The Philippine Contribution to the Biodiversity Observation Network (PhilBON): The Palanan Permanent Forest Dynamics Plot, Lessons Learned & Opportunities

Perry S. Ong, Ph. D.

Typhoon Haiyan
The Observer

Typhoon Haiyan: at least 10,000 reported dead in Philippine province

Estimated death toll soars as path of destruction leaves many parts of Philippines inaccessible to government and aid officials

This article is 3 years old

12,875

Kate Hodal in Manila, and agencies

@katehodal

Sunday 10 November 2013 05.55 GMT

At least 10,000 people are thought to have died in the central Philippine province of Leyte after Typhoon Haiyan, one of the strongest storms ever to make landfall, lashed the area, swallowing coastal towns, a senior police official said early on Sunday morning.

8 November 2013

https://www.theguardian.com/world/2013/nov/10/typhoon-haiyan-thousands-dead-philippines

In: SECOND EDITION

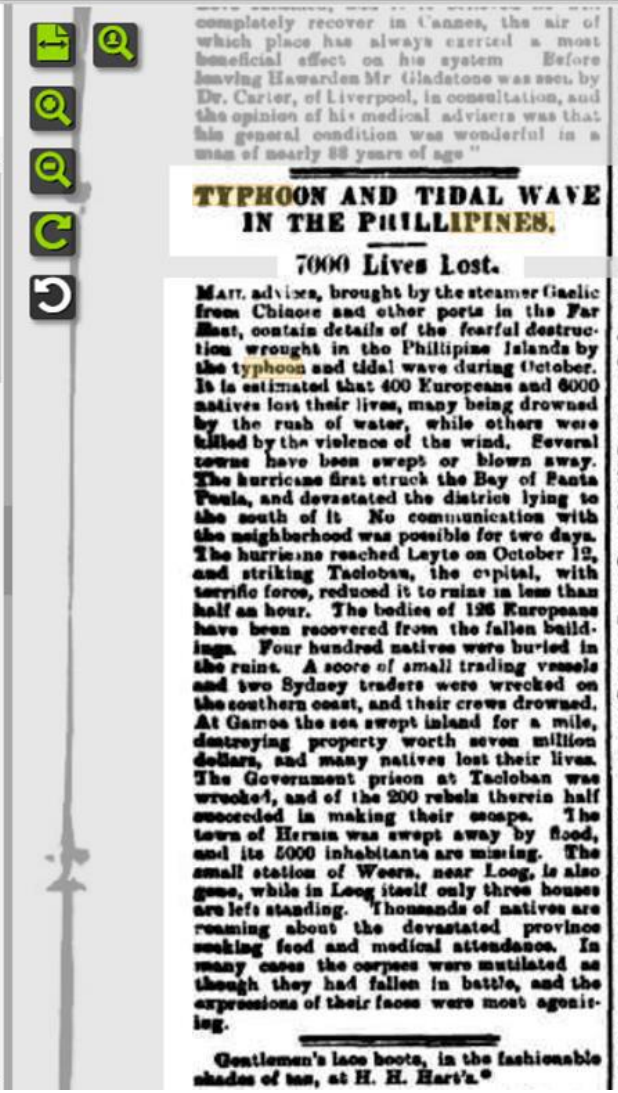
TYPHOON AND TIDAL WAVE

IN THE PHILLIPINES.

7000 Lives Lost.

MAIL advices, brought by the steamer Gaelic from Chinese and other ports in the Far East, contain details of the fearful destruction wrought in the Phillipine Islands by the typhoon and tidal wave during October. It is estimated that 400 Europeans and 6000 natives lost their lives, many being drowned by the rush of water, while others were

killed by the violence of the wind. Several towns have been swept or blown away. The hurricane first struck the Bay of Santa Paula, and devastated the district lying to the south of it. No communication with the neighborhood was possible for two days. The hurricane reached Leyte on October 12, and striking Tacloban, the capital, with terrific force, reduced it to ruins in less than half an hour. The bodies of 126 Europeans have been recovered from the fallen buildings. Four hundred natives were buried in the ruins. A score of small trading vessels



completely recover in Cannes, the air of which place has always exerted a most beneficial effect on his system. Before leaving Hawarden Mr Gladstone was seen by Dr. Carter, of Liverpool, in consultation, and the opinion of his medical advisers was that his general condition was wonderful in a man of nearly 88 years of age."

TYPHOON AND TIDAL WAVE IN THE PHILLIPINES.

7000 Lives Lost.

MAIL advices, brought by the steamer Gaelic from Chinese and other ports in the Far East, contain details of the fearful destruction wrought in the Phillipine Islands by the typhoon and tidal wave during October. It is estimated that 400 Europeans and 6000 natives lost their lives, many being drowned by the rush of water, while others were killed by the violence of the wind. Several towns have been swept or blown away. The hurricane first struck the Bay of Santa Paula, and devastated the district lying to the south of it. No communication with the neighborhood was possible for two days. The hurricane reached Leyte on October 12, and striking Tacloban, the capital, with terrific force, reduced it to ruins in less than half an hour. The bodies of 126 Europeans have been recovered from the fallen buildings. Four hundred natives were buried in the ruins. A score of small trading vessels and two Sydney traders were wrecked on the southern coast, and their crews drowned. At Samoa the sea swept inland for a mile, destroying property worth seven million dollars, and many natives lost their lives. The Government prison at Tacloban was wrecked, and of the 200 rebels therein half succeeded in making their escape. The town of Hernia was swept away by flood, and its 5000 inhabitants are missing. The small station of Weers, near Loog, is also gone, while in Loog itself only three houses are left standing. Thousands of natives are roaming about the devastated province seeking food and medical attendance. In many cases the corpses were mutilated as though they had fallen in battle, and the expressions of their faces were most agonising.

used to divert the stream into its usual channel. Scores of men worked in short shifts by torchlight, and the spectators raised a cheer when it seemed that the stream had been diverted. All at once the roadway began to break up with a tremendous noise, and in an instant the Stonebridge Rock gas main was swallowed up in the gulf. The workers fled. It was at first feared that some had been swept into the torrent, but happily this was not the case. Mr. Tinsley then had a trench cut so as to divert the course of the stream, and this work was partly accomplished by noon. The scene of the catastrophe suggests the effects of an earthquake. One large chasm swallowed up 10 yards of rails and four waggons, while others seemed likely to topple over. The ground all about the neighborhood had a disturbed appearance, and the police were busy keeping the anxious crowds out of danger, while the neighboring cottages of the workpeople were vacated, the dwellers seeking refuge with friends in more safe localities. Mr. Tinsley and others, who had worked all through the night, continued their efforts next day, when they had help from Mr. Paul Lee, manager of the White Moss Colliery Company, and Mr. Davies, son of Mr. Henry Davies, of Southport, the principal owner. The latter walked in a blinding snowstorm at 7 o'clock in the morning to the scene of the disaster. It may be mentioned that the 7ft. coal of the old mine crops out under the bed of the Tawd, and nearly 30 years ago several colliers were drowned through a flood in the shaft sunk to work the coal there. Lord Lathom's pits stopped working on Dec. 1 on account of the rush of gas from the flooded mines.

AN ARIZONA TRAIN WRECK.

THE *San Francisco Chronicle* gives particulars of a terrible railway accident which happened near Los Angeles on 29th November. The regular west-bound over and freight train, consisting of 31 cars, all but one heavily loaded, and drawn by two heavy engines, left Williams about 6 o'clock and started up the heavy grade just west of Los Angeles. It is three miles to the summit, and the heavy train toiled slowly up the slope, and reached the top without accident. The train crossed the divide and started down the other side. The air brakes

LEAVING THE HO

The following letter, wri
son himself, which we
that a really miracul
effected in his case. Mr
reads as follows:—

"King-st., Feb 4th,
"Messrs. Gould, Sons,
"Dear Sirs,—I have b
for many years from co
and constipation. At
quite yellow, and I su
appetite, depression of
was under three of t
physicians, and was told
fessional duties and go i
I did, going to Walke
matta. I was five week
worse and came out to
of the Almighty I was
Gould's Pills, and, tak
menced to improve in a
I am quite recovered.
good, gentle in their act
griping. It seems stra
could not help himself,
Calomel, &c.—I took,
relief. Since taking G
never be without them.
"Signed.

Such ailments as Con
ness after Eating, Dyspe
Kidney Troubles, Deb
Weakness, &c., &c., ar
Pills, and they are also
and sallow complexion
larities, heart palpita
breath after slight exert
side, and when used aft
been eaten they take aw
agreeable feeling.


THE WASHINGTON HERALD

NO. 2247. WASHINGTON, D. C., SATURDAY, NOVEMBER 30, 1912.—SIXTEEN PAGES. ONE CENT.

TROOPS OF FIVE EUROPEAN NATIONS CALLED TO COLORS

Germany, Austria, Russia, Roumania and Servia Make Active War Preparations—Continental Chancellories in Turmoil.

PEACE NEGOTIATIONS STILL CONTINUE

Eldridge E. Jordan Is Slated To Head Inaugural Committee; Formal Announcement Awaited

WILL BE HEAD OF INAUGURAL COMMITTEE.

ELDRIDGE E. JORDAN.

OLDFIELD TO ASK OFFICIAL PROBE OF MERGER PLANS

COMMISSIONERS CONTINUE FIGHT FOR PENSION FUND

JURY HOLDS HYDE GUILTY OF BRIBERY

ELOPE TO CAPITAL; WED; DISAPPEAR

Young Mrs. Alsop Joins Husband

JACKSON COMES TO THE SENATE

15,000 DIE IN PHILIPPINE STORM

FIRE DESTROYS M.A.C. BUILDING

21 DAYS For Shopping Before Christmas

Washington Herald

15,000 DIE IN PHILIPPINE STORM

That 15,000 persons were probably killed and wounded in a typhoon that swept the Philippine Islands last Tuesday was reported yesterday in cable dispatches to the Bureau of Insular Affairs.

The typhoon swept the Visayas and is said to have practically destroyed Tacloban, the capital of Leyte, and to have wrought enormous damage and loss of life at Capiz, the capital of the province of Capiz.

Tacloban has a population of 12,000. Capiz has a population of over 20,000. Capiz is the terminal of the railroad from Iloilo. It is a most important sugar port.

Aid Rushed to Scene.

The first news of the catastrophe came in a dispatch from the governor general of the Philippines. No figures of the dead or injured were given, but it was stated that probably half the population of the two cities had been lost.

The governor general sent his dispatch on Thursday. He informed the department that he was rushing a shipload of food, clothing, and all available medical supplies to Tacloban. All telegraphic communication has been destroyed, and it is impossible to get other than vague reports of the extent of the disaster. That Tacloban has suffered an enormous loss of life is believed to be certain.

