

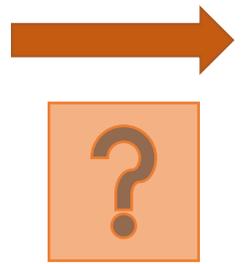
# Analyses of the regional database of stranded drifting Fish Aggregating Devices (dFADs) in the Pacific Ocean

Escalle L., Mourot J., Thellier T., Lopez J., Fuller L.,  
Wichman J., Royer S.J., Hood L., Bigler B., Jaugeon  
B., Nicholas T.R., Pollock K., Prioul F., Marks A.,  
Kutan M., Jones J., Lynch J.M., Tait H., Hamer P.

## Extensive use of Drifting Fishing Aggregating Devices (FADs)

- 46,000–65,000 deployments per year in the Pacific (16,000–25,000 in the EPO)
- Potential environmental impacts
  - Sustainability of tuna stocks
  - Bycatch

Entanglement / ghost fishing  
Marine pollution  
Damage to coastal areas

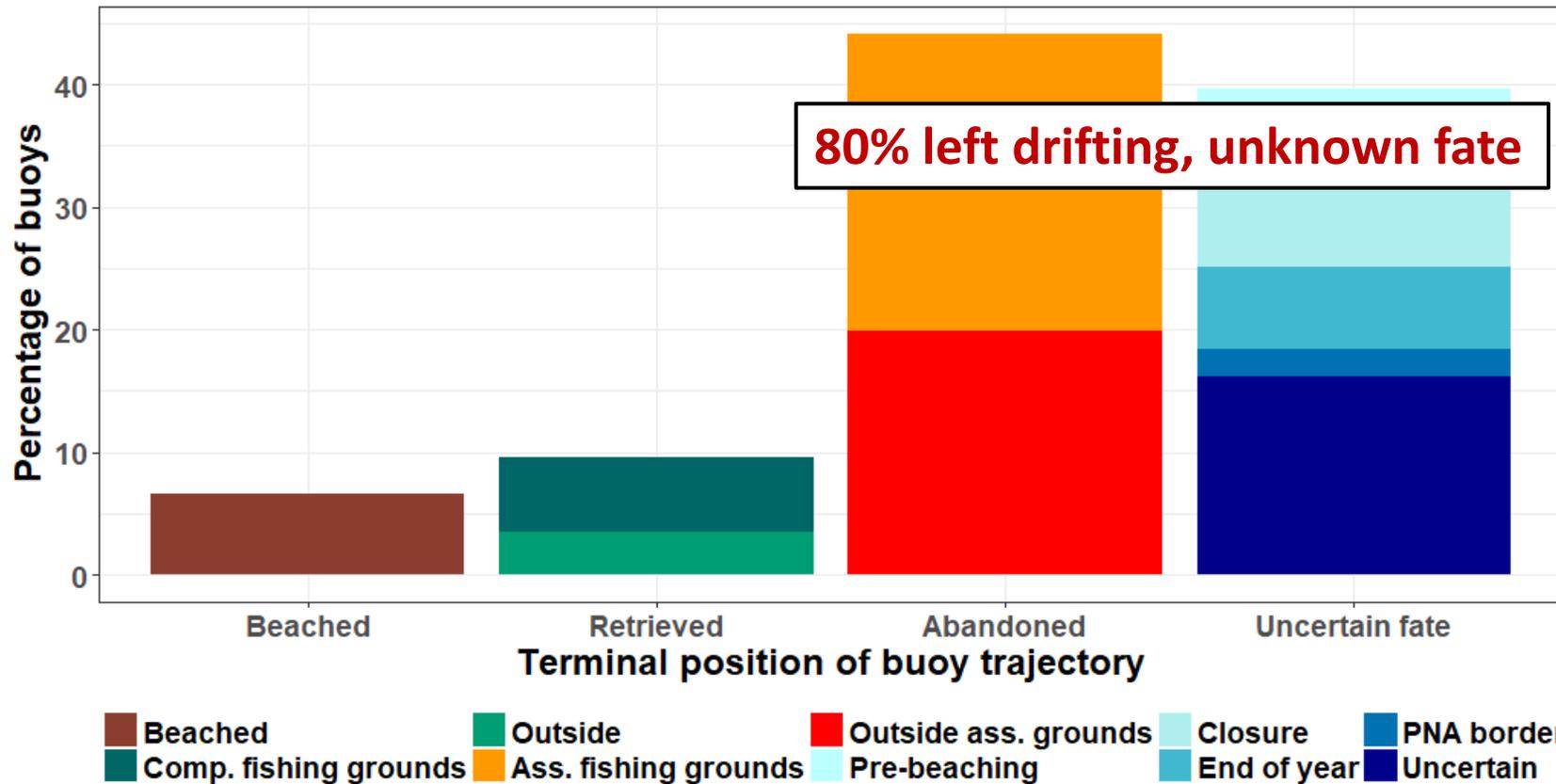


**Lack of information on the environmental impacts linked to FADs loss and abandonment**



## dFAD stranding events

- 7% of stranding events in the WCPO ; unknown rate in the EPO
- Underestimation due to buoy deactivation when lost or abandoned



## Regional stranded FAD data collection programme

### Objectives

1. Quantify the number of dFAD stranding events or dFADs drifting nearshore
2. Assess the resulting pollution and ecosystem impacts, including on species of special interest (SSIs) and key habitats
3. Evaluate materials and designs of dFADs found stranded, in relation to past and current use of dFADs in the Pacific Ocean
4. Evaluate how communities and PICTs may repurpose or recycle dFAD materials and satellite buoys locally, when possible
5. Consider ways to mitigate the impacts of dFADs and provide scientific-based advice to guide the management of dFADs in the Pacific Ocean



## Data collected in-situ

Awareness and communication materials



### RECORD ANY OF THESE DETAILS:

- What did you find ?
  - a FAD by itself
  - a FAD with a buoy
  - a buoy by itself
- Buoy ID number and any mark painted on the buoy
- Date found
- Location (Lat/Lon or name of beach, village, island...)

### Where is the buoy ID number ?



ISL+123456    DSL+123456    M3I123456    T7+123456789 or Ze0123456789    P1234NF    123456

## FISH AGGREGATING DEVICE (FAD) DRIFTING FAD FOUND BEACHED OR AT SEA ?

Where is the buoy ID number ?

**WHAT IS A DRIFTING FAD?**  
It is a raft, generally made of bamboo, with a tail of net, cords and/or canvas and a satellite buoy, deployed by tuna purse seiners to aggregate and catch tuna.

**WHY ARE WE COLLECTING THIS DATA?**  
To quantify the number of beached or lost FADs, and to note their impact on coastal areas, which will help improve the management of FAD fishing.

**WHAT TO DO WITH THE FAD?**  
If possible, tow the drifting FAD back to shore then contact the Norma office.

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- Date found
- Location (Lat/Lon or name of beach, village, island...)

**IF POSSIBLE, NOTE:**

- Environment: at-sea, coral reef, beach, lagoon
- Materials: bamboo, net, cord, floats
- Tail length (if possible)
- What did you do with the FAD/buoy? (e.g. removed from water or land, left drifting, sunk, fished)
- Any additional comments? (e.g. environmental damage, entangled animals or aggregated tuna or other animals)

**TAKE PICTURES:**

- General picture of what you found
- A close-up of the buoy with the ID number visible

**SEND AN EMAIL TO:** [jamel.james@norma.fm](mailto:jamel.james@norma.fm)  
**OR CALL:** 320-2700




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Data collection in each country (fisheries department or local partner)

### FAD Sighting form v2

Entered in the database

Data collected regarding FADs, FAD debris and/or satellite buoys found. Contact 28721 or [jar@mmr.gov.ck](mailto:jar@mmr.gov.ck)

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#### Form

**Completed on:** \_\_\_\_\_ **Completed by: First name:** \_\_\_\_\_ **Surname:** \_\_\_\_\_

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#### Observer/ person who found the FAD

**Name:** \_\_\_\_\_ **Phone number:** \_\_\_\_\_ **Email:** \_\_\_\_\_

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#### Sighting information

(Tick one or several)  A FAD and/or  A buoy - ID Number:

drifting FAD  anchored FAD  Satellite (used on FADs)  Other:

**Date of finding:** \_\_\_\_\_ **Location (village, island, beach, bay, etc.):** \_\_\_\_\_

**Coordinates (if possible):** \_\_\_\_\_

*Precise location (in case of absence of coordinates, describe where it was found):*

**Environment:**  Beach  Coral reef  Drifting in the lagoon  Drifting in the ocean  Rocky shore  Mangrove  Garden (found previously)  Wharf (found previously)  Other:

If found previously (garden, wharf, landfill), **initial date and location:** \_\_\_\_\_

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#### FAD information

**Painted marks on the buoy:** \_\_\_\_\_ **Marks on the FAD:** \_\_\_\_\_

**FAD condition:**  Intact  Beginning to break  Mostly fallen apart

**Submerged tail presence (i.e., part of the FAD normally under water):**  Yes  No  Partial  Unknown

**Raft materials:**  Unknown  Bamboo  Wood  Metal drum  Plastic drum  Floats  PVC tubes  Cords  Steel  Nets, mesh size: \_\_\_\_\_

Cotton canvas  Plastic sheet  Palm leaves  Polystyrene  Other:

**Shape of the raft:**  Square  Rectangular  Floats « sausage »  Cylindrical  Other:

**Submerged tail materials:**  Unknown  Palm leaves  Open net, mesh size: \_\_\_\_\_  Net tied as a "sausage", mesh size: \_\_\_\_\_

Cord  Cotton canvas  Plastic sheet  Other:

**Estimated size of the raft (m) (Length x Width):** \_\_\_\_\_ **Estimated depth of submerged tail (m):** \_\_\_\_\_

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#### Fate of the FAD/ the buoy

**FAD removed?**  No  Yes\* **If yes, why?**  Landfill  Burned  Research  Recycled  Storage  Re-used (specify): \_\_\_\_\_

\*If found in a garden or house, check yes **If no, fate:**  Unknown  Left  Sunk  Fished, species and catch (kg): \_\_\_\_\_  Other:

**Buoy removed?**  Yes  No\* **If so, why?**  Landfill  Burned  Recycled  Research  Storage  Re-used (specify): \_\_\_\_\_

\*If found in a garden or house, check yes **If no, fate:**  Unknown  Left  Sunk  Other:

---

#### Impact on marine life

**Entangled animals?**  None  Turtle  Shark  Coral  Fish  Marine mammal  Other:

**Status:**  Dead  Alive  Unknown **Species (if known):** \_\_\_\_\_ **Number of individuals:** \_\_\_\_\_

**Fish or other species aggregated around the FAD**  Yes  No **Species (if known):** \_\_\_\_\_

If FAD is entangled on coral reef, please state the approximate size of the area impacted:

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**Number of pictures:** \_\_\_\_\_ **Comments:** \_\_\_\_\_

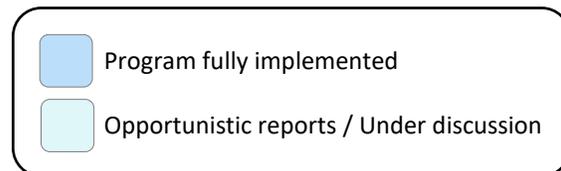
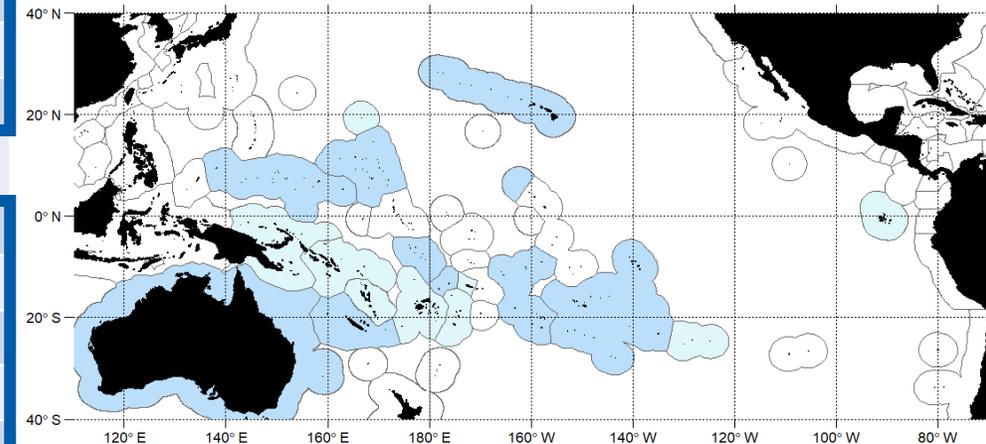


Data entry  
Local database



Regional database

PICT	Start of the program	Events recorded
French Polynesia	2019	1,044
Cook Islands	2020	238
Australia	2004	221
Wallis and Futuna	2020	165
Federated States Micronesia	2021	152
Galapagos	Opport./ 2024	est. >150*
Marshall Islands	2021	102
Hawai'i	2014	84
Palmyra	2009	63
Tuvalu	2022	58
New Caledonia	2022	46
Pitcairn	Opportunistically	7
Tonga	Opportunistically	7
Wake Island (US)	Opportunistically	6
Vanuatu	Opportunistically	3
Fiji	Opportunistically	1
PNG	Opport./under discussion	1
Samoa	Opport./under discussion	1
Solomon Islands	Under discussion	0
<b>TOTAL</b>		<b>~2,350</b>

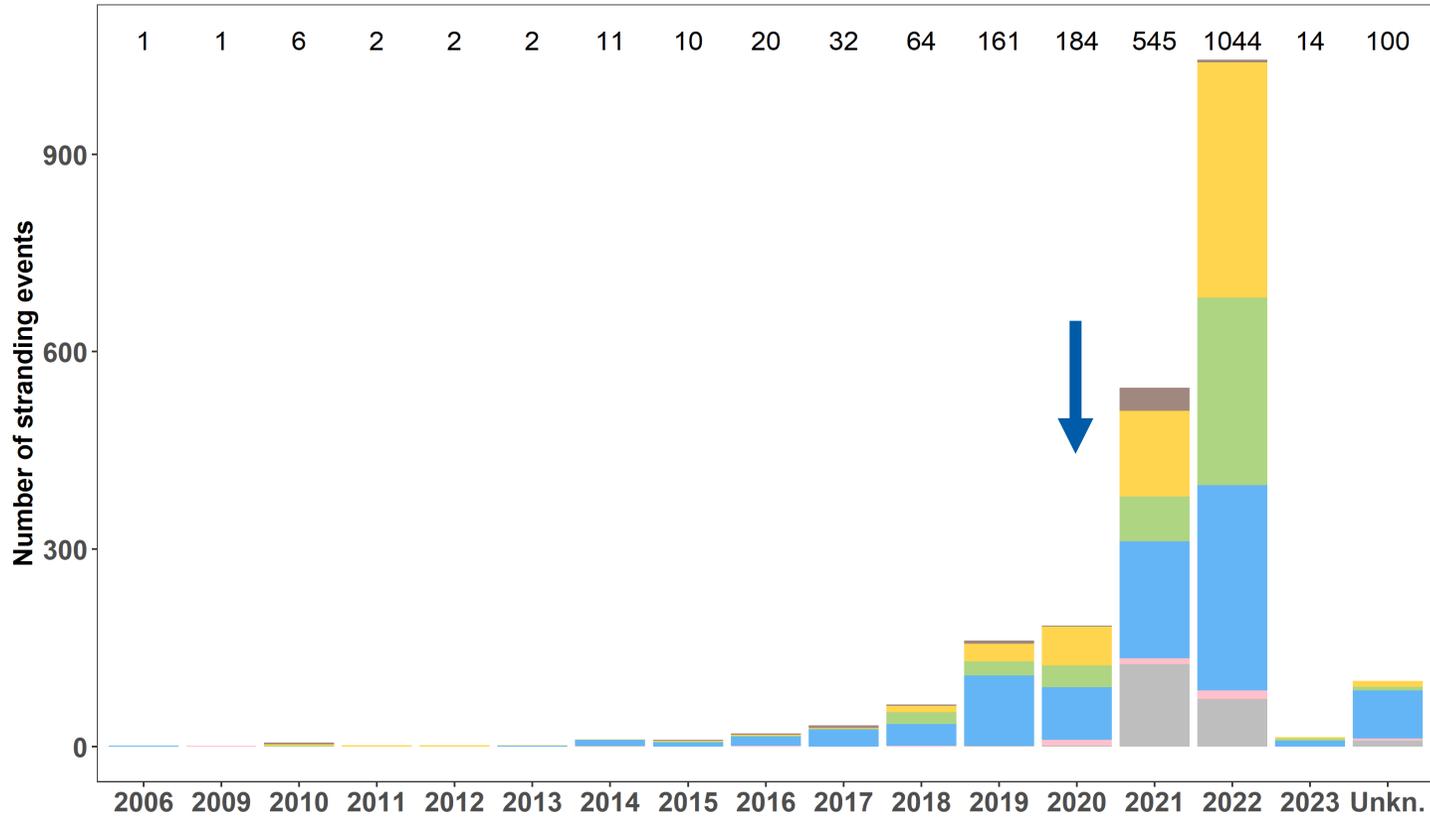


# Analyses of the regional database

- Summary of stranding events
- Spatial distribution
- Characteristics of FADs found stranded
- Habitat impacted
- Environmental impacts
- Origin of stranded FADs

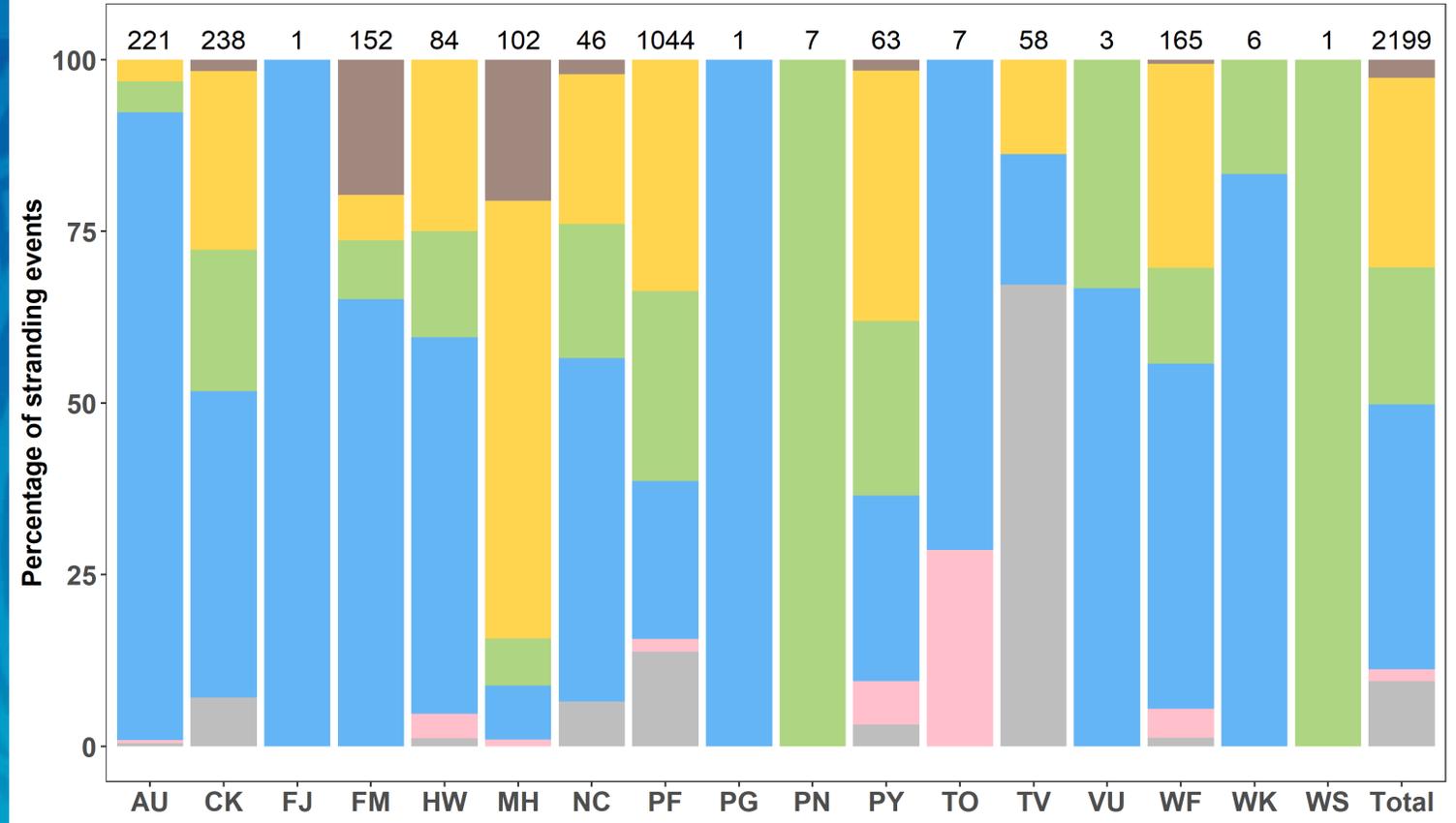


# Summary of stranding events



		FADs (1,306)		
		Presence	Absence	Unknown
Buoy (1,549)	Presence	25.6%	40.5%	3.0%
	Absence	29.5%	0.0%	0.0%
	Unknown	1.0%	0.1%	0.2%

