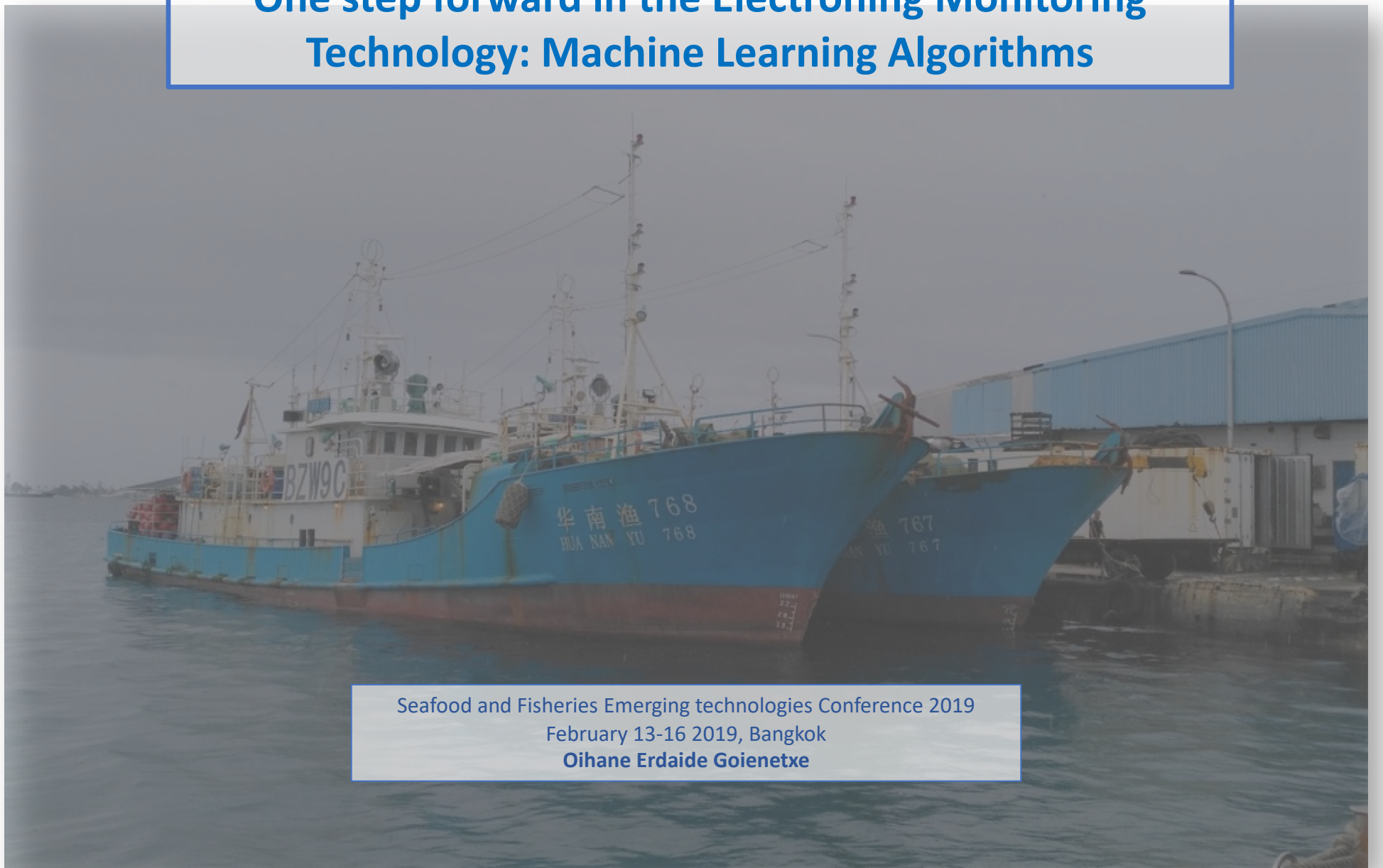
One step forward in the Electroning Monitoring Technology: Machine Learning Algorithms

