Impact survey of Super Typhoon “Yolanda” on Basic Livelihoods and Ecosystem Health in Panay of Philippines

Ricardo Babaran, Gerald F. Quinitio, Harold M. Monteclaro
University of the Philippines Visayas

Satoshi Ishikawa, Kazuo Watanabe
Research Institute for Humanity and Nature

Japan–Philippine Urgent Collaborative Projects
regarding “Typhoon Yolanda” within the J-RAPID Program

JST Japan Science and Technology Agency

DOST PCIEERD

Background

Coastal area ecosystem services are indispensable for rural people, but are also easily damaged by many things including natural disasters. Many coastal areas with high biodiversity and biological productivity are located in tropical zones, as is the case in Southeast Asia. In such areas, ecosystem services, local livelihood and culture are closely related. Therefore, relationships among life, culture, local ecosystem should be deeply taken into account for establishment of disaster-prevention measures, especially in rural.

Aims of this project

This project aims to evaluate the super typhoon impacts on both ecosystem and livelihoods in coastal zone. Collaborative field surveys for evaluation of ecosystem impacts will be conducted by Philippines and Japanese researchers.

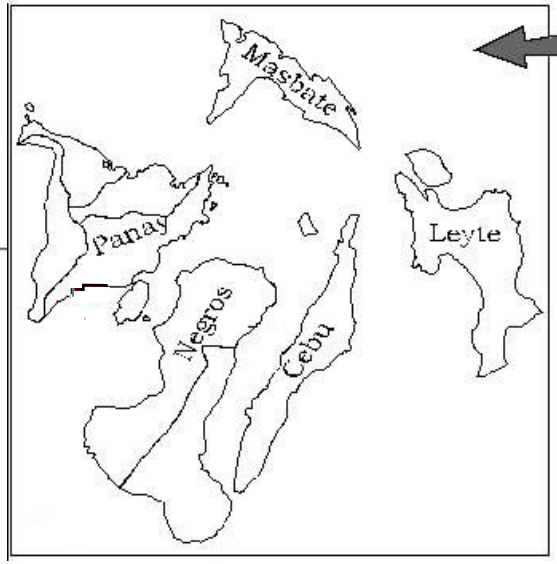
This collaborative research could provide us a good practice for disaster prevention research under global climate change.

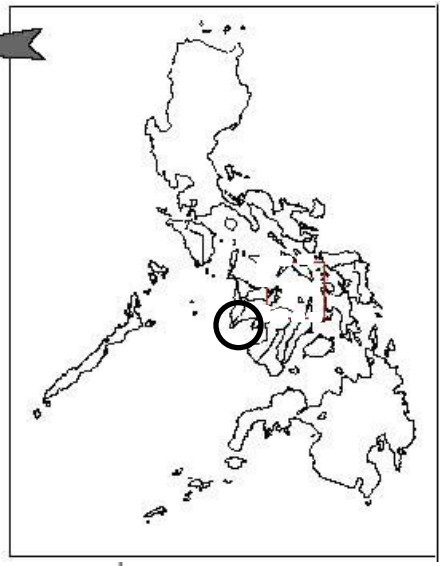
Project Framework

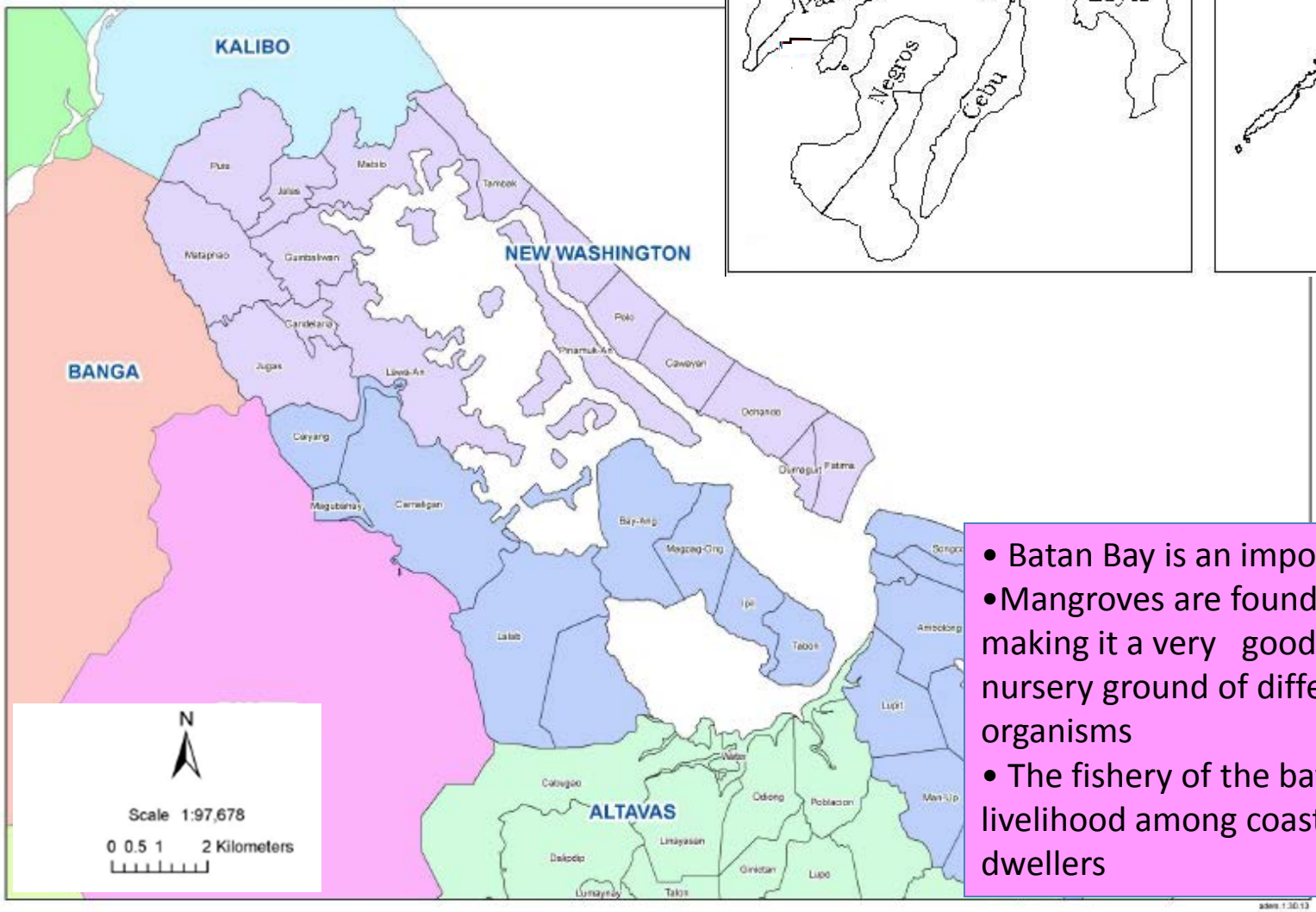
We surveyed Impacts on following items;

1. fishery including damages of fishing gears and fish catch were evaluated based on field survey at sites,
2. aquatic resources were evaluated based on environmental data and survival rate of small shrimp in aquaculture ponds.
3. Mangrove forest was evaluated through Satellite image analysis.
4. Livelihoods of small scale fishers based on the interview and observation surveys.

Batan Bay, Philippines



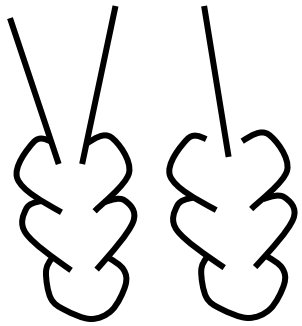


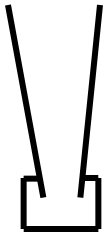


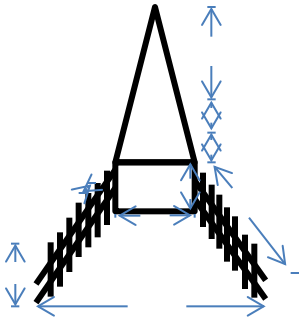
- Batan Bay is an important water body
- Mangroves are found around the bay making it a very good breeding and nursery ground of different aquatic organisms
- The fishery of the bay provides livelihood among coastal community dwellers

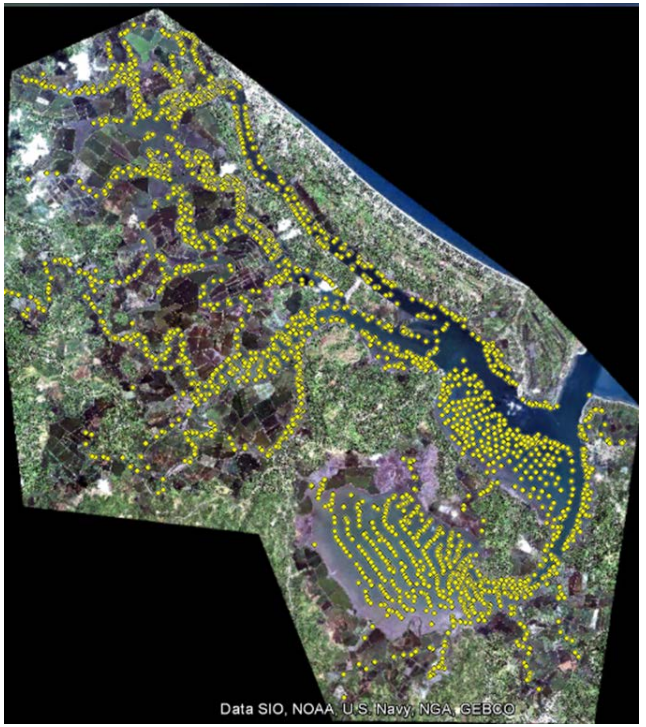
The Fisheries of Batan Bay

Fishing gears	No. of units
Mod. fish corral/lift net	1,235
Fish corral	769
Filter net	185
Lift net	276
Crab lift net	1,820
Pots (all types)	9,749
Bottom set gillnet	172
Drift gillnet	19
Barrier net	60
Line fishing (all types)	226
Others	

