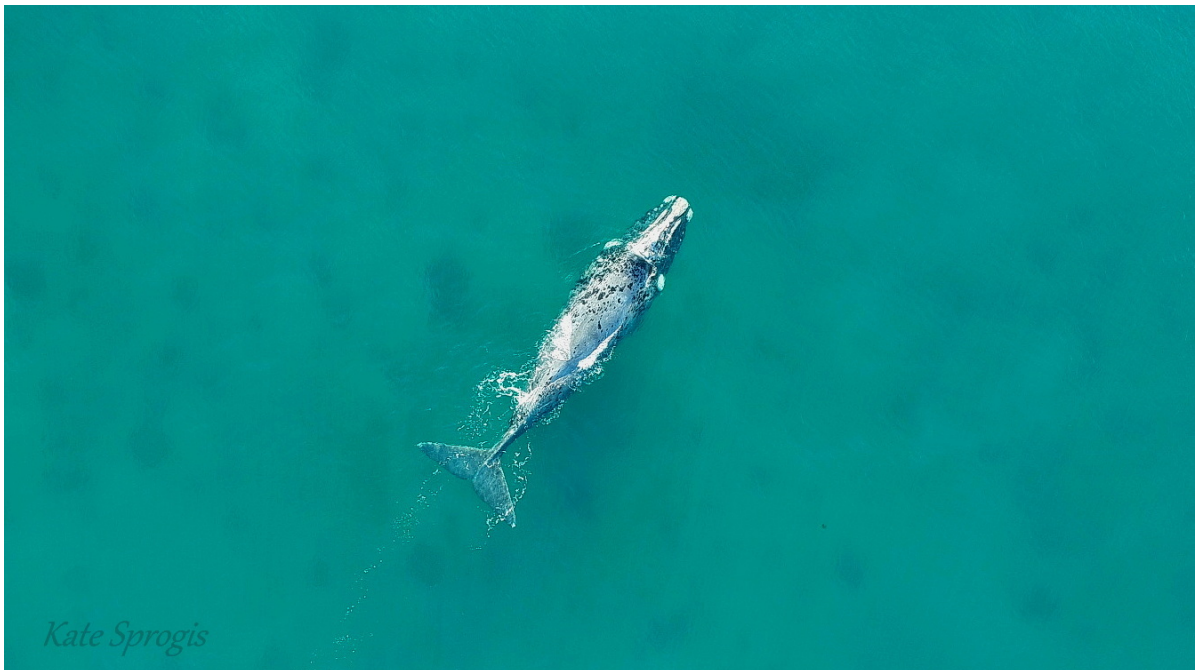




Western Australian Southern Right Whale Genetic and Tagging 2022-23 Project Update



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Key preliminary findings

Southern right whales (SRW: *Eubalaena australis*) aggregate in large numbers off the coast of Western Australian (WA) during winter months to calve and breed. However, where the whales travel to forage, and pathways taken on their journeys to these offshore foraging grounds, are still poorly understood. To examine these large-scale migrations, satellite tags were deployed on whales towards the end of the breeding season in September 2022. In addition, we collected samples that will allow us to use genetic methods to understand the relationship of whales in WA to those in southeast Australia, Aotearoa New Zealand and globally. The project engaged with local Indigenous groups, who provided the project's First Nations name 'Mirnong Maat', translating to whale journeys. During the 2022 field season, we collected eight skin biopsy samples and deployed satellite tags on WA SRWs. The satellite tracks of the whales, and the names that were gifted to the whales in local Menang/Merningar language by Indigenous elders, are made public on the project website: <https://tohoravoyages.ac.nz/welcome-to-mirnong-maat/>. The initial findings from the satellite tracks show that whales from WA migrate to several foraging grounds, ranging from Antarctica to French sub-Antarctic islands in the Indian Ocean. We also show that the foraging grounds visited by the WA SRWs are also used by SRWs from the Aotearoa New Zealand and South African populations. The satellite data are already being used by the Commonwealth government to help identify newly designated *biologically important areas* for SRWs. In this way this project is providing a scientific basis for new whale marine protected areas.

