

# Monitoring SSF

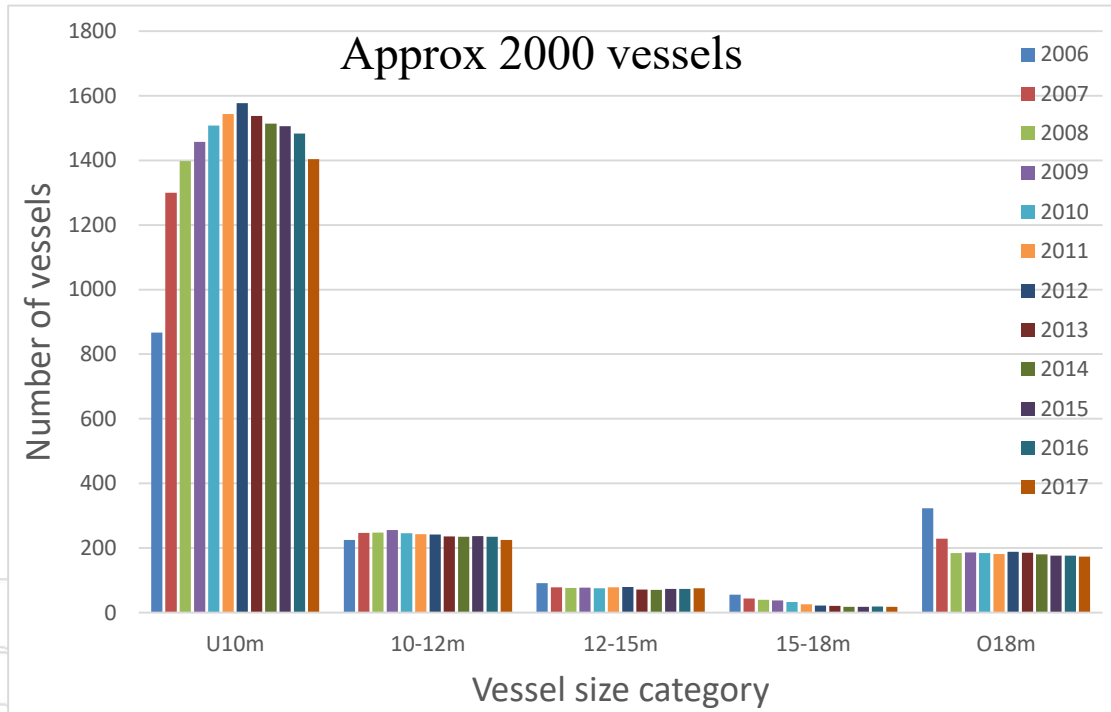
## Detecting fishing events

Oliver Tully  
Fisheries Ecosystems Advisory Services





# Fleet profile Ireland: Input users



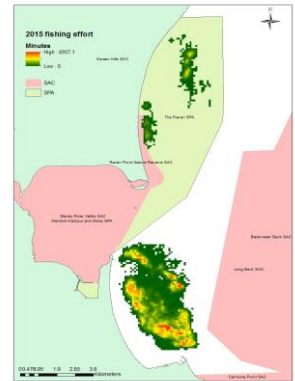
Users: 100 dredgers (mandatory)  
60 potters (voluntary)  
3 netters (voluntary)





# Output users

- Fisheries Scientists (Fisheries Assessment)
- Control authority (landings or fishing effort)
- MSFD pressure and impacts assessments
- Natura 2000 pressure and impacts assessments
- Marine Spatial Planning; the fishing footprint
- Traceability and seafood hygiene regulations
- Spatial Controls; MPAs, restricted areas



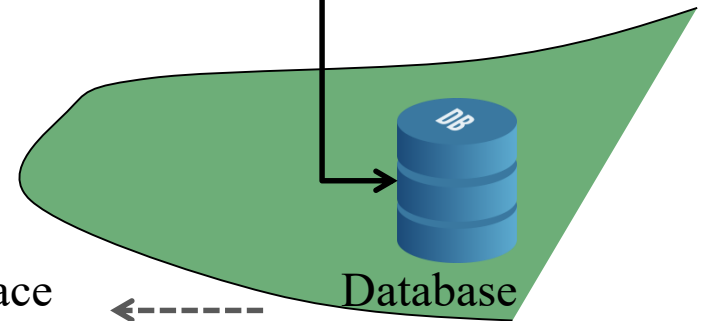
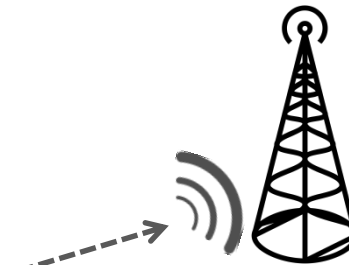
# Digital reporting: Fishing vessel to database via mobile phone network



iVMS unit and gear sensors on fishing vessel

## GPS data

- Location
- Speed
- Course/Bearing
- Gear activity
- Catch report
- High frequency

