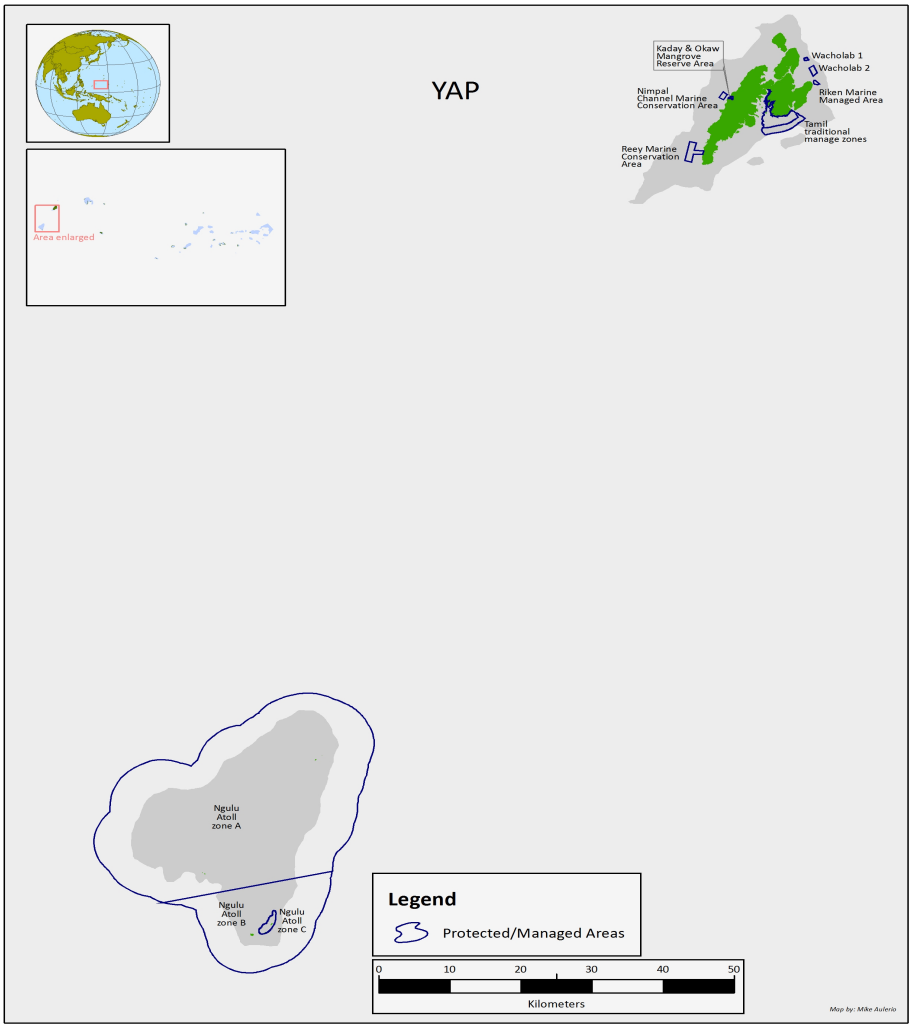
Yap Protected Areas Network Design Workshop

WORKSHOP REPORT



Yap, Federated State of Micronesia
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TNC Contact

Ms. Elizabeth Terk, Protected Area Advisor, Pohnpei Field Office, The Nature conservancy, PO Box 216, Kolonia, Pohnpei, FM 96941. Tel: +691-320-4267; Email: eterk@tnc.org

Yap State Protected Area Background

The **Micronesia Challenge** (MC) is a commitment by the Republic of the Marshall Islands (RMI), the Federated States of Micronesia (FSM), and the Republic of Palau (RP), in collaboration with the United States (US) Territory of Guam and the US Commonwealth of the Northern Mariana Islands (CNMI), to conserve their natural resources by **"effectively conserving at least 30% of the near-shore marine and 20% of the terrestrial resources across Micronesia by 2020."**

The Federated States of Micronesia (FSM) is the largest and most diverse part of the MC sub-region. It is a federation of four semi-autonomous island states, in geographic sequence from west to east - Yap, Chuuk, Pohnpei and Kosrae - comprised of 607 islands with land elevation ranging from sea level to the highest elevation of about 760 m. FSM's total landmass is 702 km², with a declared Exclusive Economic Zone covering over 1.6 million km². Its marine and terrestrial biodiversity are the nation's living wealth and species endemism is high among the terrestrial biota. The high endemism within the nation is a direct result of the isolation of the islands to one another and to other landmasses in the greater Micronesian region. The conservation and preservation of FSM's natural heritage has high national importance and its endemic species have global significance. The marine and terrestrial resources are the foundation of the country's long term economic self-sufficiency as articulated in its National Biodiversity Strategic Plan (NBSAP) and subsequently its Strategic Development Plan 2004-2026 (SDP). Maintaining the habitats and ecosystems that nurture this diversity is crucial to sustaining the country's rich ethno-biological traditions while improving Micronesians' quality of life, since sixty percent (60%) of its population is dependent on subsistence livelihoods. Further inventory and monitoring of the FSM terrestrial and marine biodiversity are integral to a thorough understanding and appreciation of the island's biodiversity.

In FSM, the responsibility for environmental issues is shared between FSM National Government and the individual FSM State governments (i.e., Pohnpei, Chuuk, Kosrae and Yap). Each State, as owner of its surrounding natural resources out to 12 nautical miles, manages these resources through policies and plans (e.g., land use plans, coastal zone plans, legislation and regulations). The National Government, on the other hand, provides on request guidance and technical assistance to the States, and manages the resources from 12 to 200 nautical miles.

The sharing of stewardship responsibility has at times resulted in duplicate legislation at the State and National levels. Additionally, it has also led to gaps in legislation due to lack of clear delineation of respective roles and responsibilities at both government levels. Often the National government does not provide tangible (policy/legislative and funding) support to the states for protected area (PA) and conservation laws. Recognizing these difficulties, FSM national and state leaders, as well as customary chiefs, have made an effort to streamline their work toward meeting their mutual goal of ensuring effective protection of natural resources.

Ownership of land and aquatic areas also varies between States. In Kosrae and Pohnpei, land is both privately and State owned, while aquatic areas are managed by the State as public trusts. In Chuuk, most land and aquatic areas are privately owned and are acquired through inheritance, gift or, more recently, by purchase. In Yap, almost all land and aquatic areas are owned or managed by individual estates and usage is subject to traditional control. In all States, land cannot be sold to non-citizens of the FSM, although there are long term leasing options available for non-citizens. These land and

aquatic ownership patterns greatly influence the strategies and actions required to sustainably manage the biodiversity of the nation.