Background

SRWs are a key sentinel species for climate change throughout the Southern Hemisphere with strong correlations among environmental conditions at their offshore feeding grounds and reproductive success and recovery of wintering populations (Leaper et al., 2006; Seyboth et al., 2016). The need to understand these linkages has become increasingly important over the past decade, as most SRW populations around the world have experienced a decline in reproductive success or mass mortality events (Rowntree et al., 2013; Vermeulen, et al., 2020). Effective management in an era of climate change requires critical missing information on where SRWs feed throughout their range.

The aims of this project are to:

1. use satellite telemetry to investigate the location of Australian SRW feeding grounds and whether these are used by other SRW populations
2. update our understanding of connectivity of WA whales with other SRW populations using genetic methods.

This Australian research is part of the circumpolar SRW project for the International Whaling Commission-Southern Ocean Research Partnership¹, where the foraging grounds of SRWs are already being examined off Argentina², South Africa³ and Aotearoa New Zealand⁴. For further details on the project see Appendix 1 and 2.

¹ <https://www.marinemammals.gov.au/sorp/the-right-sentinel-for-climate-change/>

² <https://siguiendoballenas.org/en/home/>

³ <https://www.mammalresearchinstitute.science/whale-unit>

⁴ <https://tohoravoyages.ac.nz/>

Preliminary findings: WA coastal waters

- Six satellite tags were deployed that lasted over 19 days, with one of these transmitting over 200 days, with one tag still transmitting as this report was written (see <https://tohoravoyages.ac.nz/track-the-australian-whales/>).
- Eight biopsy samples, including three from tagged whales, were collected and have been sent to the University of Auckland for genetic analysis.
- Coastal movements of these whales can be seen in Figure 1. The tracks go through proposed marine protected areas for the WA south coast, including a proposed extension of a marine protected area at Cheyne Beach, in order to encompass the aggregation area of SRWs located in these shallow waters in the cooler months.
- Whitu, a SRW tagged in Maungahuka Auckland Islands, Aotearoa New Zealand, in July 2021, arrived in coastal Australian waters in September 2022. Whitu travelled along the coast from Esperance to Bremer Bay through the Recherche Archipelago and the Fitzgerald Biosphere Reserve proposed marine parks. For more information go to www.tohoravoyages.ac.nz, and see Carroll et al. 2022.

