

SUPPLEMENTARY MATERIAL

Table S1. Summary of satellite tag deployments on reef manta rays (*Mobula alfredi*) in New Caledonia.

Manta ID	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19
Individual information:																			
Sex	Male	Female	Female	Male	Female	Female	Male	Female	Female	Male	Female	Female	Male	Female	Female	Male	Male	Male	Female
PTT	167754	167755	151348	151349	163079	167757	140916	196191	196192	196193	196194	162379	162380	167758	174667	182146	196864	196865	196866
Tracking information:																			
Tag Date	31/01/17	30/01/17	31/01/17	31/01/17	31/01/17	2/02/17	3/12/15	17/02/20	17/02/20	18/02/20	18/02/20	28/11/18	28/11/18	15/02/20	15/02/20	14/02/20	14/02/20	15/02/20	14/02/20
Duration (days)	110	54	49	50	136	174	80	22	30	131	50	3	5	54	181	105	67	88	68
Site	BC, Noumea		DC, Noumea				PS, Ouvea		PN, Ouvea				Touho						
Deployment location:																			
Latitude	-22.495	-22.495	-22.363	-22.363	-22.363	-22.363	-20.708	-20.446	-20.446	-20.446	-20.446	Undisclosed							
Longitude	166.441	166.441	166.256	166.256	166.256	166.256	166.388	166.453	166.453	166.453	166.453								
Decoded (%)	42	86	64	100	65	100	79	87	83	45	79	83	85	89	100	73	81	75	85

\* indicates tags that were retrieved after release. BC, Boulari Channel. DC, Dumbea Channel. NP, Northern Pleiades. SP, Southern Pleiades. PTT, Platform Transmitting Terminal.

Table S2. Kolmogorov-Smirnov (K-S) test statistics of differences in distributions of frequencies of distance from sites records of reef manta rays (*Mobula alfredi*) (N = 16) in New Caledonia. P-values are above the diagonals and D statistics are below the diagonals.

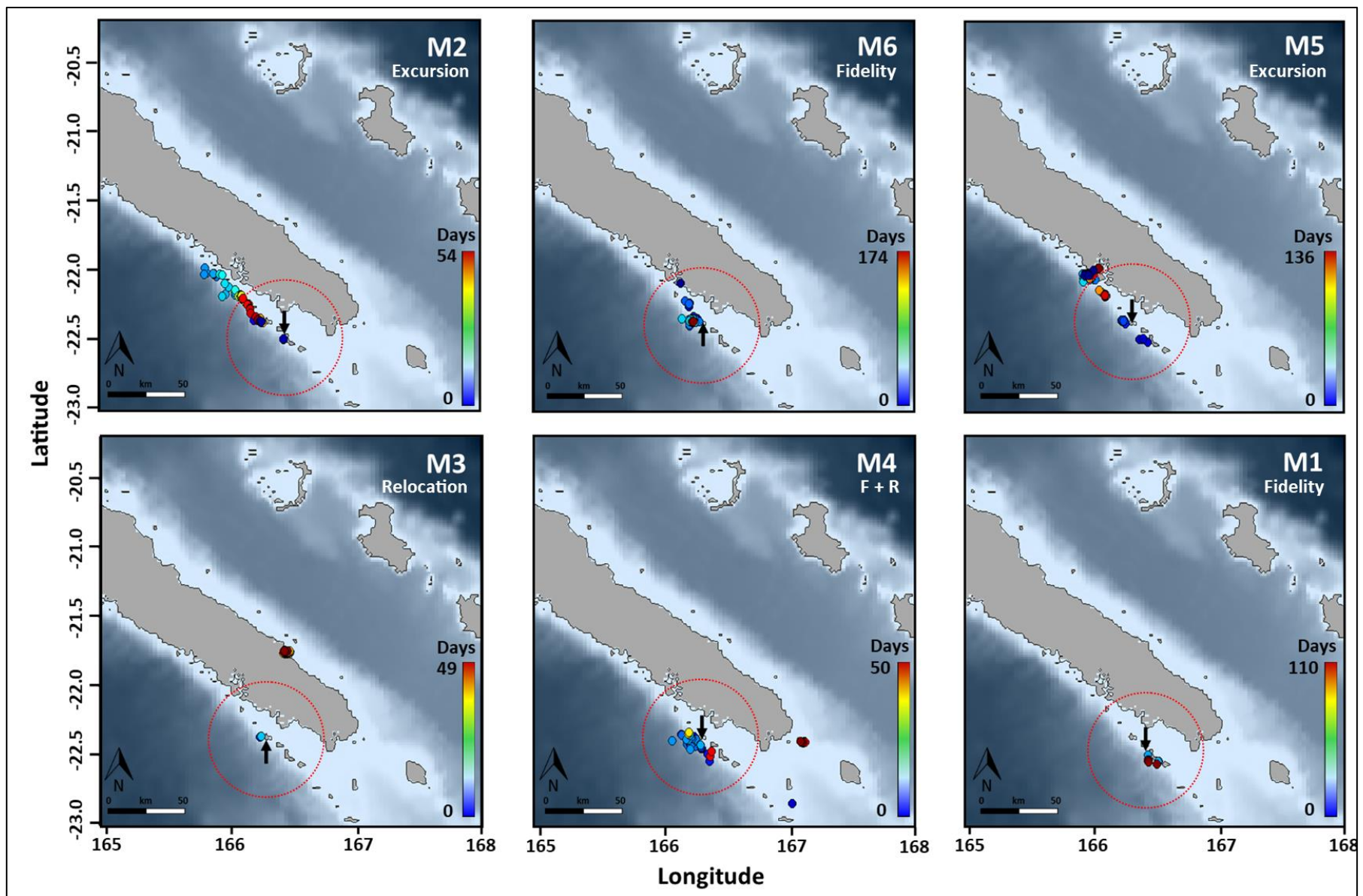
Sites	Noumea	Ouvea	Touho
Noumea		0	0.004
Ouvea	0.714		0
Touho	0.524	0.714	

