for consistency. Videos to be reanalysed were chosen at random and each chalk impact annotated was checked by the second analyst to ensure each impact category had the corresponding extent and position tags. The video was also viewed all the way through to check for any impacts that had been missed during the original analysis, with image quality also verified. Any differences between analysts were reviewed together and any necessary changes made.

After the quality assurance had taken place on 10% of the imagery, an additional quality assurance process took place on all of the imagery. The data was exported from BIGLE and processed to check for any mistakes, any impacts with missing positions or extents were highlighted and amended.

2.3. Data and Statistical Analysis

The chalk impact data were analysed separately for the 2024 and 2025 survey years and collectively for the between year comparison. The analysis used the impact records and associated tow metadata, including tow length, treatment type, treatment ID and survey area. The 2024 dataset included 17 valid tows, with STN12 excluded because no data were collected at that station. The 2025 dataset included 18 valid tows. Prior to any statistical analysis, all impacts recorded as the broad impact category 'Rubble' were removed, as requested by EIFCA. Remaining impacts records and impact severities were summarised by tow, treatment type, treatment ID, survey area and impact category. Tow length was then used to standardise impact and severity counts to frequency per 100m rugged chalk due to the varying length of tows across the two datasets.

Where a tow had no records for a particular impact category or severity class, that combination was retained as a zero-frequency value. This allowed comparisons to reflect the full survey effort within each year, treatment and area.

Descriptive statistics were produced for impact frequency and severity frequency, including mean and median frequency per 100 m rugged chalk. Boxplots were used to visualise differences between open and closed treatment areas, between survey areas and between years.

As the data were count-derived frequencies, with relatively small sample sizes and non-normal distributions, non-parametric statistical tests were used. Kruskal-Wallis tests were used to assess differences in impact frequency between open and closed treatment types. Where relevant, Dunn's multiple comparison tests with Bonferroni adjustment were applied as a post-hoc test. Although only two treatment groups were compared in most cases, the Dunn test was retained to provide a consistent pairwise comparison output between open and closed treatments.

For each survey year, Kruskal-Wallis and Dunn tests were undertaken to compare open and closed treatments across all areas combined. Additional area-specific tests were then undertaken for East Runton, Sheringham and West Runton separately, using total non-rubble impact frequency per 100 m rugged chalk as the response variable. This provided a separate p-value for the open versus closed treatment comparison within each area and year.

Severity-specific statistical testing was also undertaken to assess whether the frequency of Low, Medium and High severity impacts differed between open and closed treatments within each area and year. These tests were run separately for each combination of year, area and severity class. Where all values were zero for a given severity class, no statistical test was run because there was no variation to test.

Between-year comparisons were carried out by collating the 2024 and 2025 standardised datasets. Impact frequency and severity frequency were compared between years overall, by treatment type, by area and by area-treatment combinations. These comparisons were used to assess whether observed differences between 2024 and 2025 were consistent across the survey areas and treatment types.

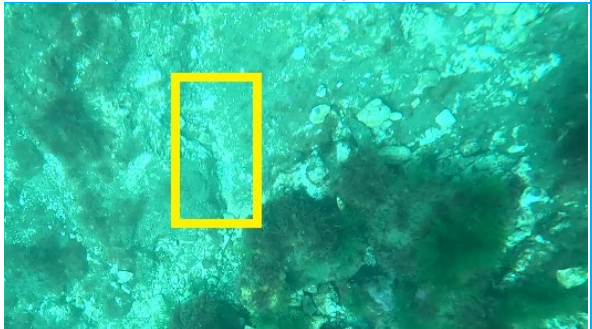
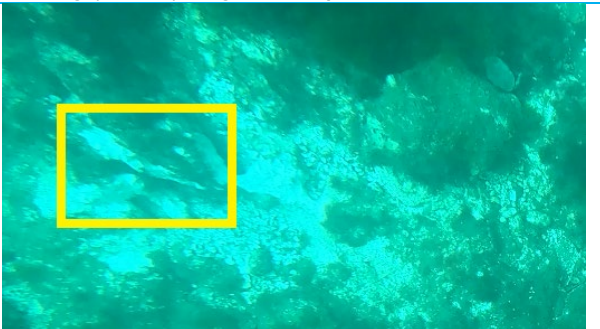
All statistical analyses and plots were produced in R using the packages 'readxl', 'dplyr', 'tidyr', 'stringr', 'ggplot2', 'FSA' and 'knitr'. Statistical significance was assessed at the 0.05 threshold, with p-values below 0.05 interpreted as evidence of a statistically significant difference.

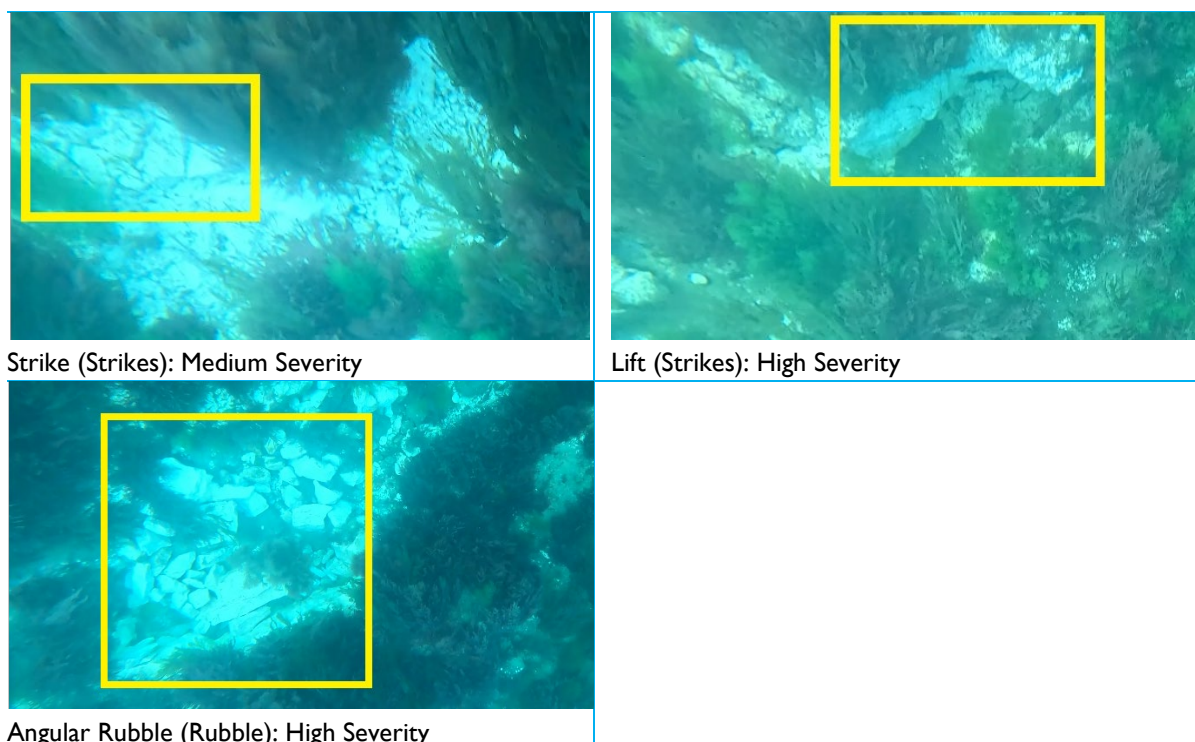
3. Results

Presentation of results shows the data from the six stations and treatments (Treatment ID) at each of the three areas (East Runton – closed treatment (ERC), East Runton – open treatment (ERO); Sheringham – closed treatment (SHC), Sheringham – open treatment (SHO); West Runton – closed treatment (WRC), West Runton – open treatment (WRO)). A comparison between 2024 and 2025 data is also presented.

Example images of the Chalk Impact Categories identified (along with Associated Broad Impact Category and Severity) for each impact recorded are presented in Table 7.

Table 7 Example images for each Chalk Impact Category recorded, with associated Broad Impact Category and Severity shown.

	
Abrasion (Grates): Low Severity	Grating (Grates): High Severity
	
Burn (Cuts): Low Severity	Cut (Cuts): Medium Severity
	
Level Shear (Cuts): High Severity	Unlevel Shear (Cuts): High Severity



3.1. 2024 Rugged Chalk Impact Analysis

A total of 17 video tows were provided for analysis, and the quality of footage ranged from 'good' to 'very poor' quality. For the majority of imagery, quality varied from 'good' to 'very poor' throughout the tow (dependent on distance of the camera system above the seabed), resulting in an overall assessment of 'poor'. The height of the camera system above the seabed, and/or low-resolution imagery with a green hue made it difficult to distinguish features such as impact categories and extent of impacts throughout the footage. The camera system was positioned in a directly downward facing angle, which made it difficult to assess the elevation of chalk features, and the system had an unstable field of view which made it difficult to identify characteristics of the seabed.

The previous analysis of imagery collected in 2024 was conducted on the entirety of the video tows. It was requested by EIFCA that the ongoing analysis should only consider areas of the video tows where rugged chalk was present, therefore segmentation of the video tows was undertaken within BIIGLE. Data was extracted from these rugged chalk segments and reprocessed.

Data were exported from BIIGLE and extracted for input into the accompanying spreadsheet '2024_CSCBMCZ_NDS_ROV_master_data_Envision_RuggedChalkDataExtraction2026_20260514.xlsx'.

A summary of the impact frequencies for rugged chalk in each tow (2024) is shown in Table 8, along with associated dive data, area name and treatment type and ID.

More detailed information on the impacts recorded is provided in Appendix A, Section 5.1, including the tow duration, length (calculated from ROV positions), imagery quality assessment, and a summary

of the frequency of impact types and severity shown in Table 10, and a detailed breakdown of rugged chalk segments within each tow shown in Table 11.

Table 8 Summary of impact frequencies for rugged chalk in each tow (2024), including associated dive data, area name and treatment type and ID.

Dive ID	Area Name	Treatment ID	Type	Length (m)	Impact Frequency	Impact Frequency per 100m
2024_07_31_NDS_1	Sheringham	SHO	Open	71.29	37	51.90
2024_07_31_NDS_2	Sheringham	SHO	Open	98.32	42	42.72
2024_07_31_NDS_3	Sheringham	SHO	Open	86.64	27	31.16
2024_07_31_NDS_4	Sheringham	SHC	Closed	110.45	38	34.41
2024_07_31_NDS_5	Sheringham	SHC	Closed	131.78	43	32.63
2024_07_31_NDS_6	Sheringham	SHC	Closed	117.23	75	63.98
2024_07_31_NDS_7	West Runton	WRO	Open	32.75	21	64.12
2024_07_31_NDS_8	West Runton	WRO	Open	49.72	19	38.21
2024_07_31_NDS_9	West Runton	WRO	Open	60.14	25	41.57
2024_07_31_NDS_10	West Runton	WRC	Closed	113.55	41	36.11
2024_07_31_NDS_11	West Runton	WRC	Closed	103.40	41	39.65
2024_07_31_NDS_13	East Runton	ERC	Closed	131.21	52	39.63
2024_07_31_NDS_14	East Runton	ERC	Closed	80.29	34	42.35
2024_07_31_NDS_15	East Runton	ERC	Closed	56.83	21	36.95
2024_07_31_NDS_16	East Runton	ERO	Open	118.97	57	47.91
2024_07_31_NDS_17	East Runton	ERO	Open	111.86	37	33.08
2024_07_31_NDS_18	East Runton	ERO	Open	62.31	21	33.70

3.1.1. Comparison of Frequency of All Impacts - 2024

The frequencies of all impacts (excluding the 'Rubble' category, as specified by the EIFCA) were standardised to 100m of rugged chalk per tow and compared statistically and presented for each area and treatment, showing variability of the values recorded in the datasets (see Figure 3).