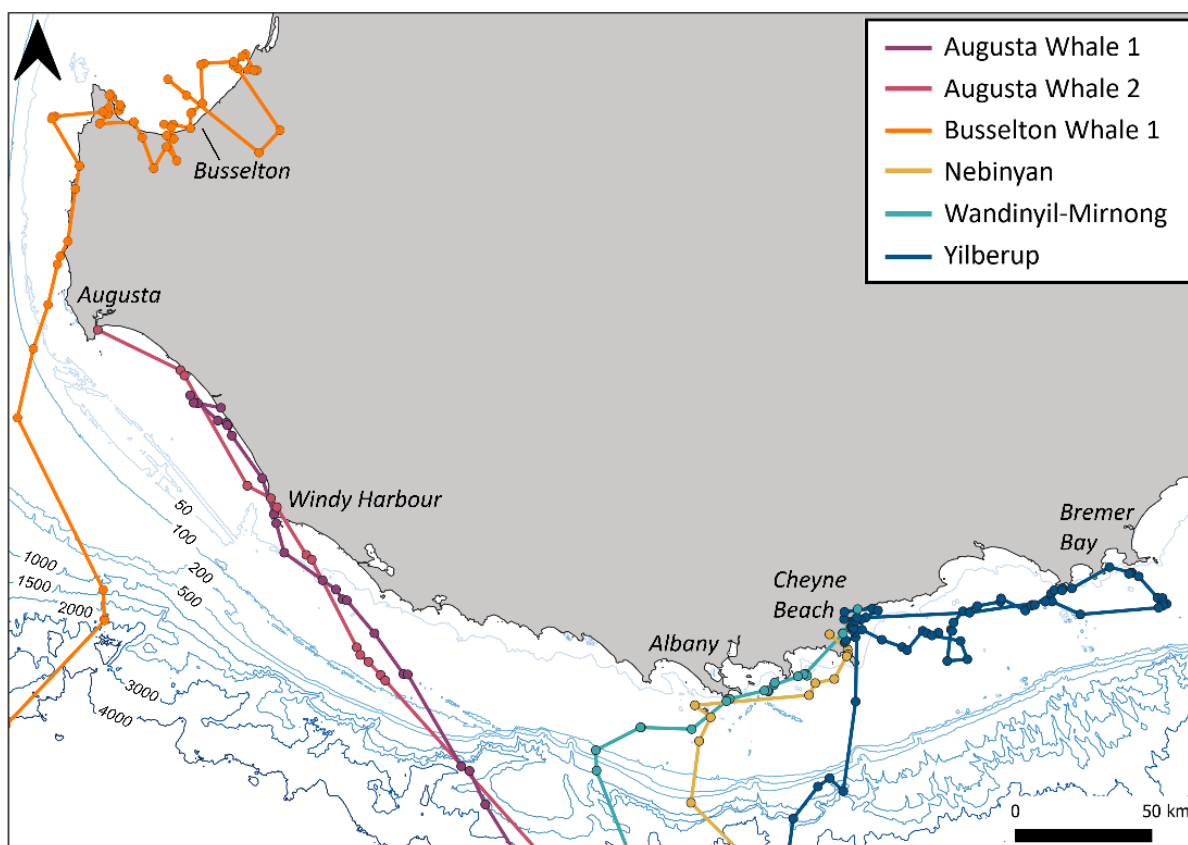


Figure 1. Map of the southwestern Australia where the whales were satellite tagged off Busselton, Augusta and Cheyne Beach. The blue coloured lines are the depth contour and the continental slope. Note: due to the location error associated with the Argos System (which can range from tens of metres to hundreds of kilometres) some position fixes of the tracked whales occur on land.

Preliminary findings: linkages between WA and offshore foraging grounds

- The tagging data shows that the WA SRWs travel to several potential foraging grounds (Figure 2);
 - o Busselton whale 1 visited a region south of Australia east of WA also visited by NZ SRWs (see <https://tohoravoyages.ac.nz/track-the-australian-and-new-zealand-whales/>),
 - o Yilberup and Nebinyan migrated to Antarctica,
 - o Wandinyil-Mirnong and Augusta whales 1 and 2 travelled into the Indian Ocean, with the former two visiting regions also known to have been visited by South African SRWs.

- For information on the whale's names see Appendix 3.

- The satellite track data from WA SRWs are being used to identify *biologically important areas* for SRWs in Australian waters, which are key areas for conservation (data shared with the Australian Antarctic Division and the Department of Department of Climate Change, Energy, the Environment and Water).