Sex	Male	Female
Male		0
Female	0.667	

Table S3. Chi-Square test statistics of differences number of individuals per movement patterns of reef manta rays (N = 16) in New Caledonia.

Variables	Stat	Movement Patterns			
		Fidelity	Excursion	Fidelity + Relocation	Relocation
Sex	t	1.17	0.08	4.75	1.78
	P	0.28	0.78	0.03	0.18
Sites	t	0.36	0.95	1.5	4
	P	0.84	0.95	0.47	0.14



**Figure S1.** Horizontal movements of reef manta rays (*Mobula alfredi*) recorded using pop-up satellite tags (SPLASH10) in New Caledonia. Arrows indicates location of tag deployment. Red circle represents the home range area. *F + R* indicates the *Fidelity + Relocation* movement pattern.

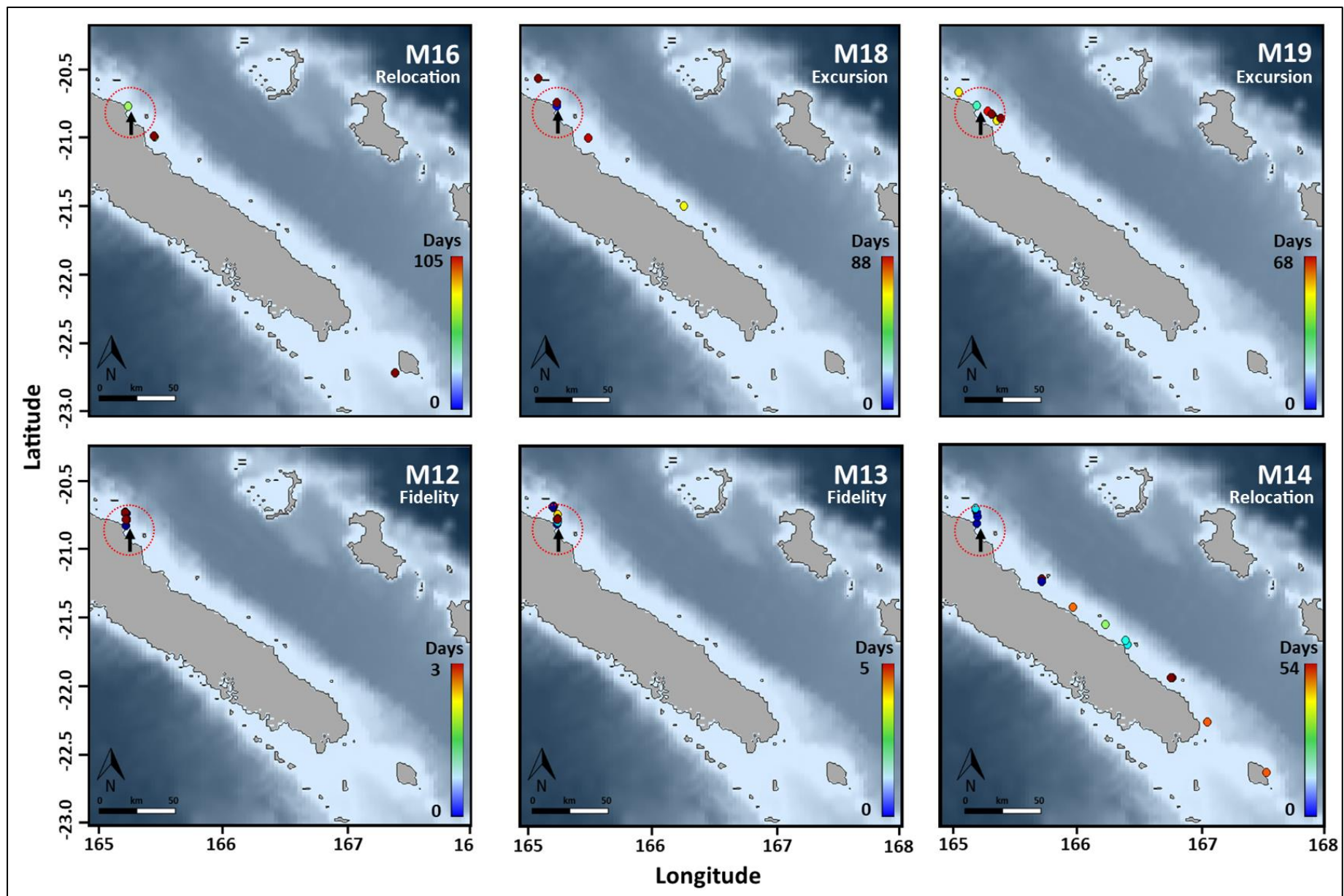


Figure S1 (continued).

