



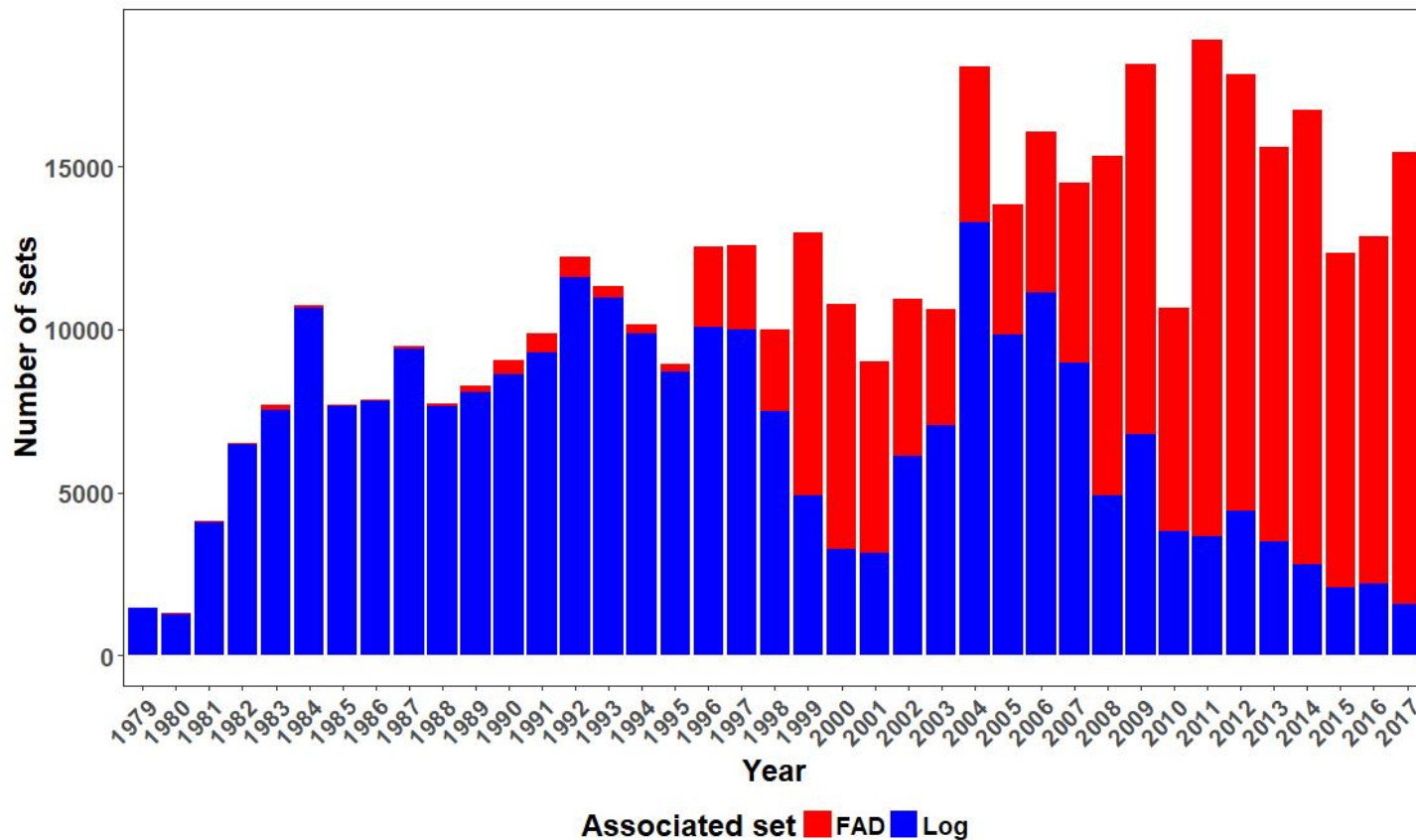
Report on analyses of the 2016/2018 PNA FAD tracking programme

Lauriane Escalle, Berry Muller, Stephen Brouwer, Graham Pilling and the PNA Office

