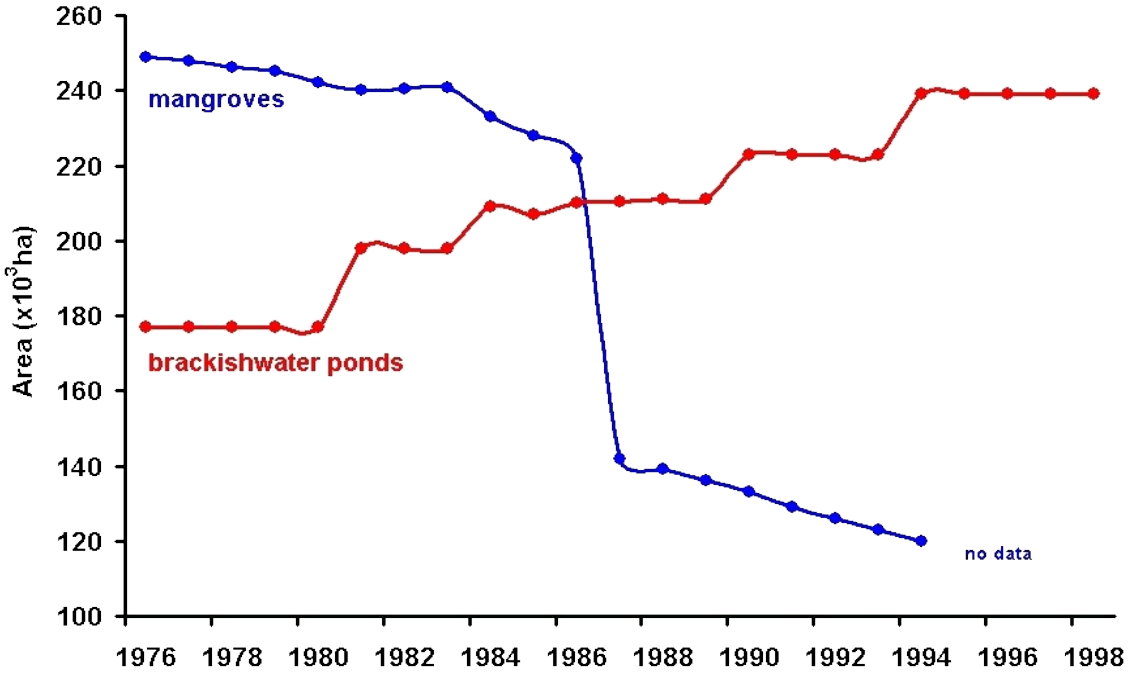
MANGROVE REHABILITATION IN THE PHILIPPINES: SCIENCE VS. QUOTAS

J.H. Primavera
Chief Mangrove Scientific Advisor, Zoological Society of London, La Paz, Iloilo City

- Integration of Mangroves and Aquaculture
- Seafront Planting: Correct sites/species; use of wildings
- Haiyan Mangrove Damage: (Rhizophora) Plantations vs Natural Forests
- *Rhizophora* Planting on Seagrass Beds
- Coastal Erosion: Green/Gray engineering, BwN
- Coastal Greenbelts: Mangroves + Beach Forests
- Reversion of Abandoned Ponds
- Mangrove Ecoparks

MANGROVES TO PONDS



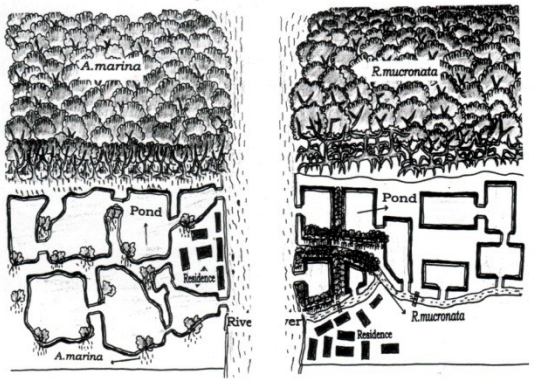
Collage by J.H. Primavera

AQUACULTURE IN MANGROVES

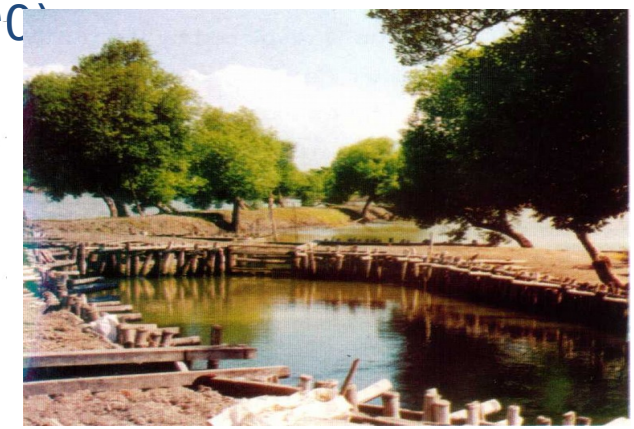
Integrated Mangrove-Aquaculture Systems

(Primavera, 2000)

HONG KONG: *Gei Wai*



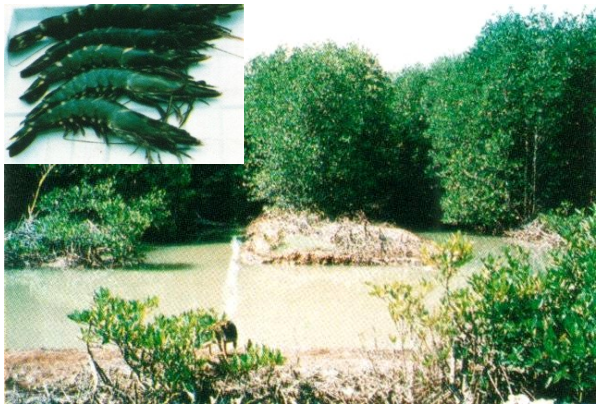
INDONESIA (Silvofishery)



INDONESIA (empang parit)

PHILIPPINES (aquasilviculture)

MALAYSIA (mudcrab pens)



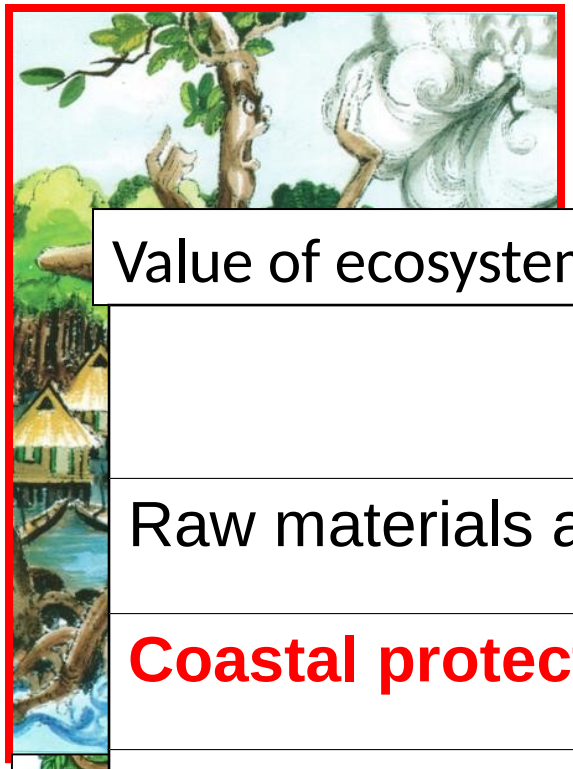
VIETNAM (mixed shrimp-mangrove farming systems