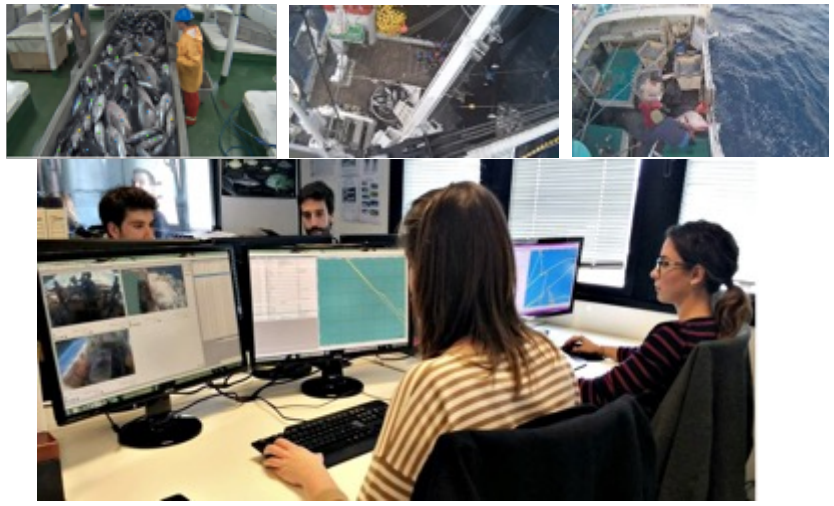


Seafood and Fisheries Emerging technologies Conference 2019
February 13-16 2019, Bangkok