Following the receipt of the dispatch announcing the heavy casualties in the Visayas, the Red Cross prepared to rush a relief fund to the governor general

Supertyphoon
26 November
1912

Reported
30 November
1912

http://chroniclingamerica.loc.gov/lccn/sn83045433/1912-11-30/ed-1/seq-1/#

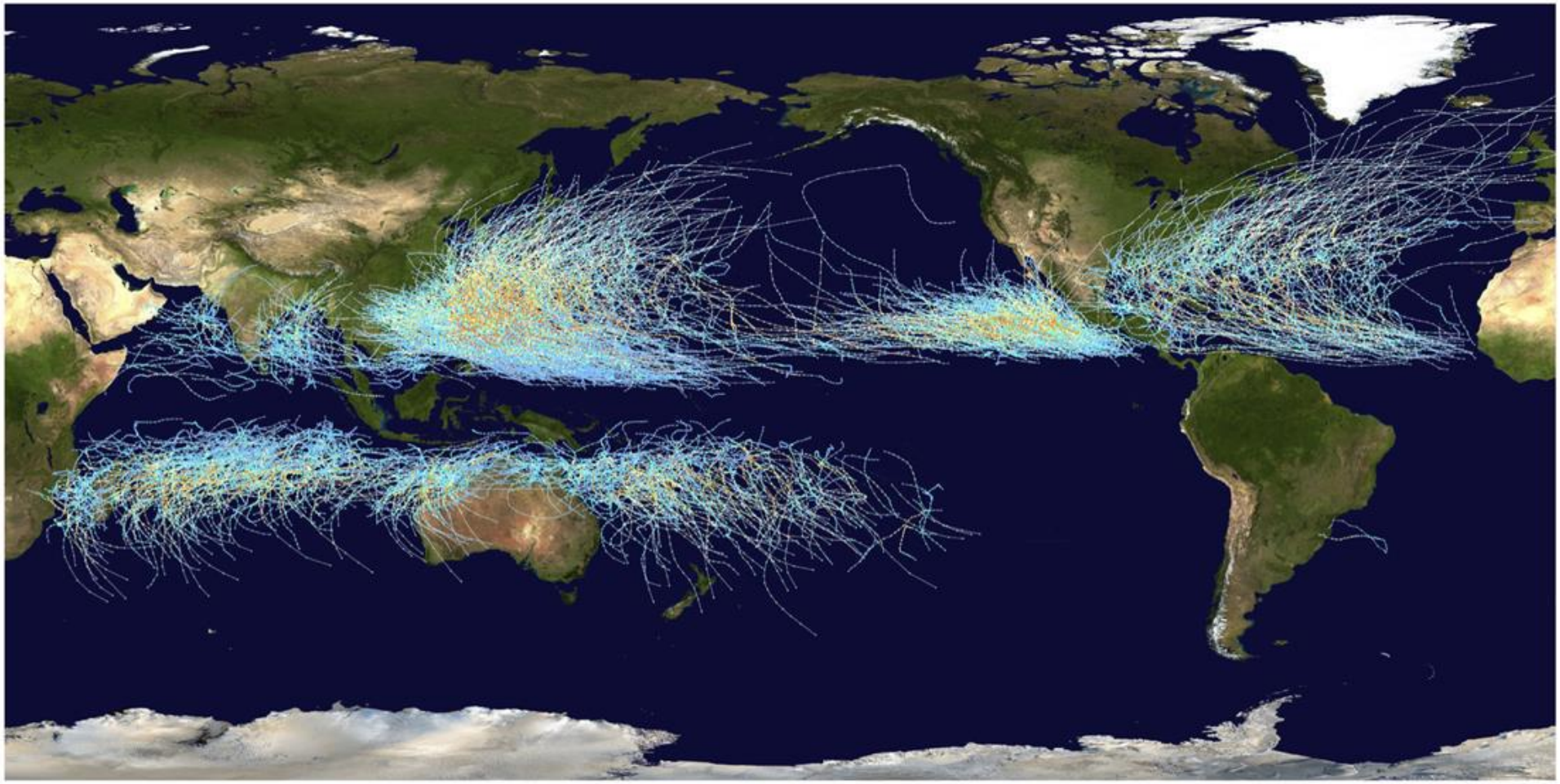


Figure 1: Global distribution of all cyclones between 1950-2000 [1]. In contrast to the Philippines, Borneo has not witnessed a cyclone in 50 years.

Supplementary material for Moritz et al., 2017, Functional preservation and variation in the cone opsin genes of nocturnal tarsiers, Phil. Trans. R. Soc. B. doi: 10.1098/rstb.2016.0075

This link provides detailed information about original data.

https://data.nodc.noaa.gov/cgi-bin/iso?id=gov.noaa.ncdc:C00834

This link is to an interactive map tools for downloading cyclone/hurricane tracks over various locations/time periods.

https://coast.noaa.gov/hurricanes/?redirect=301ocm

This is the link to the International Best Track Archive for Climate Stewardship (IBTrACS). Only data from the WMO RSMCs are provided by this subset.

https://www.ncdc.noaa.gov/ibtracs/index.php?name=wmo-data

For data from other agencies (e.g., JTWC, CMA, etc.), access the complete IBTrACS dataset.

https://www.ncdc.noaa.gov/ibtracs/index.php?name=status

Palanan Permanent Forest Dynamics Plot (Palanan PFDP)

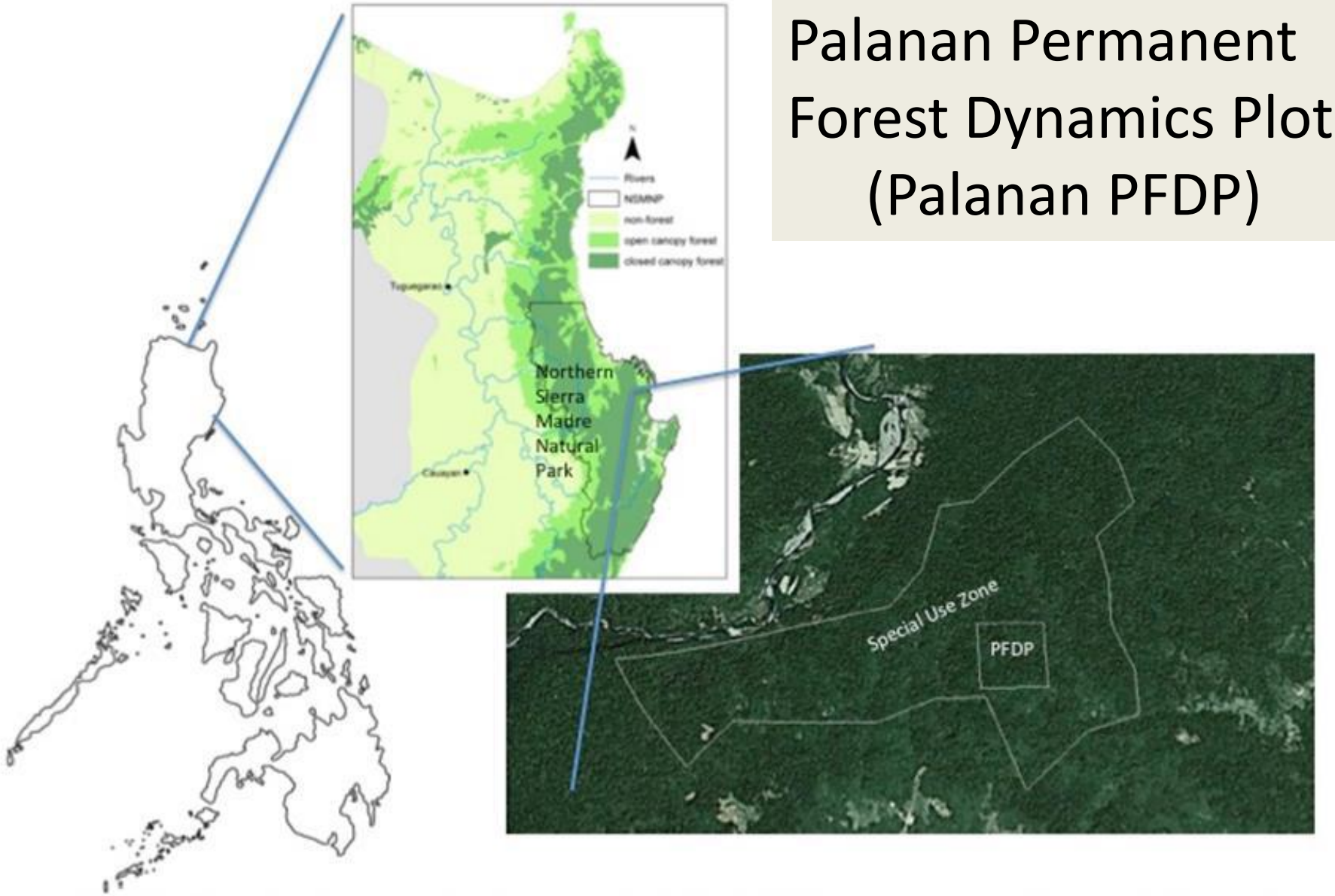
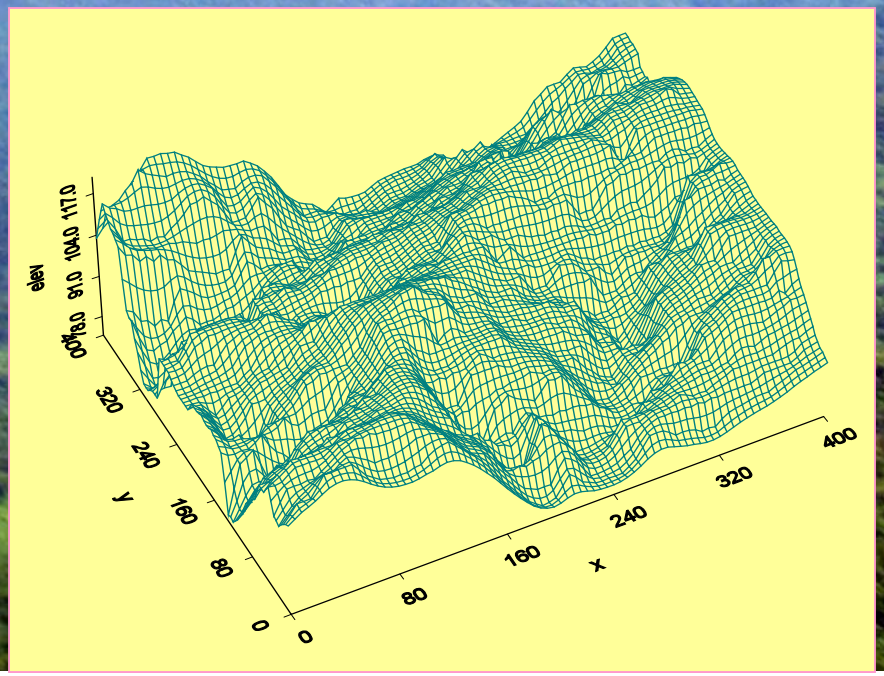
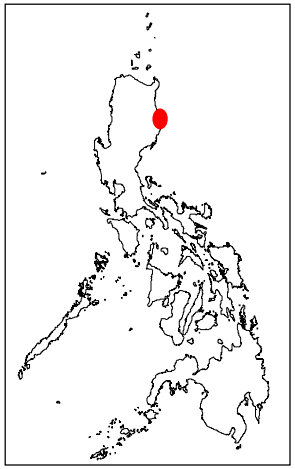


