



IPATCH: Collection and Fusion of Maritime Piracy Data

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32 ISMOR

Modern Maritime Piracy



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IPATCH receives funding from the EC FP7 Security Programme

Modern Maritime Piracy



Countermeasures



Are they working?

- Has piracy declined?
- Which countermeasures are best...?

Intelligent **P**iracy **A**voidance using **T**hreat detection and **C**ountermeasure **H**euristics

- **Co-funded** by the European Commission's 7th Framework Programme (FP7)
- **Started:** April 2014
- **Duration:** 3 years
- **Budget:** €5m

Consortium



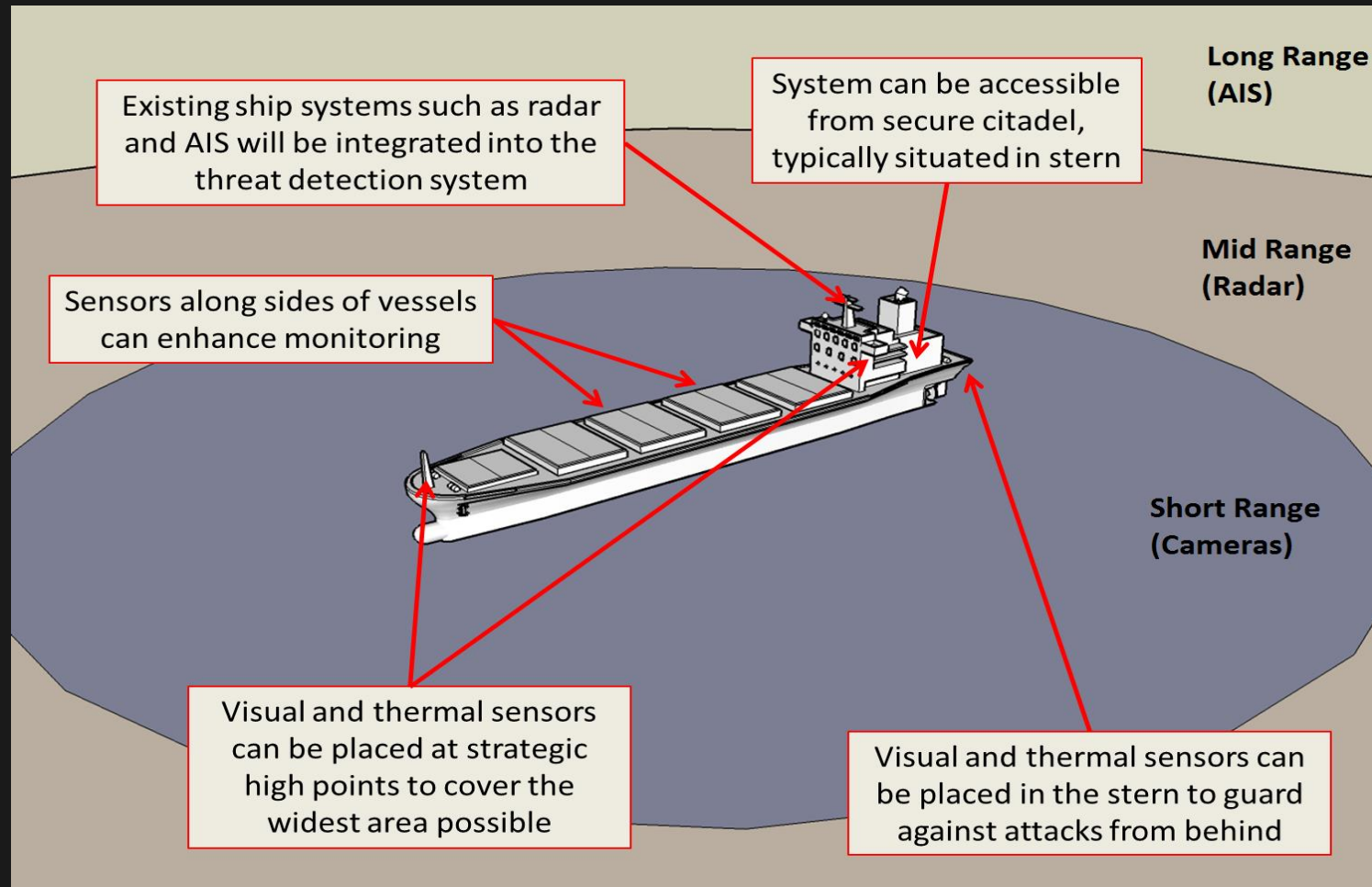
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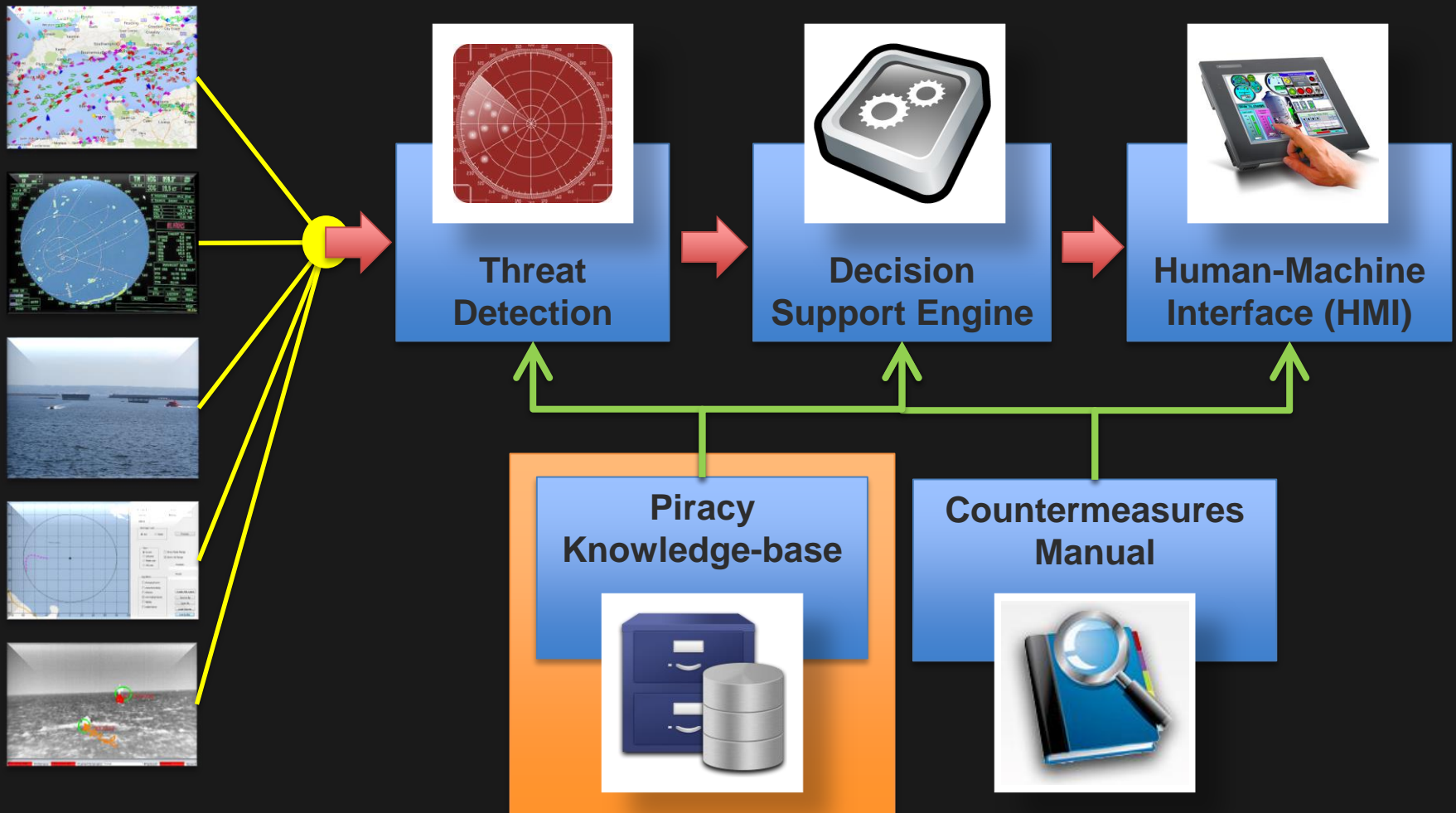
OR Objective

Conduct a rigorous analysis of reported piracy incidents to determine – and ideally quantify – the different ways pirates operate, and how effective different countermeasures are under different conditions

