

SUPPLEMENTARY MATERIALS

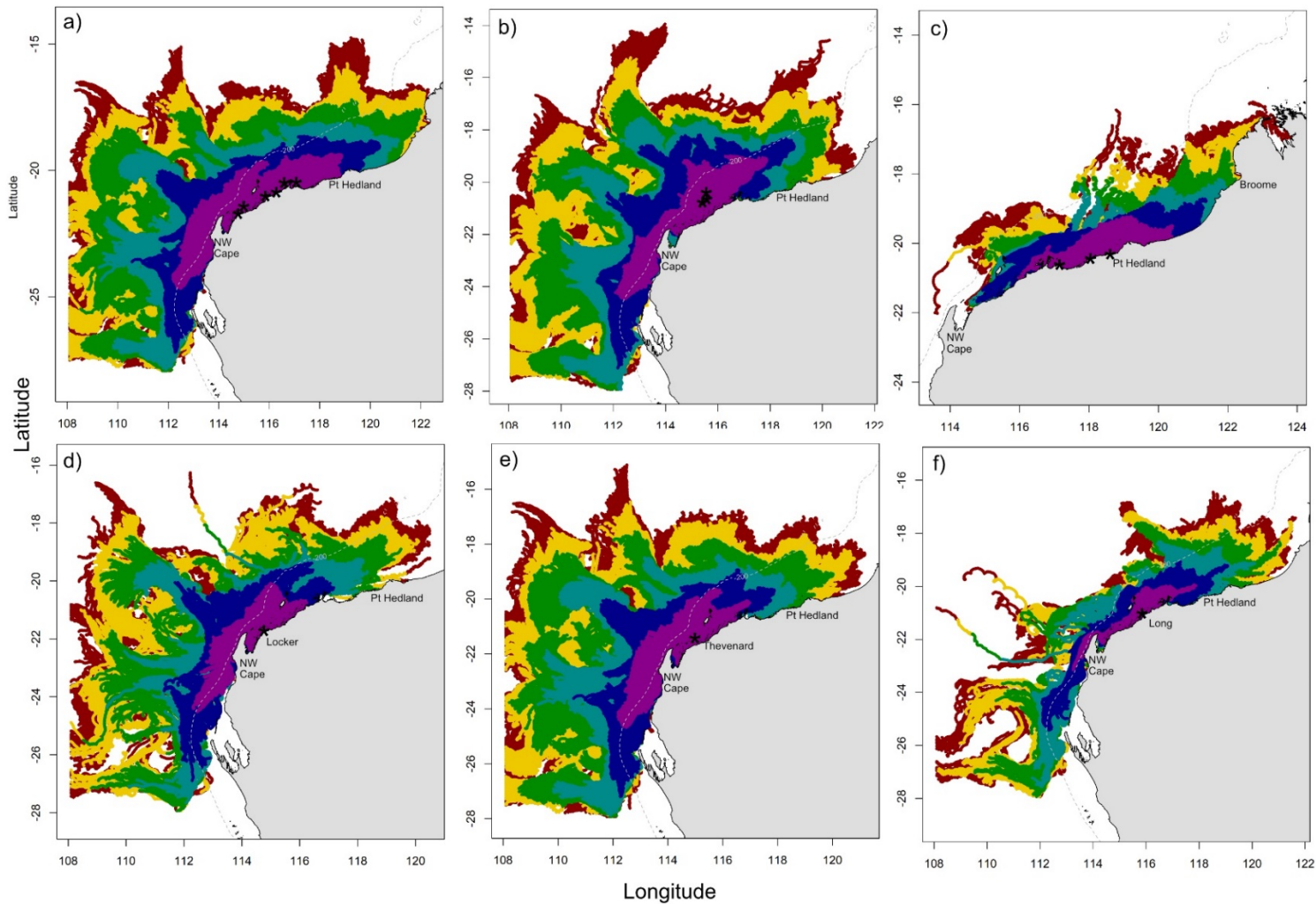


Figure S1. The distribution of virtual hatchlings released into the model domain in January and February, 2007-2009 during Days 1 to 5 (purple), Days 6 to 10 (dark blue), Days 11 to 15 (light blue), Days 16 to 20 (green), Days 21 to 25 (yellow) and Days 26 to 30 (red) for (a) all coastal island sites, (b) all offshore sites, (c) mainland rookeries, (d) Locker Island, (e) Thevenard Island and (f) Long Island. The release locations are shown as black asterisks.