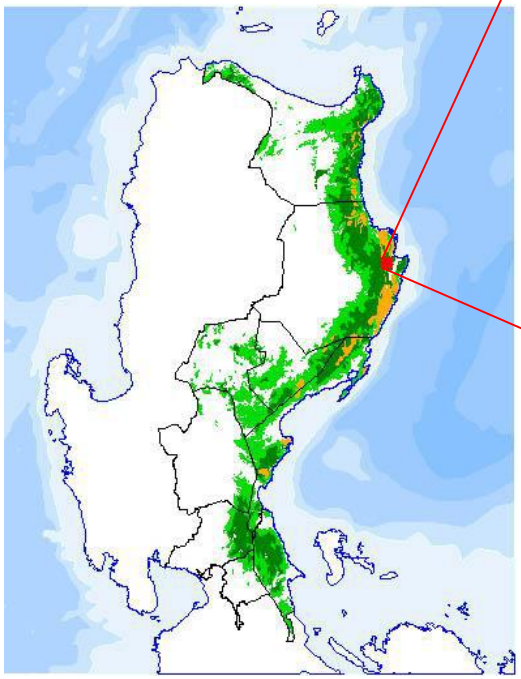
Figure 1. The 16-ha Palanan Forest Dynamics Plot and the surrounding 273-ha Special Use Zone within the Northern Sierra Madre Natural Park (NSMNP). Philippine Outline Map from Map Atlas (www.worldatlas.com). Location of NSMNP map from Biodiversity Conservation in the Northern Sierra Madre Natural Park by Marites Gatan Balbas, Mabuwaya Foundation Inc.

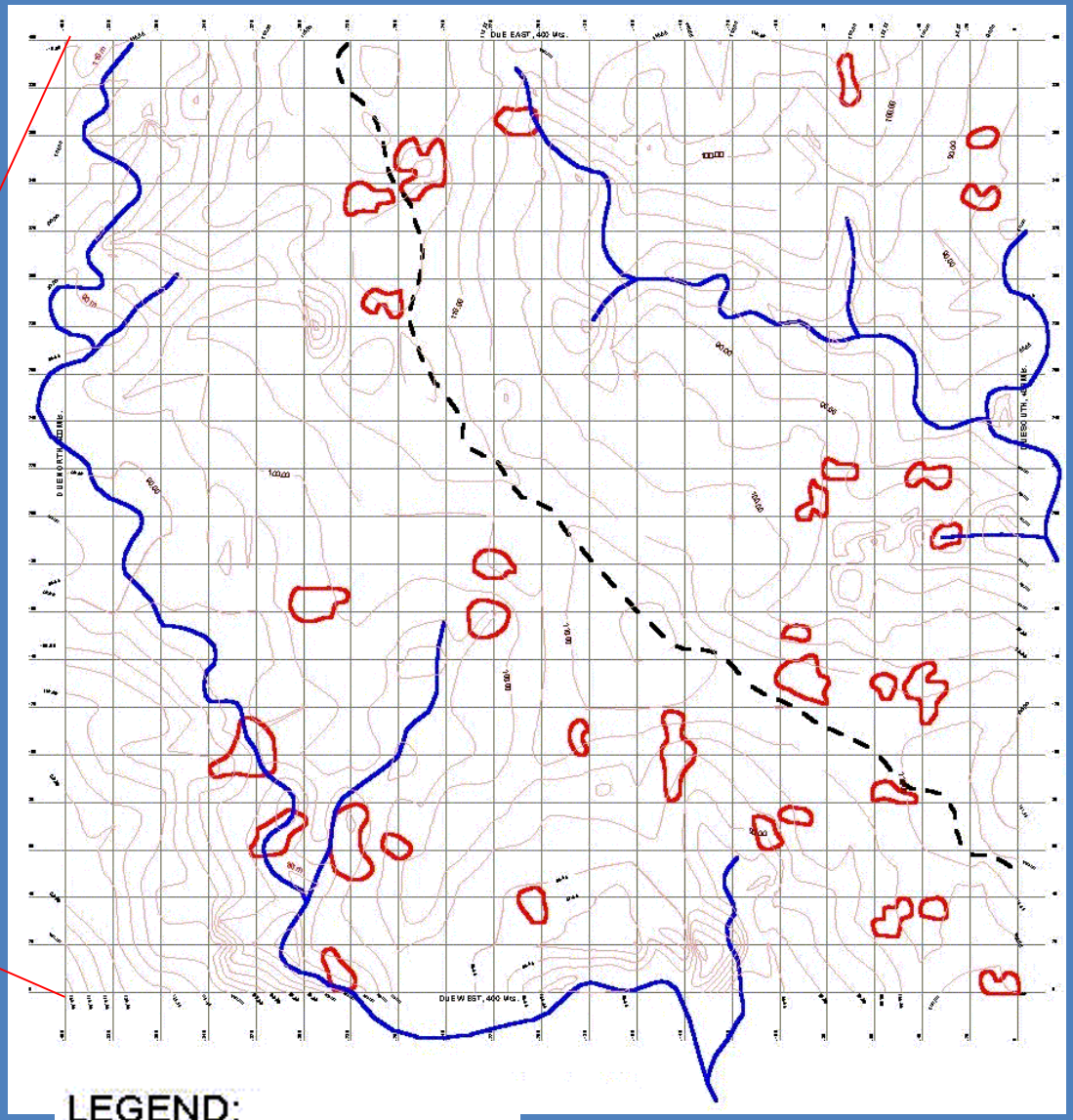
Palanan Forest Dynamics Plot



- 70 – 125 m asl
- 340 cm annual precipitation
- clay loam soils







LEGEND:

MAJOR CONTOUR
(5 m interval)
CREEK
OPEN_AREA
TRAIL
GRIDLINE

16 hectares
All trees ≥1 cm dbh
Censused every 6 years

Summary Statistics of the Palanan PFDP

Plot Size: 16 ha

Year Initiated: 1994 (8-ha); 1998 (16-ha)

Recensus: 2004 (Supertyphoon Imbudo (Category 4) hit in July 2003, before recensus)
2010 (Supertyphoon Meji (Category 5) hit in October 2010, after recensus)
2016 (Supertyphoon Haima (Category 5) hit in October 2016, after recensus)

	1998	2004	2010	2016
Species :	308	322	323	331
Trees:	61660	77586	74606	82788*

*recensus completed October 2016, numbers under review

Mortality Rates
Growth Rates
Colonization Rates
Impact of Typhoons

Journal of Vegetation Science **27** (2016) 133–143

Dynamic response of a Philippine dipterocarp forest to typhoon disturbance

Sandra L. Yap, Stuart J. Davies & Richard Condit

Keywords
Biomass; Dipterocarp forest; Forest dynamics; Forest resilience; Mortality and recruitment; Regeneration; Tree demography; Typhoon disturbance

Nomenclature
Co et al. (2006)

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Abstract

Questions: Natural hazards can wreak catastrophic damage to forest ecosystems. Here, the effects of typhoon disturbance on forest structure and demography of the 16-ha Palanan Forest Dynamics Plot in the northeast Philippines were examined by comparing census intervals with (1998–2004) and without (2004–2010) a strong typhoon. Category 4 Typhoon Imbudo, with wind gusts exceeding 210 kph, hit Palanan in July 2003. In this study, we ask: (1) was there an effect of the typhoon on stand structure and biomass; (2) was there an impact on species diversity; (3) did annual mortality, growth and recruitment change significantly between typhoon and non-typhoon periods; and (4) did the typhoon's impact vary with local topography, from leeward to windward sides of a ridge?

Location: Lowland mixed dipterocarp forest, Palanan, Isabela, Philippines.

Methods: Census data from 1998, 2004 and 2010 for all trees ≥1 cm DBH in a 16-ha permanent plot in Palanan, Isabela, were used to assess tree demography. Recorded in the census were species identification and measurements of DBH and tree locations. Biomass was calculated from published allometry.

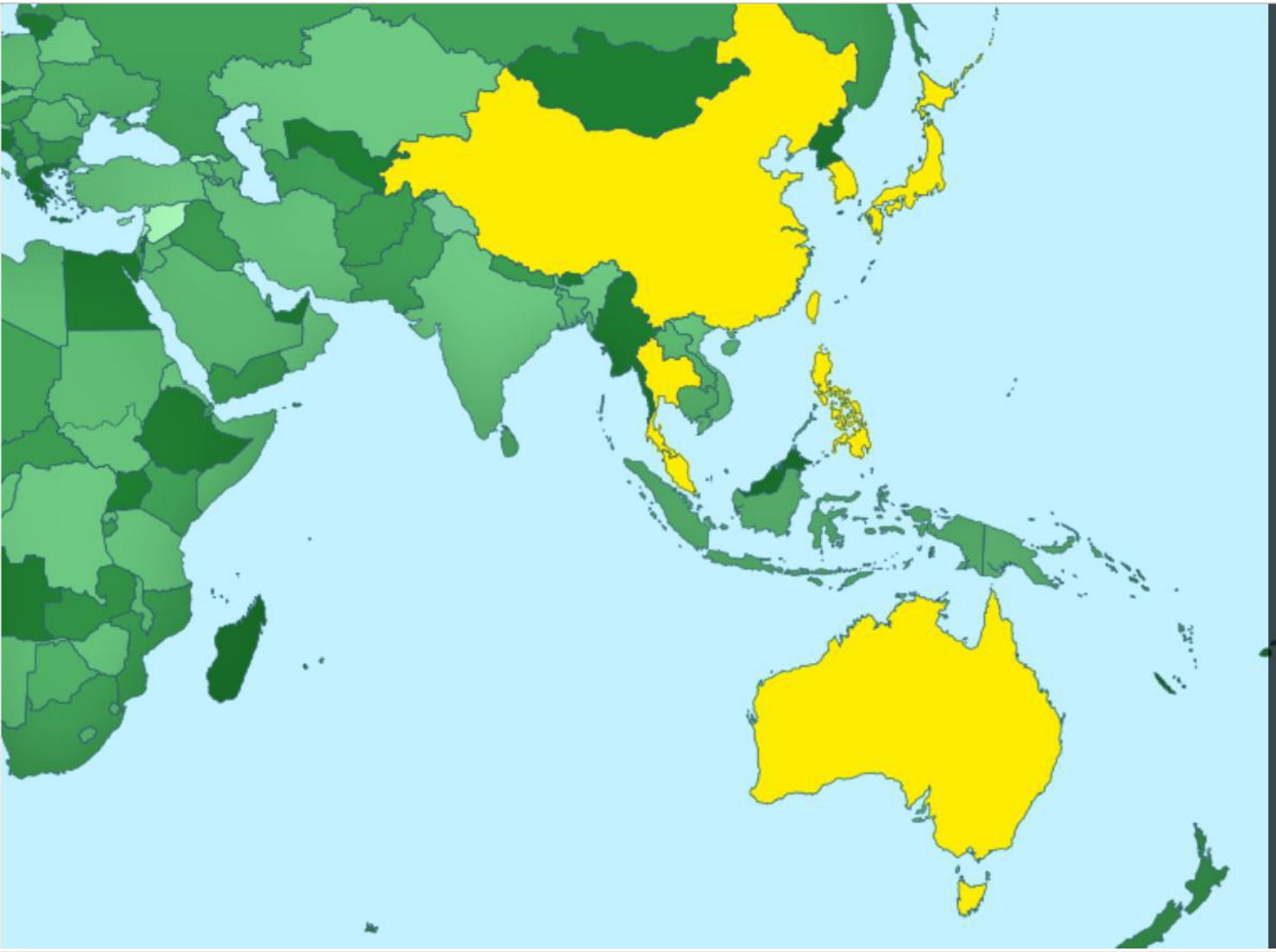
Ecosystems
September 2016, Volume 19, Issue 6, pp 1013–1022