# Summary of stranding events



- Type of objects**
- aFAD
  - dFAD
  - dFAD & Satellite buoy
  - Satellite buoy
  - Other
  - Unknown

aFAD (Payao)



dFAD



dFAD & Satellite buoy



Satellite buoy

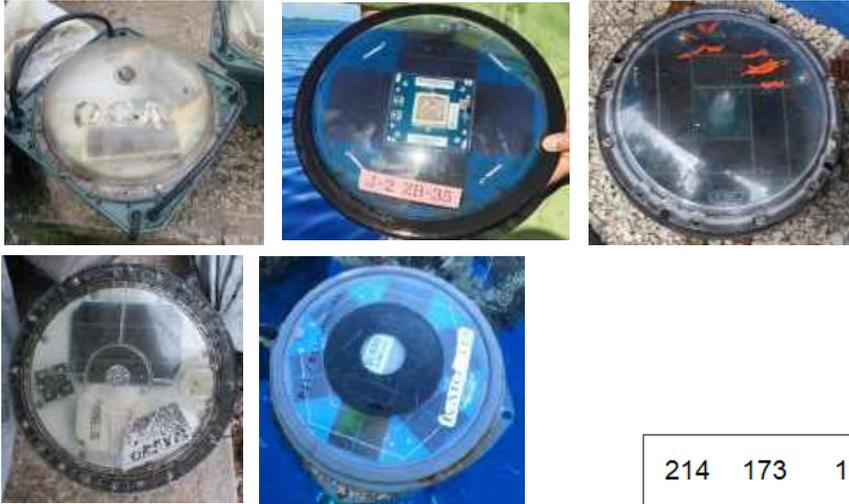


Other

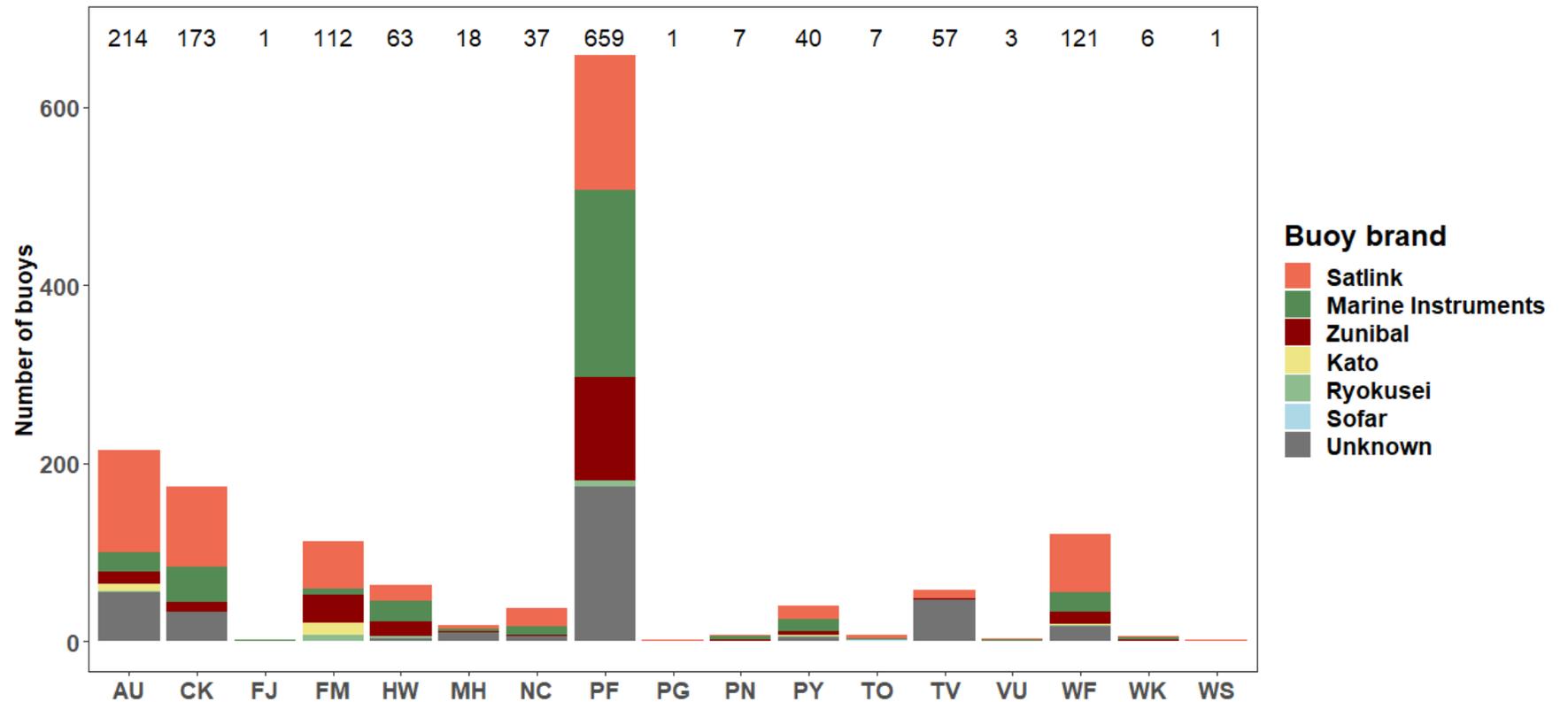


# Summary of stranding events

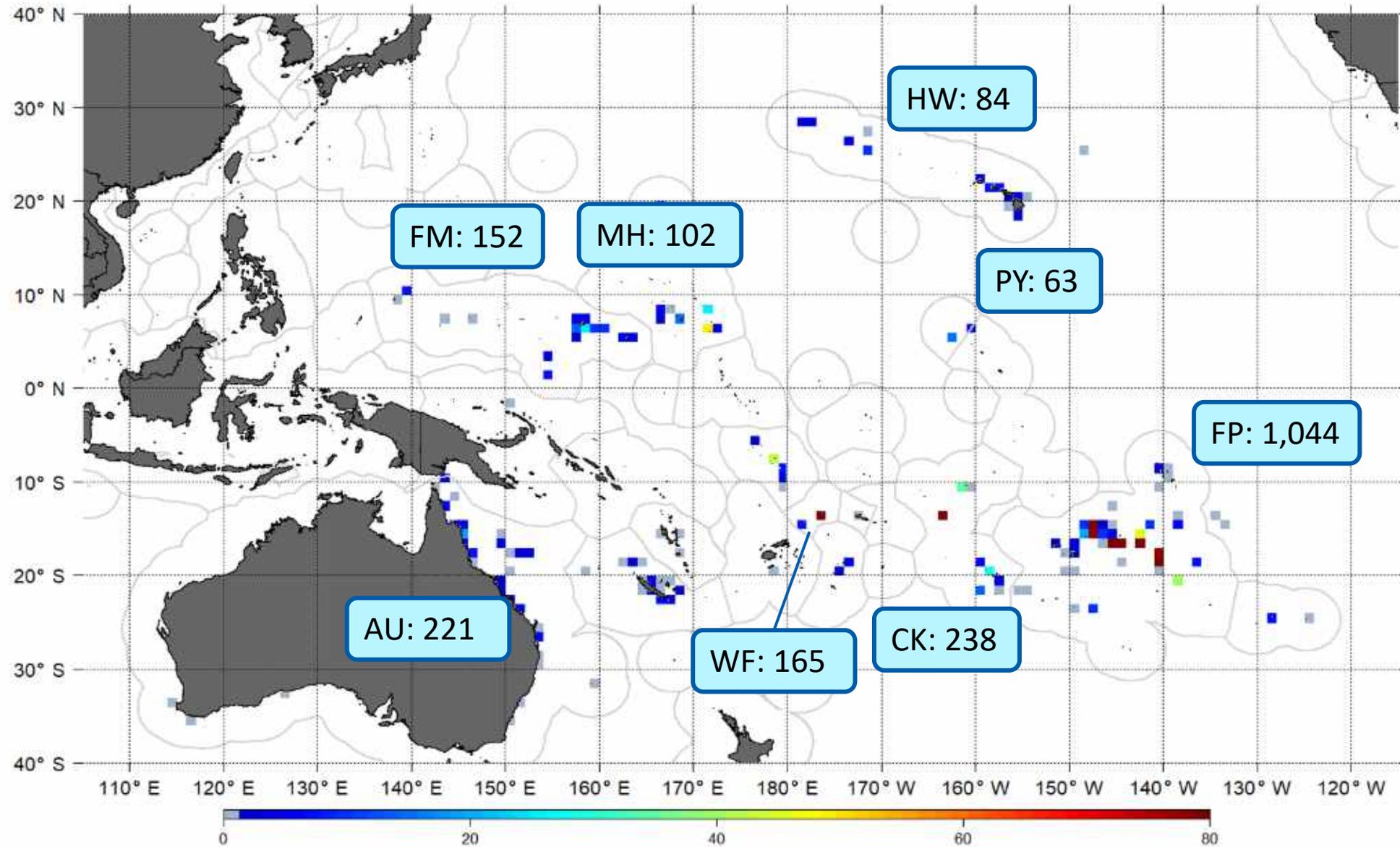
## Satellite buoy



	Buoy brand	
	Number	%
Satlink	393	35.0
Marine Instruments	258	23.0
Zunibal	163	14.5
Kato	20	1.8
Ryokusei	16	1.4
Sofar*	3	0.3
Unknown	271	24.1
<b>Total</b>	<b>1,124</b>	



