Apo Island & Sumilon Island MARINE RESERVES & BEYOND

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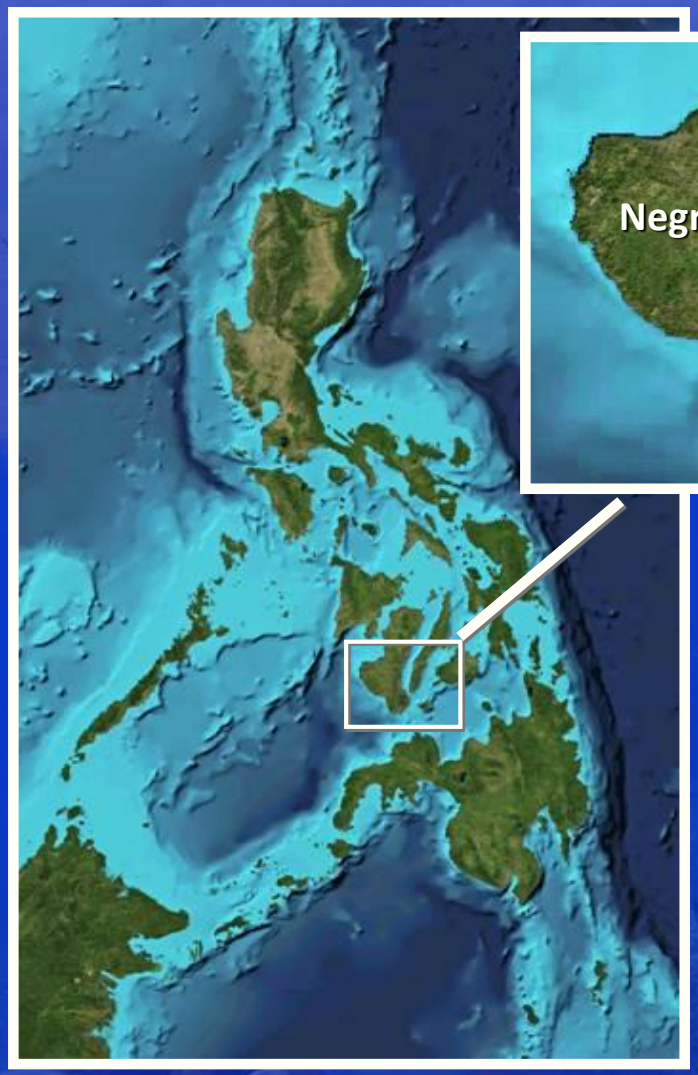
I. MARINE RESERVES or NO-TAKE MARINE RESERVES (NTMRs)

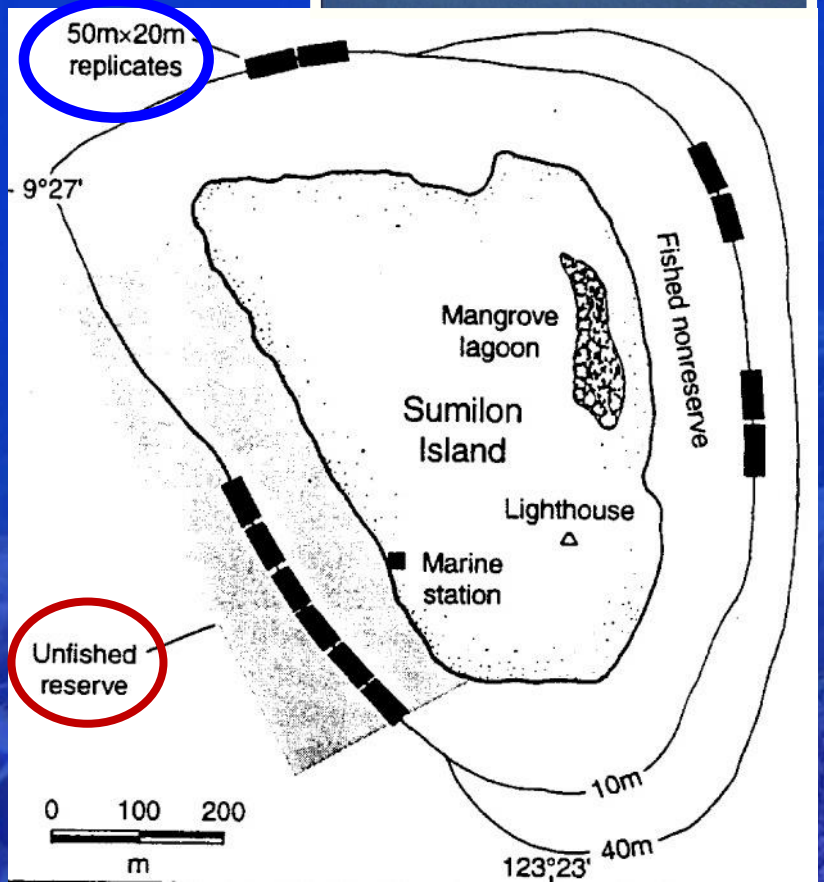
Sumilon Island, Oslob,Cebu
1st Working Local Govt-based MR in the Phils (1974)

