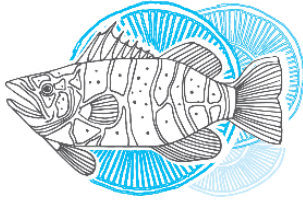# Lalang-gaddam Marine Park

Lalang-gaddam Marine Park tropical inshore jigeedany (dolphin) survey in Malandoom (Prince Regent River), 9-18 Sept 2024

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Non-technical summary

A survey of tropical inshore dolphins[1] (*jigeedany*) was done September 2024 in Malandoom (Prince Regent River) and Ngalygaany (St George Basin), Lalang-gaddam Marine Park. The survey involved vessels following line transects with observers recording all sightings of dolphins. Photographs were taken of dorsal fins of all dolphins sighted to identify individual animals based on the unique shape and markings of their fins. This information can be used to assess the number of dolphins that were using the area during the survey, and to collect life history information on individual dolphins, including group dynamics.

Based off *PV Worndoom*, two tender vessels, *Shardai* and *Pinyjiri*, covered a total of 358.71 km of survey transect lines within Malandoom Prince Regent River over five days (12-16th September 2024), equating to 23 hours dedicated searching for dolphins in the area (and an additional 384.14 km and 22 hours off effort transiting or with dolphin groups). The survey effort in Malandoom area resulted in sightings of 158 dolphins from 44 groups (including resights of the same individuals over multiple days) of snubfin and humpback dolphins and an encounter rate of 0.21 dolphins per km or 3.49 dolphins per hour of survey effort. Snubfin dolphins (*Orcaella heinsohni*) and humpback dolphins (*Sousa sahulensis*) were encountered equally during the survey, with an encounter rate ranging from 0.05 to 0.2 dolphins per km of transect line across the four days. A total of 17 individual snubfin dolphins, including five juveniles and one calf, and 26 individual humpback dolphins, including one juvenile and one calf, were sighted over the five days (excluding resights of the same individuals in the same day and over multiple days).

While 17 individual snubfins were counted, this included four snubfins with clean dorsal fins (three juveniles and one calf) that lacked markings for individual identification and would not be recognisable if later resighted. Of the 13 individual snubfins with marked fins that could be identified, 85% (11) have been seen in previous surveys i.e. there were only two new individuals that could be identified in this survey. Four individuals have been present in all six surveys and an additional five present in at least four, suggesting a high degree of site faithfulness at this time of year. The largest group sighting for 2024 was eight for both snubfin and humpback dolphins. Only six of the 25 (23%) humpback dolphins with marked fins that could be identified were resighted from previous surveys.

Dolphins were sighted throughout the river, most often occurring near creek mouths, with no sightings within the immediate vicinity of Maamboolbarda (King Cascade). There were multiple large groups observed at the mouth of Purulba Creek. This survey continues to show that the

Malandoom area supports snubfin and humpback dolphins including a potentially resident community of snubfin dolphins. Given their local value and conservation status this survey highlights the importance of identifying and monitoring such a small population that use the marine park, where pressures can be actively managed to benefit the conservation status and persistence of the species. This is particularly important given the potential increase in pressure on the river from commercial gillnet fishing, increasing boat activity (recreational and commercial) in the Malandoom and Ngalygaany area and greater Lalang-gaddam Marine Park.

In addition to the 158 dolphins sighted in the area, 7 bottlenose dolphins (*Tursiops aduncus*) and 49 humpback whales (*Megaptera novaengliae*) were sighted from *PV Worndoom* while transiting through the marine park, with most sightings occurring within the Nyiningjit Special Purpose Zone (whale conservation) – Camden Sound. These observations of other cetacean species recorded during the expedition are important to ensuring the target of no significant decline in key species diversity within the marine park can be monitored. Two species that have previously been recorded were not observed in this survey (dwarf spinner dolphin and false killer whale) but are thought to be more transient through the area.

Given these surveys were supported to continue through the Dambimangari Healthy Country Plan 2023-32 and joint management science prioritisation process in 2023, it is recommended that surveys are repeated every 2 years using the same methodology to ensure that any changes to dolphin presence and use of the area would be detected and managed. Jigeedany (dolphins) are listed as a KPI in the Lalang-gaddam Marine Park Joint Management Plan 2022, and this work supports management strategy 7.12.1, "*monitor the condition of jigeendany*", aiming for the targets of "*no significant decline in diversity or key species abundance as a result of human activity*" and "*no significant change to key species distribution as a result of human activity*".

The distinct dorsal fins in Malandoom have remained relatively stable over the last five surveys with only some being subtly modified. Regular survey effort is required to track these evolving dorsal fins ('natural tags') which will improve our understanding of the individual life histories of dolphins in the marine park. Waiting too long between surveys may lead to mis-identifying individuals as their fins can change substantially and can also mean that catastrophic events or impacts on the dolphin population are not recognised, leading to delayed management intervention.

1. Introduction

A small population of tropical inshore dolphins[1] (*jigeedany*), including Australian snubfin (*Orcaella heinsohni*) and Australian humpback dolphins (*Sousa sahulensis*), are known to inhabit Malandoom (Prince Regent River) in the Lalang-gaddam Marine Park (LgMP). Snubfins are endemic to tropical waters of northern Australia and southern Papua New Guinea. Generally, little is known about them across most of their range with the exception of several important areas (e.g. Yawuru Nagulagun (Roebuck Bay)). Snubfins are known to occur in small populations that may have limited range patterns (Bouchet et al., 2021; D'Cruz et al., 2021). Humpback dolphins have a somewhat larger distribution than snubfin dolphins and can be found from the Pilbara in WA through the Northern Territory and Queensland in Australia (Raudino et al., 2023). They also occur in small populations similar to snubfins. Both species are vulnerable to coastal impacts including disturbance, habitat degradation and fragmentation, climate change and potentially entanglement in fishing nets (Hanf et al., 2016).