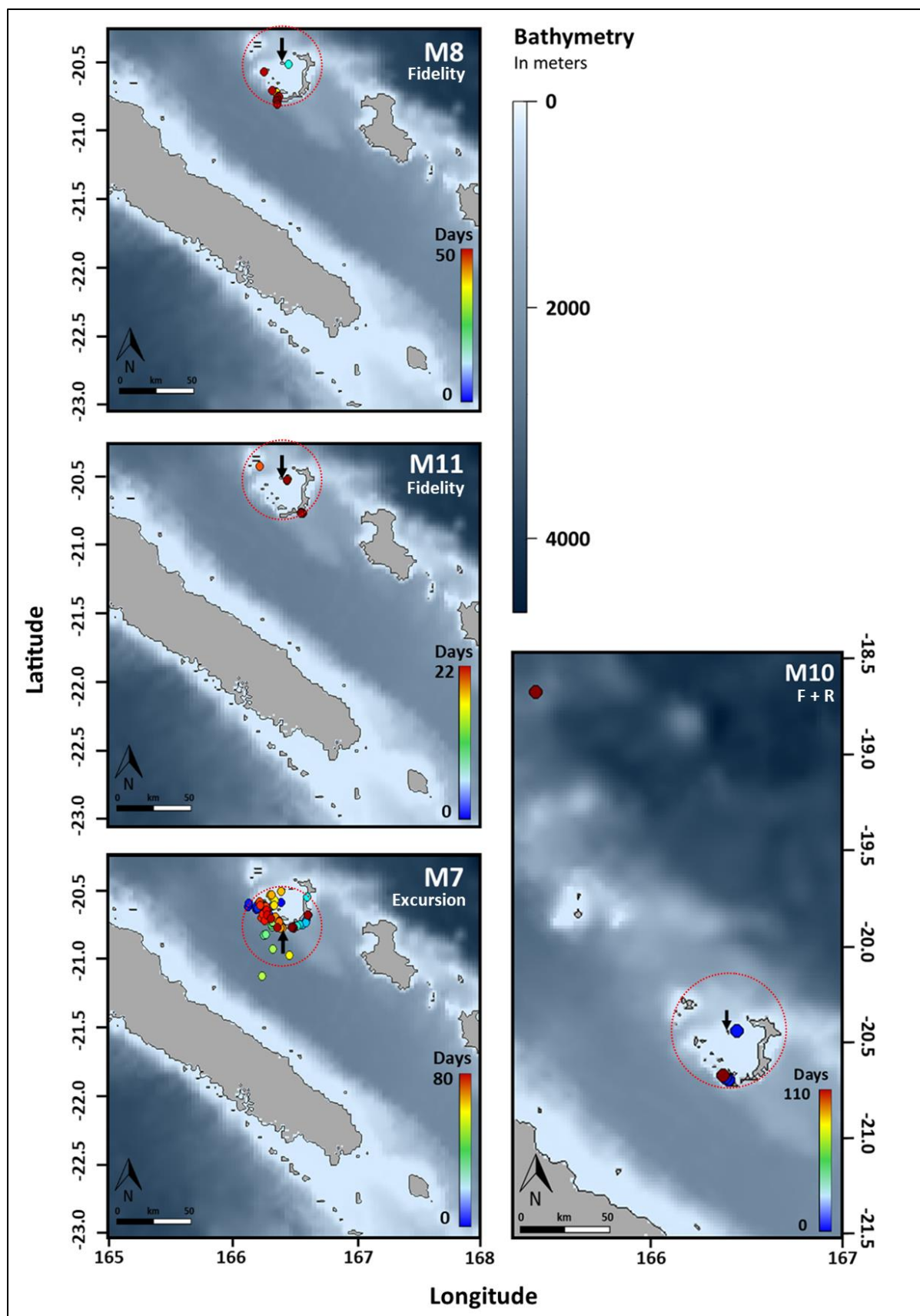