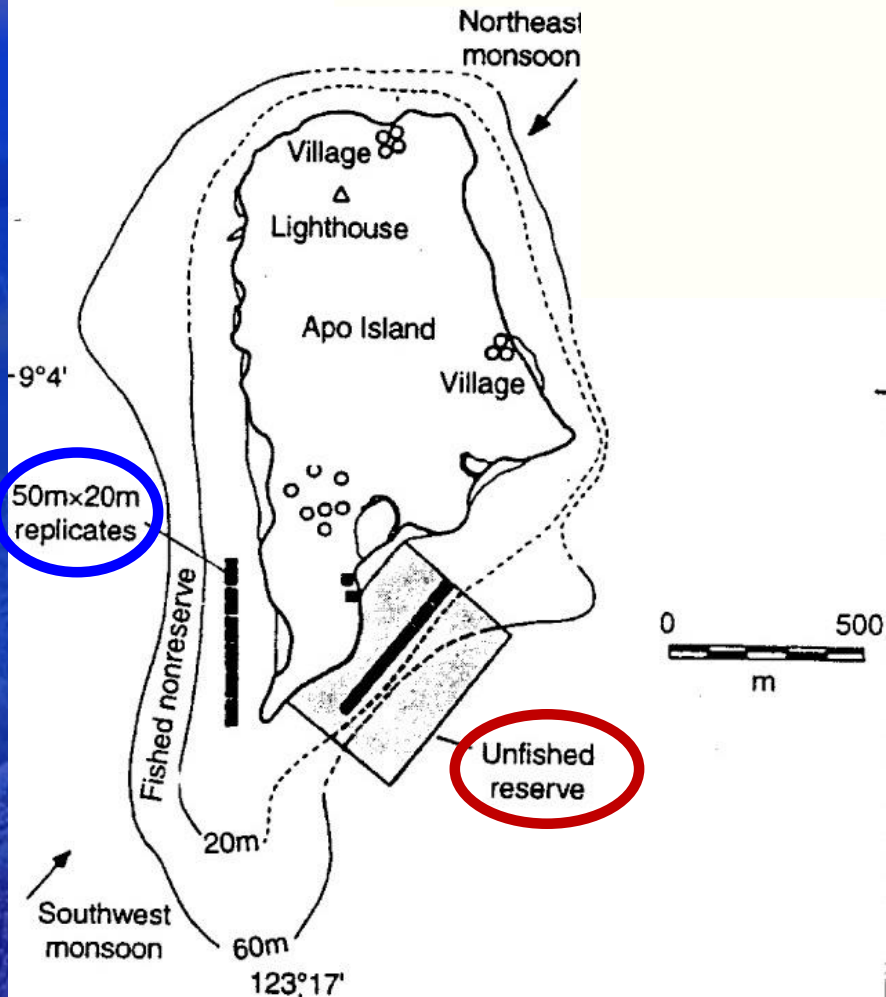
Apo Island, Dauin, Neg. Or.
1st Community-Managed MR in the Phils (1982)
NIPAS (1994)



SUMILON ISLAND and APO ISLAND

SUMILON I. (L) & APO I. (R) showing Protected Areas (Unfished reserve) and Control Sites (replicates) in fished areas





General Research Methods

Ideally, **20-30%** of reef is **fully protected** from fishing

70-80% is **fished area** (w/o use of destructive fishing gear)

Annual Monitoring using

<u>Underwater Fish Survey Method</u>:

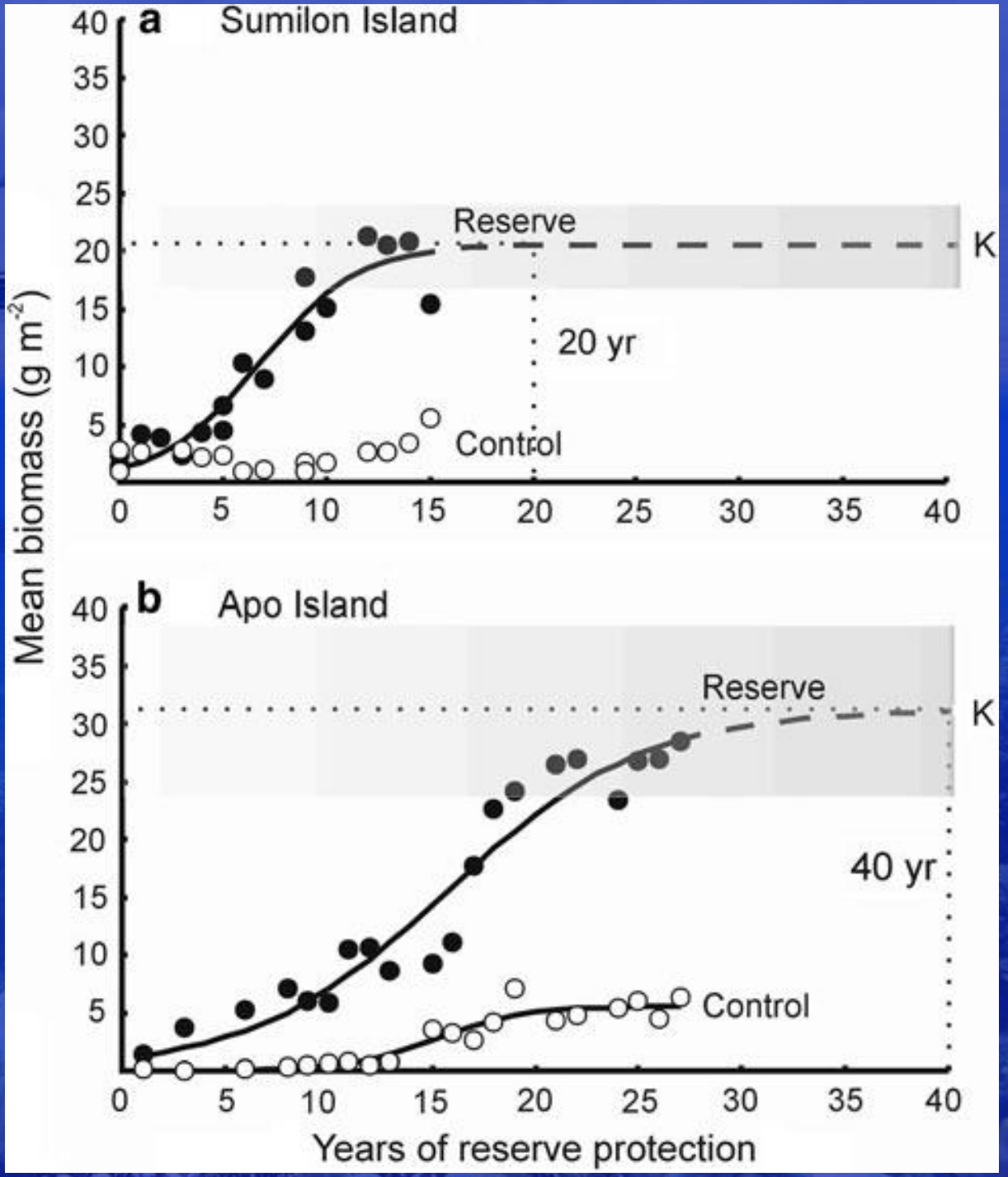
1. Fish Abundance
2. Fish Biomass
3. Coral Cover

Publications Since 1980

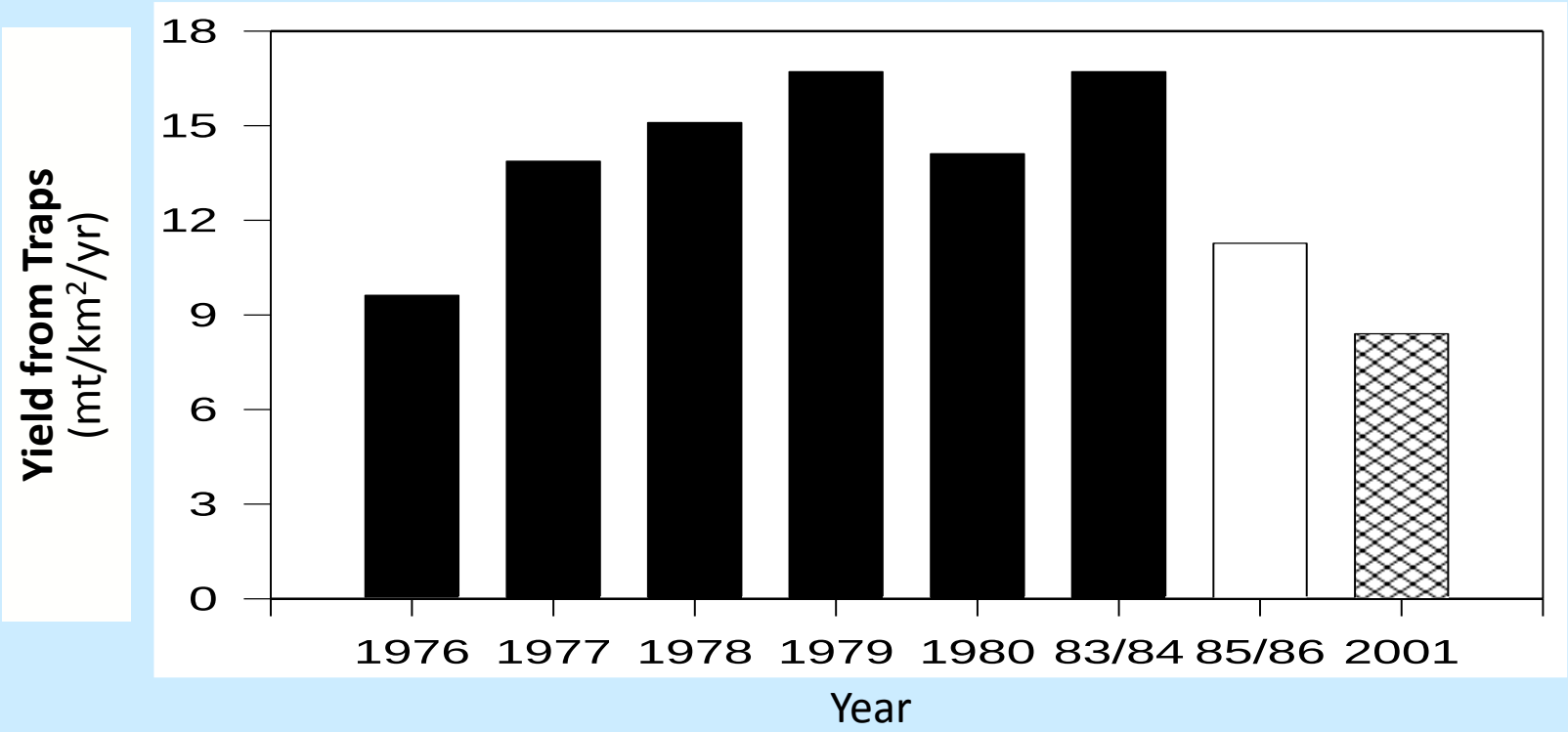
~50 papers published in NRCP Bull., Ecology, Mar. Biol., Conserv. Biol., Biol. Conserv., Mar. Ecol. Progr. Ser.,Proc. Nat. Acad. USA, Hydrobiol., Ecol. Applic.,Oecologia, Fishery Bull., Asian Fish. Sci., UPV Journal, etc. *by team SUAKCREM & James Cook Univ. researchers and others*