In 2002, a “blueprint" of the FSM's biological resources was created to provide a clear picture of areas of biodiversity significance (ABS) that can be found within the FSM and a prioritization of conservation needs. The plan took over two years to create through a coordinated effort by individuals within the governments of the Federated States of Micronesia, the U.S. Forest Service, The Nature Conservancy, university scientists, and local experts. The “blueprint” contributes to the National Biodiversity Strategic Action Plan (NBSAP). The major goal of NBSAP is to protect and sustainably manage a full representation of the FSM's marine, freshwater, and terrestrial ecosystems.

In 2005, the Yap Community Action Program (YapCAP) led a Rapid Ecological Assessment to assess the existing MPAs and identify potential new sites, based on habitat types and threat status. In 2009, a “Gap Analysis” was completed for each state in FSM using information gathered from workshops held in each state. Participants at the workshops worked together to identify conservation features (“Class”) within each state and then to define an initial set of goals for each Class. The Gap Analysis project was divided into three distinct phases where each one built on the previous. This allowed for a sequential learning process and ensured that all elements were considered. Phase 1 was designed to evaluate the status of each Class given the current configuration of Protected Areas (PAs). Summary statistics were then calculated to report on the total area of each Class captured within the PAs. Phase 2 built on these calculations by evaluating the Areas of Biological Significance (ABS). The ABS areas were defined based on expert knowledge during the FSM Blueprint project (~2002).

From the information gathered in Phase 1 and Phase 2 a report was developed on the status of all conservation features (Class) in relation to existing PAs, and illustrated how the ABS areas would complement the current PAs. Phase 3 of the Gap Analysis developed Marxan[1] models per State in order to provide guidance on achieving conservation Goals. The maps were developed digitally and passed onto the State Focal Points Agency – Kosrae Island Resource Management Authority (KIRMA), Pohnpei Department and Land and Natural Resource (DLNR), Chuuk Environmental Protection Agency (EPA) & Yap Department of Resource and Development (R&D) - and their respective Land Resource Agencies. Unfortunately, many of those currently working in resource management at the state level are unaware that the gap analysis took place and have never seen the results. This has been attributed to not clearly identifying a staff member at the state level to take over the project as well as staff turnover.

The previous Gap Analysis was not able to assess the management effectiveness of the PAs. An MPA effectiveness assessment tool has been developed for Micronesia modelled after the MPAME tool developed in Indonesia. This allows for enhanced understanding of management effectiveness of existing MPA sites to be taken into consideration of the PAN design, regarding whether sites are

[1] Marxan is a commonly used decision support tool for conservation planning, which identifies priority areas to achieve a specified conservation objective when provided with information about the spatial distribution of conservation features of interests and the socioeconomic cost of protecting different sites.

appropriate of state goals and objectives based on management level and conservation effectiveness level.

Additionally, the previous Gap Analysis focused on biodiversity as the number one objective of designated protected areas and did not take into consideration other objectives especially those of the community. This new approach will build on the gap analysis by reevaluating the PA sites in each area using previous research efforts and appropriate community consultations to ensure the PANs meet the goals of both resource managers and community members (e.g. fisheries management), are representative of biologically significant areas and incorporate resiliency.

Workshop Purpose and Objectives

This workshop was the first step in refining the design of Yap's Protected Area Network (PAN) to better meet Yap State's goals using spatial planning. The purpose of this workshop was to agree on the goals of Yap's PAN, understand the principles of protected area design and gather data and knowledge from community leaders to help assess and make recommendations on how to redesign Yap's PAN.

Workshop Objectives

(1) Refine Goals for Network
(2) Clarify scope of study
(3) Agree on network design principles
(4) Assess data needs to complete design and available data layers

Presentation: History of Planning in FSM

Berna Gorong, TNC

Mrs. Gorong highlighted the Blueprint for Conserving the Biodiversity of the FSM, identified areas of biological significance, the rapid ecological assessment conducted in 2005 and coral reef and fish surveys. She also shared the results of the Gap Analysis (as described above) conducted in all four FSM states in 2009 and lessons learned from that process.

Question from participant: Are the 2002 ABS areas still the most important places?

Answer: REAs were conducted in some areas of the state to collect data to better assess, but unsure whether the ABS areas were updated as a result.

Director: *Lots of the work is driven by data availability, and is therefore dependent upon outside expertise. We need to refocus on traditional knowledge and management so as not to lose them. Yap State has declared an emergency for non-communicable diseases. Imported food can be accessed more cheaply and easily than local resources. We need to change people's behavior.* **Food from local resources is key to health of Yapese.**

Thomas: *Data are still valuable for understanding what is going on. Fishing methods have changed – new technology and ice boxes. Conservation is not about stopping fishing, but ensuring sustainability of fish for human consumption.*

Francis: *We need to focus on different forms of fisheries and traditional management in addition to protected areas. E.g. fisheries size limits etc.*

Rachel: *"Effective management" doesn't just mean strict protected areas. The MC now has socioeconomic monitoring and is looking at the impact that protected areas have on people.*

Francis: *We need to update the terrestrial protected areas used in MC accounting.*

Sabino: *It seems like the State's focus is on marine, but we need parallel planning on land.*

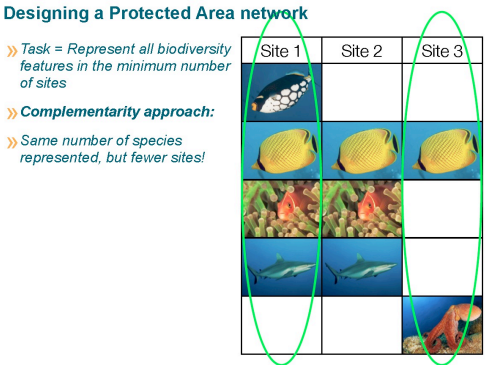
Presentation: Systematic Conservation Planning for Protected Area Networks

By: Dr. Rebecca Weeks, James Cook University

Dr. Weeks has participated in PAN design projects in several countries in the Pacific including Palau and Pohnpei. Her presentation covered how protected areas were designed in the past, using systematic conservation planning and examples of how systematic conservation planning was used in other places. Below is a summary of the main points of her presentation.

In the past protected areas were placed in certain places because they were scenic places, remote areas, areas near research institutions or culturally important/traditional protected areas. This approach is proving to not be effective because we protect areas that are not needed for anything else and areas of high conservation importance may not be protected. In addition, traditional management practices may no longer be effective in light of growing human populations and new technologies for harvesting resources.