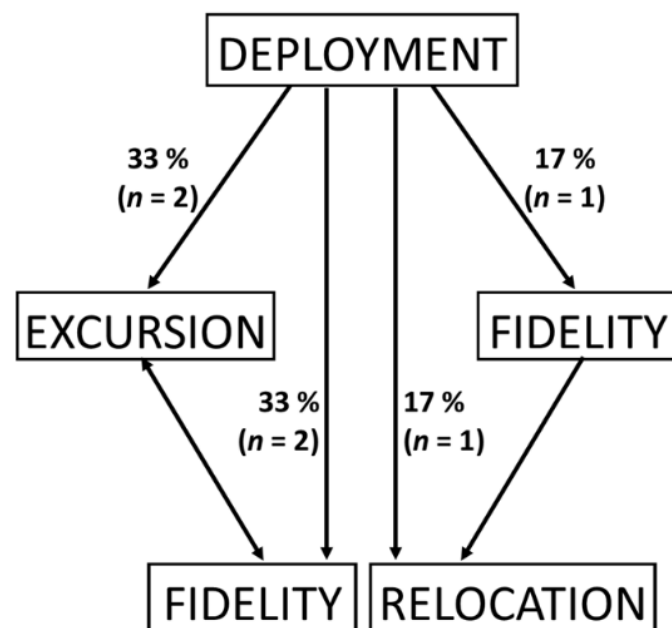
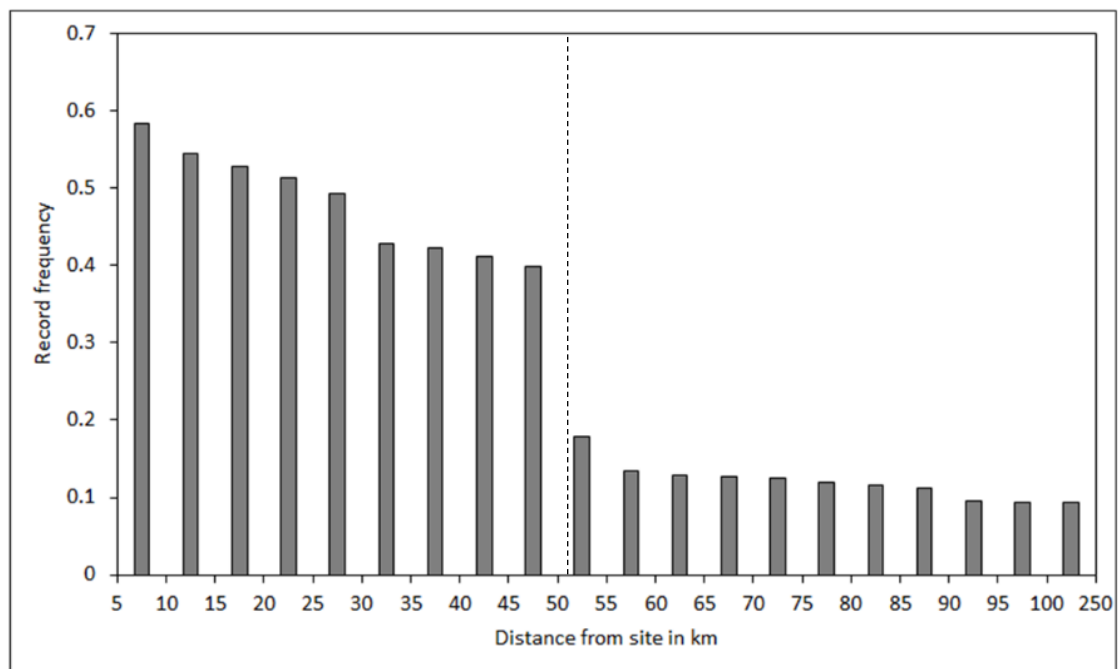