Overview

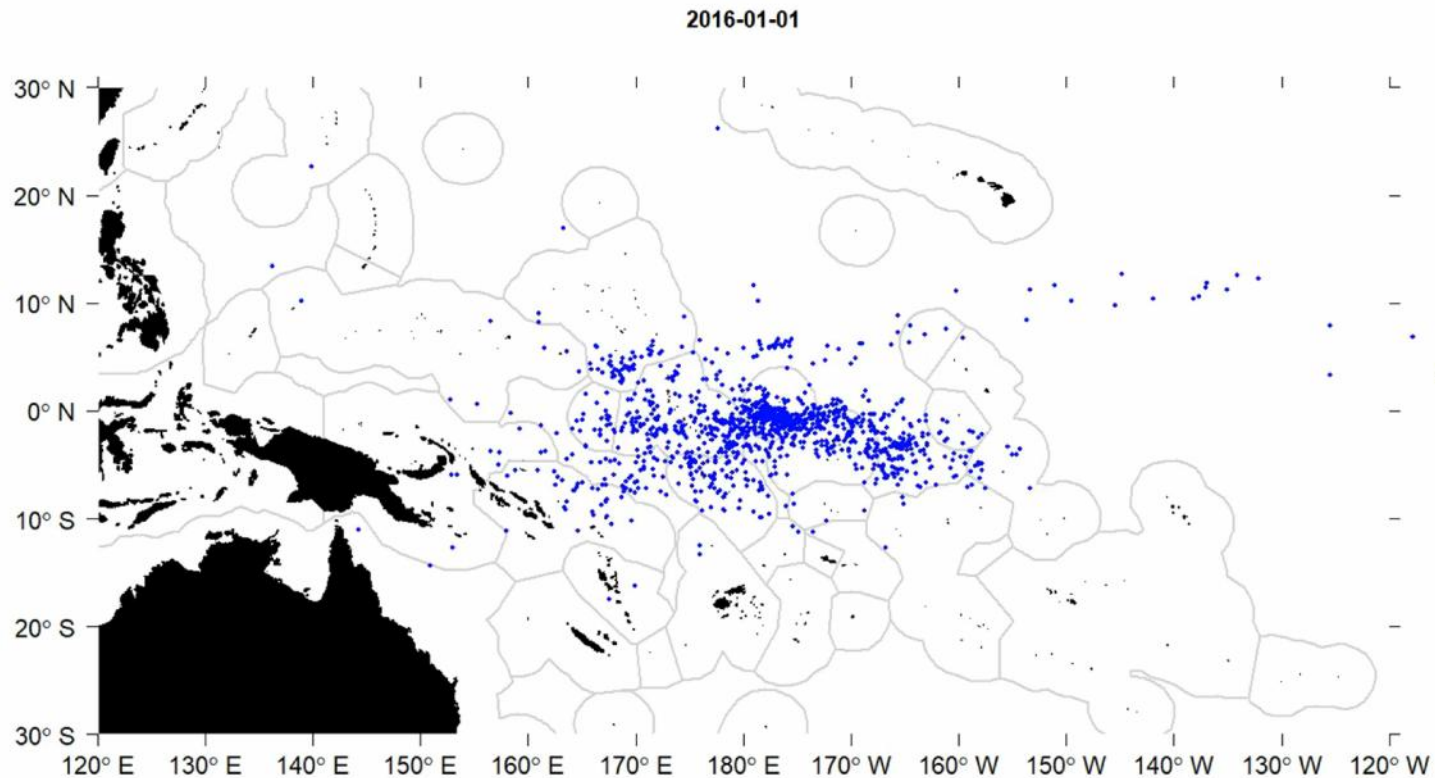


- Increase use of Fish Aggregating Devices (FAD)
- High capture of bigeye tuna on FAD associated sets → 3 to 4 months FAD closure
- Potential ecosystem impacts



The Parties to the Nauru Agreement (PNA) initiated a FAD tracking trial in 2016

- **Amount of tracking data transmitted to PNA** by fishing companies **Analyses**
- **Spatial and temporal variability of FAD density and deployments** fishing on them
- **FAD beaching** better understanding of the economics of FAD use
 - inform FAD management



Methods



- **Cleaning**

1st January 2016 and 18th March 2018

	Number of transmissions	Number of buoys
Raw dataset	15,148,063	30,069
% removed during cleaning process	3.5 %	12.0 %
Corrected dataset	14,780,799	26,595

- **Fishing companies or vessel name (62% of the buoys) owner of each buoy**

Some companies from which we have no FAD data

Methods



- Data processing

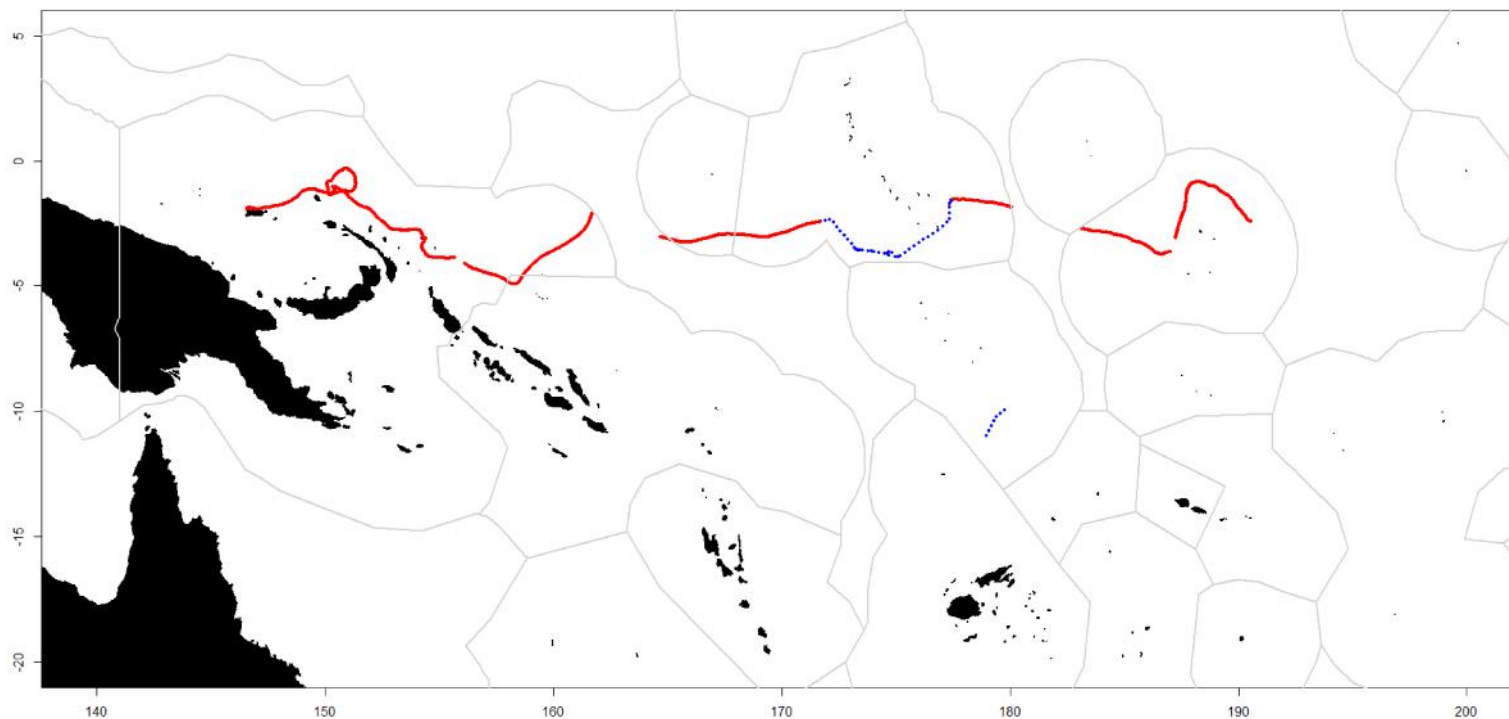
At sea portions of FAD track (Random forest)

Deployments

Geofencing

Gaps in the data

Position		% transmissions
On board	—	20.2
At sea	—	79.8



Data transmission rates to PNA



- **Matching with Observer data**

1) Using buoy manufacturer Identification number

	All			Companies found in FAD tracking data + within PNA waters		
	Number	Match with buoy track	%	Number	Match with buoy track	%
DEPLOYMENTS						
All	18,744			10,504		
Buoy ID recorded	2,958			1,538		
Buoy ID with good format*	831	185	22.3	423	131	31.0
SETS						
All	11,599			7,107		
Buoy ID recorded	2,454			1,451		
Buoy ID with good format*	684	187	27.3	461	148	32.1