In Figure 3, values were averaged for each treatment, per area, with the black vertical line representing the minimum to the maximum values, the black horizontal line representing the median value of the data, and the dashed black horizontal line represents the mean value of the data. The coloured area below the median line represents the 25-50th percentile of data, and the coloured area above the median line represents the 50-75th percentile of data.

NB whilst an 'area surveyed' value was completed for each tow, this was based on an average field of view within the imagery of 2.5 square metres, calculated from the known dimensions of fishing gear (pots) observed on occasion throughout the imagery. As the field of view was variable throughout the imagery, it was considered more appropriate to standardise the data to 100m of rugged chalk per tow, rather than area of impact.

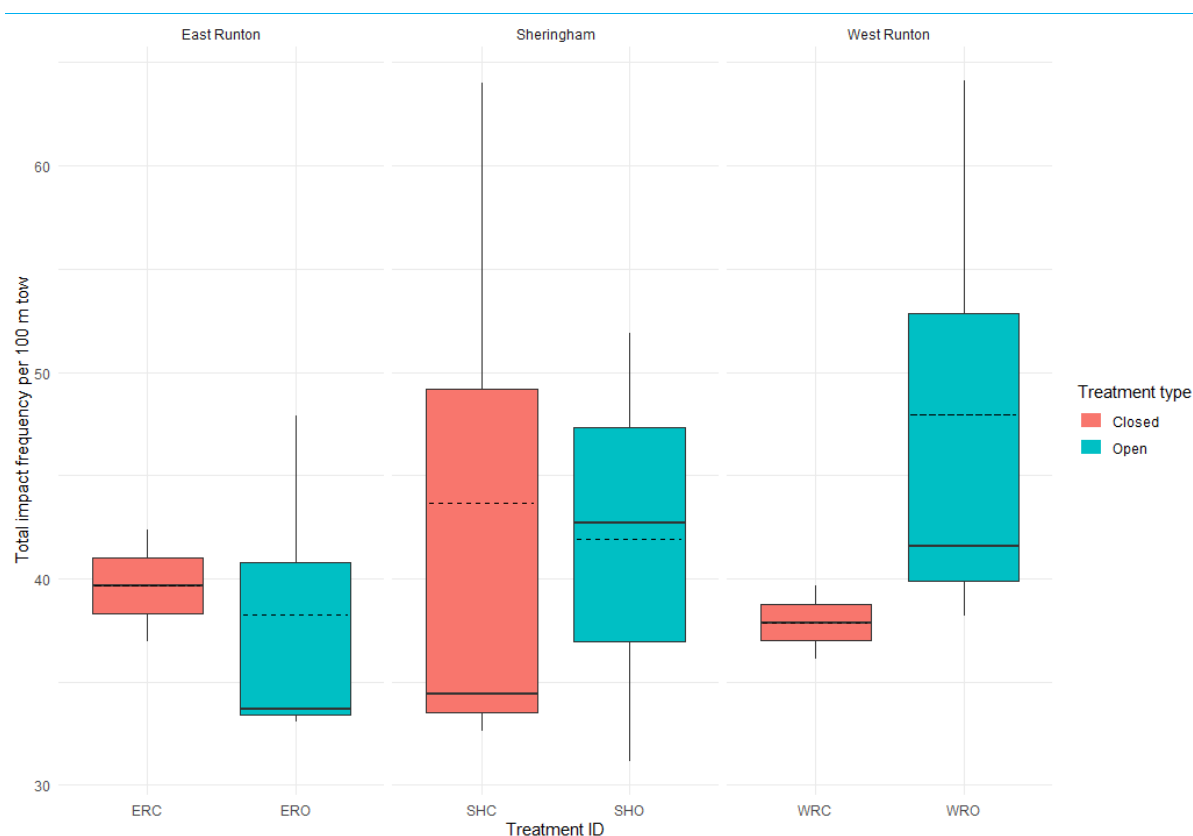


Figure I.

Chart (box and whisker) comparison of impact frequency per 100m of rugged chalk per tow (2024), for each area and treatment type, showing the minimum to maximum values (black vertical line), the median value (solid black horizontal line), and the mean value (dashed black horizontal line).

Figure I shows that total impact frequency was broadly similar between open and closed treatments across the three areas. In East Runton and Sheringham, total impact frequency was slightly higher in the closed treatment than the open treatment. In West Runton, total impact frequency was higher in the open treatment than the closed treatment. It should be noted that the West Runton closed treatment comprised two replicate tows, compared with three replicate tows in the open treatment.

However, when all areas were grouped together by closed or open treatments, comparison using a 'Kruskal-Wallis multiple comparison with Dunn post-hoc test' showed there was no significant difference between the total impact frequency in open and closed treatments ($P > 0.05$: $P = 0.63$).

Similarly, when using the 'Kruskal-Wallis multiple comparison with Dunn' test to compare all areas individually, there was no significant difference between frequencies of all impacts in open and closed treatments for any individual area ($P > 0.05$: for East Runton, $P = 0.51$; for Sheringham, $P = 0.83$; for West Runton, $P = 0.25$). Again, there was high variability within the data and low numbers of replicates lowered the power of statistical tests.

3.1.2. Comparison of Frequency of Low, Medium and High Severity Impacts - 2024

Severity of impacts were split into 'Low', 'Medium' and 'High' and compared between treatments, with the results shown in Figure 4. Medium severity impacts were recorded at very low frequencies across all areas and treatment types.



Figure 2.

Chart (box and whisker) comparison of frequency of different severities of impact per 100m of rugged chalk per tow (2024), for each area and treatment type, showing the minimum to maximum values (black vertical line), the median value (solid black horizontal line), and the mean value (dashed black horizontal line).

At East Runton, 'Low' severity impacts were slightly more frequent in the closed treatment than the open treatment. 'Medium' severity impacts were recorded at very low frequencies in both treatments. 'High' severity impacts were also similar between treatments. None of the severity comparisons at East Runton were statistically significant ($P > 0.05$: Low severity, $P = 0.83$; Medium severity, $P = 0.80$; High severity, $P = 0.83$).

At Sheringham, 'Low' severity impacts were more frequent in the closed treatment than the open treatment. 'Medium' severity impacts were recorded at very low frequencies in both treatments. 'High' severity impacts were slightly more frequent in the open treatment than the closed treatment. None of the severity comparisons at Sheringham were statistically significant ($P > 0.05$: Low severity, $P = 0.51$; Medium severity, $P = 0.82$; High severity, $P = 0.51$).

At West Runton, 'Low' severity impacts were more frequent in the open treatment than the closed treatment. 'Medium' severity impacts were low in both treatments; however the mean was higher in

the closed treatment than the open treatment. 'High' severity impacts were more frequent in the open treatment than the closed treatment. None of the severity comparisons at West Runton were statistically significant ($P > 0.05$: Low severity, $P = 0.56$; Medium severity, $P = 0.52$; High severity, $P = 0.56$).

In general, the medium severity impacts were the least commonly recorded, which may be attributed to the fact that there were fewer categories of 'Medium' severity impact (only 'Strike' and 'Cut' categories), with the qualifier 'Chalk structure broken but not removed', which may have been more difficult to ascertain from analysis of the imagery.

When severity frequency was compared across all areas by treatment type, there was no significant difference between open and closed treatments ($P > 0.05$: $P = 0.80$). Overall, the 2024 severity results do not show a consistent or statistically significant difference between open and closed treatments. Low and High severity impacts accounted for most of the severity frequency recorded, while Medium severity impacts occurred at very low frequencies across the dataset.

3.2. 2025 Rugged Chalk Impact Analysis

A total of 18 video tows were provided for analysis, and the quality of footage ranged from 'good' to 'very poor' quality. For the majority of imagery, quality varied from 'good' to 'very poor' throughout the tow (dependent on distance of the camera system above the seabed), resulting in an overall assessment of 'poor'. The height of the camera system above the seabed, and/or low-resolution imagery with a green hue made it difficult to distinguish features such as impact categories and extent of impacts throughout the footage. Again, the camera system was positioned in a directly downward facing angle, which made it difficult to assess the elevation of chalk features, and an unstable field of view made it difficult to identify characteristics of the seabed. Footage from the first day of data collection on 21st July 2025 (East Runton) were much poorer quality (distant from seabed) than the second day of data collection in other areas (West Runton and Sheringham).

Data were exported from BIIGLE and extracted for input into the accompanying spreadsheet '2025_CSCBMCZ_NDS_ROV_master_data2_Envision_20260514.xlsx'.

A summary of the impact frequencies for rugged chalk in each tow (2025) is shown in Table 9, along with associated dive data, area name and treatment type and ID.

More detailed information on the impacts recorded is provided in Appendix B, Section 5.2, including the tow duration, length (calculated from ROV positions), imagery quality assessment, and a summary of the frequency of impact types and severity shown in Table 10, and a detailed breakdown of rugged chalk segments within each tow shown in Table 11.

Table 9 Summary of impact frequencies for rugged chalk in each tow (2025), including associated dive data, area name and treatment type and ID.

Dive ID	Area Name	Treatment ID	Type	Length (m)	Impact Frequency	Impact Frequency per 100m
2025_08_14_NDS_1	Sheringham	SHO	Open	75.14	57	75.85
2025_08_14_NDS_2	Sheringham	SHO	Open	105.36	66	62.64
2025_08_14_NDS_3	Sheringham	SHO	Open	70.55	33	46.77
2025_08_14_NDS_4	Sheringham	SHC	Closed	149.13	152	101.92
2025_08_14_NDS_5	Sheringham	SHC	Closed	148.94	200	134.28
2025_08_14_NDS_6	Sheringham	SHC	Closed	148.79	161	108.21
2025_08_14_NDS_7	West Runton	WRO	Open	147.91	143	96.68
2025_08_14_NDS_8	West Runton	WRO	Open	115.79	169	145.96
2025_08_14_NDS_9	West Runton	WRO	Open	133.18	203	152.42
2025_08_14_NDS_10	West Runton	WRC	Closed	142.52	290	203.48
2025_08_14_NDS_11	West Runton	WRC	Closed	148.54	243	163.59
2025_08_14_NDS_12	West Runton	WRC	Closed	139.95	148	105.75
2025_07_21_NDS_13	East Runton	ERC	Closed	148.73	44	29.58
2025_07_21_NDS_14B	East Runton	ERC	Closed	106.85	41	38.37
2025_07_21_NDS_15	East Runton	ERC	Closed	90.00	42	46.66
2025_07_21_NDS_16	East Runton	ERO	Open	137.36	92	66.98
2025_07_21_NDS_17B	East Runton	ERO	Open	140.56	117	83.24
2025_07_21_NDS_18	East Runton	ERO	Open	111.10	41	36.90

3.2.1. Comparison of Frequency of All Impacts - 2025

The frequencies of all impacts (excluding the 'Rubble' category, as specified by the EIFCA) were standardised to 100m of rugged chalk per tow and compared statistically and presented for each area and treatment, showing variability of the values recorded in the datasets (see Figure 3).