Temporal Changes in Tree Species and Trait Composition in a Cyclone-prone Pacific Dipterocarp Forest

Carla C. Monoy, Kyle W. Tomlinson, Yoshiko Iida, Nathan G. Swenson, J. W. Ferry Slik

Abstract

Our understanding of the effects of tropical cyclones on species composition and dynamics of forest communities is mainly derived from studies that have considered single cyclonic events. Here we examined changes in the tree species and functional trait composition in an 8-ha Dipterocarp forest at Palanan in the northeastern Philippines that is subject to a high frequency of cyclonic disturbance (1–4 cyclones annually). The plot has been censused four times over a 16-year interval allowing us to consider the medium-term forest dynamics in response to repeated cyclones. We hypothesized that as the forest community in Palanan has been selected under frequent disturbance by cyclones, it should show little functional change across the census intervals. We analyzed changes in demography, species composition, and community-weighted functional traits (specific leaf area, leaf area, wood density, and specific growth rate) across the censuses and compared these against cyclone intensities during the census intervals. Demographic changes across census years suggest that the community responded to cyclonic disturbances through substantial turnover in the small- and medium-size individuals, and that there has been an increase in plot-level stem density and basal area across the measured period. Trait compositional changes from 1994 to 2010 were mostly small, but indicate a shift towards species with larger leaves and faster growth rates—traits that are associated with fast recovery after disturbance. These changes all coincide with a large intense cyclone between the second and third censuses, suggesting that cyclone strength, more than cyclone frequency, affects this forest.



The group currently encompasses

- Australia
- China
- Japan
- South Korea
- Malaysia
- Philippines
- Taiwan
- Thailand

EAP Regional Group. Chair: Hiroyuki Muraoka, Gifu University, Japan

https://www.ilternet.edu/?q=content/networks-and-regions

Global Change Biology

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Review

CTFS-ForestGEO: a worldwide network monitoring forests in an era of global change

Kristina J. Anderson-Teixeira ✉, Stuart J. Davies,

View issue TOC
Volume 21, Issue 2
February 2015
Pages 528–549

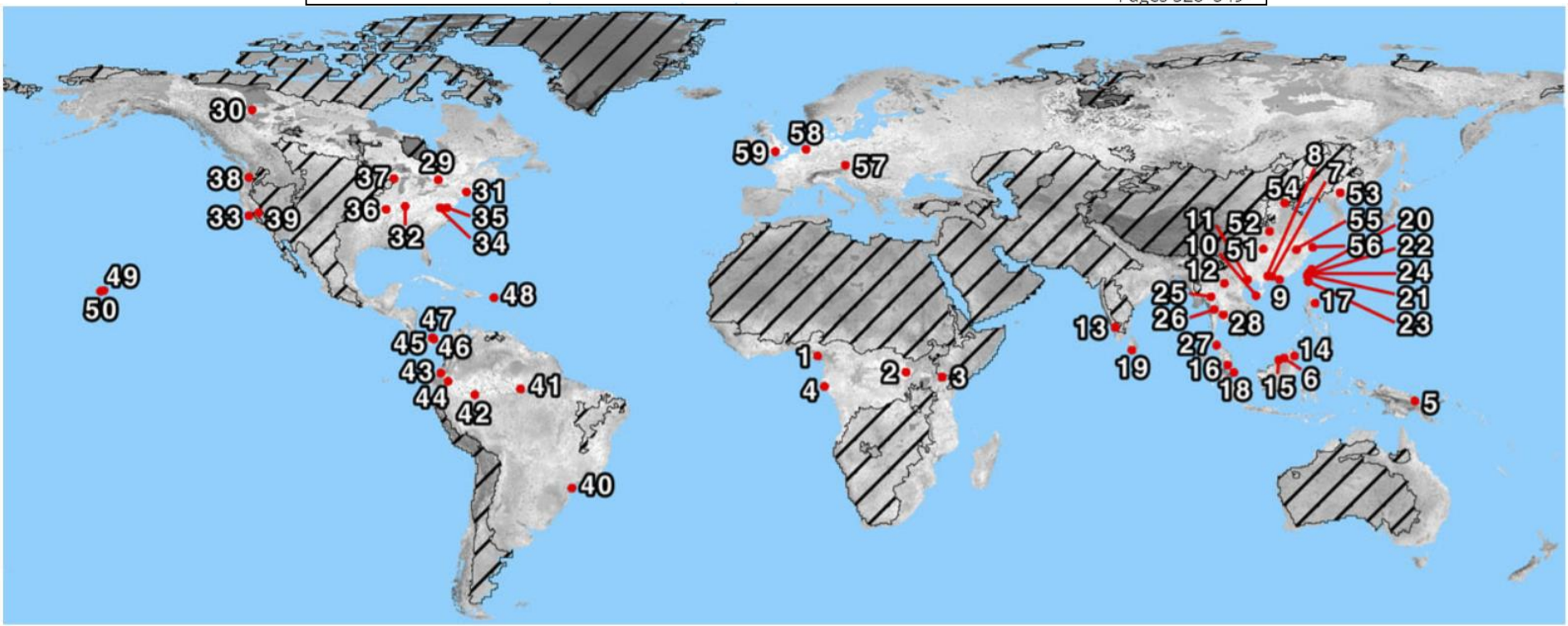


Fig. 1 Map of the CTFS-ForestGEO network illustrating its representation of bioclimatic, edaphic, and topographic conditions globally. Site numbers correspond to ID# in Table 2. Shading indicates how well the network of sites represents the suite of environmental factors included in the analysis; light-colored areas are well-represented by the network, while dark colored areas are poorly represented. Stippling covers nonforest areas. The analysis is described in Appendix S1.

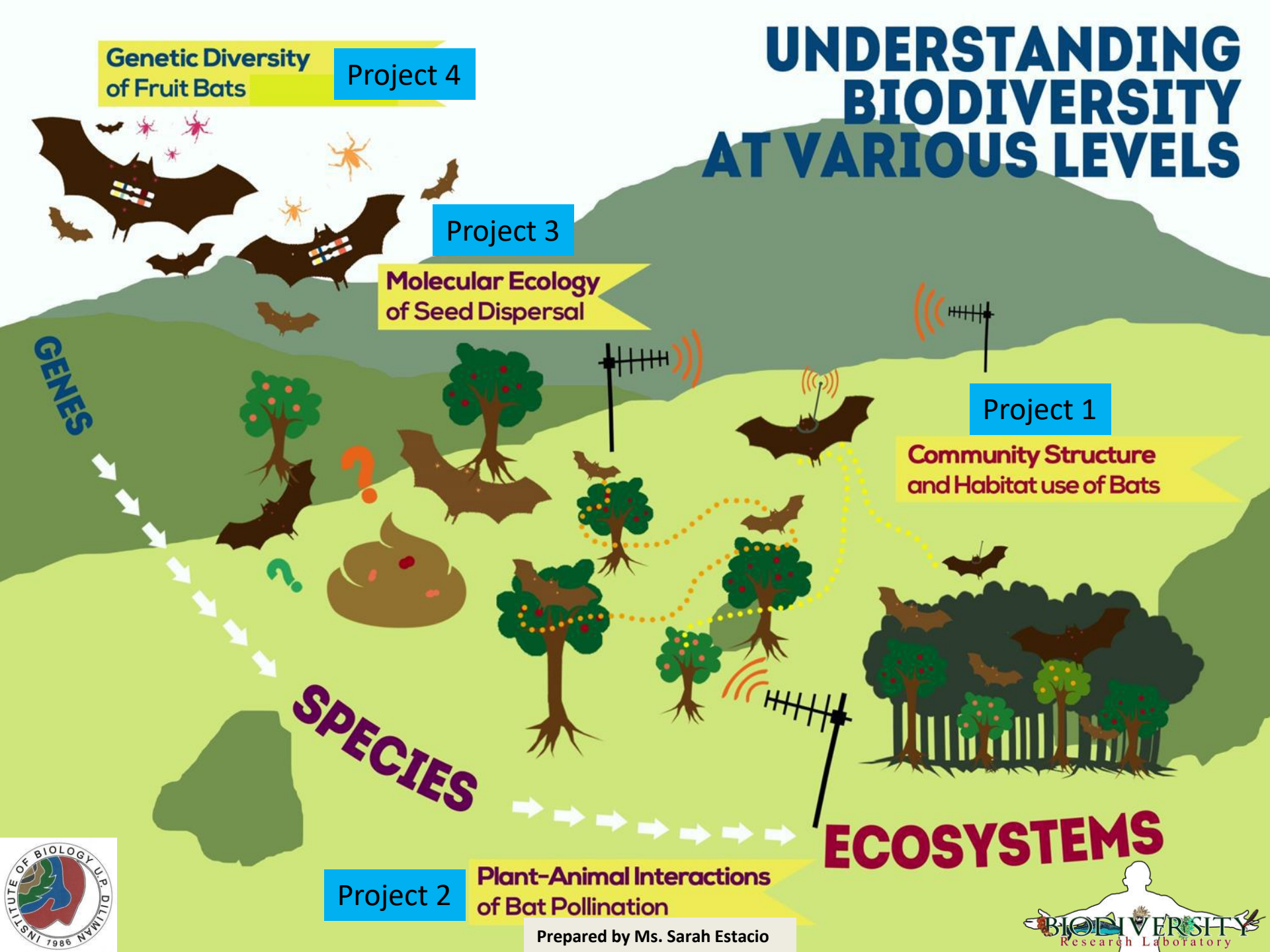
Science 30 Jun 2017: Vol. 356, Issue 6345, pp. 1389-1392
DOI: 10.1126/science.aam5678