*Rarely recorded: 5 and 13% of the sets and deployments

Data transmission rates to PNA



- Matching with Observer data

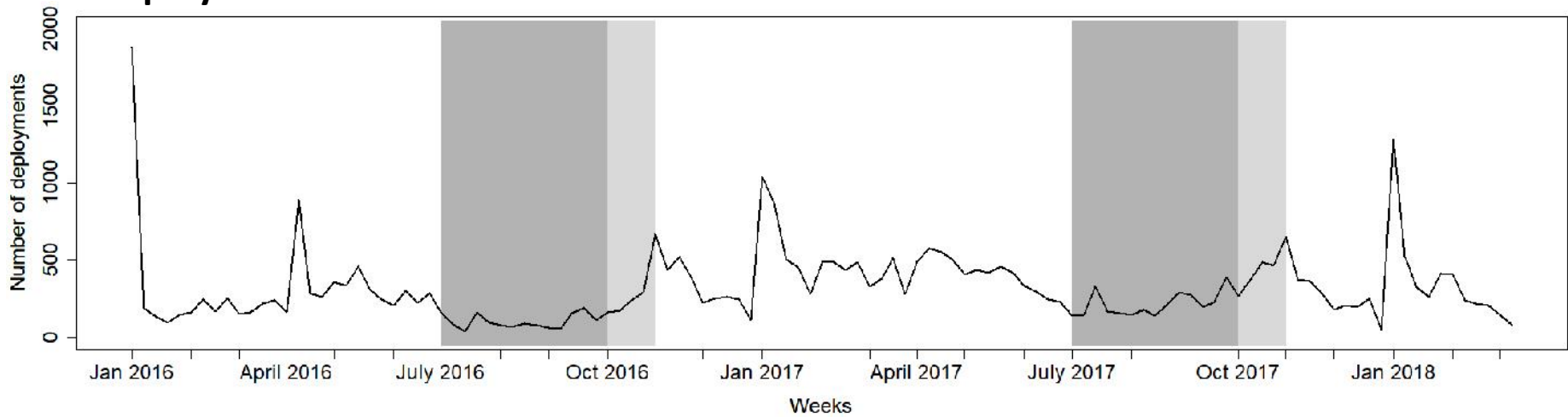
2) Using position (≤ 2 km) and time (≤ 3 hours)

	Number	Match with buoy track	%
DEPLOYMENTS			
All	18,744	4,680	25.0
Companies in FAD tracking data and PNA water	10,504	3,712	35.3
SETS Observer			
All	11,599	3,415	29.4
Companies in FAD tracking data and PNA water	7,107	2,876	40.5
SETS Logsheet			
All	21,454	7,302	34.0
Companies in FAD tracking data and PNA water	14,889	6,499	43.6