In Figure 3, values were averaged for each treatment, per area, with the black vertical line representing the minimum to the maximum values, the black horizontal line representing the median value of the data, and the dashed black horizontal line represents the mean value of the data. The coloured area below the median line represents the 25-50th percentile of data, and the coloured area above the median line represents the 50-75th percentile of data.

NB whilst an 'area surveyed' value was completed for each tow, this was based on an average field of view within the imagery of 2.5 square metres, calculated from the known dimensions of fishing gear (pots) observed on occasion throughout the imagery. As the field of view was variable throughout the

imagery, it was considered more appropriate to standardise the data to 100m of rugged chalk per tow, rather than area of impact.

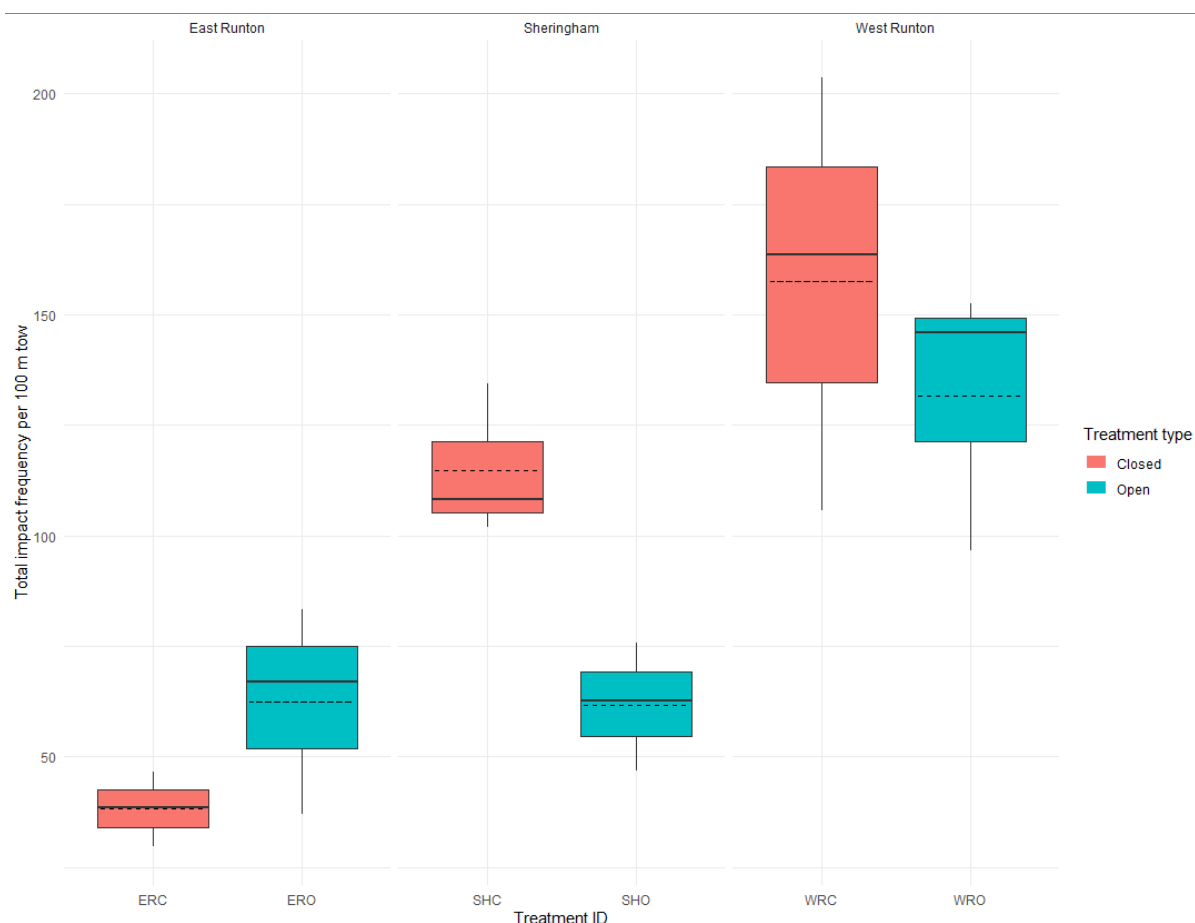


Figure 3.

Chart (box and whisker) comparison of total impact frequency per 100m of rugged chalk per tow (2025), for each area and treatment type, showing the minimum to maximum values (black vertical line), the median value (solid black horizontal line), and the mean value (dashed black horizontal line).

Figure 3 shows that impact frequencies varied between open and close treatments across the three areas. In East Runton the total impact frequency was higher in the open treatment than the closed treatment. In Sheringham and West Runton, there was a higher total impact frequency in the closed treatment than the open treatment.

However, when all areas were grouped together by closed or open treatments, comparison using a 'Kruskal-Wallis multiple comparison with Dunn post-hoc test' showed there was no significant difference between the total impact frequency in open and closed treatments ($P > 0.05$: $P = 0.51$).

When areas were tested individually, there was no significant difference between open and closed treatments at East Runton ($P > 0.05$: $P = 0.28$) or West Runton ($P > 0.05$: $P = 0.28$). However, a significant difference was recorded at Sheringham, where total impact frequency was higher in the closed treatment than the open treatment ($P < 0.05$: $P = 0.0495$). Although a significant difference was recorded at Sheringham, the pattern was not consistent across all three areas. There was high variability within the data, and the low number of replicates reduces the power of statistical tests.

3.2.2. Comparison of Frequency of Low, Medium and High Severity Impacts - 2025

Severity of impacts were split into 'Low', 'Medium' and 'High' and compared between treatments, with the results shown in Figure 4. 'Medium' severity impacts were absent from both open and close treatments at East Runton and were recorded at very low frequencies at Sheringham and West Runton.

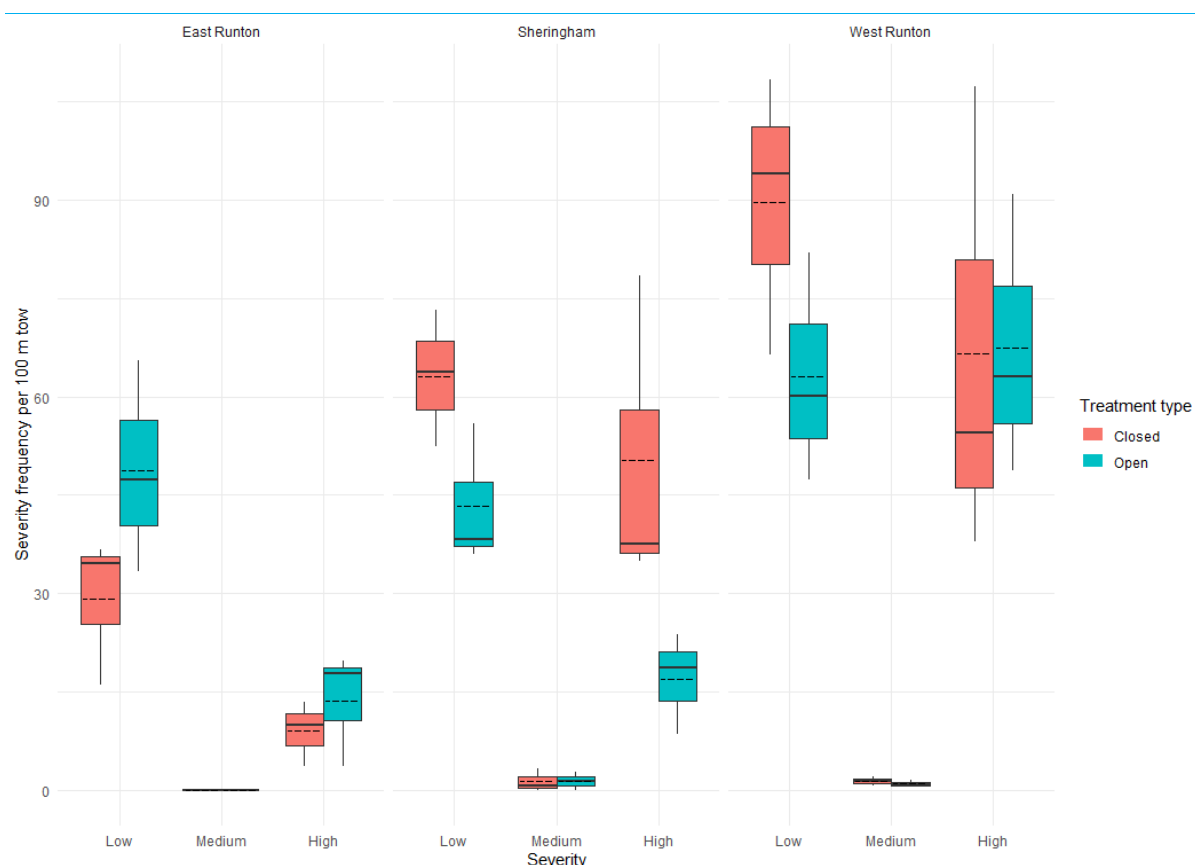


Figure 4.

Chart (box and whisker) comparison of frequency of different severities of impact per 100m of rugged chalk per tow (2025), for each area and treatment type, showing the minimum to maximum values (black vertical line), the median value (solid black horizontal line), and the mean value (dashed black horizontal line).

Figure 4 shows no consistent trends within the frequency of impacts between areas. At East Runton, 'Low' severity impacts were more frequent in the open treatment than the closed treatment. 'High' severity impacts were also slightly higher in the open treatment than the closed treatment. These differences were not statistically significant ($P > 0.05$: 'Low' severity, $P = 0.28$; 'High' severity, $P = 0.51$). The 'Medium' severity comparison was not run because there was no variation in the data.

At Sheringham, 'Low' and 'High' severity impacts were more frequent in the closed treatment than the open treatment. The difference in 'Low' severity impact frequency was not statistically significant ($P > 0.05$: $P = 0.13$), however the 'High' severity impact frequency was significantly greater in the closed treatment than the open treatment ($P < 0.05$: $P = 0.0495$). 'Medium' severity impacts were

recorded at very low frequencies in both treatments and did not differ significantly between treatments ($P > 0.05$; $P = 1.00$).

At West Runton, 'Low' severity impacts were more frequent in the closed treatment than the open treatment. 'Medium' severity frequency was low in both treatments. 'High' severity impacts were similar between treatments. None of the severity comparisons at West Runton were statistically significant ($P > 0.05$: 'Low' severity, $P = 0.13$; 'Medium' severity, $P = 0.83$; 'High' severity, $P = 0.83$).