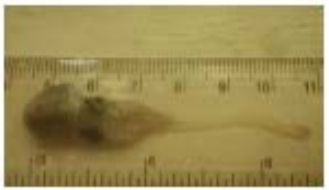




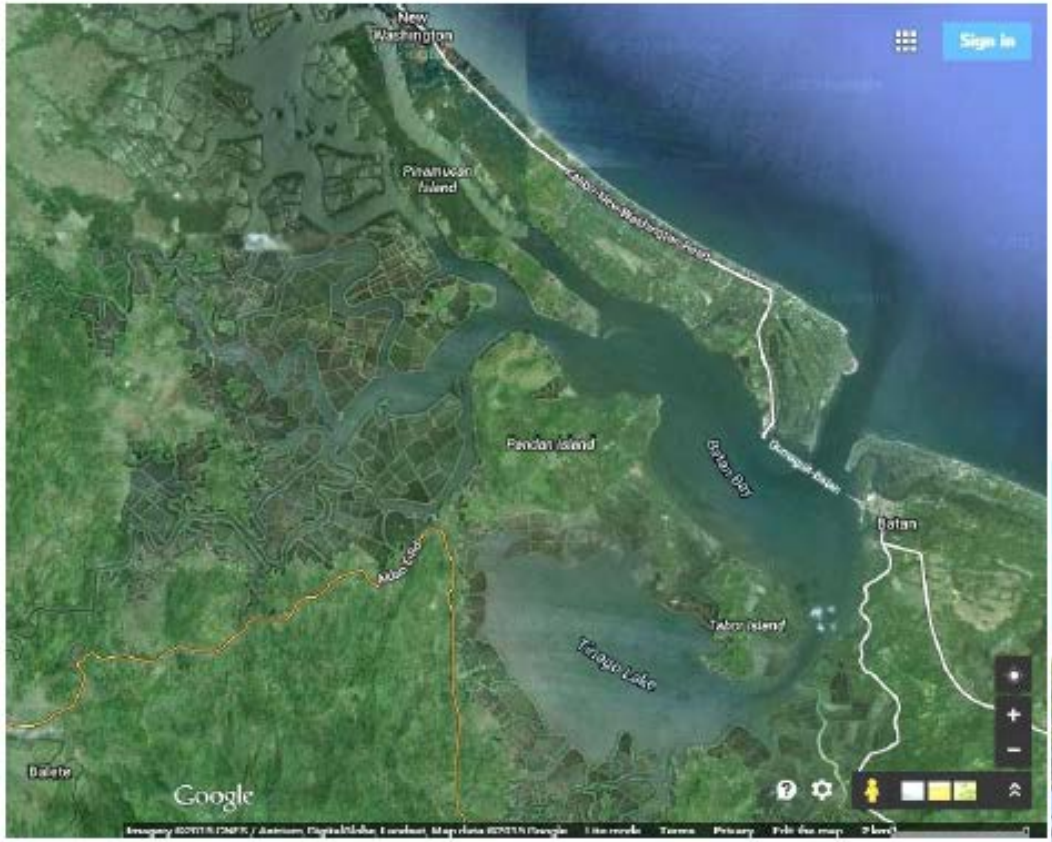




The Fisheries of Batan Bay



The Fisheries of Batan Bay

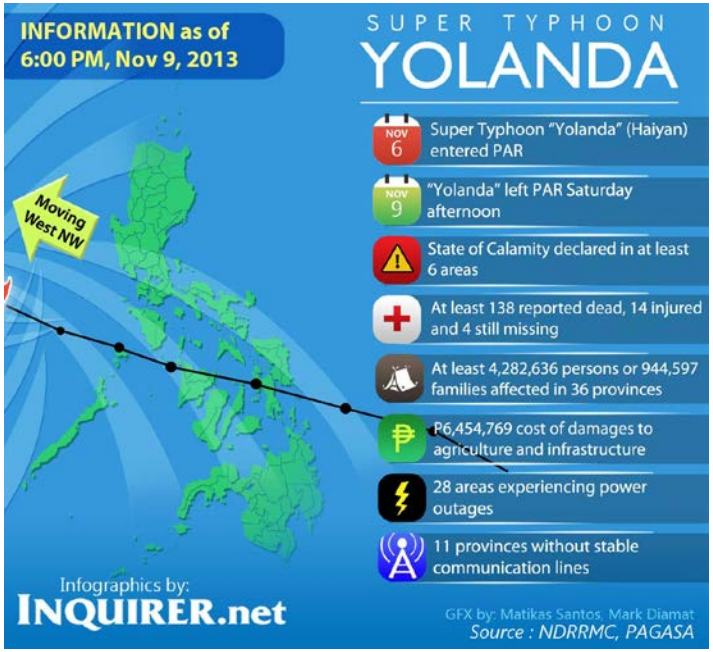


Fishponds

Oyster culture

Fish cages

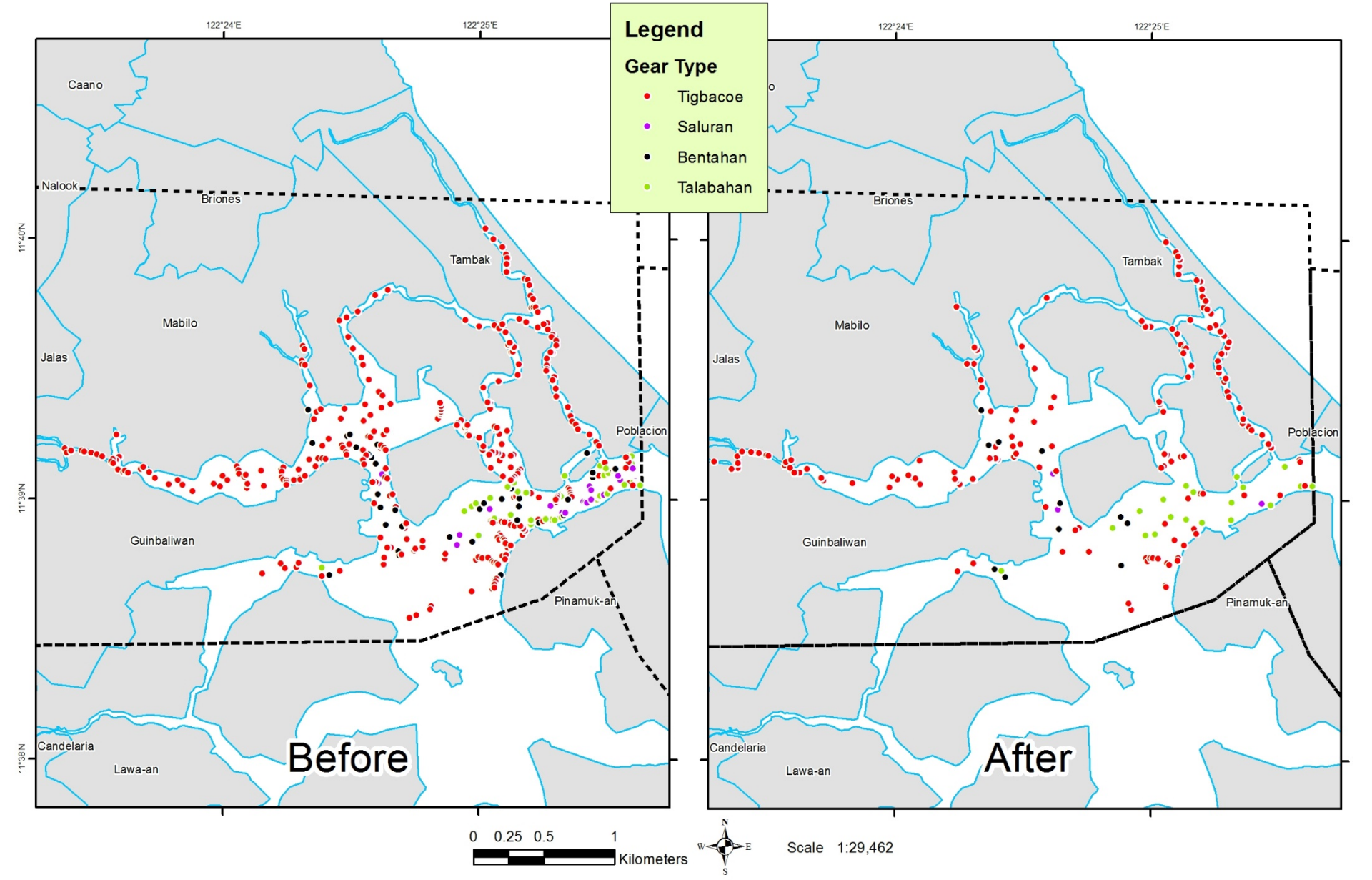
Typhoon Haiyan Impacts on Stationary Fishing Gears



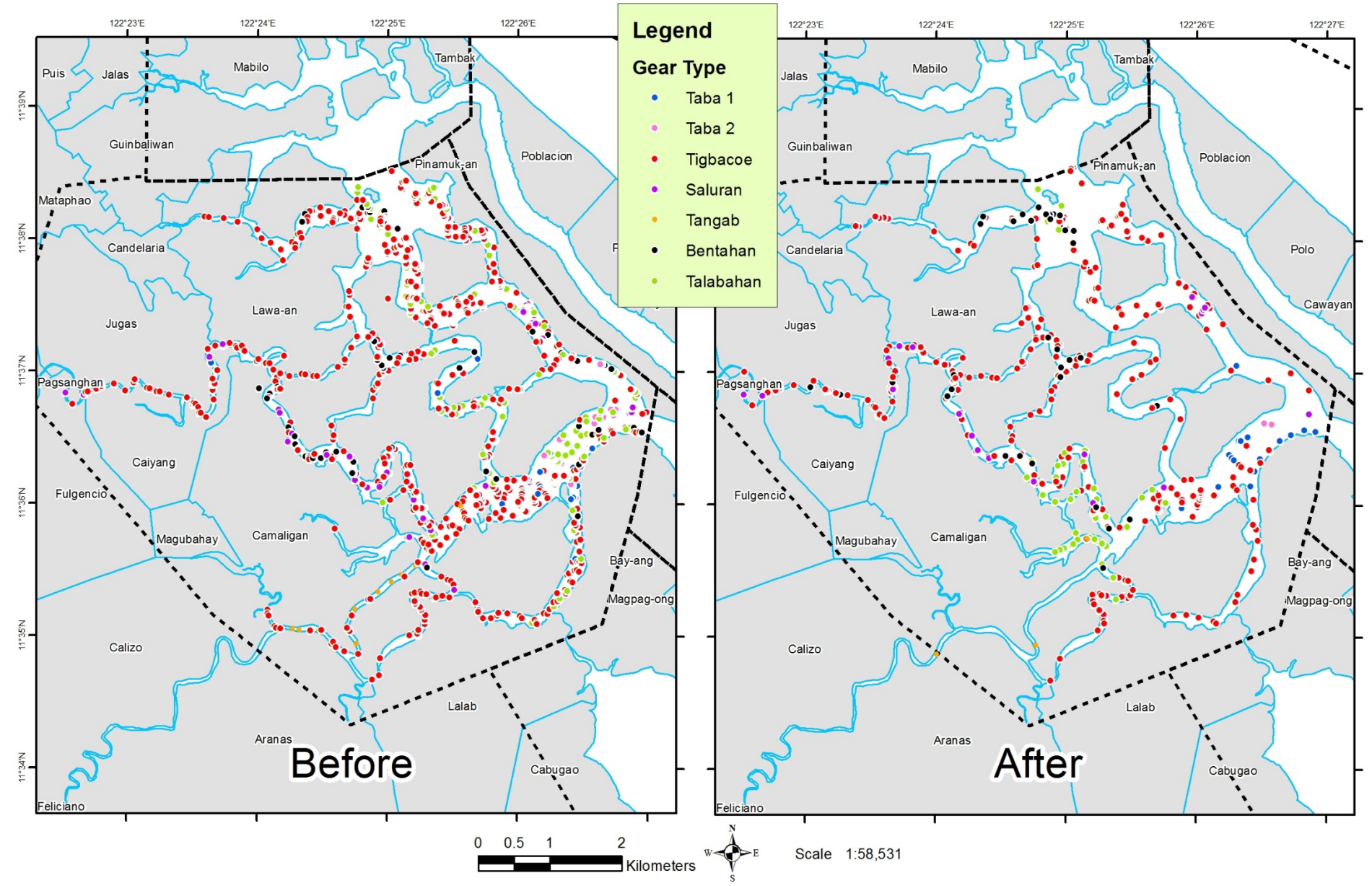
Actual Count & Coordinates of Stationary Gears + Oyster Culture Structures (before Typhoon Yolanda)	April to May 2013
Actual Count & Coordinates of Stationary Gears + Oyster Culture Structures + Condition/Status (after Typhoon Yolanda)	May 2014