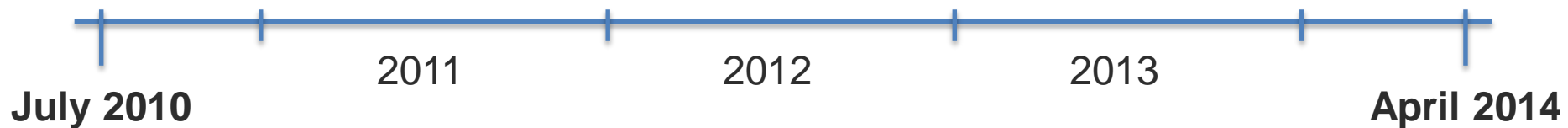
On-board System Concept



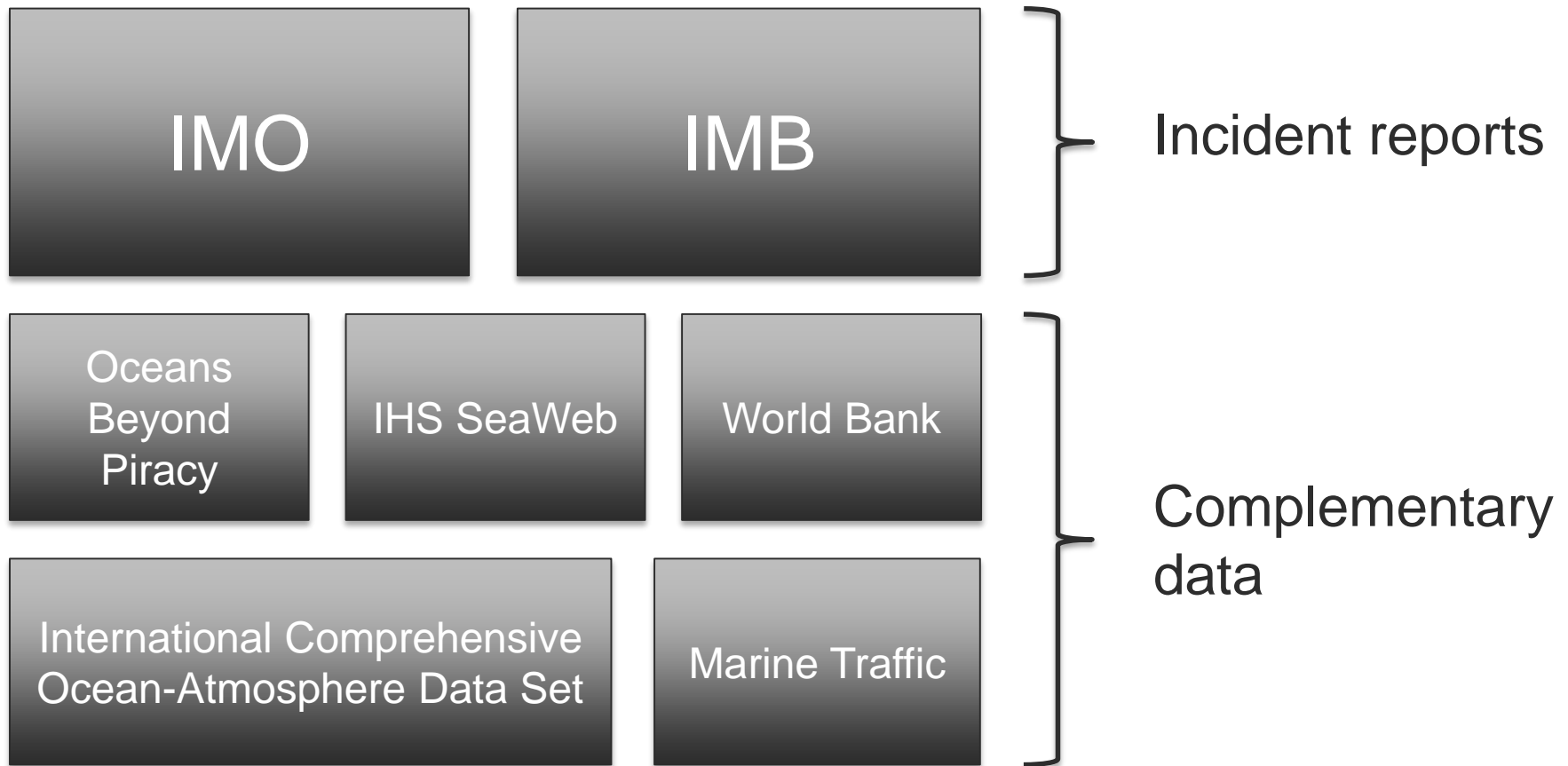
On-board System Concept



Analysis Scope



Raw Data



Raw Data

“Details of the Incident” (IMO):

