

RESEARCH IN BIODIVERSITY

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National Scientist

**TRAILBLAZERS IN SCIENCE: Lecture Series by National
Scientists**

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INTRODUCTION

3 MAIN RESEARCH PROGRAMS:

Herpetology

Giant clams

Marine Protected Areas

In 1954 to present time

Education

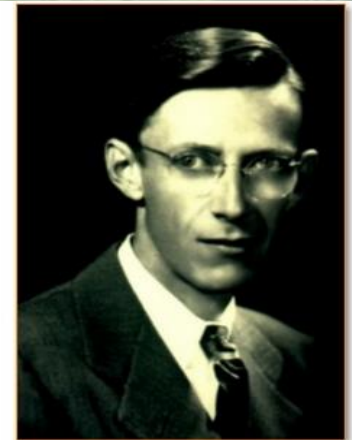
- 1951 : B.S. Biology, Silliman University (SU)**
- 1952-: Biology Instructor- taught Pre-Med & Biology classes, SU**
- 1959-1960: M.A. Biological Sciences, Stanford Univ., Calif., USA**
- 1964-1966: Ph.D. Biological Sciences, Stanford Univ.**
- 1968: Full Professor, SU**

**1954: Visit to SU of Dr. & Mrs. Walter C. Brown,
Herpetologist from Stanford University, USA**

**CHALLENGE:
NO FILIPINO
SCIENTIST
doing** 
**scientific
work on
amphibians
& reptiles**

**DECISION:
Study HERPETOLOGY!**

**Mentor &
Collaborator:
Dr. Walter C.
Brown,
Stanford Univ. ,
USA**



Walter C. Brown

Photo courtesy of California Academy Sciences Archives.

DISCUSSION

HERPETOLOGICAL STUDIES

1954-1990s Joint publication of more than 100 scientific papers /books : Ecology, Natural History & Systematics of Phil. Amphibians & Reptiles

40 new species of amphibians & reptiles from low/high mountain areas (Palawan, Visayas, Mindanao, Luzon)
Specimens: Calif. Acad. of Sci, SF, Calif.,
USA

Research grants from the U.S. National Science Foundation to W.C. Brown

DISCUSSION

HERPETOLOGICAL STUDIES

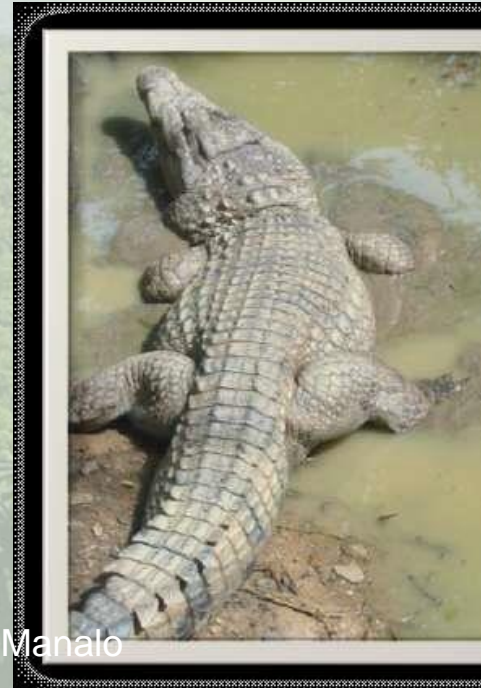
Mid - late 2000s Collaboration with
Arvin Diesmos, Rafe Brown
& colleagues yielded more
papers on amphibians &
reptiles

1960-1966 Connections started w/ the
Smithsonian Institution,
Calif. Academy of Science,
Chicago Natural History
Museum

DISCUSSION

HERPETOLOGICAL STUDIES

**Earliest study of the Phil Crocodile:
at SU Captive Breeding facility=
breeding behavior in captivity
* Produced many individuals**