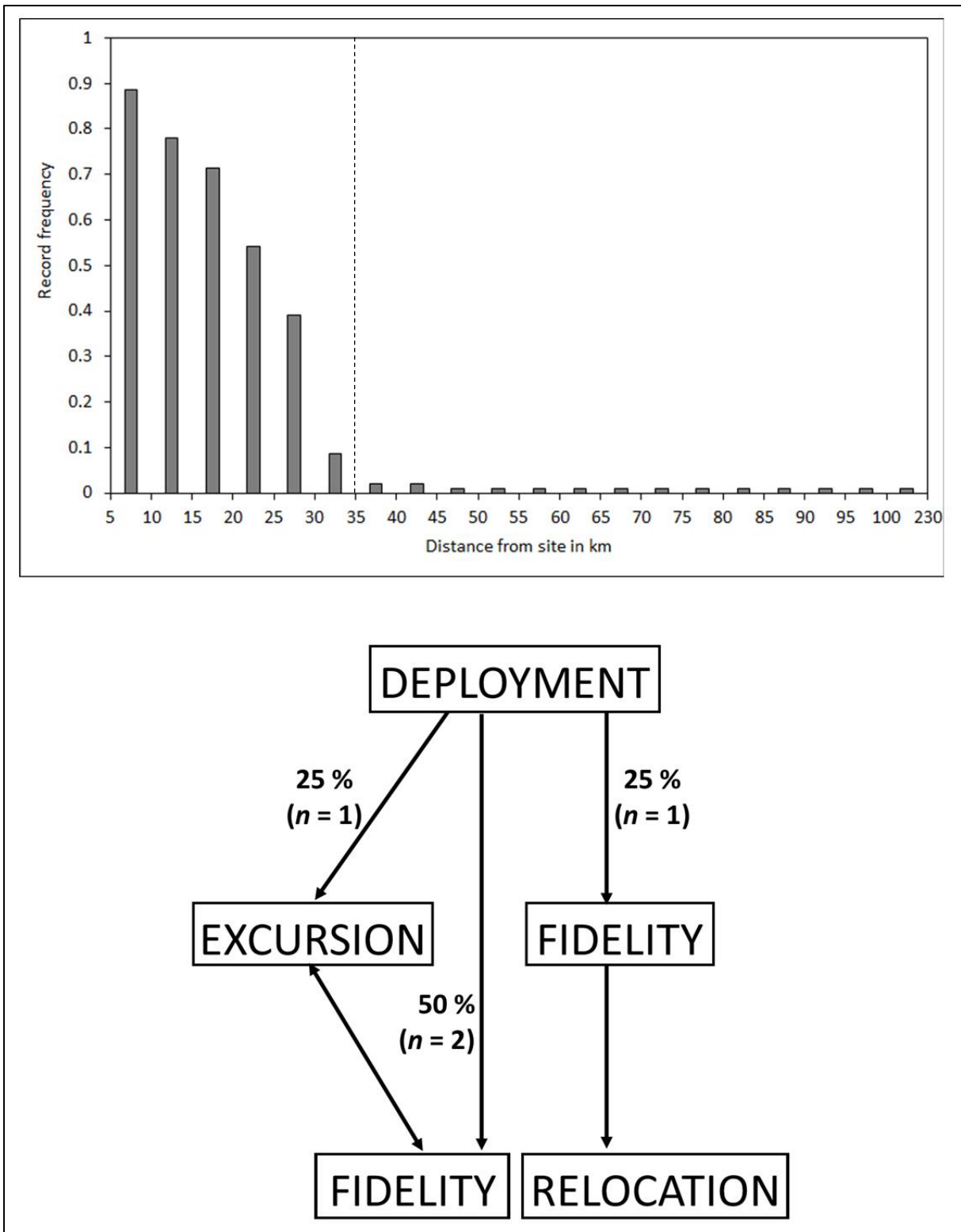