Oihane Erdaide Goienetxe

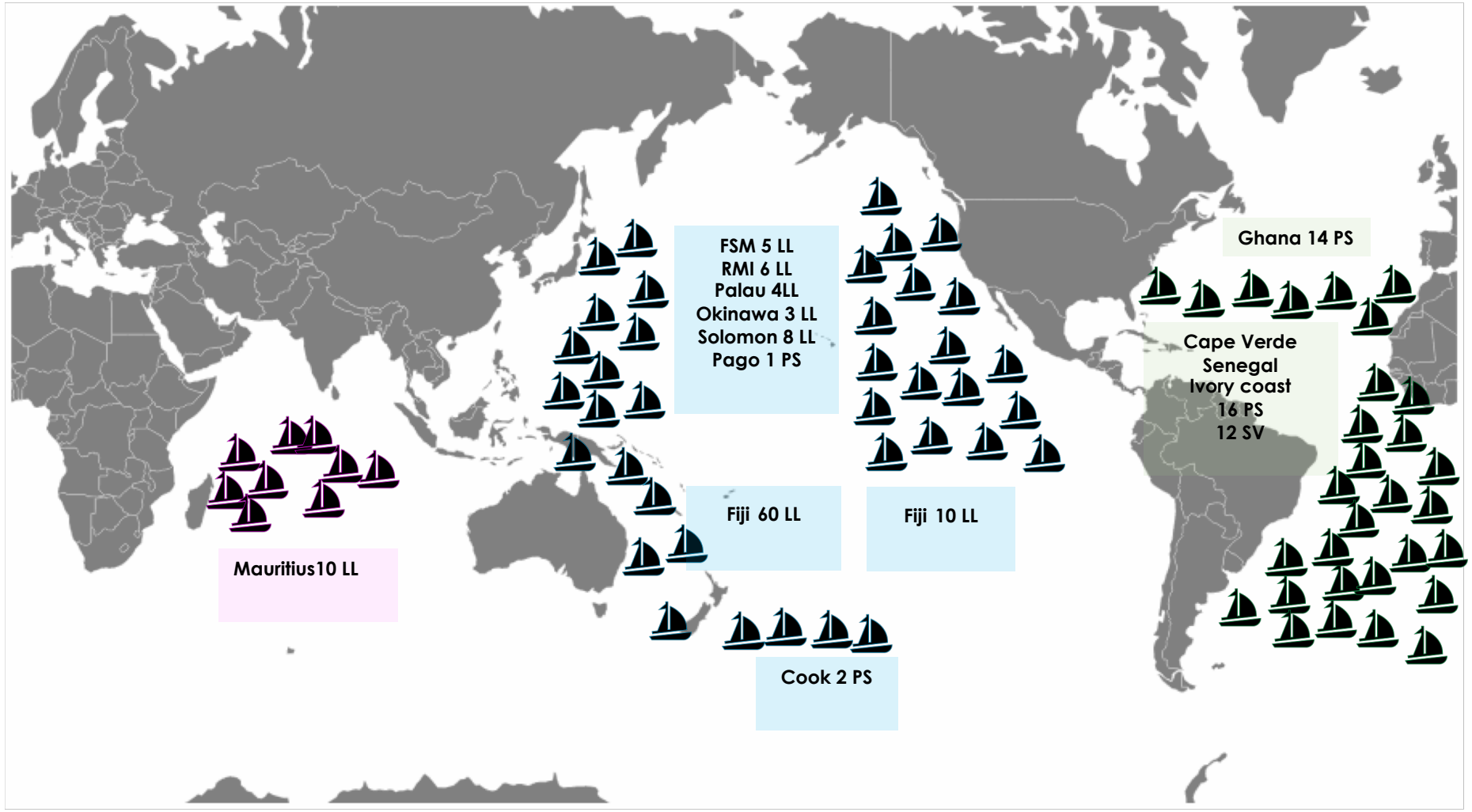
Digital Observer Services

- Independent fisheries consultancy
- Certified Electronic Monitoring (EM) service provider
- 14 observers with office based in Spain.
- Scientist, private companies, RFMO'S, NGO's etc.
- Implementation of EM autonomous Data Review Centers (DRC) worldwide.



Ongoing Projects

LL: Longline **PS:** Purse Seine **SV:** Supply Vessel

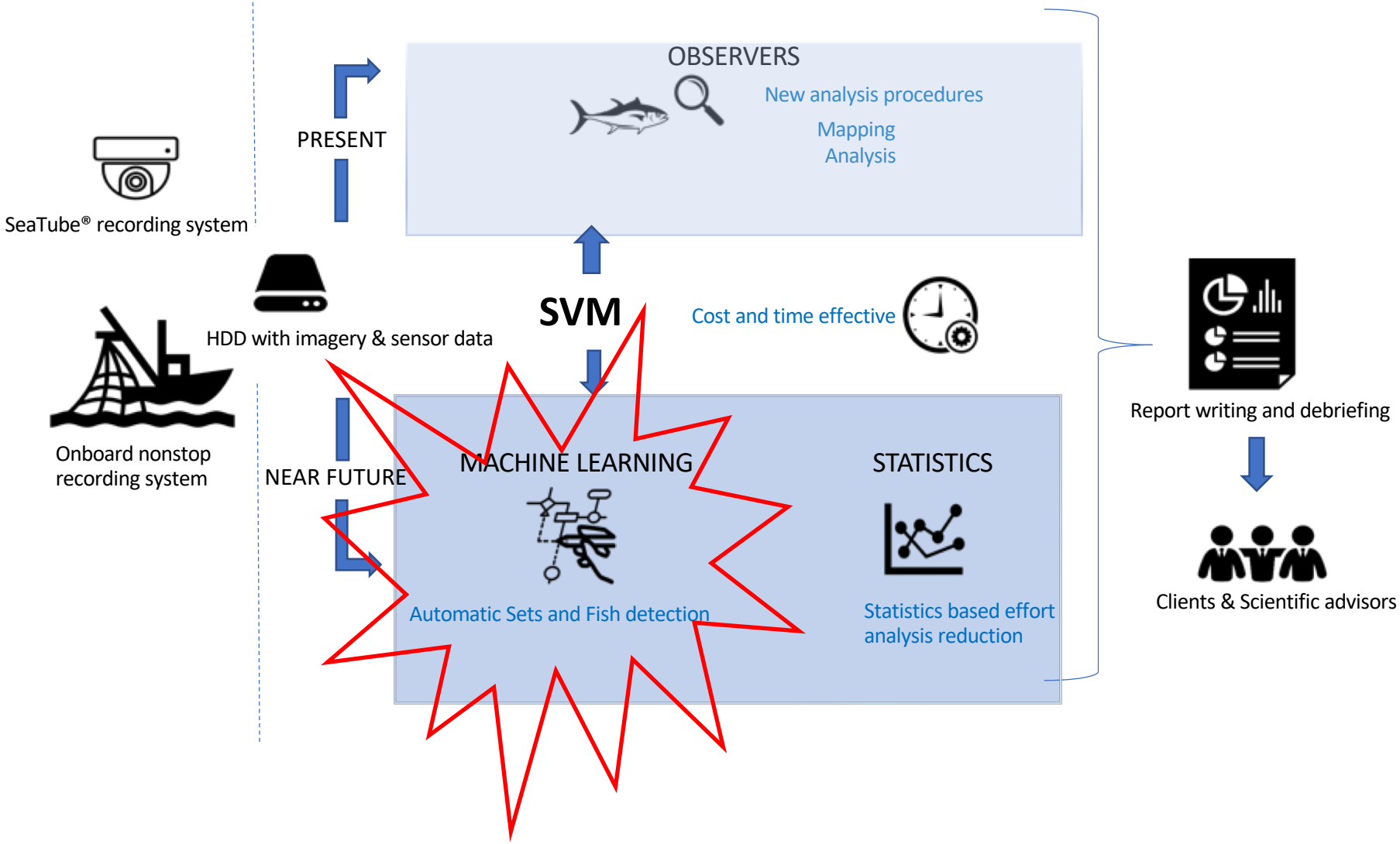


Capacity Building

143 Observers trained

10 Data Review Centers

How it works (general scheme)