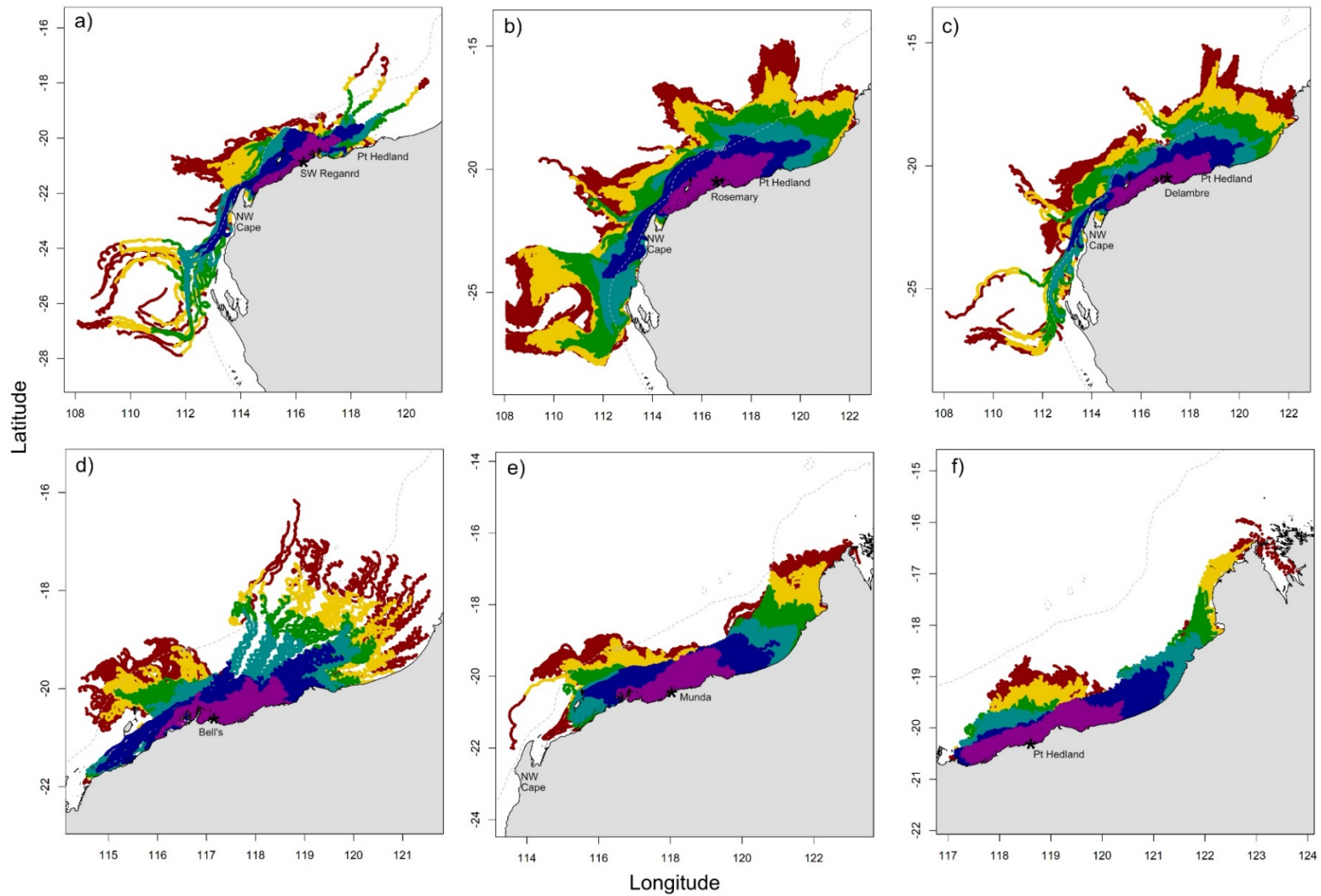


Figure S2. The distribution of virtual hatchlings released into the model domain in January and February, 2007-2009 during Days 1 to 5 (purple), Days 6 to 10 (dark blue), Days 11 to 15 (light blue), Days 16 to 20 (green), Days 21 to 25 (yellow) and Days 26 to 30 (red) for (a) South West Regnard, (b) Rosemary Island, (c) Delambre Island, (d) Bells Beach, (e) Mundabullangana and (f) Port Hedland. The release locations are shown as black asterisks.