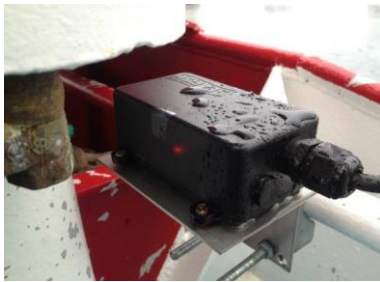


User interface  
via licenced  
login





# Digital Reporting SSF: Pilot Project in Ireland



VMS Unit	Cost	Installation	Data transmission	Annual depreciation
1	€195	€234	€135	€81 (based on swap out rate over 3 years)
2	€670	€150	€130	
3	€290	€250	€42	
<b>Gear sensor</b>				
1	€50	€0	€0	
2	€60	€0	€0	
<b>Gear tag</b>				
1	€1	€0	€0	
<b>Data hosting and visualisation (annual)</b>				
1	€15,000			
2	€12,000			
3				

Currently funded from the EMFF programme







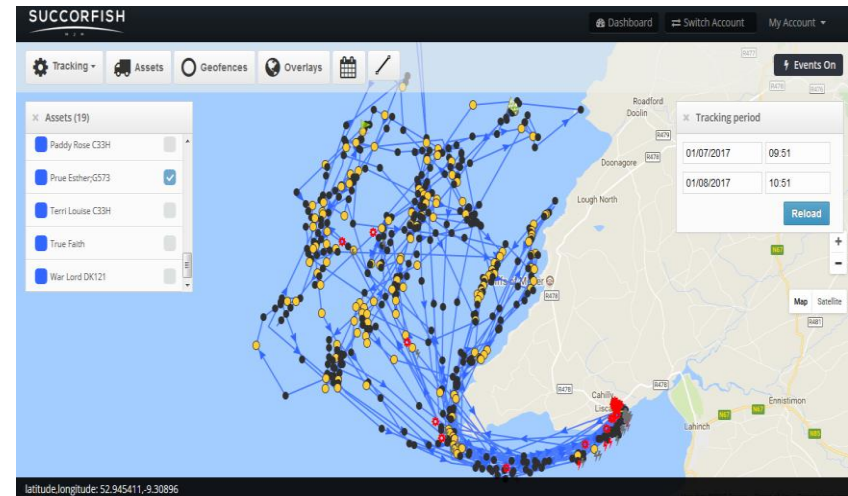
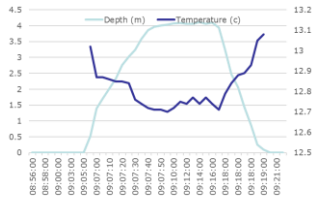
# Digital Reporting SSF: Gear Sensors



RFID reader (wired)



D&T tag (wireless)