“While underway, a suspected mother vessel disguised as a fishing vessel deployed six high speed skiffs which chased the ship. The suspected pirates on board the skiffs, who were armed with guns, circled around the ship and attempted to board it. The Master raised the alarm and made call to General Quarters (GQ), following which the water spray system was activated, speed was increased, evasive manoeuvres taken, while continuous security messages were also broadcast. Furthermore the Philippines Navy was contacted for assistance. Upon hearing the Philippines Navy’s response, the skiffs aborted the attempted attack and moved away. Alarm raised and Master made call to General Quarters (GQ). Water spray system activated, speed increased, evasive manoeuvres taken and continuous security messages broadcast.”

“Twelve pirates armed with guns hijacked the ship during ship-to-ship operations”

Rationalisation

Six pirates armed with guns and RPGs in a skiff approached the tanker underway from the STBD beam and started firing. [...]

[...] The ship sustained some damage to accommodation, superstructure and one liferaft.

Rationalisation

Six pirates armed with guns and RPGs in a skiff approached the tanker underway from the starboard beam and started firing.

[...] Alarm raised, fire pumps activated, evasive manoeuvres made and armed team made their presence known. The skiff later stopped their approach and the tanker continued her passage. [...]

[...] The ship sustained some damage to accommodation, and one liferaft.

Rationalisation

Six pirates armed with guns and RPGs in a skiff

approached the tanker underway from the starboard beam and started firing

[...] Alarm raised, fire pumps activated, evasive manoeuvres made and armed team made their presence

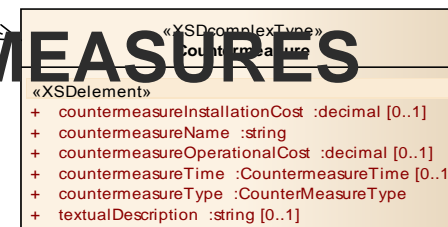
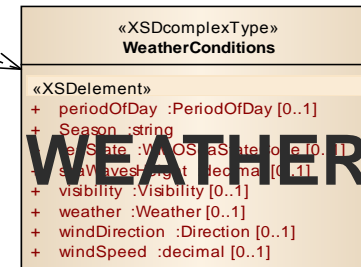
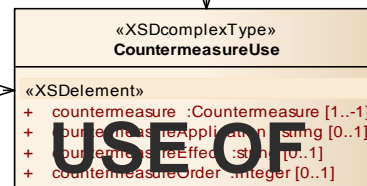
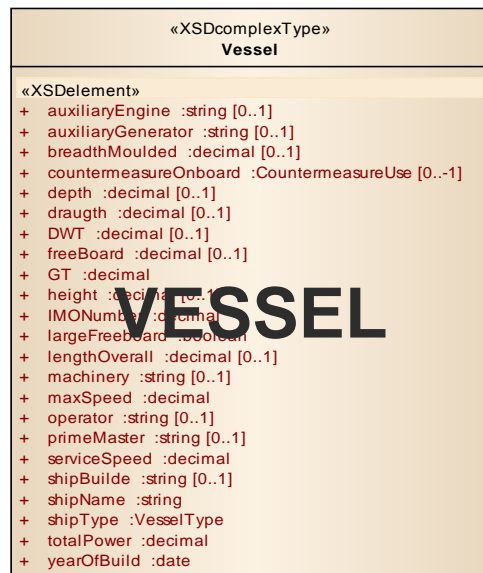
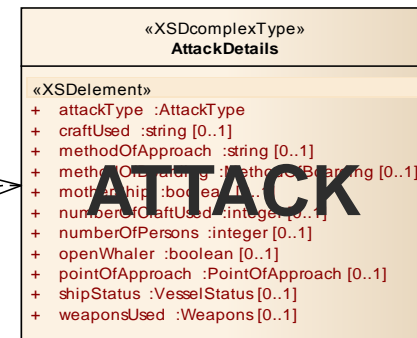
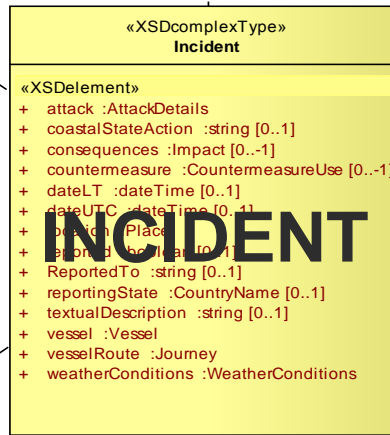
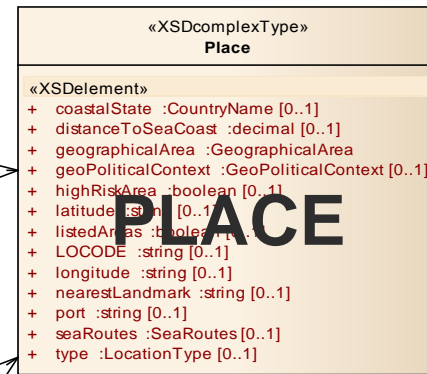
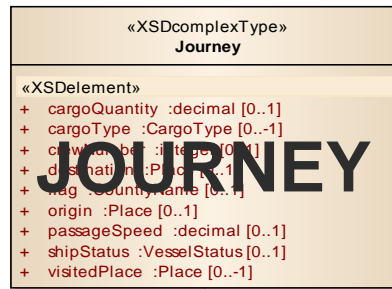
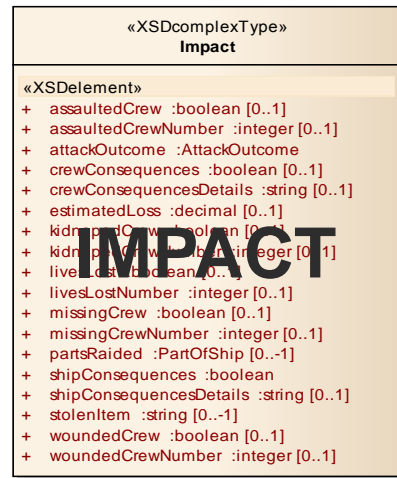
[...] The ship sustained some damage to accommodation, and one liferaft.

