## Cockle stock assessment – The Gat

During the 2019 spring cockle surveys, two dense patches of Year-0 juvenile cockles were identified on the Gat Sand. At the time of the survey, these had a size range predominantly between 4-7mm width (figure 1). There were also over 1,000 tonnes of larger Year-2 cockles on this bed. The majority of these were situated in patches to the south of the mussel bed, but some were mixed among the juvenile stocks to the east of the mussel bed.

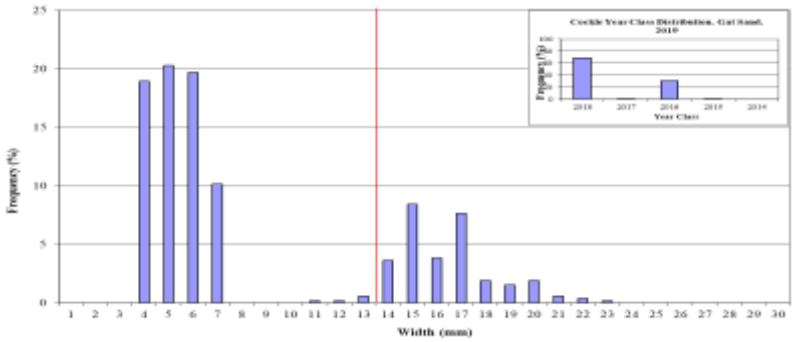



**Figure 1 – Cockle size frequency. Gat Sand. April 2019**

To protect the Year-0 juvenile stocks from the fishery, two closed areas were placed around the patches where juvenile densities were estimated to be greater than 1,000/m$^2$ (figure 2).