GIGO (wireless); binary data

	Cost
RFID	€174
RFID tag	€1
GIGO	€60
GIGO radio	€50
D&T	€270

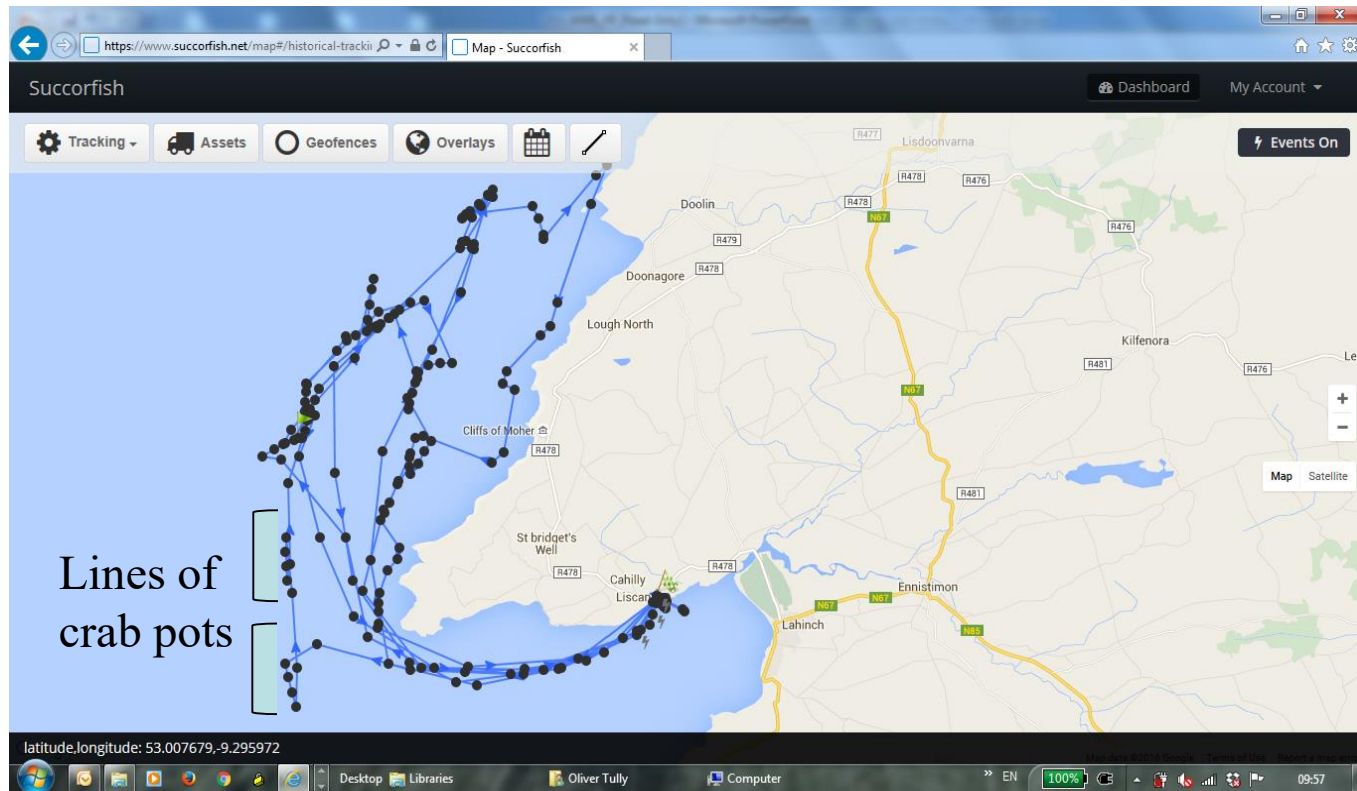


GIGO radio tag 2.4GHz (wireless)



# 'Gear sensor' 2: Data analytics

- ✓ Detecting fishing events without gear sensors
- ✓ Modelling Spatial Pattern in high Frequency VMS data



Lines of  
crab pots

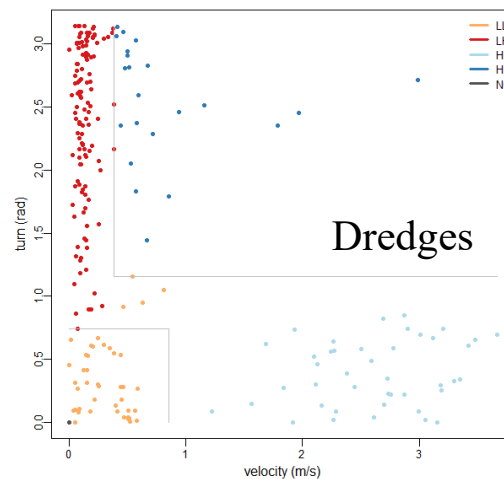
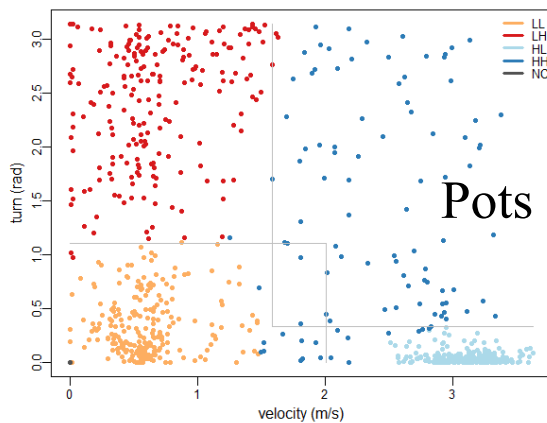
latitude,longitude: 53.007679,-9.295972



# 'Gear sensor' 2: Data analytics

## TWO METHODS

1. EXPECTATION MAXIMISATION BEHAVIOURAL CLUSTERING (EMBC)
2. HIDDEN MARKOV MODEL (HMM)



	Speed mean (m.s)	± sd	Turning angle mean (rad)	± sd	nb locs	Proportion used
State 1 LL	0.59	0.29	0.32	0.28	236	28.78
State 2 LH	0.69	0.4	2.43	0.58	210	25.61
State 3 HL	3.11	0.22	0.05	0.09	272	33.17
State 4 HH	2.51	0.58	1.65	1.03	101	12.32





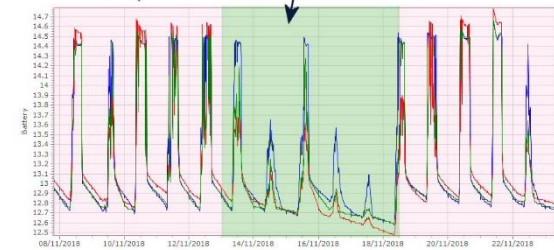
# Recommendations

## ■ VMS

- Need to be independent of vessel power (solar)
- Low costs systems can be sufficiently reliable
- Maintenance SLAs and communication very important
- Data visualisation on mobile devices needs to be improved
- Data integration from multiple device types need to be developed

Normal mixed weather  
with approx 9-10 hour day light

Stormy period with reduced  
solar panel performance



IDS VMS Power/Battery data for three sample boats over 2 weeks up to 23rd Nov 2018

## ■ Gear Sensors

- Need to be wireless; minimise disruption and costs
- Data analytical methods can probably provide the same information

## ■ SSF monitoring

- Scale up costs significant (1000s of vessels)
- Monitoring requirements vary case by case; targeted approach needed
- Data integration and management is a significant cost
- Data analytics may be a key element