# Spatial distribution of stranding events



# Spatial distribution of stranding events

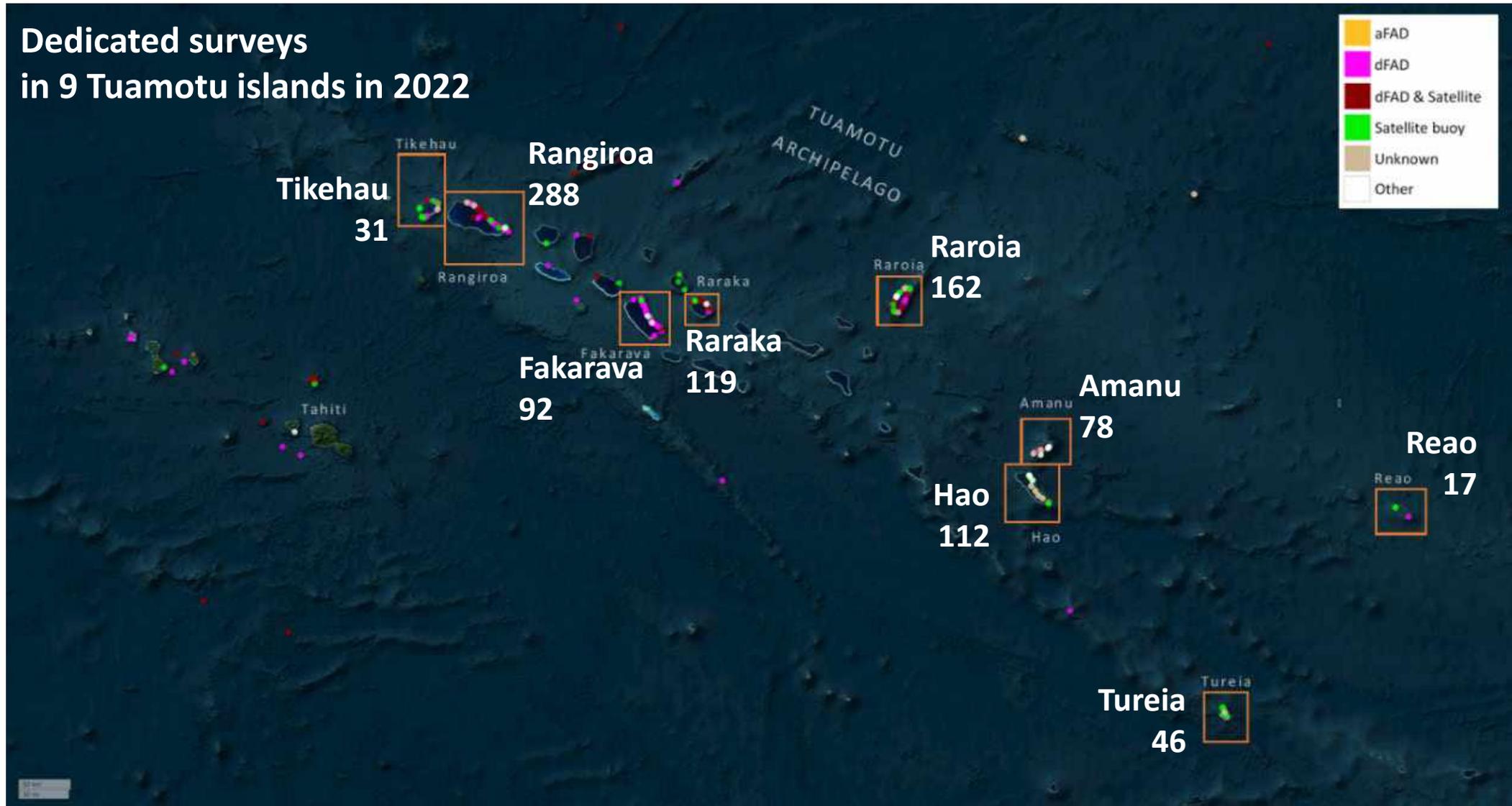
**French Polynesia:** - only PICT in the regional database located in the IATTC (& WCPFC)  
- presents the highest number of stranding events (high data collection effort)