The vessel was en route from Adabiya, Egypt, to Singapore and carrying 19,475m of steel cable and a crew of 21 on board. [...]

The skiff later stopped and the tanker resumed passage. [...]

[...] Four crew were badly injured.





JOURNEY

PLACE

INCIDENT

ATTACK

VESSEL

COUNTERMEASURE USE OF

WEATHER

COUNTERMEASURES

Final Database

830 incident records

- July 2010 to April 2014
- East and West Africa

99 variables

Challenges

- Labour-intensive process
- Low data quality
 - missing/incomplete data
 - vague descriptions
- Varying granularities of data

Challenges

- Reporting bias
 - unsuccessful/near-misses not reported
- Non-reporting
 - successful attacks may not be reported

...weak mathematical foundation

Early Results

Goal: predict probability of success and level of harm

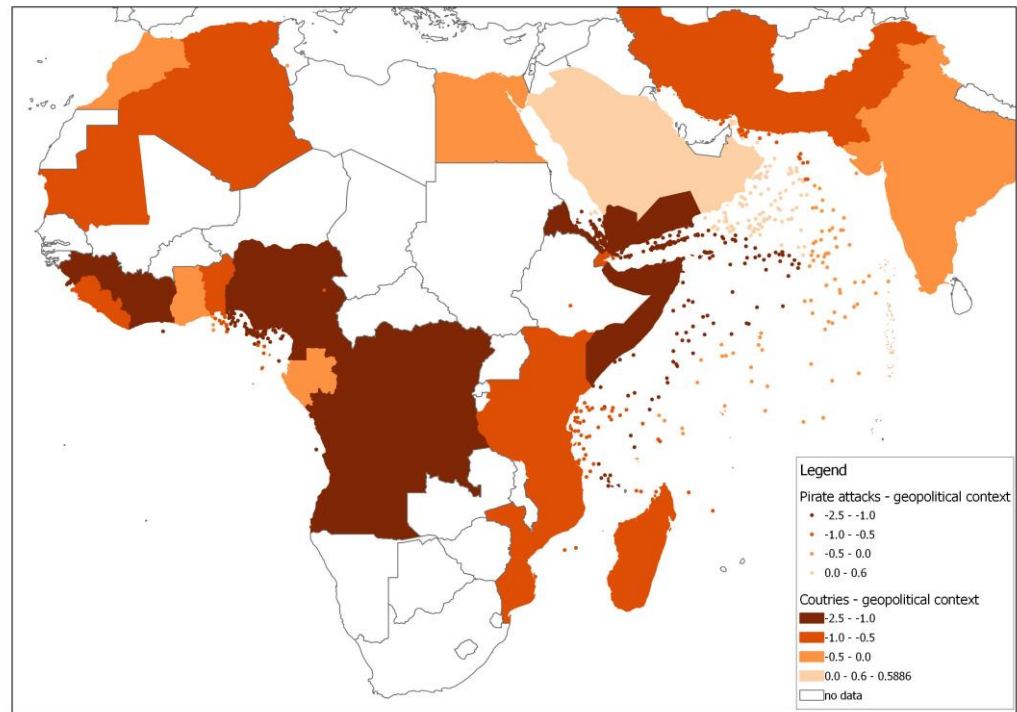
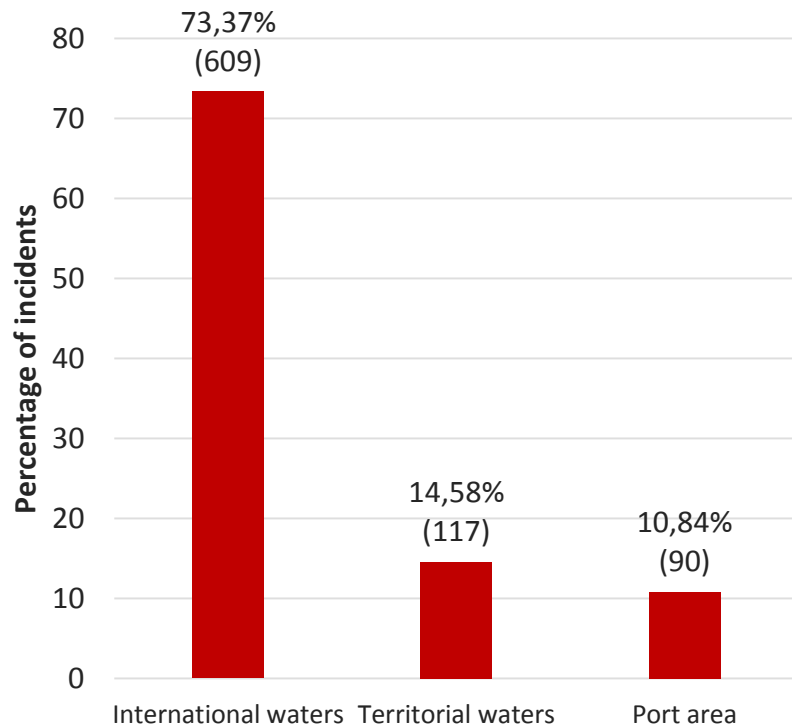
- Selection of ‘good’ variables
- Basic frequentist ‘probabilities’
- Logistic regression

'Good' Variables

Dimensions	Variables
Where	Geographical area
	Geopolitical context
	Distance to sea coast
	Sea routes
Who & How	Weapon used
	Number of craft used
	Mothership
Whom	Ship Type
	Ship status
	Service speed
	Gross tonnage
When	Period of the day

