Lyttelton Port Company

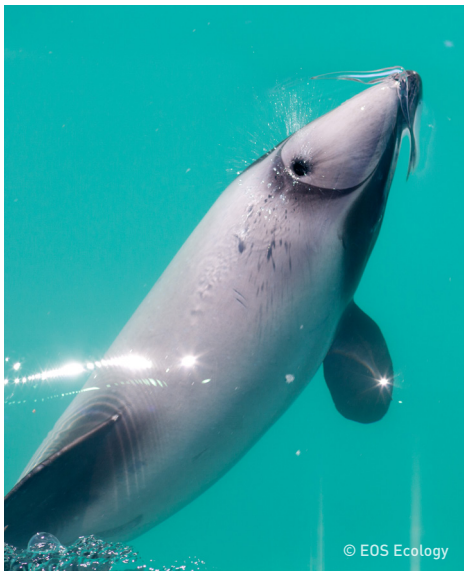
Helping care for our Taonga

Upokohue/ Hector's Dolphin

Lyttelton Port Company's Cruise Berth facility was completed in 2020. Constructing the new berth entailed pile driving which unfortunately created underwater noise. Marine mammals, in particular Upokohue/ Hectors' dolphins, are sensitive to underwater noise.

The management plan for this project required us to undertake a five-year monitoring programme to assess potential underwater noise effects from the construction activities on local Hector's dolphins. Whakaraupō/Lyttelton Harbour is part of the Banks Peninsula Marine Mammal Sanctuary, and home to these nationally vulnerable dolphins.

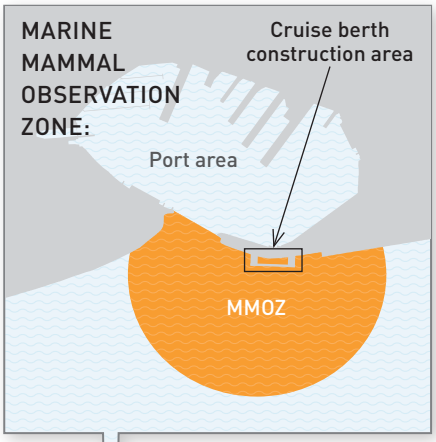
Results from the monitoring have been analysed by the Cawthron Institute and Styles Group and are summarised here.



MONITORING METHODS

Our Cruise Berth was one of the first large-scale coastal development projects in New Zealand to use both VISUAL and ACOUSTIC methods to protect Hector's dolphins from underwater piling noise.