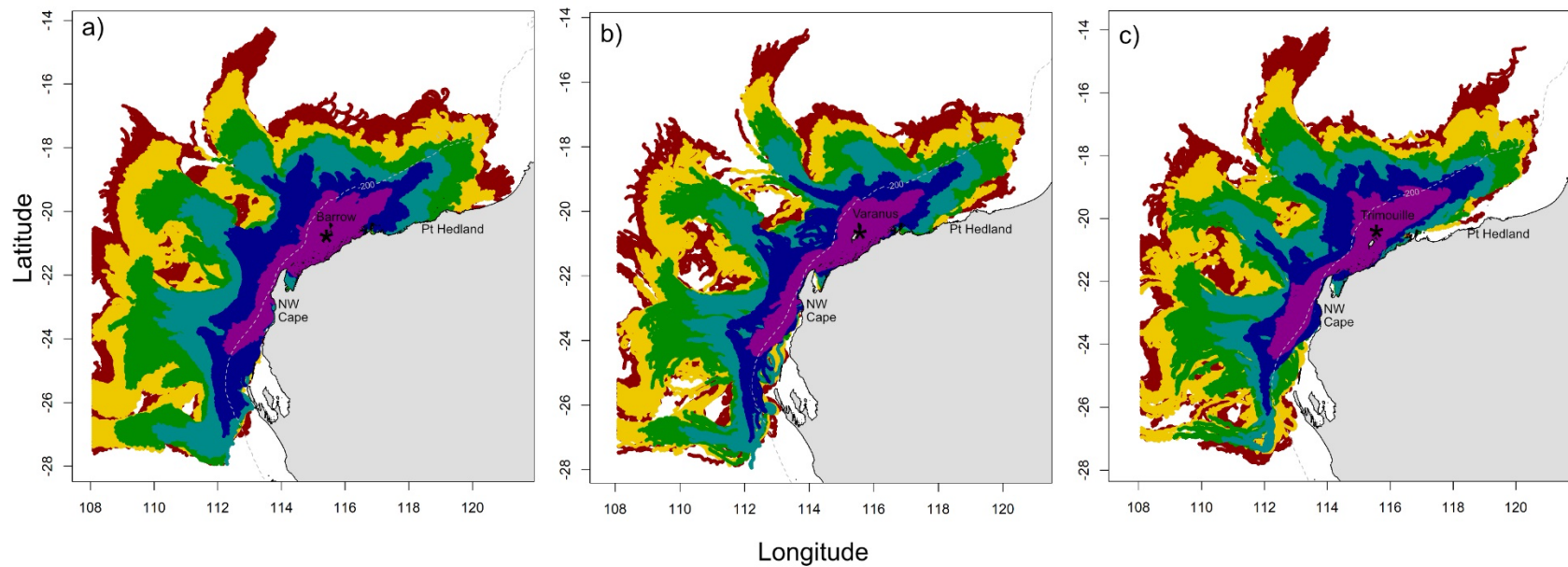


Figure S3. The distribution of virtual hatchlings released into the model domain in January and February, 2007-2009 during Days 1 to 5 (purple), Days 6 to 10 (dark blue), Days 11 to 15 (light blue), Days 16 to 20 (green), Days 21 to 25 (yellow) and Days 26 to 30 (red) for (a) Barrow Island, (b) Varanus Island and (c) Trimouille Island. The release locations are shown as black asterisks.