Aquaculture Research

Mud Crab Pen Culture - Fish Biomass Replacement and Mangrove Community Structure

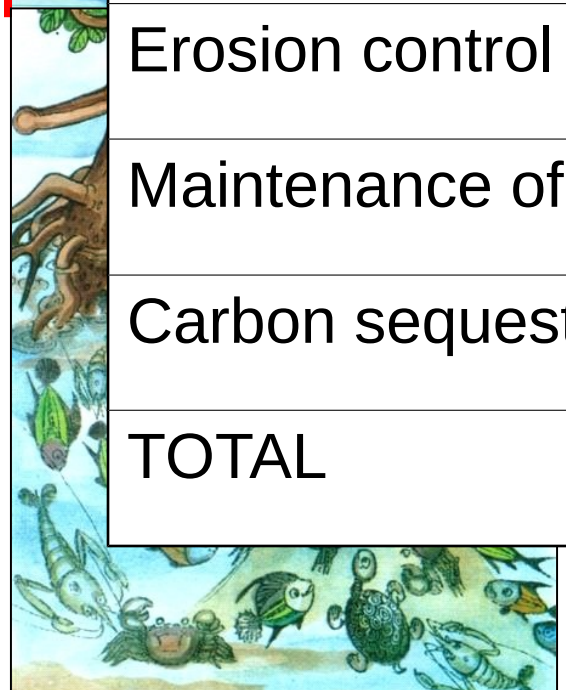
Mudcrab Culture in Mangrove Pe

USES OF MANGROVES

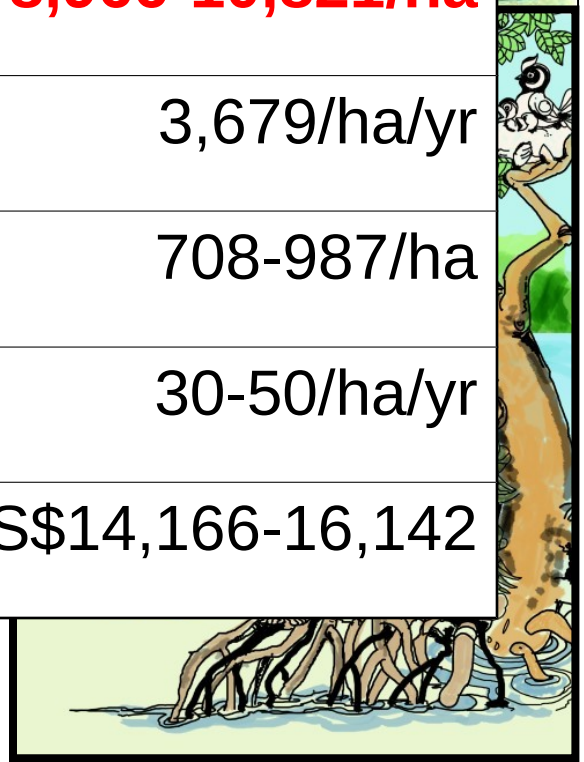


Value of ecosystem services of mangroves (Barbier et al, 2011)

	Examples of value (US$)
Raw materials and food	484-585/ha/yr
Coastal protection	**8,966-10,821/ha**
Erosion control	3,679/ha/yr
Maintenance of fisheries	708-987/ha
Carbon sequestration	30-50/ha/yr
TOTAL	US$14,166-16,142



Artwork by Ta Luu



MANGROVES	PONDS
1918: 450,000 ha	1940: 61,000 ha
2003: 240,000 ha	1994: 232,000 ha

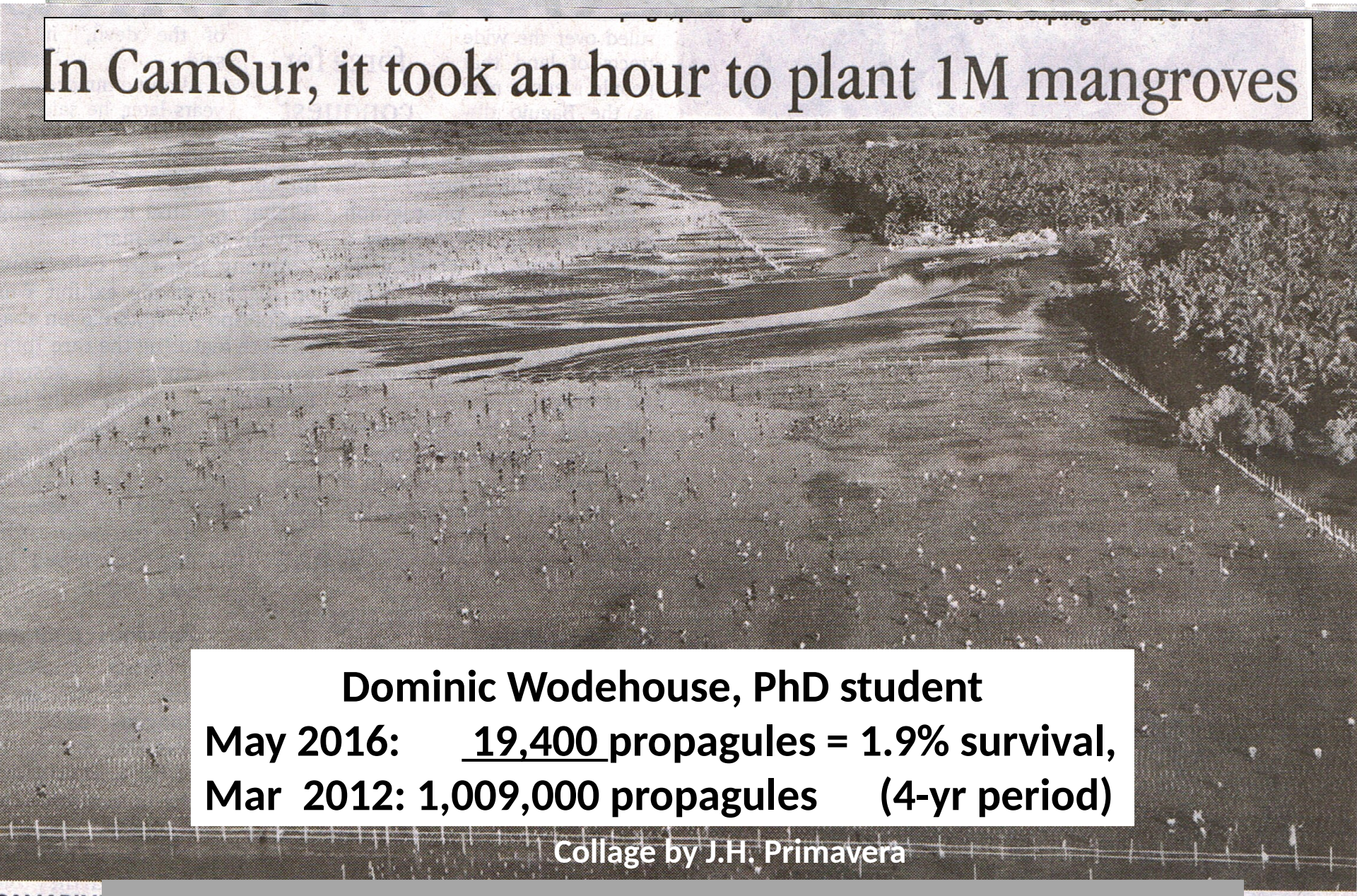
PRESENT MANGROVE: POND RATIO - 1: 1

IDEAL RATIO (Saenger et al 1983) - 4: 1

THEREFORE, NEED TO REHABILITATE MANGROVES!!!

SUNDAY, MARCH 11, 2012 PHILIPPINE DAILY INQUIRER

In CamSur, it took an hour to plant 1M mangroves



Dominic Wodehouse, PhD student

May 2016: 19,400 propagules = 1.9% survival,

Mar 2012: 1,009,000 propagules (4-yr period)

Collage by J.H. Primavera

1,000,000 mangroves by 7,000 volunteers in 1 hr!!

WRONG SPECIES!!

