BLUESKIN BAY: 2021/2022 INTERTIDAL SEDIMENT MONITORING SUMMARY

Salt Ecology Short Report 007. Prepared by Barrie Forrest for Otago Regional Council, March 2022

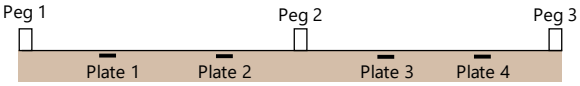
OVERVIEW

Otago Regional Council started State of the Environment monitoring in Blueskin Bay in Jan-2021, to assess trends in the deposition rate, mud content, and oxygenation of intertidal sediments. Sediment monitoring is undertaken at two sites (Fig. 1), with a second survey carried out on 27 November 2021.

Fig. 1. Location of Blueskin Bay monitoring sites.

METHODS

Estuary sedimentation is measured using the 'sediment plate' method (e.g. Forrest et al. 2021). The approach involves measuring sediment depth from the sediment surface to the top of each of four buried concrete pavers. Measurements are averaged across each plate (n=3) and used to calculate a mean annual sedimentation rate for each site.



A composite sample of the surface 20mm of sediment is collected adjacent to the plates and analysed for particle grain size (wet sieve, RJ Hill laboratories). This approach allows changes in sediment muddiness to be determined even where there are no changes in sediment depth. Sediment oxygenation is an ancillary biological health variable that is visually assessed in the field by measuring the depth at which sediments show a change in colour to grey/black, commonly referred to as the apparent Redox Potential Discontinuity (aRPD). Results for all indicators are compared to condition ratings of ecological state shown in Table 1.

RESULTS

Table 2 shows a summary of results for the latest survey and their respective condition ratings corresponding to the colours in Table 1.

Table 2. Indicator values and condition ratings from Nov-2021 survey.

Indicator	A	B
Sedimentation (mm/yr)*	-5.39	-1.64
Mud content (%)	4.0	6.6
aRPD (mm)	20	30

* Annual sedimentation rate relative to the baseline (n=1 year). Five years of data are required to assess a meaningful trend.

Sedimentation rate

The cumulative change in sediment depth over plates at each site is shown in Fig. 2. Erosion occurred at both sites in the first year of monitoring, corresponding to a condition rating of 'very good'. A longer time series (e.g. 5 years) will be required to establish a meaningful trend.

Table 1. Summary of condition ratings for sediment plate monitoring

Indicator	Unit	Very Good	Good	Fair	Poor
Sedimentation rate[1]	mm/yr	< 0.5	≥0.5 to < 1	≥1 to < 2	≥ 2
Mud content[2]	%	< 5	5 to < 10	10 to < 25	≥ 25
aRPD[3]	mm	≥ 50	20 to < 50	10 to < 20	< 10

Condition ratings derived or modified from: [1]Townsend and Lohrer (2015), [2]Robertson et al. (2016), [3]FGDC (2012).

Sediment mud content and oxygenation

Blueskin Bay sediments are sand-dominated, with a low mud component. Accordingly, sediment mud content was rated as 'very good' at Site A and 'good' at Site B (Table 2), with the values recorded in Nov-21 similar to the baseline survey in Jan-2021 (Fig. 3).

The average aRPD depth was 20mm at Site A and 30mm at Site B, reflecting well-oxygenated conditions (a rating of 'good'). This high level of oxygenation is likely maintained by the porous sandy sediments, and the presence of organisms such as crabs and shellfish, which turn over surface sediments and create voids that allow air and water to transfer oxygen to underlying layers.

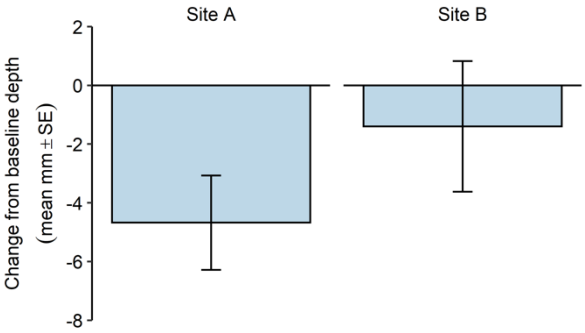


Fig. 2. Change in mean sediment depth over buried plates (±SE) relative to the Jan-2021 baseline.

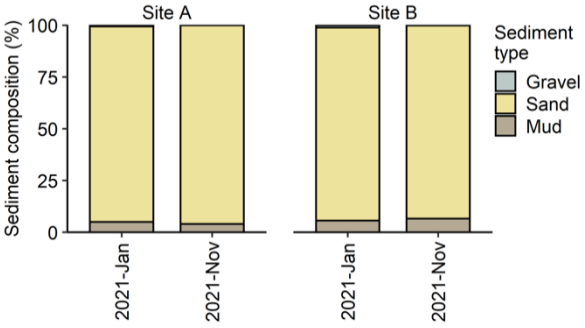


Fig. 3. Sediment particle grain size at each site. The baseline result for each site is also shown.

CONCLUSIONS

Blueskin Bay consists of clean and well-oxygenated sandy sediments, with no mud deposition recorded in the first year of monitoring. A longer time series (e.g. five years) will be required to establish a meaningful trend.

Top: well oxygenated sediment at Site A. Bottom: Site B in Nov-2021

RECOMMENDED MONITORING

Continue annual monitoring of sedimentation rate, sediment grain size and aRPD depth, and report results annually via a summary report. Comprehensive reporting should be undertaken as part of 'fine scale' ecological and sediment monitoring (next due in the summer of 2022/23).

REFERENCES

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