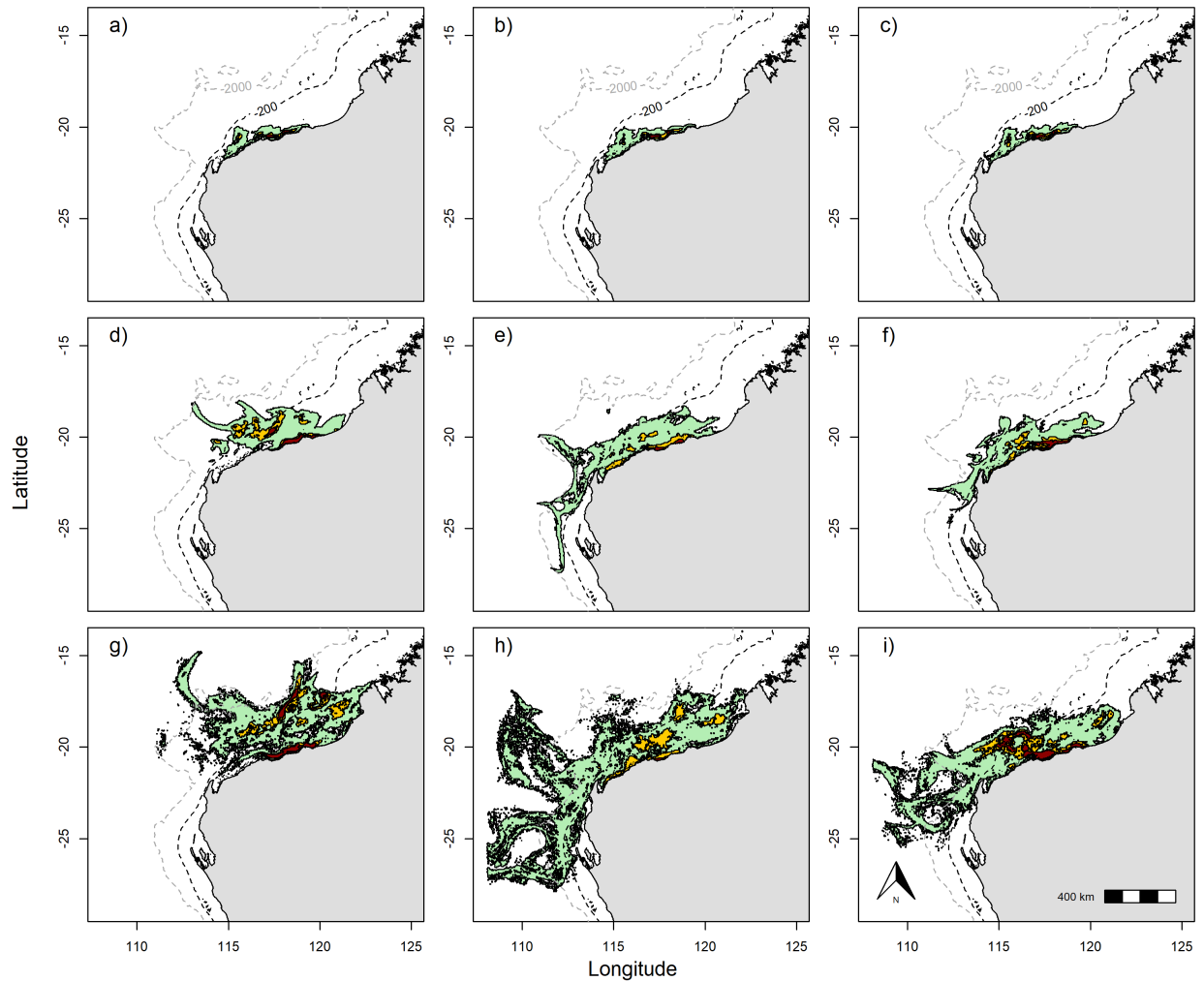


Figure S4. Distribution of virtual flatback turtles during their first 4 days (top panels), Days 10 to 15 (middle panels) and Days 25 to 30 (bottom panels) after entering the sea in 2007 (a, d, g), 2008 (b, e, h) and 2009 (c, f, i) calculated by summing the number of particles per 4×4 km grid cell. Red: 25% cumulative frequency distribution, yellow: 50% and green: 95%. Dashed lines are depth contours, black: 200 m, grey: 2000 m.