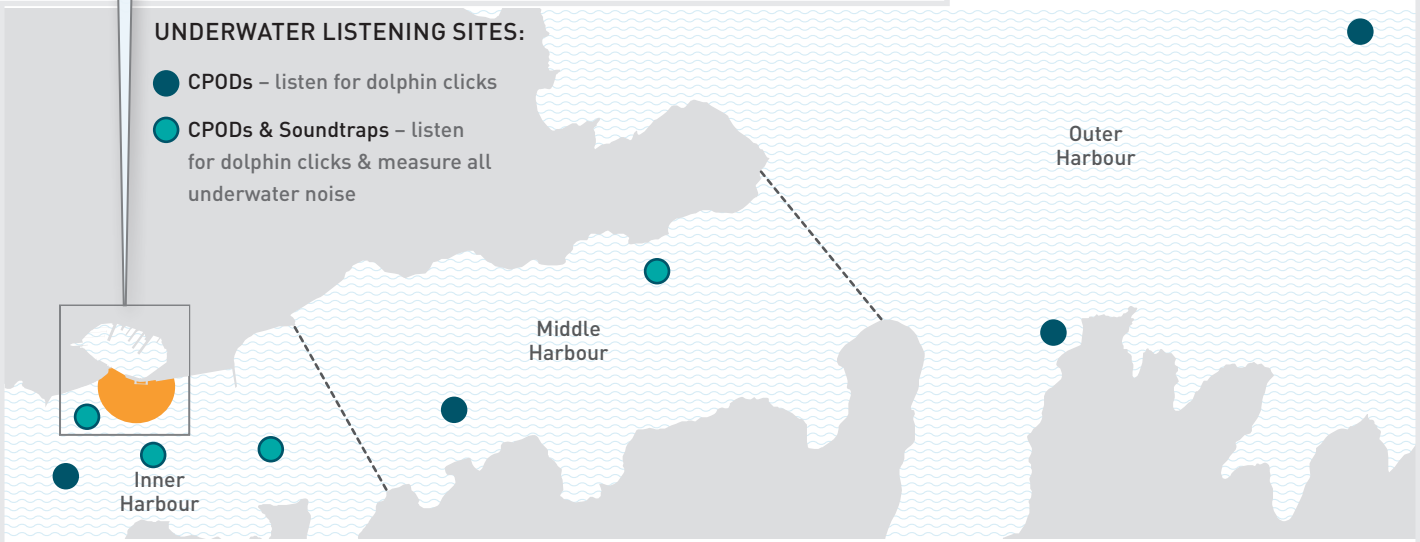
Visual Monitoring



Trained marine mammal observers (MMO's) were present whenever pile driving occurred, and were tasked with monitoring the safety zone, or **Marine Mammal Observation Zone (MMOZ)**. The MMOZ extended approximately 450 m out from the piling site, to avoid the risk of temporary hearing loss in Hector's dolphins. All piling work had to stop whenever an MMO saw dolphins within the MMOZ.

A trained MMO watches for dolphins from an elevated platform near the piling rig.

Acoustic Monitoring



Acoustic monitoring involves using special underwater hydrophones to listen for the unique high-frequency clicks made by Hector's dolphins. They're one of the few dolphin species that can be distinguished acoustically from other dolphin species as their sounds are at a higher frequency.

Two different types of underwater hydrophones were located across the inner, middle and outer areas of the Harbour between January 2017–April 2021. They let us monitor any changes in Hector's dolphin's use of the Harbour prior to, during and after the Cruise Berth construction.

Three of these monitoring sites were within 2 km of the Cruise Berth construction site. They were positioned specifically to monitor piling noise, and the presence of Hector's dolphins closest to the Port.

PROTECTIVE MEASURES

In addition to visual and acoustic monitoring, we implemented a range of protective measures during piling to minimise noise impacts on Hector's dolphins. These included:

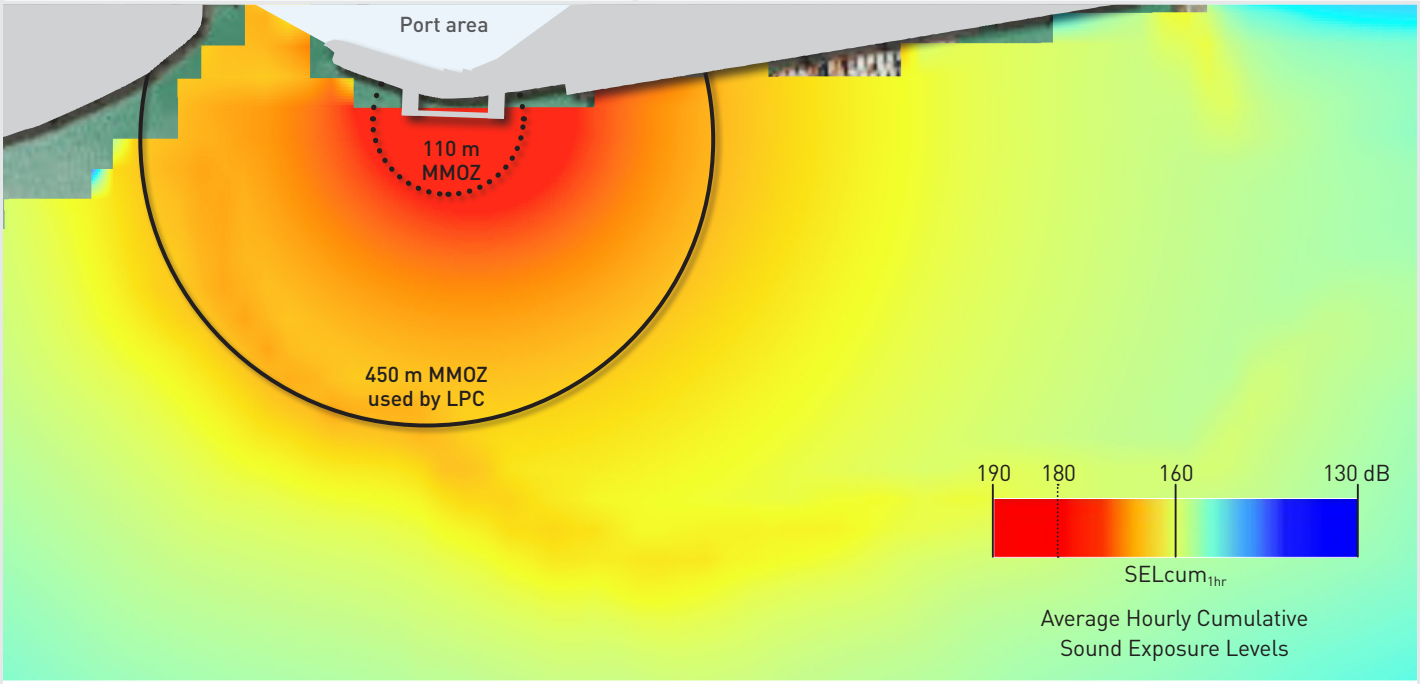
- **using 'soft start' techniques**, in which machinery noise was increased slowly, giving dolphins time to move away
- **using 'standby' and 'shutdown' procedures** if a dolphin was seen within/about to enter the MMOZ
- **postponing piling work** when visibility was too poor to see any dolphins which may be in the area.