**Total:**  
**945**

**FADs:**  
**593**

**Buoys:**  
**477**

**Dedicated surveys  
in 9 Tuamotu islands in 2022**

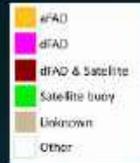


# Spatial distribution of stranding events

## French Polynesia

Dedicated surveys  
in 9 Tuamotu islands in 2022

### Raraka



T = 119  
F = 105  
B = 40

### Hao

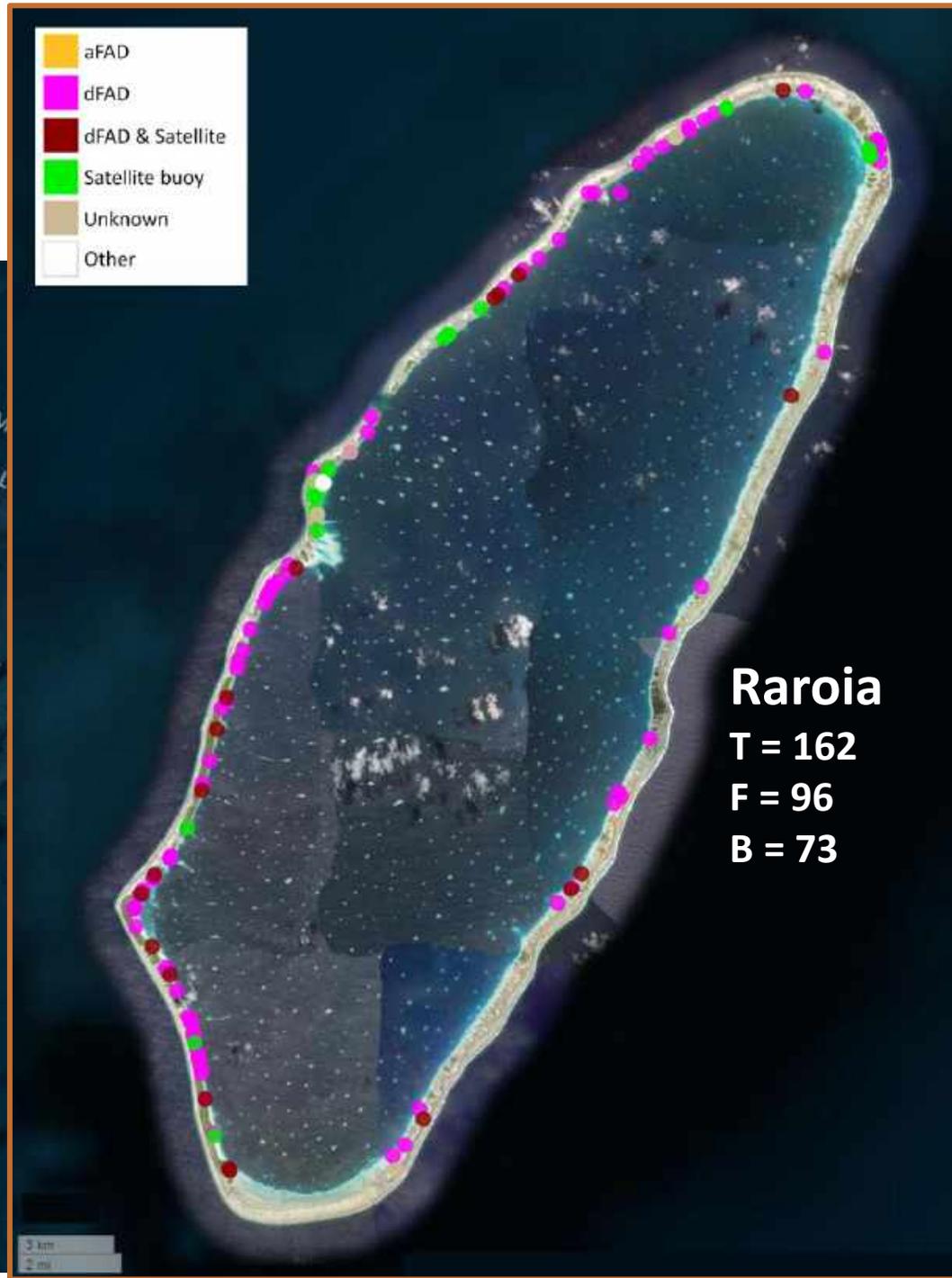
T = 112  
F = 34  
B = 63



# Spatial distribution of stranding events

## French Polynesia

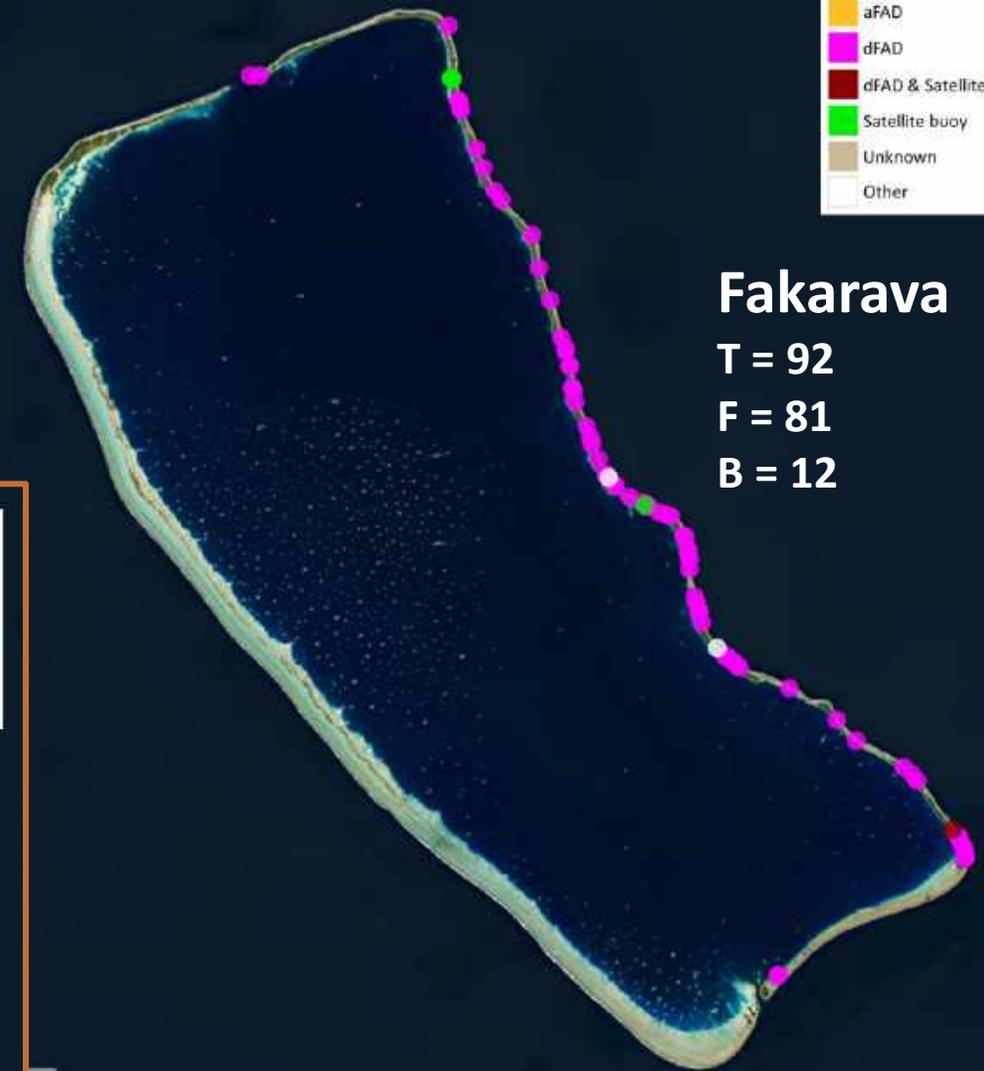
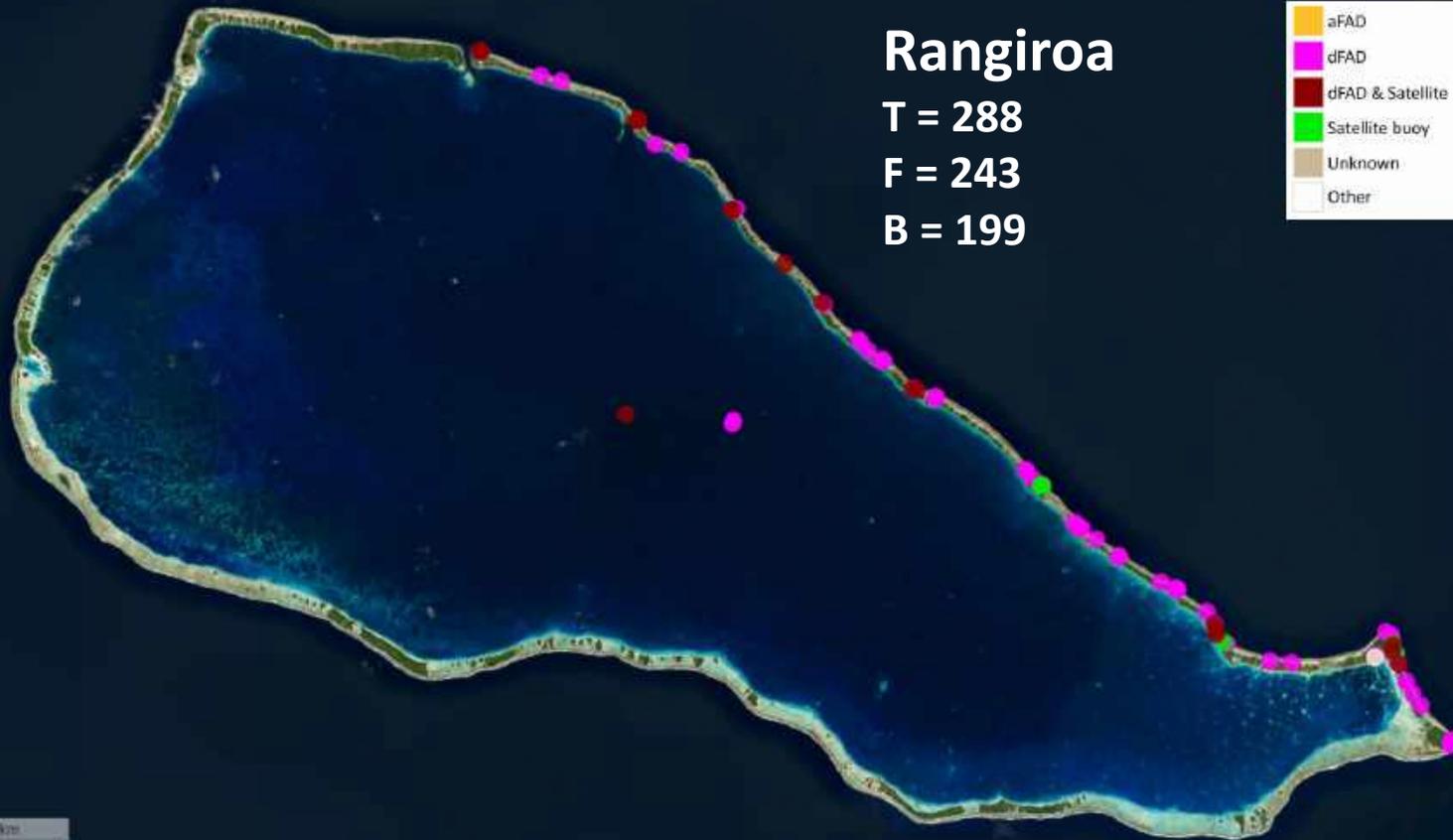
Dedicated surveys  
in 9 Tuamotu islands in 2022



# Spatial distribution of stranding events

## French Polynesia

Dedicated surveys  
in 9 Tuamotu islands in 2022



# Spatial distribution of stranding events

## French Polynesia



Pacific Community  
Communauté du Pacifique



# Spatial distribution of stranding events

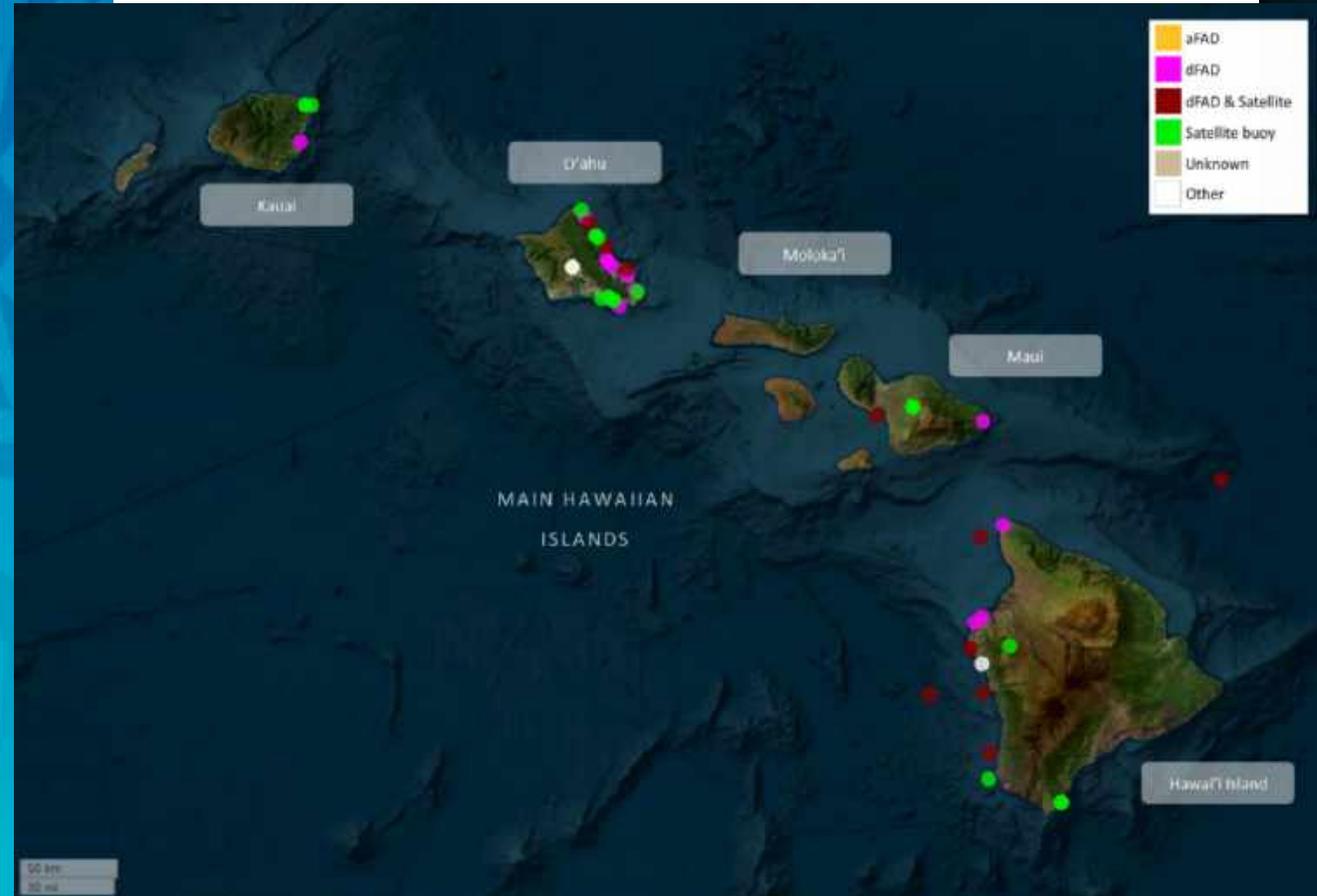
## Other PICTs located to the east of the WCPO



Pacific Community  
Communauté du Pacifique

Palmyra *Palmyra Atoll Program, The Nature Conservancy*

### Hawai'i (main Hawaiian Islands)



### The Cook Islands (Rarotonga and Aitutaki)

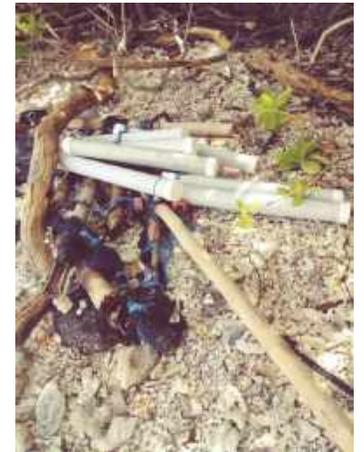


Center for Marine Debris Research (CMDR) at Hawai'i Pacific University

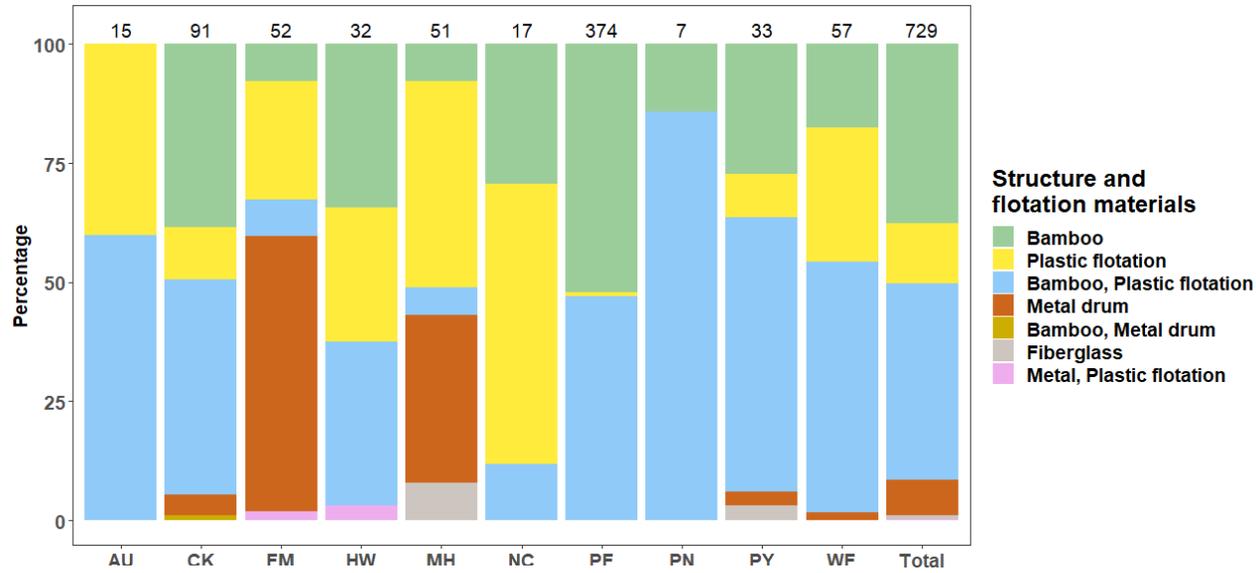
Offshore Fisheries Division, Ministry of Marine Resources