II. MAJOR SCIENTIFIC FINDINGS (1976 to 2017)

Best-fit logistic growth models fitted to mean biomass of predatory reef fish indicate 20-40 yr to reach carrying capacity of NTMRS



Yield of Reef Fishes at Sumilon Fished Area (mt/km^2/yr)



Yields during period of Full Reserve Protection from fishing

Yield during period of No Protection from fishing

Yield during period of Reduced Protection from fishing

Yield of Reef and Reef-associated fish taken from Traps at Sumilon Island from 1976 to 2001 based on 10- to 12-month data. (Number of fishers and family composition of catch, uniform in all years; 2001 data unpublished). *Data from 1976 to 1986 from Alcala and Russ (1990) (for black and white bars: one sample t-test, $t_5 = 3.05$, $p < 0.05$). Maximum fish yield in '83/84 but declined in '85/86 and 2001 when protection was withdrawn, showing high yields dependent on protection of marine reserve.*








1. Fully protected NTMRs build up fish biomass and improve/maintain good reef environment.

Fully Protected NTMRs = *MORE and BIGGER FISH*

h

Apo Marine Sanctuary *(established in 1982)*

27x higher biomass
11x more species of large predatory fishes

26 yrs protection

1983 → *2009*

Russ & Alcala 2010, 2011

2.Increased target fish biomass in NTMRs resulted in Stable Fish Catch (Apo) in 20 y and Increasing Catch (Sumilon) in 10 yr due to SPILLOVER EFFECT.

