

[10.1071/ZO24020](https://doi.org/10.1071/ZO24020)

*Australian Journal of Zoology*

### Supplementary Material

#### **Spatiotemporal distribution of humpback whales off north-west Australia quantifying the Exmouth Gulf nursery area**

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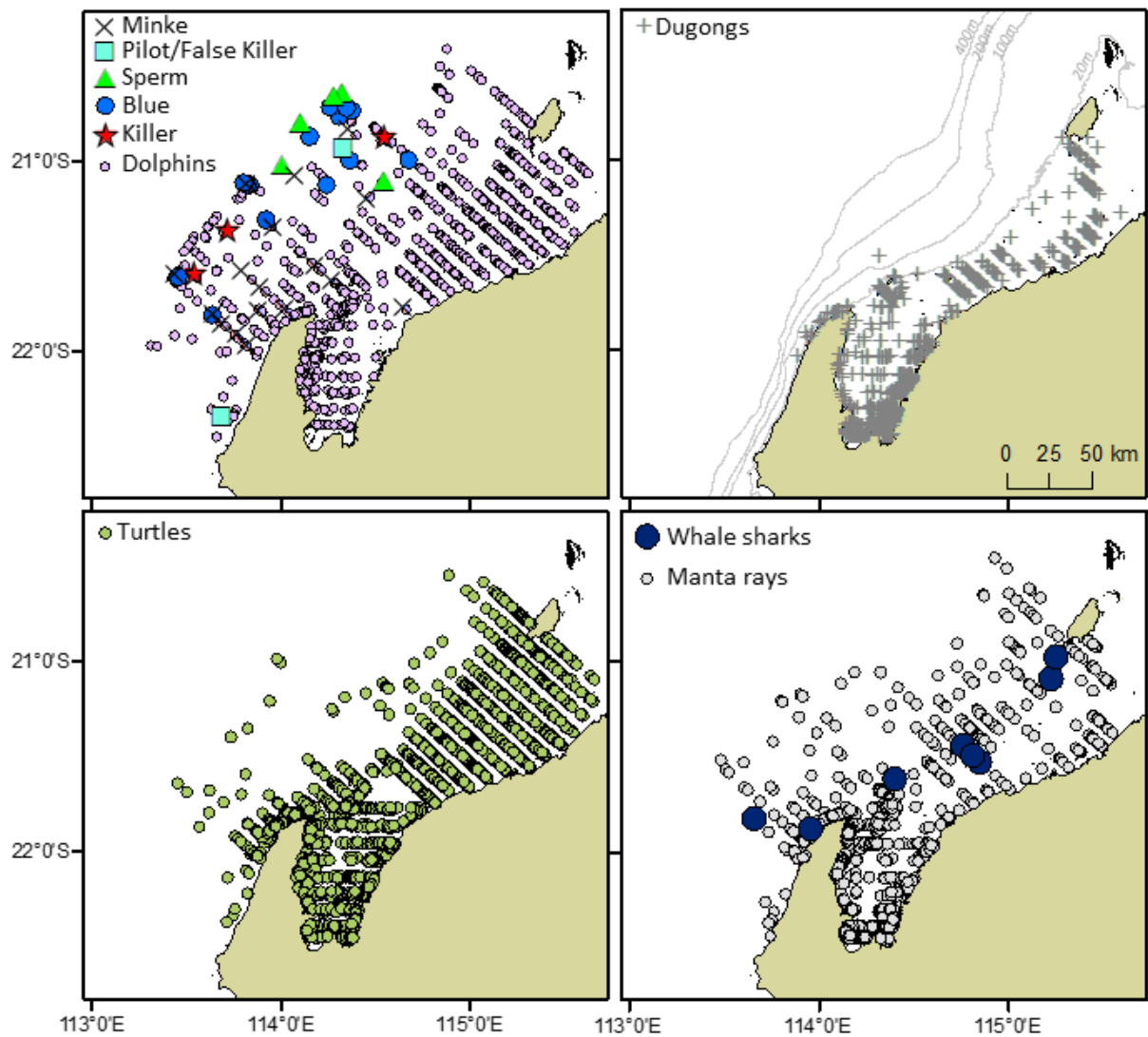
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## Supplementary material 1

### *Other marine megafauna*

Opportunistic observations were collected for other marine megafauna, such as other species of whales, dolphins, dugongs, turtles, whale sharks and manta rays. Data collected on other megafauna included species identification where possible, and any indistinguishable ‘large’ megafauna were not used for further investigation. Vertical and/or horizontal angles were not recorded for other marine megafauna species, therefore, the GPS location for these sightings represent the location of the plane and the true location of the sighting can be assumed to be within 2.5 kilometres of the plane’s location. The survey design limited the interpretation of the results for smaller megafauna (i.e., smaller species such as turtles were less likely detected across survey width). The consistent data collection on other marine megafauna is presented to help inform the temporal/spatial presence of animals only. It is noted that manta rays (*Mobula* spp.) were distinguished from other rays by their distinctive shape (Armstrong *et al.* 2020), however, it is possible that other species of bottom dwelling rays were mistaken for manta rays along the mangrove creek areas of Exmouth Gulf which is noted as a limitation.