# Type of FADs found stranded

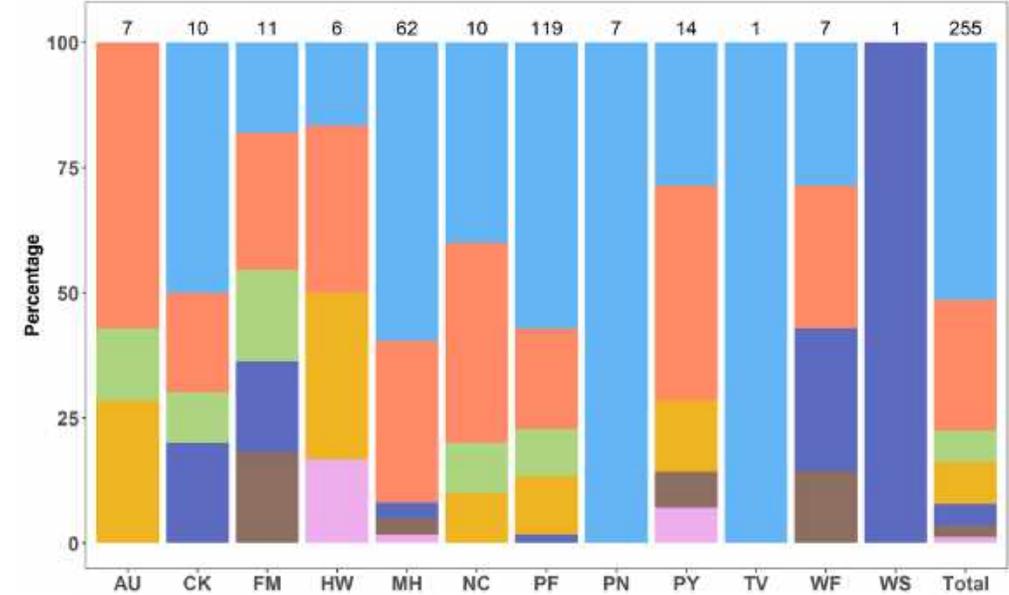
Submerged appendages		
	N	%
Present	482	39.3
Absent	557	45.4
Unknown	187	15.3
Total	1226	



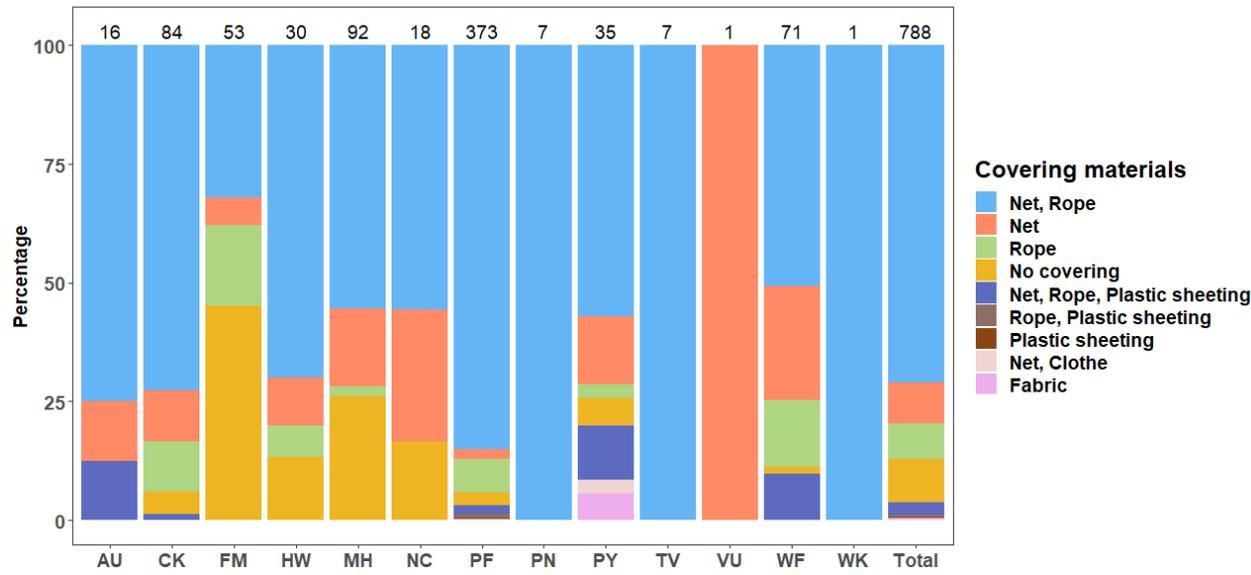
## Structure and flotation



## Submerged appendages



## Raft covering



# Characteristics of FADs found stranded

## Designs

Shape of the raft	Unknown	Rectangular	Square	Cylindrical	Buoy sausage	Octagonal	Boat shape
Percentage	52.9%	24.5%	12.6%	5.1%	4.6%	0.2%	0.1%



Design	Percentages	Mesh net size	Percentages
Unknown design	39.1%	Unknown size	13.4%
Open panel	30.2%	Small (< 7 cm)	47.5%
Rolled up in a bundle	27.2%	Large (≥7cm)	35.6%
Mixed design	3.5%	Small and large	3.5%



# Habitats impacted

	Total
<i>Number of events</i>	2191
<b>ENVIRONMENT</b>	
Unknown	11.2%
Beach	40.3%
Previously collected*	28.8%
Drifting in the ocean	8.1%
Coral reef	5.9%
Shore	3.7%
Drifting in the lagoon	1.7%
Mangrove	0.2%
Anchored in the ocean	0%



Unknown	22.3%	71.2%
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# Environmental impacts



	Total FADs	dFAD	dFAD with tail	dFAD without tail	aFAD
Unknown	54.5%	54.5%	63.9%	35.5%	22.4%
No damage recorded	39.8%	39.8%	26.1%	62.3%	72.4%
Entangled on corals	3%	3%	6.8%	0.2%	3.4%
Entangled on rocks	2%	2%	2.3%	1.8%	0.0%
Entangled with animals	0.6%	0.6%	0.9%	0.2%	1.7%



	Small (<7cm)	Large (≥7cm)	Small and large	Unknown size
Coral damage	22.6% (7)	9.7% (3)	6.5% (2)	35.5% (11)
Rocks damage	12.9% (4)	3.2% (1)	0.0% (0)	9.7% (3)



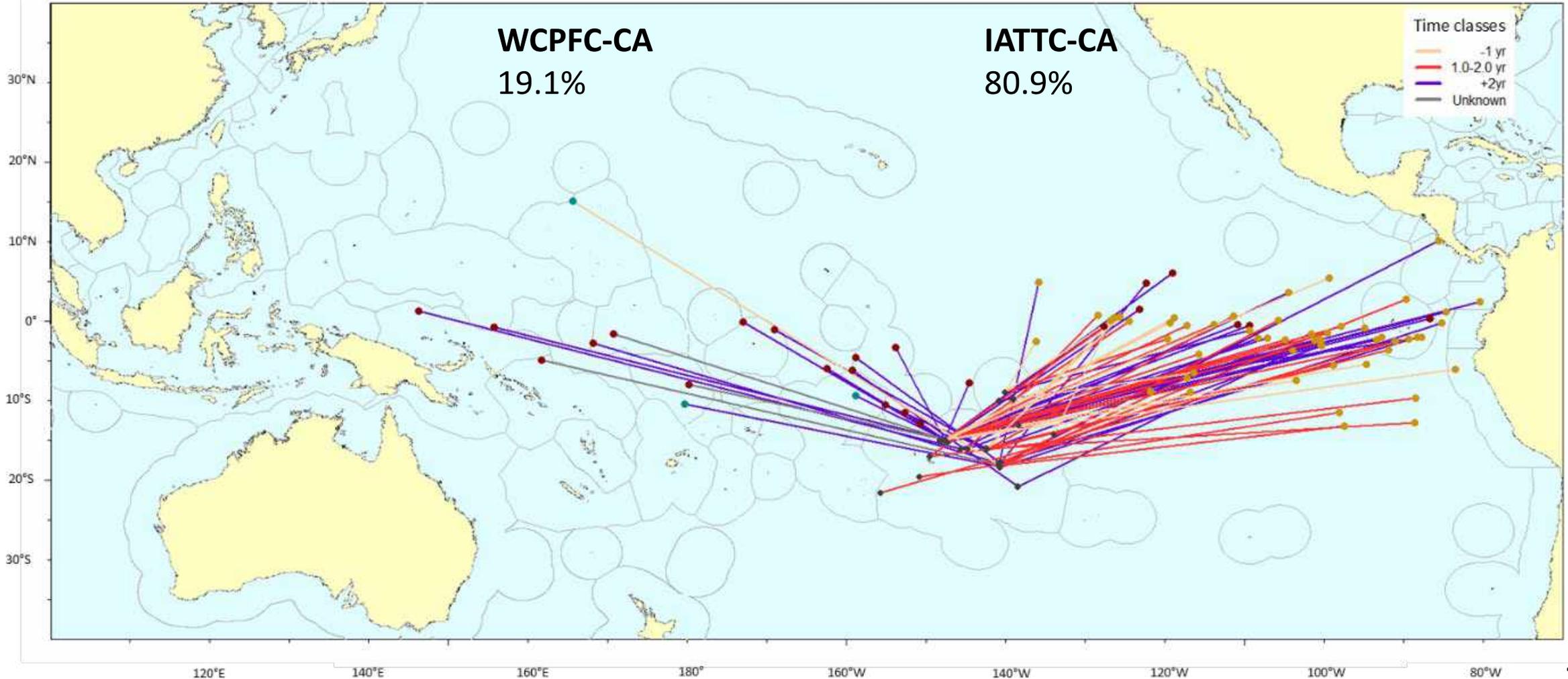
### Origin of buoys found stranded in the Pacific Ocean

- Unique Buoy Identification number – searched in available fishery databases
  - WCPFC and IATTC observer database: last recorded activity on the buoy
  - PNA FAD tracking database: last available transmission from the buoy (position and date)
  