Coordinates plotted using ArcGIS version 10

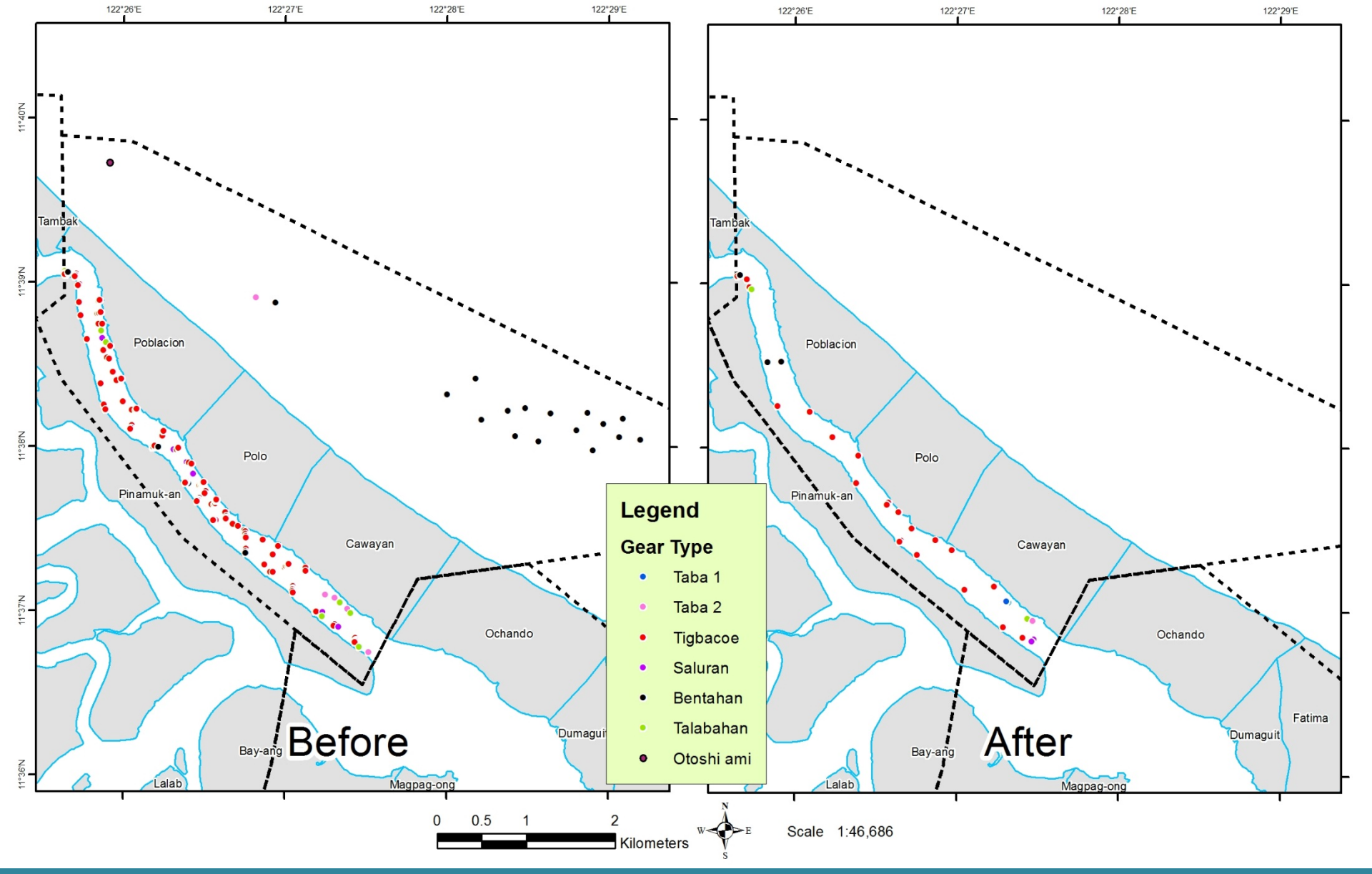
Section 1


Legend
Gear Type
Tigbacoe
Saluran
Bentahan
Talabahan
122°24'E
122°25'E
11°40'N
11°39'N
11°38'N
Caano
Nalook
Briones
Tambak
Mabilo
Jalas
Poblacion
Guinbaliwan
Pinamuk-an
Candelaria
Lawa-an
Before
After
0 0.25 0.5 1
Kilometers
N
W
E
S
Scale 1:29,462

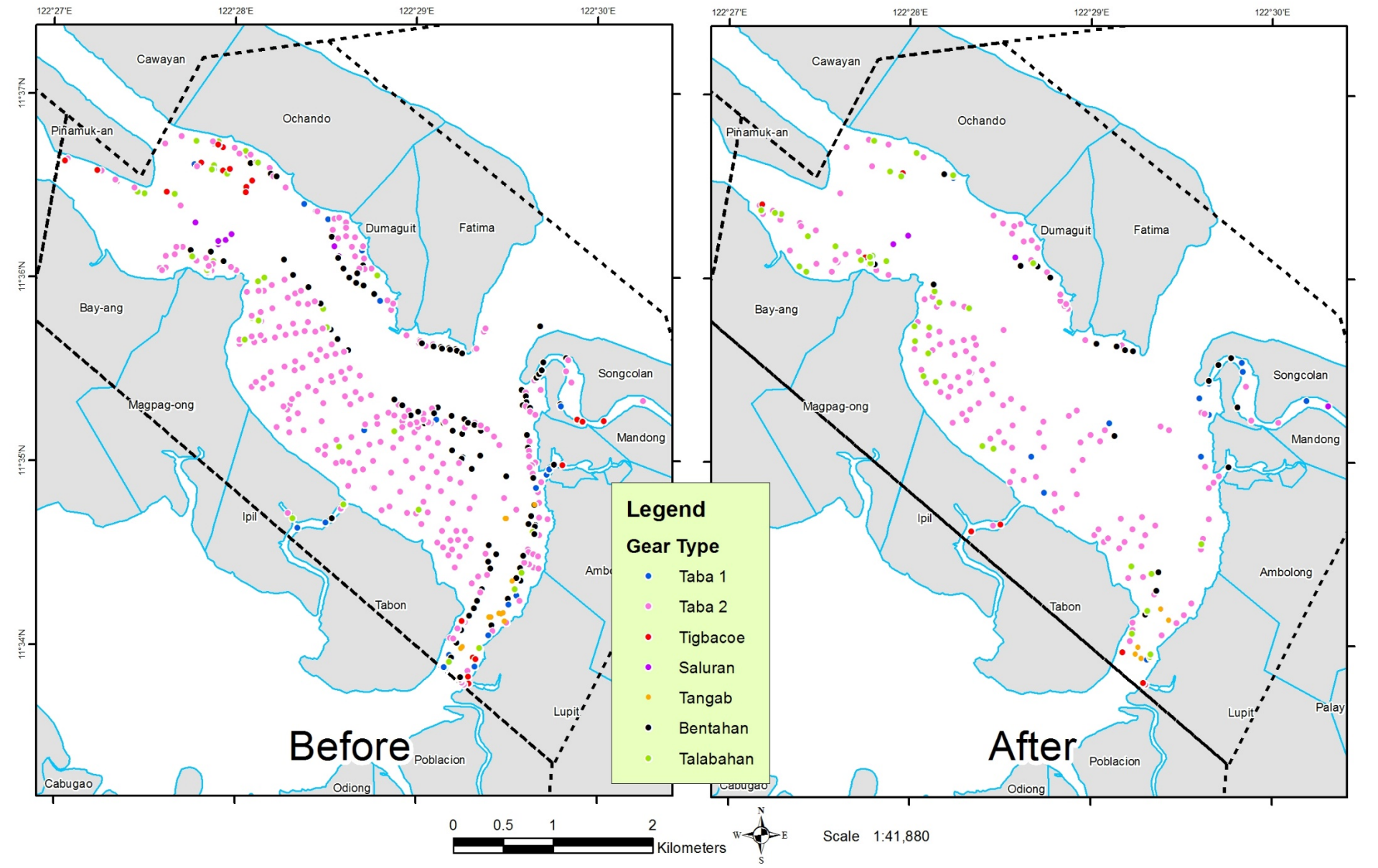
Section 2


Legend
Gear Type
Taba 1
Taba 2
Tigbacoe
Saluran
Tangab
Bentahan
Talabahan
Before
After
Puis
Jalas
Mabilo
Tambak
Guinbaliwan
Pinamuk-an
Poblacion
Mataphao
Candelaria
Lawa-an
Jugas
Pagsanghan
Caiyang
Fulgencio
Magubahay
Camaligan
Bay-ang
Magpag-ong
Calizo
Lalab
Aranas
Cabugao
Feliciano
Polo
Cawayan
122°23'E
122°24'E
122°25'E
122°26'E
122°27'E
11°39'N
11°38'N
11°37'N
11°36'N
11°35'N
11°34'N
0 0.5 1 2
Kilometers
N
W
E
S
Scale 1:58,531