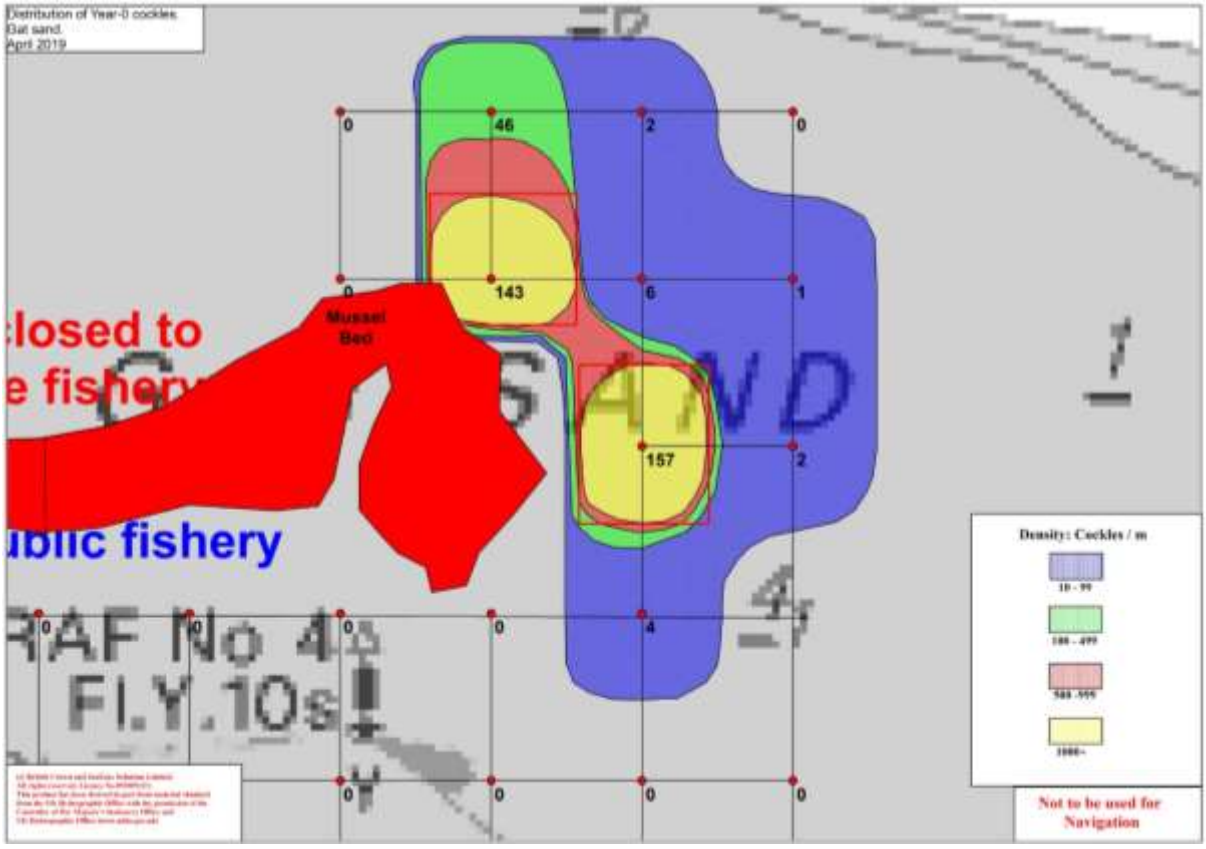



**Figure 2 – Chart showing the numbers of Year-0 cockles present at each survey station in April 2019, their modelled distribution and the two closed areas protecting them**

During July and August there were several reports received from fishermen complaining that small juvenile cockles were being landed from the Gat beds, threatening the sustainability of next year's fishery. These reports were collaborated with observations made by IFCOs conducting landings, in which samples of cockles that had been landed from the Gat sand had average size frequencies between 11.4mm and 12.7mm. An assessment of the cockles on the east side of the Gat, close to the closed areas was conducted on August 20th. At the time of this assessment, approximately ten vessels were fishing close to the southern and western edges of the southern closed box (outside of the closed boxes).

August Assessment

Two teams conducted a foot survey by walking to the beds from the research vessel, which was anchored in the Gat Channel. During this assessment, cockles were sampled at 16 stations spread within and around the two closed areas. The numbers of cockles present in each 0.1m$^2$ sample were counted and a representative sub-sample were measured.

Figure 3 shows the positions of the 16 stations sampled in August and the numbers of Year-1[1] cockles present at each. For comparative purposes, these overlay the cockle distribution charts produced following the April survey.