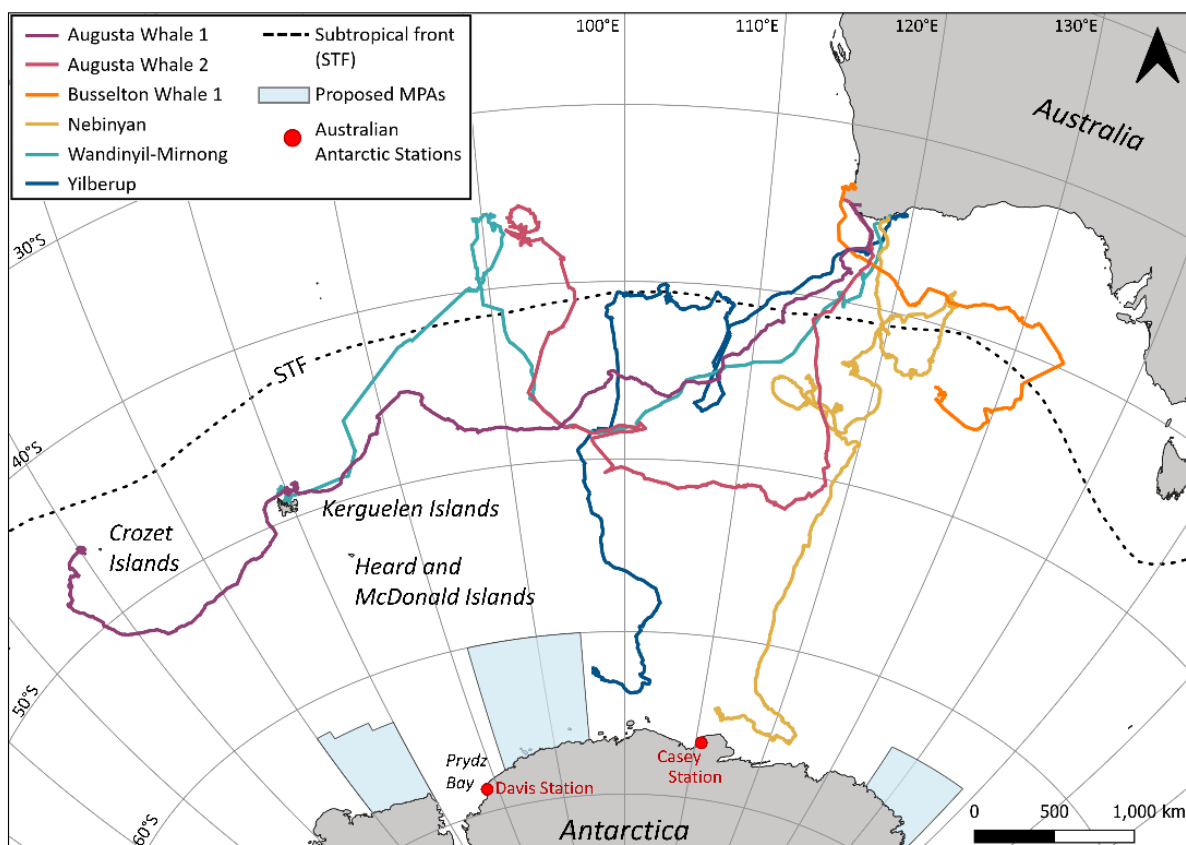


Figure 2. Tracks of the SRWs tagged on breeding grounds in southwest Australia into the presumed Southern Ocean feeding grounds. Each different coloured track line represents an individual satellite tagged whale (names of the whales are provided in the legend). The map shows the arrival of the tagged whales to the Kerguelen Islands, Crozet Islands and Antarctica. The Subtropical Front (STF) is represented by a dotted line. The proposed Antarctic marine protected areas are shaded in light blue.

Recent related scientific findings

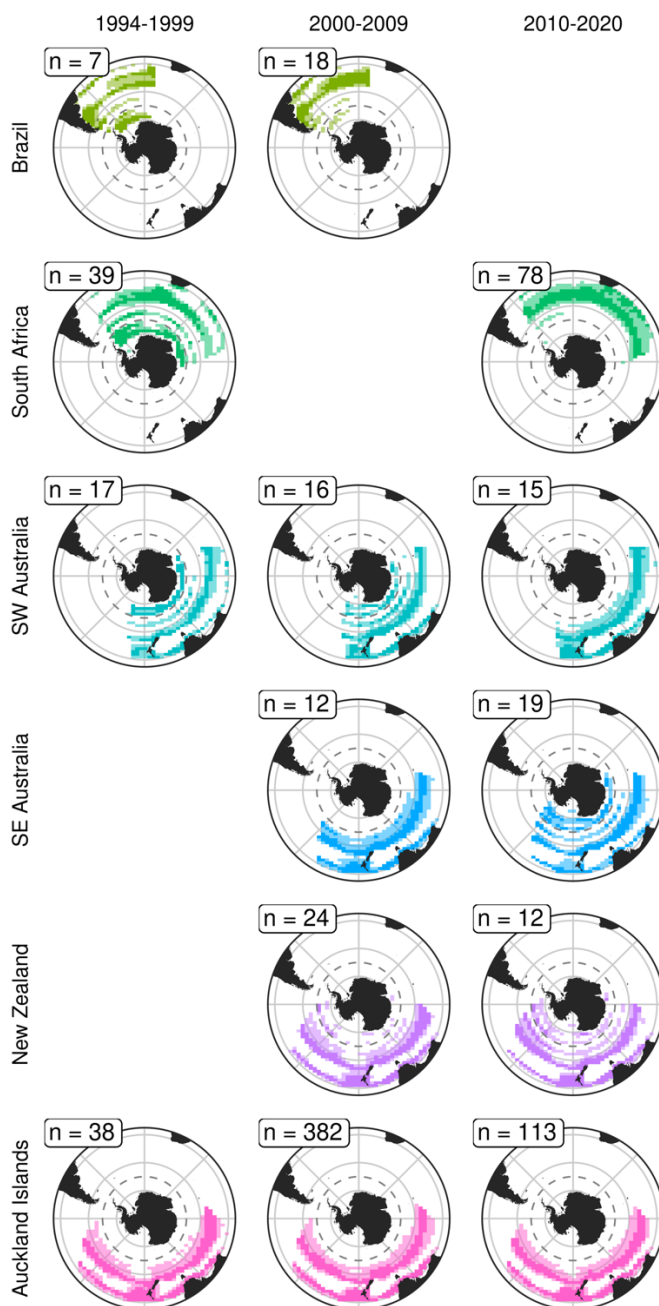
A recent paper, led by one of the researchers from this project (E. Carroll: (Derville et al., 2023)), has used microchemical markers in whale skin samples like those collected during the 2022 field work to identify the broad ocean region of where the whales are foraging. This work included skin samples from WA SRW that were collected in the 1990s, as well as samples from the Head of Bight, South Australia, SRW calving ground collected in 2014. The microchemical markers in the whale skin were then compared with an oceanic map of these markers to look at likely foraging areas.