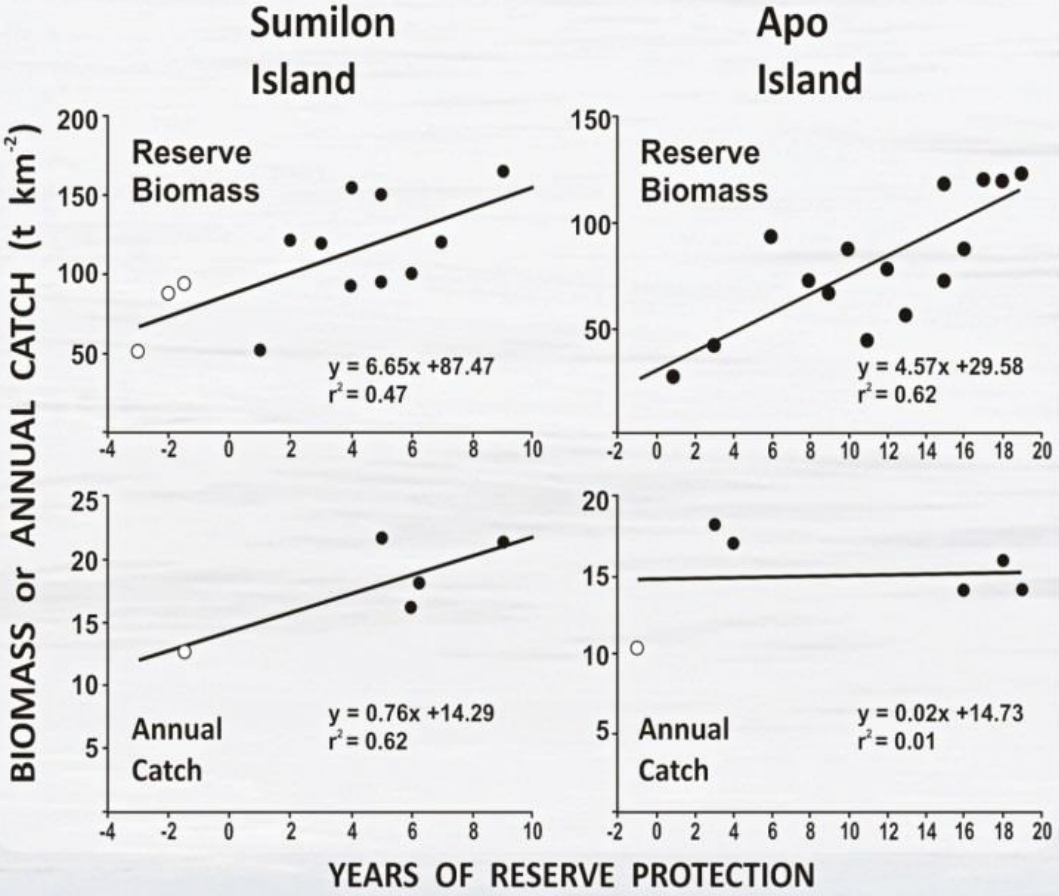


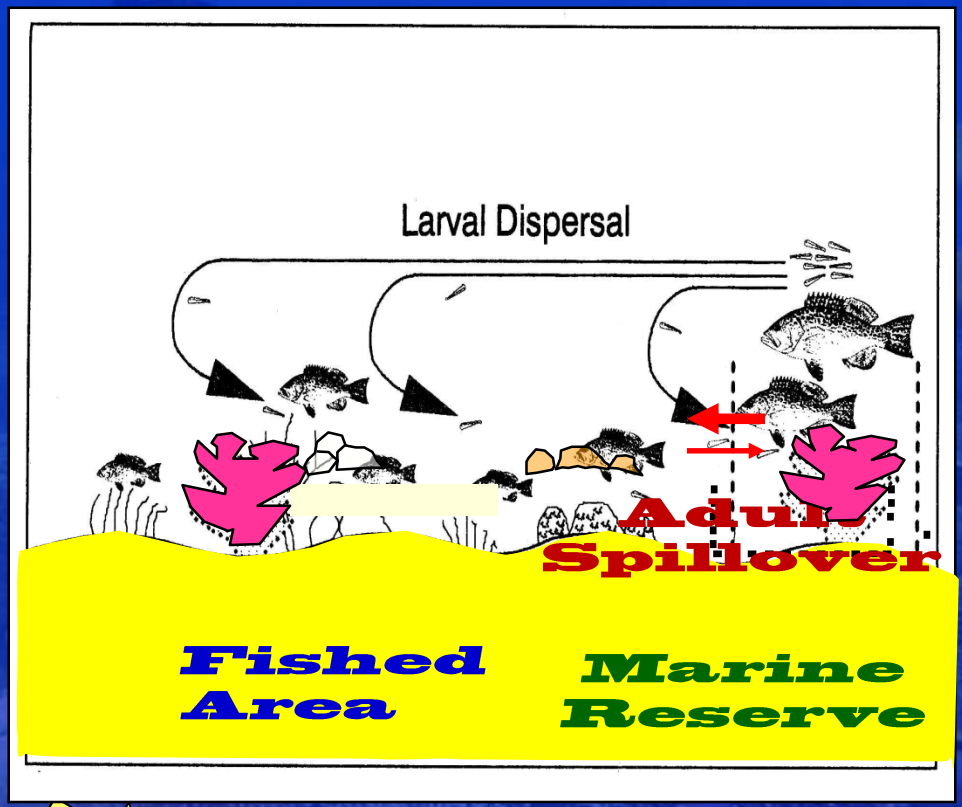
Figure 1. Annual biomass of targeted fish inside reserves and the fisheries catch of these fish outside reserve plotted against years of reserve protection at Sumilon and Apo islands. Redrawn from Alcala and Russ 2006

3. ADULT SPILLOVER occurs

NTMRs → *Build Fish Biomass*

→ *Some fish move out and occupy areas fished by people*

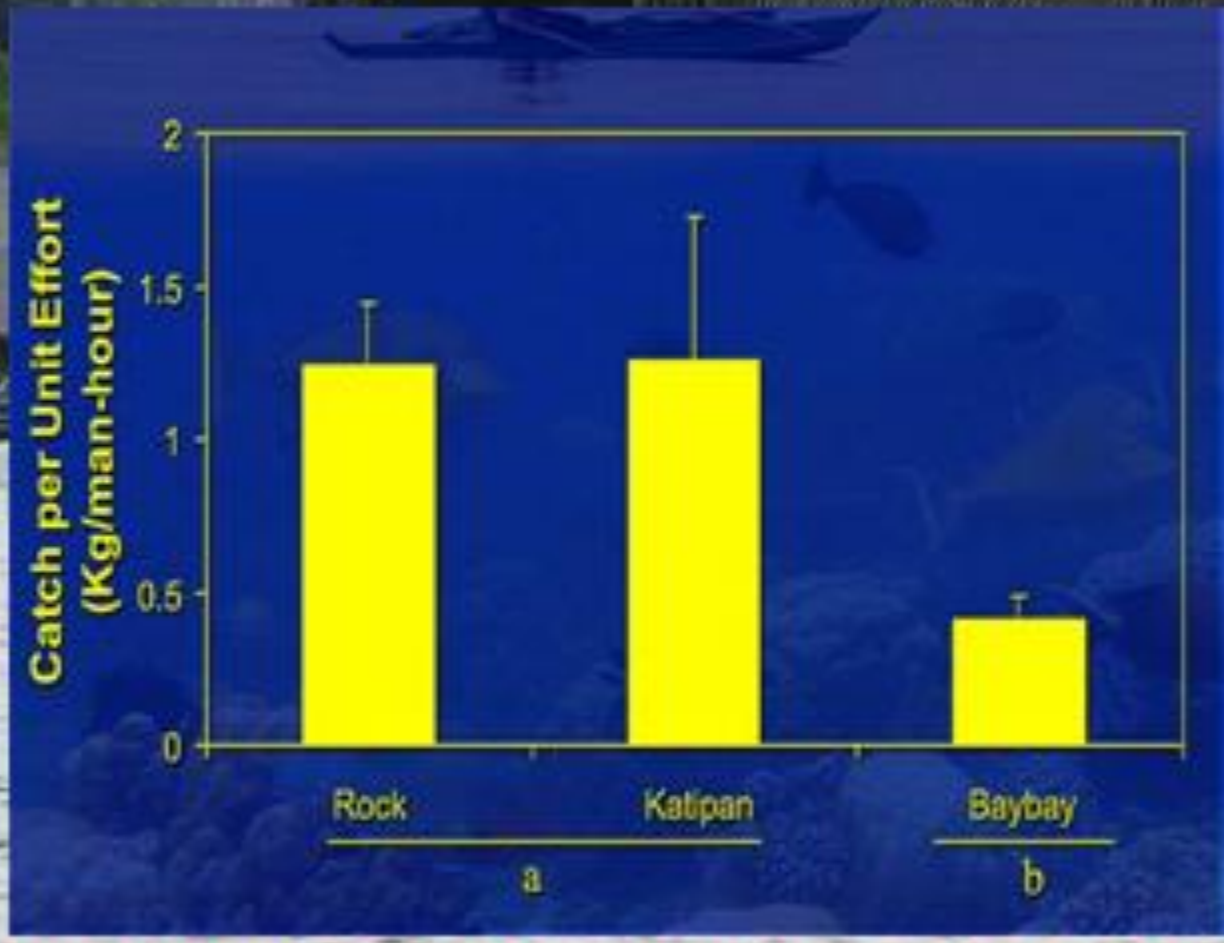
Ideal Goal: 20-30% of fishing area be declared as NTMRs