FOREST ECOLOGY

Plant diversity increases with the strength of negative density dependence at the global scale

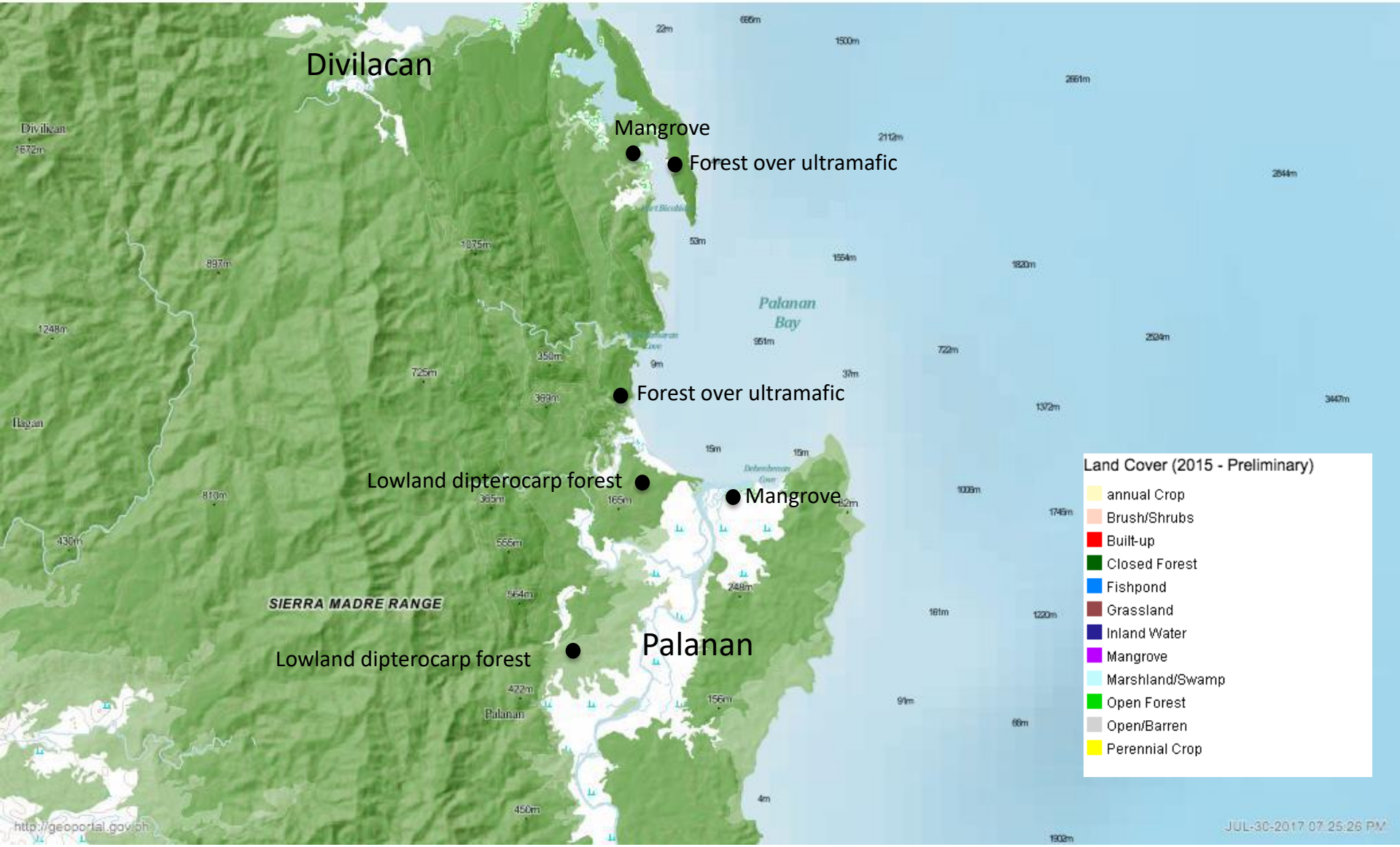
Joseph A. LaManna,[1,2*] Scott A. Mangan,[2] Alfonso Alonso,[3] Norman A. Bourg,[4,5] Warren Y. Brockelman,[6,7] Sarayudh Bunyavejchewin,[8] Li-Wan Chang,[9] Jyh-Min Chiang,[10] George B. Chuyong,[11] Keith Clay,[12] Richard Condit,[13] Susan Cordell,[14] Stuart J. Davies,[15,16] Tucker J. Furniss,[17] Christian P. Giardina,[14] I. A. U. Nimal Gunatilleke,[18] C. V. Savitri Gunatilleke,[18] Fangliang He,[19,20] Robert W. Howe,[21] Stephen P. Hubbell,[22] Chang-Fu Hsieh,[23] Faith M. Inman-Narahari,[14] David Janík,[24] Daniel J. Johnson,[25] David Kenfack,[15,16] Lisa Korte,[3] Kamil Král,[24] Andrew J. Larson,[26] James A. Lutz,[17] Sean M. McMahon,[27,28] William J. McShea,[4] Hervé R. Memiaghe,[29] Anuttara Nathalang,[6] Vojtech Novotny,[30,31,32] Perry S. Ong,[33] David A. Orwig,[34] Rebecca Ostertag,[35] Geoffrey G. Parker,[28] Richard P. Phillips,[12] Lawren Sack,[22] I-Fang Sun,[36] J. Sebastián Tello,[37] Duncan W. Thomas,[38] Benjamin L. Turner,[13] Dilys M. Vela Díaz,[2] Tomáš Vrška,[24] George D. Weiblen,[39] Amy Wolf,[21,40] Sandra Yap,[41] Jonathan A. Myers[1,2]

Theory predicts that higher biodiversity in the tropics is maintained by specialized interactions among plants and their natural enemies that result in conspecific negative density dependence (CNDD). By using more than 3000 species and nearly 2.4 million trees across 24 forest plots worldwide, we show that global patterns in tree species diversity reflect not only stronger CNDD at tropical versus temperate latitudes but also a latitudinal shift in the relationship between CNDD and species abundance. CNDD was stronger for rare species at tropical versus temperate latitudes, potentially causing the persistence of greater numbers of rare species in the tropics. Our study reveals fundamental differences in the nature of local-scale biotic interactions that contribute to the maintenance of species diversity across temperate and tropical communities.


UNDERSTANDING BIODIVERSITY AT VARIOUS LEVELS
Genetic Diversity of Fruit Bats
Project 4
Project 3
Molecular Ecology of Seed Dispersal
GENES
Project 1
Community Structure and Habitat use of Bats
SPECIES
ECOSYSTEMS
Project 2
Plant-Animal Interactions of Bat Pollination
Prepared by Ms. Sarah Estacio
INSTITUTE OF BIOLOGY U.P. DILIMAN 1986
BIODIVERSITY Research Laboratory

Community Structure and Habitat Use of Fruit Bats in Tropical Lowland Forests, Palanan, Isabela

Study Sites


Divilacan
Mangrove
Forest over ultramafic
Forest over ultramafic
Lowland dipterocarp forest
Mangrove
SIERRA MADRE RANGE
Palanan
Lowland dipterocarp forest
Palanan Bay
Land Cover (2015 - Preliminary)
annual Crop
Brush/Shrubs
Built-up
Closed Forest
Fishpond
Grassland
Inland Water
Mangrove
Marshland/Swamp
Open Forest
Open/Barren
Perennial Crop
http://geoportal.gov.ph
JUL-30-2017 07:25:26 PM

Capture and processing of bats in the field

Figure 2. Field activities include: capturing of bats through misnets (A), measuring of morphometrics (B), assessing reproductive status of bats (C), collecting biopsy wing punches (D), tagging of bats using ballchains (E nd F), collection of fecal and pollen samples (G), and releasing of processed bats (H).

- Characterized the three habitat types based on species diversity, tree density, tree height, crown cover etc
- Conducted phenology in each of the habitat type
- A total of 10 species of fruit bats and 8 species of insectivorous bats were recorded

Fruit bats recorded within the six study sites. Frugivores (a). *Ptenochirus jagori*, (b). *Cynopterus brachyotis*, (c). *Haplonycteris fisheri*, (d). *Pteropus vampyrus*, (e). *Desmalopex leucopterus*, and (f). *Acerodon jubatus*. Nectarivores (g). *Rousettus amplexicaudatus*, (h). *Macroglossus minimus*, (i). *Eonycteris robusta* and (j). *Eonycteris spelaea* (ES).