Malandoom and Ngalygaany (St George Basin) are within a general purpose zone of the Lalang-gaddam Marine Park, thus it is an area where multiple marine park user groups interests overlap. There are many significant cultural sites for Dambeemangarddee people in the area that feature in creation stories, as well as an international cruise industry with Kimberley destinations on their itineraries, local boutique cruise industry, recreational vessels, and increased presence from a commercial gillnet fisher in the river following gazettal of marine park sanctuary zones in June 2022 (pers. comm. M. Hourn). Growing numbers of recreational and large commercial vessels visiting Malandoom and more regular commercial gillnet fishing activity are likely to increase pressure on dolphin populations inhabiting these waters (DBCA, 2020).

While Yawuru Nagulagun Roebuck Bay is recognised as a stronghold for snubfin dolphins in the Kimberley, with the largest local population, small local populations are still important to the species' conservation. Vessel traffic and vessel noise may pose a more significant pressure in Malandoom compared to Roebuck Bay given the nature of the environment, with narrow water ways where dolphins may not be able to move away from vessels if disturbed. Commercial gillnet fishing activity is known to occur in the river and can cause entanglement leading to injury or mortality. Given the recent conservation status listing as Vulnerable to extinction (EPBC Act 1999) of the dolphin species present in the region, there is a need to better understand the populations and the potentially increasing pressures upon them. The Marine Science Program and LgMP District team have collaboratively led a research project to better understand these populations and their place in the context of the broader Kimberley since 2016. The aim of the overall project is to provide the joint park managers with the capacity to confirm and quantify the site-fidelity

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[1] Australian snubfin (*Orcaella heinsohni*), Australian humpback (*Sousa sahulensis*) and Indo-Pacific bottlenose (*Tursiops aduncus*) dolphins.

and long-term dynamics of the dolphins that inhabit Malandoom in the LgMP, providing the basis to detect any response to increasing human pressures with future monitoring effort. While the main emphasis is on the snubfin dolphin population, given its propensity for small local populations, monitoring also includes the humpback dolphins and other marine mammals in the park.

Malandoom and the wider Kimberley region are recognised on an international level as important habitat for coastal jigeedany. The river sits within an Important Marine Mammal Area (IMMA) designated by the Marine Mammal Protected Areas Taskforce under the International Union for Conservation of Nature (IUCN). Although IMMA's do not provide any legal or regulatory status, the designation of the area by the IUCN highlights the need for conservation and management for marine mammal species within the region. Given the species and the region is recognised on an international level, ongoing monitoring efforts are key for conservation and management.

An initial research expedition was conducted in 2016 by the Department of Biodiversity, Conservation and Attractions (DBCA) – Dambimangari Joint Management team and an external scientist. They surveyed [1]jigeedany in LgMP, with a focus on Malandoom and adjacent waters. This was followed by expeditions in 2018, 2019 and 2020 with scientists from the Marine Science Program (Dr Holly Raudino and Ellen D'Cruz). These initial surveys were used to refine research design and survey methodology, train staff and establish baseline information on dolphin presence and identification in the study area to underpin any future long-term monitoring program for these species. In 2022 the LgMP District staff led the fifth dolphin monitoring expedition engaging an external scientist to assist with the field component, support for data processing and report writing with MSP providing oversight and reviewing the report.

Between 10 and 18 Sept 2024, the sixth research expedition on *PV Worndoom* was undertaken involving DBCA West Kimberley District staff, Marine Science Program, Dambimangari Rangers and traditional owners. This report describes the field trip activities, data collection and results of the survey and provides recommendations for continuing this long-term monitoring program to inform management of dolphin populations in LgMP.

The objectives of this research expedition were to:
1. Collect long-term monitoring data on the distribution and relative abundance of tropical inshore jigeedany (dolphins) within the study area using boat-based surveys and photo-identification.
2. Provide further training in jigeedany survey techniques for Dambimangari Rangers.

Team:

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Tamisha Van Der Donk, PV Worndoom Engineer

Jesse Bradshaw, PV Worndoom Vessel Mate, Parks and Wildlife Service (DBCA)

Jenny D'Cruz, Volunteer cook and data scribe

2. Research activities

10 Sep: Travel to Cygnet Bay, board Worndoom and travel to Coppermine.

11 Sep: Depart Coppermine and travel to Hanover Bay

12 Sep: Depart Hanover Bay and travel to Purulba Creek. Survey Rothsay, Munster Waters & St George Basin.

13 Sep: Prince Regent River dedicated dolphin survey.

14 Sep: Prince Regent River dedicated dolphin survey.

15 Sep: Prince Regent River dedicated dolphin survey.

16 Sep: Prince Regent River dedicated dolphin survey (morning only). Depart Prince Regent River and transit to Sampson Inlet.

17 Sep: Depart Sampson Inlet and transit to Silver Gull Creek.

18 Sep: Depart Silver Gull Creek transit to Cygnet Bay and depart to Broome.

More detail on the dolphin surveys is included below under Methods.

3. Methods

Survey Design

A key objective of the 2018-20 project was to develop a survey design and protocol that was reproducible and could be implemented by the joint management team to produce an indicator of the condition of the dolphin population (i.e. numbers are consistent and the same individuals are sighted) within the survey area. The methods specific to Malandoom developed during that project were followed here, complemented by complete methods for dolphin surveys using

photo-identification outlined in the standard operating procedure 'Vessel-based Cetacean Surveys Using Photo Identification' (DBCA 2020).

The survey design consists of two transects that adequately cover the study area and would likely capture all dolphins in the area on a given day. The study area and transects were selected based on several important factors:

1) the survey area is reportedly regularly used by reasonable numbers of both snubfin and humpback dolphins;
2) the Prince Regent River and St George Basin areas contain significant cultural sites for Dambeemangarddee people, featuring in creation stories;
3) it is a key visitor site on of the majority of commercial (expedition cruise ships and boutique vessel tours) and recreational boating schedules (yachts and Superyachts) within the broader area;
4) its sheltered waters increase the likelihood that planned survey activities can be completed in suitable calm sea conditions;
5) the length of transect route can be completed within a single good weather day given moderate numbers of dolphin sightings; and
6) the narrowness of the waterway increases the chances of a survey detecting dolphins if they are present.