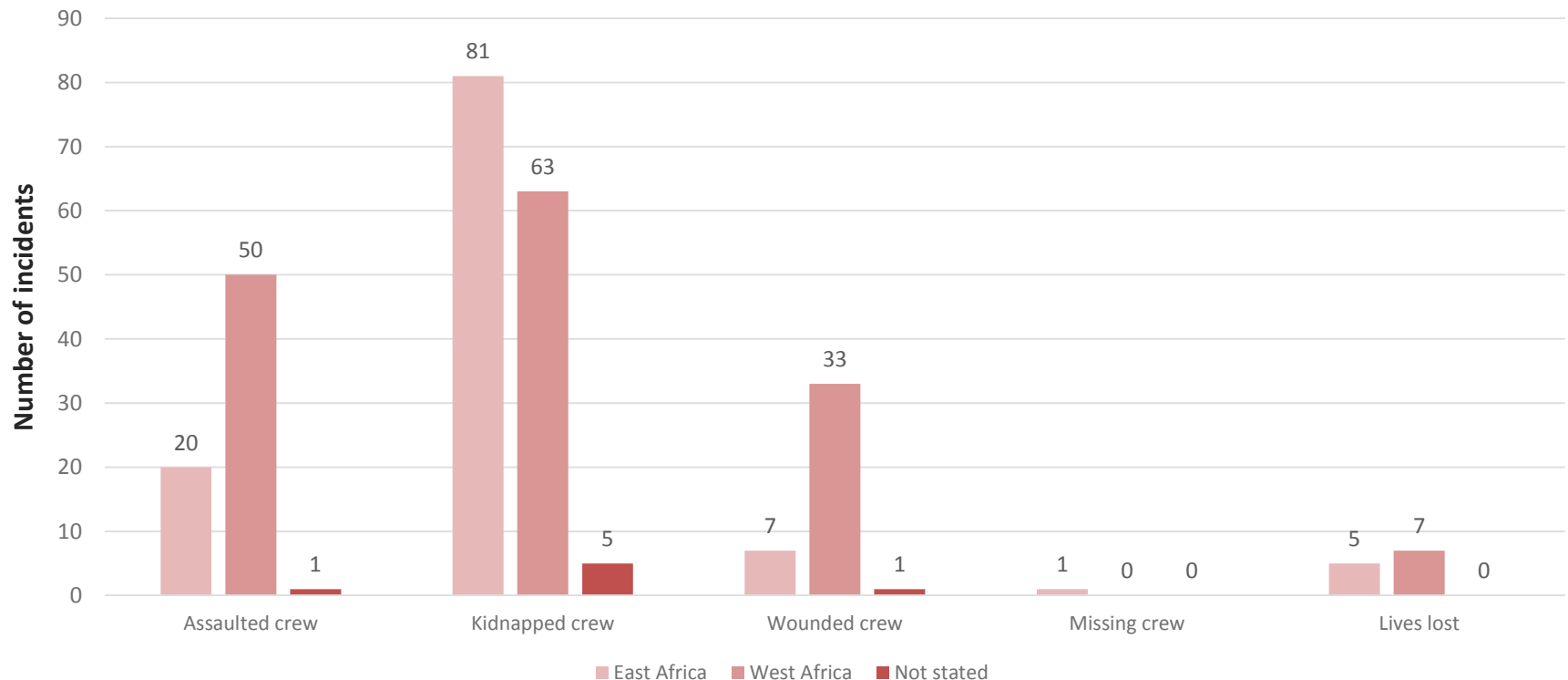
- **Utility:** relevance in determining the threat of a pirate attack
- **Completeness:** low number of missing values