Across all areas and years surveyed, confirmed sightings of other cetacean species included minke (*Balaenoptera bonaerensis*;  $n = 17$ ), sperm (*Physeter macrocephalus*;  $n = 5$ ), blue (*B. musculus*;  $n = 15$ ), and killer (*Orcinus orca*;  $n = 3$ ) whales (Fig. 5). Two sightings were recorded of short-finned pilot (*Globicephala macrorhynchus*) and false killer whales (*Pseudorca crassidens*), and these species were grouped together given the difficulty in distinguishing between the species from a high aerial viewpoint. Most cetacean species were sighted beyond the 100 m depth contour, except for one minke whale observed at the northern margin of Exmouth Gulf. Sightings of dolphins (species not distinguished;  $n = 1001$ ) occurred across most of the study area. Dugongs ( $n = 873$ ) were mostly sighted in shallower waters ( $< 20$  m depth) and were most concentrated within Exmouth Gulf, particularly along the eastern and southern margins. Turtles (species not distinguished;  $n = 5397$ ) were well distributed across the study area and mostly in shallow coastal waters to the 100 m depth contour. Manta rays ( $n = 1092$ ) were sighted across most of the study area however appeared to be more concentrated around the margins of Exmouth Gulf. Eight sightings of whale sharks were made around the North West Cape and off the Pilbara. For further detail on monthly sightings, refer to Table S2.



**Fig. S1.** Spatial distribution of marine megafauna sightings off North West Cape, Pilbara and Exmouth Gulf off Western Australia between 2000-2010, including cetaceans (mysticetes and odontocetes), dugongs, turtles and elasmobranchs (whale sharks and manta rays). Water depth contours are represented in light grey lines (in dugong panel).

North-west Australia supports the occurrence of numerous protected megafauna species. In addition to the opportunistic observations of minke, sperm, blue, killer and pilot/false killer whales during this study, other whale species have been recorded in the region, including fin whales (*Balaenoptera physalus*) (Chittleborough 1953), southern right whales (*Eubalaena australis*) (Allen and Bejder 2003; Sprogis and Parra 2022) and Omura's whales (*Balaenoptera omurai*) (Cerchio *et al.* 2019). Dolphins were observed across the study region, and likely included Australian humpback (*Sousa sahulensis*), Indo-Pacific bottlenose (*Tursiops aduncus*), common bottlenose (*T. truncatus*), and may have included pantropical

spotted (*Stenella attenuata*), dwarf spinner dolphins (*S. longirostris*), and snubfin (*Orcaella heinsohni*) (Hanf *et al.* 2022; Raudino *et al.* 2023; Sprogis and Parra 2022). Dugongs were sighted most often along the southern and eastern margins inside Exmouth Gulf, which is a recurrent finding across several studies examining Exmouth Gulf and surrounding waters (Cleguer *et al.* 2021; Hodgson 2007; Preen *et al.* 1997). Whale sharks were sighted in waters around North West Cape and Pilbara and migrate seasonally (Wilson *et al.* 2001). Their regular and often reliable occurrence has seen the establishment and growth of the marine wildlife tourism industry (Raudino *et al.* 2016; Sprogis *et al.* 2020). Manta rays largely exhibited similar inshore patterns to dugongs aligning with sightings from more recent aerial surveys (Irvine and Salgado Kent 2019). Manta ray species likely composed mostly of *M. alfredi* inshore, and *M. birostris* more offshore (Armstrong *et al.* 2020). Sea turtles were mostly sighted over shallower coastal waters inside and outside of Exmouth Gulf as well as around well-known and significant nesting locations for green (*Chelonia mydas*), flatback (*Natator depressus*) and hawksbill (*Eretmochelys imbricata*) turtles, such as Thevenard Island and Barrow Island (Fossette *et al.* 2021a; Fossette *et al.* 2021b; Pendoley *et al.* 2016). While the opportunistic sightings of smaller megafauna made during the aerial surveys of this study have inherent biases, the patterns observed are reflected in numerous studies across north-west Australia and highlight the importance of Exmouth Gulf and surrounding shallow coastal waters for megafauna species.