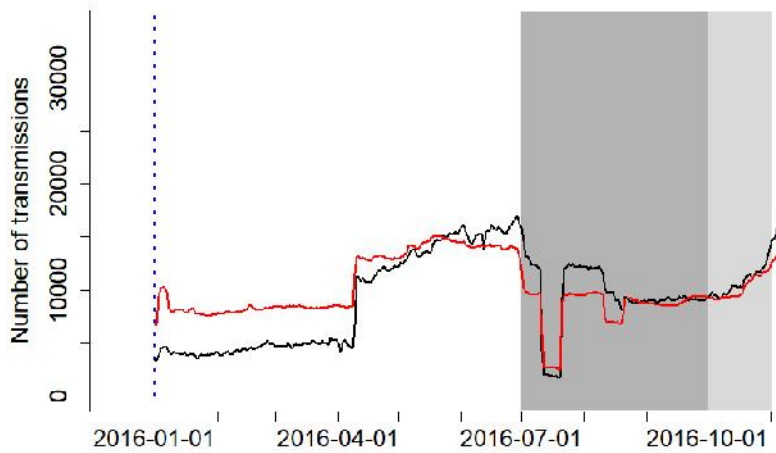
Summary of data



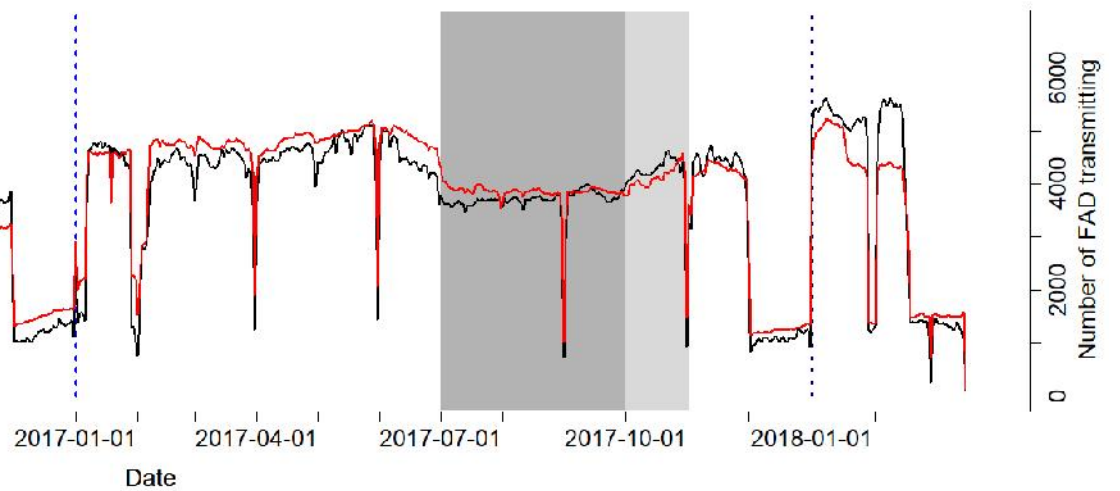
Deployments



Number of transmissions

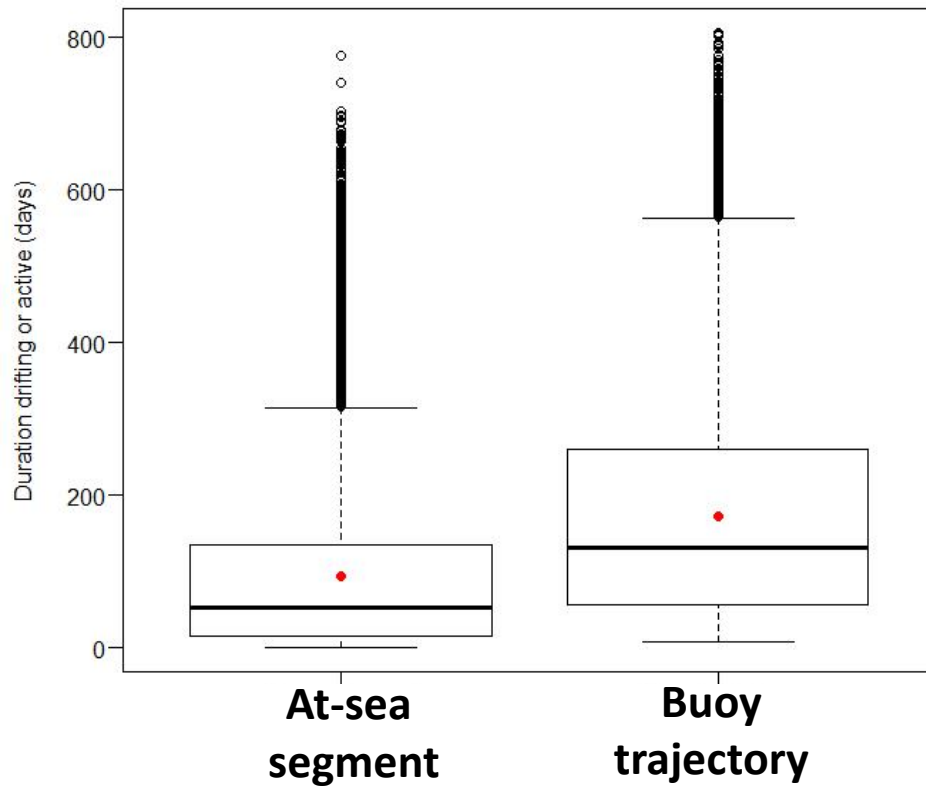


Number of FAD transmitted

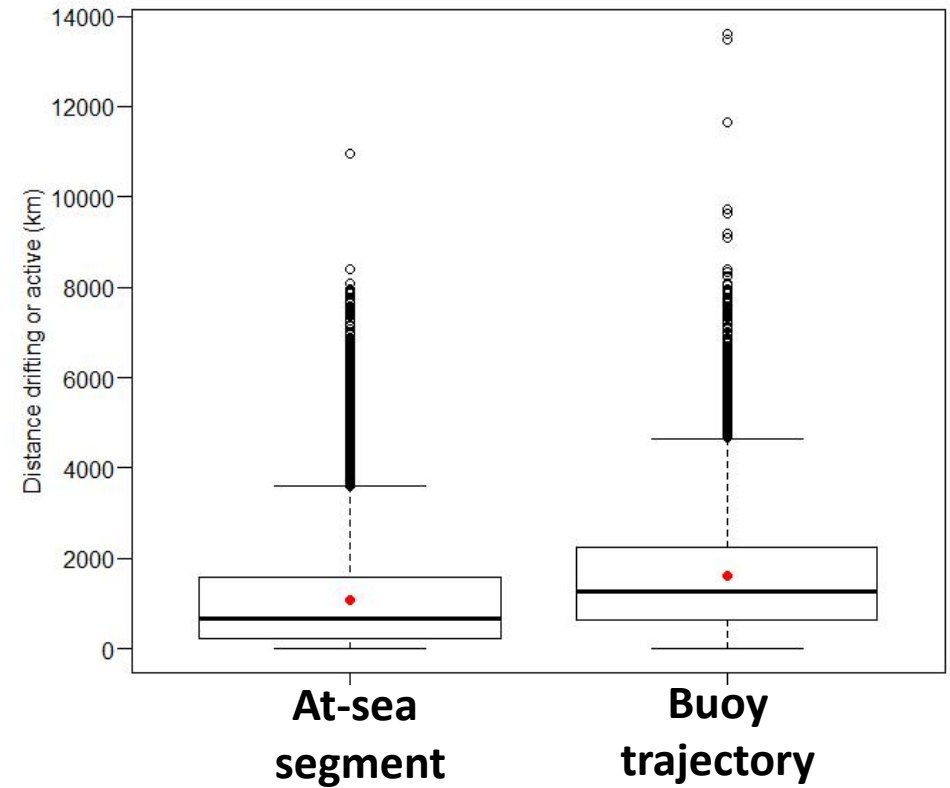


Summary of data