So far at DOS……

✓ 144 vessels monitored daily

✓ Transshipments Events detections

✓ 36.564 Sea days analyzed
✓ Information of 996 Trips

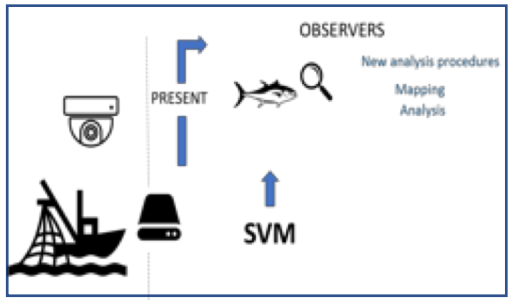
✓ Discards Events detections

✓ Each bycatch individuals registered

✓ Shark finning Events detections

ML APPLICATION WE CAN SAVE MUCH MORE TIME!

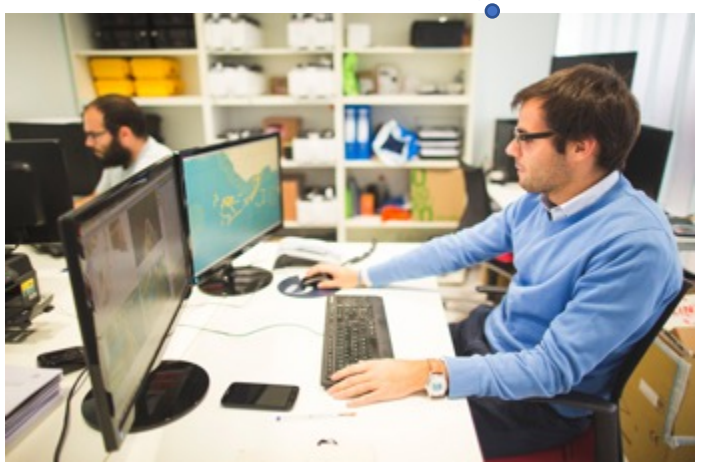
Observers at PRESENT analysis



@*%?****!!

Video files

Meta data

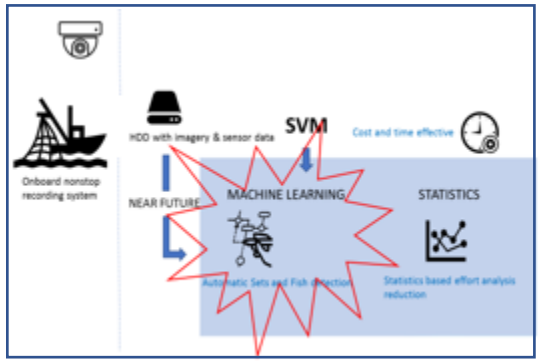


Onboard nonstop recording system

HDD with imagery & metadata

Observers on SVM need to find and declare all the Fishing events as well as cath/bycath identification.

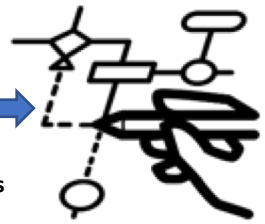
Observer in the NEAR FUTURE with ML



Video files

Metadata files

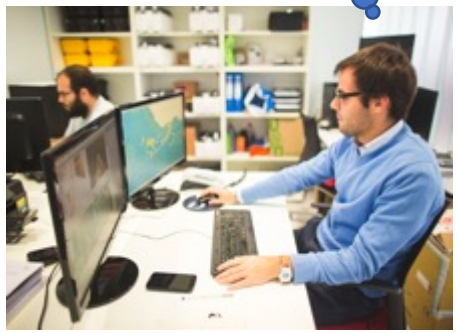
ML



Video files

Metadata

ML Processed data



Observers have sets and fish detection identified.
They only need to determine the species

Algorithms and Machine Learning

Purse Seiner Analysis

QUICK Analysis (based on METADATA)	Detailed Analysis (based on VIDEO)
Trip start/ Trip End	Brailing detections per set • Total number of brails per set • Automatized catch estimate per brail (ongoing Project)
Fishing start/ Fishing end per set	