RESULTS

Over 1,800 hours of data from the MMO's, and 100,000 hours of underwater acoustic data were collected and analysed. Here's a summary of what the results told us...

Noise Map

Data from all 615 hours measured Dec 2018–Feb 2020



MMOZ PROVIDED A GOOD PROTECTION AREA:

The MMOZ was set at a distance of 450 m from the piling. At this distance, the noise produced by impact (hammer) piling was expected to reach a level of 180 decibels (dB) over a one-hour period. This level of noise could potentially cause temporary hearing loss in Hector's dolphins.

During the construction period, a total of 615 hours of impact piling were recorded by the underwater soundtrap devices. Once this data was analysed by computer models, it was determined that the MMOZ could have been smaller while still ensuring the safety of the dolphins.

Temporary hearing loss would happen around a distance of approximately 110 metres from the construction site. This means that the MMOZ was larger than needed, providing extra protection for the dolphins.

Piling noise did reduce dolphin presence, but they returned to normal patterns quickly.
Research showed that piling noise had a short-lived negative influence on Hector's dolphin's visiting the Port approximately 2 km from the Cruise Berth.

As pile driving noise increased, very gradual declines in dolphin detections occurred nearest the Port. However, once piling ceased for the day, dolphins returned. MMOs generally observed them back within an hour, while acoustic detections showed that dolphin presence would take more than 48 hours to go back to pre-piling levels.

These observations suggest that dolphins appear to respond to piling noise by swimming away, before returning relatively quickly to their usual patterns when the noise stops.

Mitigation measures used were effective in helping dolphins to leave the area. During 14 months of piling, only 15 full shutdowns were needed due to animals appearing in the 450 m safety zone. This confirms that gradually ramping up noise levels and employing stand-by procedures successfully gave dolphins time to move away from the area, and ensured they were protected if/when they chose not to move away.

There was a general decline in dolphin numbers over the monitoring period. The monitoring programme indicated a general decline in annual detection rates of Hector's dolphins at outer and mid-harbour sites between 2017–2020. The cause of this decline – whether due to piling work, climate effects (e.g., marine heatwaves) or a combination of these (or other) factors – is unknown.

Hector's dolphins are found most often in the outer harbour. Over the years, Hector's dolphins were consistently detected least in the inner harbour, moderately in the middle harbour, and most often in the outer harbour. This trend was observed consistently across all years and seasons of monitoring. Data also showed that dolphin activity decreased significantly during winter, which aligns with several decades of existing Hector's dolphin research in the Harbour.

WHAT THIS ALL MEANS

The results from our monitoring programme have helped us better understand Hector's dolphins response to piling noise in the Harbour. This information will enable us to protect this taonga species as we undertake new infrastructure projects.

What the data means for future LPC construction projects:

- Mitigation measures used in the Cruise Berth construction will be incorporated into future piling projects. We've trialled bubble curtains to reduce noise from piling, and will be closely watching these curtains in action at Centre Port and Port Marlborough to understand their effectiveness better.
- The combination of visual and acoustic marine mammal observations (real-time and recorded), will be undertaken for future Port developments. Together, these observations ensure that immediate protective measures are enforced and monitoring is carried out effectively.
- We will review our pile driving activities to understand which operations generate the most noise, so that we can look at possible better options and alternatives for future works.

Through collaboration and investment in research, we now have a better understanding of how Hector's dolphins react to underwater noise and use the Harbour – so are better placed to protect these unique and valuable species.

www.lpc.co.nz

Our website contains more indepth articles about the marine mammal observers and the science behind our work. Check out the following:

www.lpc.co.nz/harbourwatchnews/trained-eyes-on-the-hectors-dolphins
www.lpc.co.nz/harbourwatchnews/eavesdropping-on-dolphins-builds-scientific-knowledge
www.lpc.co.nz/trillions-of-data-points-unlimited-potential

MORE DETAIL

The content of this document has been summarised from research commissioned by LPC.

The following reports are relevant to this fact sheet:

- Clement D, Pavanato H, Pine M 2022. LPC's Cruise Berth Project – Marine Mammal Research Report. Prepared for Lyttelton Port Company Ltd. Cawthron Report No. 3820. 78 p. plus appendices.
- Pine M 2022. Cruise Berth Project: Assessment of the 450m TTS shut down zone. Consulting Advice Note prepared for LPC. 17 p.

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