→ thus **IMPROVE Fish Catch !**

Effects of MPAs on Fish Populations and on CPUE in central Philippines

Effect of spillover on CPUE, ca 10% of total catch



Mean CPUE (kg/person-hr, mean ± S.E. < 0.05) for three sites at Apo Island. Subsets a and b according to Tukey's HSD.

4. SUSTAINABILITY of reef fisheries

Coastal Fisheries (mostly from protected coral reefs) contribute **20-30%** of total fishery catch in the Phils.

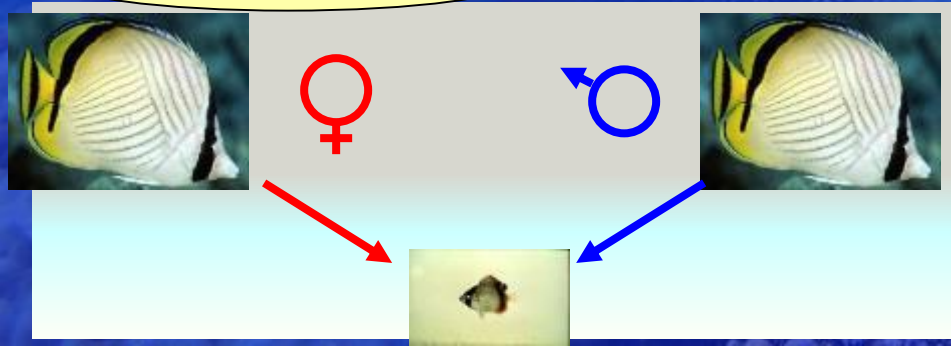
and are accessible to coastal human populations.

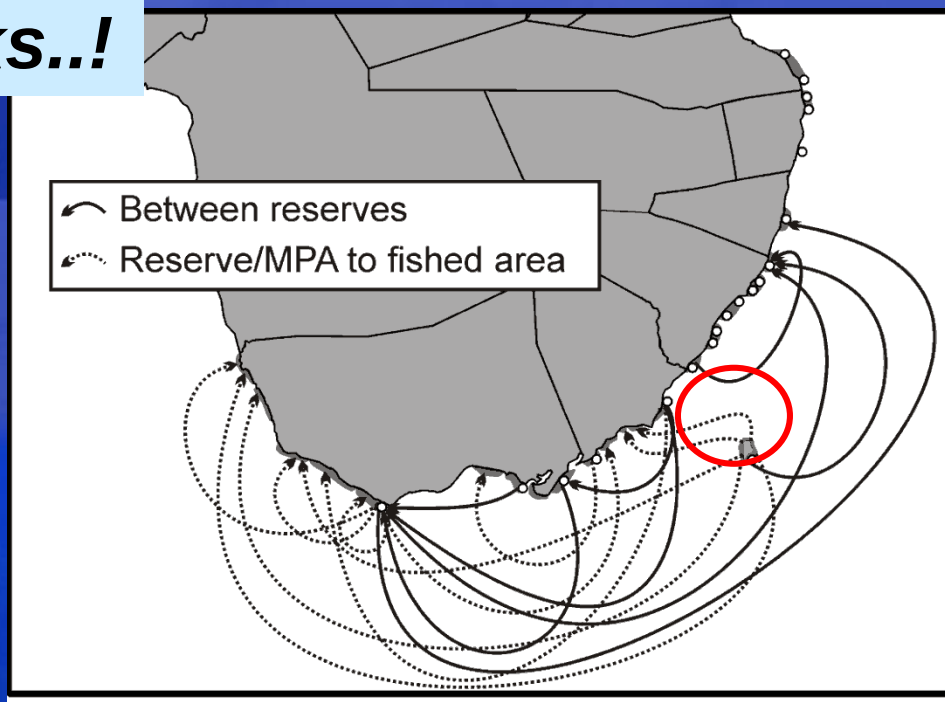
Need for Reserve Networks..!