Partial summary of marked and recaptured fruit bats for April and May 2017 in the lowland forest of Palanan, Isabela

Species	Total Captured	Total Tagged	Total Recap	% recap
Ptenochirus jagori	52	41	12	29.27
Cynopterus brachyotis	28	21	7	33.33
Macroglossus minimus	9	9	0	0.00
Haplonycteris fischeri	25	20	6	30.00
Eonycteris robusta	13	11	0	0.00
Rousettus amplexicaudatus	31	31	0	0.00
Eonycteris spelaea	3	1	0	0.00
Desmalopex leucopterus	7	5	1	20.00
Total	**168**	**139**	**26**	

Partial summary of marked and recaptured fruit bats for April and May 2017 in the mangrove forest of Palanan and Divilacan, Isabela

Species	Total Captured	Total Tagged	Total Recap	% recap
Ptenochirus jagori	18	6	3	50.0
Cynopterus brachyotis	10	10	0	0.0
Macroglossus minimus	26	32	3	9.0
Eonycteris robusta	7	5	2	40.0
Rousettus amplexicaudatus	1	1	0	0.0
Total	**62**	**54**	**8**	

Pollen Resources of Phytophagous Bats in the Tropical lowland Forests Palanan, Isabela

Bat swab collections (April 2016 – June 2017)

Summary

	Apr-16	May-16	Jun-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Feb-17	Mar-17	Apr-17	May-17	Jun-17	TOTAL
Ptenochirus jagori	147	68	54	66	108	84	60	93	17	37	57	14	10	815
Cynopterus jagori	87	33	64	68	69	39	39	44	7	2	27	30	11	520
Macroglossus minimus	34	17	10	17	20	25	14	17	12	6	40	29	15	256
Haplonycteris fischeri	22	13	5	7	26	11	18	12	3	7	23	20	6	173
Eonycteris robusta	33	26	60	41	37	19	6	1	4	2	27	7	4	267
Rousettus amplixicaudatus	4	11	126	71	29	78	48	8	10	2	29	8	87	511
Eonycteris spelaea	24	6	8	1	9	6	1	-	-	-	1	3	2	61
Desmalopex leucopterus	1	5	10	7	8	9	1	5	4	2	8	8	2	70
Acerodon jubatus	-	-	-	-	1	-	-	-	-	-	-	-	-	1
Pteropus vampyrus	-	-	-	-	-	-	-	1	-	-	-	-	-	1
TOTAL	352	179	337	278	307	271	187	181	57	58	212	119	137	2675

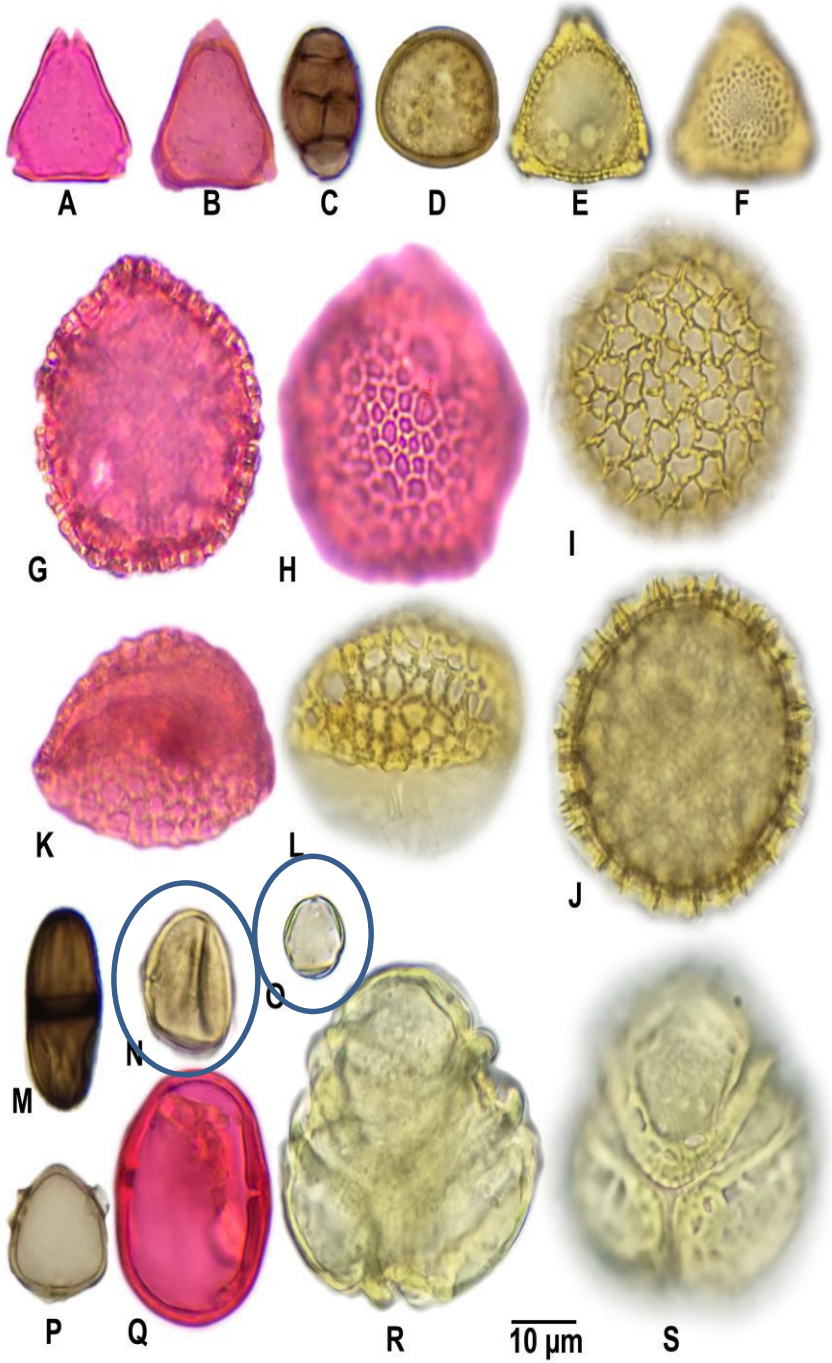
Positive readings of bat swab samples

(April 2016 to March 2017)

	April 2016	May 2016	June 2016	August 2016	September 2016	October 2016	November 2016	December 2016	February 2017	March 2017	Total
Eonycteris robusta	15	23	11	35	26	12	3	1	3	2	131
Ptenochirus jagori	23	38	12	57	55	62	33	13	8	14	315
Desmalopex leucopterus		3	2	7	7	9	2		3		33
Haplonycteris fischeri	6	4	3	6	12	8	16	7	3	6	71
Rousettus amplexicaudatus		5	57	58	11	38	33	1	1	1	205
Macroglossus minimus	3	11	2	11	12	8	11	7	10	7	82
Cynopterus brachyotis	17	22	19	55	24	21	24	10	7		199
Eonycteris spelaea	3	1	4	1	9	6	1				25
Acerodon jubatus					1						1
Total number (+) readings	67	107	110	230	157	164	123	39	35	30	1062

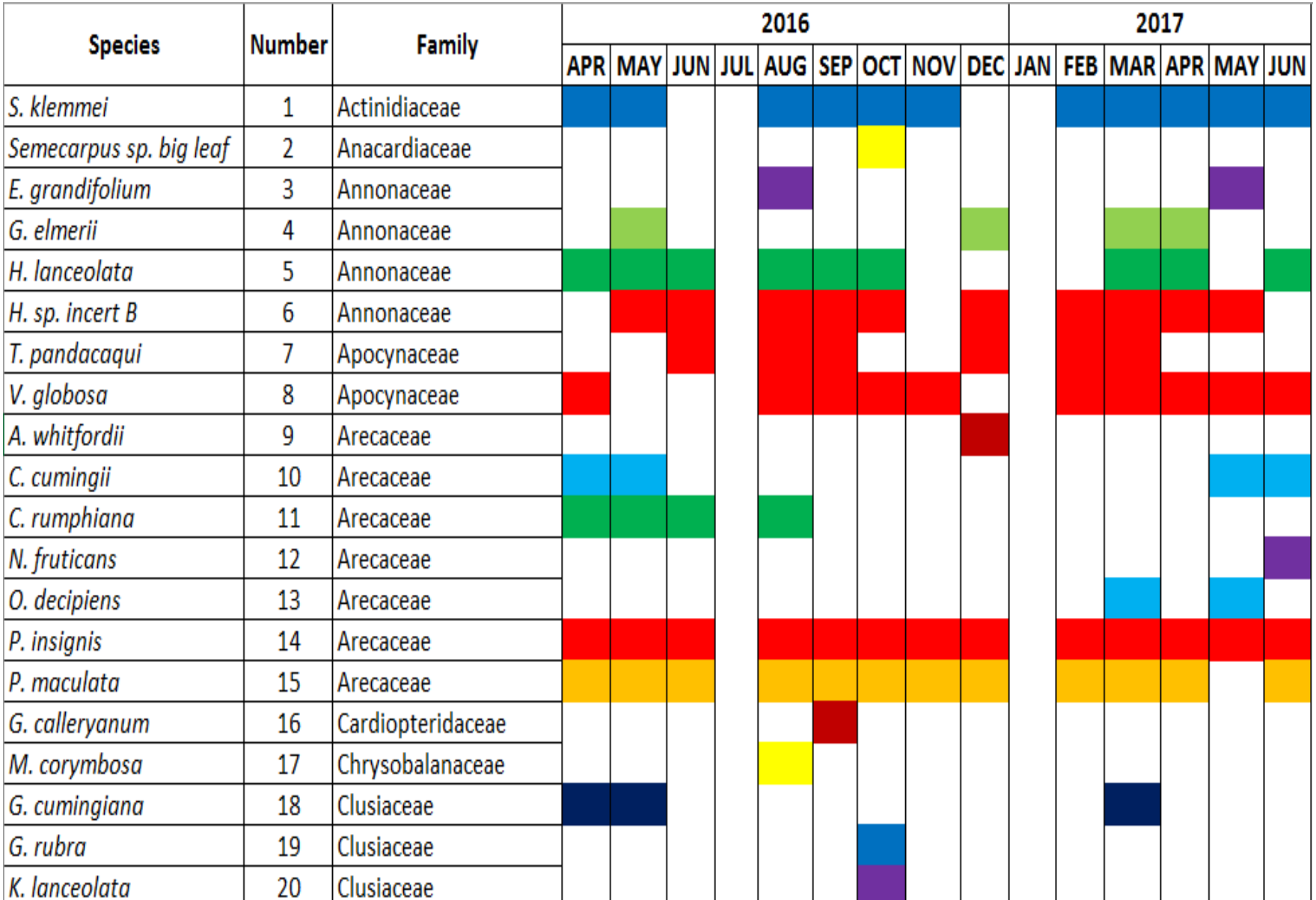
Pollen Types from Bat Swabs

(A-B) Anacardiaceae
(C) Leguminaceae/Fabaceae
(D) Poaceae/Pandanaceae type
(E-F) Anacardiaceae
(G-J) Euphorbiaceae
(K-L) Liliaceae type
(M) Acanthaceae
(N) Arecaceae
(O) Moraceae
(P-S) Unidentified.



Phenology monitoring

110 species, 42 families



Species	Number	Family	2016									2017					
			APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
S. klemmei	1	Actinidiaceae															
Semecarpus sp. big leaf	2	Anacardiaceae															
E. grandifolium	3	Annonaceae															
G. elmerii	4	Annonaceae															
H. lanceolata	5	Annonaceae															
H. sp. incert B	6	Annonaceae															
T. pandacaqui	7	Apocynaceae															
V. globosa	8	Apocynaceae															
A. whitfordii	9	Arecaceae															
C. cumingii	10	Arecaceae															
C. rumphiana	11	Arecaceae															
N. fruticans	12	Arecaceae															
O. decipiens	13	Arecaceae															
P. insignis	14	Arecaceae															
P. maculata	15	Arecaceae															
G. calleryanum	16	Cardiopteridaceae															
M. corymbosa	17	Chrysobalanaceae															
G. cumingiana	18	Clusiaceae															
G. rubra	19	Clusiaceae															
K. lanceolata	20	Clusiaceae															

Diet Analysis of Fruit Bats Using Metagenomics to Assess Plant Dispersal in the Tropical Lowland Forests of Palanan, Isabela

Summary of Total Fecal Samples of Eight Fruit Bat Species collected from April 2016 to May 2017 in the Tropical Lowland Forests of Palanan, Isabela.