## Supplementary material 2

Table S2. Sightings of all megafauna across each survey region of the north-west coast between 2000-2010 for all sighting conditions (*e.g.*, BSS 0-5). The total number of individuals present during sightings is given in parentheses and calf sightings for humpback whales, dugongs and dolphins are provided in square brackets. EG = Exmouth Gulf, NWC = North West Cape. Note: sightings of ‘other sharks’ are presented here but are not analysed further given they were not accounted for during aerial surveys off the Pilbara.

| Survey region | Year | Month | # transects | Humpback whales | Dugongs    | Dolphins    | Turtles   | Manta rays | Blue whales | Killer whales | Minke whales | Pilot/false killer whales | Sperm whales | Unidentified large megafauna | Whale sharks | Other sharks | Sea snakes | Other rays |
|---------------|------|-------|-------------|-----------------|------------|-------------|-----------|------------|-------------|---------------|--------------|---------------------------|--------------|------------------------------|--------------|--------------|------------|------------|
| Pilbara       | 2009 | May   | 2           |                 | 5 (16)     | 28 (243)    | 109 (154) | 2 (2)      |             |               |              |                           |              |                              | 1 (1)        |              |            |            |
| Pilbara       | 2009 | Jun   | 2           | 32 (56)         | 26 (43)[5] | 32 (76)     | 107 (154) | 16 (16)    |             |               | 1 (1)        | 1 (25)                    |              |                              |              |              |            |            |
| Pilbara       | 2009 | July  | 2           | 110 (170)[3]    | 13 (27)    | 39 (125)[2] | 91 (114)  | 4 (4)      |             |               |              |                           | 2 (2)        |                              |              |              |            |            |
| Pilbara       | 2009 | Aug   | 2           | 264 (399)[20]   | 20 (31)[2] | 23 (102)[2] | 163 (292) | 18 (24)    |             |               | 1 (1)        |                           |              | 2 (2)                        |              |              |            |            |
| Pilbara       | 2009 | Sep   | 2           | 238 (363)[32]   | 15 (20)[1] | 51 (207)    | 192 (271) | 8 (13)     |             |               |              |                           |              | 1 (2)                        |              |              |            |            |
| Pilbara       | 2009 | Oct   | 4           | 246 (384)[53]   | 6 (7)      | 29 (208)    | 152 (276) | 13 (15)    |             |               |              |                           |              | 1 (7)                        | 1 (1)        |              |            |            |
| Pilbara       | 2009 | Nov   | 5           | 24 (35)[10]     | 6 (10)[2]  | 45 (351)[5] | 380 (551) | 30 (33)    | 5 (8)       | 1 (6)         |              |                           |              | 2 (6)                        | 1 (1)        |              |            |            |
| Pilbara       | 2009 | Dec   | 4           | 1 (2)[1]        |            | 15 (201)[2] | 94 (105)  | 6 (6)      | 1 (3)       |               |              |                           |              | 1 (1)                        | 1 (1)        |              |            |            |
| Pilbara       | 2010 | Jan   | 5           |                 | 6 (8)[2]   | 14 (83)     | 212 (317) | 22 (51)    |             |               |              |                           |              |                              |              |              |            |            |
| Pilbara       | 2010 | Feb   | 4           |                 | 3 (4)[1]   | 11 (96)     | 112 (136) | 14 (36)    |             |               |              |                           | 2 (2)        |                              |              |              |            |            |
| Pilbara       | 2010 | Mar   | 4           |                 | 6 (9)[1]   | 24 (124)    | 273 (479) | 5 (5)      |             |               |              |                           |              | 1 (1)                        |              |              |            |            |
| Pilbara       | 2010 | Apr   | 5           |                 | 22 (35)[5] | 52 (322)[7] | 426 (692) | 11 (11)    | 2 (4)       |               |              |                           | 1 (10)       | 2 (4)                        |              |              |            |            |
| Pilbara       | 2010 | May   | 2           | 1 (2)           | 13 (19)[4] | 20 (116)[2] | 300 (609) | 6 (7)      |             |               |              |                           |              | 1 (1)                        |              |              |            |            |
| Pilbara       | 2010 | Jun   | 2           | 18 (25)         | 10 (14)[1] | 26 (198)[3] | 112 (176) | 20 (52)    |             |               |              |                           |              |                              |              |              |            |            |