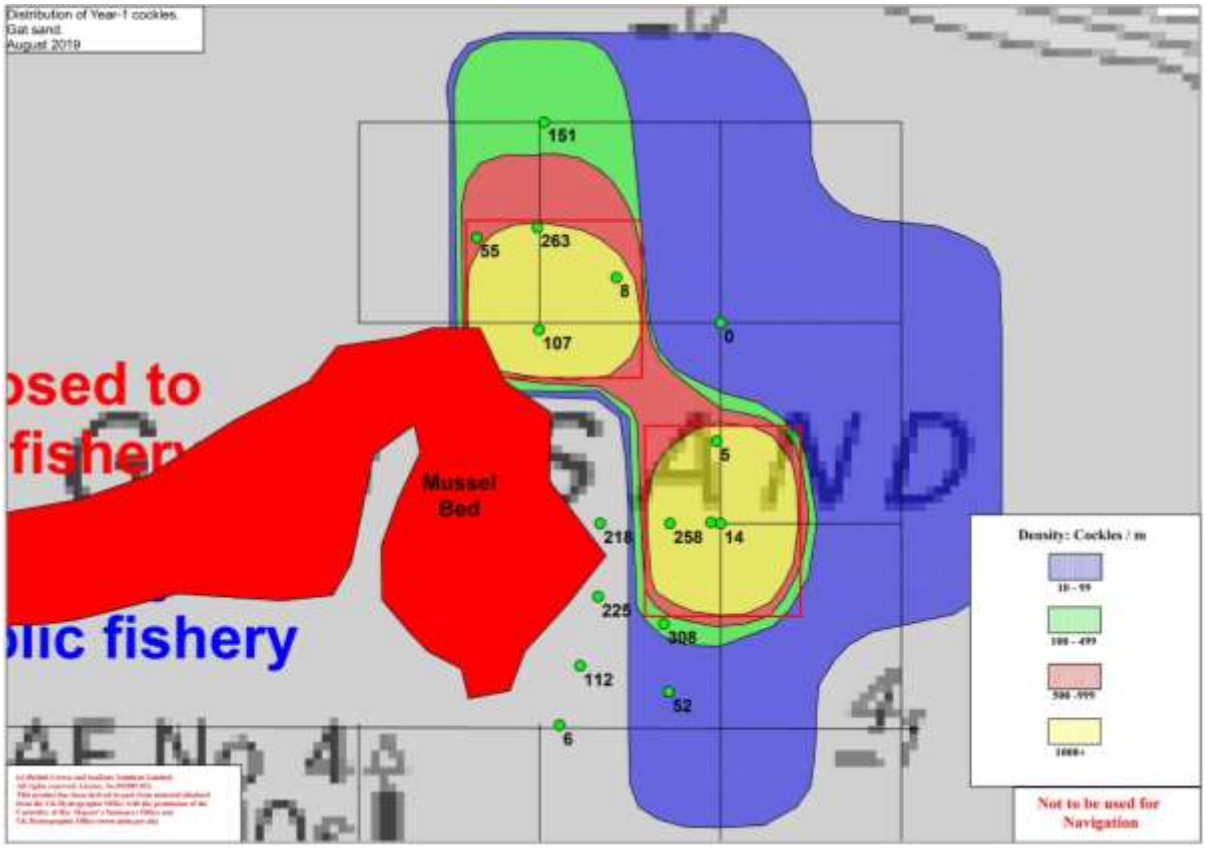



**Figure 3 – Chart showing numbers of Year-1 cockles present at survey sites in August and their modelled distribution based on April surveys**

[1] Note – due to their time of settlement, the 2018 year-class of cockles that were Year-0 in April are now classed as being Year-1 in August

The stations sampled in August were conducted at a higher spatial resolution than those sampled in April. While the densities of juvenile cockles were found to be high within the closed boxes, the improved resolution of the latter survey showed their distribution to be different to that modelled using the April data. Figure 4 shows the distribution of Year-1 cockles modelled from the August survey data. It can be seen from this chart that the coverage of high-density (≥1000/$m^2$) patches of Year-1 cockles is more extensive than previously mapped. It also highlights that the closed boxes are only being partially effective at protecting the high-density patches and are also unnecessarily closing some of the lower-density patches that should otherwise be accessible to the fishery.