Systematic conservation planning is the integration of biological assessment, stakeholder engagement and socio-economics in cost-effect conservation action. Rather than just identifying areas that are important for biodiversity, conservation planning seeks to balance and achieve good outcomes for both biodiversity conservation and human wellbeing. The process is based on clear statements about stakeholder objectives and expected results. It is a scientific, data driven approach, which is transparent. It supports decision making, but does not make decisions. There are 11 stages in the conservation planning process.



In the past sites with greatest species richness were selected when trying to represent all biodiversity feature in the minimum number of sites. Using the complementarity approach the same number of species can be represented, but fewer sites are designated as PAs. In this approach, sites complement each other if they contain different biodiversity features and each time a site is added what is already protected is considered. This approach also allows for flexibility because there may be more than one way to achieve the objectives of the PAN design.

Stages in the conservation planning process

1	Scoping & costing the planning process
2	Identifying & involving stakeholders
3	Describing the context for conservation areas
4	Identifying conservation goals
5	Collecting data on biodiversity & other natural features
6	Collecting data on socioeconomic variables & threats
7	Setting conservation objectives
8	Reviewing current achievement of objectives (gap analysis)
9	**Selecting additional conservation areas**
10	Applying conservation actions to conservation areas
11	Maintaining & monitoring areas

Once you start considering additional conservation features and scope of the project the problem can quickly become too difficult to solve by hand. This is why decision-support tools are useful. Computer programs like Marxan can do the calculations faster than we can do.

Social and economic "costs" in conservation planning are not monetary values. "Costs" indicated the opportunities that different stakeholders give up to establish a PA. e.g. fishing, agriculture. Tourists or recreational sites can have positive values or "costs". Conservation planning allows us to balance trade-offs between biodiversity and human uses.

Thomas – *We shouldn't talk about conservation, we need to talk about food security and people. We have a very limited water area for protection and use.*

Yap Protected Area Network Vision

English:
The People of YAP State, in the face of inevitable change, taking shared local actions anchored in their rich traditional knowledge and values, adapted to meeting today's challenges to safeguard sustainable management of precious natural resources, on which our livelihood and sustenance depends on for a vibrant, healthy, and happy communities, today and for many generations to come.

Ulithian:
Yarmatal Yapei le, luwol changes ke ye bubuthog, ngo yir re yangang fangal luwol makla kol faluyar bo rebe rol hofag irel waires ke ye bubuthog ngalir. Bwo ile ngo be mwal yar hafele ngo re kamahoy resources kla yar bo howlugul yarmat igla mo wagay.

Satawal:
Aeremesaen Yap eei ina, reen minikka esooar no iugiunoan aan ikkitto siussiuweniy fetaeneei girh, ra affeori fengaenniy aekkaaew affeeor ne eno pwoapwun noan minikka kkon faniuwarh me minikka e rhaeng me reerh, pwe e pwe ananeeow firhiy minikka aewwaeiraesiy noan raennekkeei pwe epwe

aefirhefirha wunuunun aarh aaeyae minikka eno pwe geoniugiurh ikka etipaengi faniuw, saaet, me aeremas pwe re pwe menaw nge re kker, iwe nge e teeoteo noa pwe geoniugiurh igina me saeretaaen kkena wenimmwarh noa.

Yapese:
Pigirdien ea State nu Wa'ab, u fithik e tini be thilthil ko nam nge faileng, e kartaareb niged rogon e mithmith rorad, kar yiluyed ko m'ag nge lowan nge par rodad, kar uned I turguy e tin nib moomaw nifen e chiney, ni nge ayweg I tanmiy rogon i chathowliy e tin nib tuuf mab gaa fan, ni nge par e nam nge dai nib galunglung mab faas, ni faan ko dabaa nge tin gabul e mfaen.

Successes and Challenges of Existing MPAs

Participants discussed and listed the success and challenges facing existing MPAs.

Common Successes:

- Strong community support and traditional leadership
- Have seen fish increase in number
- Have observed overflow of fish, improving food security
- Improved quality of fish habitat / healthy coral reefs
- Strengthened community involvement around establishing the MPA
- Observed success led to willingness to manage connected habitats, e.g. mangroves, land.

Common Challenges:

- Lack of funding
- Communities need to better understand the purpose of the PA, false expectations of how much involvement would be required and what results would be led to lack of community support and non-compliance
- Poaching and lack of enforcement. Need dedicated personnel.
- There's no alternative to fishing. Near-shore FADs?
- Lack of community awareness – need to improve understanding to shore up commitment.

Objectives of PAs are largely for food security, also economic opportunities. Ngulu specifically for mud crabs and clams (some zones).

Scope of planning

Participants discussed and agreed on scope of PAN planning for Yap.

1. We will plan for the whole of Yap State, including the outer islands.
   Request from traditional council of outer islands that they be included. But need to think about how remote areas can be enforced.
2. We will plan for both marine and terrestrial environments.
3. We will focus first on achieving local objectives but will consider how these can feed into the Micronesia Challenge and other international objectives.

4. The plan will include protected areas and other management strategies, including traditional resource management.
5. We need to have clear roles and responsibilities for implementing the PAN plan.
   Communities (traditional leaders and councils) will first and foremost take responsibility for implementation. Yap State and FSM agencies will provide support, for example by creating and enforcing laws that support community-led management actions. NGOs will provide technical support for planning and implementation, and donors will provide funding for management activities.
6. We want a workable and realistic management plan that integrates local knowledge and best practices informed by science.
   We need to build community capacity in terms of understanding how ecology (e.g. fish movement patterns) can inform management, and which different management strategies might work to achieve community objectives.

Presentation: Designing Resilient Networks of Marine Protected Areas to Achieve Fisheries, Biodiversity and Climate Change Objectives

By Liz Terk, TNC on behalf of Dr. Alison Green, TNC

MS. Terk gave a presentation on MPA design principles that can be used to achieve fisheries, biodiversity and climate change objectives. She presented new science which is being used to design MPAs. She also highlighted how connectivity based on this new science can be used to improve marine reserve design.. Information for the presentation came from the following sources:

Green, A., White, A., Kilarski, S. (Eds.) 2013. Designing marine protected area networks to achieve fisheries, biodiversity, and climate change objectives in tropical ecosystems: A practitioner guide. The Nature Conservancy, and the USAID Coral Triangle Support Partnership, Cebu City, Philippines. viii + 35 pp.

http://www.uscti.org/uscti/Resources/MPA%20Practitioner%20Guide%20Final%207Mar13.pdf

Green et al 2013 *Designing Marine Reserves for Fisheries Management, Biodiversity Conservation, and Climate Change Adaptation*) that provides the scientific basis for this approach which is available online at:
http://www.tandfonline.com.elibrary.jcu.edu.au/doi/full/10.1080/08920753.2014.877763#.Uyd_j02KDrc

Over five years, the Coral Triangle Support Partnership (CTSP: supported by USAID and the American people) has supported a project, led by The Nature Conservancy, focused on improving our ability to design marine protected area (MPA) networks to achieve multiple objectives regarding fisheries management, biodiversity conservation and climate change adaptation in the Coral Triangle. This presentation focuses on some of the latest science that was done in support of this. While this work was developed in the Coral Triangle, the results are applicable to any tropical marine ecosystem.