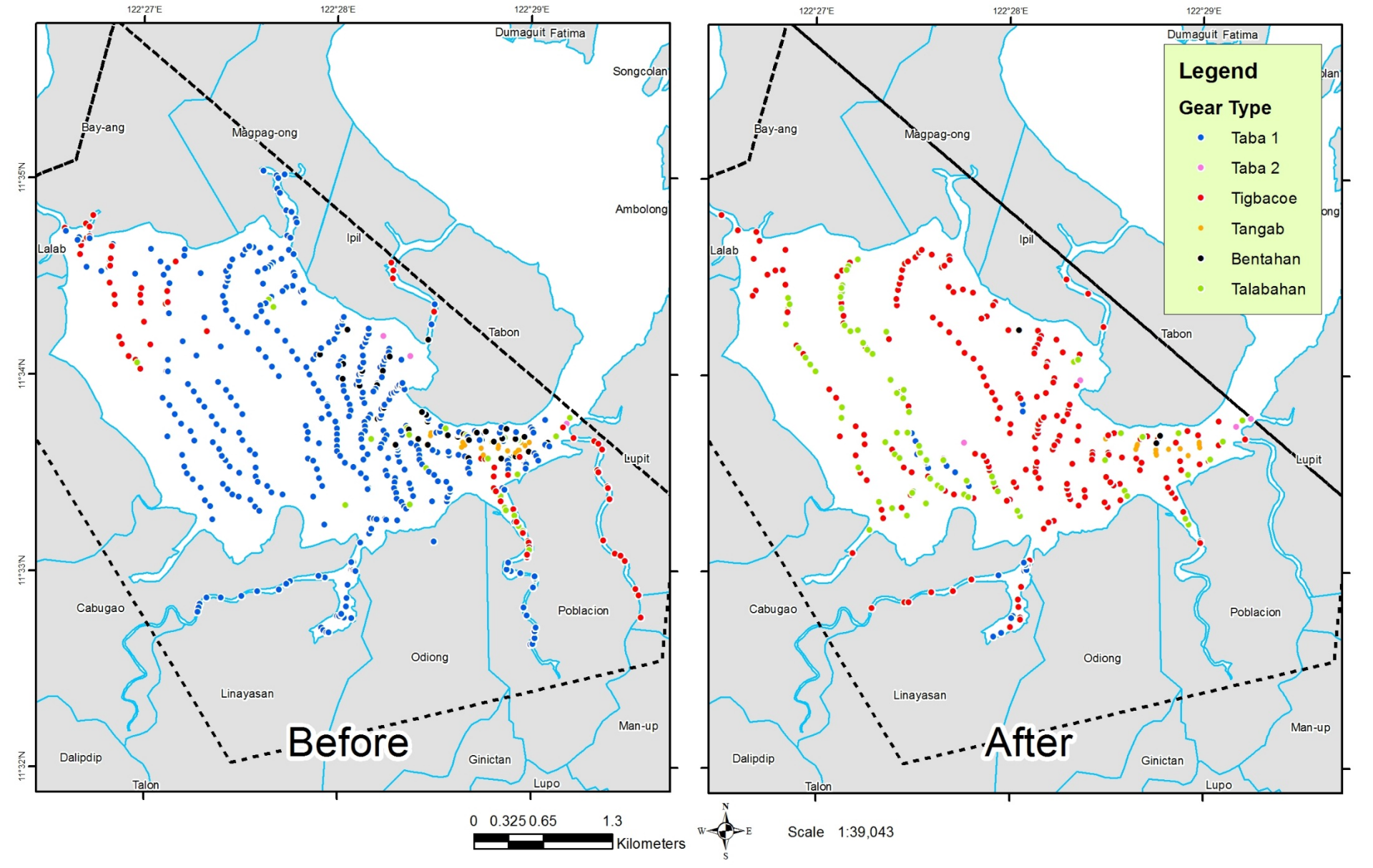
Section 3


122°26'E
122°27'E
122°28'E
122°29'E
11°40'N
11°39'N
11°38'N
11°37'N
11°36'N
Tambak
Poblacion
Polo
Pinamuk-an
Cawayan
Ochando
Dumaguit
Fatima
Bay-ang
Lalab
Magpag-ong
Before
After
Legend
Gear Type
Taba 1
Taba 2
Tigbacoe
Saluran
Bentahan
Talabahan
Otoshi ami
0 0.5 1 2
Kilometers
N
W
E
S
Scale 1:46,686

Section 4


122°27'E
122°28'E
122°29'E
122°30'E
11°37'N
11°36'N
11°35'N
11°34'N
Cawayan
Ochando
Piñamuk-an
Dumaguit
Fatima
Bay-ang
Songcolan
Magpag-ong
Mandong
Ipil
Tabon
Lupit
Poblacion
Cabugao
Odiong
Ambolong
Palay
Before
After
Legend
Gear Type
Taba 1
Taba 2
Tigbacoe
Saluran
Tangab
Bentahan
Talabahan
0
0.5
1
2
Kilometers
N
W
E
S
Scale 1:41,880

Section 5


122°27'E
122°28'E
122°29'E
11°35'N
11°34'N
11°33'N
11°32'N
Dumaguit Fatima
Songcolan
Bay-ang
Magpag-ong
Ambolong
Ipil
Lalab
Tabon
Lupit
Cabugao
Poblacion
Odiong
Linayasan
Man-up
Dalipdip
Talon
Ginictan
Lupo
Before
After
Legend
Gear Type
Taba 1
Taba 2
Tigbacoe
Tangab
Bentahan
Talabahan
0 0.325 0.65 1.3
Kilometers
N
W
E
S
Scale 1:39,043

Typhoon Haiyan Impacts on Stationary Fishing Gears

Section	Taba1	Taba2	Tigbacoe	Saluran	Tangab	Bentahan	Talaban	Otoshi-ami	Total	%
Before Yolanda										
1	-	-	360	52	-	14	37	-	463	
2	28	16	658	72	12	68	106	-	960	
3	-	5	106	6	-	22	7	1	147	
4	21	285	26	9	14	106	38	-	499	
5	411	3	85	-	20	39	26	-	584	
Total	460	309	1235	139	46	276	214	1	2680	
After Yolanda										
Not damaged	0	0	117	3	0	3	57	1	181	**6.8**
Partially damaged	23	156	444	28	20	42	121	0	834	**31.1**
Completely damaged	437	153	674	108	26	231	36	0	1665	**62.1**
% Damaged	**100**	**100**	**90.5**	**97.8**	**100**	**98.9**	**73.4**	**0**	**93.2**	

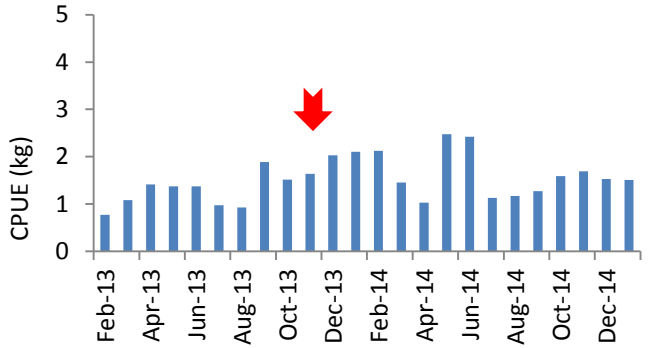
Typhoon Haiyan Impacts on Capture Fisheries

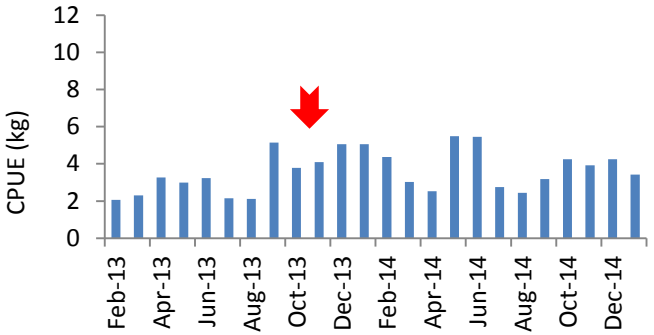
Fishing gears	Resumption of fishing
Mod. fish corral/lift net	From day 9
Fish corral	From day 9
Filter net	From day 21
Lift net	From day 21
Crab lift net	From day 21
Pots (all types)	From day 21
Gillnet	From day 7
Line fishing (all types)	From day 9

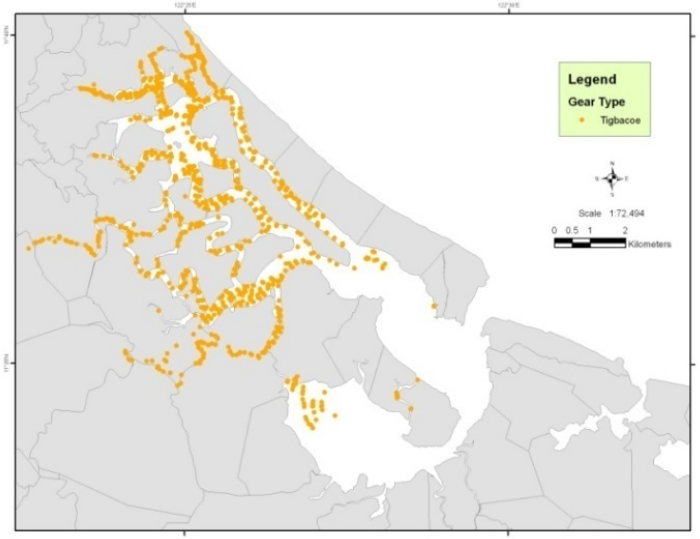
Typhoon Haiyan Impacts on Capture Fisheries