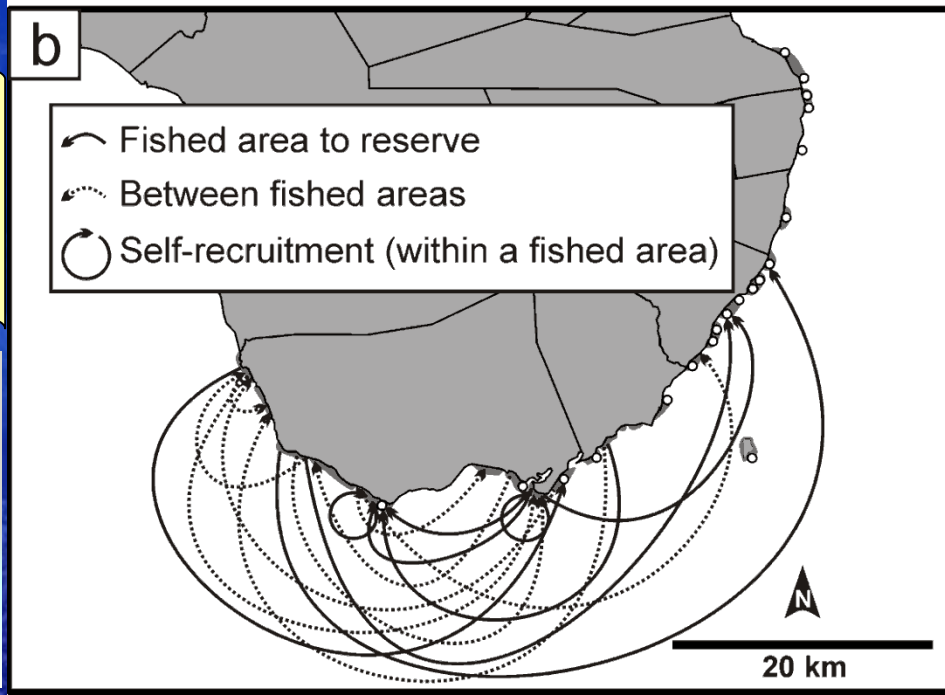
Larval connection among a network of 23 NTMRs (white dots) on the southern Negros coastline:

1. **Reserve** to reserve.
2. **Reserve** to fished.
3. **Fished** to reserve.
4. **Fished** to fished.
5. **Self-recruitment** (within fished areas)

Apo Island has a reserve protected for 31 years and supplies larvae to the coastline.







Genetic Parentage Analysis Experiments demonstrate LARVAL or RECRUITMENT SPILLOVER to many MRs & fished areas along coast of southern Negros