If well designed and implemented, MPAs can contribute to achieving multiple objectives including: protecting biodiversity, climate change adaptation, fisheries production and management and other

resource management (e.g. Tourism). MPAs often don't achieve these objectives because they are either not well designed or effectively managed. Furthermore, the way in which we design MPAs for different objectives are slightly different (particularly for biodiversity and fisheries). So we needed to come up with a way of combining this advice for people who wish to design their MPAs to achieve all of these objectives at the same time.

In recent years, there has also been some new and exciting science emerging which will help design MPAs to maximize their contribution to these objectives. Based on this new science, we developed 15 biophysical principles or guidelines for field practitioners for designing resilient networks of MPAs to achieve fisheries, biodiversity and climate change outcomes simultaneously. This presentation covers some of these principles and the rationale for each. The principles should be used with a similar set to address social, economic and cultural considerations.

First, it is important to create large multiple use areas that include but are not limited to marine reserves (no-take areas). This is because while marine reserves are the most powerful tool in our MPA toolbox for achieving our objectives, they cannot be effective on their own, and need to be integrated with other zones to be successful.

The next principle is the need to represent 20-40% of each habitat in marine reserves. This is because different species use different habitats, so it's important to protect representative examples of each habitat in no-take areas to protect all biodiversity and key fisheries species. How much depends on fishing pressure and other fisheries management outside.

Another principle is the need spread the risk by protecting at least 3 widely separated replicates of each habitat type in marine reserves. This minimizes the risk that all examples of a habitat will adversely impacted by the same disturbance. Protected habitats that survive the disturbance can act as a source of larvae to help recovery in other areas. Replication also helps manage the uncertainty associated with biological heterogeneity within habitats. Since variations in communities and species within habitats are often poorly understood, habitat replication increases the likelihood that examples of each are represented within the network of protected areas.

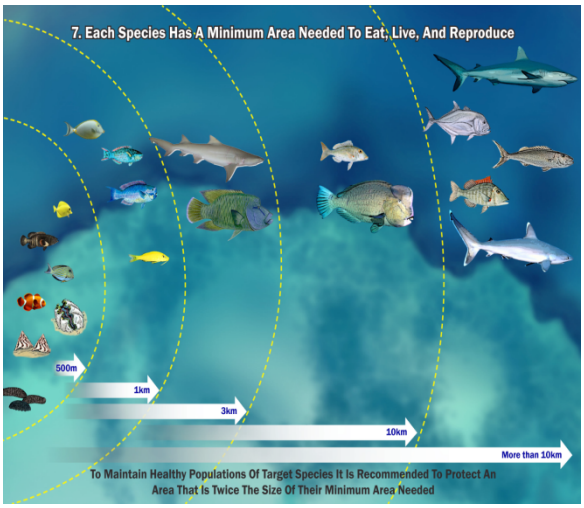
It is also important to make sure that critical, special and unique areas are protected in marine reserves. For fisheries management we need to protect critical habitats for key fisheries species at critical stages in their life histories, including important aggregation sites (e.g. for spawning and feeding) and juvenile fish habitat. For biodiversity protection we need to protect special or unique sites in no-take areas, including important sites for rare or threatened species (e.g. turtle nesting sites) or habitats, endemic species or areas of high biodiversity.

It is also important to identify and protect areas that may be more resistant or resilient to climate change in marine reserves. For example mangroves that have space to move inland with rising sea levels or ecosystems that have resisted or recovered from damage (e.g. coral bleaching) in the past and have characteristics that indicate they are more likely to survive impacts in the future (e.g. heat-tolerant corals that may be more resistant to coral bleaching.) Resilient sites (refugia) for key habitats and species should be included in MPAs, preferably marine reserves, because they are likely to be important for maintaining biodiversity in the face of climate change.

The rest of this presentation focuses on some of the science done in support of this regarding the connectivity of reef and coastal pelagic species, and how it can be used to improve MPA network design (based on Green et al. in review).

Most reef fishes have two life history phases. For example, we have two adult coral trout, a male and female, living on the reef. When they reproduce, hundreds of thousands to millions of tiny larvae are released into the waters above the reef. The larvae spend about 30 days out in the blue growing, and for the vast majority, dying – we estimate that as many as 99% of them die during this period, most of them eaten by other animals. How far they travel away from their parents is a real mystery and could be hundreds of kilometers. For the lucky few who survive the voyage they find a reef and settle down, and will generally stay on that reef for the rest of their lives.

Reef fish move different distances in these two life history phases. Most species don't move very far (a few meters, 100s of meters, or a few kms) as adults and juveniles, while larvae have the potential to move much further (10s, 100s or 1000s of kms). Scientists (e.g. Palumbi et al. 2004) recommend that since adults and juveniles are most vulnerable to fishing outside of marine reserves, we should set the size of NTAs size according to movement patterns of adult/juvenile fishes.



Why do we want the MPA size to be bigger than the home range of key species? Because size matters! A 40cm coral trout will produce around 350,000 larvae but a 50cm trout will produce 1 million larvae and a 60cm trout will produce 3 million larvae. So, big fish produce a lot more babies than small fish, which they can export to fished areas. So we aim to protect individuals so they can reach large sizes, where they will produce more larvae to export to other areas.

Latest science suggests that the size should depend on key species (and how far they move) and if other effective protection is in place. While we've known this for a while, how do we apply it to MPA network design? The key is to consider the key species the communities want to manage, and how far they move. Unfortunately we haven't been able to able to apply this information in any detail before because we didn't have the information on movement patterns of key species available.