During each dolphin expedition, the transects have been repeated a minimum of two times (though ideally three times where possible) over a three day to weeklong period. This was repeated annually over a three-year period between 2018-2020 at roughly the same time of year (September) to build an adequate baseline dataset on number of dolphins using Malandoom. The transects need to be repeated a minimum of two times over a short period but ideally three times each survey as dolphins will be missed on individual transects. This may occur because 1. the dolphins are at the water surface but missed by observers (perception bias due to observer fatigue) or 2. the dolphins are submerged during a dive and not available to be detected (availability bias).

Surveys were only conducted when sea conditions were considered suitable (i.e. Beaufort Sea State [BSS] <3). The dolphins present in Malandoom (snubfin and humpback) have a low surfacing profile, so may be missed in conditions where white caps are present (i.e. BSS >2), resulting in a misleading underestimate of the number of dolphins using the area.

Data Collection
During this expedition, daily surveys were conducted from *PV Worndoom* tender vessels, *Shardai* and *Goolaan*, following pre-determined routes (transects) through the study area and following

these using onboard navigating system. Tender vessel *Pinyjiri* was used on the first day when training the survey team and while operating in the Ngalygaany St George Basin area. When two tenders were on survey at the same time in the same area, they followed separate transects and travelled towards opposite ends of the river as far as the tide would allow, ensuring spatial separation across the survey area. In addition, several hours of survey effort were conducted from the roof of *PV Worndoom* on transit from Koolan Island to the southern mangrove arm in St George Basin.

During a survey, vessels maintained a speed of 8-10 knots while on transect, slowed during dolphin sightings and transited between transects at faster speeds. A minimum of three people were onboard each vessel; the skipper and two observers dedicated to scanning for dolphins (with the naked eye) ahead and on each side of the vessel. When dolphins were sighted, the point where the transect was left was noted by the skipper using the onboard navigation system and the dolphin group was approached to collect data on group size, composition (i.e. species, sex and age class) and behavioural activity. The location (latitude and longitude) of the sighting was recorded using the onboard navigation system. Photographs of the dorsal fins of all dolphins in the group were taken for the purpose of photo-identification of individual animals. Each vessel had at least one person using a DSLR camera with a 400mm zoom lens for photo-identification.

Data Analysis

Sighting histories (produced from repeat sightings of the same individual dolphin on multiple occasions over time) provide valuable information on the age and composition of the population, group dynamics and on residency patterns. Individual dolphins were identified from photographs primarily based on patterns of nicks and notches on the trailing and leading edge of the dorsal fin as well as secondary marks such as pigmentation, scars, rake marks, wounds and lesions on the surface of the dorsal fin. Scars, wounds and lesions on other parts of the body visible at the surface were also used for identification when present. These are evolving tags that can change relatively quickly in some populations due to interactions with conspecifics (i.e., member of the same species), predation attempts, and vessel and fisheries interactions. If the dorsal fin is substantially modified, individual dolphins may be mis-identified during a later survey which will lead to inaccurate population estimates because dolphins are double counted.

After the survey, all photographs were qualitatively analysed for focus, contrast, angle, visibility and proximity of the fin and the best photos of each individual were retained. Individuals were categorised by the degree of marks on the dorsal fin as either distinctive (D1), subtle (D2) or clean (D3). The overall number of clean fins was calculated for each group and for each day, however,

the same clean fin individuals could potentially have been resighted between days as they had no distinguishing features.

All images and sighting information were entered into the DolFin database https://dolfin.dbca.wa.gov.au. This online database allows data accessibility remotely and by all project partners. Attempts to match distinct individual dolphins to those already in the photo-identification catalogue were made by two researchers independently. If a match was not made, then the individual was added to the photo-identification catalogue and given a new ID code. If fins had no distinguishing features, they were not added to the catalogue as they would not be recognisable through time. Fins that had minor markings that they were able to be distinguished in this survey, but it would be likely that the marks would not be visible at the time of the next survey, were given a temporary ID code for this survey but were not added to the catalogue.

4. Results

The 2024 dolphin expedition covered 358.71 km and 23 hours of transects on effort in Malandoom and an additional 384.14 km and 22 hours off effort transiting or with dolphin groups. Transit from Cygnet Bay to Purulba Creek covered an additional 608 km (return).

Four species of cetaceans were observed, bottlenose dolphin (*Tursiops aduncus*), humpback dolphin (*Sousa sahulensis*), snubfin dolphin (*Orcaella heinsohni*) and humpback whale (*Megaptera novaeangliae*). Two groups of bottlenose dolphins (7 adults), and 34 groups of humpback whales (incl. 9 mother + calf pairs, two of which had an escort) were recorded during the transit from Koolan Island through the LgMP to Malandoom and return (Figure 1). Both groups of bottlenose dolphin were sighted within the Gooddee (Kuri) Special Purpose Zone (Pearling); one in Camden Harbour and the other in the passage between Joonoolgoo and Wurroolgu (Augustus Island).

In Malandoom and Ngalygaany, two species of dolphin were sighted (snubfin and humpback; Figure 2; Figure 3). The combined effort in the study area resulted in 158 dolphins (of the two species) being sighted in 44 groups, 104 (in 30 groups) were on effort. This equated to 0.21 dolphins per km of effort or 3.49 dolphins per hour of survey effort. This included repeated sightings of the same individual dolphins.

Dolphin sightings

Results are presented according to the three areas: (1) Lalang-garram / Camden Sound; (2) Malandoom Prince Regent River; (3) Ngalygaany (St George Basin incl. Munster Water).