(L)
*Crocodylus
porosus*;
(R)
*Crocodylus
mindorensis*

**Present studies: Distribution & Ecology of the
2 species of Phil. crocodiles**

DISCUSSION

HERPETOLOGICAL STUDIES

Significant Findings

1. Unusual modes of breeding of *Platymantis* frog spp.= eggs develop directly into froglets (Master's Thesis, published in the journal *Copeia*)



Negros Cave Frog *Platymantis spelaeus*.ACA & Brown 1998 (Above)



(L) Naomi's forest frog. *Platymantis naomii*.
Alcala & Brown 1998

DISCUSSION

HERPETOLOGICAL STUDIES

Significant Findings

2. Several spp. of LIZARDS mature sexually early, in about a year

Skinks



Flying lizard



L: King cobra,
R: Phil. cobra



3. Only very **few spp.** of **poisonous SNAKES** in Phils. (compared to Australia); explained by movements of land masses allowing venomous snakes to colonize some continents in the past

DISCUSSION

HERPETOLOGICAL STUDIES

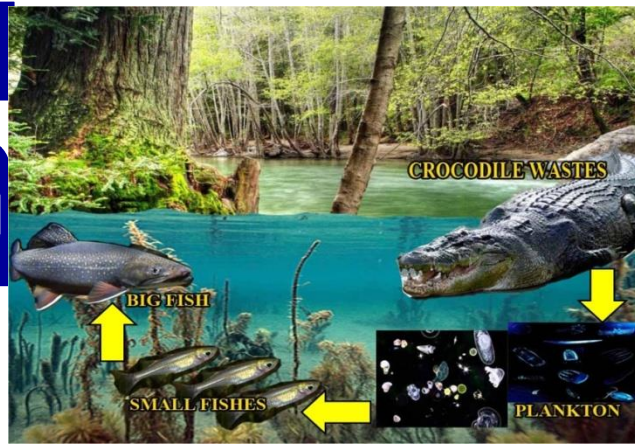
Significant Findings

4. People's fear of snakes in most cases has no basis=
SNAKES in general **ARE AFRAID of People!**



Ex. The Python is harmless to people; rat feeder

5. Crocodiles should be given opportunity to co-exist w/ people by reserving forested habitat for them



Crocodiles can help in production of fish, thus improve fisheries in lower parts of river systems, coastal areas

DISCUSSION

HERPETOLOGICAL STUDIES

Significant Findings

6. Philippine herpetofauna are **mostly ENDEMIC**
(75% Limited to the Philippines only)



Platymantis raborii.

Diesmos et al 2014



Platymantis insulatus.

Diesmos et al 2014



Nyctixalus spinosus.
Diesmos et al 2014

DISCUSSION

GIANT CLAM RESEARCH & Breeding in the Lab

**Philippines: 7 spp.
of Giant Clams**



**Uses: 1. Food & Aquarium purposes
2. Provide heterogeneity in the
environment, needed to maintain
normal functions of coral reefs**

**1980s: 3 spp. RARE or on verge of LOCAL
EXTINCTION due to human exploitation**

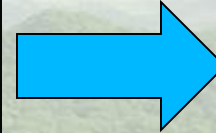
**1980s: Captive Breeding Program of SU
Marine Lab, James Cook U (Australia) and
UP-MSI**

DISCUSSION

GIANT CLAM RESEARCH & Breeding in the Lab

Philippines: 7 spp. of Giant Clams

Induced clams to breed using **Serotonin** or brief exposure to **sun**



Larvae raised in tanks



DR. ED GOMEZ/
UPMSI:
T. gigas in Bolinao,
Pangasinan, etc.