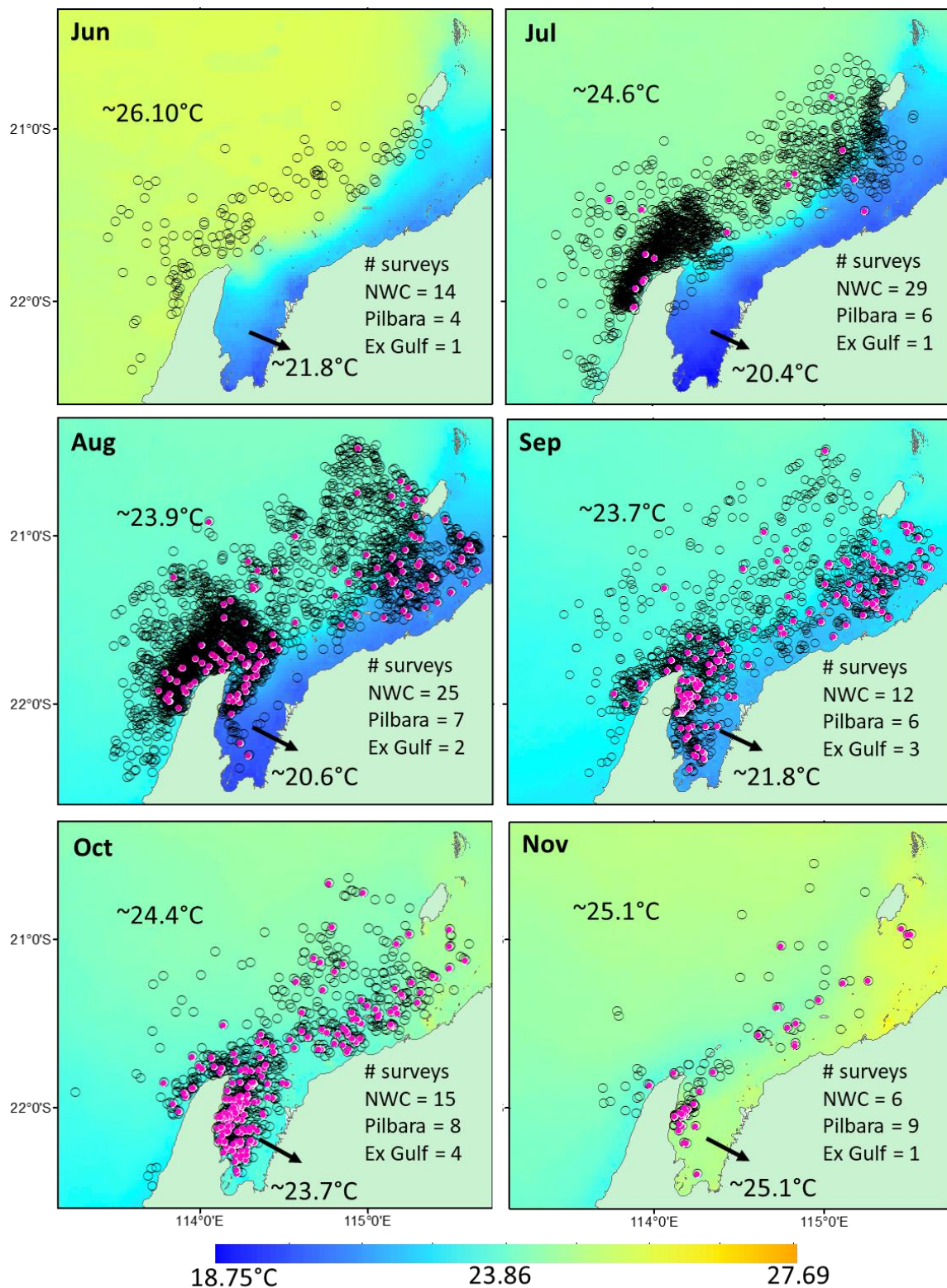
| Survey region | Year | Month | # transects | Humpback whales | Dugongs       | Dolphins     | Turtles   | Manta rays | Blue whales | Killer whales | Minke whales | Pilot/false killer whales | Sperm whales | Unidentified large megafauna | Whale sharks | Other sharks | Sea snakes | Other rays |
|---------------|------|-------|-------------|-----------------|---------------|--------------|-----------|------------|-------------|---------------|--------------|---------------------------|--------------|------------------------------|--------------|--------------|------------|------------|
| Pilbara       | 2010 | Jul   | 4           | 336 (500)[3]    | 9 (13)[1]     | 5 (48)       | 84 (107)  | 2 (2)      |             |               |              |                           |              |                              |              |              |            |            |
| Pilbara       | 2010 | Aug   | 5           | 716 (1061)[47]  | 36 (53)[9]    | 62 (490)[3]  | 129 (219) | 24 (36)    |             |               |              |                           |              |                              |              |              |            |            |
| Pilbara       | 2010 | Sep   | 4           | 222 (334)[33]   | 15 (19)[3]    | 26 (98)      | 133 (249) | 14 (37)    |             |               |              |                           |              |                              |              |              |            |            |
| Pilbara       | 2010 | Oct   | 4           | 32 (52)[8]      | 17 (29)[6]    | 57 (369)[16] | 347 (783) | 6 (6)      |             |               |              |                           | 2 (2)        |                              |              |              |            |            |
| Pilbara       | 2010 | Nov   | 4           | 14 (23)[4]      | 9 (16)[3]     | 45 (265)[3]  | 291 (747) | 21 (43)    |             |               |              |                           | 1 (6)        | 1 (1)                        |              |              |            |            |
| EG            | 2004 | Oct   | 3           | 193 (336)[69]   | 126 (285)[28] | 21 (73)[1]   | 127 (137) | 118 (223)  |             |               |              |                           |              |                              |              | 44 (213)     |            |            |
| EG            | 2004 | Nov   | 1           | 19 (38)[9]      | 40 (70)[4]    | 7 (11)[1]    | 40 (55)   | 54 (92)    |             |               |              |                           |              |                              |              | 28 (180)     |            |            |
| EG            | 2005 | Feb   | 1           |                 | 18 (27)[2]    |              | 30 (31)   | 12 (13)    |             |               |              |                           |              |                              |              | 1 (1)        |            |            |
| EG            | 2005 | Mar   | 1           |                 | 29 (52)[6]    | 7 (46)[1]    | 104 (123) | 24 (44)    |             |               |              |                           |              |                              |              | 8 (8)        |            |            |