Rhizophora spp.

(Collage by JH Primavera)

MANGROVE AREA: PHILIPPINES

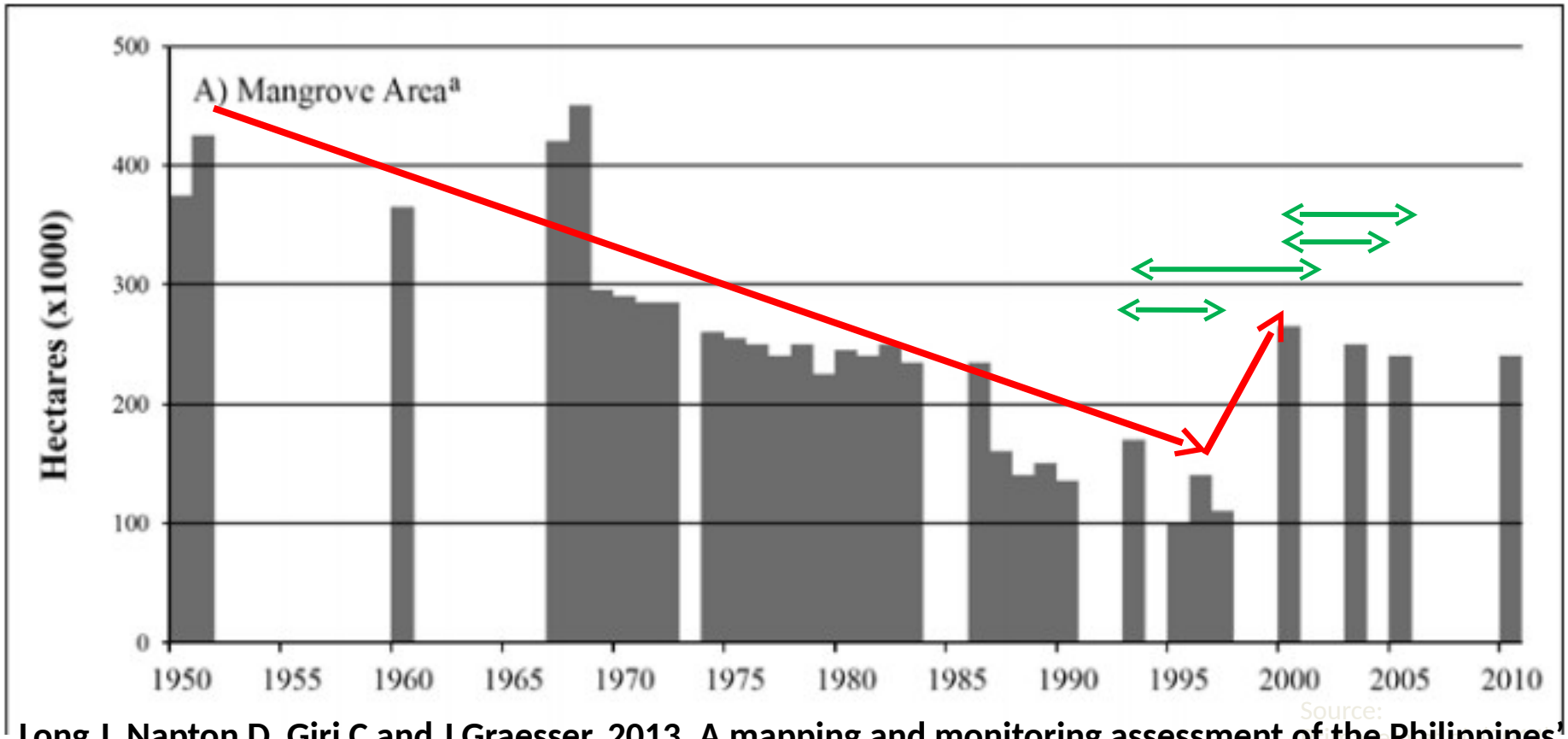
1918-2000 – decline: 500,000 ha to 137,000 ha

1995-2003 – increase: 140,000 ha to ~250,000/

1995-2006 - 289,000 ha (NAMRIA)

1984-2006 - 26,000 ha planting (JBIC, ADB, WB)

Collage J.H. Primavera



Source:

Long J, Napton D, Giri C and J Graesser. 2013. A mapping and monitoring assessment of the Philippines' mangrove forests from 1990 to 2010. J. Coastal Research. DOI. 10.112/JCOASTRES-D-13.00057.1

Major Mangrove Rehabilitation Projects in the Philippines, 1957-2006

Project Name	Funding Source/Amount	Area (ha)	Species Planted	Ave. Survival
Banacon, Bohol (1957-1990)	Local	500	RS	high, tidal flat
Pagangan, Bohol (late 1950s)	Local	54	RS	high, tidal flat
CVRP (1984-1992)	WB, US$3.5 million NSF	994	Rhizophora sp.	17-19% (1995)
Kalibo, Aklan (1989-1993)	OECF, $561,705	50	RA, RM	high
	OECF, $305,343	13	RA, RM	high
	CDF, PhP100,000	7	RA, RM	high
UNDP-GEF (20 Projects: 1992-20004)	UNDP-SGP, ave. $35,000	31	Rhizophora sp.	5% (1 proj)
FSP (1993-2003)	JBIC, $938,800	11,486	Rhizo.sp.	88% (1)
FRMP (1999-2004)	ADB & JBIC, $11,218/ha	1,900	Rhizo. sp., AM, Nypa	50%
CBRMP (1999-2006)	WB, $38 Million	5,302	Rhizo. sp.	60%

NO PLANTING ON SEAGRASS BEDS!

SEAGRASSES ARE IMPORTANT, TOO!

PLANT MANGROVES IN THE RIGHT PLACE!

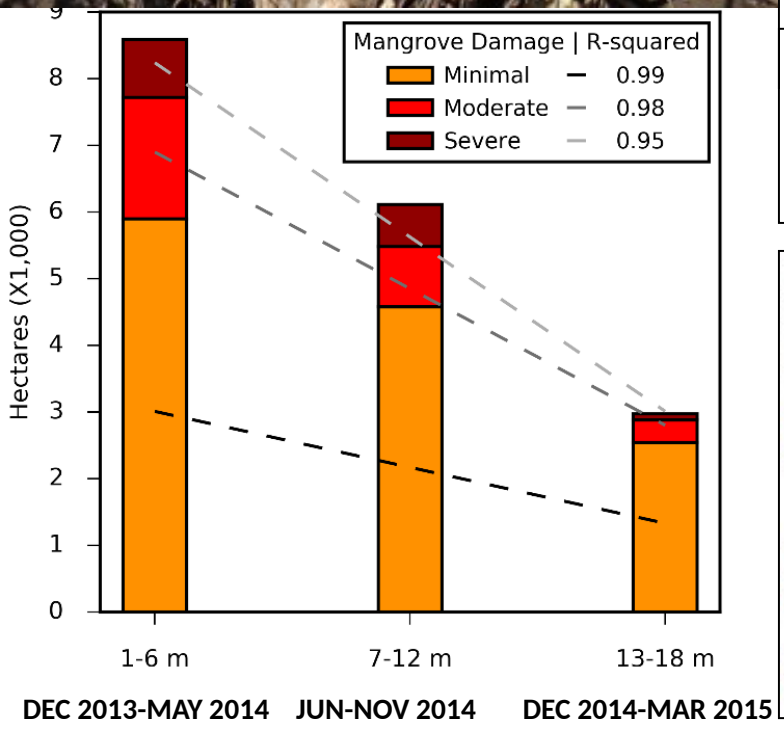
ZSL Living Conservation · Darwin Initiative · Oxfam

FORESTRY

...o by 5,000 hectares

...ve Director Benjamin ...rdered his officials to ...GP implementation. ...2 established 15,320.55 ... the target of 14,532 ha ...t of 105 percent. These ...e provinces, namely; Mahogany, Narra, Rain Tree, Gmelina, Tuai, Molave, Bitaog, Kamagong, White Lauan, Red Lauan, Ipil, Rubber Tree and Talisay and fruit trees composed of mango, coconut, Rambutan, Cacao, Jackfruit, Lanzones, Calamansi, Pomelo, Guyabano, Lubeg, Atis, Cashew and Cincum.