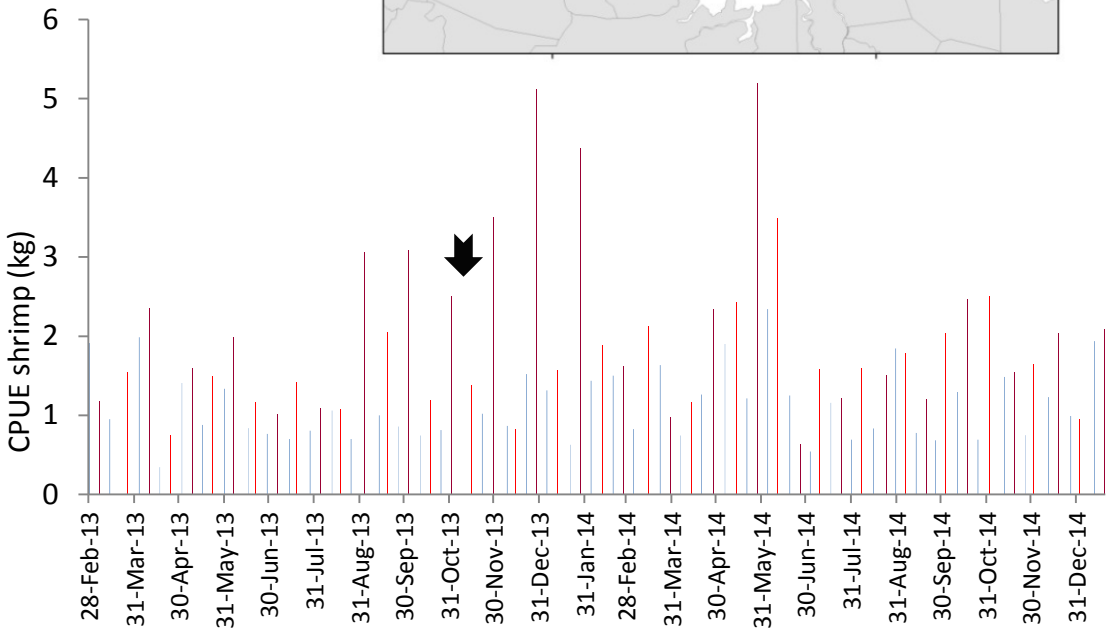
-Materials
-Supply
-Cost
-Labor

Typhoon impacts on Modified Fish Corral/Lift Net

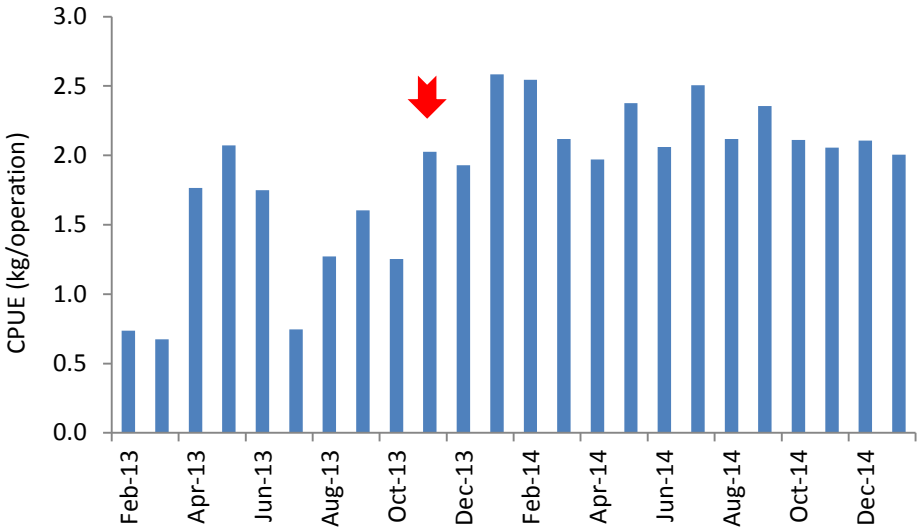




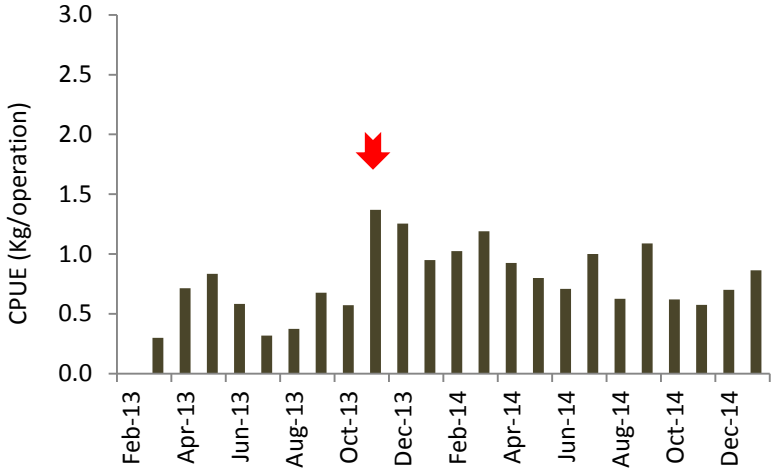




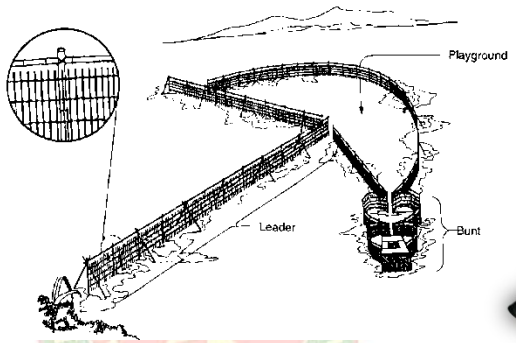
Typhoon impacts on Fish Corral



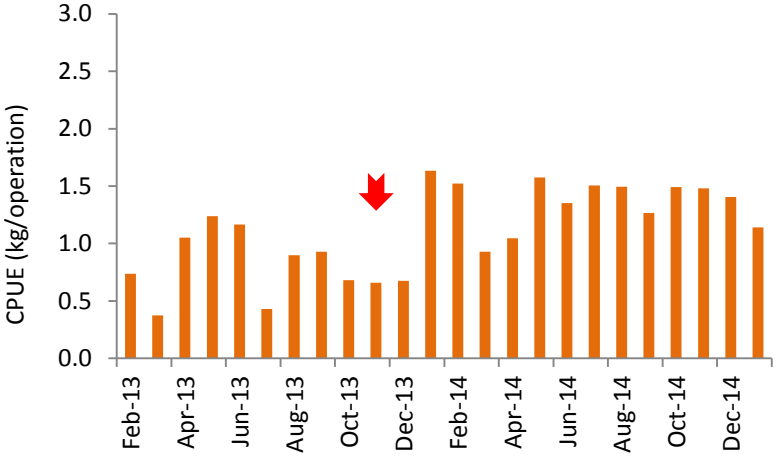
CPUE (kg/operation)



CPUE (kg milkfish/operation)

