

**Mapping pathways of larval connectivity in the Marianas
Summary of Project Kickoff Meetings in CNMI and Guam
January 28 – February 1 2013**

Jan. 28

Meeting at Division of Environmental Quality

Attendees: Matt Kendall, Chris Caldw, Matt Poti, Dana Okano, Steve McKagan (NOAA), Jose Quan, John Ignel, Ryan Okano

Chris provided an overview of the Biogeography Branch and prior activities in the Pacific. Matt K. presented on the proposed larval connectivity study, including preliminary results from satellite drifter analyses and details of the larval transport simulation and the types of questions it can be used to answer. Matt P. demonstrated the modeling process, including the GNOME interface and typical GIS outputs.

Discussion topics and suggestions for revised work plan:

- Observations on how the results so far differed from expectations.
- Question about coupling our results with genetic studies. All agreed this was an important counterpart to our modeling approach.
- Question about changes in current intensity/patterns from climate change and how it would affect results. Studies suggest that key currents will weaken. We could focus some simulations in modal years with weaker currents or explore the possibility of reducing HYCOM vectors by a specific intensity to simulate this.
- Confirmed the interest in some training component to build local capability for future work. Noted CRM plan to hire GIS analyst, DFW to have fellow working on MPA design, that may be key staff interested in training.
- Interest in focusing some simulations to trace where juvenile fish may have come from that arrive at certain date (e.g. rabbitfish). Mention of prior rabbitfish studies to build on and base hypotheses.
- Species of interest: rabbitfish, goatfish, big eye scad, and trevally recruits, COTS, trochus, sea cucumber
- Coral species of interest based on recently ESA listed species. Many corals spawn 1 week after full moon in July (to start simulations); specific interest in listed species that are more abundant.
- Question of how to scale productivity was discussed. Previously used 0-150 isobath but coral cover estimates or fish surveys could also be used.

Jan. 29

Individual Meetings with CNMI DEQ

Jose Quan, GIS Specialist:

- Expressed interest in building skills through GIS/modeling training to be able to run future model simulations and explore additional questions
- Discussed hardware/software requirements, and determined that Jose has the necessary hardware and ArcGIS license to run GNOME and the Python scripts
- It was suggested that Jose download GME and R for potential use in analyzing drifter and model output datasets.
- Jose will specifically review the training component of the work plan to be sure it addresses his needs and expectations.

Steven Johnson:

- Discussed lack of any known spawning aggregations to focus simulations
- Suggested DFW creel survey in Saipan lagoon may provide data for timing of recruitment pulses, but published reports are generally lacking (contact Sean McDuff)
- Expressed priority interest in more abundant ESA listed corals – will provide priority list with notes on reproductive strategy (e.g. brooders vs. broadcasters and timing of spawning if known).
- Steven will look for ref. on spawning dates for hard corals – 1 week after full moon in July
- Discussed MPAs – 5 full no take, trochus reserve, sea cucumber sanctuary, no commercial fishing for 3 northern islands. Suggested getting GIS boundaries from DFW
- Expressed interest in running simulations for years and locations with big recruitment events, Steven will look at coral data to identify possible pulses of coral recruits.
- Speculation that coral community in Saipan/Rota/Tinian (and Guam) may be dominated by brooders b/c of strong NEC sweeping away broadcasters, northern islands may have greater self-seeding with broadcasters due to eddies. Steven will look into the coral data among islands at proportions of brooders/broadcasters to generate potential hypothesis.
- Interest in modeling COTS, suggested Houk's paper on timing of chl front to id years/seasons for simulations. Is there an annual record of COTS abundance?
- Discussed scaling of productivity based on fish biomass or difference in coral cover. Suggested Dave Benavente as another possible data source. CRED database.

MPA Workshop

At the request of Allen Tom (NOAA ONMS), Chris gave a brief presentation on the work done by the Biogeography Branch in the Pacific to date and our proposed larval connectivity study in the Marianas to the MPA Workshop.

PM Matt and Chris in field at west coast MPAs with Ryan and John

Jan. 30

AM Visit to Lau Lau Bay with Dana, Ryan, and John

PM Meeting with CNMI DFW

Attendees: Matt Kendall, Chris Caldow, Matt Poti, Dana Okano (NOAA), Flinn Curren (USFWS), Frank Villagomez, Todd Miller, Sean Macduff, Trey Dunn

Chris provided an overview of the Biogeography Branch and prior activities in the Pacific. Matt K. presented on the proposed larval connectivity study, including preliminary results from satellite drifter analyses and details of the larval transport simulation and the types of questions it can be used to answer.