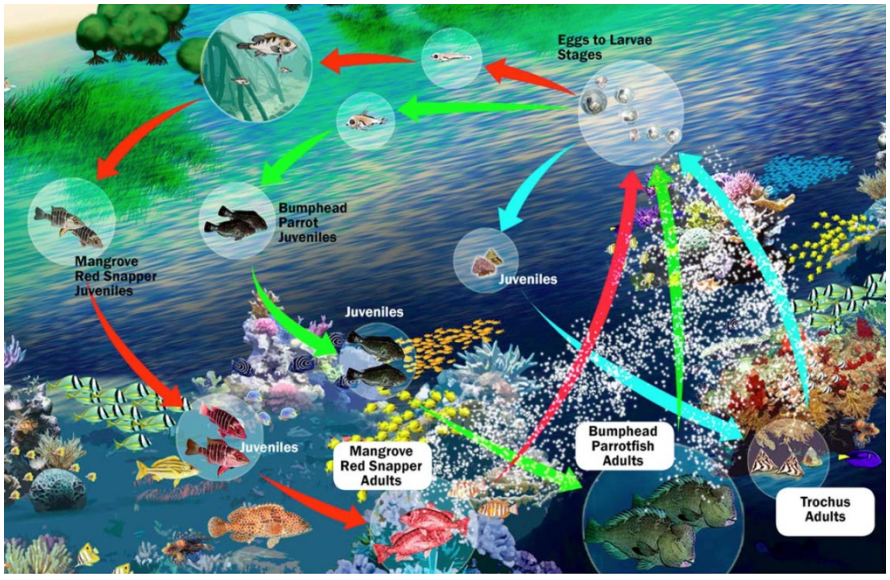
Over the last few years, we've reviewed the best available science regarding movement patterns of adult/juvenile coral reef and coastal pelagic fish species (Green et al in review). We can now use this info to have informed discussions with communities regarding how large NTAs should be based on key species they are interested in and how far they move and there is other effective protection in place.

Most species don't move very far as adults/juveniles (most <1-3km^2), although some move longer distances (5 to >20km). So if possible, it is better to have large MPAs (10-20kms) because they protect larger populations of more species. But if this is not feasible (e.g. for most community managed areas in inshore areas), then we need to think clearly about what species communities

want to protect, how far they move, and how to protect them (i.e. NTAs of the appropriate size, or by some other means e.g. regulations to protect wide ranging species).

How we can use information on larval dispersal in MPA design? Scientists (e.g. Palumbi et al. 2004) recommend that we set the spacing of marine reserves according to larval dispersal distance (since they are less vulnerable to the fishery when they move outside of NTAs, and they are important for replenishment of areas after disturbance). Biophysical models predict that the scale of coral reef fish larval dispersal is likely to be in the 10's of kms (3-50km or more). However recent direct measurements of larval dispersal (e.g. using DNA parentage analysis) of a range of coral reef species shows that self-recruitment is more common than we thought, and in fact 20-60% actually stay in the local area where they were spawned (most within 15km). Therefore, we recommend that marine reserves be separated by <15kms (Green et al in review). We also recommend that marine reserves are close to fishing grounds, to maximize the benefits to local fisheries.

Another thing to consider is the location of no-take areas (ie the need to locate NTAs where the primary habitat of key species is located) and connectivity among habitat types i.e. where key species use different habitats throughout their lives.



This image shows how some species (e.g. the mangrove red snapper, also called mangrove jack) use different habitat types throughout its life. Therefore, to protect this species, it is necessary to protect all of the habitat types it uses throughout its life (and to make sure these areas are close enough together to allow for movement among them).

Another ecological concept that we need to consider is vulnerability and recovery times of fishes and implications for duration of marine reserves. Many factors affect vulnerability and recovery rates of reef fishes (based on Abesamis et al in review) including life history characteristics (maximum size, growth rate, life span, age/length at maturity) and trophic level (Rate of natural mortality, Recruitment rates, Species interactions and Population size due to fishing intensity)

Life history and trophic characteristics are useful but not perfect indicators of vulnerability and recover times, which we can use in data poor situations. Some species (e.g. herbivores such as most parrotfishes), are less vulnerable to fishing pressure and take less time to recover after protection because they have smaller maximum sizes, shorter life spans, and grow and mature more quickly. Others (eg. large carnivores like groupers) are more vulnerable to fishing and take longer to recover after protection because they have larger maximum sizes, longer life spans, and grow and mature

more slowly. Therefore NTAs (for 20-40% habitat representation) need to be long term/permanent to allow time for all species to recover, including key fisheries species such as groupers. Short term areas can provide short term fisheries benefits for some species (e.g. to stockpile resources for feasts/school fees), but are no substitute for long term areas for biodiversity protection and fisheries production for all species. So short term areas should be used in addition to, and not instead of, long term areas.

It is also important to prohibit destructive activities and minimize or avoid local threats. If these threats cannot be managed effectively, it is important to protect areas with lower levels of threats in no-take areas.

This is great news for MPA network design, particularly small community managed marine areas because now we can demonstrate benefits to local people more clearly. The latest scientific evidence suggests that local fisheries management through marine reserves, even small ones, can result in local benefits for communities because NTAs protect spawning stock that provides recruitment to local fisheries since most coral reef and coastal pelagic fishes don't move very far as adults or juveniles (most <1-3km^2), although there are some wide ranging species that move longer distances (5 to >20km); and the scale of larval dispersal is much smaller than previously thought (20-50% of recruits stay in the local area, most within 5km).

This information covered in this presentation is available in several formats for different audiences.

Designing Marine Protected Area Networks to Achieve Fisheries, Biodiversity and Climate Change Objectives in Tropical Ecosystems

- A scientific paper (Green et al 2013 *Designing Marine Reserves for Fisheries Management, Biodiversity Conservation, and Climate Change Adaptation*) that provides the scientific basis for this approach which is available online at: http://www.tandfonline.com/doi/full/10.1080/08920753.2014.877768

- A guide for field practitioners (Green et al 2013 *Designing marine protected area networks to achieve fisheries, biodiversity and climate change objectives in tropical ecosystems - a Practitioner's Guide*), which provides a succinct, graphic and user-friendly synthesis of the best available scientific information for practitioners who may not have access to, or the time to review, the increasing amount of research literature regarding this issue. This is available online at: http://www.coraltriangleinitiative.org/library/guide-designing-marine-protected-area-networks-achieve-fisheries-biodiversity-and-climate

- A guide for community based managers (Gombos et al 2013 *Designing Effective Locally Managed Areas in Tropical Marine Environments*), where we provide a series of flip charts and speaking notes for facilitators to discuss important considerations regarding MPA network design with local communities who may own and manage these resources. This is available at: http://www.coraltriangleinitiative.org/library/training-material-designing-effective-locally-managed-areas-tropical-marine-environments-3

- A policy brief (Green and White 2013 *Using Marine Protected Area Networks to Achieve Fisheries, Biodiversity and Climate Change Objectives*), which is designed for use by government departments

and senior government officials and is online at:
http://www.uscti.org/uscti/Resources/MPANetworkDesignPolicyBriefFinal4.pdf

Discussion

Thomas – inshore reef areas have got shallower and no longer are habitat for juvenile fishes. Can communities remove sand and rubble to make the areas deeper again?

Berna added that traditionally communities managed these channels.