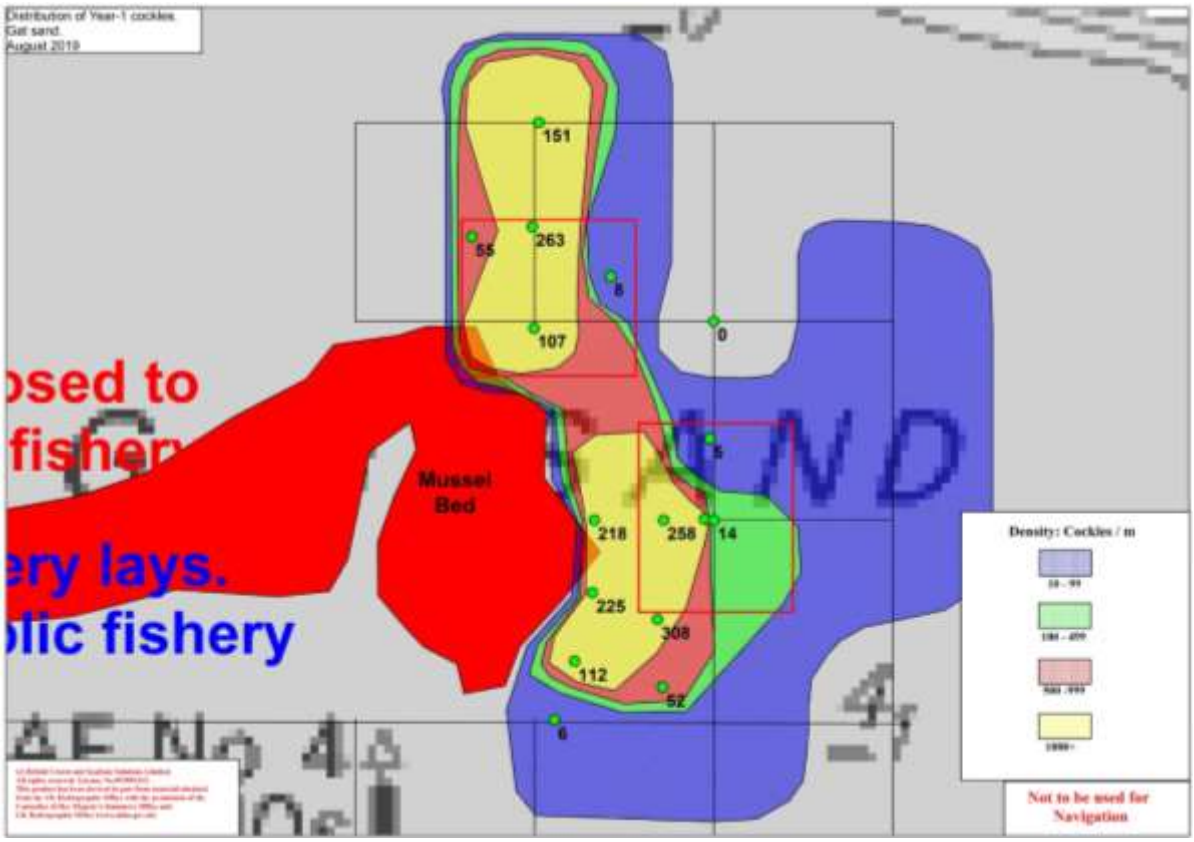



**Figure 4 – Chart showing numbers of Year-1 cockles present at survey sites in August and their adjusted modelled distribution taking into account these data**

The majority of the cockles found during the assessment were from the 2018 year-class cohort (total 1,868), although most sites also contained low numbers of older cockles from the 2016 year-class cohort (total 66). None of the samples contained any freshly settled Year-0 cockles.

The size frequency of the cockles measured at each station were plotted (see figures in appendix 1). The site numbers refer to the station numbers displayed in figure 5.

Overall, the Year-1 cockles were found to have a mean size of 10.6mm width, while the older cockles had a mean size of 17.5mm width. The figures in appendix 1, however, show there is variation in size distribution between sites. Due to intraspecific competition with other cockles, cockles in high-density patches tend to grow slower

than those from lower density areas. The cockles sampled during the August survey exhibited this. The Year-1 cockles taken from high-density patches (sites 4, 5, 6, 7, 9, 10, 12, 14 and 15) were found to have a mean size of 10.4mm width compared to a mean size of 11.4mm width of those sampled from lower-density patches (sites 1, 2, 3, 8, 11, 13 and 16). Within the high-density patches where the cockle densities exceeded 1,200/$m^2$ (sites 5, 6, 7, 9, 10, and 14) the mean size of Year-1 cockles was found to be 10.3mm width compared to 10.6mm at sites where the densities were between 1,000/$m^2$ and 1,200/$m^2$ (sites 4, 12 and 15).