ECOSYSTEM TRANSFORMATION (OR ROBBING PETER TO PAY PAUL)!!



Marine Pollution Bulletin

Damage and recovery assessment of the Philippines' mangroves following Super Typhoon Haiyan

Jordan Long [a,*,2], Chandra Giri [b], Jurgenne Primavera [c], Mandar Trivedi [d]

Contents lists available at ScienceDirect

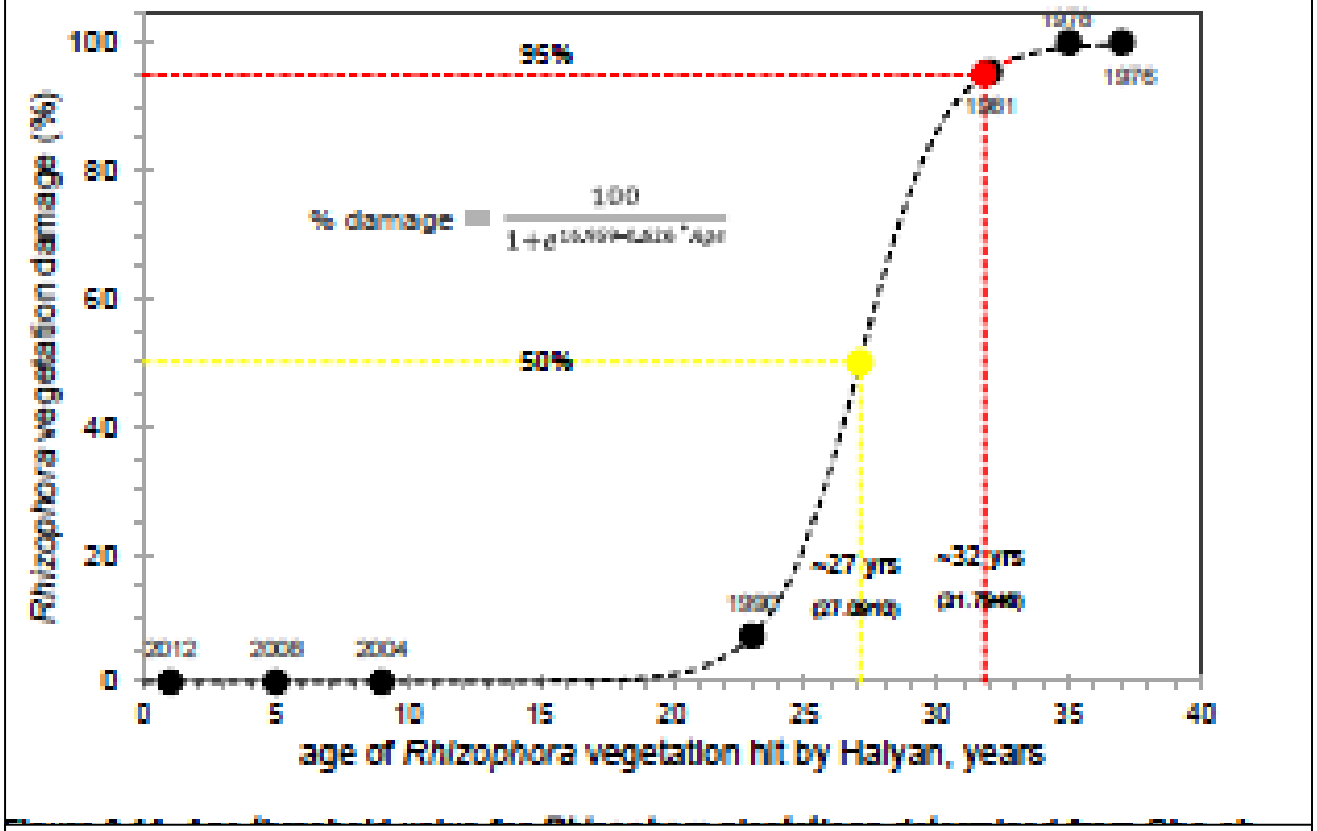
Marine Pollution Bulletin

ELSEVIER

journal homepage: www.elsevier.com/locate/marpolbul

Preliminary assessment of post-Haiyan mangrove damage and short-term recovery in Eastern Samar, central Philippines

J.H. Primavera [a,*], M. dela Cruz [b], C. Montilijao [a], H. Consunji [c], M. dela Paz [d], R.N. Rollon [e], K. M
M.S. Samson [g], A. Blanco [a]



Ocean & Coastal Management 132 (2016) 1–14

Contents lists available at ScienceDirect

Ocean & Coastal Management

journal homepage: www.elsevier.com/locate/ocecoaman

Impact of *Haiyan* on Philippine mangroves: Implications to the fate of the widespread monospecific *Rhizophora* plantations against strong typhoons

Betty May R. Villamayor [a], Rene N. Rollon [a, *], Maricar S. Samson [b], Giannina Marie G. Albano [c], Jurgenne H. Primavera [d]

PhP1B/US$22M for Mangrove Rehab, Yolanda Areas
(UP Diliman, 22 March 2014)

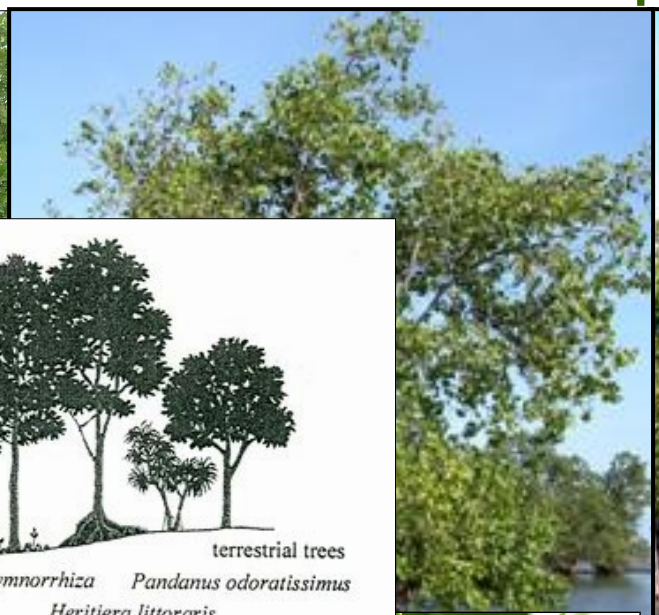
- **Protect** natural mangroves
- **Mangrove rehabilitation (if needed) – dominant species, nurseries, community-based**
- **Resettle** vulnerable coastal communities
- Enforce **no-build zones for greenbelts**
- Establish **100-m coastal greenbelts**