Duration



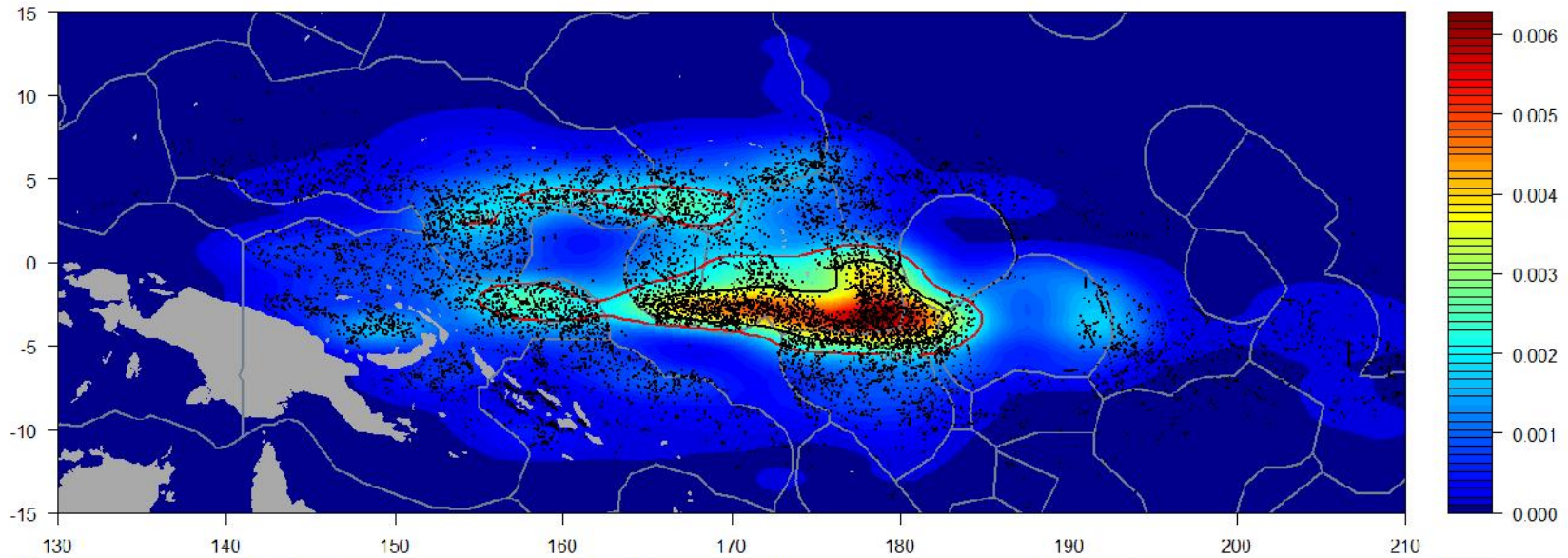
Distance



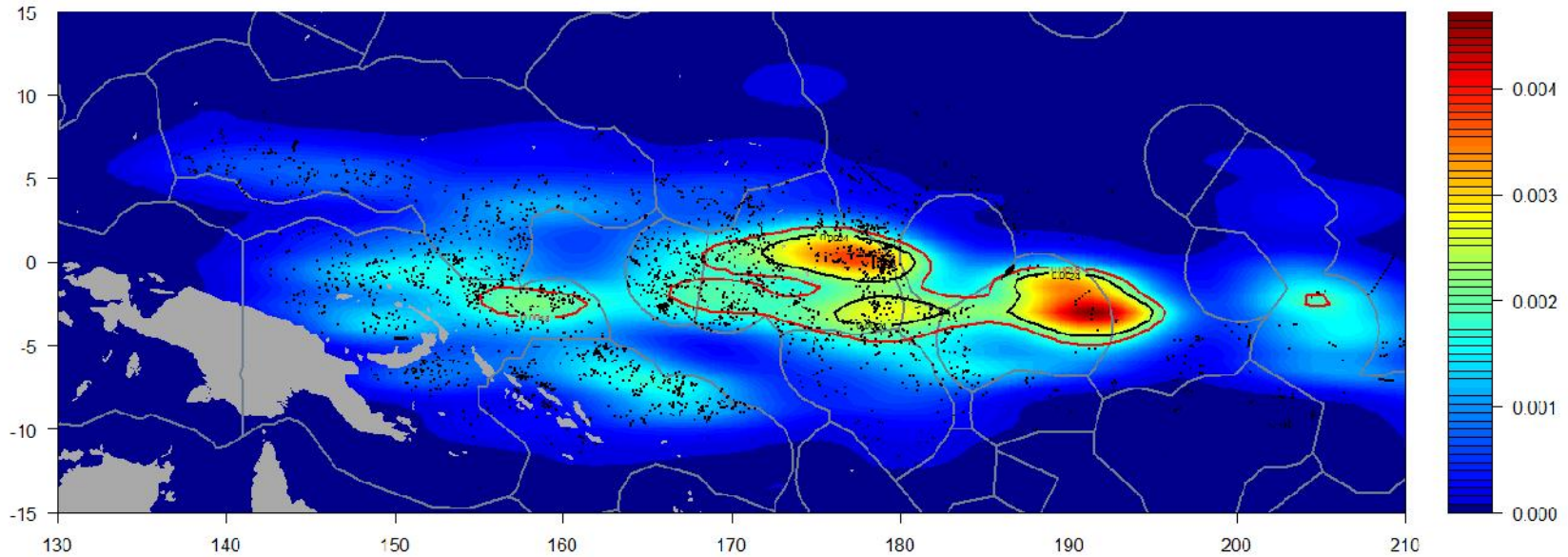
Spatial distribution

Deployments

2016



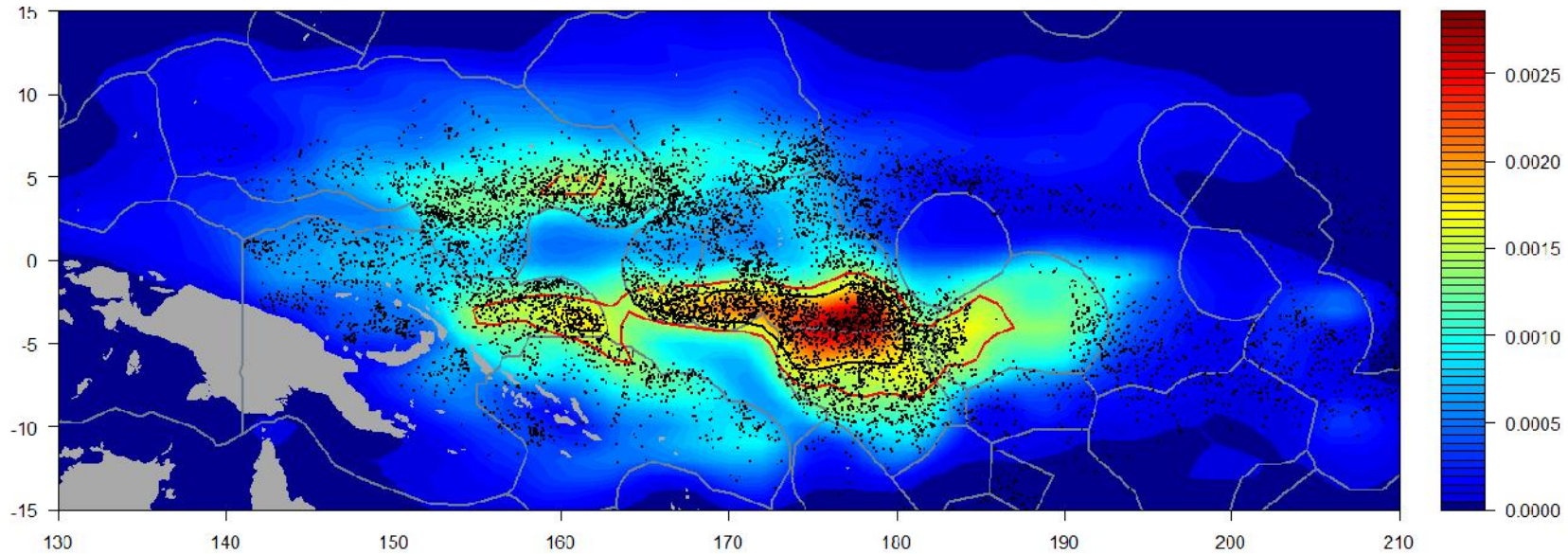
2017



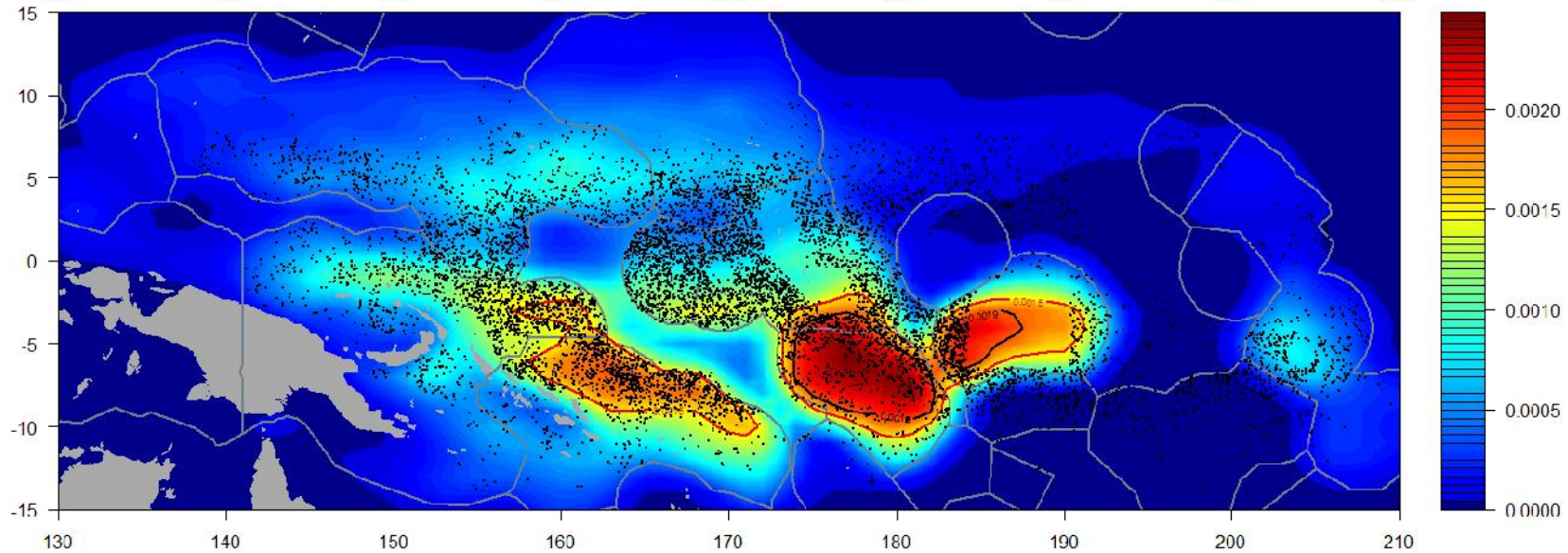
Spatial distribution

FAD density

2016



2017



FAD connectivity



Position month t	Position month t + 1					
	N	SW	SC	SE	Deactivated	Unknown
North (N)	63.2	2.4	1.2	1.1	27.9	4.3
Southwest (SW)	3.1	57.0	2.5	0.2	33.9	3.4
South center (SC)	4.6	13.0	46.0	1.9	28.7	5.9
Southeast (SE)	2.3	0.2	20.6	43.6	26.0	7.2