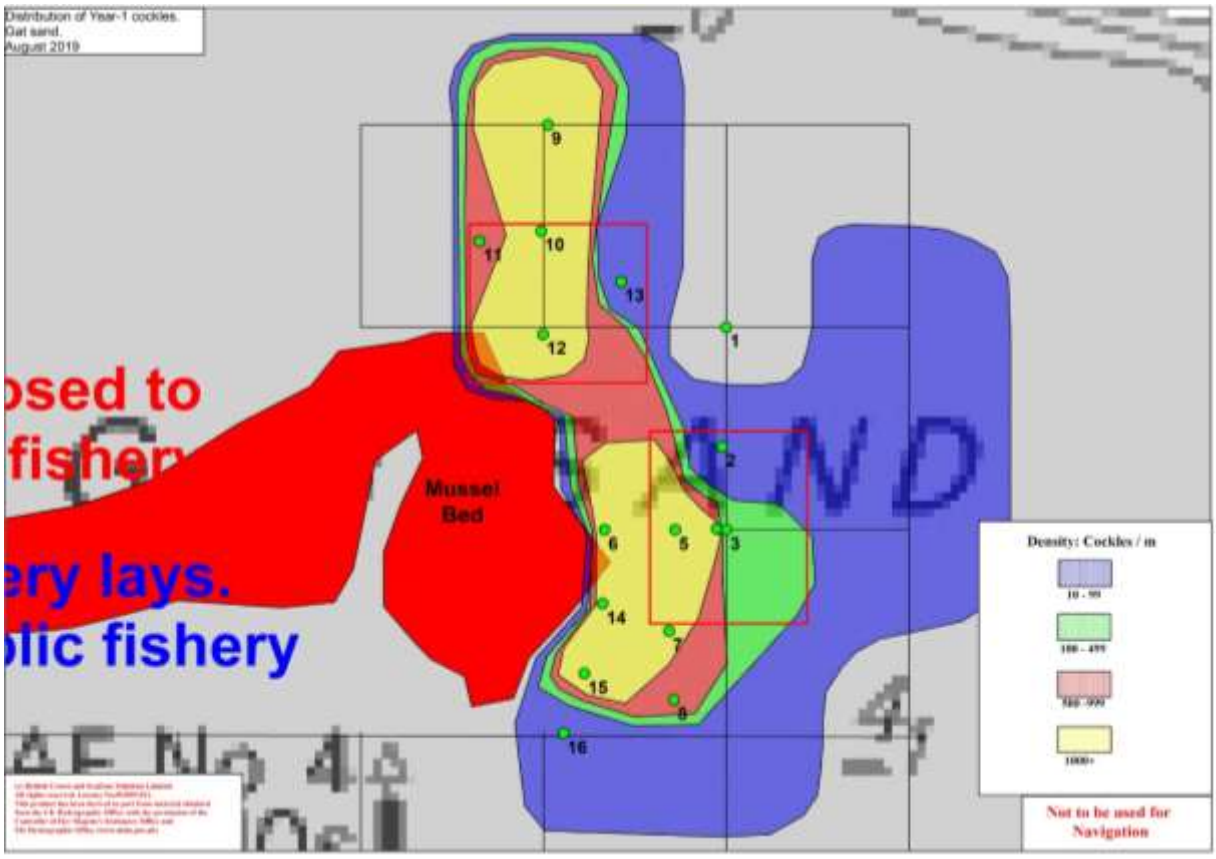
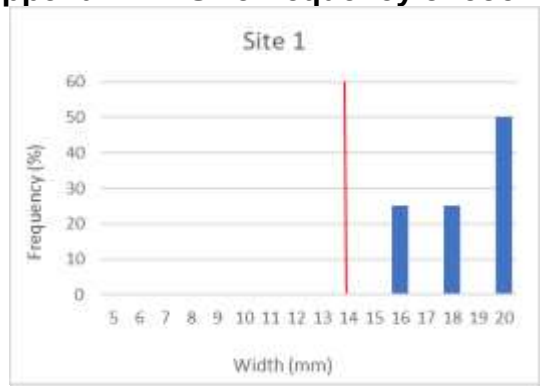