Table 4.1 Dolphin and whale sightings: Lalang-gaddam Marine Park

Species	# group sightings	Group size range; mean	# of calves detected
Bottlenose dolphin (*Tursiops aduncus*)	2	3-4; 3.5	0
Humpback whale (*Megaptera novaeangliae*)	34	1-3; 1.5	9

Sightings off survey effort during transit (i.e. opportunistic).

Table 4.2 Dolphin sightings: Malandoom Prince Regent River

Species	# group sightings	Group size range; mean	Number of calves detected	Number of juveniles detected
Snubfin (*Orcaella heinsohni*)	21	1-8; 3.5	2	5
Humpback (*Sousa sahulensis*)	18	1-8; 3.8	1	1

Includes sightings while both on and off (i.e. opportunistic) survey effort.

Table 4.3 Dolphin sightings: Ngalygaany (St George Basin incl. Munster Water)

Species	# group sightings	Group size range; mean	Number of calves detected	Number of juveniles detected
Snubfin (*Orcaella heinsohni*)	1	3	0	0
Humpback (*Sousa sahulensis*)	4	3-6; 4	1	0

Includes sightings while both on and off (i.e. opportunistic) survey effort.
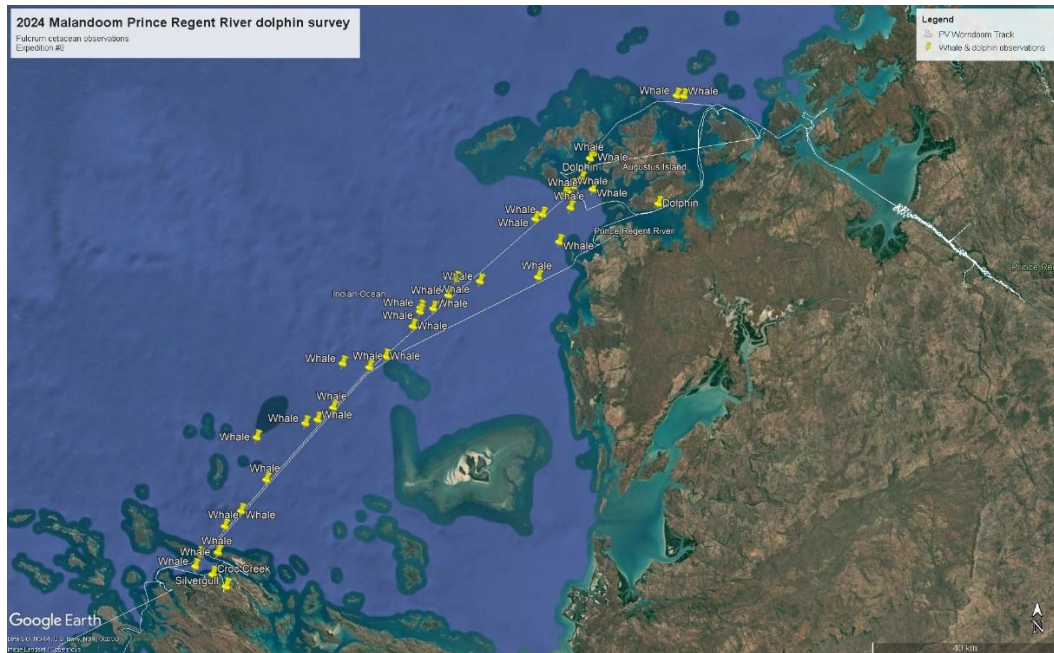
Figure 1 Cetacean sightings in Lalang-gaddam Marine Park on transit from Koolan Island to Ngalygaany St George Basin September 2024.
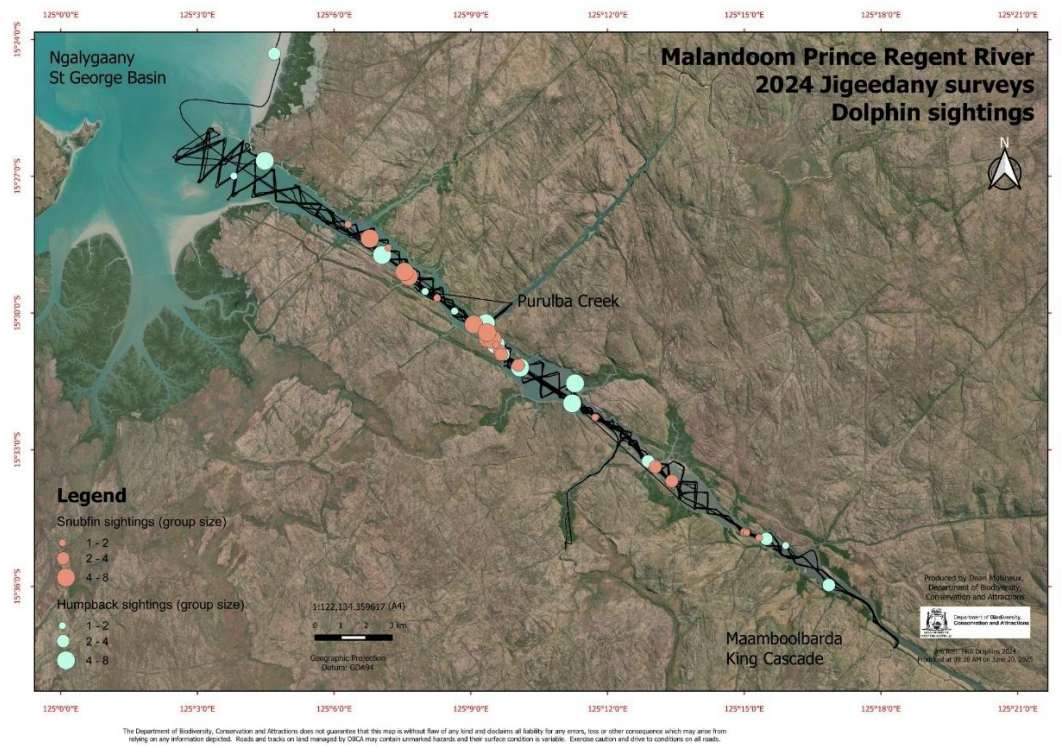