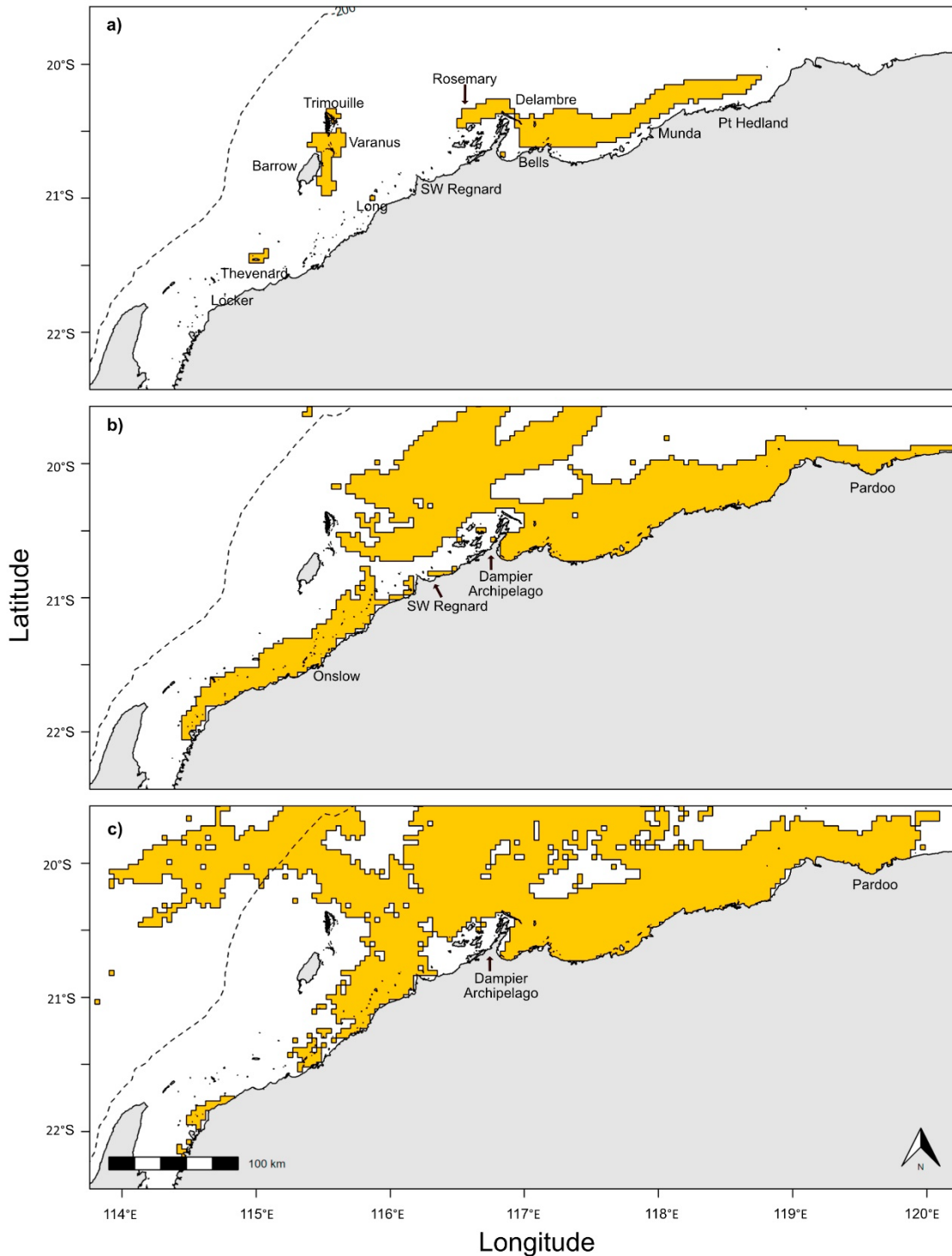


Figure S5. The core hatchling area (50% distribution) of virtual flatback turtles during (a) their first 4 days, (b) Days 10 to 15 and (c) Days 25 to 30 after entering the sea, calculated by summing the number of particles per 4×4 km grid cell. Dashed line is the 200 m depth contour. Panels ‘b’ and ‘c’ are zoomed to highlight core areas as they relate to the area shown in Panel ‘a’.