Released to coral reefs

DISCUSSION

RESEARCH & EXTENSION NO TAKE MARINE RESERVES

1973-74 Overexploitation of Phil. coral reefs:
Degraded habitats, Declining fisheries

Solution: Establish **Marine Protected Areas (MPAs) or No-take Marine Reserves (NTMRs)** to rebuild fish biomass & diversity of fish

IMPT. COMPONENT:
Participation of local communities
and local government
units (LGUs)

DISCUSSION

RESEARCH & EXTENSION
NO TAKE MARINE
RESERVES

PROGRAM: Partnerships w/ local govt. units, local communities, govt. agencies & other stakeholders for sustainable management



DISCUSSION

RESEARCH & EXTENSION -
NO TAKE MARINE
RESERVES

PROGRAM: Community organizing, IEC,



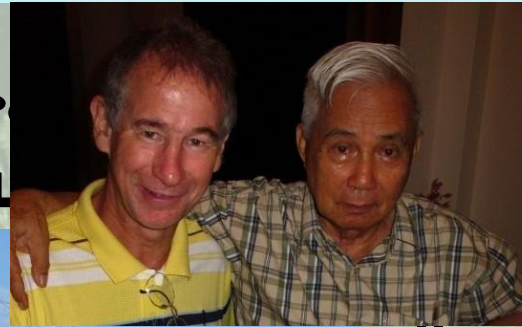
DISCUSSION

RESEARCH & EXTENSION -
NO TAKE MARINE
RESERVES

PROGRAM:

❖ **Regular monitoring of protected reefs using standard research methods**

by
r
stu



colleague P
Australia



DISCUSSION

RESEARCH & EXTENSION NO TAKE MARINE RESERVES

PROGRAM:

Since 1983, collaboration w/ Dr. Garry Russ & his students at James Cook Univ., Australia

The US Pew Fellowship allowed us to extend establishment of NTMRs to the Bohol Sea, including Selinog Isl. & Camiguin Isl.



DISCUSSION

**RESEARCH & EXTENSION -
NO TAKE MARINE
RESERVES**

Marine Protected Areas in Neg.Occ.:Carbin Reef in Sagay and Danjungan Is. in Cauayan; in Dauin, Amlan, etc Neg. Or.; ca 1000+ in PH.



Danjungan Island, Cauayan

DISCUSSION

RESEARCH & EXTENSION - NO TAKE MARINE RESERVES

RESULTS:

1. Enhanced Target Fish Biomass

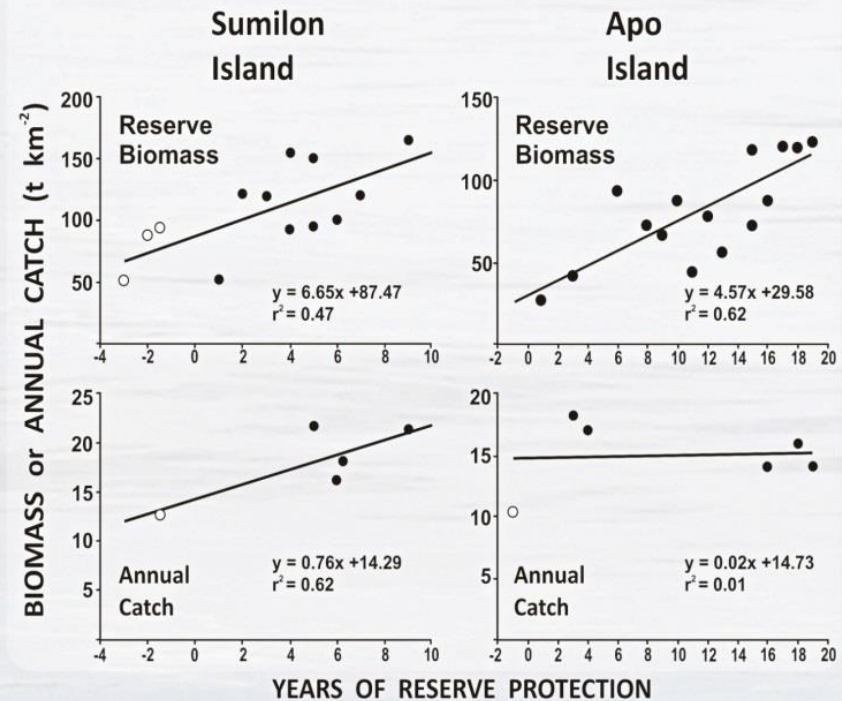


Figure 1. Annual biomass of targeted fish inside reserves and the fisheries catch of these fish outside reserve plotted against years of reserve protection at Sumilon and Apo islands. Redrawn from Alcala and Russ 2006