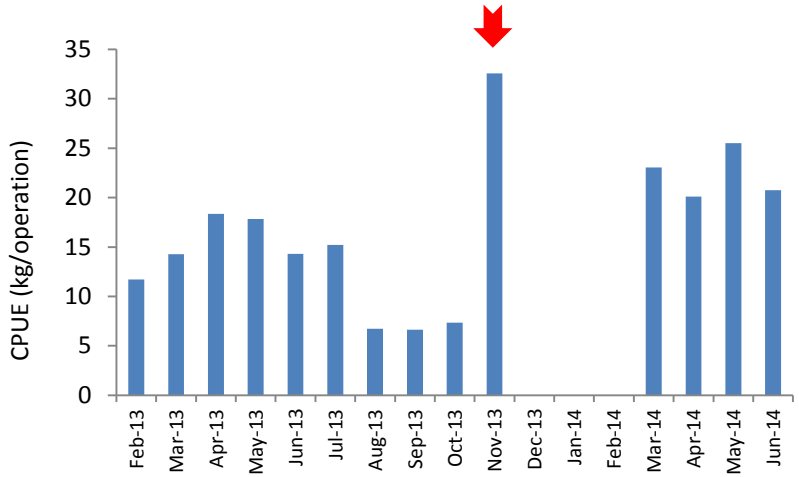


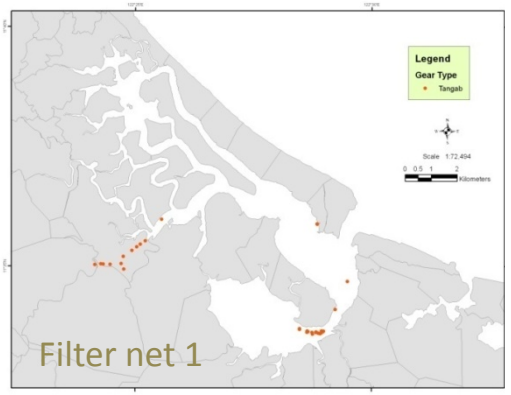
Milkfish *Chanos chanos*

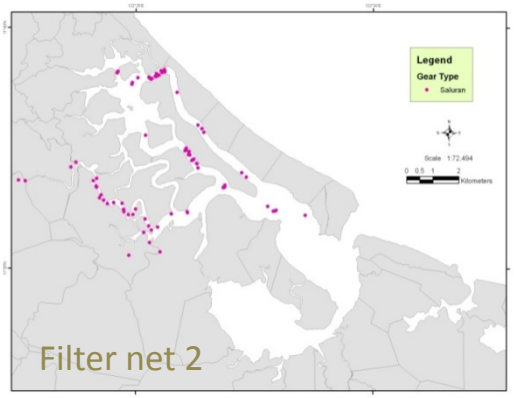


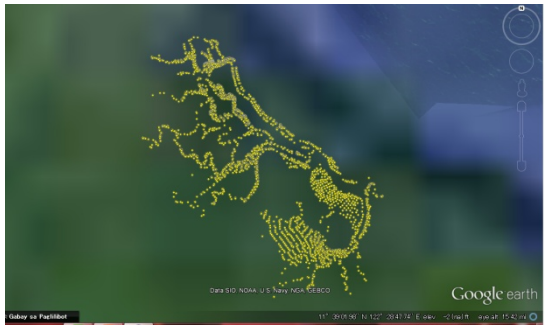
CPUE (kg/operation) less milkfish

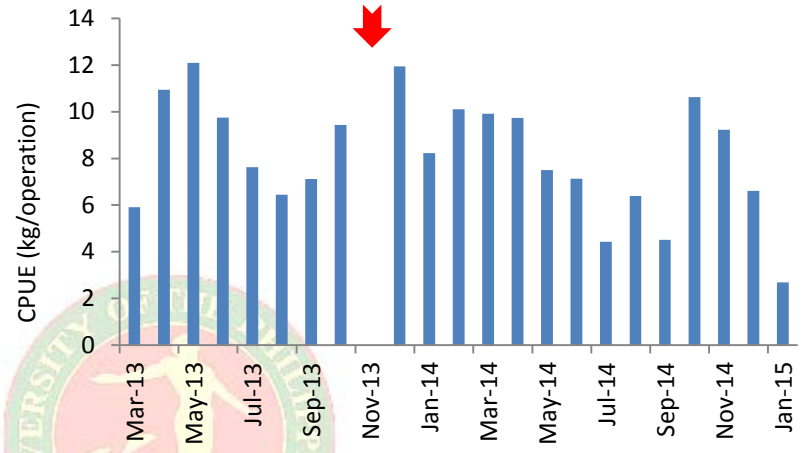
Typhoon impacts on Filter Net



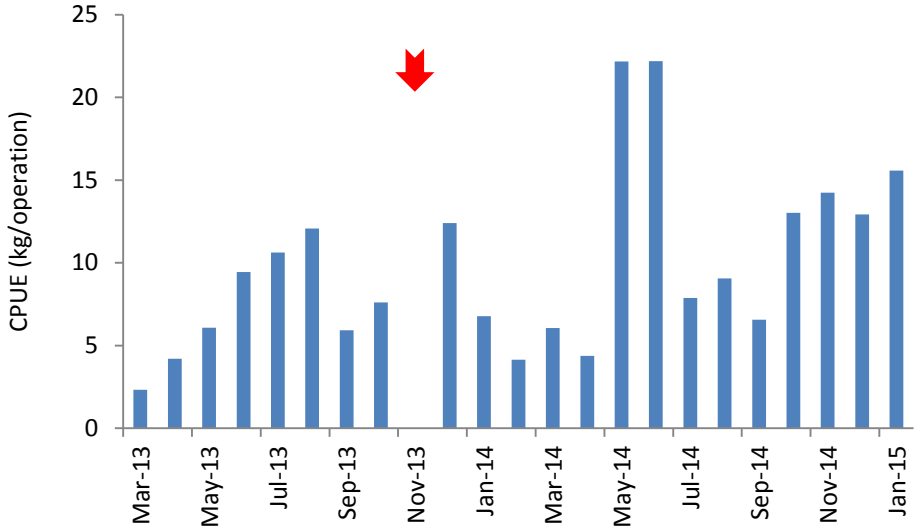








Typhoon impacts on Lift Net



Typhoon impacts on Pots and Gillnet

- Lack of bait materials
- Drift gillnets to set gillnets

Government support

1. Work for cash (mangrove planting)
2. Oyster culture support
3. Net
4. Boat

Summary

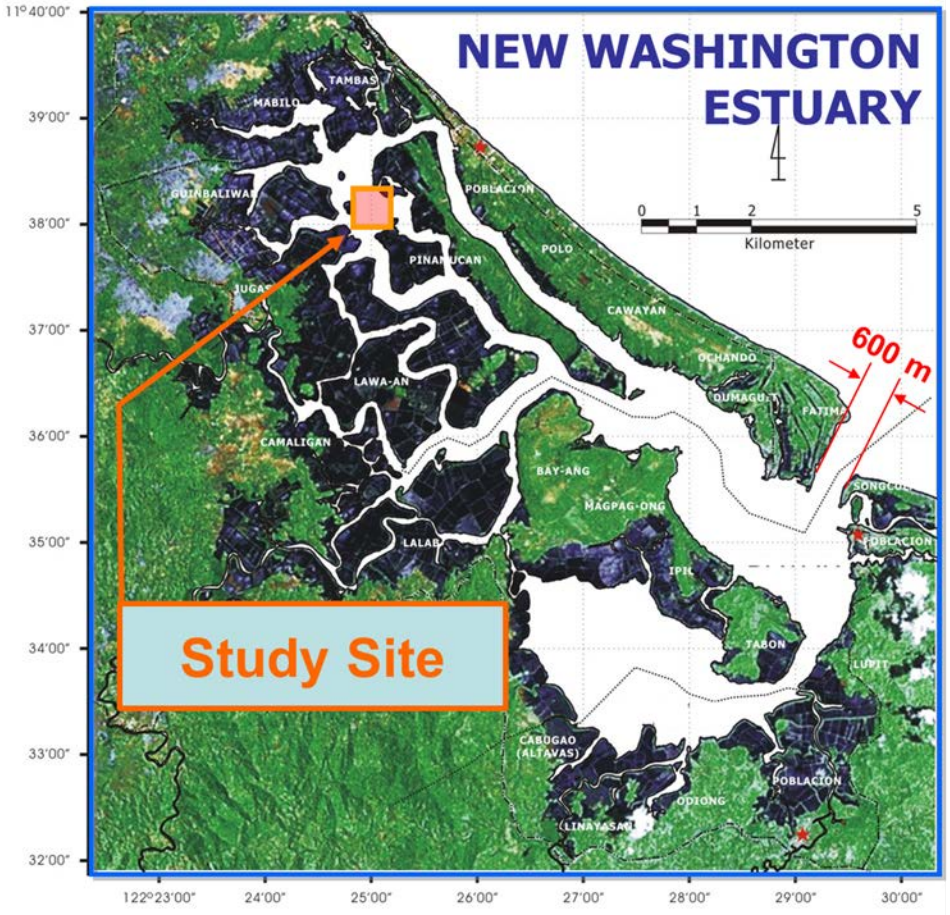
1. Stationary fishing gears in Batan Bay are highly vulnerable to extreme weather events such as super typhoons
   1.1 Pre-Yolanda: 2,680 stationary gears
   Post-Yolanda: >93% damaged (partial and complete)
   1.2 Among the gears left:
   Not damaged: 17.8%
   Partially damaged: 82.2%

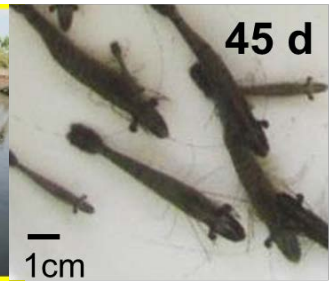
2. Resilience is influenced by several factors:
   - Availability of construction materials
   - Connectivity of fishing operations in Batan Bay
3. Adaptation in some gears.

4. Government role
   - Institutional support
   - Opportunity for management reforms

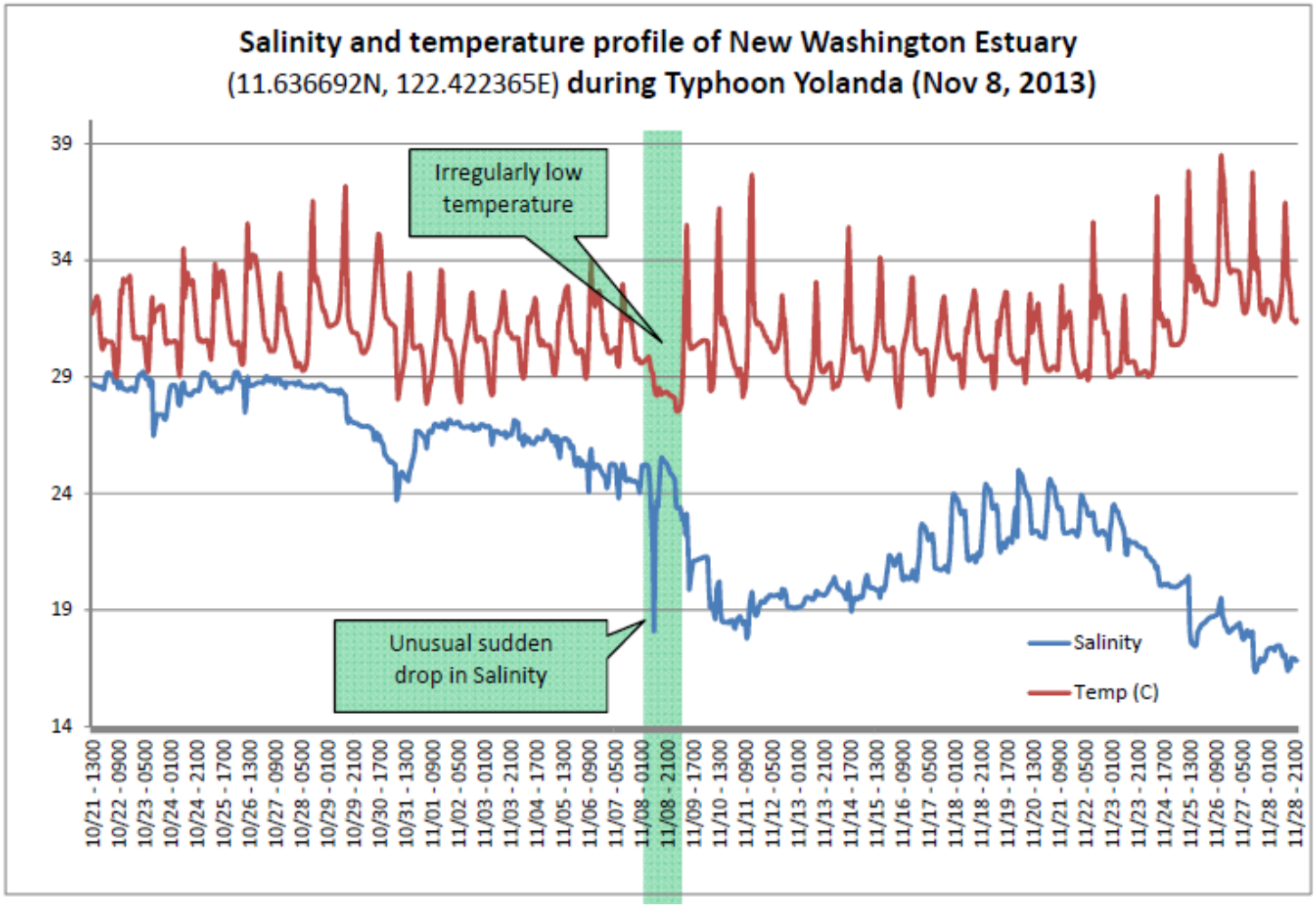
5. With the lessons from the Batan Bay cases, the November 2013 super typhoon offers opportunity of understanding the vulnerability of similarly-situated tropical coastal environments with high probabilities of extreme weather events.