This work found that SRW populations in South Africa, Brazil and southwest Australia (WA and Head of Bight) have used foraging grounds around Antarctica less in recent decades than previously (Figure 3). In contrast, these high latitude foraging grounds are used slightly more frequently by SRW from Aotearoa New Zealand and southeast Australia. This seems to be in line with ecosystem changes; the South Atlantic and Indian Ocean sector of the Southern Ocean is warming faster than the South Pacific sector. The skin samples collected during the 2022 and planned 2023 WA field seasons will also look at whether this pattern continues. This is a broad scale approach, complementing the details insights on coastal movements and migration paths, as well as oceanic features used by the SRW to forage provided by satellite telemetry.

Next steps

- A 2023 field season is being planned with regional and head DBCA offices.
- Skin biopsy samples will be analysed for genetic and microchemical markers at the University of Auckland.
- Analysis of the satellite track data from WA 2022-23 and 2023-24 will be analysed together with data from 25 tagged New Zealand SRWs as part of a two-year postdoctoral study through the University of Auckland beginning in June 2023.

a



b

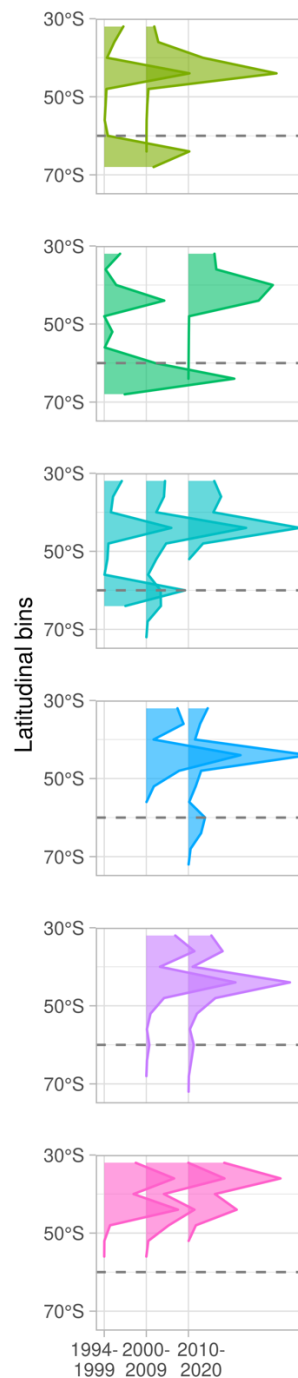


Figure 3: Southern right whale foraging grounds assignments by wintering ground and decade from Derville et al 2023. (a) Maps of assigned general and core foraging areas. Sample size is indicated in each panel. Population-level average core and general foraging areas are represented for each decade by population-level combination in dark and light colors, respectively. (b) Distribution of the population-level foraging probabilities summed over all pixels (i.e., thresholds) in latitudinal bins of 4°, for each decade. Note Australia wintering grounds are divided in southwest (SW) and southeast (SE). Parallels of latitude represented in grey in each map mark 30°S, 50°S, and 70°S, and the dashed line delineates the 60°S latitude.