- Marking on the buoy (i.e., vessel name)
  - WCPFC and IATTC online vessel register

# Origin of buoys found stranded

Unique Buoy Identification number – searched in WCPFC observer database (red dots)  
IATTC observer database (orange dots)  
PNA FAD tracking database (blue dots)

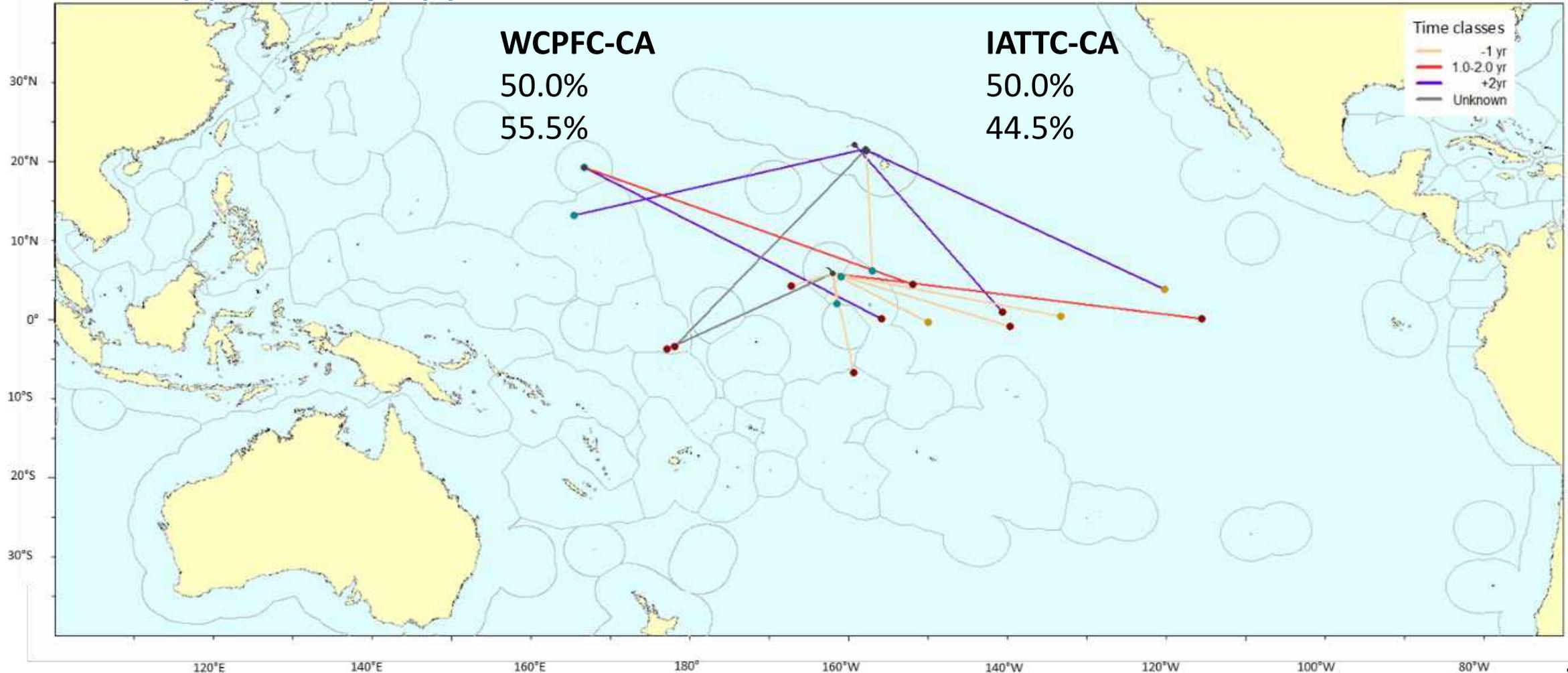
## French Polynesia (85)



# Origin of buoys found stranded

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IATTC observer database (orange dots)  
PNA FAD tracking database (blue dots)

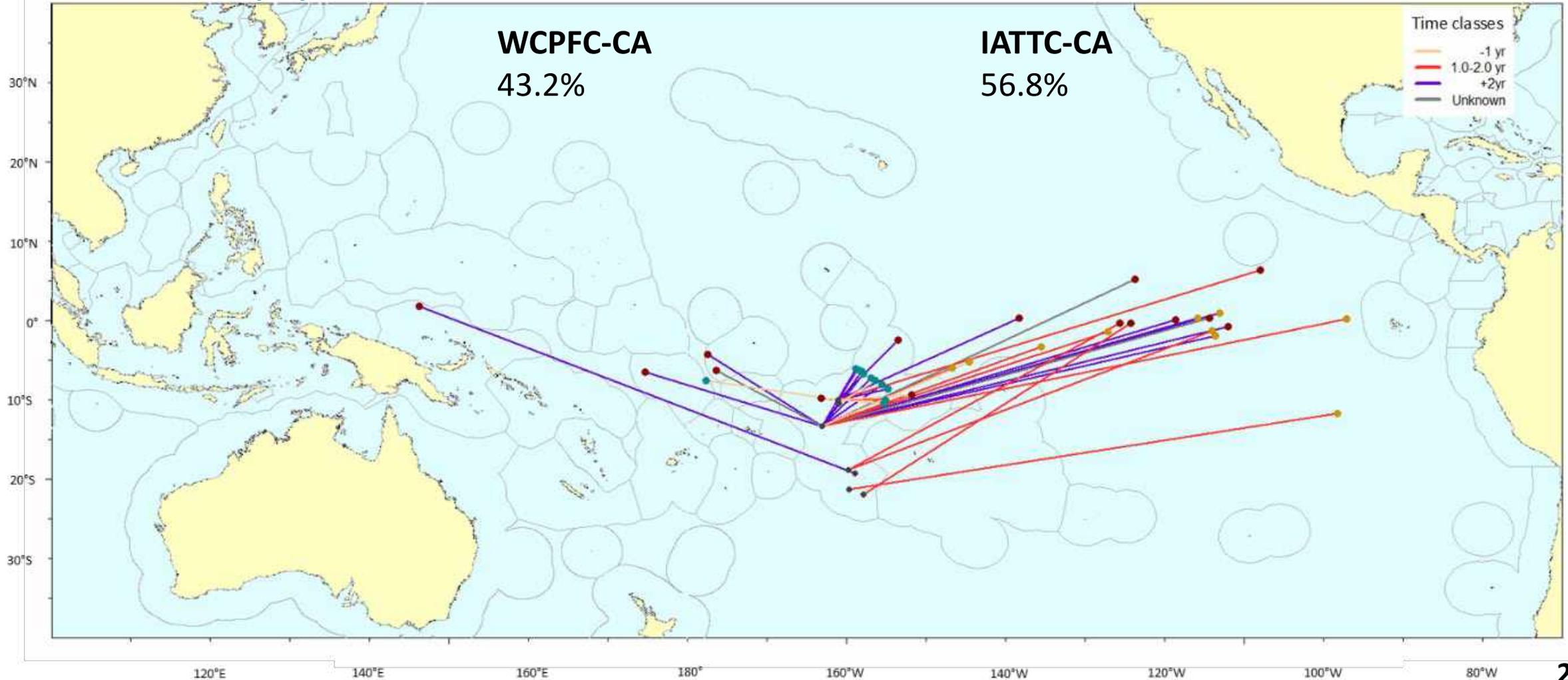
## Hawai'i (5) and Palmyra (9)



# Origin of buoys found stranded

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IATTC observer database (orange dots)  
PNA FAD tracking database (blue dots)

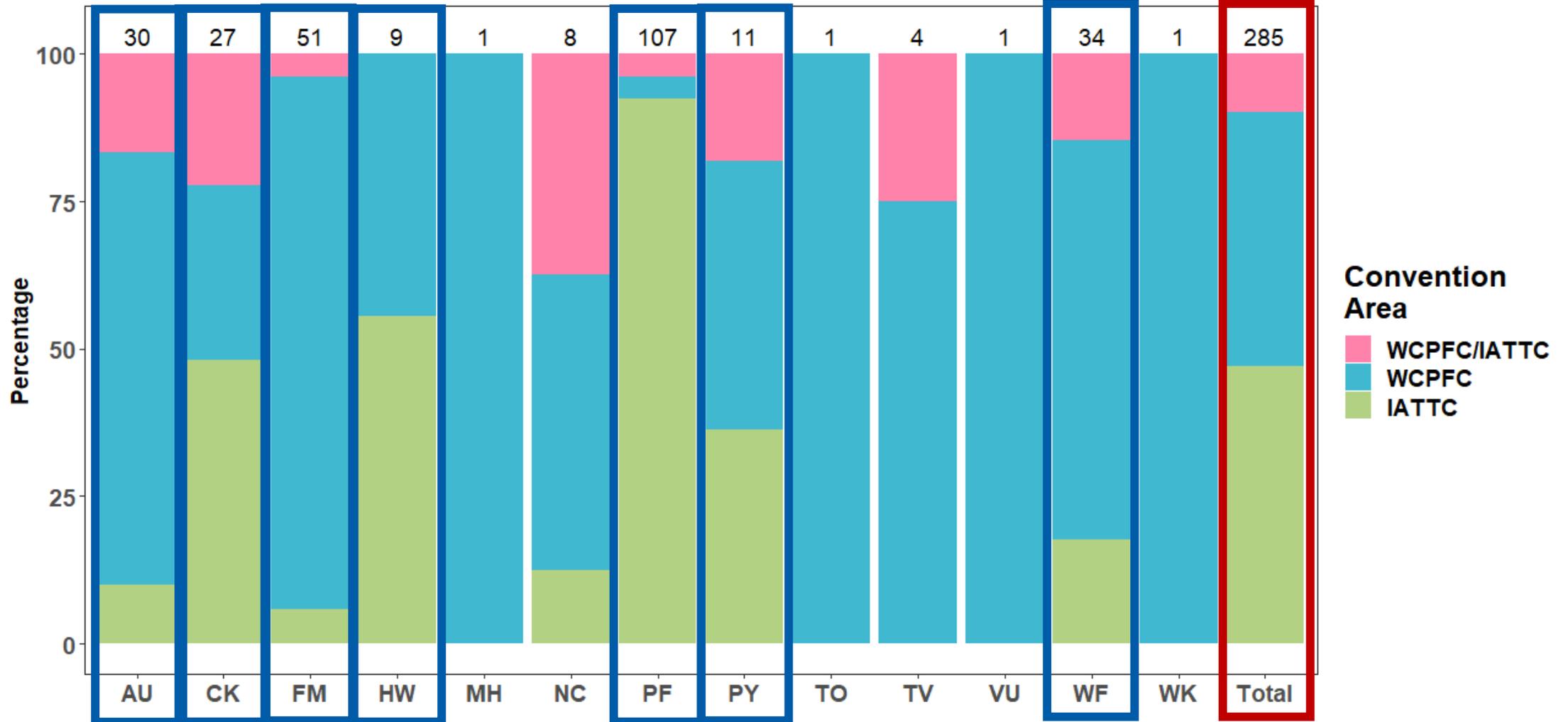
## Cook Islands (36)