Impacts on tiger prawn resources



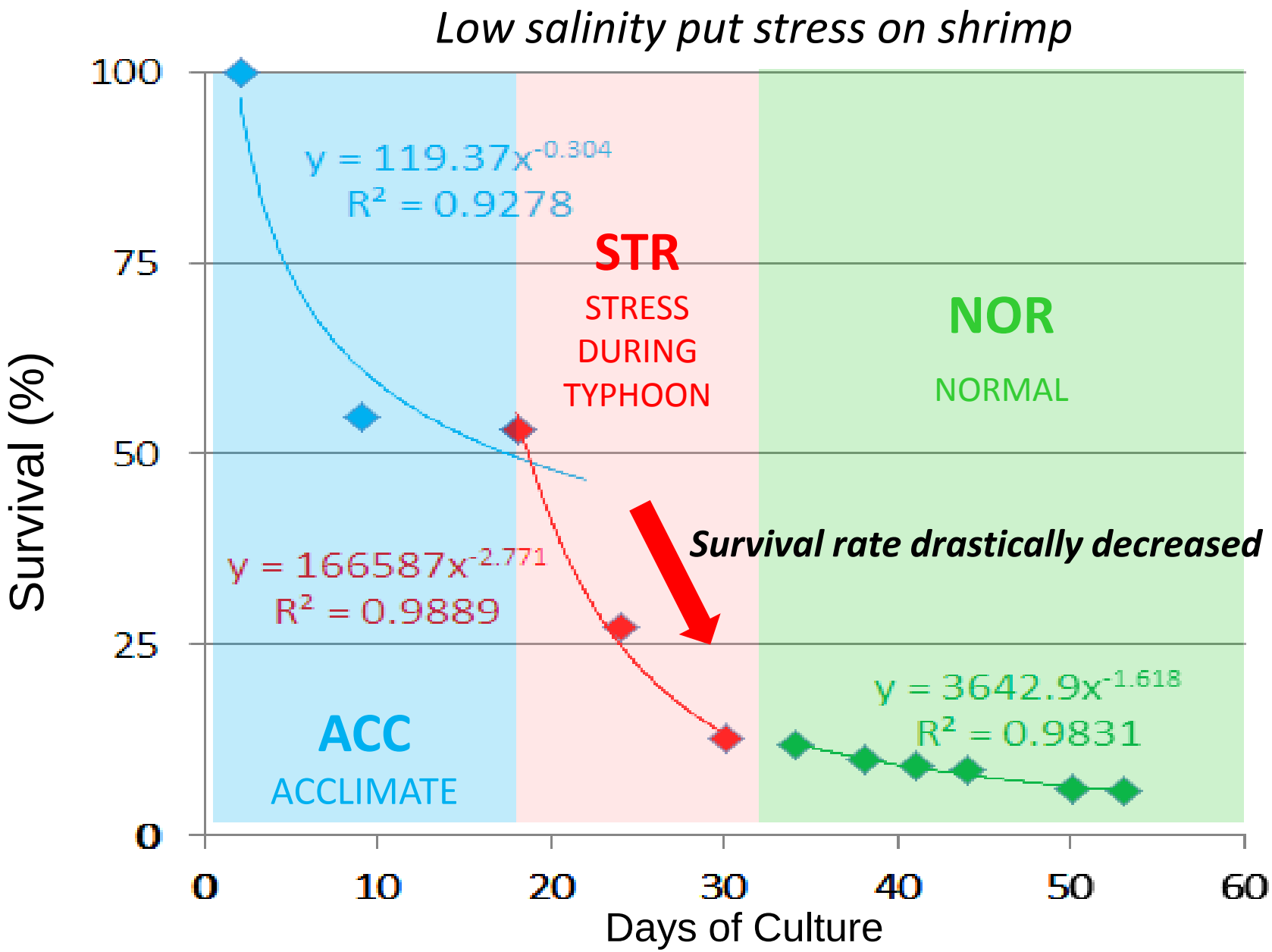


Impacts on shrimp growth and mortality rate

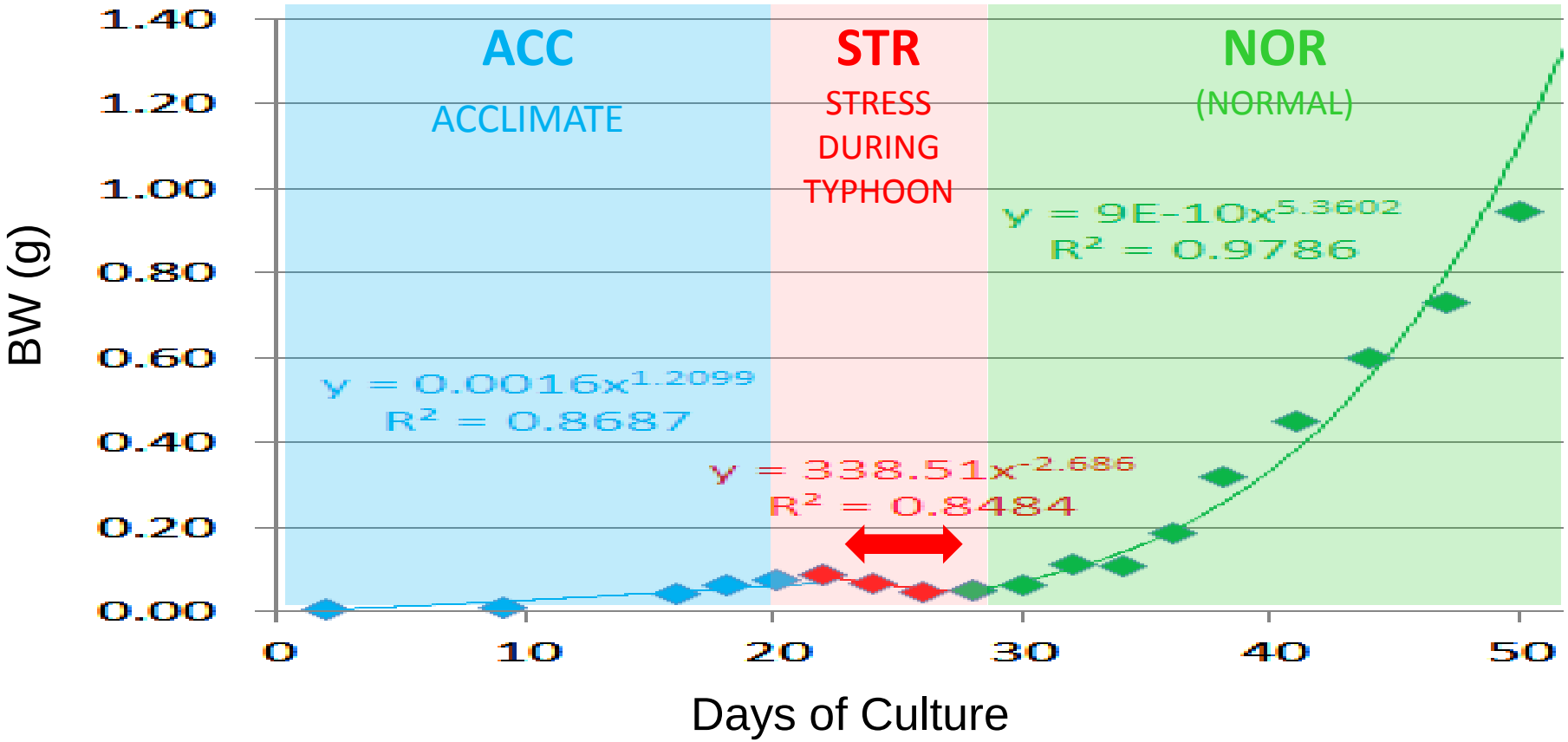


Heavy rain by “Yolanda” derive low salinity in the coastal habitats.

Results: Survival of shrimps



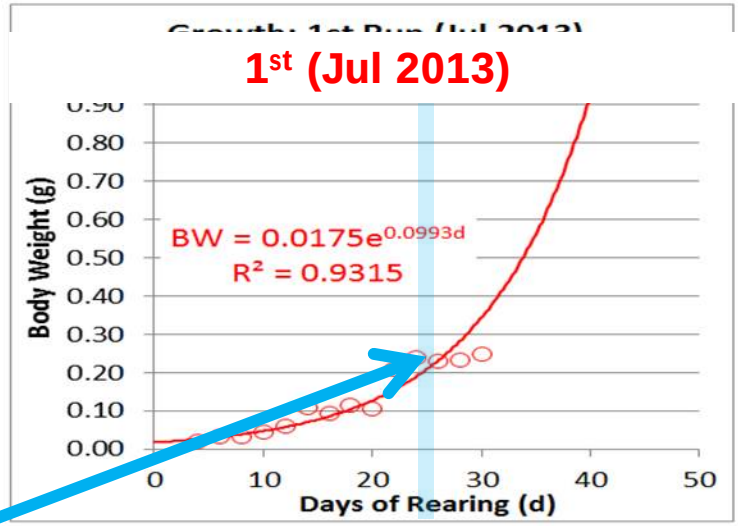
Results: Growth of shrimps

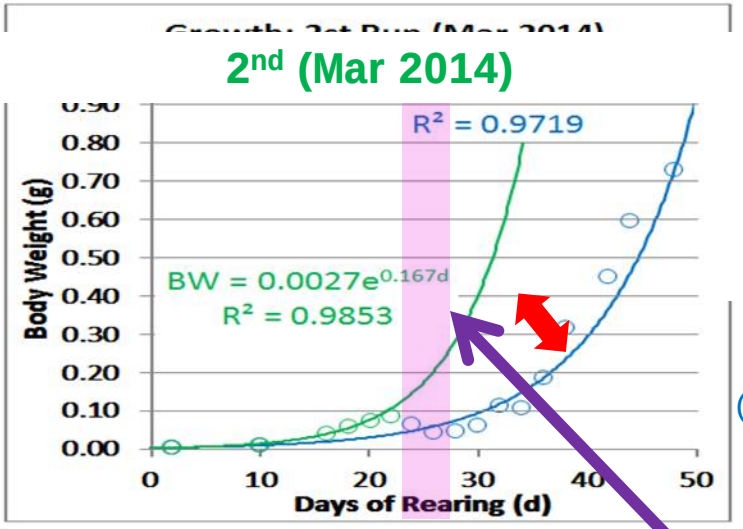


Growth rates were also deteriorated after Typhoon.

Typhoon and heavy rain cause bad impacts both on growth and survival rate of shrimps

[1st]
0.34 g
at Day 30



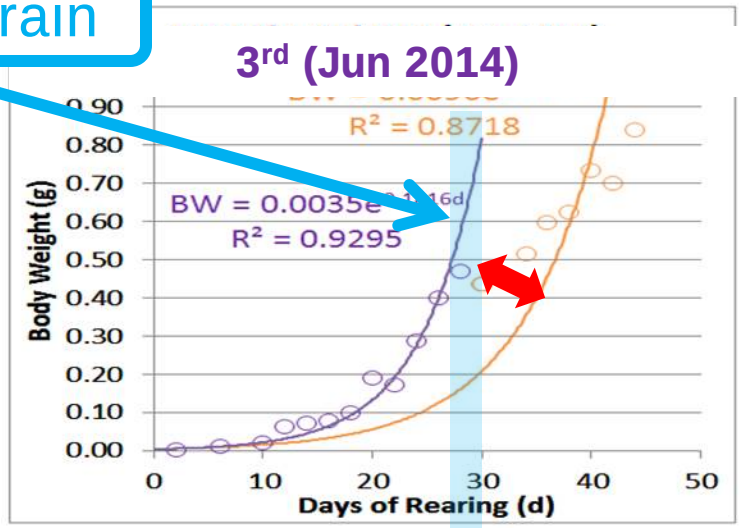


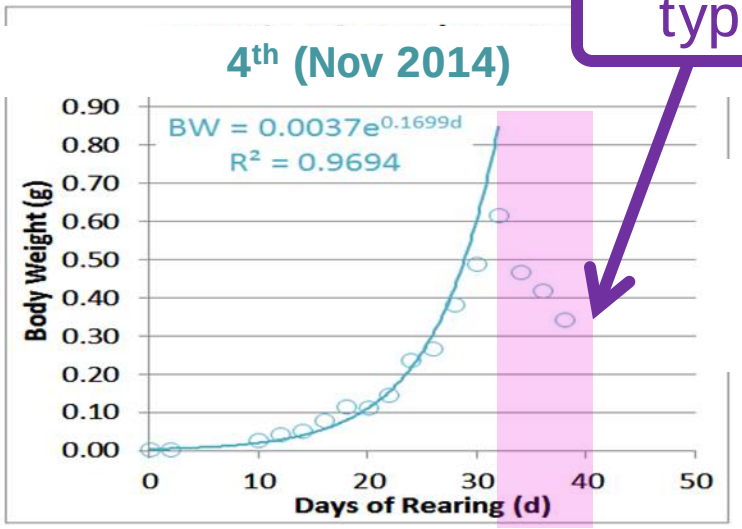
[2nd]
0.40 g
at Day 30
(no typhoon)
0.09 g
at Day 30
(w/ typhoon)

heavy rain

typhoon

[3rd]
0.81 g
at Day 30
(no typhoon)
0.30 g
at Day 30
(w/ typhoon)