Figure 2 Dolphin sightings in Malandoom Prince Regent River during September 2024 survey.
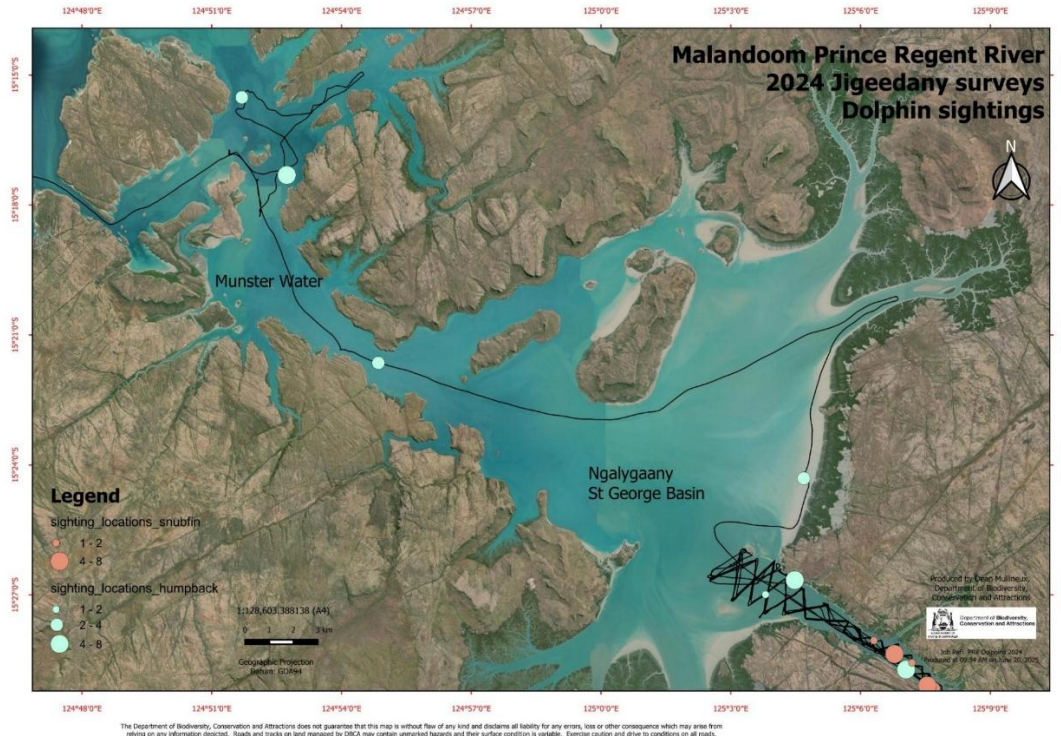
Figure 3 Dolphin sightings in Munster Water during September 2024 survey.

Encounter rates

Encounter rates were calculated as a measure of the number of dolphins observed per km of survey effort. Encounter rates were calculated per km per day, and also per vessel, illustrating how variable this measure can be throughout the survey (Tables 3.4 & 3.5).

Encounter rates were calculated using the best estimate of group size for each sighting, including any calves present. If the same individual was observed more than once in one day (shown by photo-ID), then it was only counted once for that day. Some snubfin dolphins were resighted multiple times over the multiple day survey. Dolphins observed opportunistically while not on survey effort (e.g. while motoring at speed between areas) were not included. Similarly, the distance travelled while not on survey effort was also not included.

Table 4.4 Daily encounter rates: Malandoom Prince Regent River using only the on effort vessel distances and sightings

Date	km effort	# snubfin dolphins per km effort	# humpback dolphins per km effort
2024_09_12	58.8	.05	0.15
2024_09_13*	97.65	0.09	0.08

2024_09_14 *	103.1	0.20	0.18
2024_09_15 *	99.16	0.09	0.19
2024_09_16*	all off effort		

*on 3 days there were 2 vessels surveying at the same time. For encounter rate by individual boat, see Table 4.5.

Table 4.5 Encounter rates when two boats were operating concurrently using only the on effort vessel distances and sightings. Encounter rates for each boat are presented separately where two boats were used concurrently.

Date	km effort	# snubfin dolphins per km effort	# humpback dolphins per km effort	Boat name
2024_09_13	64.02	0.11	0.00	Goolaan
2024_09_13	33.63	0.06	0.24	Shardai
2024_09_14	57.64	0.31	0.14	Goolaan
2024_09_14	45.46	0.24	0.09	Shardai
2024_09_15	51.81	0.14	0.21	Goolaan
2024_09_15	47.35	0.04	0.17	Shardai

Table 4.6 Resighting history of individual snubfins identified in the Malandoom study area, ticks indicate sighted and present, crosses indicate absent or missed.

Dolphin ID code	2016	2018	2019	2020	2022	2024
OhLG01	✓	x	✓	x	x	x
OhLG02	✓	✓	✓	✓	✓	✓
OhLG03	✓	x	?	x	x	x
OhLG04	✓	✓	✓	✓	✓	✓
OhLG05	✓	x	✓	✓	x	✓
OhLG06	✓	✓	✓	✓	✓	✓
OhLG07	✓	x	✓	✓	✓	x
OhLG08	✓	x	✓	✓	x	x
OhLG09	✓	✓	✓	✓	✓	✓
OhLG10	-	✓	x	x	x	x
OhLG11	-	✓	x	✓	x	x
OhLG12	-	✓	x	x	✓	x
OhLG13	-	✓	✓	✓	✓	x
OhLG14	-	-	✓	x	✓	x

OhLG15	-	-	✓	✓	✓	✓
OhLG23	-	-	✓	✓	✓	✓
OhLG24	-	-	-	✓	x	x
OhLG25	-	-	-	✓	✓	✓
OhLG26	-	-	-	-	✓	x
OhLG27	-	-	-	-	✓	x
OhLG28	-	-	-	-	✓	✓
OhLG29	-	-	-	-	✓	x
OhLG30	-	-	-	-	✓	x
OhLG31	-	-	-	-	✓	x
OhLG32	-	-	-	-	✓	✓
OhLG33	-	-	-	-	✓	✓
OhLG34	-	-	-	-	✓	x
OhLG35	-	-	-	-	✓	x
OhLG37	-	-	-	-	-	✓
OhLG38	-	-	-	-	-	✓

4.7 Resighting history of individual humpback dolphins identified in Lalang-gaddam Marine Park, ticks indicate sighted and present, crosses indicate absent or missed.