Discussion topics and suggestions for revised work plan:

- Todd was very interested in testing hypotheses from the larval connectivity work through genetic studies (with Evan Carlson)
- Also discussed were potential studies of influence of primary production on productivity and latitudinal gradients
- Species of interest for modeling include rabbitfish, goatfish, and juvenile carangid events but also mentioned were parrotfish, Napoleon wrasse, lutjanids- Todd will provide a list of particular taxa
- Expressed interest in using models to assess/compare MPAs in terms of highest larval returns.

- Confirmed that CNMI spawning aggregations were poorly known
- Concern that data for spawning times for some species may be not be seasonal, perhaps simulations could be done bi-monthly for comparison
- Expressed interest in shallow seamounts, reefs/banks (e.g. Pathfinder)
- DFW creel survey data is not spatially sufficient (Saipan Lagoon only) to inform scaling of starting points, suggested we look into CRED data
- DFW creel survey data is sufficient to resolve months and possibly day of recruitment pulse for rabbitfish and goatfish, Sean Macduff can provide this information or data is available via WPRFMC.
- Rabbitfish paper mentioned again – Kevin Rhodes 2012
- Trey provided MPA boundary information to Matt K. on thumb drive

Jan. 31

AM Wrap up meeting with Dana and CNMI DEQ

Attendees: Matt Kendall, Chris Caldow, Matt Poti, Dana Okano, Ryan Okano, Steven Johnson

- Steven will look at ESA list priorities with notes on reproduction, recruitment patterns among island and years, and proportion of brooders versus broadcasters by island.
- Suggestion that CNMI GIS user group be included in training, link in via Jose
- Question of modeling mangrove propagules. We will look into this possibility.
- Matt P will look at drifters relative to timing of typhoons and their potential to influence transport paths; 1997-1998 noted as high years for typhoon activity.

PM Travel to Guam

Feb. 1

Presentation/Discussion of Proposed Work at NOAA Office

Attendees: Matt Kendall, Chris Caldow, Matt Poti, Tom Shils, Laurie Raymundo, Amanda Devillers, Roxanna Miller, Bob Schroeder, Peter Houk, Dave Burdick, Adrienne Loerzel, Val Brown, Eric Cruz, Marybelle Quinata, Jay Gutierrez

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Discussion topics and suggestions for revised work plan:

- Tom mentioned interest in exploring connections between marine ecoregions using drifter data, with particular interest in algae species; Tom will provide paper for follow-up
- Interest in modeling COTS (primary mode of coral loss); we will need info on PLD, could couple to primary productivity- will examine Houk paper as first step
- Typhoon transport discussed– possible infrequent driver of long distance or rare event connectivity- Matt P. will incorporate this into drifter analyses underway
- Possible faculty at Univ. of Guam looking into spawning aggregations
- Question of incorporating larval vertical migratory behavior– could do, but timing, env., and biophysical response info not known.
- If using biomass or coral cover to scale productivity, need consistent data for everywhere in archipelago. CRED likely the only option.

- Starting dates for simulations of key taxa: soft corals in Apr, May, Jun; hard corals in Jun, Jul, Aug; Val offered to provide further information
- Key fish taxa: blue spined unicornfish, large bodied parrotfish, proposed or soon to be listed species, top caught reef fish. Jay offered to send a list of key emperorfish species and we need others.
- Several interested in GIS/model training to conduct similar analyses in the future– (Jay, Dave, Peter)
- MPAs in Guam – seasonal take, few specific protections, GIS boundaries and list of specific regulations needed
- Expressed interest in banks – e.g. Galvez, Santa Rosa, White Tuna? Etc.? Adrienne offered to get list (coordinates needed, bathy and GIS files best)
- Mention of Atlantis model (will follow up with Mariska)
- Agreed to do a seminar at Univ. of Guam lecture series when we return

PM Drop in meeting with Vange Lujan, Director, Guam Coastal Management Program

- Introduced the main objectives and approach of our connectivity work in the Marianas.
 - Discussed other potential applications of connectivity models for future work.
 - Discussed our entire research portfolio to consider additional potential partnership studies such as spatial planning.
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Next steps:

- Follow-up with individuals on data needs and specific topics as noted above.
- Complete revised work-plan and distribute for comment.