Dr. Weeks cautioned against removing substrate in case there are downstream impacts of sediment. If traditional practices are revived, need to be careful about changing how they are undertaken, i.e. don't do it with bulldozers.

Presentation: Gap Analysis

Dr. Rebecca Weeks, JCU

Dr. Weeks gave a presentation on the preliminary gap analysis she did based on available data for the current Yap PAN. The gap analysis looked is an assessment of the extent to which a protected area system meets conservation goals. The assessment can consider representation gaps, ecological gaps and management gaps. Representation gaps are when not enough examples of a feature are within the protected area network. Ecological gaps are when protected areas are not adequate to ensure features persist within them. Management gaps are when protected areas exist, but management effectiveness is poor or regulations insufficient. It is also important to look at data gaps because this would affect your analysis.

For representation gaps, Dr. Weeks assessed what percentage of different habitat or reef types were protected. Currently for Yap, 22% of reefs and .04% of land are within protected areas. Overall 16% island reefs, 0% bank reefs and 26% of atolls reefs are protected. Atoll reef habitats vary between 0% and 100% protected with 30% MC target achieved (lagoon pinnacle, enclosed lagoon, pass and pass reef flat). Islands reef habitats very between 0% and 39% protected with the 30% MC target achieved only for reef channels.

Results from this preliminary gap analysis will need to be updated following discussion by the group as to which of Yap's PAs should be considered as actively managed at present.

For ecological assessment, Dr. Weeks focused on the recommendations that marine reserves should be twice as large as fish species' home ranges to be effective and that MPAs on reefs near seagrass and mangroves are more effective for some species. She compared the home ranges of popular fish species from Yap with the size of existing MPAs to determine if MPAs were large enough to protect the species Yap cares about.

The preliminary gap analysis did not look at the current management status of Yap's MPAs. This information was gathered for several MPAs in Yap using the Marine Protected Area Management Effectiveness (MPAME) tool. Scores from this tool can be used when conducting the gap analysis.

Discussion:

Tomil – initially the management was undertaken by Tamil Resources Conservation Trust (TRCT), 3 years later it is the communities who are doing management activities, and there needs to be better communication between them and TRCT.

For example on paper Pohnpei have reached the MC targets (representation), but monitoring shows that Yap's MPAs are more effective.

Communities need to submit any new MPAs for them to be counted.

Thomas – communities know where their MPAs are, the government should collect the information.

There are additional sites to add – the boundaries are not yet final, so we can make design recommendations.

Group Exercise: Ecological Adequacy of MPAs and Fish Movement

Participants were given the home ranges of popular fish from Yap and the size of all the existing MPAs. They were asked to determine whether Yap's MPAs effectively protect their chosen fish species. Then could either chose several fish species and one MPA, or look at how well all MPAs protect one fish species.

Group 1 – looked at Nimpal Channel and found that most fish home ranges are too large for them to be protected by the MPA.

Group 2 – looked at Reey MPA, and four species. Two species move too far and maybe a seasonal closure is needed. Rabbitfish are a priority. The Reey MPA protects a larger area of forereef, so affords better protection to fish that use the outer reef habitat; fish that use the lagoonal reefs are less well protected by the smaller area there. It's harder to make that area larger because they have only a small fishing ground.

Group 3 – looked at all MPAs. Found that snapper and trevally are not well protected anywhere and need different management approaches

Presentation: Chuuk Fisheries Management Plan

Liz Terk, TNC

Provided example of comprehensive fisheries management plan that was developed for Chuuk that used both spatial and non-spatial management approaches based on the best available science.

Discussion:
Noted that Yap is near Palau, so we can use their fish life history data.
Thomas – do the Onei community comply with night time spearfishing ban? Liz – its not yet implemented but we hope so.

Exercise: Situation Analysis

The next step in the workshop was to conduct a situation analysis of the current conservation situation. The participants identified priority conservation features, critical threats to these and impacts on human wellbeing.

Conservation primary targets

Conservation primary targets are species of concern, habitats or ecological processes that are chosen to represent and encompass the full suite of biodiversity in the project area. They are the basis for setting goals, carrying out conservation actions, and measuring conservation effectiveness.

- Turtles
- Corals
- Reef fish
- Mangroves
- Bumphead parrotfish and humphead wrasse
- Marine invertebrates (trochus, clam, sea cucumber)
- Forests
- Fruit bats

Discussion:

Thomas – we need to identify spawning areas for Bumphead parrotfish.

Rachel – we shouldn't forget sea and land birds.

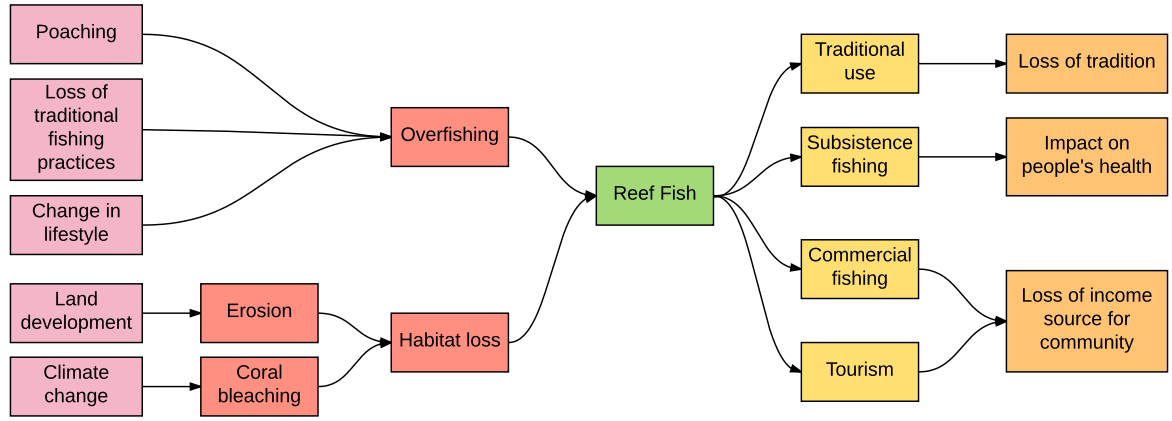
Explanatory notes from reporting back:

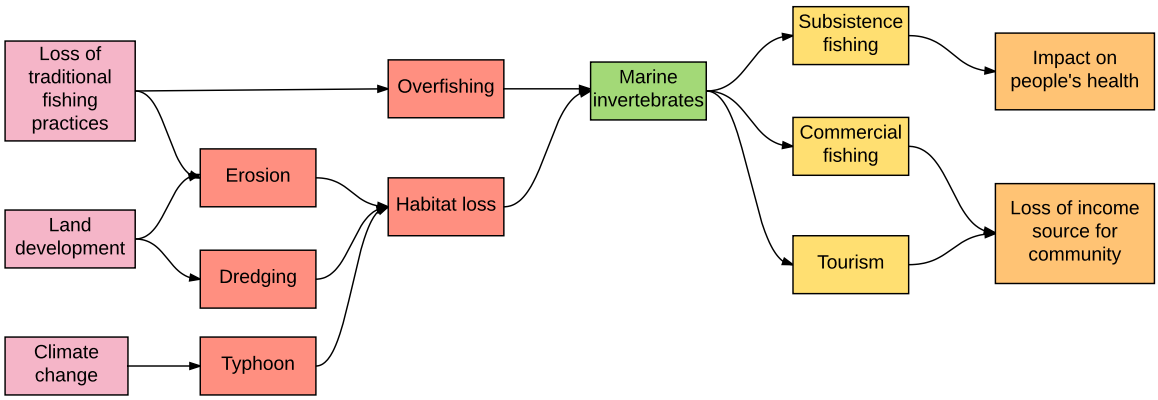
- Overfishing has been caused by breakdown of traditional fishing practice where people took only what they needed, and lifestyle change – people eat more fish now.
- Link between invertebrates and tourism because inverts help keep water quality clear and something is missing if they are not there
- Development threat to corals is from road building
- Fire is used to clear land for farming, creating wildfires that threaten forests.
- There is a need to better understand the key threats to bumphead parrotfish here in Yap
- Mangroves: need for line = telegraph line. Wood is used for the poles.

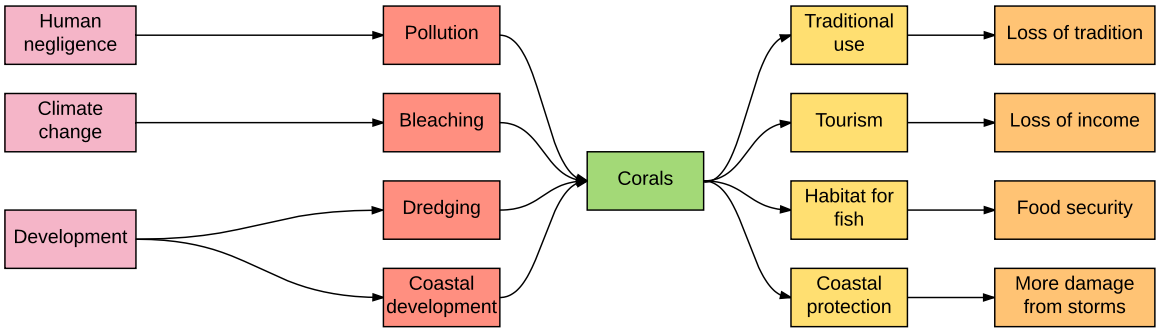
Key challenges:

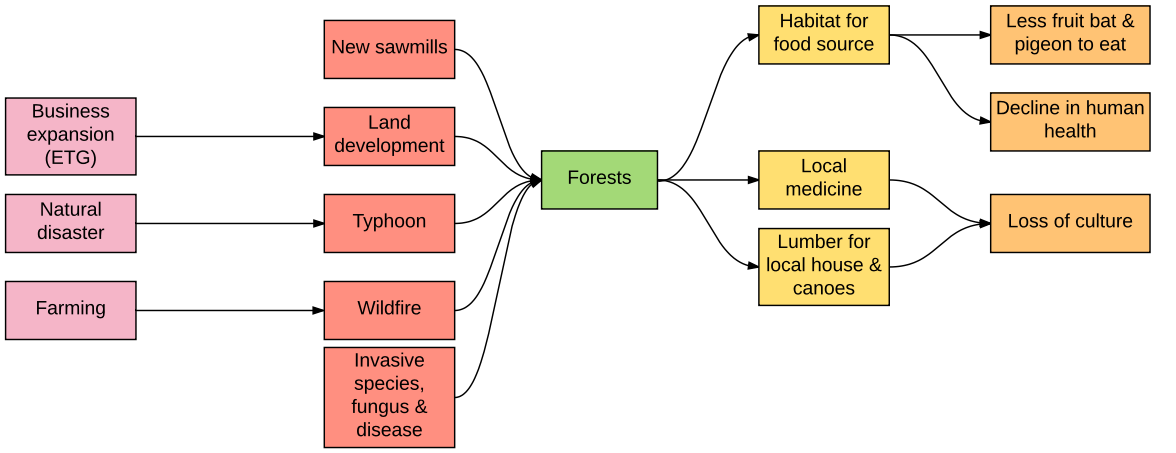
Key challenges articulate the links between primary conservation targets, threats to those features, drivers and social or economic outcomes. Two key challenges were identified for Yap State:

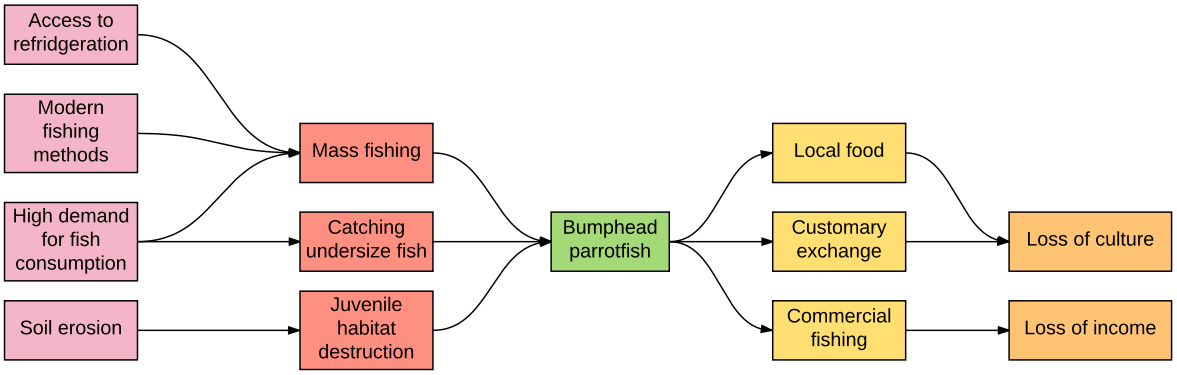
1. Overfishing of reef fish and invertebrates caused by replacement of traditional fishing practices with modern methods lowers access to local food supply and income for local communities, with negative impacts on Yapese culture and health.
2. Land development is leading to the destruction of forests and mangroves which threatens food security and local cultural practice, and negatively impacts nursery habitat for fish species.