Fishing Effort

Current results: ~ 99% accuracy

Catch Estimation

Current results: > 99% accuracy

ML Processed data

Algorithms and Machine Learning

Longline Analysis




QUICK Analysis (based on METADATA)	DETAILED Analysis (based on VIDEO)
Trip start/ Trip End	Fish detection onboard
Setting start/Setting End per set Hauling Start/Hauling End per set	• Only during Hauling (pre-filtered videos) • Fish Identification (ongoing Project)

Fishing Effort
Current results: ~90% of accuracy

Catch Estimation
Current results: ~ 75% of accuracy

ML Processed data

Automatic SET detection

Trained Algorithm:

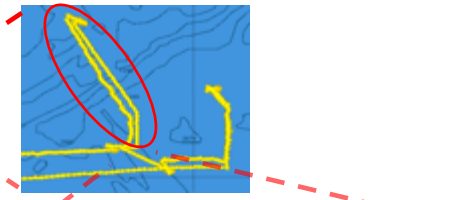
Input GPS list: Date/ Time/ Long/ Lat/Speed Course

Gps List

Date	Hour	Latitude	Longitude	Speed	Course
2017-09-15	10:58	-20.1577	57.498	0.0	
2017-09-15	10:58	-20.1577	57.498	0.0	
2017-09-15	10:58	-20.1577	57.498	0.0	
2017-09-15	11:08	-20.1577	57.498	0.0	
2017-09-15	11:08	-20.1577	57.498	0.0	
2017-09-15	11:08	-20.1577	57.498	0.0	
2017-09-15	11:18	-20.1577	57.498	0.0	
2017-09-15	11:18	-20.1577	57.498	0.0	
2017-09-15	11:18	-20.1577	57.498	0.0	
2017-09-15	11:28	-20.1577	57.498	0.0	
2017-09-15	11:28	-20.1577	57.498	0.0	
2017-09-15	11:28	-20.1577	57.498	0.0	
2017-09-15	11:43	-20.1577	57.498	0.0	

Recognition results:

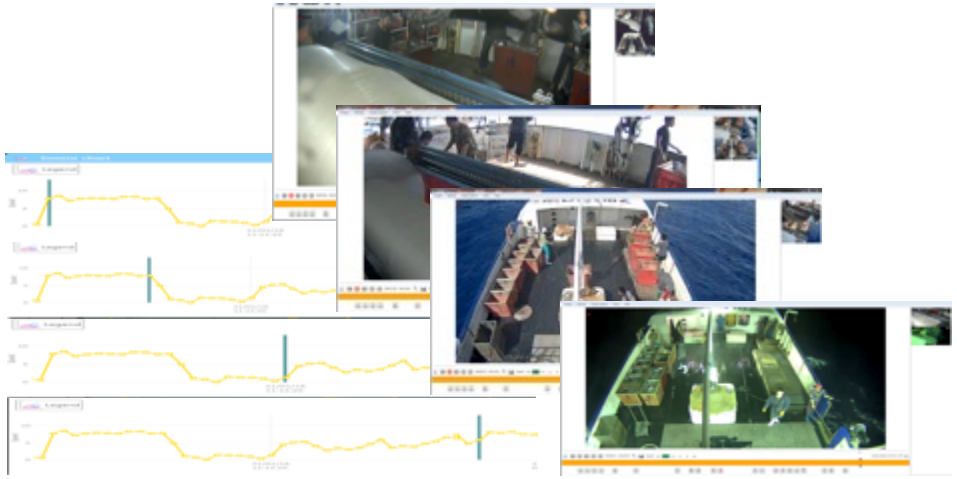
Processing Sets detection:



position (Date/time/Long/Lat) detected

1) Setting Start
2) Setting End
3) Hauling Start
4) Hauling End

Date / Time	Cam	I	Item type	Notes (Edi captions)	Data
12/01/2017 3:05:03	2		Report start	Trip Number: 20170112 Port Code: FJSUV Project Is Master For Other Sets: Y	
16/01/2017 17:02:36	1		Setting start	Set Number: 001 Note:	SetNo 1
16/01/2017 23:06:55	1		Setting end	Note:	Setting time 06:04:19
17/01/2017 3:57:39	2		Hauling start	Note:	
17/01/2017 14:31:53	2		Hauling end	Note:	Hauling time 10:34:14 Soak time 21:29:17
23/01/2017 17:40:17	1		Setting start	Set Number: 002 Note:	SetNo 2
23/01/2017 23:42:25	1		Setting end	Note:	Setting time 06:02:08
24/01/2017 4:20:15	2		Hauling start	Note:	
24/01/2017 17:16:06	2		Hauling end	Note:	Hauling time 12:55:51