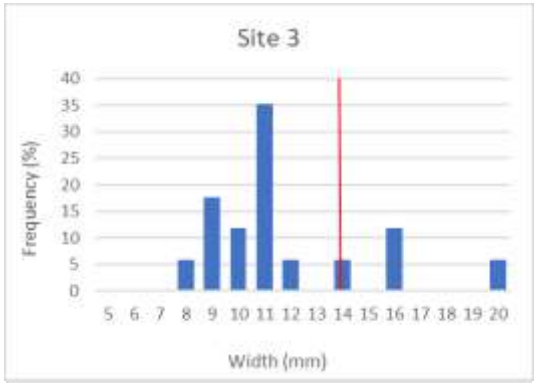

**Figure 5 – Chart showing the site numbers of the survey stations sampled in August.**

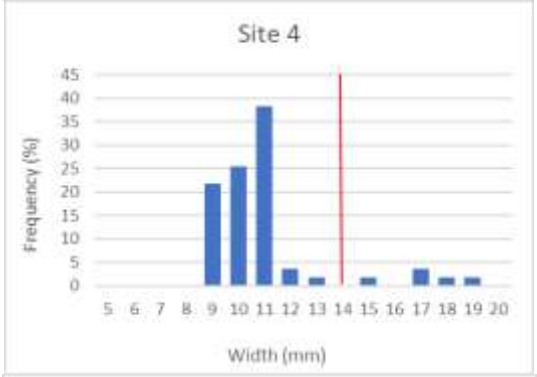
At the time of the assessment the cockles appeared to be well established in the ground and showed no signs of ridging out.