Dolphin ID code	2016	2018	2019	2020	2022	2024
SsLG01	✓	x	x	x	x	x
SsLG02	✓	✓	✓	✓	x	✓
SsLG03	✓	x	✓	x	x	x
SsLG04	✓	x	✓	x	x	x
SsLG05	✓	x	x	x	x	x
SsLG06	✓	x	x	x	x	x
SsLG07	✓	x	x	x	x	x
SsLG08	✓	x	x	x	x	x
SsLG09	✓	x	x	x	✓	x
SsLG10	✓	x	x	x	x	x
SsLG11	✓	x	x	x	x	x
SsLG12	✓	x	x	x	x	x
SsLG13	✓	x	x	x	x	x
SsLG24	-	✓	x	x	x	x

SsLG28	-	✓	x	x	x	x
SsLG29	-	-	✓	✓	x	x
SsLG30	-	-	✓	x	x	x
SsLG31	-	-	✓	x	x	✓
SsLG32	-	-	✓	x	x	x
SsLG33	-	-	✓	x	x	x
SsLG34	-	-	✓	x	✓	✓
SsLG35	-	-	✓	x	x	x
SsLG36	-	-	✓	x	x	x
SsLG37	-	-	-	✓	x	✓
SsLG38	-	-	-	-	✓	x
SsLG39	-	-	-	-	✓	✓
SsLG40	-	-	-	-	✓	✓
SsLG41	-	-	-	-	✓	x
SsLG42	-	-	-	-	✓	x
SsLG43	-	-	-	-	✓	x
SsLG44	-	-	-	-	✓	x
SsLG45	-	-	-	-	✓	x
SsLG46	-	-	-	-	✓	x
SsLG47	-	-	-	-	✓	x
SsLG48	-	-	-	-	✓	x
SsLG49	-	-	-	-	✓	x
SsLG51	-	-	-	-	-	✓
SsLG52	-	-	-	-	-	✓
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SsLG57	-	-	-	-	-	✓
SsLG58	-	-	-	-	-	✓
SsLG59	-	-	-	-	-	✓
SsLG60	-	-	-	-	-	✓
SsLG61	-	-	-	-	-	✓
SsLG62	-	-	-	-	-	✓

SsLG63	-	-	-	-	-	✓

Photo-identification ('Photo-ID')

For the Munster Water to Malandoom area, 13 distinctive snubfin and 25 distinctive humpback dolphins were identified using photographs. Five juvenile snubfin, two calves, one juvenile humpback dolphin and one calf were sighted. Eleven of the 28 snubfin dolphins that have been identified in previous surveys were resighted in the 2024 survey suggesting strong site fidelity to the area at this time of year (Table 3.6). With an additional two marked individuals in 2024 this brings the total to 30 individually distinctive snubfin dolphins that have been photo-identified for Malandoom, excluding calves and clean fins across the eight years where surveys have been undertaken including the initial pilot survey (2016-2024). Six humpback dolphins were resighted from previous surveys (Table 3.7). There is a total of 49 individually distinctive humpback dolphins that have been photo-identified for Lalang-gaddam Marine Park, excluding calves and clean fins.

Trends over time

More individual humpback dolphins were identified based on the photo-ID in the 2024 survey compared to all previous surveys (Figure 4). The number of snubfin dolphins sighted in the 2024 survey is comparable to previous years (Figure 4). The 2024 survey had the highest number of group sightings for both species of 22 (Figure 5).
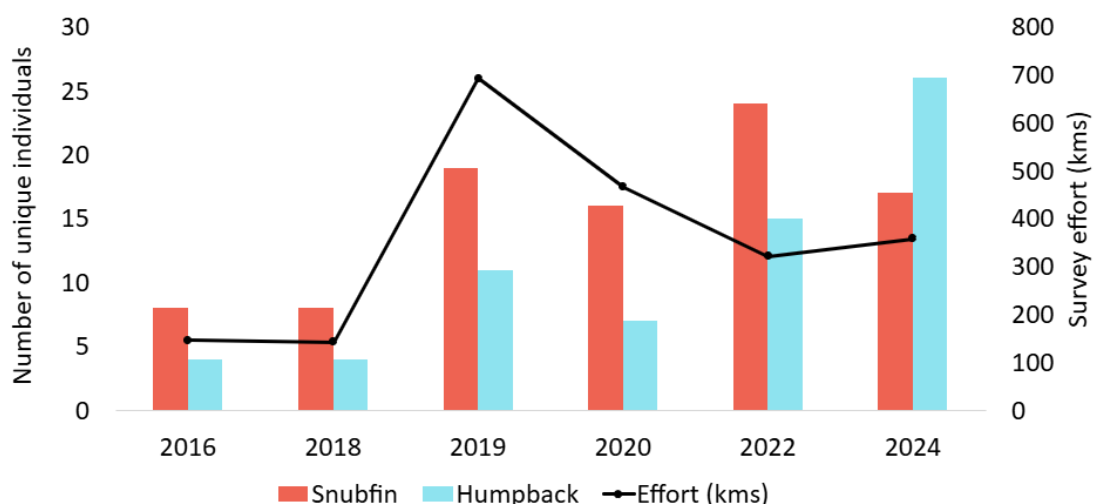