DISCUSSION

RESEARCH & EXTENSION - NO TAKE MARINE RESERVES

RESULTS:

2. Enhanced Biodiversity Outside Reserve

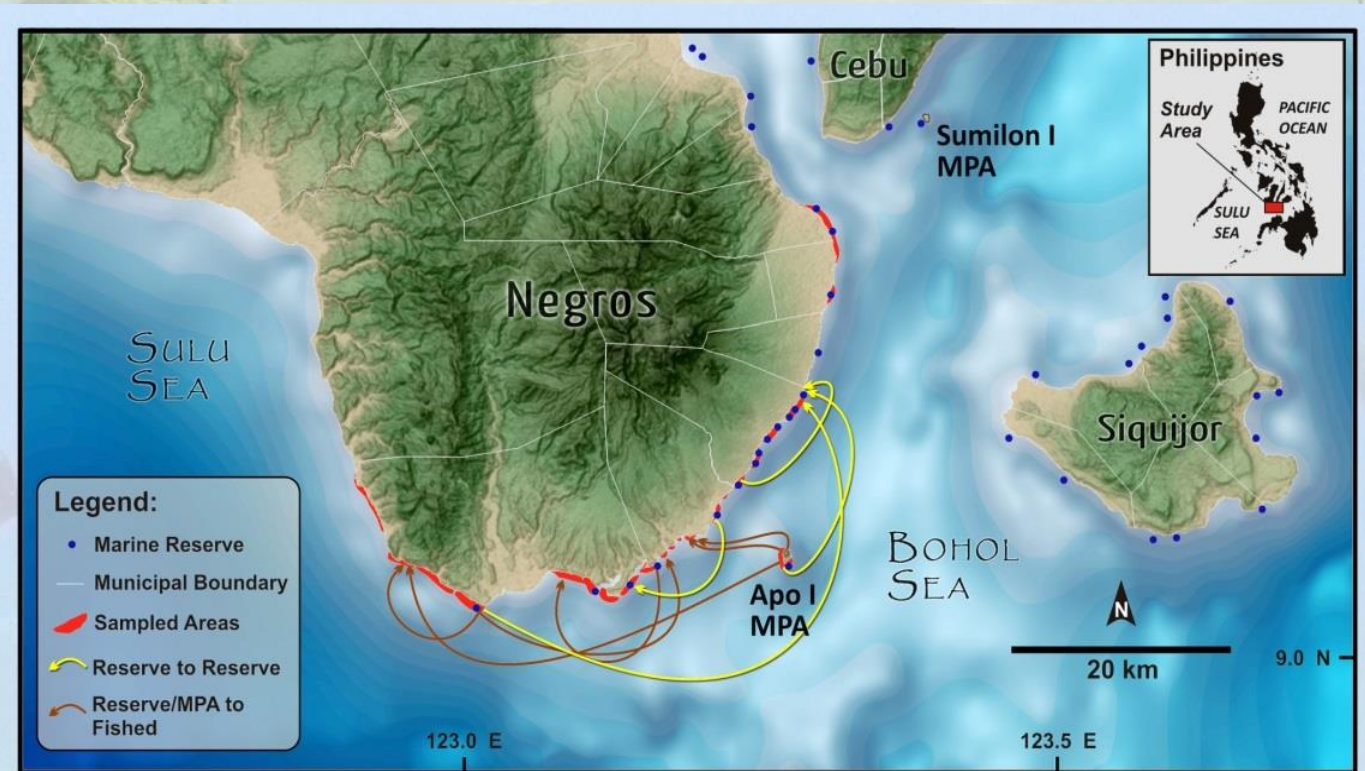


Figure 2. Results of genetic parentage analysis on 1 species of coral reef fish (*Chaetodon vagabundus*) indicating the trajectories of larval dispersal from reserves to fished areas and other reserves.