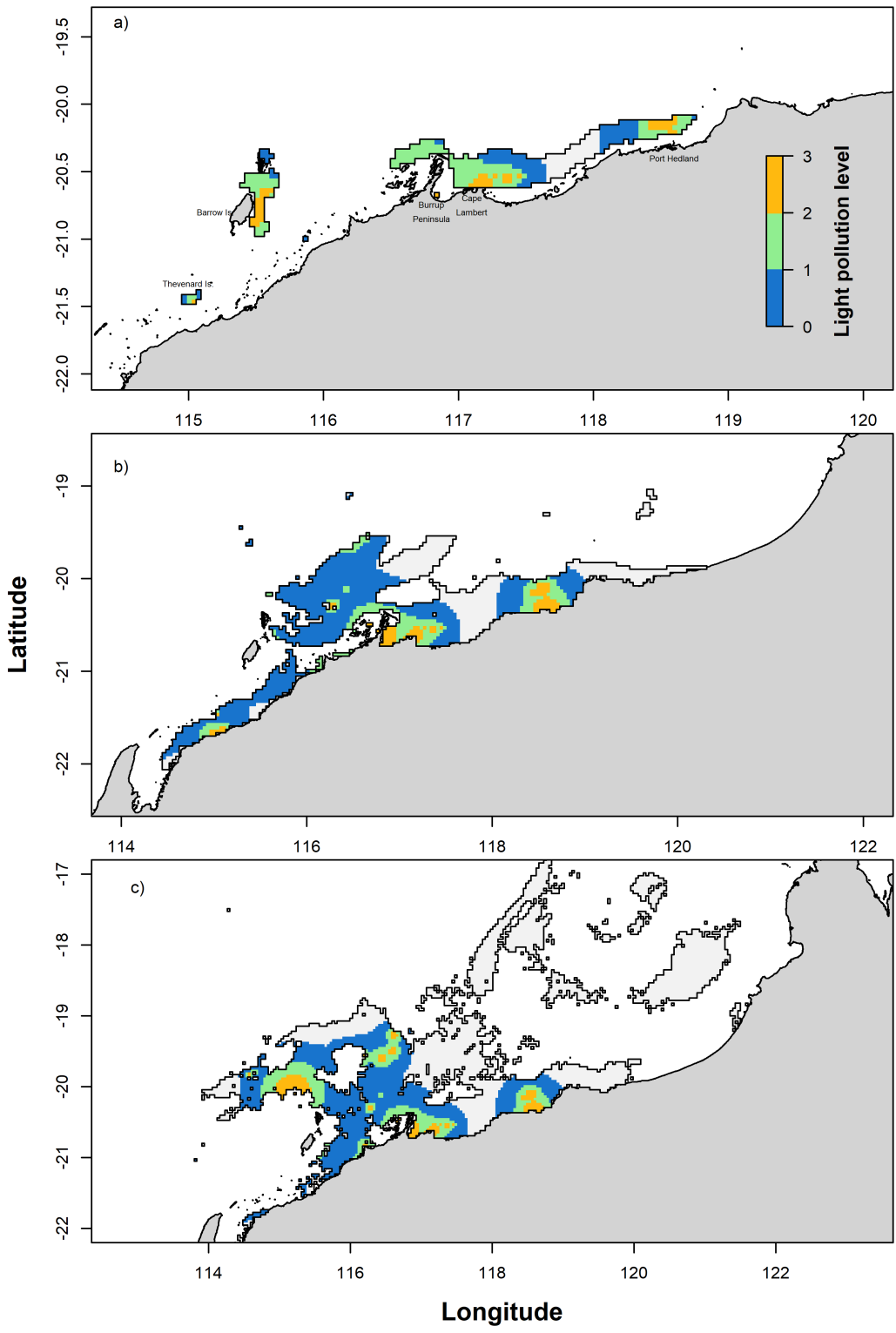


Figure S6. Overlap between the core areas (50% cumulative frequency distribution) during (a) the first four days at sea, (b) Days 10–15 and (c) Days 25–30 and artificial light pollution (orange: >87 mcd/m², green: 14–87 mcd/m², blue: 1.7–14 mcd/m²).

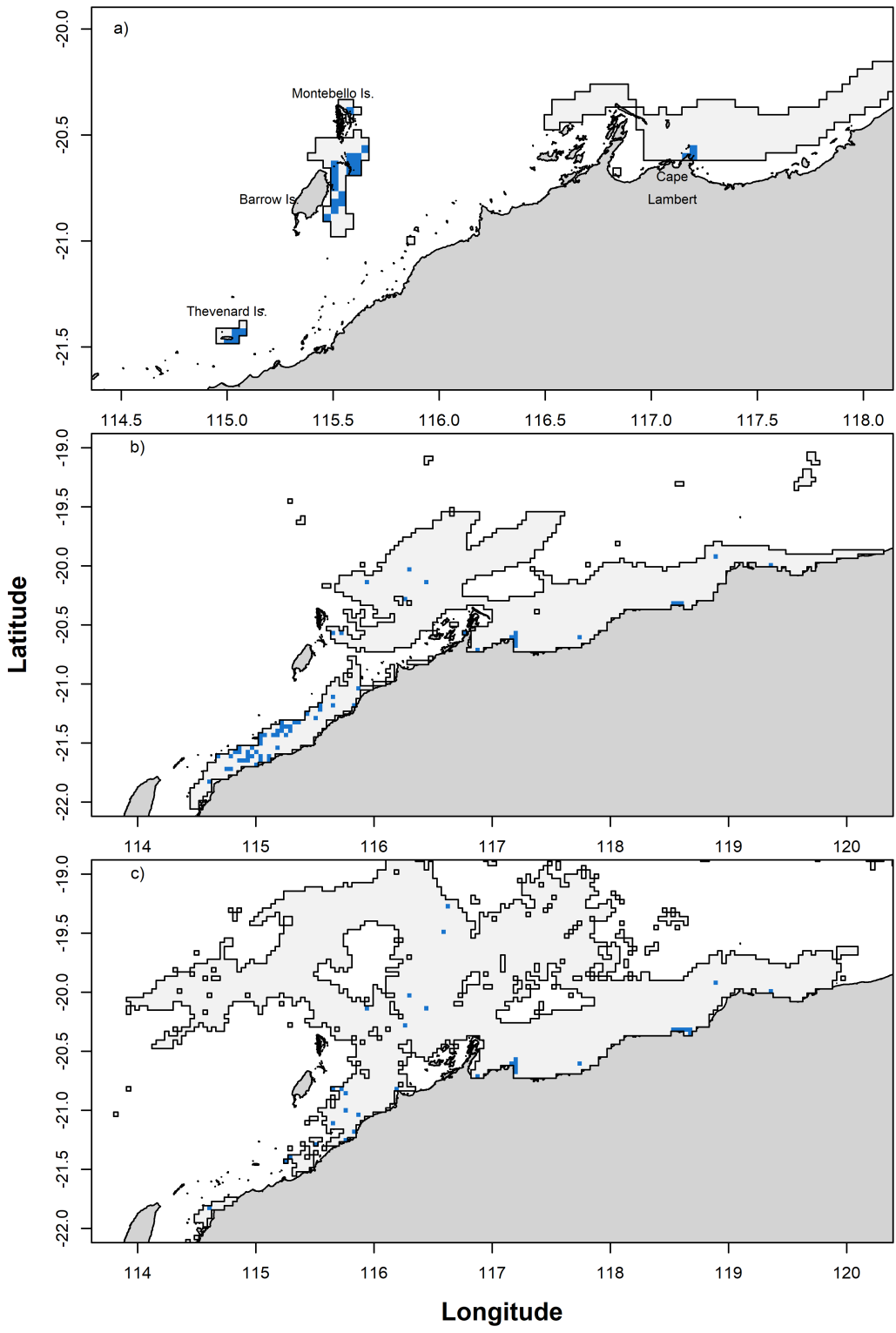


Figure S7. Grid cells (4 x 4 km) containing artificial structures (blue squares: oil and gas platforms, wells, shipwrecks, coastal infrastructure) within core areas defined for (a) the first 4 days at sea, (b) Days 10 to 15 and (c) Days 25 to 30.