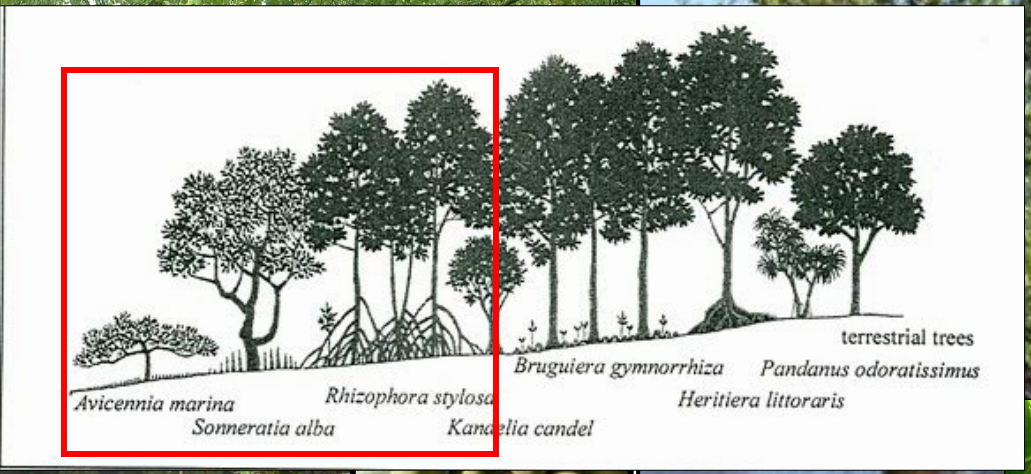
PROGRAM/PROJECT/ACTIVITY	INITIAL RELEASE	
Site validation & assessment	12,330,000	(3.0%)
Baseline data collection (research)	20,550,000	(5.1%)
Site preparation	54,800,000	(14.7%)
Community Nurseries	**8,550,000**	**(2.1%)**
WILDINGS/PROPAGULES COLLECTION	**240,070,400**	**(60.0%)**
Plantation establishment	27,400,000	(6.8%)
Community capacity building	**174,000**	**(0.04%)**
Project monitoring & supervision	36,125,600	(9.0%)
Mangrove protection		**(0%)**
TOTAL	**PhP1B/US $22M**	**(100%)**

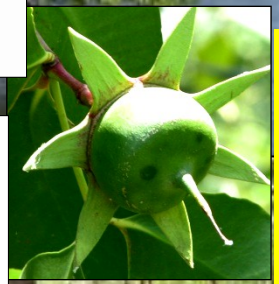
BUNGALON/APIAPI *Avicennia marina*

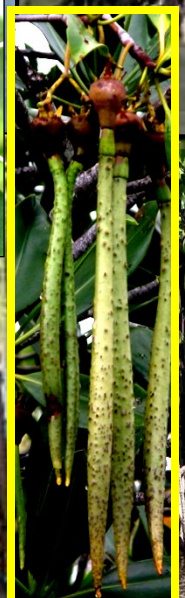
PAGATPAT *Sonneratia alba*

BAKHAW *Rhizophora* species









Duke in Tomlinson,1986

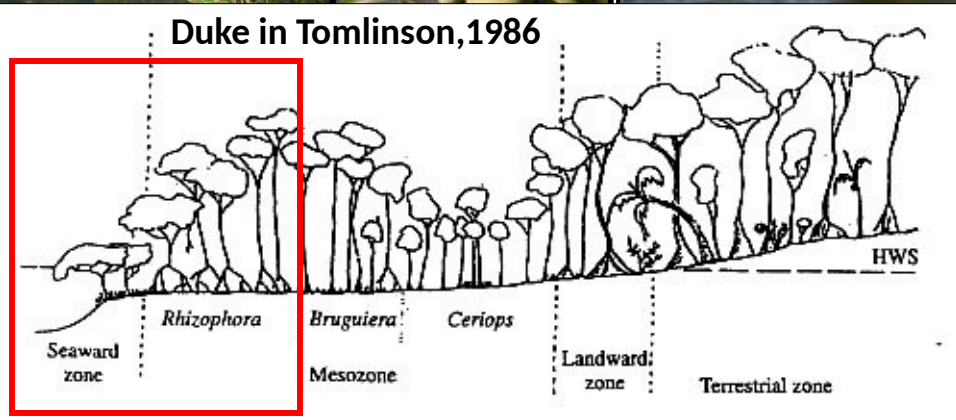


Fig. 4.1 Profile of a shore in north-eastern Australia (an area of high rainfall) to show mangrove zonation. HWS indicates the level of high water, spring tides. Reproduced with permission of Dr N.C. Duke and the publishers from Tomlinson, P.B. 1986. *The Botany of Mangroves.*

2014 National Greening Program, Region 8 (Eastern Visayas)

DRIVERS: QUOTAS OF TARGET SEEDLINGS/ AREA (BEGINNING)
SCIENCE OF SEEDLINGSURVIVAL/ HECTARES FOREST PRODUCED (END)

NAME OF ORGANIZATION/ SITES/LOA's	Province, Municipality, Barangay	AREA (ha)	Seedlings to be Produced	Seedlings Produced	Area Planted	Species	No. Of seedlings planted	Mode of propagation
OVERALL TOTAL		**2,658.0**	**6,645,000**	**6,699,200**	**2,679.7**		**6,699,200**	
BLGU Guintigian-Rep by: Nestor Lacaba	Leyte, Babatngon, Guitigian	50.0	125,000	125,000	50.0	Bakauan	**125,000**	
BLGU Taguite- Rep by: LerioLampayan	Leyte, Babatngon, Taguite	50.0	125,000	125,000	50.0	Bakauan	**125,000**	
BLGU Uban- Rep by: Rogelio Fabi, Jr.	Leyte, Babatngon, Uban	100.0	250,000	250,000	100.0	Bakauan	**250,000**	
BLGU of Balud	Leyte, Capoocan, Balud	5.0	12,500	12,500	5.0	Mayapi	12,500	Propagules, Wildlings
BLGU of Cabul-an	Leyte, Capoocan, Cabul-an	5.0	12,500	12,500	5.0	Mayapi	12,500	Propagules, Wildlings
BLGU of Culasian	Leyte, Capoocan, Culasian	10.0	25,000	25,000	10.0	Mayapi/ Bungalon	25,000	Propagules, Wildlings
BLGU of Pinamopoan	Leyte, Capoocan, Pinamopoan	10.0	25,000	25,000	10.0	BungalonPuti/ Mayapi	25,000	Propagules, Wildlings

RECOVERING **(Photos R. Rollon)**

Pagatpat *Sonneratia alba*

Collage JH Primavera

RIGHT SPECIES - pagatpat *Sonneratia alba*

Sonneratia alba **PLANTATION: ERMITA** (Primavera et al, 2012)