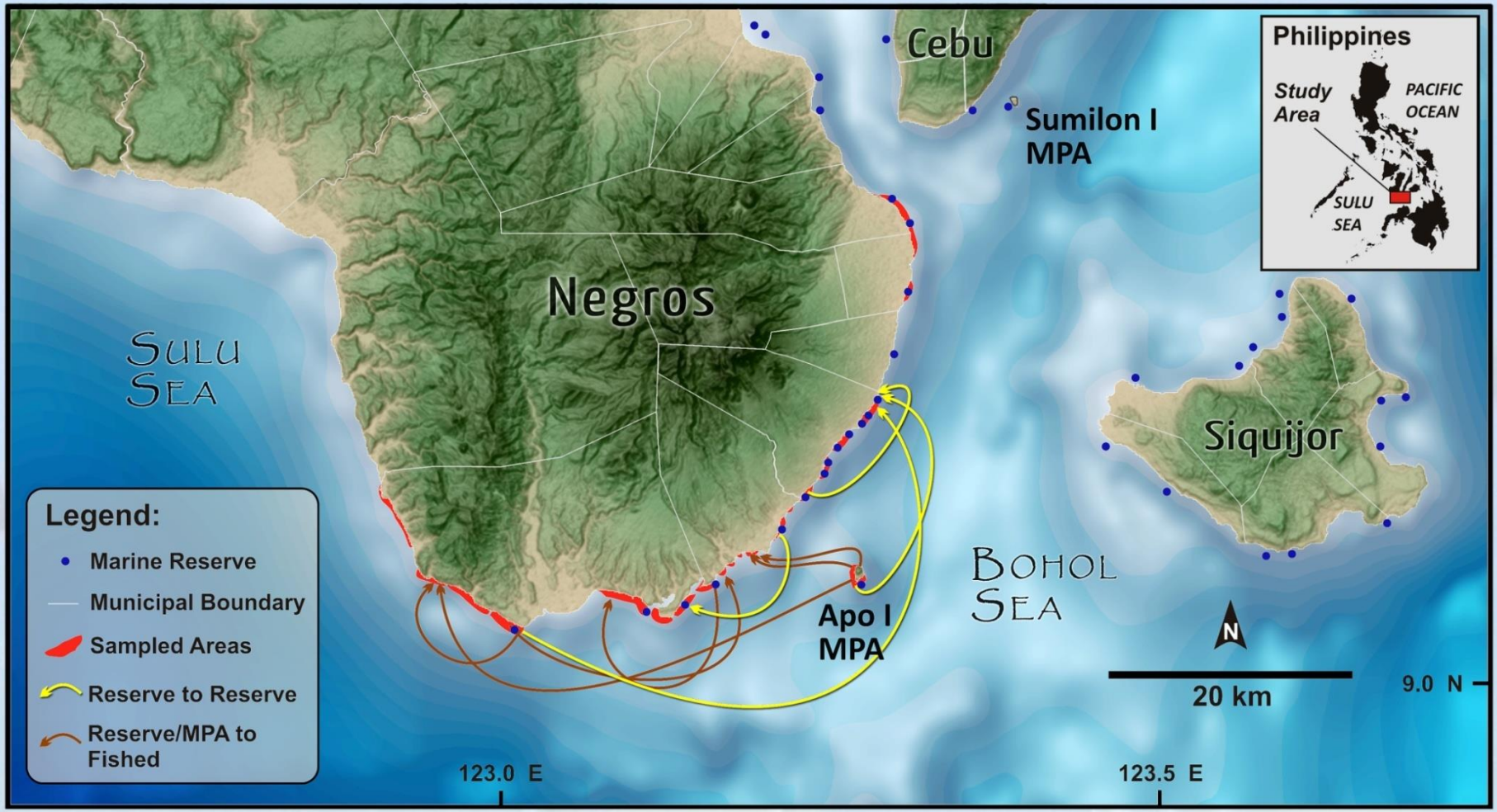


Figure 2. Results of genetic parentage analysis on 1 species of coral reef fish (*Chaetodon vagabundus*) indicating the trajectories of larval dispersal from reserves to fished areas and other reserves.
*[**Layout** modified from RA Abesamis (unpublished) by JLP Maypa; **Basemap** rendered from CIAT-CSI SRTM 4.1 & GEBCO]*

5. Socio- economic Effects:
from “Rags” to “Riches” (Apo I.)













***Improved* fish catch, *more income* from tourism & *better living* conditions**

III. CONCLUSION

Sumilon & Apo studies demonstrate:

PROTECTION OF ENVIRONMENT

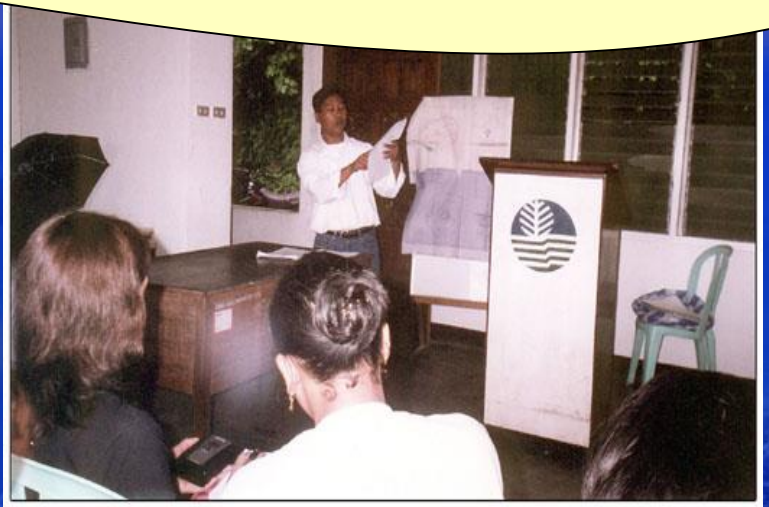
key

to the sustain-ability of coastal & marine resources

IV. BEYOND APO AND SUMILON: *What should be done to conserve and maintain coral reef fisheries & associated marine biodiversity?*

1. **EXPAND the NTMRs** beyond present 5% of total coral reef area of 25,000 Km2

2. EMPOWER the LGUs/NGOs for coastal management



Foster partnerships w/ local govt. units, local communities, govt. agencies & other stakeholders for sustainable management

3. Provide SUFFICIENT BUDGET for the DENR & the Bureau of Fisheries

4. Set up a MONITORING SYSTEM to determine progress of the program and provide interventions to solve emerging problems & issues

Apo Island

Excellent Model of COASTAL RESOURCE MANAGEMENT

Pattern for the Establishment of No-Take Marine Reserves in the country

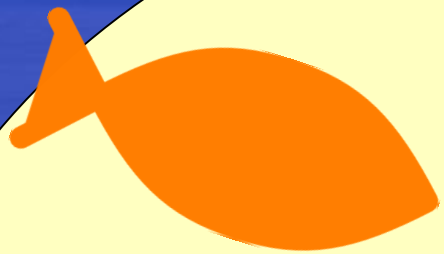
Showcased in the **SHEDD Aquarium** in Chicago, **USA**

ACKNOWLEDGMENT

Most of the work on Marine Protected Areas & No Take Marine Reserves have been made with:

Dr. Garry R. Russ

Professor, James Cook University, Australia



FISH

be with us all