In general, the medium severity impacts were the least commonly recorded, which may be attributed to the fact that there were fewer categories of 'Medium' severity impact (only 'Strike' and 'Cut' categories), with the qualifier 'Chalk structure broken but not removed', which may have been more difficult to ascertain from analysis of the imagery.

Statistical comparison on data from all areas grouped together by closed or open treatments (using a 'Kruskal-Wallis multiple comparison with Dunn' test) showed no significant difference between the severity of impact frequencies in open and closed treatments ($P > 0.05$; $P = 0.68$). Overall, the severity of impacts does not show a consistent pattern between open and closed treatments across all areas. The clearest difference was recorded at Sheringham, where 'High' severity impacts were significantly more frequent in the closed treatment, but this was not evident at either East Runton or West Runton.

3.3. Comparison of 2024 and 2025 Data

A comparison was undertaken between the 2024 and 2025 chalk impact data to identify whether total impact frequency and severity frequency differed between survey years. A total of 17 video tows were included in the 2024 analysis and 18 video tows were included in the 2025 analysis. Rubble records were removed from the impact frequency analysis in both years, with total impact frequency calculated by combining all non-rubble broad impact categories for each tow and standardising by tow length, as impact frequency per 100 m tow.

It should be noted that the data collected in 2025 from West Runton and Sheringham was better quality than the data collected in 2024, however footage from the first day of data collection on 21st July 2025 (East Runton) were much poorer quality (distant from seabed) than the rest of the 2025 data and the 2024 data, which is likely to affect comparison of the data.

3.3.1. Comparison of Frequency of All Impacts

Overall, total impact frequency was higher in 2025 than in 2024 across all areas and treatment types as shown in Figure 5. Statistical comparison using a Wilcoxon rank sum test showed that the difference in total impact frequency between years was significant ($P < 0.05$; $P = 0.0005$).

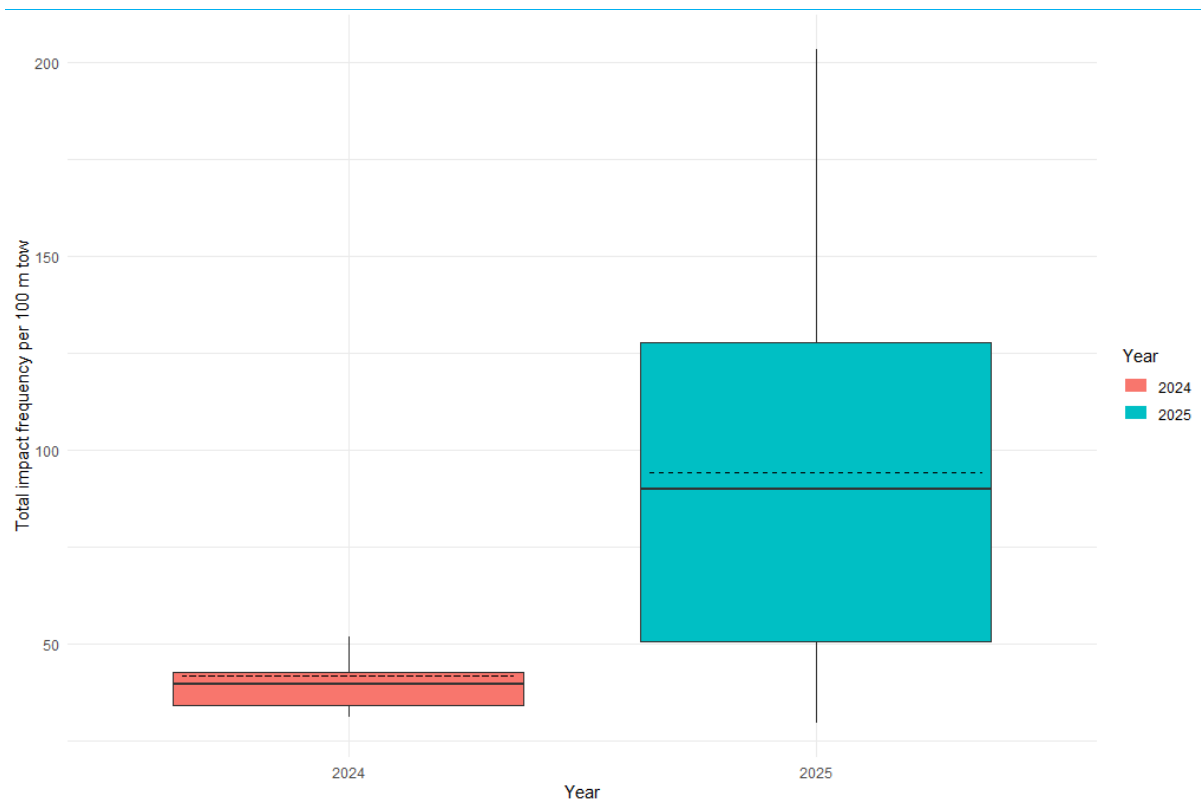
**Figure 5.**

Chart (box and whisker) comparison of frequency of total impacts per 100m of rugged chalk per tow for each year, showing the minimum to maximum values (black vertical line), the median value (solid black horizontal line), and the mean value (dashed black horizontal line).

When split by treatment type, total impact frequency increased between 2024 and 2025 in both closed and open treatments as shown in Figure 6. These differences were statistically significant for both closed treatments ($P < 0.05$: $P = 0.0304$) and open treatments ($P < 0.05$: $P = 0.0081$).

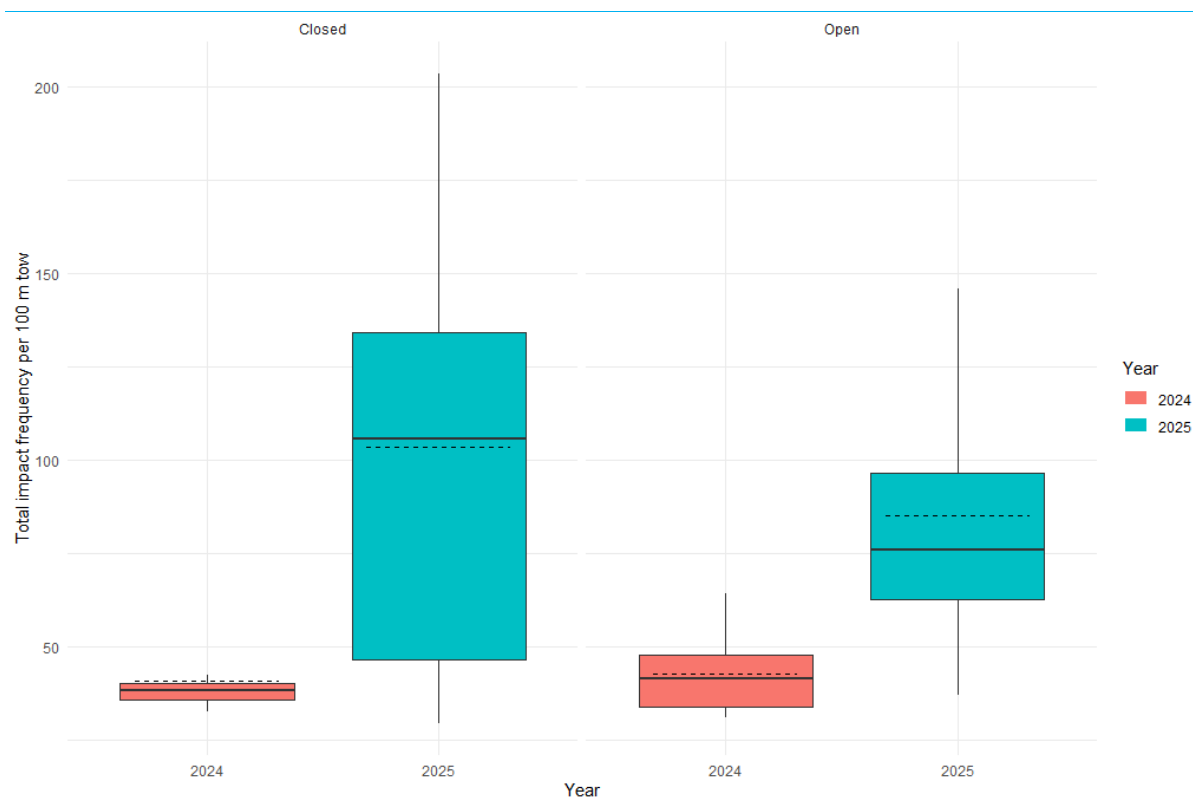


Figure 6.

Chart (box and whisker) comparison of frequency of total impacts per 100m of rugged chalk per tow for each year for each treatment type, showing the minimum to maximum values (black vertical line), the median value (solid black horizontal line), and the mean value (dashed black horizontal line).

At the area level, the increase in total impact frequency was not consistent across all three areas, as shown in Figure 7. East Runton showed a smaller increase between years (NB data collected from this area in 2025 was poorer quality footage). This difference was not statistically significant ($P > 0.05$: $P = 0.575$). In contrast, Sheringham showed an increase from 2024 to 2025, which was significantly different ($P < 0.05$: $P = 0.0202$). West Runton showed the largest increase from 2024 to 2025, which was also significantly different ($P < 0.05$: $P = 0.0081$). The largest increases were recorded in the Sheringham closed, West Runton closed and West Runton open treatments.

**Figure 7.**

Chart (box and whisker) comparison of frequency of total impacts per 100m of rugged chalk per tow for each year for each treatment type across each individual area, showing the minimum to maximum values (black vertical line), the median value (solid black horizontal line), and the mean value (dashed black horizontal line).

3.3.2. Comparison of Frequency of Low, Medium and High Severity Impacts between 2024 and 2025

Severity frequency was also compared between years as shown in Figure 8. Across all areas, there was a significant difference in severity frequency between 2024 and 2025 ($P < 0.05$; $P = 0.0188$). 'Low' severity impacts showed the clearest increase with a statistically significant difference ($P < 0.05$; $P = 0.00001$). 'Medium' severity impacts remained very low in both years, increasing slightly in 2025, however this difference was not statistically significant ($P > 0.05$; $P = 0.424$). 'High' severity impacts increased from 2024 to 2025, although this difference was not statistically significant ($P > 0.05$; $P = 0.269$).