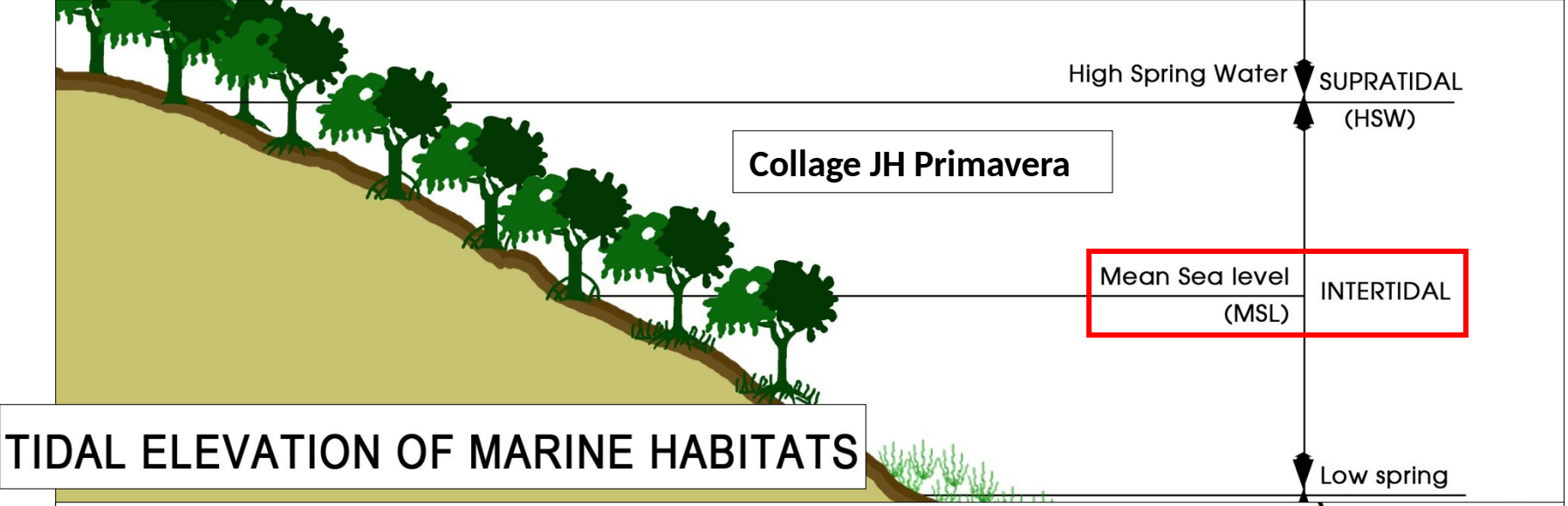
RIGHT SPECIES - apiapi

Avicennia marina

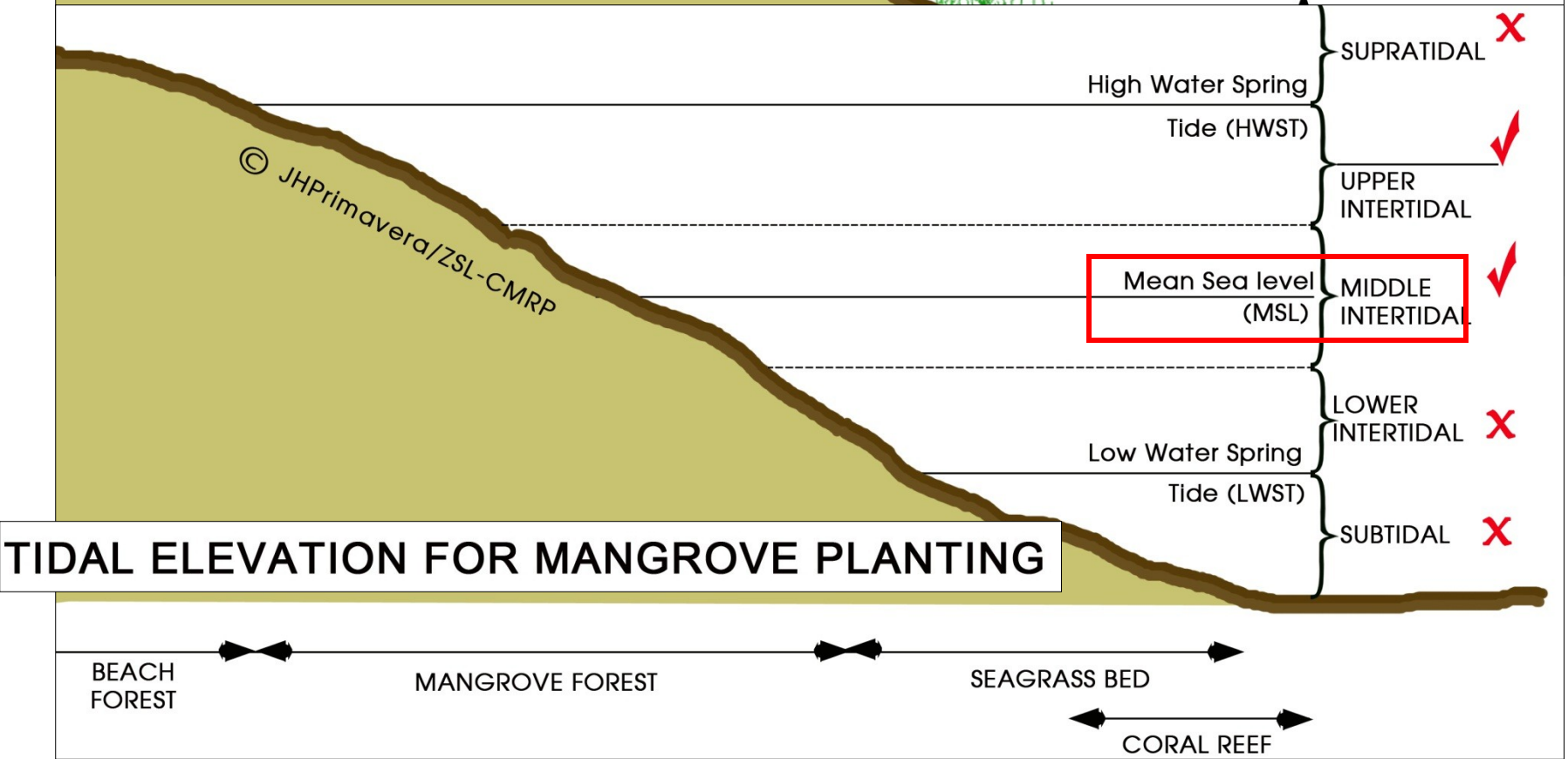
After 3 weeks

Collage JH Primavera

After 3 months



TIDAL ELEVATION OF MARINE HABITATS



TIDAL ELEVATION FOR MANGROVE PLANTING


GREENBELT
Balaring, Ivisan, Capiz
PO: NewBAMA
Area: 15 has
Area Planted: 2.5 has
CBFMA Area: 38 has
SA planted
AM planted
AM planted + natural recruits
NATIONAL GREENING PROGRAM
SA/AM planted
AM/SA/RM planted
SA planted
AM/SA/RM planted

IVISAN (2015): NGP (National Greening Program) planted 63 ha in mid-2013; 5% survival