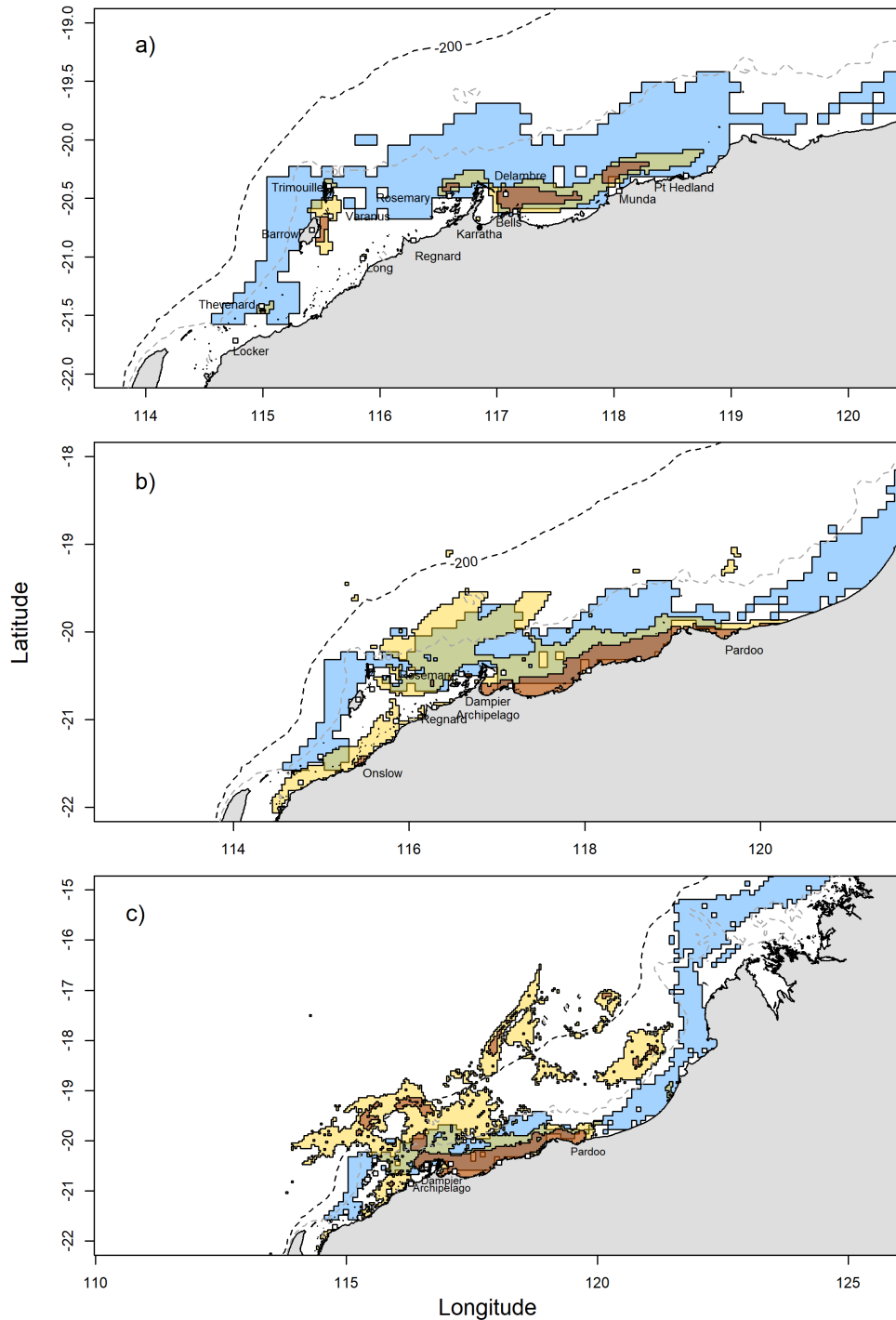


Figure S8. Overlap between important areas for foraging flatback turtles (blue shaded areas: 75% distribution based on number of turtles) from the NW Stock obtained from L. R. Peel et al. unpubl. and high use and core hatchling areas (orange: 25% distribution, yellow: 50% distribution) predicted from the hatchling dispersal model during (a) Days 1 to 4, (b) Days 10 to 15 and (c) Days 25 to 30. The 50 and 200 m depth contour are shown as grey and black dashed lines, respectively.

Table S1. Summary of field records of post-hatchling flatback turtles (*Natator depressus*). DBCA: Western Australian Department of Biodiversity, Conservation and Attractions, Pendoley Env: Pendoley Environmental.