Acknowledgements

We acknowledge the overall project in southwest Australia is situated on Noongar land and sea, and that Noongar people remain the spiritual and cultural custodians of their land and sea, and continue to practice their values, languages, beliefs and knowledge. We pay our respects to the Traditional Custodians of the sea and on which we conduct our research.

The Menang/Merningar language and cultural input for the Mirnong Maat (Whale Journeys) project is used with permission and is the intellectual property of First Nations peoples. Gratitude to Lynette Knapp, a Merningar descendent and Elder, and daughter Shandell for naming of the southern right whales off Cheyne Beach. Thank you to Menang/Merningar artist Michael Cummings from Xthensio arts for the Mirnong Maat logo. We thank Prof. Stephen Hopper at The University of Western Australia, Albany campus, for assistance and support with the First Nations component.

Much appreciation to Dr Nick Gales (Australia's IWC commissioner) for his expertise and tagging the whales. Thank you to Department of Biodiversity Conservation and Attractions (DBCA) South Coast (Tim Button, Jon Pridham, Steve Toole, Greg Freebury), DBCA Blackwood (Dave Lierich, Sahira Bell, Ian Anderson, Glen Sutton), DBCA Perth (Kelly Waples, Holly Raudino), the Large Whale Disentanglement Team (incl. Kirsty Alexander), the Southern Aboriginal Corporation (Bryan Colbung, Jyrin Woods, Jon Marwick), Cheynes Beach Caravan Park, UWA's Great Southern Marine Research Facility, and Catherine Gales for field assistance and support. Thank you to Pacey, Parker, Asha, Brett for assistance. Appreciation to Rowan Calder and Kevin Lay at Wildlife Computers for technical support. Thank you to Leena Riekkola for producing figures 1 and 2. Funded by Macquarie University and anonymous supporters, with support from Emu Point Café.

Further reading and references

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Appendix 1- 2022 project brochure

September 2022



Welcome to Mirnong Maat (Whale Journeys)

The meaning behind the title:

The title “Mirnong Maat” is Menang/Merningar Noongar language for ‘Whale travel path’, and is akin to ‘Whale Journeys’. Mirnong means ‘whale’ and Maat is ‘travel path’. As the whales are migrating to and from their feeding grounds they undertake a journey along a path, and here we liken their migration to ‘Maat’.

Quick facts on southern right whales:

- Were hunted to near extinction during the 19th and 20th century off Australia, as they were the “right” whale to hunt.
- Are listed as Endangered, under the Australian EPBC Act 1999.
- Breed and calve off Australia over the cooler months.
- Occur along the Australian coastline from around May to November, peaking in number across the austral winter.
- Occur in at least 13 main aggregation areas across the south coast.
- Have been recorded as far north as Exmouth Gulf in Western Australia.
- Feed on their foraging grounds in the Southern Ocean.
- Feed on small planktonic animals; copepods and krill.

Research project aims:

- To understand migratory connections between southern right whales in southwest Australia and feeding grounds in the Southern Ocean, and
- To gain insight into the connectivity between Australian and New Zealand right whales using genetics and the voyages of the whales.

Background of project:

The research is an international collaboration and circumpolar project, including satellite tagging southern right whales off Australia, New Zealand, South Africa and Argentina. This is the first year Australia is joining the current projects. The Academic team is Kate Sprogis, Emma Carroll, Rob Harcourt (details below), and Nick Gales (Australia’s International Whaling Commissioner).

Where will the Australian whales feed, and will they mix with the New Zealand whales?

Since 2020, 25 whales have been satellite tagged off New Zealand, and they are feeding in the Southern Ocean south of Australia.



See the satellite tracks of whale migrations on Tohorā Voyages website (Māori for ‘Whale Voyages’).