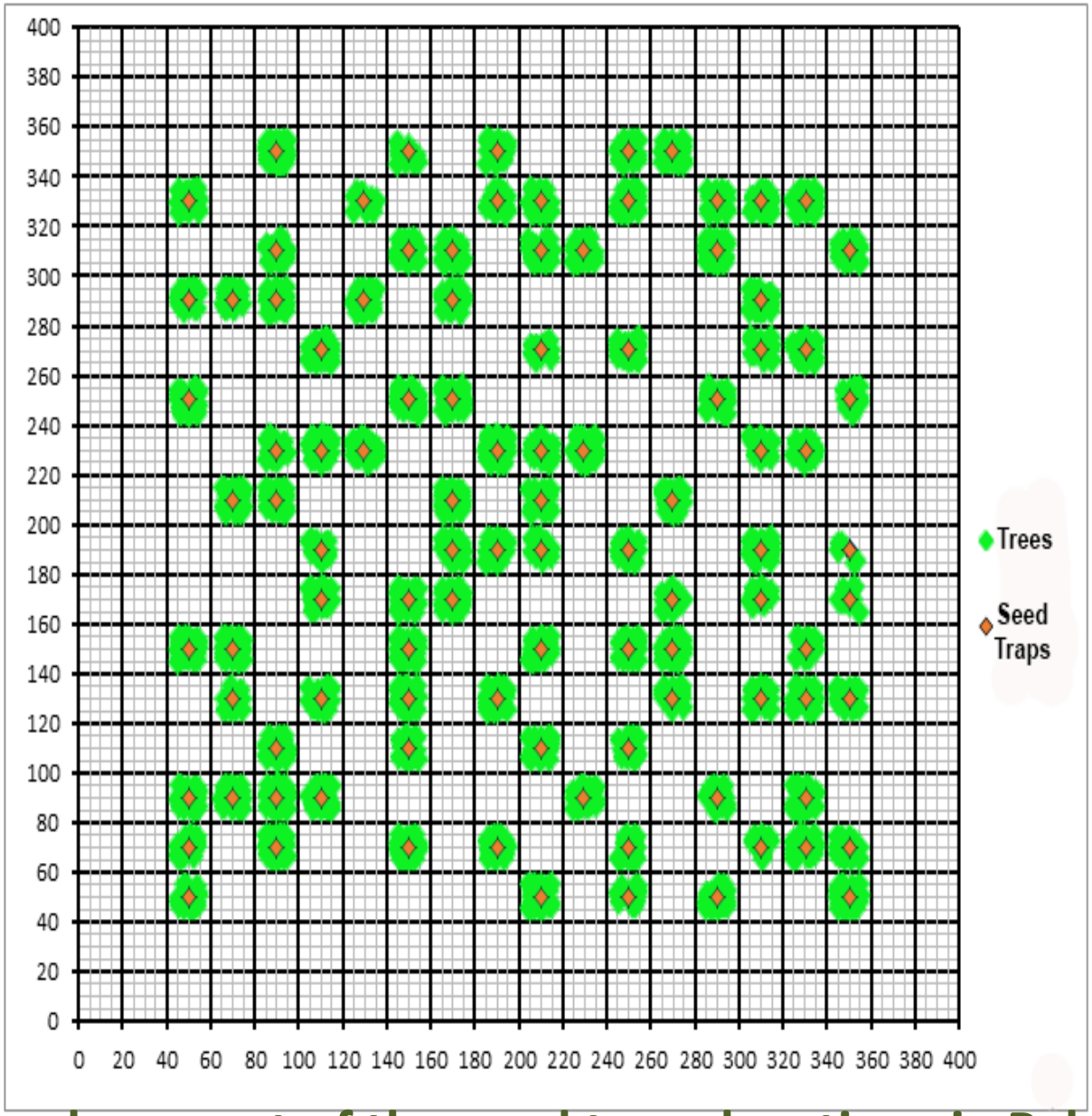
FRUIT BAT SPECIES	TOTAL NUMBER OF FECAL SAMPLES COLLECTED												
	Year-1 (UP-OVPAA)								Year-2 (DOST-PCAARRD)			TOTAL
	2016								2017			
	APR	MAY	JUL	AUG	SEPT	OCT	NOV	DEC	FEB	MAR	APR	MAY	
Ptenochirus jagori	45	16	5	13	16	18	15	44	8	21	21	1	**223**
Cynopterus brachyotis	26	4	10	9	8	11	10	18	3	2	7	6	**114**
Desmalopex leucopterus	0	1	2	2	2	0	0	0	0	1	1	1	**10**
Haplonycteris fischeri	4	3	1	1	5	0	2	5	0	5	4	3	**33**
Rousettus amplexicaudatus	2	5	14	13	4	19	12	1	1	0	26	0	**97**
Macroglossus minimus	9	1	3	2	9	12	10	4	1	0	2	3	**56**
Eonycteris robusta	8	5	7	8	12	7	0	0	3	2	6	6	**64**
Eonycteris spelaea	7	0	3	0	2	4	0	0	0	0	0	2	**18**
TOTAL	**101**	**35**	**45**	**48**	**58**	**71**	**49**	**72**	**16**	**31**	**67**	**22**	**615**

Summary of Total Fecal Samples with Seeds of Eight Fruit Bat Species collected from April 2016 to May 2017 in the Tropical Lowland Forests of Palanan, Isabela.

FRUIT BAT SPECIES	TOTAL NUMBER OF FECAL SAMPLES WITH SEEDS COLLECTED												
	Year-1 (UP-OVPAA)								Year-2 (DOST-PCAARRD)			TOTAL
	2016								2017			
	APR	MAY	JUL	AUG	SEPT	OCT	NOV	DEC	FEB	MAR	APR	MAY	
Ptenochirus jagori	5	10	3	1	2	3	4	12	4	9	4	1	**58**
Cynopterus brachyotis	0	4	2	3	1	0	4	5	2	1	2	4	**28**
Desmalopex leucopterus	0	0	1	1	1	1	0	0	0	0	0	0	**4**
Haplonycteris fischeri	0	0	0	0	0	0	0	3	0	1	0	0	**4**
Rousettus amplexicaudatus	0	1	1	1	0	1	0	0	0	0	7	0	**11**
Macroglossus minimus	0	0	0	0	0	0	1	1	0	0	0	0	**2**
Eonycteris robusta	0	1	0	1	0	0	0	0	0	0	0	0	**2**
Eonycteris spelaea	0	0	0	0	0	0	0	0	0	0	0	0	**0**
TOTAL	**5**	**16**	**7**	**7**	**4**	**5**	**9**	**21**	**6**	**11**	**13**	**5**	**109**

Status of Seed Traps collected and processed April 2016-May 2017

MONTH COLLECTED	REMARKS	SORTED BY
APRIL 2016	Completely sorted; not yet Identified	Medeva Jay Busaing (former RA)
MAY 2016	Completely sorted; some Identified	Karen Mae R. Lego (URA-I)
JUNE 2016	Completely sorted; not yet Identified	(hired Herbarium Aides)
AUGUST 2016	Completely sorted; not yet Identified	(hired Herbarium Aides)
OCTOBER 2016	Partially sorted; not yet identified	(hired Herbarium Aides)
NOVEMBER 2016	Unsorted and not yet identified	N/A
DECEMBER 2016	Completely sorted; not yet Identified	(hired Herbarium Aides)
JANUARY 2017	Completely sorted; not yet Identified	(hired Herbarium Aides)
FEBRUARY 2017	Completely sorted; not yet Identified	(hired Herbarium Aides)
MARCH 2017	Unsorted and not yet identified	N/A
APRIL 2017	Unsorted and not yet identified	N/A
TOTAL	**7 completely sorted; 1 partially sorted; 3 unsorted; most not yet identified**	



Random placement of the seed traps locations in Palanan Forest Dynamic Plot (PFDP) along with the tree species around each traps (Total seed trap = 100).

Expected Outputs

PUBLICATION

- At least six (6) Thomson-Reuters- or Scopus Indexed Journals
- 1 Field Guide to the Pollens from Bat-pollinated plants of Tropical Lowland Evergreen Forests
- 1 Field Guide to Bat-dispersed seeds of Tropical Lowland Evergreen Forests

PEOPLE

Capability building on Long Term Ecological Research:

- Post graduate and undergraduate students
- Faculty and Researchers

PLACES

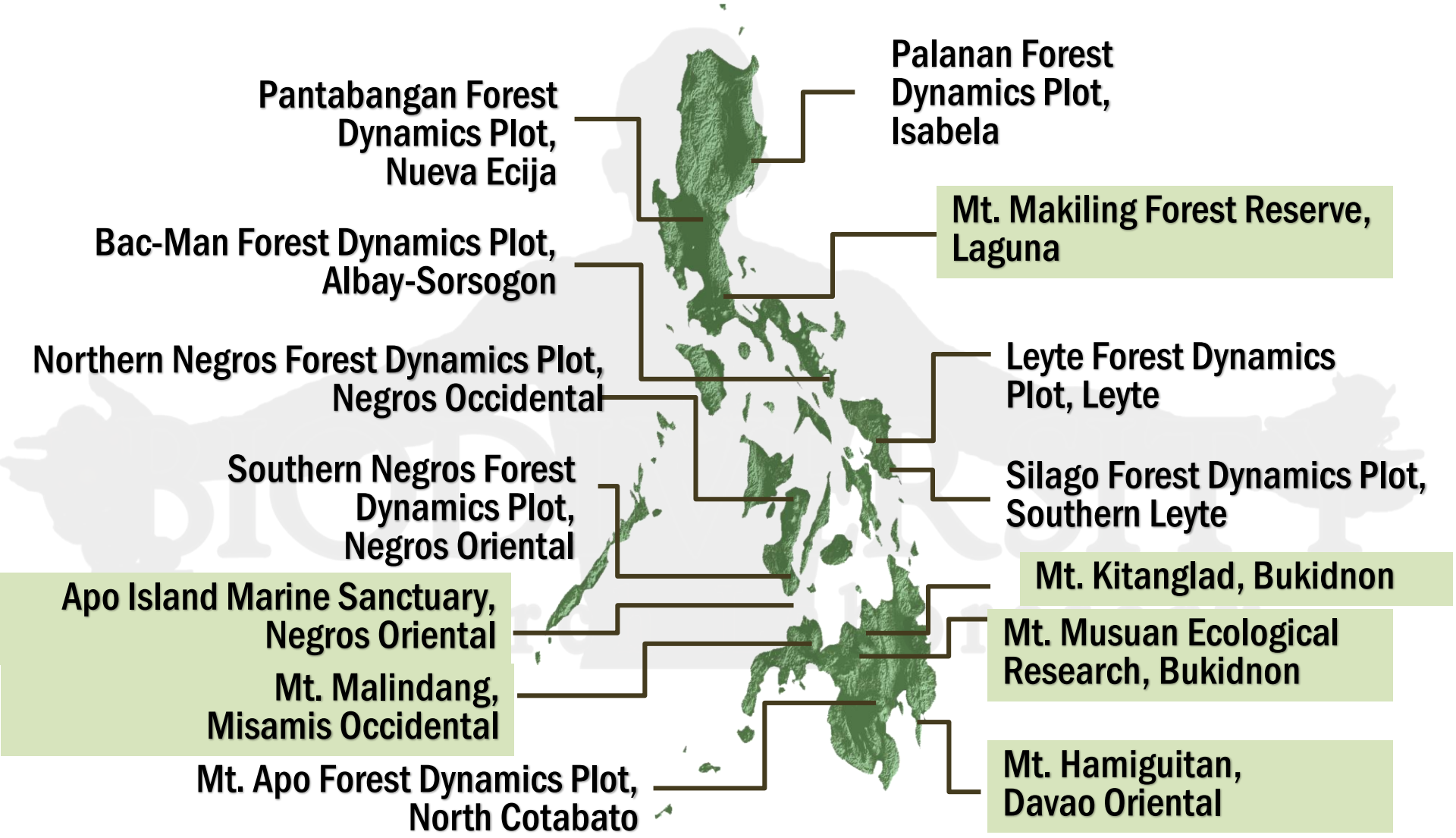
Establishment of FERN (Forest Ecological Research Network) with the Palanan Permanent Forest Dynamocs Plot (PFDP) as the center of Long Term Ecological Research in the country. Currently part of the Smithsonian Institution-Center for Tropical Forest Science (SI-CTFS) as well as the International Long Term Ecological Research Network (ILTERnet)