| EG            | 2005 | Apr   | 2           |                 | 55 (108)[7]   | 4 (11)       | 89 (104)  | 54 (96)    |             |               |              |                           |              |                              |              | 15 (15)      |            |            |
| EG            | 2005 | May   | 1           |                 | 51 (163)[7]   | 2 (14)       | 37 (45)   | 17 (22)    |             |               |              |                           |              |                              |              | 6 (6)        |            |            |
| EG            | 2005 | Jun   | 1           |                 | 16 (32)[1]    |              | 11 (12)   | 4 (7)      |             |               |              |                           |              |                              |              | 3 (3)        |            |            |
| EG            | 2005 | Jul   | 1           |                 | 39 (145)[4]   | 7 (22)       | 64 (71)   | 23 (28)    |             |               |              |                           |              |                              |              | 6 (6)        |            |            |
| EG            | 2005 | Aug   | 2           | 38 (50)[3]      | 54 (128)[3]   | 23 (55)      | 74 (79)   | 50 (77)    |             |               | 1 (1)        |                           |              |                              |              | 5 (5)        |            |            |
| EG            | 2005 | Sep   | 3           | 209 (342)[27]   | 138 (365)[10] | 34 (109)[4]  | 124 (147) | 148 (284)  |             |               |              |                           |              |                              |              | 8 (8)        |            |            |
| EG            | 2005 | Oct   | 1           | 79 (126)[14]    | 42 (107)[1]   | 4 (18)[3]    | 23 (28)   | 46 (69)    |             |               |              |                           |              |                              |              | 4 (4)        |            |            |
| NWC           | 2000 | Jun   | 4           | 25 (27)[1]      | 2 (2)         | 7 (14)       | 6 (14)    | 6 (15)     |             |               |              |                           |              |                              |              |              | 3 (5)      |            |
| NWC           | 2000 | Jul   | 4           | 156 (229)       | 3 (4)         | 22 (114)     | 13 (41)   | 7 (19)     |             |               | 1 (1)        | 1(15)                     |              | 3 (5)                        |              | 6 (9)        |            |            |
| NWC           | 2000 | Aug   | 3           | 356 (451)[2]    | 3 (4)         | 19 (112)     | 10 (30)   | 14 (21)    |             |               |              |                           |              | 3 (17)                       |              | 2 (2)        | 4 (4)      |            |
| NWC           | 2000 | Sep   | 2           | 111 (174)[2]    |               | 11 (65)      | 14 (39)   | 9 (10)     |             |               |              |                           |              | 2 (2)                        |              | 1 (1)        | 1 (1)      |            |