Thank you to all contributors and sponsors (e.g. DBCA, Emu Point Cafe, Merningar Knapp family and logo artist Xthensio Arts). We acknowledge the project (southwest and south coast Australia) is on Noongar land/sea.

Please contact us: Website for Australia and New Zealand projects: www.tohoravoyages.ac.nz



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Appendix 2- Background details on Mirnong Maat

Yawul! The Australian First Nations comprise the longest living cultures in the world. First Nations people have inhabited this land since time immemorial. In southwestern Australia, Noongar people are the Traditional Custodians of the land and sea.

Across Australia, there are hundreds of different Indigenous languages. In southwest and the south coast of Western Australia, there are several different Noongar dialects. We acknowledge the different Noongar dialects. This project was initiated at Albany campus of The University of Western Australia, on Menang/Mirningar Noongar Country, our tallyerark kaaleep boodja ('home fires', and akin to 'home country'). Tallyerark kaaleep boodja describes the coastal habitat perfectly, as family fireplaces were used for many thousands of generations and passed down from ancestors. The content on these Australian website pages are inspired by local Menang/Merningar people. First Nations languages are from a spoken language and were passed on to generations through storylines and to family members, and so the spelling on certain words may differ across the region depending on when and where the word was spelt out.

The title Mirnong Maat is Menang/Merningar Noongar language for 'Whale Travel Path' and is akin to 'Whale Journey'. Mirnong means 'whale' and Maat means 'travel path'. As the whales are migrating to and from their feeding grounds they undertake a journey along a path, and here we liken their migration to 'Maat'.

The meaning behind the Australian logo is an Aboriginal storyline. The Menang/Merningar have had a long connection with the whales that frequent the coast of Albany, part of their totemic practices where they etched whales breaching in the granite outcrops to signify their travel paths.

The First Nations peoples around Albany were fishermen which is evidenced by ancient fish traps that still remain, and are dated to older than 7,000 years. The fish traps allowed for fish to swim into the trap during high tide, and as the tide lowered the larger fish were caught while the smaller fish could swim between the holes among the rocks. This allowed for sustainable fishing over thousands of years, so that the young fish had a chance to reproduce. These fish traps can be viewed today in Oyster Harbour, Albany, Western Australia.

It was in 1826, that brig Amity sailed into Albany and 'claimed' the land for Britain, which was only around 200 years ago. The arrival of Englishmen to Albany meant the meeting between Noongar people and Englishmen. On the timeline of things, 200 years is small in comparison to the time First Nations people have been connected to this land (more than 60,000 years ago) and are the first sovereign Nations of the Australian continent.

Appendix 3- Details on the names of tagged southern right whales

Yilberup is a mother with a calf that was tagged off Cheyne Beach, Western Australia, on 16 September 2022. Yilberup (Mount Manypeaks) is the mother of the sisters Twertup and Moolyup (little hill). Their story is key in the creation of the hills and fresh water lake systems from the Stirling Range to Cheyne Beach. The Manypeaks region is the mountain range adjacent to Cheyne Beach, where some of the research for Mirnong Maat (Whale Journey) was conducted. Mount Manypeaks is a special area where Waychinicup National Park is located. This region is a reserve for the endangered noisy scrub bird and the world's most endangered marsupial, Gilbert's potoroo.

Wandinyil-mirnong is an adult southern right whale that was tagged off Cheyne Beach on 19 September 2022. Wandinyil-mirnong [Wand-an-yil-mer-nong] was known as Tommy King, which is one of Tommy's many names. Wandinyil-mirnong means; Wand= peppermint tree, in= 'an' kept, Yil= hill, meaning an abundance of peppermint trees on the hill. Mirnong is Merningar for whale. Wandinyil-mirnong made the first written land claim for Aboriginal men and their descendants, written up at the Albany town hall.

Nebinyan is an adult southern right whale that was tagged off Cheyne Beach on 19 September 2022. Nebinyan was named after a man, born around 1840 at Two Peoples Bay, and was known as the "whale man". He was an Aboriginal whaler of this colonial industry at various stations, including Cheyne Beach whaling station. During the whaling era, whales were killed for their blubber and baleen and the meat was then able to be consumed between the two cultures. Nebinyan was also a songman, and was known for his songs.