[Layout modified from RA Abesamis (unpublished) by JLP Maypa; Basemap rendered from CIAT-CSI SRTM 4.1 & GEBCO]

DISCUSSION

RESEARCH & EXTENSION - NO TAKE MARINE RESERVES

RESULTS:

3. As result of MPA, fishers fish 50-100m from shore using only hand-paddled canoes, thus no fossil fuel is needed for fishing.



DISCUSSION

RESEARCH & EXTENSION - NO TAKE MARINE RESERVES

RESULTS:

Protection from fishing= More and Bigger fish

Apo Marine Sanctuary (established in 1982)



Angel Alcala



Garry Russ



26 yrs protection

1983



2009

DISCUSSION

RESEARCH & EXTENSION - NO TAKE MARINE RESERVES

PRESENT WORK: (SUAKCREM, JCU, UPMSI)

DEMOGRAPHIC CONNECTIVITY OF MARINE RESERVES IN THE BOHOL SEA



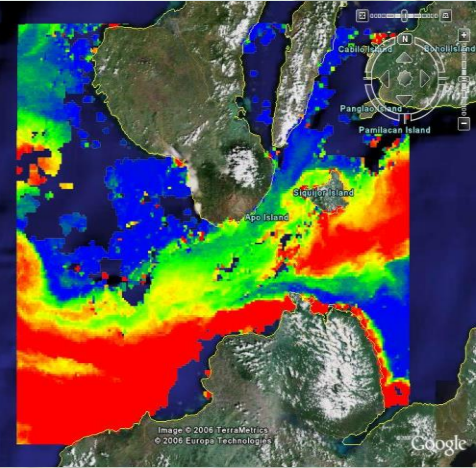
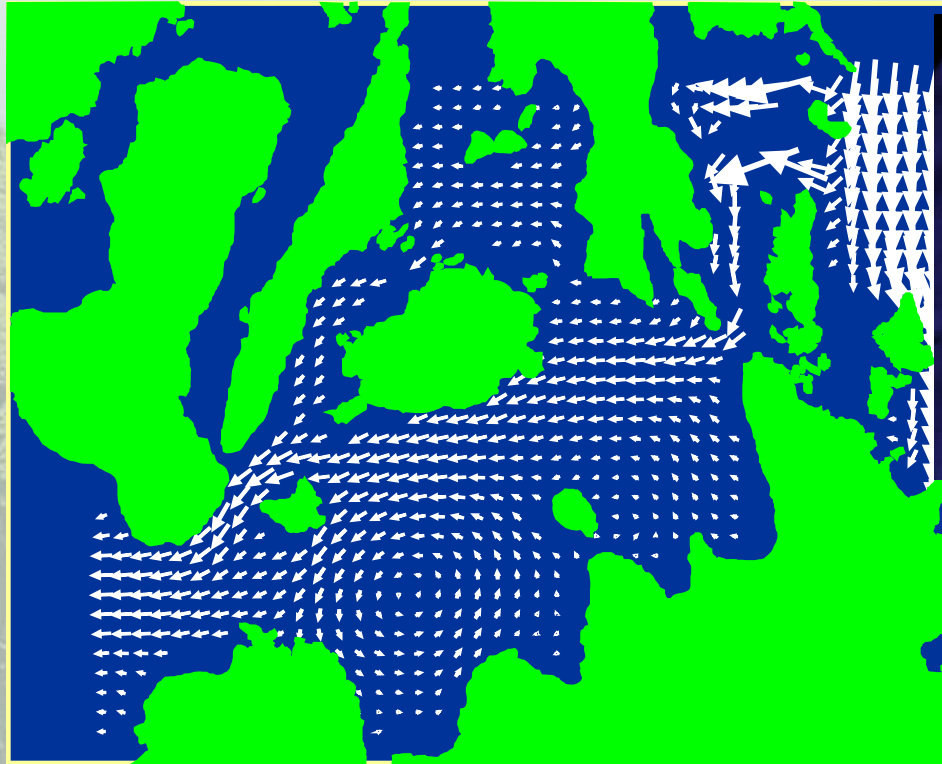
Recent studies (biogeography & genetics) suggest separation of populations at finer scales (<100 km)