Examples: Where



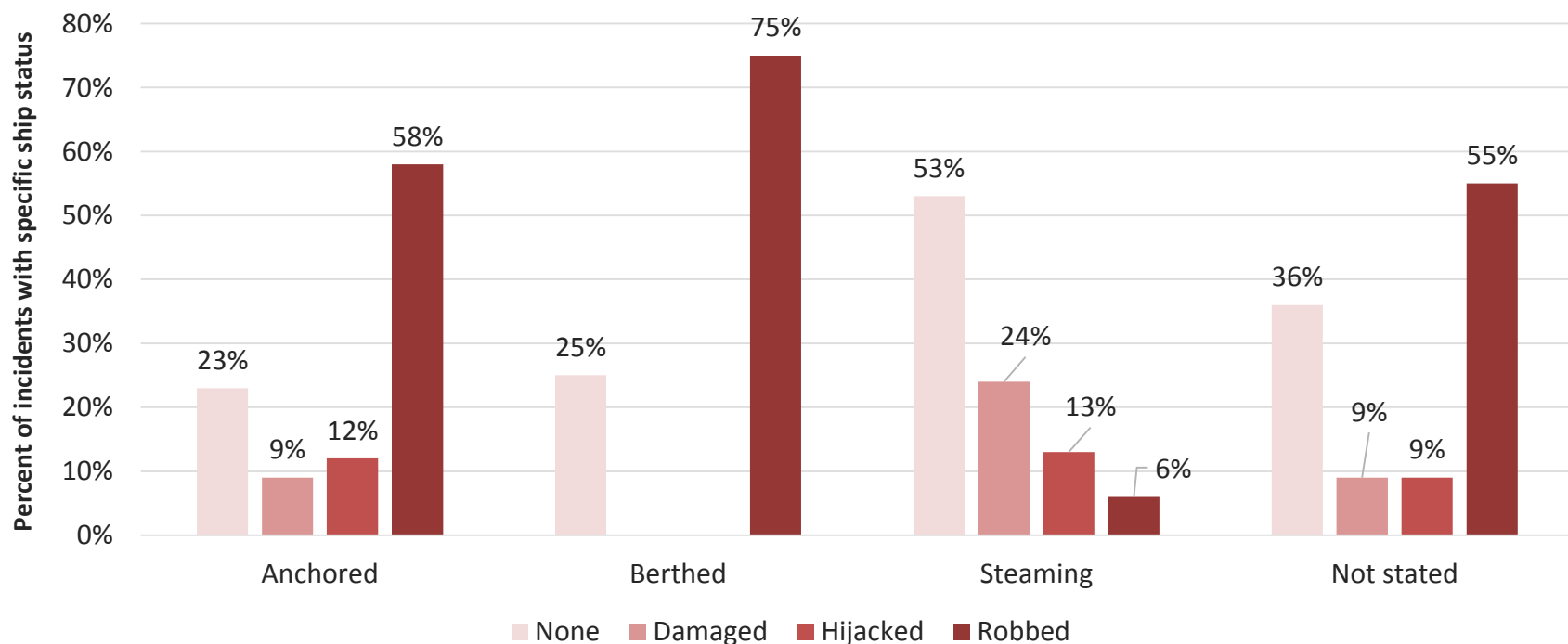
Example: Impact on crew

Consequences to crew in connection with geographical area



Example: Impact on vessel

Types of ship consequences in connection with vessel status



Logistic Regression

	T	E.S.	Wald	Signif.	e ^B	Odds
Atlantic_Ocean	1.649	.369	19.924	.000	5.201	420%
Arabic_Sea	.329	.261	1.591	.207	1.390	
Gulf_Aden	-.885	.411	4.635	.031	.413	-59%
Red_Sea	-.998	.424	5.542	.019	.369	-63%
SeaRoutes2	-.198	.276	.516	.473	.820	
GeopoliticalContext	-.330	.202	2.683	.101	.719	
m12	-.740	.210	12.442	.000	.477	-52%
d12_200	-.958	.299	10.273	.001	.384	-62%

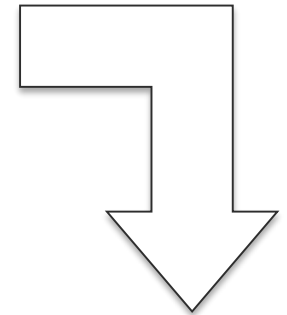
Ref: Indian Ocean, > 200 NM, M-L risk (Geopolitical context), M-L sea routes

	Probability of success	Distance to sea coast		
		<12	12-200	>200
Geographical area	Atlantic Ocean	64%	59%	79%
	Arabic Sea	26%	14%	42%
	Gulf of Aden	13%	10%	23%
	Red Sea	11%	9%	21%
	Indian Ocean	26%	22%	42%

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Logistic Regression

Attack Details

	e ^B	Odds
Weapons Used:		
- Knives or others	36.49	+3,549%
- Guns	1.983	+98%
- RPG	n.s.	n.s.
Number of Craft Used:		
- Two	n.s.	n.s.
- More than two	0.313	-69%
Mothership Used:		
- Yes	n.s.	n.s.

Ref: 'No weapons', 'One craft', 'No'

Countermeasures

	e ^B	Odds
Access_control	1.399	
Alarms	.538	-46%
Information_sharing	.915	
Manoeuvres	.005	-100%
Other	.076	-92%
Physical_barriers	.334	
Guards	.005	-99%
Citadel	1.705	
Upper_lighting	.074	-93%
Watchkeeping	1.855	

Conclusions (so far...)

- Support ‘common knowledge’
- Early warning is good in all cases
- Approach has potential...
 - ...but suffers from under/non-reporting
 - IPATCH will look at semi-automated reporting

Future Work

- Analysis complete end of July
- Input to Threat Detection
 - contextual information
 - Bayesian networks and decision trees
- Input Decision Support
 - derive rules for Rete network

Thank you

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