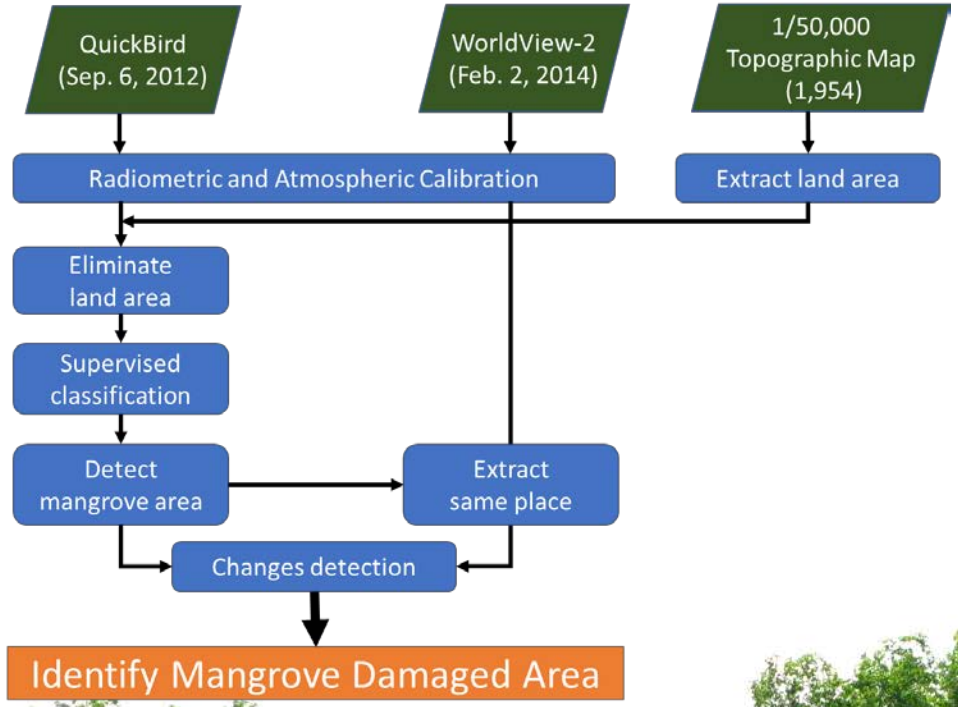




[4th]
0.61 g
at Day 30
(no typhoon)

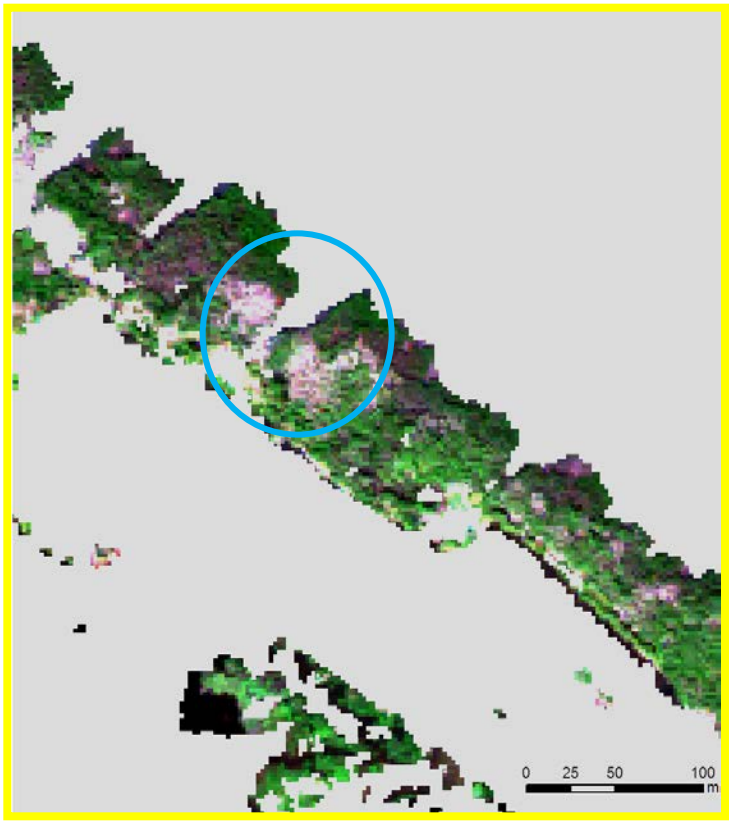
Impacts on mangroves

Development of impact assessment method through satellite image analysis.



Results

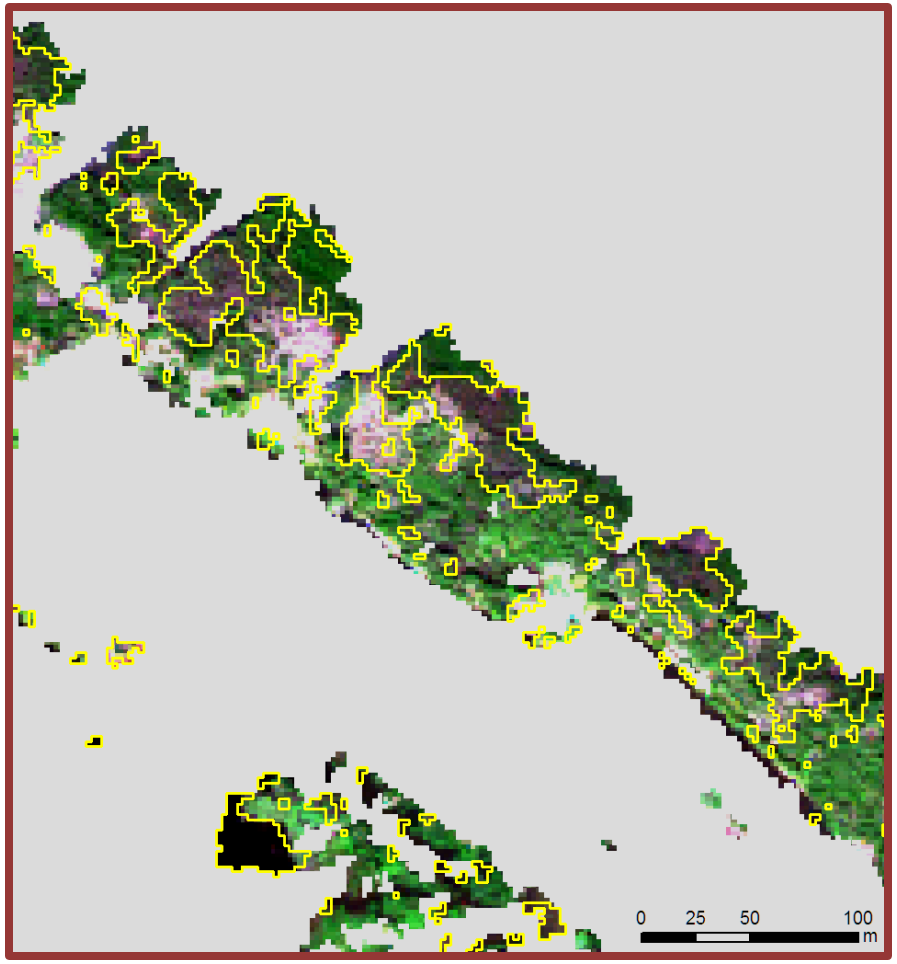
Image comparison completely same place between pre and post Typhoon Yolanda



Damaged area could be identified.

Results

Spatial distribution of damaged mangrove blocks.



Results

Characteristics of spatial distribution of damaged mangrove blocks.

- Total damaged area was 80 ha of total mangrove area (429 ha)
- Minimum maximum and average block size of damaged area was 5 m^2, 20,217m^2 (2 ha) and 68.4 m^2 respectively.
- Small size of damaged mangrove blocks were scattering in whole research area.
- North faced mangrove trees were strongly damaged.

Conclusion

- We succeeded to develop urgent mangrove damage evaluation method by using two temporal high resolution remote sensing images.
- We could recognized the spatial characteristics of mangrove degradation.
- Fortunately, we have captured image of this area before Yoland hit. We could not analyze if we didn't order this image to the satellite image distributor, before disaster. In fact, we could not find any good images in some places before Yolanda. This situation suggests that frequently or annual monitoring by remote sensing is needed for places where are affected by disaster frequently for preparing to future disaster and monitoring system.

Impacts on livelihoods

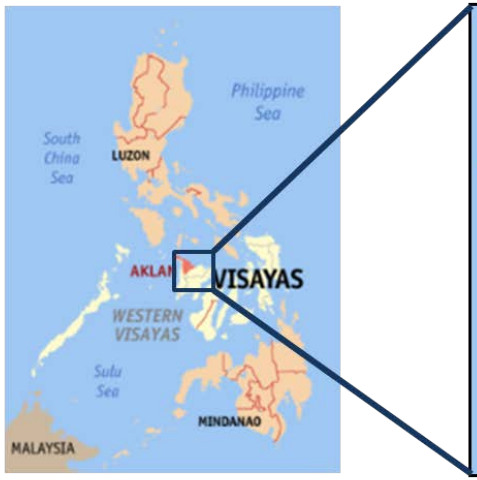
Impacts on livelihoods

Strong wind destroyed many building structure and trees.

Was your house flooded during Typhoon Yolanda?	Yes No	1 2	82 356
How would you describe the extent of damage? *Paano mo mahambae do kabahoeon it nasamad?*	No damage Partially Damaged Totally Damaged	1 **2** **3**	23 **201** **215**
What mainly caused the damage?	Flood **Strong wind** Combination of flood and strong wind Trees felling Other specify	1 **2** 3 4 5	4 **346** 30 93 1

Heavy rain affected on coastal fishery resources and ecosystems, though.

Disaster management and Preventions



1. Household surveys
2. Key informant interviews

Photo credits © 2012 by JG Suyo

Preparation is important to reduce damages from Typhoon.

Quetion	Answer	No.HH
Did you prepare for the coming of Typhoon Yolanda? *Nagpreparar ka baea sa pag-abot it bagyong Yolanda?*	Yes	413 (94 %)
	No	26 (6 %)

Many Families treat their Houses and trees.

Tied the house to a tree; 212HH (48.3%)
Put weights on the roof ; 153HH (34.9%)

Disaster management and Preventions

Questions	Answer	No.
When was the first time you heard about Typhoon Yolanda? *Kan-o mo una nabatian ro parte sa bagyong Yolanda?*	Never heard before it hit	5
	One week to two days	**402**
	One day	32
What was the first information you heard about Typhoon Yolanda? *Anong klaseng impormasyon ro imong unang habatian parte sa bagyong Yolanda? Multiple answer allowed*	**It is a Supertyphoon**	**425**
	Will destroy all along its path	43
	Need for evacuation of families in the coastal areas	**107**
	It will bring high storm surge	2
	Others	6
Where did the information come from? *Siin naghalin do impormasyon?*	Barangay Officials	148
	Neighbor	79
	Radio	**264**
	TV	**358**
	Newspaper	6
	Others , Specify	13

Many residents got information from TV and Radio, But *necessary of evacuation was not highlighted*.

Disaster management and Preventions

Disaster management strategies	n (%)
Preparedness/response mechanisms*	
Prepared food	**70 (37)**
Strengthened house structure	35 (19)
Evacuated/relocated	35 (19)
Secured belongings	27 (14)
Others (prayed, trimmed trees)	15 (8)
None	5 (3)
Coping mechanisms (Top 3 responses)*	
Engaged in other income source/s	43 (38)
Relied on external assistance	32 (28)
Loaned money	20 (18)

Note: * Multiple response items

Prepared FOOD is most important.

Role of coastal fishery

(Photos, 8:29am, 9th Nov. 2013)

- After 2 days from Yolanda Passed, fish market was sold fish and shrimps.
- This small scale fishery provided food and incomes to local residences.

Coastal ecosystem and small scale fishery have important roles as safety net for rural area.

This fact should be taken into account for disaster management.

Information supply and food security Including fishery adaptation are quite important.

Thank you!