| Survey region | Year | Month | # transects | Humpback whales | Dugongs  | Dolphins    | Turtles  | Manta rays | Blue whales | Killer whales | Minke whales | Pilot/false killer whales | Sperm whales | Unidentified large megafauna | Whale sharks | Other sharks | Sea snakes | Other rays |
|---------------|------|-------|-------------|-----------------|----------|-------------|----------|------------|-------------|---------------|--------------|---------------------------|--------------|------------------------------|--------------|--------------|------------|------------|
| NWC           | 2000 | Oct   | 3           | 80 (103)[4]     | 1 (1)    | 8 (148)     | 5 (7)    | 1 (1)      |             |               |              |                           |              |                              |              |              | 2 (2)      |            |
| NWC           | 2000 | Nov   | 2           | 7 (7)           |          | 1 (1)       | 15 (19)  |            |             |               |              |                           |              | 1 (1)                        |              |              |            |            |
| NWC           | 2001 | Jun   | 4           | 18 (23)         | 6 (19)   | 29 (136)    | 48 (114) | 32 (120)   |             |               |              |                           |              | 9 (13)                       |              | 6 (6)        |            |            |
| NWC           | 2001 | Jul   | 4           | 74 (111)        | 1 (1)[1] | 2 (2)       | 13 (19)  | 7 (9)      |             |               |              |                           |              | 1 (2)                        |              |              |            |            |
| NWC           | 2001 | Aug   | 2           | 212 (358)[4]    |          | 8 (42)      | 8 (47)   | 7 (9)      |             |               |              |                           |              | 4 (6)                        |              |              |            |            |
| NWC           | 2001 | Sep   | 2           | 85 (119)[8]     |          | 2 (3)       | 3 (3)    | 4 (63)     |             |               |              |                           |              | 2 (3)                        |              |              |            |            |
| NWC           | 2001 | Oct   | 3           | 72 (109)[18]    | 2 (5)    | 11 (112)    | 14 (20)  | 11 (20)    |             |               |              |                           |              | 8 (19)                       |              |              |            |            |
| NWC           | 2001 | Nov   | 1           | 10 (14)         |          | 7 (147)     | 3 (3)    | 2 (3)      |             |               |              |                           |              | 7 (14)                       |              |              |            |            |
| NWC           | 2006 | Jun   | 3           | 22 (30)         | 4 (9)[1] | 6 (32)[1]   | 54 (92)  | 15 (30)    |             |               | 4 (4)        |                           |              |                              | 2 (2)        |              |            |            |
| NWC           | 2006 | Jul   | 3           | 88 (113)[2]     | 5 (6)[1] | 7 (31)      | 77 (207) | 31 (85)    |             |               |              |                           |              |                              |              | 5 (5)        |            |            |
| NWC           | 2006 | Aug   | 3           | 214 (323)       | 2 (5)[1] | 11 (156)    | 73 (92)  | 26 (37)    |             | 1 (10)        | 1 (1)        |                           |              | 1 (1)                        |              |              |            | 1 (2)      |
| NWC           | 2006 | Sep   | 3           | 87 (139)[15]    |          | 28 (231)[1] | 95 (172) | 12 (34)    | 4 (5)       |               | 7 (10)       |                           |              | 2 (7)                        | 1 (1)        | 18 (18)      |            |            |
| NWC           | 2006 | Oct   | 3           | 22 (33)[1]      |          | 6 (120)     | 35 (67)  | 25 (52)    | 1 (3)       |               | 1 (3)        |                           |              | 2 (9)                        |              | 1 (1)        |            |            |
| NWC           | 2007 | Jun   | 1           | 4 (4)           | 2 (2)[1] |             | 5 (5)    | 6 (13)     | 1 (1)       |               |              |                           |              |                              |              |              |            |            |
| NWC           | 2007 | Jul   | 4           | 144 (239)[5]    | 1 (1)    | 10 (299)    | 66 (225) | 36 (16)    | 1 (1)       |               |              |                           |              | 5 (5)                        |              | 11 (11)      |            |            |
| NWC           | 2007 | Aug   | 3           | 213 (337)[9]    |          | 10 (95)     | 21 (24)  | 31 (109)   |             |               |              |                           |              | 2 (7)                        |              | 4 (4)        |            |            |
| NWC           | 2007 | Sep   | 2           | 80 (112)[6]     |          | 6 (76)      | 4 (4)    | 3 (3)      |             |               |              |                           |              |                              |              | 1 (1)        |            |            |
| NWC           | 2007 | Oct   | 3           | 69 (111)[12]    |          | 20 (350)    | 58 (84)  | 4 (4)      |             |               |              |                           |              | 5 (14)                       |              | 1 (1)        |            |            |
| NWC           | 2008 | Jun   | 2           | 8 (10)          |          |             | 2 (2)    | 2 (2)      |             |               |              |                           |              | 3 (9)                        |              |              |            |            |
| NWC           | 2008 | Jul   | 5           | 275 (396)[1]    | 7 (10)   | 12 (121)    | 27 (32)  | 16 (17)    |             |               |              |                           |              | 4 (9)                        |              | 23 (23)      | 3 (3)      |            |