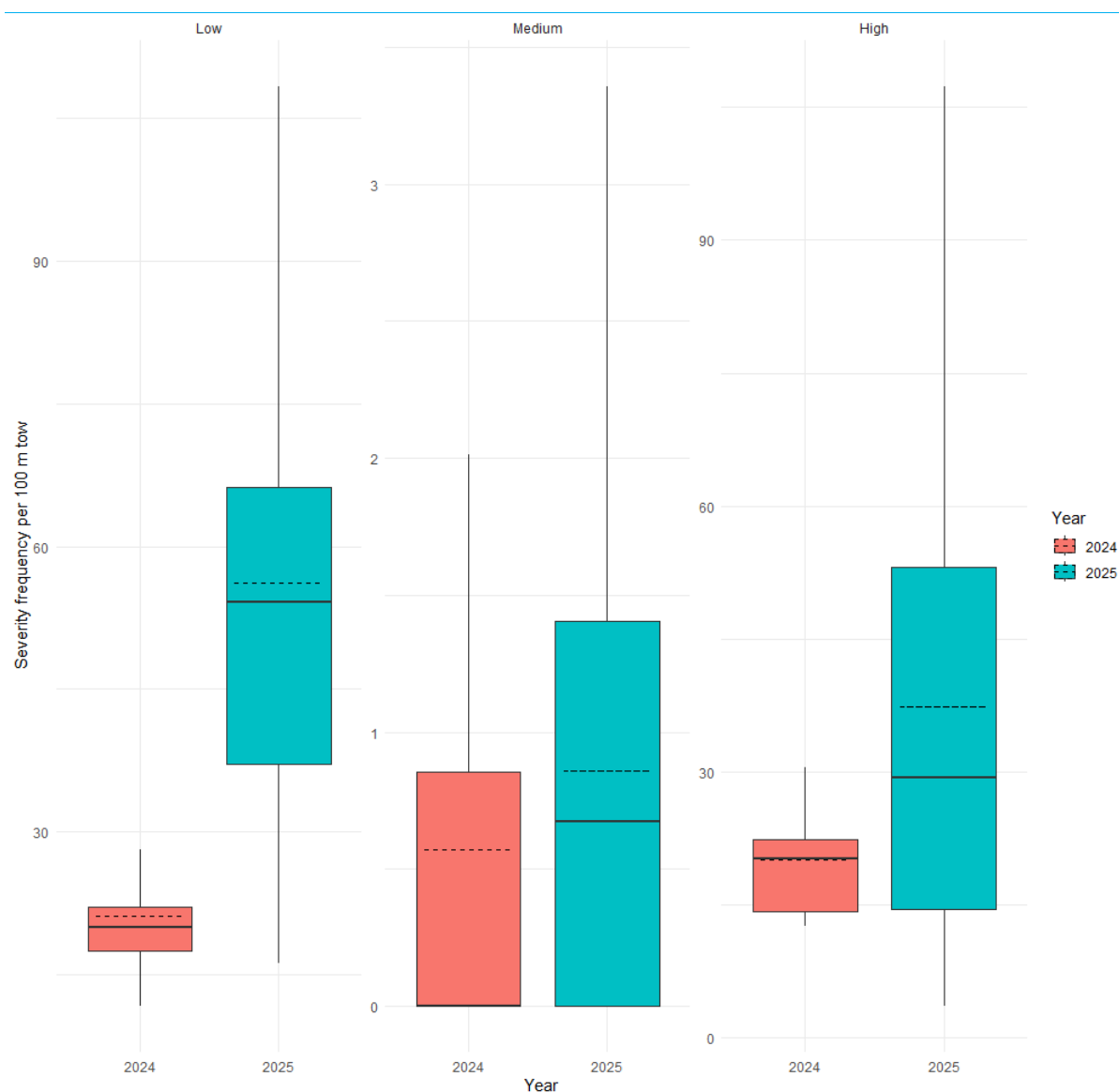


Figure 8.

Chart (box and whisker) comparison of frequency of different severities of impact per 100m of rugged chalk per tow between different years, showing the minimum to maximum values (black vertical line), the median value (solid black horizontal line), and the mean value (dashed black horizontal line).

When severity frequency was compared between treatment types, there was no clear evidence of a consistent difference between open and closed treatments across the two survey years as shown in Figure 9. In 2024, severity frequency was broadly similar between treatment types. In 2025 mean severity frequency increased in both treatment types. However, the difference between years was not statistically significant when assessed separately for closed or open treatments ($P > 0.05$: closed treatments, $P = 0.114$; open treatments, $P = 0.103$).

Overall, the treatment-level comparison indicates that severity frequency increased between 2024 and 2025 in both open and closed treatments, but there was no statistically significant evidence that this increase was specific to either treatment type. The most consistent statistically significant change

between years was the increase in 'Low' severity impacts, rather than a significant difference between open and closed treatment areas.



Figure 9.

Chart (box and whisker) comparison of frequency of different severities of impact per 100m of rugged chalk per tow for each treatment type across both years showing the minimum to maximum values (black vertical line), the median value (solid black horizontal line), and the mean value (dashed black horizontal line).

When each individual area was compared, West Runton shows the largest year-on-year increase in severity frequency as shown in Figure 10. When all severity classes were considered together, severity frequency in the closed treatment areas increased in 2025. This increase was not statistically significant when tested within the closed treatment alone ($P > 0.05$: $P = 0.18$), although the 2024 closed treatment had only two replicate tows. In the open treatment, severity increased in 2025. This increase was close to, but did not meet, the 0.05 significance threshold ($P > 0.05$: $P = 0.09$).

In 2024, 'Low' and 'High' severity impacts were more frequent in the open treatment than the closed treatment. 'Medium' severity impacts were low in both treatment types, although slightly higher in the closed treatment. None of the Open vs Closed severity comparisons at West Runton in 2024 were statistically significant ($P > 0.05$: 'Low' severity, $P = 0.56$; 'Medium' severity, $P = 0.52$; 'High' severity, $P = 0.56$).

In 2025, both open and closed treatments at West Runton showed marked increases in 'Low' and 'High' severity impacts. 'Low' severity impacts were higher in the closed treatment than the open treatment. 'High' severity impacts were similar between treatments. 'Medium' severity impacts remained low. None of the Open vs Closed severity comparisons at West Runton in 2025 were statistically significant ($P > 0.05$: 'Low' severity, $P = 0.13$; 'Medium' severity, $P = 0.83$; 'High' severity, $P = 0.83$).

Overall, West Runton showed the strongest year-on-year increase in severity frequency, with increases in both open and closed treatments. The increase was mainly associated with 'Low' and 'High' severity impacts, while 'Medium' severity impacts remained low. Although the increase was most pronounced in the closed treatment, the same broad pattern was also evident in the open treatment, and no statistically significant Open vs Closed differences were recorded for any severity class in either year.

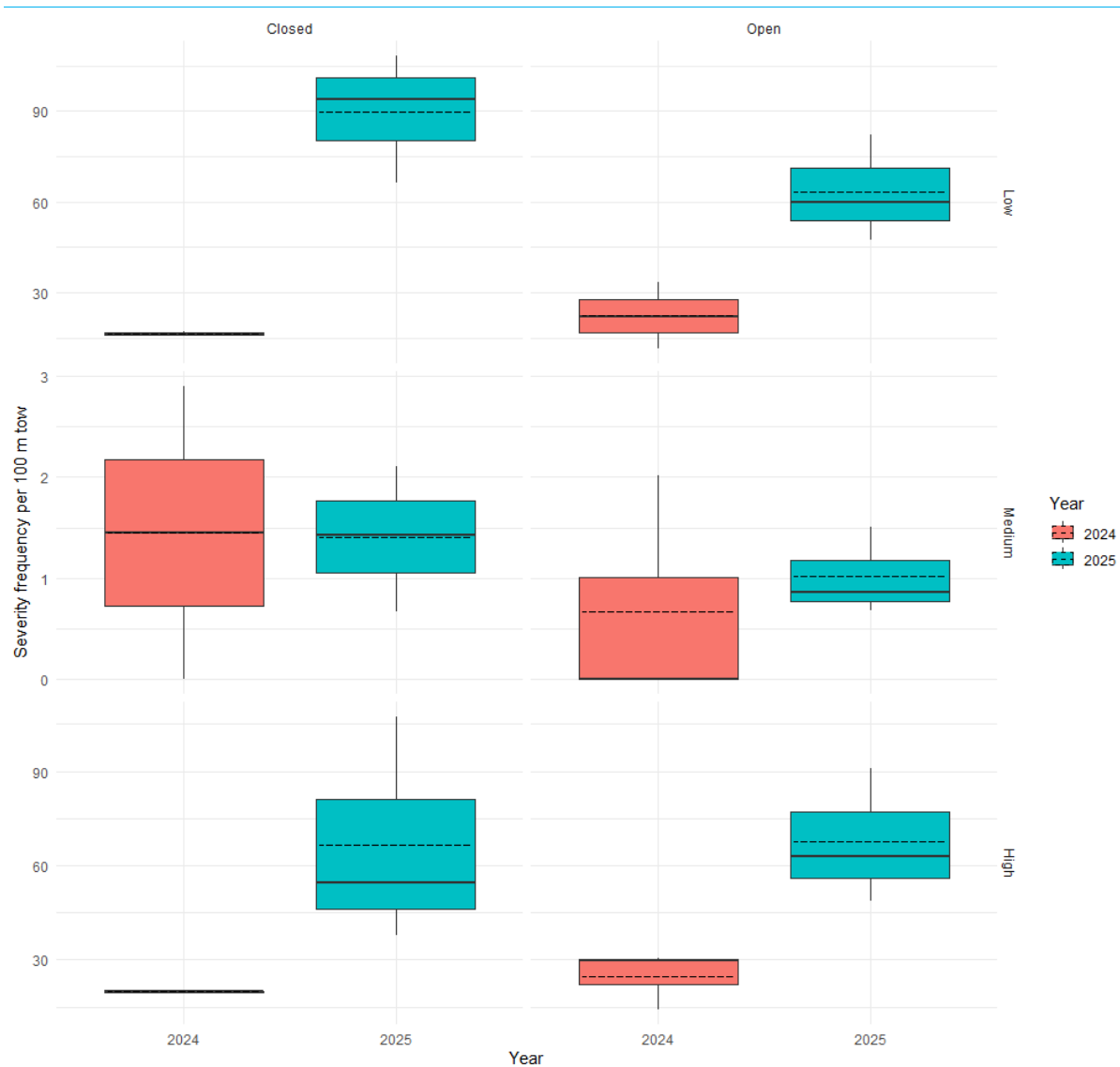
**Figure 10.**

Chart (box and whisker) comparison of frequency of different severities of impact per 100m of rugged chalk per tow for each treatment type across both years for West Runton, showing the minimum to maximum values (black vertical line), the median value (solid black horizontal line), and the mean value (dashed black horizontal line).

At Sheringham, severity frequency increased between 2024 and 2025, particularly in the closed treatment as shown in Figure 11. When all severity classes were considered together, severity frequency in the closed treatment increased in 2025. This increase was not statistically significant at the 0.05 level ($P > 0.05$: $P = 0.14$), but it represented a clear descriptive increase. In the open treatment, there was also an increase in severity frequency which was also not statistically significant ($P > 0.05$: $P = 0.48$).

In 2024, 'Low' severity impacts were slightly more frequent in the closed treatment than the open treatment. 'Medium' severity impacts were very low in both treatments. 'High' severity impacts were slightly higher in the open treatment than the closed treatment. None of the Open vs Closed comparisons at Sheringham in 2024 were statistically significant ($P > 0.05$: 'Low' severity, $P = 0.51$; 'Medium' severity, $P = 0.82$; 'High' severity, $P = 0.51$).