- **Black:** Results of biogeographic studies of reef fish (SUAKCREM)
- **Red:** Genetics of *Dascyllus trimaculatus* (Ablan, 2005)
- **Clustering in Bohol Sea** (even with strong east west current)

DISCUSSION

RESEARCH & EXTENSION -
NO TAKE MARINE
RESERVES

PRESENT WORK:



Studies to predict connectivity using simulations of larval dispersal, test predictions by more biogeographic surveys, genetics and tagging of larvae



DISCUSSION

RESEARCH & EXTENSION - NO TAKE MARINE RESERVES

Looking to the Future:

1. EXPANDING AREAS OF NTMRs in Phils to more than 4-5 % of total coral reef area (25,000 sq km) in the country



2. INVESTIGATING the contributions of other marine habitats (MANGROVES, SEAGRASSES) to the conservation and management of marine biodiversity

CHALLENGE: Many young scientists now attracted to the problems & issues concerning Marine Biodiversity, incl. those in the Spratlys

Spratly islands connected to the Phil. thro' ocean currents that transport marine propagules to Palawan & W. Luzon

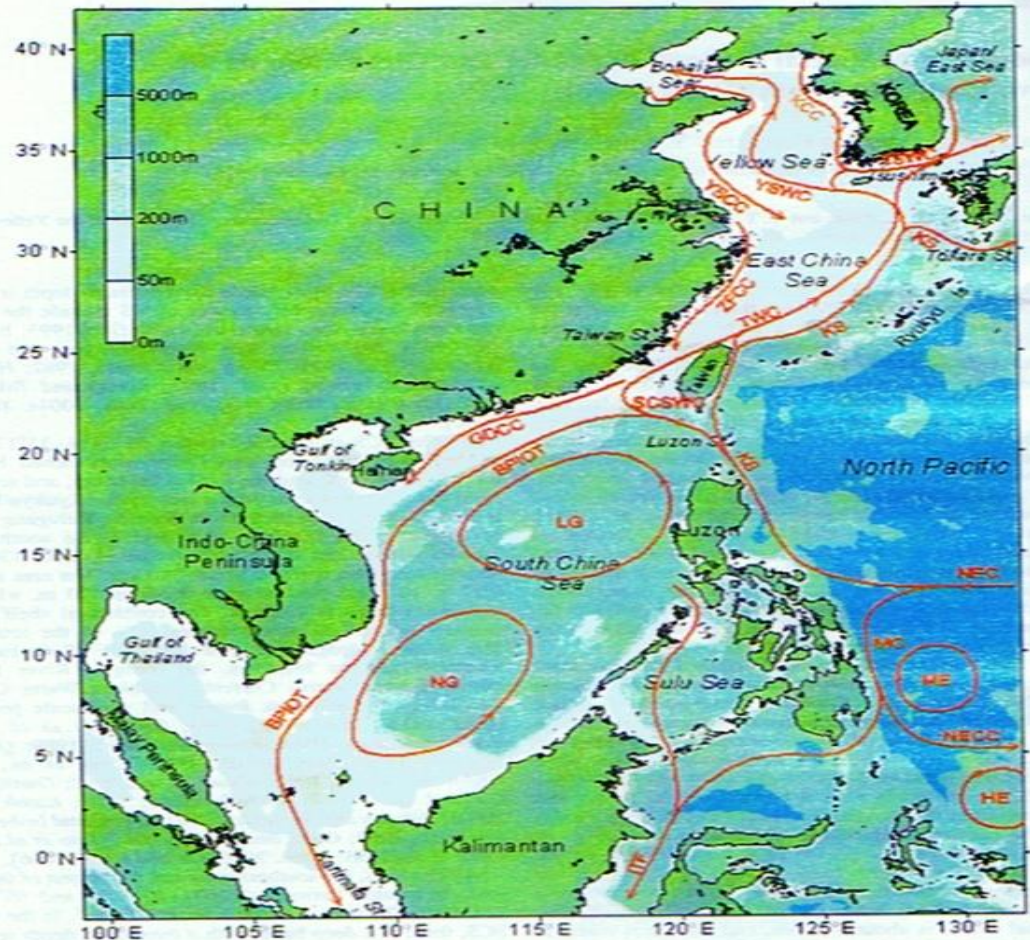


Figure 1. Topography and schematic representation of the major winter currents in the Yellow, East, and South China Seas. The current system diagram is a composite mainly based on *Su et al.* [1990] and *Fine et al.* [1994] for the western North Pacific, *Guan* [1988] for the Yellow and East China Seas, and *Fang et al.* [1998, 2005] for the South China Sea, with some modifications. The abbreviations stand for the following: BPIOT, Branch of the Pacific-to-Indian Ocean Throughflow; GDCC, Guangdong Coastal Current; HE, Halmahera Eddy; ITF, Indonesian Throughflow; KCC, Korea Coastal Current; KS, Kuroshio; LG, Luzon Gyre; MC, Mindanao Current; ME, Mindanao Eddy; NEC, North Equatorial Current; NECC, North Equatorial Countercurrent; NG, Nansha Gyre; SCSWC, South China Sea Warm Current; TSWC, Tsushima Warm Current; TWC, Taiwan Warm Current; YSCC, Yellow Sea Coastal Current; YSWC, Yellow Sea Warm Current; ZFCC, Zhejiang-Fujian Coastal Current.