Fate of FADs



Drifting

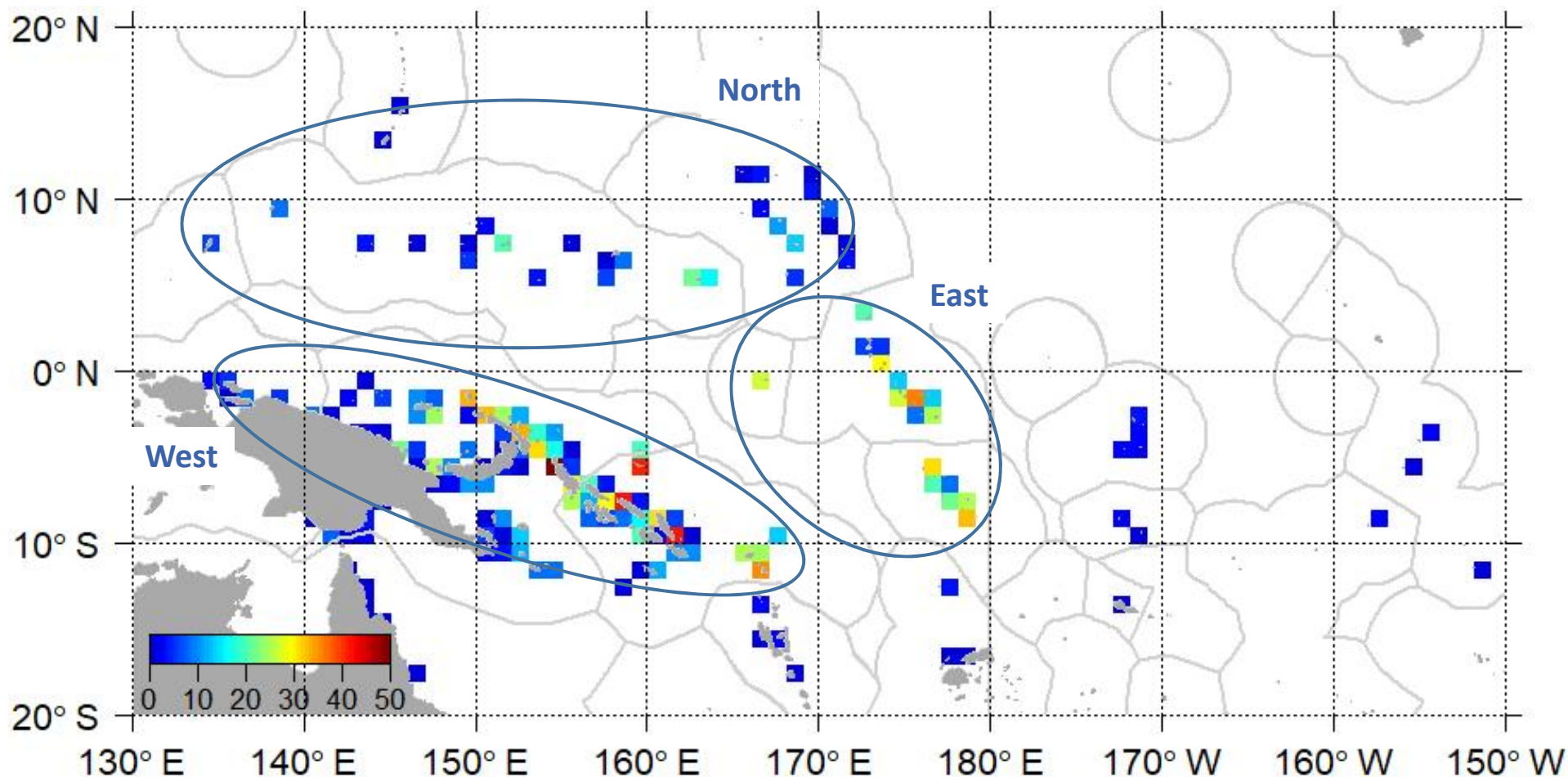
Lost

Recovered

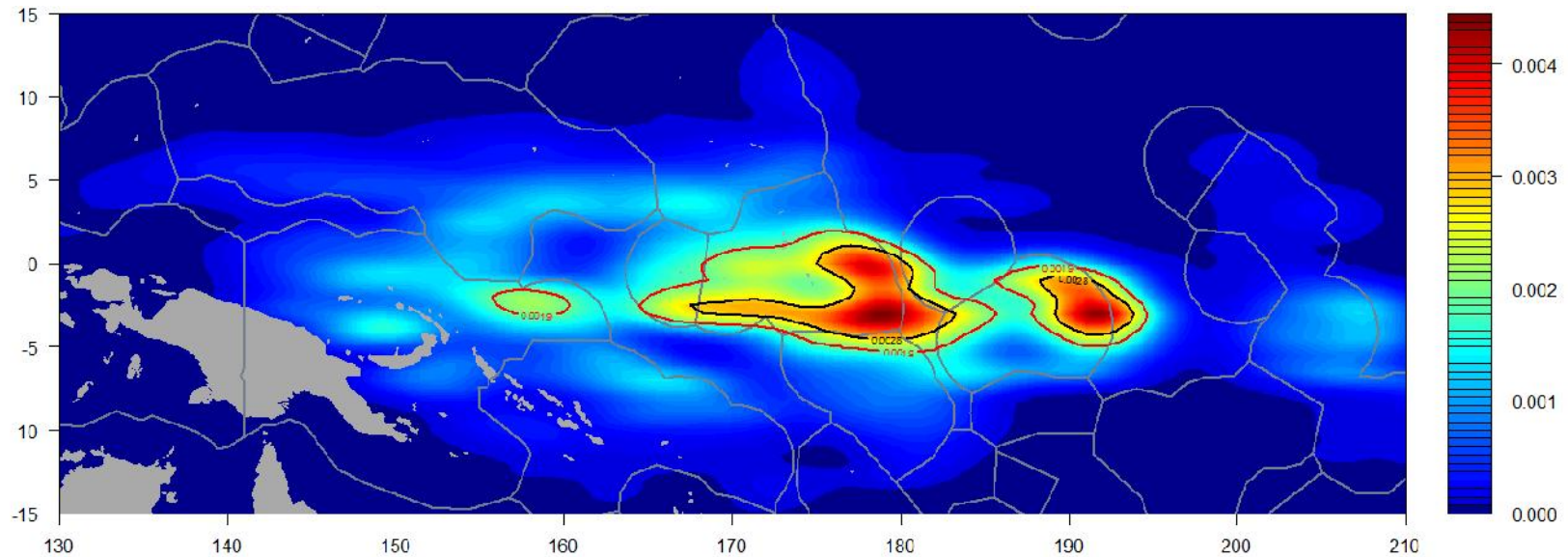
Beached

Beaching

- Density of FAD beaching (1350) in 2016 and 2017
3 consecutive transmissions when within 10km of land



- Deployments in specific hotspot areas



- West of the high sea pocket 2 (Hotspot 1)
- Centred on the high seas areas between the EEZs of Kiribati and Tuvalu (Hotspot 2)
- West of the eastern high seas area (Hotspot 3)

Beaching



- Summary of beaching depending on deployment areas and drifting time

- 3 beaching areas
- 3 deployment hotspots or 3 other deployment area

Beaching cells	OUT North					OUT Southwest					Hotspot 1					Hotspot 2					OUT Southcenter					Hotspot 3				
	<1	1-3	3-6	6-9	9+	<1	1-3	3-6	6-9	9+	<1	1-3	3-6	6-9	9+	<1	1-3	3-6	6-9	9+	<1	1-3	3-6	6-9	9+	<1	1-3	3-6	6-9	9+
North	5	20	22	15	12	0	1	1	1	1	0	0	0	0	1	0	1	1	4	6	0	0	0	1	2	0	0	0	1	2
Southwest	0	0	1	1	1	8	15	13	5	4	0	2	2	0	0	0	3	9	7	6	0	0	2	5	8	0	0	1	3	4
Southcenter	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	15	17	8	4	3	3	6	11	5	8	0	6	8	2	3