Region	Location	Date	CCL (cm)	Lat	Lon	Source	Ref
Kimberley	Broome Fish Kill	21/03/2016	8.5	-17.731	122.201	Stranding	(Young et al., 2020)
Kimberley	Broome Fish Kill	24/03/2016	9	-17.993	122.201	Stranding	(Young et al., 2020)
Kimberley	Roebuck Bay	18/02/2020	9.7	-18.032	122.335	Foraging	DBCA
Pilbara	East Island	21/10/2014	10	-21.274	115.598	Sea eagle nest	DBCA
Pilbara	Bessieres	17/11/2015	10	-21.528	114.763	Sea eagle nest	DBCA
Pilbara	South Passage	18/11/2014	10	-21.143	115.731	Stranding	DBCA
Kimberley	Broome Fish Kill	04/03/2016	10.4	-17.731	122.201	Stranding	(Young et al., 2020)
Kimberley	Broome Fish Kill	24/03/2016	10.5	-17.993	122.201	Stranding	(Young et al., 2020)
Pilbara	Barrow	01/12/2015	11	-20.791	115.456	Foraging	Pendoley Env
Kimberley	Broome Fish Kill	24/03/2016	11.1	-17.993	122.201	Stranding	(Young et al., 2020)
Kimberley	Broome Fish Kill	24/03/2016	11.2	-17.993	122.201	Stranding	(Young et al., 2020)
Kimberley	Broome Fish Kill	21/03/2016	12	-17.667	122.192	Stranding	(Young et al., 2020)
Pilbara	Rosily Island	01/12/2015	12.5	-21.264	115.024	Fish gut	C.Thomas pers. comm
Kimberley	Broome Fish Kill	21/03/2016	12.9	-17.993	122.201	Stranding	(Young et al., 2020)
Kimberley	Broome Fish Kill	24/03/2016	13	-17.667	122.192	Stranding	(Young et al., 2020)
Pilbara	East Island	21/10/2014	14	-21.274	115.598	Sea eagle nest	DBCA
Pilbara	East Island	21/10/2014	14	-21.274	115.598	Sea eagle nest	DBCA
Kimberley	Broome Fish Kill	24/03/2016	14.1	-17.993	122.201	Stranding	(Young et al., 2020)

Table S2. The percentage of the total number of virtual hatchlings released from each nesting site that were present in areas with the maximum threat score of 4 (red grid cells in Figure 4, labelled A1-L) during each dispersal period (Days 1 to 4, Days 10 to 15 and Days 25 to 30). The table is shaded by the percentage contribution (warmer colours represent greater contributions of nesting site to areas where threat score = 4) and this was calculated by summing the total number of virtual hatchlings from each nesting site that were present in an area with 4 threats and dividing it by the total number of individual virtual hatchlings released from that site. The letter uniquely identifies the location with a threat score of 4 and the number identifies the period (1 = Days 1 to 4, 2 = Days 10 to 15, 3 = Days 25 to 30) for areas identified as having a threat score of 4 across 1 or more dispersal phases.

Nesting site	Group	Day 1 to 4 (Frenzy)			Day 10 to 15							Day 25 to 30						
		A1	B	C1	D	A2	E2	F	G	C2	H2	I	J	C3	H3	E3	K	L
Delambre SW	Coastal Is.	0.03	0.00	19.51	0.55	0.59	0.22	0.19	5.16	7.69	4.32	0.23	0.39	5.13	0.98	0.14	0.09	0.03
Regnard	Coastal Is.	1.37			7.91	4.62	0.44			0.44					0.37			
Locker	Coastal Is.	8.51	0.04		1.91	0.11	0.86								0.37			0.19
Long	Coastal Is.	0.52	0.01		0.52	0.69	1.78	0.12		0.23	0.12	0.19	0.19	0.09	0.19	0.66	0.28	0.09
Rosemary	Coastal Is.	0.00		0.84	1.99	0.49	0.46	0.03	0.34	1.71	1.09	0.24	0.01	0.42	0.35	0.23	0.30	0.09
Thevenard	Coastal Is.	33.47	1.63		1.90	0.57	0.74	0.01		0.02		0.12			0.16	0.28	0.23	
Bells	Mainland			89.51	0.31	0.10		0.10	12.46	16.28	3.10		1.31	4.31	0.37	0.75	0.56	0.19
Munda Port	Mainland			0.60			0.07	0.18	0.84	7.95	5.78	0.11	0.16	5.28	1.82	0.16	0.60	0.75
Hedland	Mainland									0.16	3.12			2.43	1.03			
Barrow	Offshore Is.	0.17	99.64		0.62	0.97	0.45					0.04	0.02	0.09		0.19	0.30	0.29
Trimouille	Offshore Is.	0.19	4.20		1.33	0.52	0.37					0.06					0.31	0.37
Varanus	Offshore Is.	0.09	100.00		0.21	0.70	0.77					0.09			0.09	0.47	0.19	