COLLABORATORS among Institutions and LGUs

- ❖ **James Cook University, Queensland, Australia**
- ❖ **Smithsonian Institution, USA**
- ❖ **Pew Trusts, USA**
- ❖ **California Academy of Sciences, USA**
- ❖ **Chicago Museum of Natural History, USA**
- ❖ **Senckenberg Museum, Germany**
- ❖ **LGUs: Negros Or., Cebu, Bohol, Siquijor**
- ❖ **LGU: Negros Occ. Gov. Alfredo G. Marañon, Jr.**

CONCLUSION

1. ESTABLISHMENT of NTMRS = Excellent way to build up Fish Biomass:

- ✓ Participation of
- ✓ local communities
- ✓ & LGUs

- ✓ Expansion of
- ✓ the Area of
- ✓ Protected areas

- ✓ Ask people
- ✓ to protect
- ✓ 20% of Phil.

- ✓ Coral reefs

CONCLUSION

2. COLLABORATIVE RESEARCH WORK = Fruitful & Productive



✓ More than 100 publications on Biodiversity/No-take MPAs

✓ Contributed ca 40 (10%) to int'l. peer-reviewed sci.literature (300+ papers worldwide) on the specific subjects of Marine Protected Areas, Marine Biology

2/3 in peer-reviewed, refereed intl. journals

Mainly in collaboration w/ Prof. Garry Russ, R. Abesamis, B. Stockwell, E. Alcala, A. Bucol J. Maypa and IEMS (SU)

CONCLUSION


3. COMMITMENT & PASSION to work hard to find out how NATURE WORKS & How biodiversity benefits humankind



Angel Chua Alcala

Photo courtesy of California Academy Sciences Archives.





INDEED,
Philippine Biodiversity plays an
important role in supporting
human life &
THEREFORE NEEDS TO BE
STUDIED & CONSERVED



THANK YOU

**We hope all of you will help
promote conservation of
biodiversity on Negros Island
and consider conducting
research on biodiversity**