Figure S1 (continued).

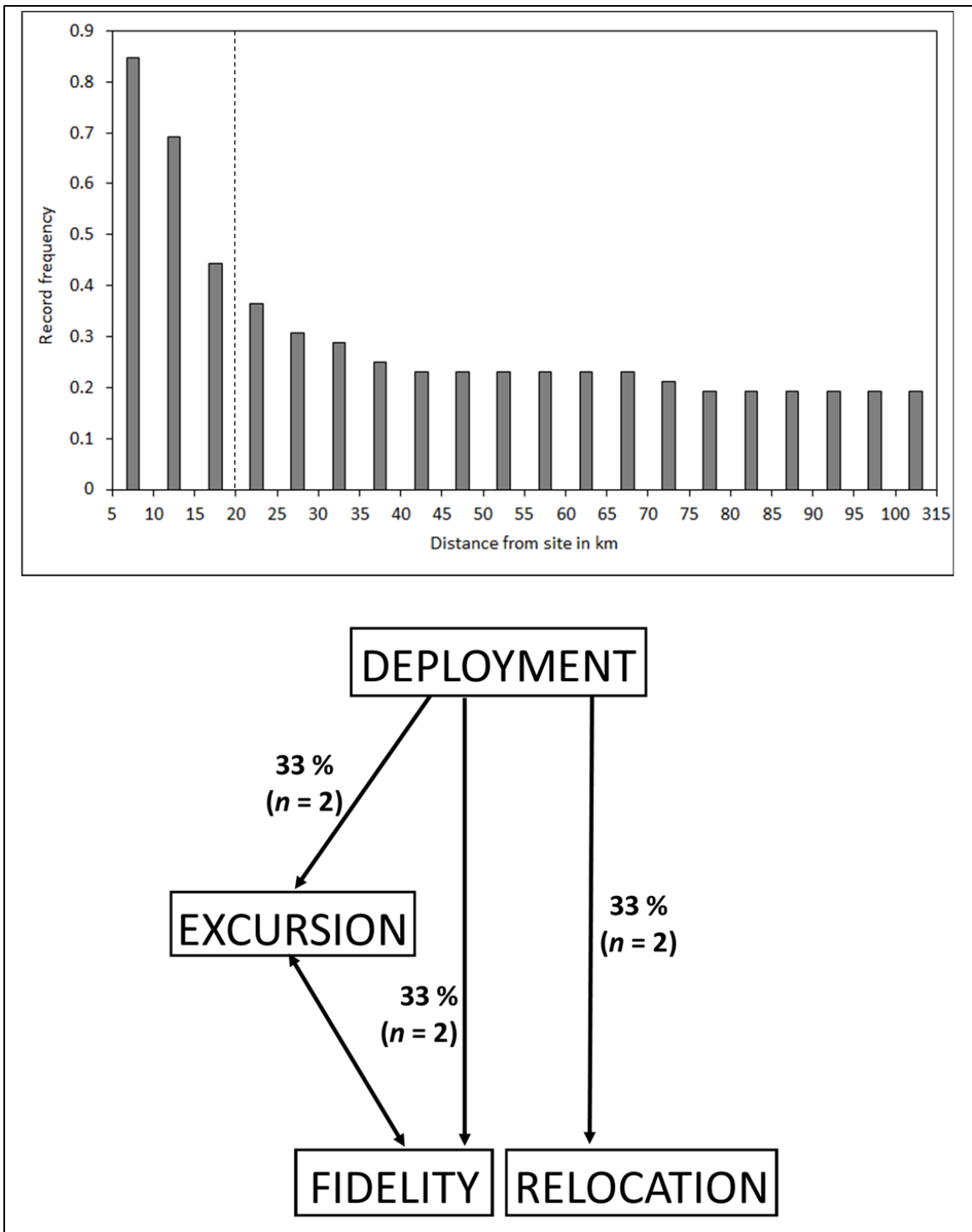




**Figure S2.** Movement patterns recorded for reef manta rays (*Mobula alfredi*) after deployment of the tag, using satellite tag (SPLASH10), in Noumea, New Caledonia. Percentage based on the total number of individuals ( $N = 6$ ). The Dashed line represent the home range limit.



**Figure S2.** Continued. Ouvea ( $N = 4$ ).



**Figure S2.** Continued. Touho ( $N = 6$ ).

**Table S4.** Horizontal and vertical movement metrics for reef manta rays (*Mobula alfredi*) tracked using satellite tags in New Caledonia. Patterns are F : Fidelity, E : Excursion, F + R : Fidelity + Relocation and R : Relocation

Manta ID	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19
Individual information:																			
Site	Noumea	Noumea	Noumea	Noumea	Noumea	Noumea	Ouvea	Ouvea	Ouvea	Ouvea	Ouvea	Touho	Touho	Touho	Touho	Touho	Touho	Touho	Touho
Sex	Male	Female	Female	Male	Female	Female	Male	Female	Female	Male	Female	Female	Male	Female	Female	Male	Male	Male	Female
PTT	167754	167755	151348	151349	163079	167757	140916	196191	196192	196193	196194	162379	162380	167758	174667 <sup>M</sup>	182146	196864	196865	196866
Horizontal movements:																			
Pattern	F	E	R	F + R	E	F	E	F		F + R	F	F	F	R		R		E	E
Mean distance per day (km)	2.3	3.9	0.2	7.4	3.9	7.2	8.4	3.9	-	1.9	1.8	12.3	6.6	6.8	-	3	-	3.6	1.3
Total track length (km)	23.4	393.6	344.6	336	529.6	405.4	662	81.4	-	277.7	87.3	24.6	26.3	687.5	-	305.3	-	314.6	89.1