| Survey region | Year | Month | # transects | Humpback whales | Dugongs    | Dolphins    | Turtles   | Manta rays | Blue whales | Killer whales | Minke whales | Pilot/false killer whales | Sperm whales | Unidentified large megafauna | Whale sharks | Other sharks | Sea snakes | Other rays |
|---------------|------|-------|-------------|-----------------|------------|-------------|-----------|------------|-------------|---------------|--------------|---------------------------|--------------|------------------------------|--------------|--------------|------------|------------|
| NWC           | 2008 | Aug   | 6           | 444 (653)[24]   | 2 (5)      | 9 (36)      | 31 (53)   | 30 (47)    |             |               |              |                           |              | 4 (4)                        |              | 8 (9)        | 3 (3)      |            |
| NWC           | 2009 | Jul   | 3           | 108 (38)        |            | 4 (19)[1]   | 8 (8)     | 8 (11)     |             |               |              |                           |              | 4 (4)                        |              |              |            |            |
| NWC           | 2009 | Aug   | 3           | 300 (424)[16]   | 2 (4)      | 7 (113)     | 49 (89)   | 18 (24)    |             |               |              |                           |              | 4 (43)                       |              |              |            |            |
| NWC           | 2009 | Sep   | 3           | 221 (395)[36]   |            | 8 (34)      | 15 (15)   | 12 (18)    |             |               |              |                           |              | 1 (1)                        |              |              |            |            |
| NWC           | 2009 | Oct   | 3           | 151 (260)[52]   |            | 12 (60)     | 57 (91)   | 15 (20)    |             |               |              |                           |              | 2 (2)                        |              |              |            |            |
| NWC           | 2009 | Nov   | 3           | 43 (70)[17]     |            | 6 (179)     | 13 (19)   | 11 (17)    |             | 1 (6)         |              |                           |              | 3 (7)                        |              |              |            |            |
| NWC           | 2010 | Jul   | 6           | 331 (509)[1]    | 26 (34)[1] | 32 (181)[1] | 151 (297) | 35 (73)    |             |               |              |                           |              | 4 (4)                        |              |              |            |            |
| NWC           | 2010 | Aug   | 5           | 591 (892)[16]   | 9 (14)     | 13 (118)[1] | 70 (182)  | 13 (18)    |             |               |              |                           |              | 10 (72)                      |              |              |            |            |