In 2025, Sheringham showed a clearer difference between treatment types. 'Low' severity impacts were higher in the closed treatment than the open treatment. 'Medium' severity impacts remained low in both treatment types. 'High' severity impacts showed the strongest difference. The Open vs Closed comparison for 'High' severity impacts was statistically significant in 2025 ($P < 0.05$: $P = 0.0495$), while 'Low' and 'Medium' severity comparisons were not significant ($P > 0.05$: 'Low' severity, $P = 0.13$; 'Medium' severity, $P = 1.00$).

Overall, Sheringham showed an increase in severity frequency between 2024 and 2025, particularly in the closed treatment. The most notable result was the significant difference in 'High' severity impacts in 2025, with higher frequency recorded in the closed treatment than the open treatment. This suggests that the increase at Sheringham was not associated with higher severity frequency in the open treatment but was instead driven mainly by increases in the closed treatment, especially for 'Low' and 'High' severity impacts.

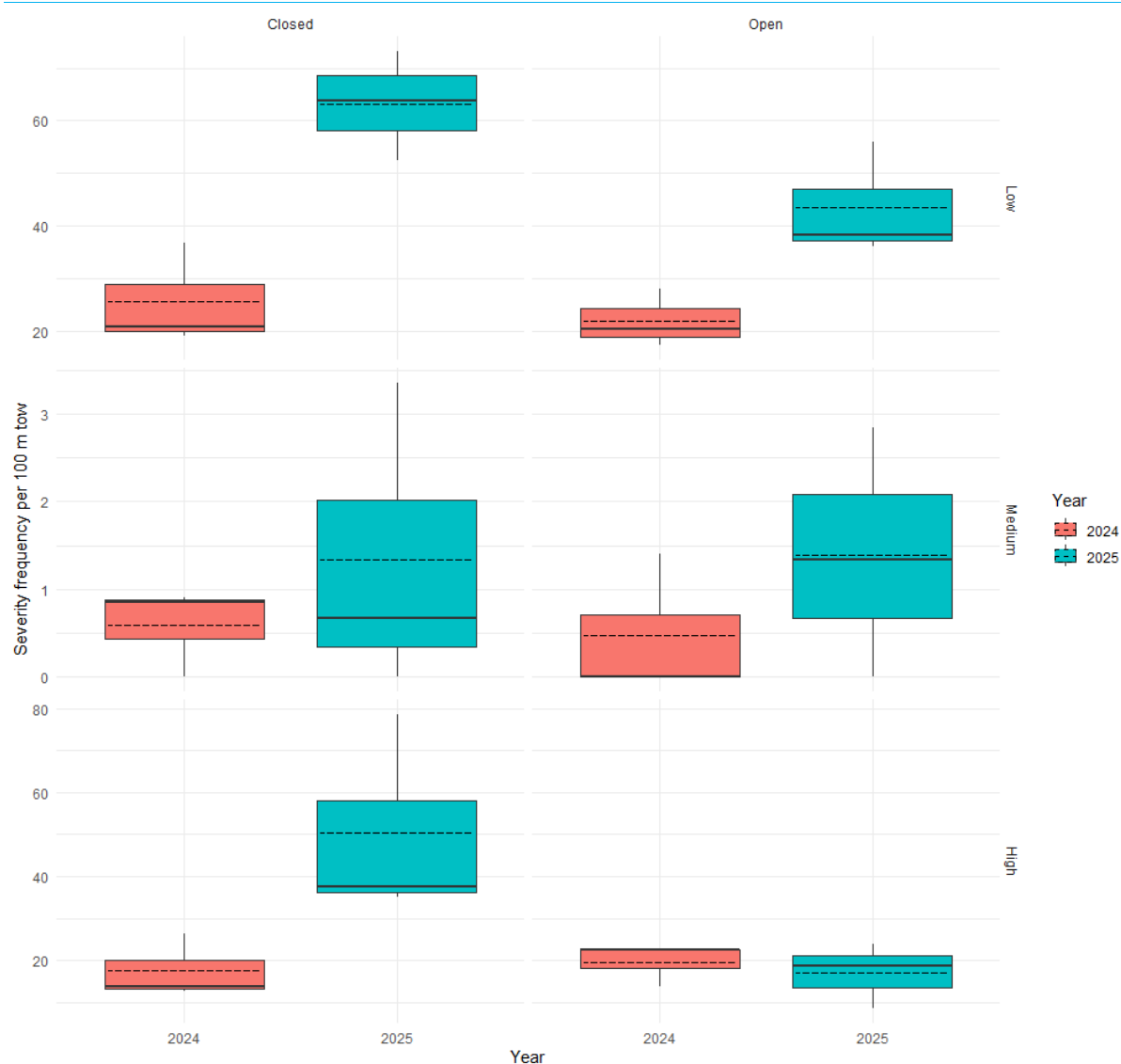
**Figure 11.**

Chart (box and whisker) comparison of frequency of different severities of impact per 100m of rugged chalk per tow for each treatment type across both years for Sheringham, showing the minimum to maximum values (black vertical line), the median value (solid black horizontal line), and the mean value (dashed black horizontal line).

At East Runton, severity frequency was relatively similar between 2024 and 2025 in the closed treatment when all severity classes were considered together as shown in Figure 12. Severity frequency in the closed treatment was higher in 2025 than in 2024, but this year-on-year difference was not statistically significant ($P > 0.05$: $P = 0.59$). In the open treatment, severity frequency increased from 2024 to 2025, although this increase was also not statistically significant ($P > 0.05$: $P = 0.72$).

In 2024, 'Low' and 'High' severity impacts occurred at broadly similar frequencies in open and closed treatments at East Runton. 'Low' severity impacts were slightly higher in the closed treatment than the open treatment. 'High' severity impacts were similar in the open and closed treatment. 'Medium' severity impacts were very low in both treatment types. None of the Open vs Closed comparisons for East Runton in 2024 were statistically significant ($P > 0.05$: 'Low' severity, $P = 0.83$; 'Medium' severity, $P = 0.80$; 'High' severity, $P = 0.83$).

In 2025, the pattern at East Runton changed, with 'Low' severity impacts becoming more frequent in the open treatment than the closed treatment. 'High' severity impacts were also slightly higher in the open treatment than the closed treatment. 'Medium' severity impacts were absent from both treatment types. Despite these differences, the Open vs Closed comparisons were not statistically significant for 'Low' or 'High' severity impacts ($P > 0.05$: 'Low' severity, $P = 0.28$; 'High' severity, $P = 0.51$), and the 'Medium' severity test was not run because there was no variation in the data.

Overall, East Runton did not show a statistically significant change in severity frequency between 2024 and 2025. The main descriptive change was an increase in 'Low' severity impacts in the open treatment in 2025, while 'High' severity impacts decreased in the closed treatment and remained relatively low in the open treatment.

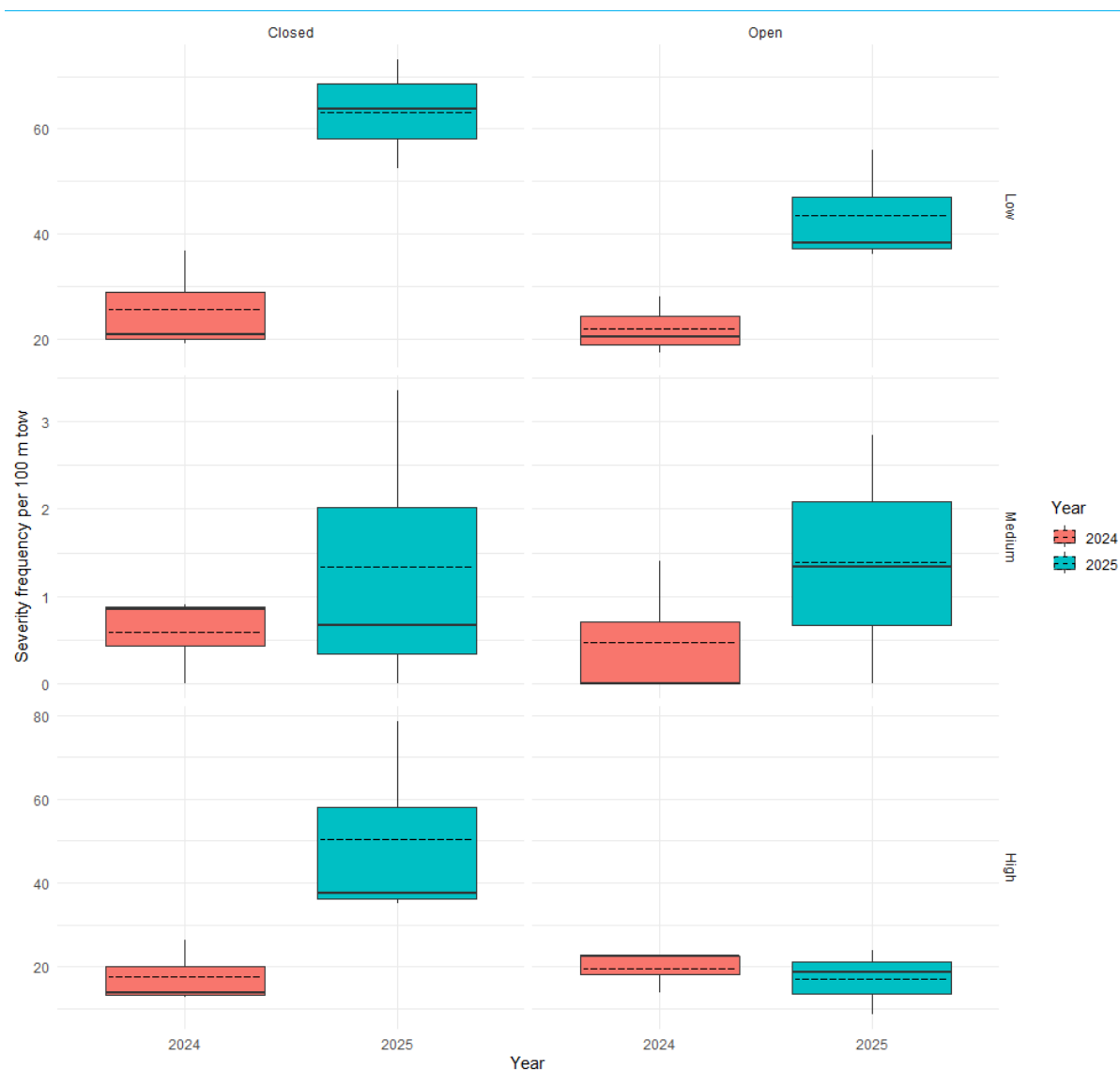
**Figure 12.**

Chart (box and whisker) comparison of frequency of different severities of impact per 100m of rugged chalk per tow for each treatment type across both years for East Runton, showing the minimum to maximum values (black vertical line), the median value (solid black horizontal line), and the mean value (dashed black horizontal line).

4. Conclusions

In summary, the 2024 chalk impact data do not show significant difference in total impact frequency between open and closed treatments. Total impact frequency was similar between treatments at East Runton and Sheringham, while West Runton showed higher mean impact frequency in the open treatment than the closed treatment. However, none of the area-specific Open vs Closed comparisons were statistically significant.