## Appendix 1 – Size frequency of cockles at sample stations

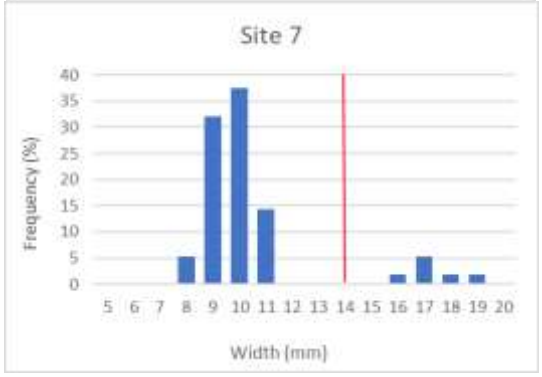


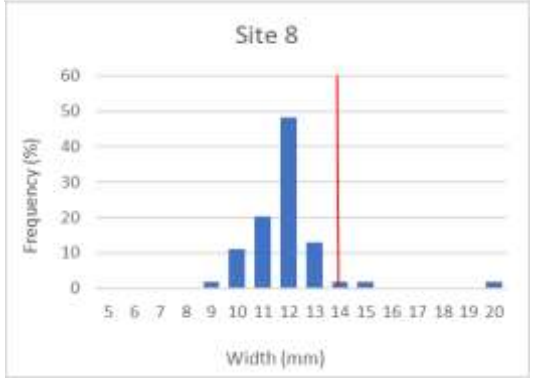


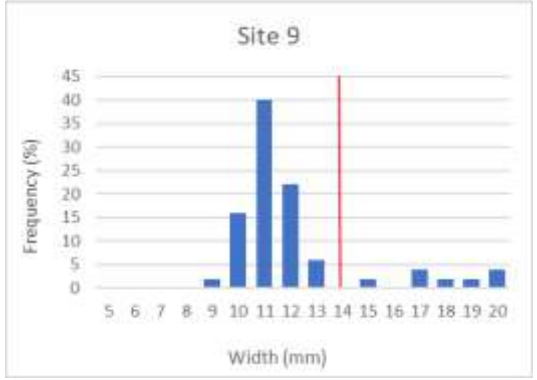


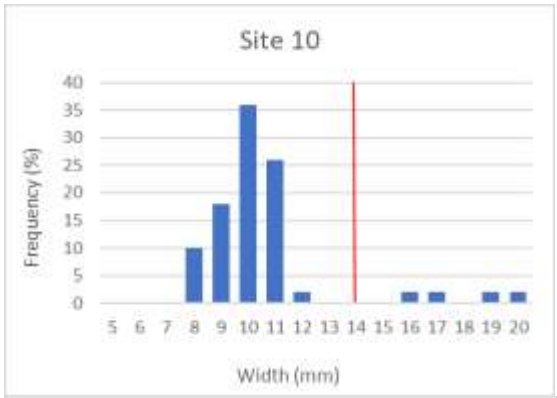



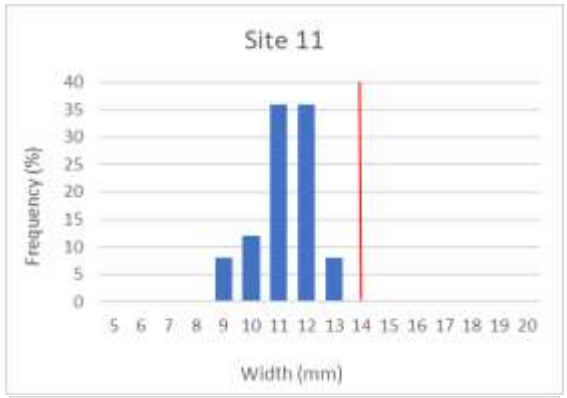



Site 10
Frequency (%)
0 5 10 15 20 25 30 35 40
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Width (mm)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Frequency (%)
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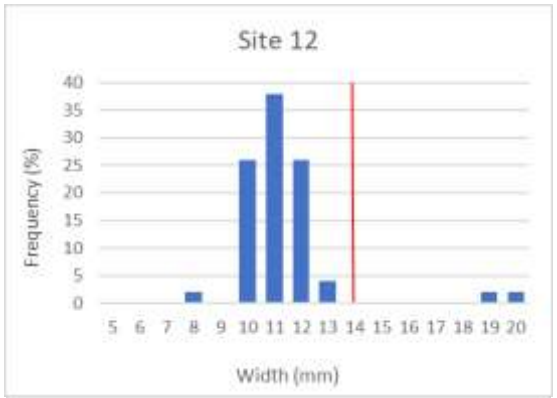
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Width (mm)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Frequency (%)
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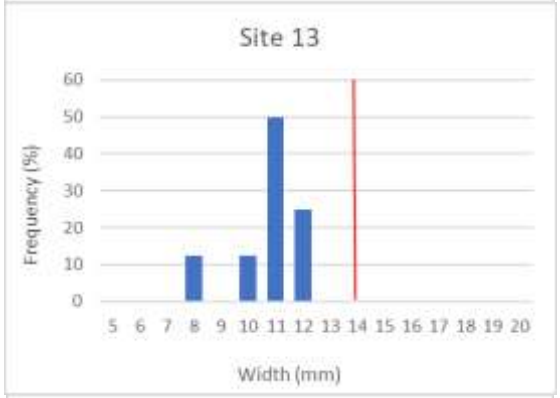
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Width (mm)


Site 13
Frequency (%)
0 10 20 30 40 50 60
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Width (mm)


Site 14
Frequency (%)
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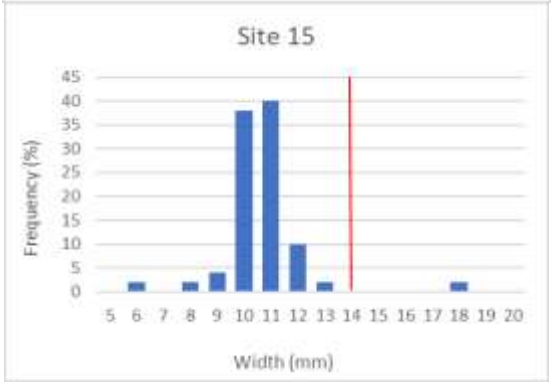
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Width (mm)


Site 15
Frequency (%)
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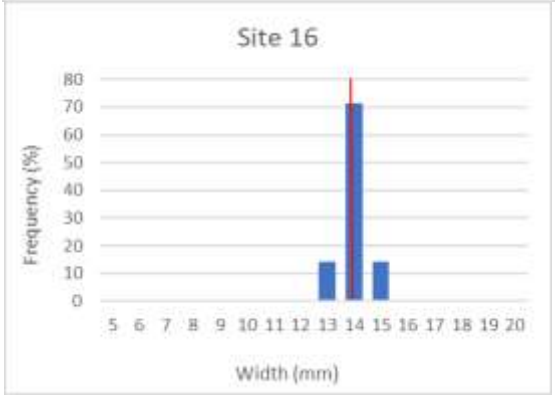
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Width (mm)


Site 16
Frequency (%)
0 10 20 30 40 50 60 70 80
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Width (mm)