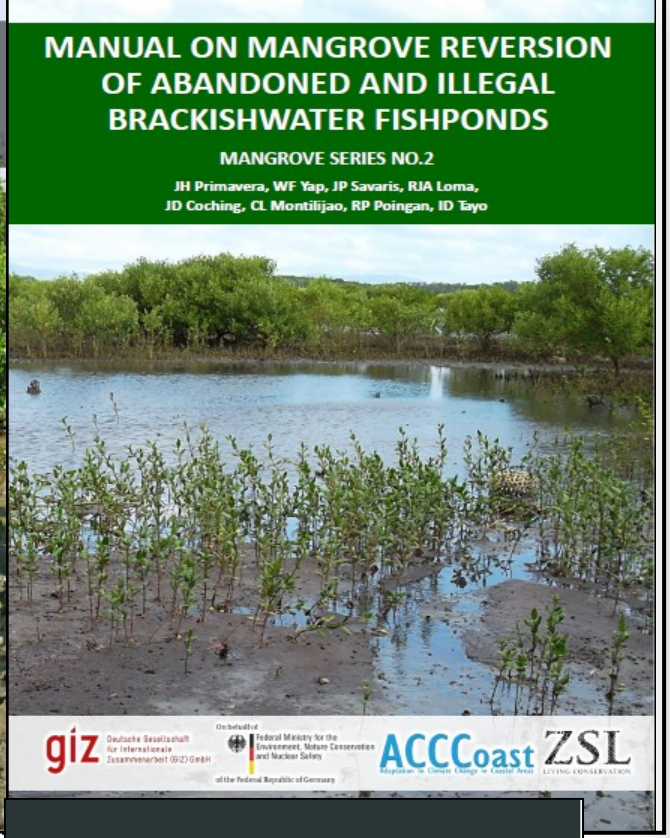
Collage by J.H. Primavera

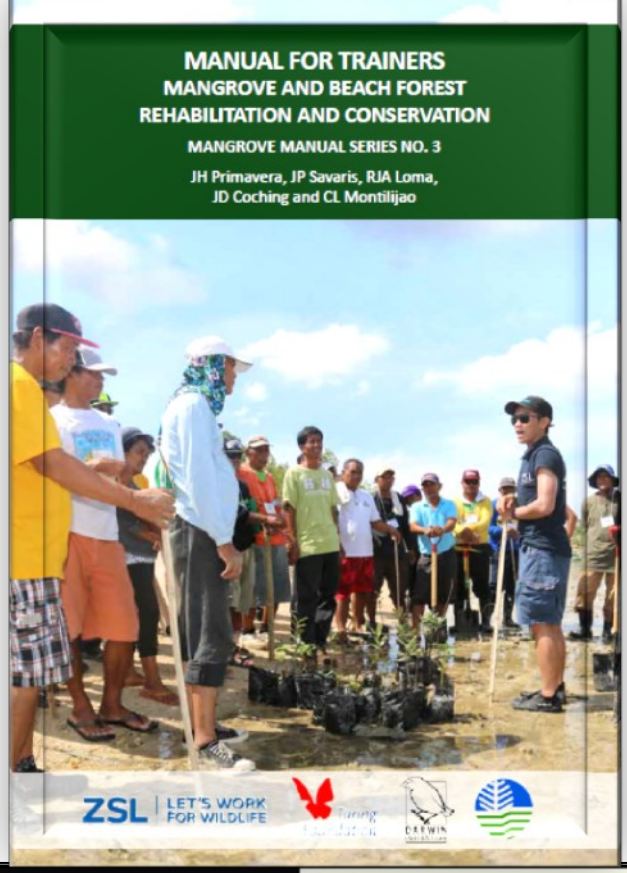
IVISAN (2014): ZSL-CMRP planted 6.6 ha in 2009-2011 at 50-80% survival

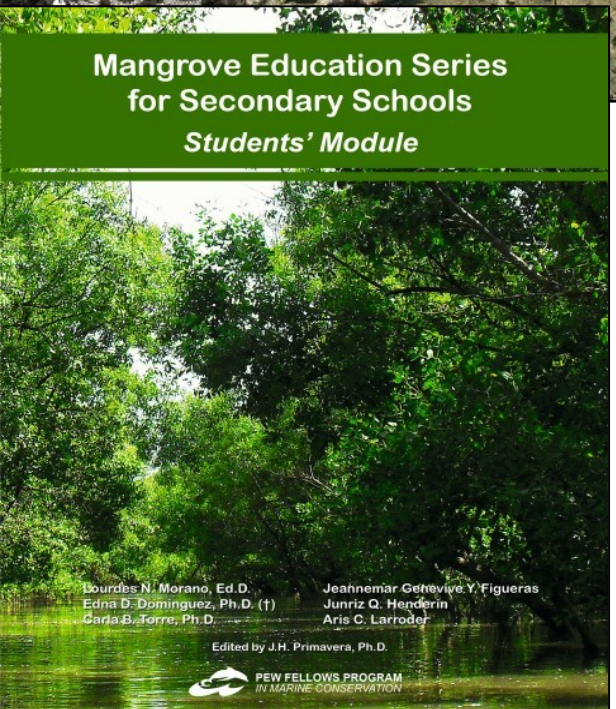
PARADIGM SHIFT

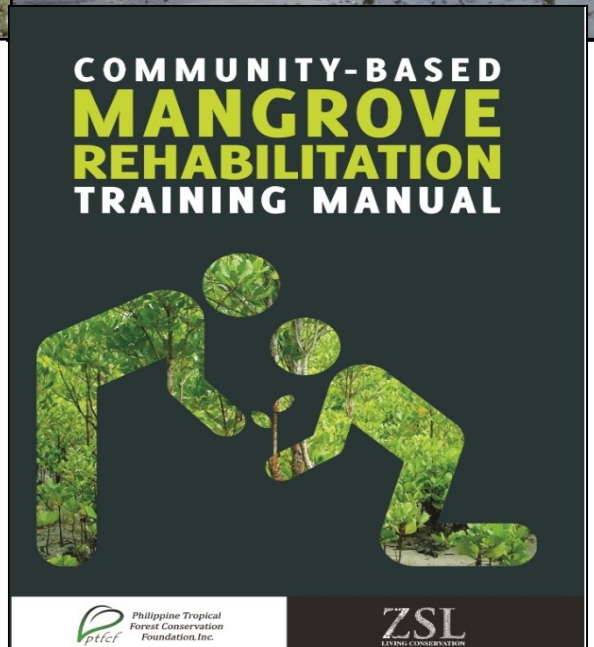
<u>DENR/NGP success</u> (start):
% seedlings/hectares <u>planted</u>
<u>Biological success (end)</u>:
% survival, hectares of forest


MANUAL ON COMMUNITY-BASED MANGROVE REHABILITATION
JH Primavera, JP Savaris, B Bajoyo, JD Coching, DJ Curnick, R Golbeque, AT Guzman, JQ Henderin, RV Joven, RA Loma and HJ Koldewey
ZSL


MANUAL ON MANGROVE REVERSION OF ABANDONED AND ILLEGAL BRACKISHWATER FISHPONDS
MANGROVE SERIES NO.2
JH Primavera, WF Yap, JP Savaris, RJA Loma, JD Coching, CL Montilijao, RP Poingan, ID Tayo
giz
ACCCoast
ZSL


MANUAL FOR TRAINERS
MANGROVE AND BEACH FOREST REHABILITATION AND CONSERVATION
MANGROVE MANUAL SERIES NO. 3
JH Primavera, JP Savaris, RJA Loma, JD Coching and CL Montilijao
ZSL LET'S WORK FOR WILDLIFE


Mangrove Education Series for Secondary Schools
Students' Module
Lourdes N. Morano, Ed.D.
Edna D. Dominguez, Ph.D. (†)
Carla B. Torre, Ph.D.
Jeannemar Genevive Y. Figueras
Junriz Q. Henderin
Aris C. Larroder
Edited by J.H. Primavera, Ph.D.
PEW FELLOWS PROGRAM IN MARINE CONSERVATION