No significant differences in 'Low', 'Medium' or 'High' severity impact frequency were recorded between open and closed treatments at East Runton, Sheringham or West Runton. When all severity records were grouped by treatment type, there was also no significant difference between open and closed treatments.

These results suggest that, based on the 2024 survey data, there is no clear evidence of higher total impact frequency or greater impact severity in open treatments compared with closed treatments. Interpretation should be cautious due to the low number of replicate tows within each area and treatment, particularly in West Runton closed treatment where only two replicate tows were included.

The 2025 chalk impact data do not show a consistent trend between open and closed treatments across all areas. Total impact frequency was higher in the open treatment at East Runton, but higher in the closed treatments at Sheringham and West Runton. When all areas were grouped together, there was no significant difference in total impact frequency between open and closed treatments.

At the area level, Sheringham was the only area where a significant difference in total impact frequency was recorded, with higher impact frequency in the closed treatment than the open treatment. Sheringham was also the only area where a significant difference in severity frequency was recorded, with 'High' severity impacts occurring more frequently in the closed treatment than the open treatment. No significant open/closed differences were recorded for total impact frequency at East Runton or West Runton, and no significant Low, Medium or High severity differences were recorded at West Runton.

These results suggest that, based on the 2025 survey data, there is no consistent evidence of higher impact frequency or severity in open treatments compared with closed treatments. However, interpretation should be cautious due to the low number of replicate tows within each treatment and area, and the observed variability in impact frequency between replicate tows. Further comparison with subsequent years of survey data may allow clearer temporal patterns to be identified and may help determine whether differences between open and closed treatments become more consistent over time.

The 2024 and 2025 comparison indicates a clear increase in total impact frequency between survey years, with significantly higher total impact frequency recorded in 2025 than in 2024. This increase was most apparent at Sheringham and West Runton, while East Runton showed a smaller and non-significant change (potentially due to differences in imagery quality).

Although impact frequency and 'Low' severity impacts were higher in 2025, this pattern occurred across both open and closed treatments. The results therefore indicate a year-on-year increase in recorded chalk impact frequency, rather than a clear treatment-specific pattern between open and closed areas. Interpretation should remain cautious due to the low number of replicate tows within each area and treatment, and because inter-annual differences may reflect a combination of natural disturbance, survey conditions, imagery quality prior impact history, and any developing treatment effects.

Continued monitoring will be important to determine whether the higher impact frequencies recorded in 2025 represent a sustained temporal trend or year-specific variability. Further comparison across subsequent survey years should help clarify whether consistent differences emerge between open and closed treatments, and whether particular areas, such as West Runton and Sheringham, continue to show higher levels of impact frequency.

5. Appendices

5.1. Appendix A: Rugged Chalk Segments - 2024

Table 10 Summary of information recorded for all rugged chalk in each tow (not standardised to 100m), including dive data, quality, tow details and frequency of impact type and severity.

Dive Data		Tow Details				Impact Type				Impact Severity		
Tow	Dive ID	Quality	Duration (m:ss)	Length (m)	% Rugged	Strikes	Grates	Cuts	Rubble	Low	Medium	High
1	2024_07_31_NDS_1	Poor	01:39	140	93	0	41	2	8	25	0	26
2	2024_07_31_NDS_2	Poor	02:02	140	83	1	66	8	3	43	1	34
3	2024_07_31_NDS_3	Poor	01:34	148	80	1	37	0	6	23	1	20
4	2024_07_31_NDS_4	Poor	02:51	129	19	1	32	4	6	20	1	22
5	2024_07_31_NDS_5	Poor	02:58	131	73	1	39	2	1	20	0	23
6	2024_07_31_NDS_6	Poor	03:24	144	60	0	26	1	2	15	0	14
7	2024_07_31_NDS_7	Poor	00:40	121	29	0	19	2	0	11	0	10
8	2024_07_31_NDS_8	Poor	01:15	134	89	0	36	5	4	18	0	27
9	2024_07_31_NDS_9	Poor	01:02	138	41	0	16	3	4	11	1	11
10	2024_07_31_NDS_10	Poor	01:59	139	75	3	37	1	9	18	3	29
11	2024_07_31_NDS_11	Poor	02:10	135	41	0	24	1	4	7	0	22
12	2024_07_31_NDS_12		-	-	-	-	-	-	-	-	-	-
13	2024_07_31_NDS_13	Good	02:41	136	88	3	47	2	14	24	1	41
14	2024_07_31_NDS_14	Poor	01:43	148	81	1	50	6	11	27	1	40
15	2024_07_31_NDS_15	Very Poor	01:06	135	78	0	33	4	5	21	0	21
16	2024_07_31_NDS_16	Very Poor	03:33	114	75	1	29	4	9	16	0	27
17	2024_07_31_NDS_17	Very Poor	02:06	137	42	0	20	1	5	12	0	14
18	2024_07_31_NDS_18	Poor	01:26	127	50	0	20	1	4	9	0	16

Table 11 Summary of rugged chalk segments recorded within each tow, including dive data, tow and rugged chalk segment details and frequency of impact type and severity for 2024 data.

Dive Data		Rugged chalk segment data			Impact Type				Impact Severity		
Tow	Dive ID	Rugged chalk segment ID	Duration (mm:ss)	Length (m)	Strikes	Grates	Cuts	Rubble	Low	Medium	High
1	2024_07_31_NDS_1	STN1_RC_001	00:00:17	8.8	0	10	0	2	1	0	11
1	2024_07_31_NDS_1	STN1_RC_002	00:00:52	38.0	0	13	2	3	10	0	8
1	2024_07_31_NDS_1	STN1_RC_003	00:00:15	12.1	1	5	2	1	5	1	3
1	2024_07_31_NDS_1	STN1_RC_004	00:00:06	4.8	0	2	0	0	2	0	0
1	2024_07_31_NDS_1	STN1_RC_005	00:00:09	7.5	0	2	0	0	2	0	0
2	2024_07_31_NDS_2	STN2_RC_001	00:02:02	98.3	1	39	2	1	20	0	23
3	2024_07_31_NDS_3	STN3_RC_001	00:00:19	17.2	0	6	0	0	4	0	2
3	2024_07_31_NDS_3	STN3_RC_002	00:00:05	5.4	0	2	0	0	0	0	2
3	2024_07_31_NDS_3	STN3_RC_003	00:00:10	9.4	0	3	1	0	3	0	1
3	2024_07_31_NDS_3	STN3_RC_004	00:00:38	35.2	0	7	0	2	4	0	5
3	2024_07_31_NDS_3	STN3_RC_005	00:00:22	19.4	0	8	0	0	4	0	4
4	2024_07_31_NDS_4	STN4_RC_001	00:00:47	33.3	0	10	0	0	8	0	2
4	2024_07_31_NDS_4	STN4_RC_002	00:00:22	15.1	0	4	0	1	1	0	4
4	2024_07_31_NDS_4	STN4_RC_003	00:01:42	62.0	1	23	0	5	14	1	14
5	2024_07_31_NDS_5	STN5_RC_001	00:00:39	24.2	0	7	0	0	6	0	1
5	2024_07_31_NDS_5	STN5_RC_002	00:01:38	83.7	0	18	1	6	9	0	16
5	2024_07_31_NDS_5	STN5_RC_003	00:00:36	19.6	0	15	1	2	9	0	9
5	2024_07_31_NDS_5	STN5_RC_004	00:00:05	4.3	0	1	0	0	1	0	0
6	2024_07_31_NDS_6	STN6_RC_001	00:00:13	6.5	0	7	1	0	5	0	3
6	2024_07_31_NDS_6	STN6_RC_002	00:00:05	2.6	0	3	0	0	0	0	3
6	2024_07_31_NDS_6	STN6_RC_003	00:03:06	108.1	1	56	7	3	38	1	28
7	2024_07_31_NDS_7	STN7_RC_001	00:00:06	5.9	0	1	0	0	1	0	0
7	2024_07_31_NDS_7	STN7_RC_002	00:00:23	19.5	0	14	1	0	7	0	8
7	2024_07_31_NDS_7	STN7_RC_003	00:00:11	7.3	0	4	1	0	3	0	2
8	2024_07_31_NDS_8	STN8_RC_001	00:00:12	8.4	0	4	0	1	2	0	3
8	2024_07_31_NDS_8	STN8_RC_002	00:00:23	15.0	0	3	1	3	2	0	5
8	2024_07_31_NDS_8	STN8_RC_003	00:00:26	16.6	0	2	0	0	2	0	0
8	2024_07_31_NDS_8	STN8_RC_004	00:00:14	9.7	0	7	2	0	5	1	3
9	2024_07_31_NDS_9	STN9_RC_001	00:00:04	4.8	0	2	0	0	1	0	1
9	2024_07_31_NDS_9	STN9_RC_002	00:00:04	4.0	0	2	0	0	0	0	2
9	2024_07_31_NDS_9	STN9_RC_003	00:00:17	15.7	0	4	0	4	1	0	7
9	2024_07_31_NDS_9	STN9_RC_004	00:00:03	3.5	0	4	0	0	1	0	3
9	2024_07_31_NDS_9	STN9_RC_005	00:00:12	10.9	0	4	0	0	1	0	3
9	2024_07_31_NDS_9	STN9_RC_006	00:00:11	9.5	0	5	1	0	2	0	4
9	2024_07_31_NDS_9	STN9_RC_007	00:00:04	2.2	0	0	0	0	0	0	0
9	2024_07_31_NDS_9	STN9_RC_008	00:00:07	9.5	0	3	0	0	1	0	2
10	2024_07_31_NDS_10	STN10_RC_001	00:00:07	7.0	0	5	0	0	2	0	3
10	2024_07_31_NDS_10	STN10_RC_002	00:00:56	47.5	0	15	4	1	6	0	14