Figure 4 Number of individual dolphins that were identified from unique fin markings in the Munster Water to Malandoom area and survey effort (kms travelled) for each survey since 2016.
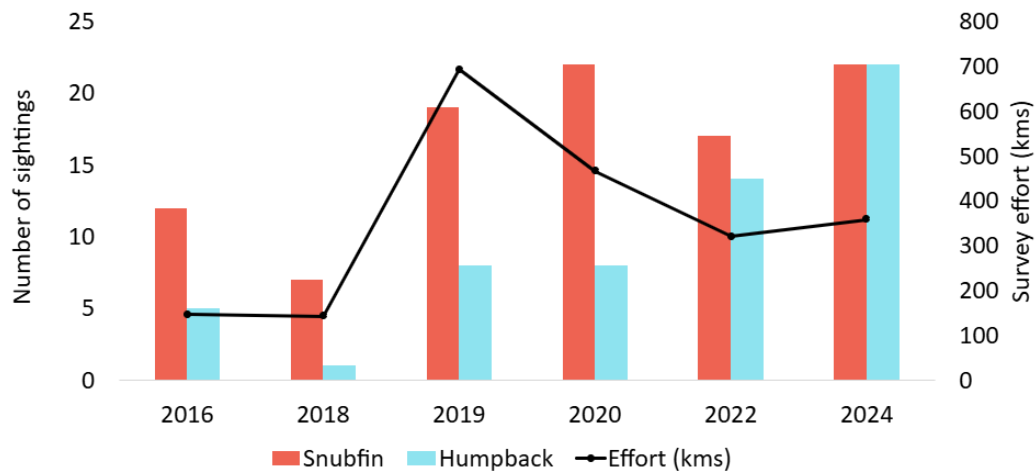
Figure 5 Number of dolphin group sightings in the Munster Water to Malandoom area and survey effort (kms) for each survey since 2016. Note each group sighting includes from 1-16 individual dolphins

Other observations

On four occasions during the survey, snubfin dolphins were observed using spitting as a feeding technique (Figure 6). This unique behaviour has been observed in all previous surveys of Malandoom and in the Yawuru Nagulagun Roebuck Bay population. A wolf herring (*Chirocentrus dorab*) was observed jumping away from OhLG25 after spitting was observed (Figure 7).
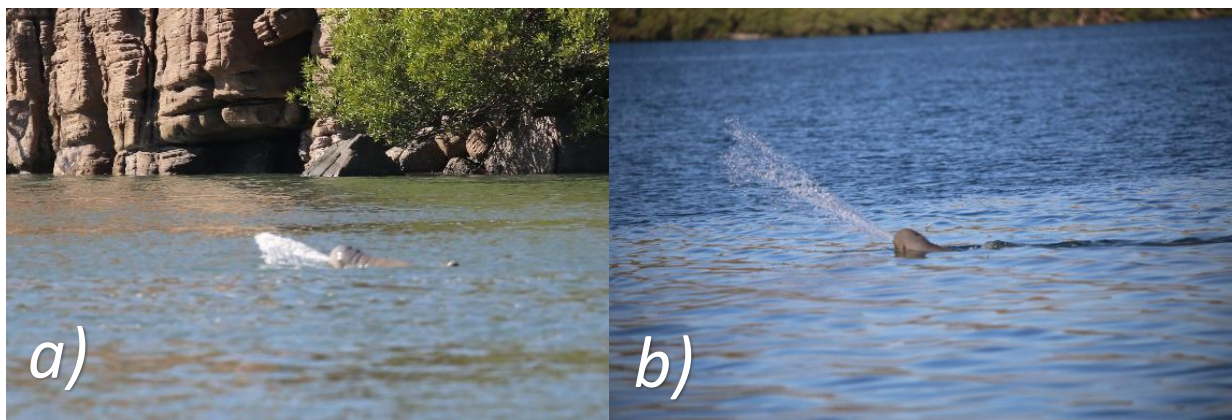
Figure 6 (a) Snubfin dolphin (OhLG15) spitting a jet of water and (b) snubfin dolphin (OhLG25) spitting a jet of water.

Figure 7 Wolf herring jumping away from dolphin after spitting from OhLG25 (sighting 3, Shardai, 14 Sept 2024).

Interestingly, humpback dolphins are often sighted near the rocks or edge of the mangroves on the banks of the river rather than in the middle of the river and are frequently foraging in this habitat. This is in contrast to the sightings of snubfin dolphins which were more common across the river. Similar observations have been reported in previous years and may indicate habitat preferences by humpback dolphins for the near shore areas of the river and possibly spatial segregation to avoid competition for food or agonistic social interactions.

5. Discussion

We now have six years of survey effort that suggest the area supports a maximum of 24 snubfin dolphins at any one time at this time of year. Eleven of the snubfin dolphins sighted this year were seen in previous years which suggests that there is a high degree of site fidelity. However, surveys at different times of the year would be needed to confirm this and to identify whether there are any seasonal changes in distribution. The small population of snubfins that use Malandoom is reportedly locally important to Dambeemangarddee people (Department of Parks and Wildlife, 2016). Given their local value, conservation status (vulnerable globally on the IUCN Redlist, near threatened in Queensland, priority and recently listed as Vulnerable under the Commonwealth EPBC Act), and that the region sits within an IMMA, this survey highlights the importance of such a small population using a marine park, where threats can be actively managed to benefit the conservation status and the persistence of the species. Indeed, data from these surveys was used in proposals for the both the listing of these species under the EPBC Act and the creation of the IMMA, highlighting the value of these surveys in dolphin conservation.

The survey design and methodology have proven effective in capturing how many dolphins are using the river at any one time. Using two vessels allowed a more intensive survey effort and demonstrates the availability and perception biases compared to when using one survey vessel. That is, with two boats covering the same stretch of water (albeit on reciprocal transects), encounter rate differed as a result of dolphins being missed because they were submerged and unavailable, or observers were scanning a different area or were fatigued and missed them surfacing. Two vessels on the water at the same time are more likely to sight all dolphins in the

area through better spatial and temporal coverage. However, staff fatigue needs to be considered in rostering and planning for the next survey, with some staff again missing field days towards the end of the survey as in the 2022 survey. This left the remaining team under resourced and having to borrow the volunteer cook onboard to fill key survey roles. The dedicated survey team requires adequate time off (if rostered staff) prior to commencing field work and must understand the survey intensity prior to committing, as there is significant cost invested in the expedition to get to the area and to cover staff / specialists whilst on board.