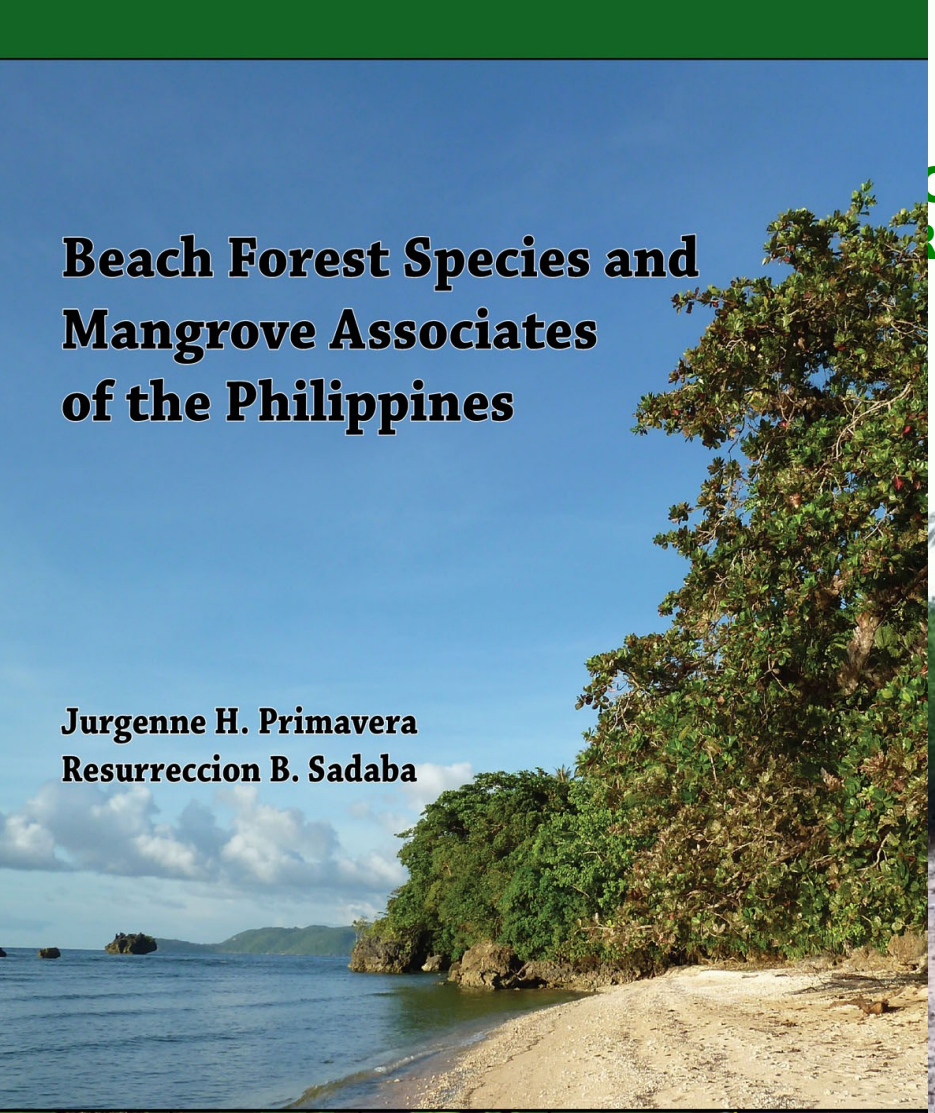

COMMUNITY-BASED
MANGROVE
REHABILITATION
TRAINING MANUAL
Philippine Tropical Forest Conservation Foundation, Inc.
ZSL


FIELD GUIDE TO PHILIPPINE MANGROVES
by J.H. Primavera, Ph.D.
Acanthus
Avicennia
Avicennia alba
Avicennia marina
ZSL

PHILIPPINE MANGROVE GREENBELT/OTHER LAWS

P.D. 705 (1975)	Revised Forestry Code: mangrove strips in islands providing protection from high winds, typhoons shall not be alienated
P.D. 953 (1976)	Fishpond/mangrove lease holders required to **retain or replant 20-m mangrove** strip along rivers, creeks
BFD A.O. 2 (1979)	Min. 25% of total mangrove forest in given area completely protected as Mangrove Wilderness Areas
P.P. 2151 & 2152 (1981)	Declaration of 4,326 ha mangroves as wilderness areas, 74,767 ha as forest reserves
MNR A.O. 42 **(1986)**	Expansion of **mangrove belt in storm surge, typhoon areas: 100 m along shorelines, 50 m along riverbanks**
DENR A.O. 76 (1987)	Establishment **of buffer zone: 50 m fronting seas/oceans and 20 m along riverbanks**; lessees of FLA ponds to plant **20-50 m-mangrove strip**
DENR A.O. 77 (1988)	Integrated Social Forestry Program (provision of legal tenure incentives for co-management of forest resources)
DENR A.O. 123 (1990)	Award of 25-yr Community Forestry Management Agreement for small scale mangrove use, *Rhizophora* and *Nypa* plantations, aquasilviculture
DENR A.O. 15 (1990)	Policies on communal forests, plantations, tenure through Mangrove Stewardship Contracts; revert abandoned ponds to forest; **ban cutting** of trees in FLA areas; **prohibit conversion** of thickly vegetated areas
DENR A.O. 3 (1991)	Policies and guidelines for Mangrove Stewardship Agreement
DENR A.O. 23 (1993)	Combined 3-yr Mangrove Reforestation Contract and 25-yr Forest Land Management Agreement into 25-yr FLMA for families (1-10 ha) and communities (10-1,000 ha)

R.A. 8550 (1998 Fisheries Code) Pond lessee: undertake **reforestation for riverbanks, bays ... seashore fronting dike**



SEAFDEC
Southeast Asian Fisheries Development Center Aquaculture Department

UNESCO
United Nations Educational, Scientific and Cultural Organization

MAB
Man and the Biosphere Programme

Japan Funds-in-Trust

Abandoned Ponds Naturally Regenerated Back to Mangroves (15-20 yrs)

1989

1993

(Collage J.H. Primavera)

2004

2006

Fisheries Code (Rep. Act 8550): Reversion of abandoned, unutilized and underdeveloped ponds back to mangroves

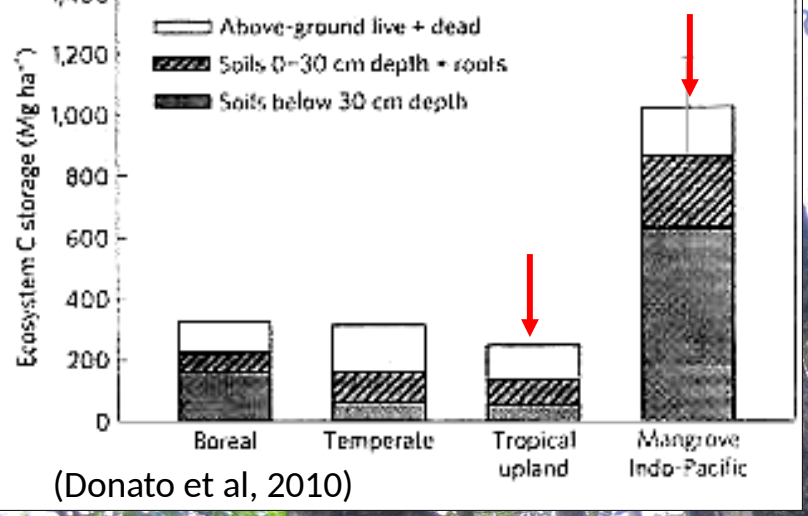
ZSL Site: Nabitasan, Leganes, Iloilo: 3 yr

(Primavera et al, 2013)

Nabitasan, Leganes, Iloilo: 2014

***KATUNGGAN* MANGROVE PARK: LEGANES, ILOILO (Collage by JH Primavera)**

200-meter greenbelt



(Donato et al, 2010)

4 Wednesday, June 30, 2010 / PANAY NEWS www.panaynewsphilippines.com AKLAN

Ibajay to vie for Asia's largest mangrove

By Jun Ariolo Aguirre

AKLAN – Ibajay town here will compete for the record of having the largest mangrove tree in Asia.

Ibajay Mayor Lulu Miraflores said a group of Japanese experts arrived specie to Japan for study.

"Their purpose is to determine the age of the mangrove tree, which have been initially estimated to be more than a century old. We are already promoting the area as an alternative tourism destination to month. Tourists from Iloilo, Negros and nearby provinces already visited the park.

Currently, the town entered into a memorandum of agreement with the Zoological Society of London, which role is to train the local residents in tourist-guiding and conserving the mangrove trees.

The Ibajay mangrove area was discovered by Dr. Jurgenne Primavera, a multi-awarded Ilonggo scientist and environmentalist, along with students from the University of the Philippines in the Visayas during their study tour in 2000.

It has 28 out of the 35 mangrove species found in the country./PN

Avicennia rumphiana (3 m Ø)

HOW MANY PERSONS?

Photo courtesy
JH Primavera

KATUNGGAN IT IBAJAY ECOPARK

How To Get There

From Manila

Take a plane to Caticlan or Kalibo
- Take a van/bus to Bgy. Naisud, Ibajay, Aklan
- Get off at Naisud Central School before Ibajay town proper (see below) and take tricycle to KII

Take a plane to Roxas City or Iloilo
- Take a bus/van to Caticlan (via Kalibo)
- Get off at Naisud Central School and take tricycle to KII

For inquiries, contact:

Ibajay Tourism Council
Ibajay, Aklan
Tel. no: +63 36 289 2025/2024

Community-Based Mangrove Rehabilitation Project in the Philippines
MSL Building, 132 Quezon St., 5000 Iloilo City
Tel. no: +63 33 338 4430
Email: mangroveproject@zsl.org

ZSL

THANK YOU!!!