10	2024_07_31_NDS_10	STN10_RC_003	00:00:09	11.1	0	5	0	0	5	0	0
10	2024_07_31_NDS_10	STN10_RC_004	00:00:38	38.9	0	10	1	3	4	0	10
10	2024_07_31_NDS_10	STN10_RC_005	00:00:09	9.1	0	1	0	0	1	0	0
11	2024_07_31_NDS_11	STN11_RC_001	00:00:35	27.9	0	12	0	5	2	0	15
11	2024_07_31_NDS_11	STN11_RC_002	00:01:00	47.6	3	15	1	3	9	3	10
11	2024_07_31_NDS_11	STN11_RC_003	00:00:35	28.0	0	10	0	1	7	0	4
13	2024_07_31_NDS_13	STN13_RC_001	00:00:03	2.7	0	2	0	1	1	0	2
13	2024_07_31_NDS_13	STN13_RC_002	00:00:27	17.4	0	6	1	6	3	0	10
13	2024_07_31_NDS_13	STN13_RC_003	00:00:09	3.7	0	3	0	0	3	0	0
13	2024_07_31_NDS_13	STN13_RC_004	00:02:02	107.4	3	36	1	7	17	1	29
14	2024_07_31_NDS_14	STN14_RC_001	00:00:35	28.3	1	9	3	3	5	0	11
14	2024_07_31_NDS_14	STN14_RC_002	00:00:41	31.8	0	11	0	4	6	0	9
14	2024_07_31_NDS_14	STN14_RC_003	00:00:15	11.6	0	6	0	1	3	0	4
14	2024_07_31_NDS_14	STN14_RC_004	00:00:07	6.1	0	2	1	0	1	0	2
14	2024_07_31_NDS_14	STN14_RC_005	00:00:05	2.4	0	1	0	1	1	0	1
15	2024_07_31_NDS_15	STN15_RC_001	00:00:12	10.1	0	3	0	0	2	0	1
15	2024_07_31_NDS_15	STN15_RC_002	00:00:14	12.0	0	4	0	1	3	0	2
15	2024_07_31_NDS_15	STN15_RC_003	00:00:08	6.5	0	1	0	0	1	0	0
15	2024_07_31_NDS_15	STN15_RC_004	00:00:32	28.2	0	12	1	4	6	0	11
16	2024_07_31_NDS_16	STN16_RC_001	00:03:19	8.8	1	50	6	11	27	1	40
16	2024_07_31_NDS_16	STN16_RC_002	00:00:07	38.0	0	0	0	0	0	0	0
16	2024_07_31_NDS_16	STN16_RC_003	00:00:07	12.1	0	0	0	0	0	0	0
17	2024_07_31_NDS_17	STN17_RC_001	00:00:08	4.8	0	3	0	2	1	0	4
17	2024_07_31_NDS_17	STN17_RC_002	00:00:12	7.5	0	1	1	0	1	0	1
17	2024_07_31_NDS_17	STN17_RC_003	00:00:04	98.3	0	1	0	1	1	0	1
17	2024_07_31_NDS_17	STN17_RC_004	00:00:04	17.2	0	2	0	0	1	0	1
17	2024_07_31_NDS_17	STN17_RC_005	00:00:05	5.4	0	3	0	0	2	0	1
17	2024_07_31_NDS_17	STN17_RC_006	00:00:15	9.4	0	3	0	0	1	0	2
17	2024_07_31_NDS_17	STN17_RC_007	00:00:17	35.2	0	3	0	2	2	0	3
17	2024_07_31_NDS_17	STN17_RC_008	00:01:01	19.4	0	17	3	0	12	0	8
18	2024_07_31_NDS_18	STN18_RC_001	00:00:30	33.3	0	7	0	1	5	0	3
18	2024_07_31_NDS_18	STN18_RC_002	00:00:06	15.1	0	2	0	1	1	0	2
18	2024_07_31_NDS_18	STN18_RC_003	00:00:06	62.0	0	0	0	0	0	0	0
18	2024_07_31_NDS_18	STN18_RC_004	00:00:03	24.2	0	2	0	0	0	0	2
18	2024_07_31_NDS_18	STN18_RC_005	00:00:10	83.7	0	4	1	1	3	0	3
18	2024_07_31_NDS_18	STN18_RC_006	00:00:13	19.6	0	2	0	1	0	0	3
18	2024_07_31_NDS_18	STN18_RC_007	00:00:06	4.3	0	2	0	0	0	0	2
18	2024_07_31_NDS_18	STN18_RC_008	00:00:08	6.5	0	1	0	0	0	0	1
18	2024_07_31_NDS_18	STN18_RC_009	00:00:04	2.6	0	0	0	0	0	0	0

5.2. Appendix B: Rugged Chalk Segments - 2025

Table 12 Summary of information recorded for all rugged chalk in each tow (not standardised to 100m), including dive data, quality, tow details and frequency of impact type and severity.

Dive Data		Tow Details				Impact Type				Impact Severity		
Tow	Dive ID	Quality	Duration (mm:ss)	Length (m)	% Rugged	Strikes	Grates	Cuts	Rubble	Low	Medium	High
1	2025_08_14_NDS_1	Poor	03:02	148	51	1	55	1	0	42	1	14
2	2025_08_14_NDS_2	Poor	03:12	148	71	4	62	0	6	38	3	31
3	2025_08_14_NDS_3	Good	01:36	71	100	0	32	1	4	27	0	10
4	2025_08_14_NDS_4	Poor	03:26	149	100	2	143	7	13	95	1	69
5	2025_08_14_NDS_5	Poor	03:28	149	100	8	184	8	7	78	5	124
6	2025_08_14_NDS_6	Poor	03:16	149	100	0	158	3	3	109	0	55
7	2025_08_14_NDS_7	Poor	03:39	148	100	3	139	1	19	70	1	91
8	2025_08_14_NDS_8	Poor	03:40	148	78	1	168	0	7	95	1	80
9	2025_08_14_NDS_9	Poor	03:31	148	90	2	199	2	3	80	2	124
10	2025_08_14_NDS_10	Poor	03:42	150	95	4	285	1	8	134	3	161
11	2025_08_14_NDS_11	Good	04:02	149	100	2	241	0	6	161	1	87
12	2025_08_14_NDS_12	Good	03:06	148	94	4	144	0	5	93	2	58
13	2025_07_21_NDS_13	Very Poor	03:50	149	100	0	40	4	2	24	0	22
14B	2025_07_21_NDS_14B	Very Poor	02:54	134	80	0	37	4	1	37	0	5
15	2025_07_21_NDS_15	Very Poor	03:54	149	60	0	40	2	1	33	0	10
16	2025_07_21_NDS_16	Very Poor	03:32	149	92	1	90	1	4	65	0	31
17B	2025_07_21_NDS_17B	Very Poor	02:46	148	95	0	115	2	4	92	0	29
18	2025_07_21_NDS_18	Very Poor	04:18	150	74	0	40	1	0	37	0	4

Table 13 Summary of rugged chalk segments recorded within each tow, including dive data, tow and rugged chalk segment details and frequency of impact type and severity for 2025 data.

Dive Data		Rugged chalk segment data			Impact Type				Impact Severity		
Tow	Dive ID	Rugged chalk segment ID	Duration (mm:ss)	Length (m)	Strikes	Grates	Cuts	Rubble	Low	Medium	High
1	2025_08_14_NDS_1	STN1_RC_001	00:16	16.1	1	9	0	0	6	1	3
1	2025_08_14_NDS_1	STN1_RC_002	00:13	13.1	0	5	1	0	1	0	5
1	2025_08_14_NDS_1	STN1_RC_003	00:14	9.6	0	9	0	0	8	0	1
1	2025_08_14_NDS_1	STN1_RC_004	00:12	12.2	0	16	0	0	13	0	3
1	2025_08_14_NDS_1	STN1_RC_005	00:02	1.4	0	2	0	0	2	0	0
1	2025_08_14_NDS_1	STN1_RC_006	00:09	6.7	0	4	0	0	2	0	2
1	2025_08_14_NDS_1	STN1_RC_007	00:16	12.1	0	6	0	0	6	0	0
1	2025_08_14_NDS_1	STN1_RC_008	00:07	4.0	0	4	0	0	4	0	0
2	2025_08_14_NDS_2	STN2_RC_001	01:49	83.0	4	56	0	4	36	3	25
2	2025_08_14_NDS_2	STN2_RC_002	00:19	12.2	0	6	0	0	2	0	4
2	2025_08_14_NDS_2	STN2_RC_003	00:10	10.2	0	0	0	2	0	0	2
3	2025_08_14_NDS_3	STN3_RC_001	01:36	70.6	0	32	1	4	27	0	10
4	2025_08_14_NDS_4	STN4_RC_001	03:26	149.1	2	143	7	13	95	1	69
5	2025_08_14_NDS_5	STN5_RC_001	03:28	148.9	8	184	8	7	78	5	124
6	2025_08_14_NDS_6	STN6_RC_001	03:16	148.8	0	158	3	3	109	0	55
7	2025_08_14_NDS_7	STN7_RC_001	03:40	147.9	3	139	1	19	70	1	91
8	2025_08_14_NDS_8	STN8_RC_001	00:55	37.3	0	34	0	1	26	0	9
8	2025_08_14_NDS_8	STN8_RC_002	02:03	78.5	1	134	0	6	69	1	71
9	2025_08_14_NDS_9	STN9_RC_001	00:24	23.1	1	34	0	0	18	1	16
9	2025_08_14_NDS_9	STN9_RC_002	02:41	110.1	1	165	2	3	62	1	108
10	2025_08_14_NDS_10	STN10_RC_001	01:55	80.5	3	181	1	7	74	2	116
10	2025_08_14_NDS_10	STN10_RC_002	01:34	62.0	1	104	0	1	60	1	45
11	2025_08_14_NDS_11	STN11_RC_001	04:02	148.5	2	241	0	6	161	1	87
12	2025_08_14_NDS_12	STN12_RC_001	03:06	140.0	4	144	0	5	93	2	58
13	2025_07_21_NDS_13	STN13_RC_001	03:50	148.7	0	40	4	2	24	0	22
14B	2025_07_21_NDS_14B	STN14_RC_001	00:46	44.9	0	12	3	0	12	0	3
14B	2025_07_21_NDS_14B	STN14_RC_002	00:43	32.4	0	18	1	0	18	0	1
14B	2025_07_21_NDS_14B	STN14_RC_003	00:21	14.1	0	3	0	0	3	0	0
14B	2025_07_21_NDS_14B	STN14_RC_004	00:32	15.5	0	4	0	1	4	0	1
15	2025_07_21_NDS_15	STN15_RC_001	00:11	7.8	0	1	0	0	1	0	0
15	2025_07_21_NDS_15	STN15_RC_002	01:21	52.1	0	1	0	0	1	0	0
15	2025_07_21_NDS_15	STN15_RC_003	00:11	8.1	0	32	2	1	25	0	10
15	2025_07_21_NDS_15	STN15_RC_004	00:33	22.1	0	6	0	0	6	0	0
16	2025_07_21_NDS_16	STN16_RC_001	00:06	6.6	1	5	0	2	3	0	5
16	2025_07_21_NDS_16	STN16_RC_002	00:09	8.6	0	78	1	2	58	0	23
16	2025_07_21_NDS_16	STN16_RC_003	00:14	11.2	0	3	0	0	1	0	2
16	2025_07_21_NDS_16	STN16_RC_004	02:48	111.0	0	4	0	0	3	0	1
17B	2025_07_21_NDS_17B	STN17B_RC_001	00:08	8.8	0	7	0	2	6	0	3

17B	2025_07_21_NDS_17B	STN17B_RC_002	02:29	131.7	0	108	2	2	86	0	26
18	2025_07_21_NDS_18	STN18_RC_001	00:05	6.8	0	0	0	0	0	0	0
18	2025_07_21_NDS_18	STN18_RC_002	00:44	36.5	0	14	1	0	13	0	2
18	2025_07_21_NDS_18	STN18_RC_003	00:20	10.2	0	4	0	0	3	0	1
18	2025_07_21_NDS_18	STN18_RC_004	00:24	12.6	0	5	0	0	4	0	1
18	2025_07_21_NDS_18	STN18_RC_005	00:35	15.0	0	5	0	0	5	0	0
18	2025_07_21_NDS_18	STN18_RC_006	00:57	30.1	0	12	0	0	12	0	0