Supplementary material 3



**Fig. S3.** The spatial coverage of humpback whales ( $n = 7,413$  unfiltered) across north-west Australia between June-November, from aerial survey flown between 2000 and 2010 (excluding 2002-03). Open circles represent humpback whale group sightings, and magenta dots indicate the occurrence of a mother-calf pair. Note that these sightings are the total

sightings and are not accounted for survey effort, *e.g.*, there are more sightings off the North West Cape where there was higher survey effort. Sightings are overlaid on bathymetric depth data and averaged sea surface temperature imagery (2000-2010). Bathymetry data was obtained from Geoscience Australia and included the 2009 bathymetric grid of Australia at a resolution of 250 m (<http://www.ga.gov.au>). Mean sea surface temperature data was obtained for each month between 2000-2010 from the Integrative Marine Observing System (IMOS; <http://imos.org.au/>) portal at a resolution of 2 km.

## References

- Allen S and Bejder L (2003) Southern right whale *Eubalaena australis* sightings on the Australian coast and the increasing potential for entanglement. *Pacific conservation biology* **9**, 228-233. doi: <https://doi.org/10.1071/PC030228>.
- Armstrong AJ, Armstrong AO, Bennett MB, McGregor F, Abrantes KG, Barnett A, Richardson AJ, Townsend KA, and Dudgeon CL (2020) The geographic distribution of reef and oceanic manta rays (*Mobula alfredi* and *Mobula birostris*) in Australian coastal waters. *Journal of Fish Biology* **96**, 835-840. doi: <https://doi.org/10.1111/jfb.14256>.
- Cerchio S, Yamada TK, and Brownell Jr RL (2019) Global distribution of Omura's whales (*Balaenoptera omurai*) and assessment of range-wide threats. *Frontiers in Marine Science* **6**, 67. doi: <https://doi.org/10.3389/fmars.2019.00067>.
- Chittleborough R (1953) Aerial observations on the humpback whale, *Megaptera nodosa* (Bonnaterre), with notes on other species. *Marine and Freshwater Research* **4**, 219-226. doi: <https://doi.org/10.1071/MF9530219>.
- Cleguer C, Kelly N, Tyne J, Wieser M, Peel D, and Hodgson A (2021) A novel method for using small unoccupied aerial vehicles to survey wildlife species and model their density distribution. *Frontiers in Marine Science* **8**, 462. doi: <https://doi.org/10.3389/fmars.2021.640338>.
- Fossette S, Ferreira LC, Whiting SD, King J, Pendoley K, Shimada T, Speirs M, Tucker AD, Wilson P, and Thums M (2021a) Movements and distribution of hawksbill turtles in the Eastern Indian Ocean. *Global Ecology Conservation* **29**, e01713. doi: <https://doi.org/10.1016/j.gecco.2021.e01713>.
- Fossette S, Loewenthal G, Peel LR, Vitenbergs A, Hamel MA, Douglas C, Tucker AD, Mayer F, and Whiting SD (2021b) Using aerial photogrammetry to assess stock-wide marine turtle nesting distribution, abundance and cumulative exposure to industrial activity. *Remote Sensing* **13**, 1116. doi: <https://doi.org/10.3390/rs13061116>.
- Hanf D, Hodgson AJ, Kobryn H, Bejder L, and Smith JN (2022) Dolphin distribution and habitat suitability in North Western Australia: applications and implications of a broad-scale, non-targeted dataset. *Frontiers in Marine Science* **8**. doi: <https://doi.org/10.3389/fmars.2021.733841>.
- Hodgson A (2007) The distribution, abundance and conservation of dugongs and other marine megafauna in Shark Bay Marine Park, Ningaloo Reef Marine Park and Exmouth Gulf. *Report to the Western Australia Department of Environment and Conservation* 34.
- Irvine L and Salgado Kent C (2019) The distribution and relative abundance of marine mega-fauna, with a focus on humpback whales (*Megaptera novaeangliae*), in Exmouth Gulf, Western Australia, 2018. Subsea 7, Attachment 2J Humpback Whale Aerial Survey Report. (Exmouth, Western Australia). 25
- Pendoley KL, Whittock PA, Vitenbergs A, and Bell C (2016) Twenty years of turtle tracks: marine turtle nesting activity at remote locations in the Pilbara, Western Australia. *Australian Journal of Zoology* **64**, 217. doi: <https://doi.org/10.1071/ZO16021>.
- Preen AR, Marsh H, Lawler IR, Prince RIT, and Shepherd R (1997) Distribution and abundance of dugongs, turtles, dolphins and other megafauna in Shark Bay, Ningaloo Reef and Exmouth

- Gulf, Western Australia. *Wildlife Research* **24**, 185-208. doi: <https://doi.org/10.1071/WR95078>.
- Raudino H, Rob D, Barnes P, Mau R, Wilson E, Gardner S, and Waples K (2016) Whale shark behavioural responses to tourism interactions in Ningaloo Marine Park and implications for future management. *Conservation Science Western Australia* **10**, 1-7.
- Raudino HC, Bouchet PJ, Douglas C, Douglas R, and Waples K (2023) Aerial abundance estimates for two sympatric dolphin species at a regional scale using distance sampling and density surface modeling. *Frontiers in Ecology and Evolution* **10**, 1331. doi: <https://doi.org/10.3389/fevo.2022.1086686>.
- Sprogis KR, Bejder L, Hanf D, and Christiansen F (2020) Behavioural responses of migrating humpback whales to swim-with-whale activities in the Ningaloo Marine Park, Western Australia. *Journal of Experimental Marine Biology and Ecology* **522**, 151254. doi: <https://doi.org/10.1016/j.jembe.2019.151254>.
- Sprogis KR and Parra GJ (2022) Coastal dolphins and marine megafauna in Exmouth Gulf, Western Australia: informing conservation management actions in an area under increasing human pressure. *Wildlife Research* **50**, 435-450. doi: <https://doi.org/10.1071/WR22023>.
- Wilson SG, Taylor JG, and Pearce AF (2001) The seasonal aggregation of whale sharks at Ningaloo Reef, Western Australia: currents, migrations and the El Niño/Southern oscillation. *Environmental Biology of Fishes* **61**, 1-11. doi: <https://doi.org/10.1023/a:1011069914753>.