Sea conditions were fair throughout the dedicated survey with consistently low or light winds in the morning and strong westerly winds setting in about midday or early afternoon. This resulted in survey effort being concentrated in the morning as afternoon conditions were unsuitable (BSS >2) for sighting and photographing dolphins. This survey pattern of ceasing around the middle of the day may have been beneficial to the dolphins as it reduced the likelihood of multiple encounters in the same day with the same individuals and cumulative exposure to boat time. This also allows staff to rest or process data in the afternoons. On occasion, the afternoon conditions were favourable and staff went out on one boat to an area that had not been targeted that day to do some opportunistic (off-transect) searching for dolphins.

Survey effort was again spent in Ngalygaany St George Basin and Munster Water, which has proven beneficial in previous years to encounter humpback dolphins throughout Munster Waters and investigate dolphin occurrence in other parts of Ngalygaany. More humpback dolphins were sighted and identified this year compared to previous surveys, likely due to the use of the temporary ID codes being assigned to individuals with marking that would likely disappear over time (so could not be used to identify individuals between years, only days).

If human pressures continue to increase in Malandoom (e.g. increased boat or gillnet fishing activity) then monitoring through regular (annual) surveys may be required to determine the impact these pressures are having on the local population over timeframes that allow for successful management intervention. Though, fishery related mortalities could be catastrophic to the population, unless new individuals move into the area, with surveys only able to confirm a lower number of individuals. And genetic results suggesting limited connectivity, mixing and breeding to snubfins in the Kimberley (Chabanne et al., 2021)

As described in the 2020 report, monitoring to inform additional management responses to lower dolphin numbers may include:
1) the need for additional surveys at different times of year (peak and off-peak seasons) to monitor the dolphin population as well as collection of data on numbers of boats present at any one time and across the season to monitor the pressure including vessel track data

to identify pinch points or hotspots in traffic spatially (potentially using AIS or AMSA vessel data which has been used in site visitor analysis for visitor planning)

2) the number of dolphins using the area and encounter rates can then be compared between years to detect changes that can be assessed relative to changes in the number of boats also using the area

3) activity budgets for the dolphins and habitat use to determine whether these factors change in the presence of increasing numbers of vessels

Annual or more frequent surveys would provide better data on life history parameters of the population including recruitment such as calving and weaning. It would also be possible to estimate home range size (i.e., size of the area used by an individual and population within the confines of a study area) of individual dolphins through repeat sightings of the same individuals. Tens of sightings of an individual (i.e. 30-50 sightings on different days) would be required which might be available for some individuals that have been sighted throughout the duration of the project. While we are not quite at the number of sightings required, as our sighting history of individual animals has increased, we are getting closer (for example OHLG04, OHLG06 and OHLG09 have been sighted on 17, 16 and 13 days respectively and in all six survey years). Increase in data collection that would allow for home range assessment would provide valuable insight into how dolphin range may intersect with areas of human use.Together these data may provide a point of comparison to investigate whether dolphins are being displaced from the area or continue to use Malandoom regardless of boat activity. It should be noted that dolphins may continue to use an area, for example to forage, even if it is sub-optimal due to boat traffic which may impact their short-term activity budget. If exposure is continued and chronic it may result in a fitness cost to the population (Allen and Read, 2000). However this research and analysis would require additional staff capacity.

6. Recommendations

The Dambimangari Healthy Country Plan 2023-2032 identified 'continuing long-term monitoring of snubfin and humpback dolphins in priority locations, including Prince Regent River' as a key strategy in their saltwater country management. Jigeedany were ranked as low priority in the science prioritisation process in November 2023, likely because there is currently good knowledge of the population in Prince Regent River, compared to other ecological values throughout the marine park. However, the biennial surveys in the Malandoom Prince Regent River were supported to continue, with the Senior Ranger from LgMP to coordinate and on-going support from the Marine Science Program.

Given this, it is recommended that a survey be conducted in Malandoom following the same methodology and design at a minimum of every 2 years ie September 2026 with 2-3 repetitions

of the transects over a 3-7 day period based on vessel availability. A minimum of eight days should be allocated to the task, given unpredictable weather conditions. Surveys should be undertaken at the same time of year and should avoid spring tides. Where possible, two vessels should be used for the survey. These surveys should continue to record sightings of other marine mammals, particularly when in transit, to inform marine park targets on species diversity. This will allow for a quantitative assessment of dolphin abundance and distribution throughout the study area as well as the collection of important demographic information on site fidelity, reproduction and longevity. There would be limitations on answering some of these questions if surveys were conducted too infrequently as dolphin dorsal fins can change rapidly, leading to mis-identification of individuals. However, once the baseline has been established over 10 years (2016-2026) consideration could be given to 3-yearly surveys, rather than the current biennial frequency. Further, regular surveys will allow for detection of catastrophic events that may have an impact on the local dolphin population that can be addressed through management. Leaving a longer interval between surveys will mean that demographic information is lost and therefore limit the questions that can be answered on dolphin population health.

Additional research questions may also be addressed using these data over time, or an added focus can be included in the biennial survey. For example, to estimate home range, a minimum of 30 sightings, preferably ~100 sightings of each individual dolphin would be needed, requiring additional survey effort. A number of tissue samples from snubfin dolphins in Malandoom have been collected and this effort could continue should there be priority research questions on relatedness and connectivity within and between populations.

Finally, all staff will need to ensure that they are appropriately covered by DBCA scientific licences and Animal Ethics Approval for any future dolphin surveys and biopsy collection.

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