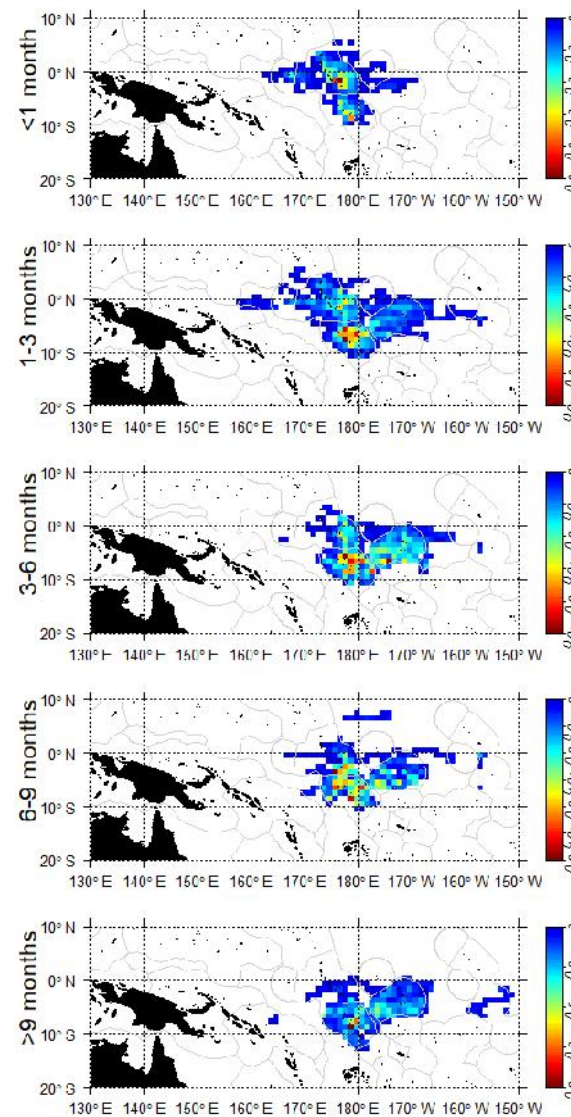
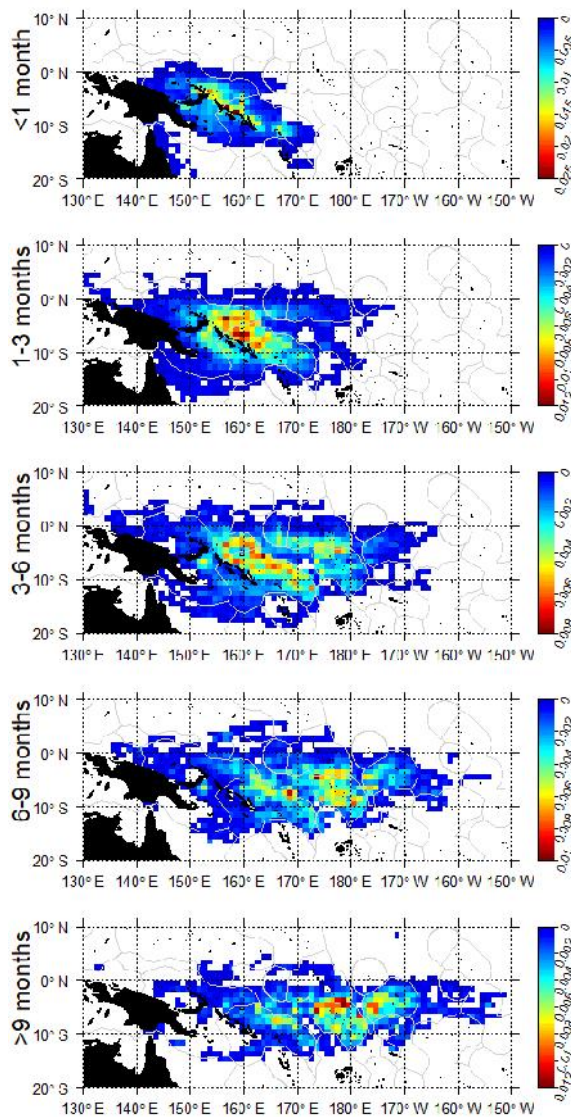
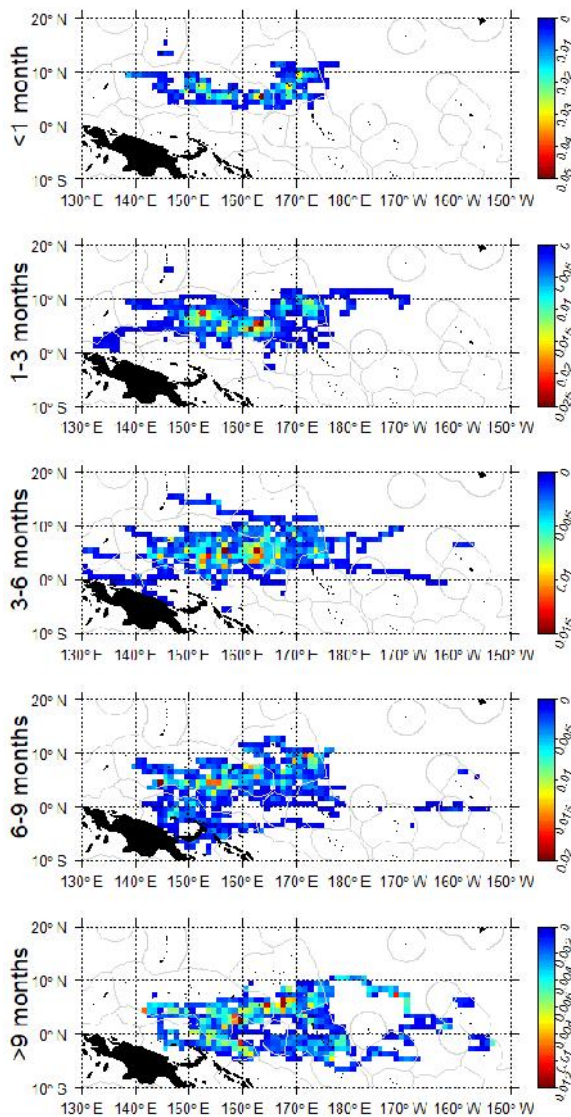
Beaching



North

Southwest

Southeast



- **Note this analysis on PNA FAD tracking.**
- **Note the importance of complete FAD tracking data to support scientific analyses and encourage their provision by fishing companies.**
- **Noting on-going WCPFC considerations, and findings that an estimated 25% of the FADs drifted out of main fishing areas and 5% are beached, SC14 is invited to discuss i) the importance of FAD marking and monitoring programmes to better identify and follow individual FADs and ii) the potential benefit of using biodegradable materials on FADs.**

Thanks for your attention

Acknowledgments

We thank the members of the **Parties to the Nauru Agreement** for data access and the **Pew Charitable Trusts** for the funding provided to support these analyses