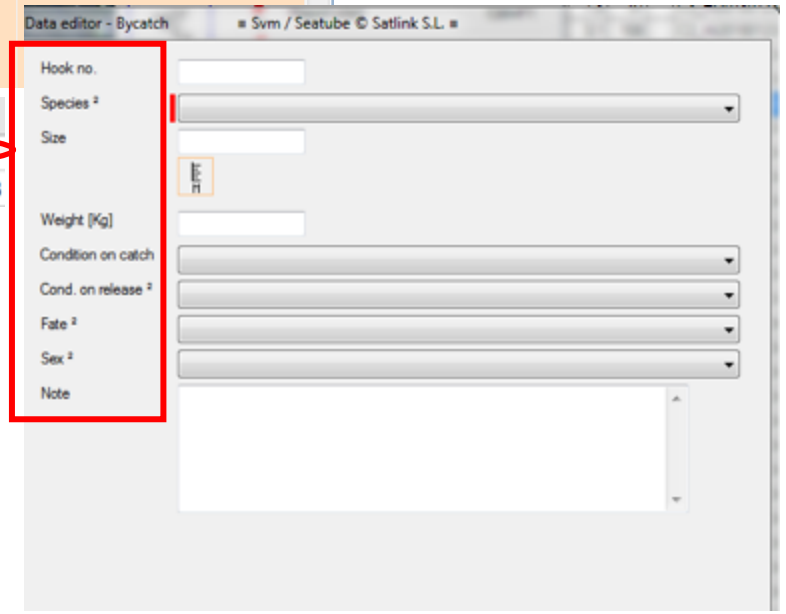


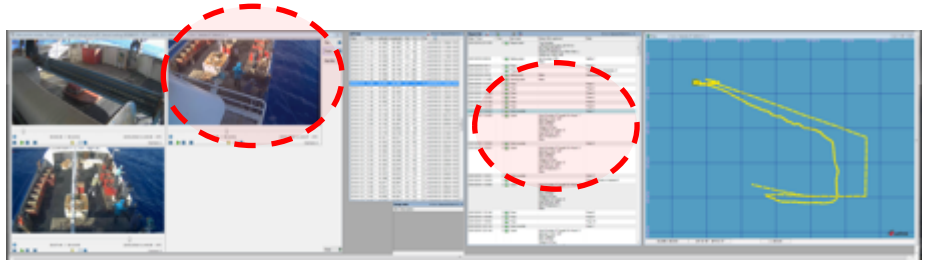
Automatic FISH detection

Report list ≡ Svm / Seatube © Satlink S.L. ≡

Date / Time	Cam	i	Item type	Notes (Edi captions)	Data
22/01/2018 23:10:36	2		Report start	Trip Number: LuRongYuanYu202_20170114 Port Code: MUPLU Project Is Master For Other Sets: y Observer Code: SAB	
23/01/2018 0:08:36	1		Setting start	Set Number: 005 Note:	SetNo 1
23/01/2018 6:18:11	1		Float		Float 1
23/01/2018 6:18:21	1		Float total		Total number of baskets: 0
23/01/2018 6:18:39	1		Setting end	Note:	Setting time 06:10:03
23/01/2018 11:14:05	2		Hauling start	Note:	
23/01/2018 11:14:17	2		Float		Float 1
23/01/2018 11:18:09	2		Float		Float 2
23/01/2018 11:23:06	2		Float		Float 3
23/01/2018 11:26:58	2		Float		Float 4
23/01/2018 11:31:08	2		Float		Float 5
23/01/2018 11:32:38	2		Float		Float 6
23/01/2018 11:34:43	2		Hook counter		Hook 1
23/01/2018 11:34:48	2		Bycatch	Hook Number If Caught On Hook: Species Code: Size Of Fish: Weight Of Fish: Condition On Catch: Condition On Released From Gear: Fate Of Fish: Sex Of Species: Note:	

	A	B	C	D	E
	Set nº	Date (bycatch)	Time (bycatch)	long	lat
1	1	16/04/2017	4:58:03	179,3028	-12,0023





Conclusions

- Machine learning implementation help greatly reducing the time analysis to the observer
- Cost effective system
- Increase the coverage, allowing to collect data for all the gear types
- Quality and refutable data
- Further development is needed on Machine Learning to increase the accuracy of detections

Thank you for your attention!

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