- Palanan, Isabela

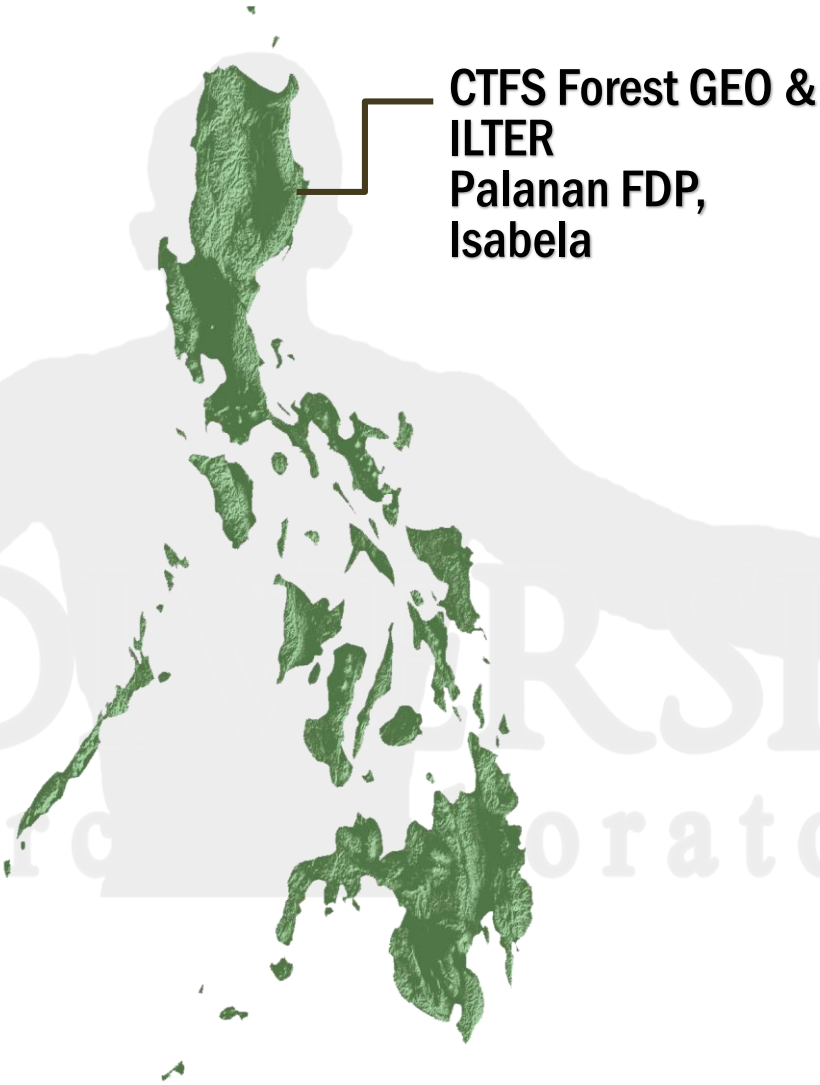
POLICY

- Explore the development of a model for Research Toursim
- At least 1 National Workshop on Long Term Ecological Research on Tropical Lowland Evergreen Forest

Philippine LTER Sites (ILTER)



PhiLTERNet Sites (UP Biology)
Palanan Forest Dynamics Plot, Isabela



PhiLTERNet Sites (UP Biology)
First Gen Hydro Power Corporation
Pantabangan Forest Dynamics Plot, Nueva Ecija

FGEN Biodiversity Conservation and Monitoring Program

Rafflesia consueloae Biology & Ecology

Pantabangan FDP Forest Succession

PhiLTERNet Sites (UP Biology)

Holcim Biodiversity Action Plan

Holcim BAP La Union Site, La Union

Holcim BAP Agno Site, Pangasinan

Holcim BAP Norzagaray Site, Bulacan

Holcim BAP Puning Cave Offset Site, Doña Remedios Trinidad, Bulacan

Holcim BAP Lugait Site, Misamis Oriental

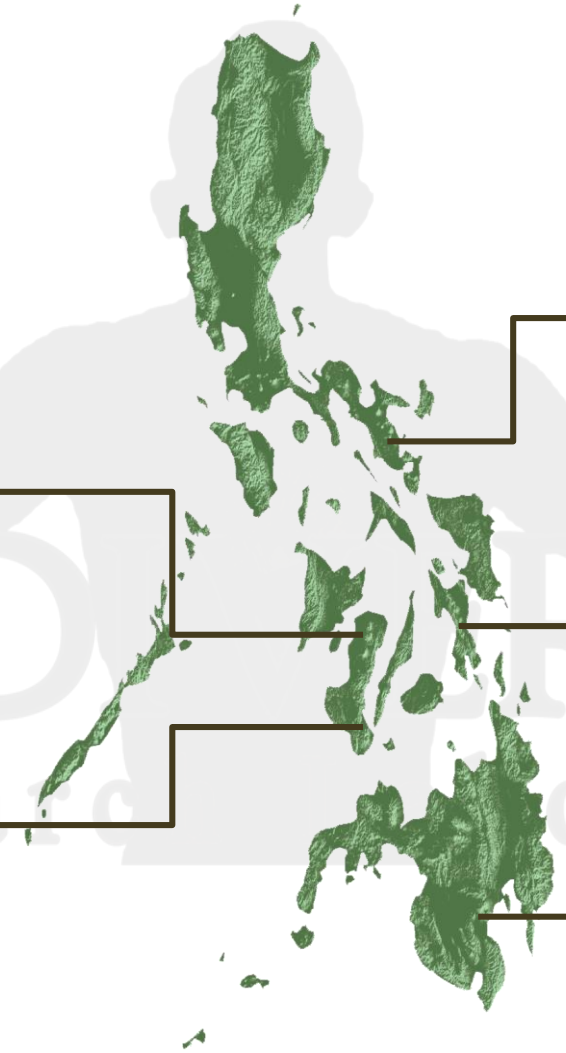
Holcim BAP Initao-Libertad PLS Offset Site Misamis Oriental

Holcim BAP Maasim Site, Sarangani

Holcim BAP Bunawan Site, Davao City

Holcim BAP Mati Site, Davao Oriental

PhiLTERNet Sites (UP Biology)
Energy Development Corporation
Biodiversity Conservation and Monitoring Program



EDC BCMP
Bacon-Manito Site,
Albay-Sorsogon

EDC BCMP
Northern Negros
Site,
Negros Occidental

EDC BCMP
Ormoc City Site,
Leyte

EDC BCMP
Southern Negros
Site,
Negros Oriental

EDC BCMP
Mt. Apo Site,
North Cotabato

PhiLTERNet Sites (UP Biology)

UP-DENR-PEFI Philippine Eagle Project

PEP Calbiga & Taft Survey Sites, Samar

PEP Burauen & Baybay Survey Sites, Leyte

PEP Mt. Nacolod Survey Site, Southern Leyte

PhiLTERNet Sites (UP Biology)
Various Partners

ACB Biodiversity Assessment Mt. Tapulao Site, Palauig, Zambales

NewCAPP Biodiversity Resource Assessment Mts. Iglit-Baco Site, Mindoro Occidental

Pangolin Forensics, Puerto Princesa, Palawan

CHED BaR, Palanan FDP, Isabela

Emerging Interdisciplinary Research, Palanan FDP, Isabela

CHED BaR, Silago FDP, Southern Leyte

Biodiversity Assessed and Monitored

- Species Assemblages and Abundance
  - Plant
  - Mammals
  - Birds
- Ecosystems
  - Terrestrial (12 forest formations)
  - Freshwater
  - Marine
- Ecosystem services
  - Pollination
  - Seed Dispersal
  - Productivity (Fish)
  - Resilience (recovery from catastrophic disturbances)

Lessons Learned

- Biodiversity (and ecosystem services) can only be observed in the field! Nothing can replace field work.
- Doing fieldwork is not easy. It is hard work and requires sacrifices. Needs a team of dedicated field staff.
- Resources badly needed to collect other long term data to better understand how biodiversity is maintained and how ecosystem provides services
- Long term research needs long term support and resoruces to ensure continuity and getting comprehensive understanding of systems and processes
- Local Issues, Global Implications – International Cooperation

Opportunities

- Historical data should be included in analysis (models to make accurate hindcasts to increase reliability of forecasts)
- Resources should be equally allocated to field work and data processing
- Advances in Technology require changes in mindsets on how biodiversity and ecosystem services can be understood
- Data integration and analysis of different domains (e.g., health, environment –green, blue and brown, education, disasters, climate change) should to synthesize lessons from these domains (e.g., cutting across domains, cutting across geographical boundaries)
- International Cooperation – no need to reinvent the wheel, avoiding overlaps, maximizing limited resources


Cảm ơn!
Arigatou gosaimasu!
谢谢
Gamsahamnida
Terima kasih!
Thank you!
Salamat po!