Latitudinal range (km)	34.1	215.9	7.1	57.5	58.9	71.2	68.7	32.8	-	224	37.4	11.7	15	56.8	-	212.4	-	101.3	22.7
Max. dist. from site (km)	10.1	86.1	249.7	96.3	51.8	33.2	43.7	34.4	-	225.1	30.2	11.8	15.3	311.4	-	304.5	-	131.5	22
Max. dist. from reef (km)	4.3	12.4	5.3	17	6.9	7.4	35	5.6	-	104.6	2.1	7	6.3	7	-	1.9	-	5.1	4.5

<sup>M</sup> for MiniPAT tag, others are SPLASH10 tags. PTT, Platform Transmitting Terminal.



**Table S5.** Z-test statistics of differences in proportion of dive below 300 m between movement patterns recorded for reef manta rays (*Mobula alfredi*) ( $N = 16$ ) in New Caledonia. *P*-values are above the diagonals and Z statistics are below the diagonals.

<b>Movement Patterns</b>	<i>Relocation</i>	<i>Excursion</i>	<i>Fidelity</i>	<i>Fidelity + Relocation</i>
<i>Relocation</i>		0.18	0	0
<i>Excursion</i>	1.3		0	0
<i>Fidelity</i>	6.6	8.7		0.09
<i>Fidelity + Relocation</i>	3.3	4.5	1.7	

0 value indicates  $p < .0001$ .

**Table S6.** Kolmogorov-Smirnov (K-S) test statistics of differences in distributions of time spent at different depth ranges between movement patterns recorded for reef manta rays (*Mobula alfredi*) ( $N = 16$ ) in New Caledonia. *P*-values are above the diagonals and *D* statistics are below the diagonals.

<b>Movement Patterns</b>	<i>Relocation</i>	<i>Excursion</i>	<i>Fidelity</i>	<i>Fidelity + Relocation</i>
<i>Relocation</i>		0.6974	0.9996	0.6974
<i>Excursion</i>	0.4		0.6974	0.6974
<i>Fidelity</i>	0.2	0.4		0.6974
<i>Fidelity + Relocation</i>	0.4	0.4	0.4	