# Origin of buoys found stranded

Marking on the buoy (i.e., vessel name)

→ WCPFC and IATTC online vessel register



- Data collection in-country complements trajectory data (when available)
- Stranding events of deactivated buoys or FAD without a buoy
  - Next steps: estimates global number of stranding events
- More detailed information on the characteristic of the stranding event, including environmental impacts
- Many PICTs located in the WCPO present stranding events from dFADs used in the EPO
- Need to collect data in the IATTC-CA
- Need to consider recovery approaches to limit FAD loss and abandonment and mitigation approaches to reduce environmental impacts in coastal environments
- Develop recycling facilities in PICTs, and/or develop initiatives to re-use buoys or FADs (Satlink ReCon project)

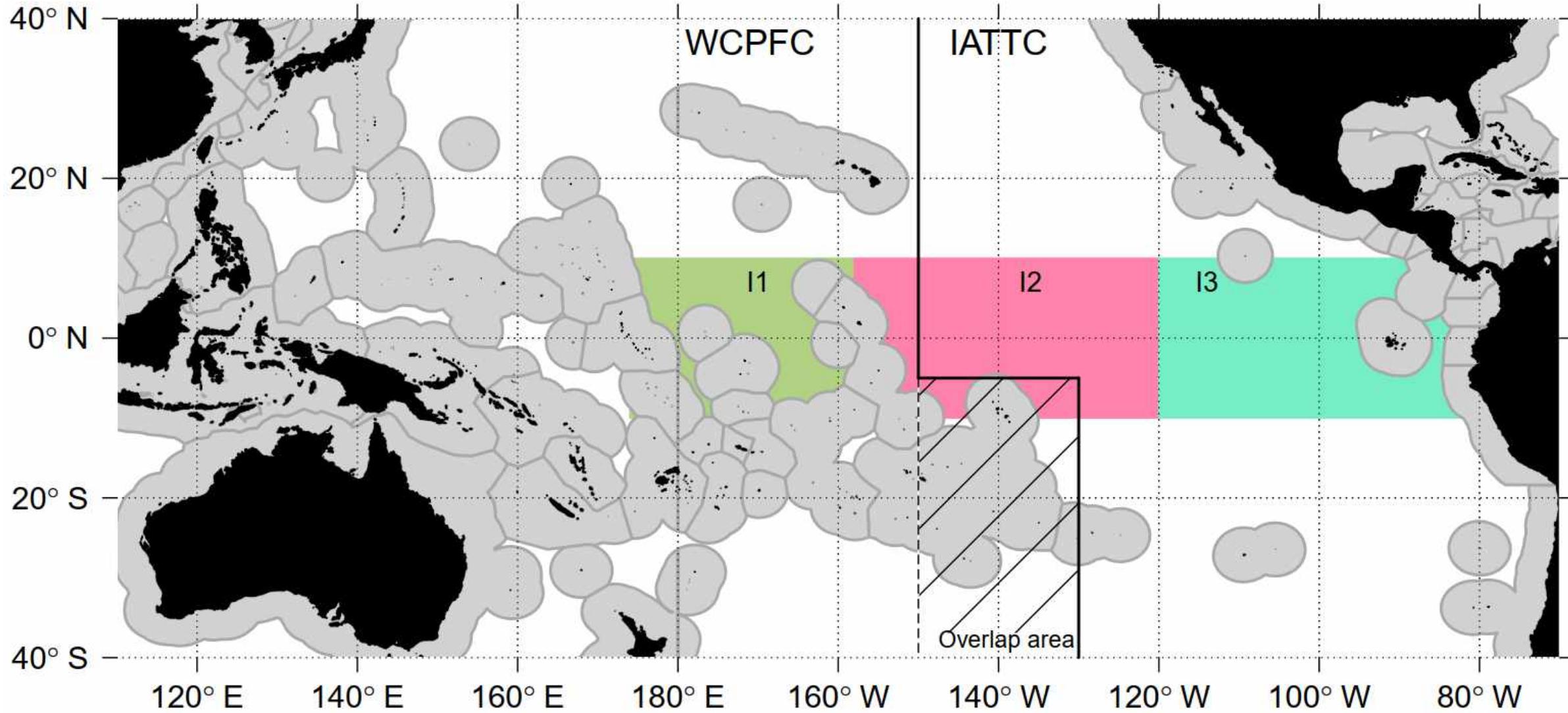
1. Note the preliminary results from analyses of the regional database presented in this paper.
2. Note the need for FAD-buoy trajectory data, including for historical periods, from both the IATTC and WCPFC convention areas to better determine the origin of FADs and buoys found stranded and explore spatial management options to reduce stranding events.
3. Consider the need for in-situ data to be collected to better quantify dFAD stranding events and the impacts of dFADs on marine and coastal ecosystems.
4. Encourage the expansion of the in-country data collection programs to other members of IATTC.
5. Highlight the need to explore potential FAD retrieval programs, before dFADs reach coastal areas, as a measure to mitigate the impacts of lost FADs, and encourage collaboration between companies and management bodies (with or without fees upon retrieval).
6. Consider ways to mitigate impacts of dFADs, develop solutions to process/recycle FAD materials in ports, and provide scientific-based advice to guide the management of dFADs in the Pacific Ocean.



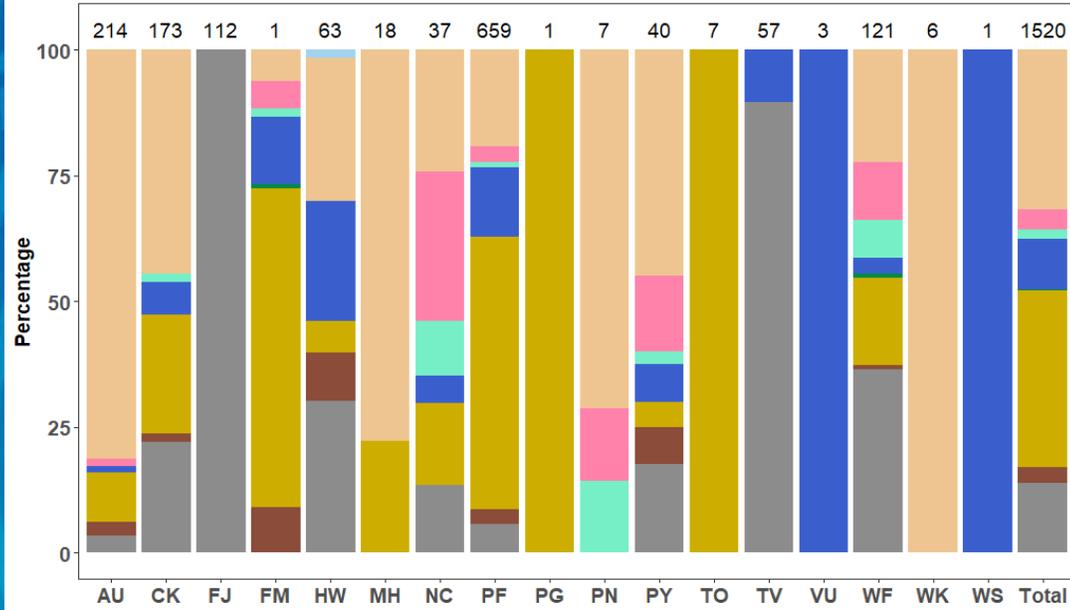
## Acknowledgments

### Jennyfer Mourot and other co-authors

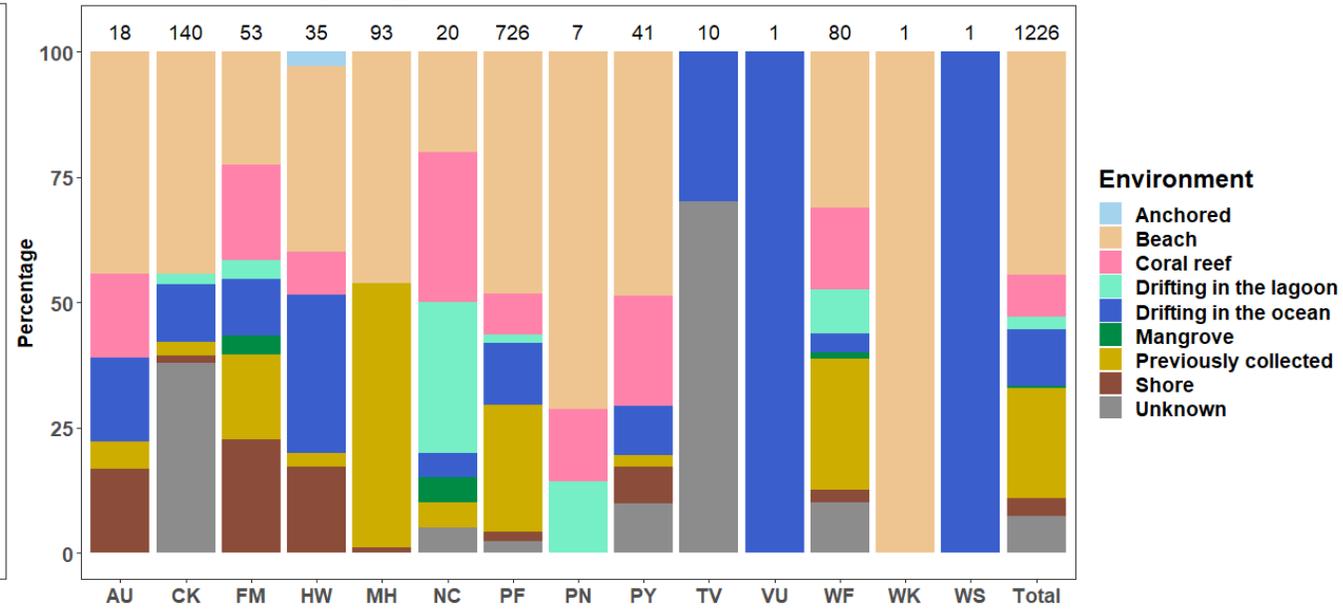
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## Buoys



## FADs



- Environment**
- Anchored
  - Beach
  - Coral reef
  - Drifting in the lagoon
  - Drifting in the ocean
  - Mangrove
  - Previously collected
  - Shore
  - Unknown