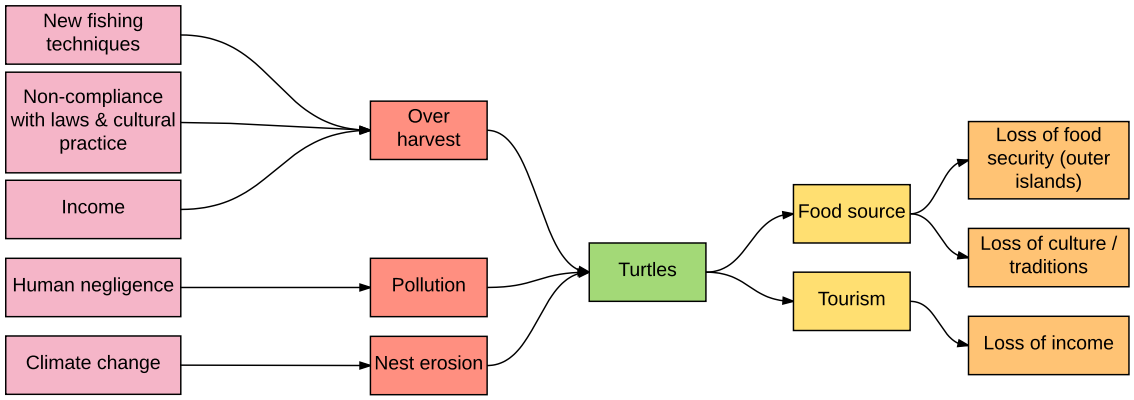


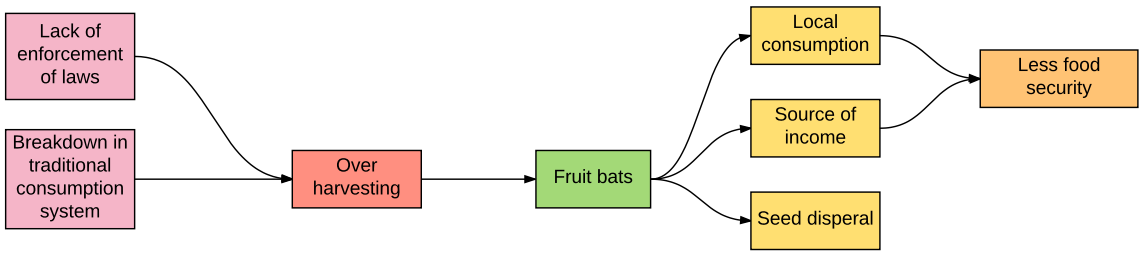


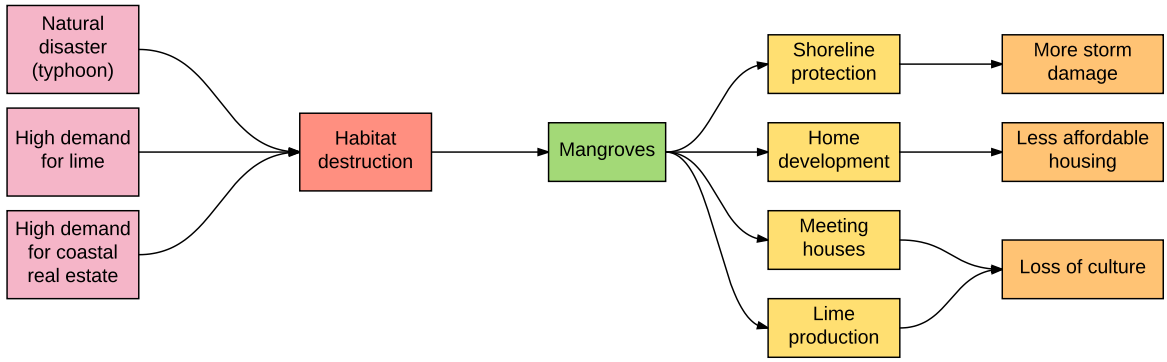



New sawmills
Business expansion (ETG)
Land development
Natural disaster
Typhoon
Farming
Wildfire
Invasive species, fungus & disease
Forests
Habitat for food source
Less fruit bat & pigeon to eat
Decline in human health
Local medicine
Loss of culture
Lumber for local house & canoes


Access to refridgeration
Modern fishing methods
High demand for fish consumption
Soil erosion
Mass fishing
Catching undersize fish
Juvenile habitat destruction
Bumphead parrotfish
Local food
Customary exchange
Commercial fishing
Loss of culture
Loss of income


New fishing techniques
Non-compliance with laws & cultural practice
Income
Human negligence
Climate change
Over harvest
Pollution
Nest erosion
Turtles
Food source
Tourism
Loss of food security (outer islands)
Loss of culture / traditions
Loss of income


Lack of enforcement of laws
Breakdown in traditional consumption system
Over harvesting
Fruit bats
Local consumption
Source of income
Seed disperal
Less food security



Goals

Reef Fish

- Want to see more in the future to provide more food security and wellbeing
- Food security = enough for everyone to eat fish every day
- We will be successful if we can see schools of fish in the lagoon again, if people don't have to travel so far to fish, and if community observation and monitoring demonstrates increases in fish abundance

Marine Invertebrates

- We want to see more clams, trochus, sea cucumbers and sea shells (for money).
- More invertebrates will provide and be indicated by a healthy reef and clean water
- We will be successful if there are no more complaints from fishers about too few resources (Rachel noted there are tools to elicit community perceptions about resource status)

NOTES – There is a current moratorium on sea cucumber collection, but some non-compliance (sold for export). It is often women involved in collecting invertebrates.

Corals

- We want to see more, healthy corals, indicated by an increase in percent cover, and maintained / restored coral diversity
- Progress will be assessed though monitoring data, community perceptions and information from divers.

NOTE – we can't prevent bleaching, but can monitor and respond.

Turtles

- We want enough turtles to allow for sustainable consumption and traditional use

NOTE – outer island chiefs distribute turtle catch, but the system is being abused. Now it is being shipped to and sold on the main island.

Bumphead parrotfish

- We want to see an increase in abundance and size of bumphead parrotfish, and recover the population to previous levels, so that there will be enough to provide for future cultural practice (main island)

Forests

- We want healthier forests and vegetation, an increase in fruit yielding trees. This will provide a sustainable source of lumber and allow for revival in use of medicinal plants and healthier diet

Mangroves

- We want to see an increase in the extent of mangrove forest areas and rehabilitation of damaged mangrove forest areas

Fruit bats

- We want to see more bat colonies (but are unsure of population trajectory) and an increase in the number of seed-bearing trees as a result (bats are primary seed dispersers)

NOTES – There are laws for traditional use, but non-compliance. Traditionally only land-locked villages should eat bat, now others eat for special occasions.

Strategy Mapping

Using the situation analysis the breakout groups came up with strategies for achieving their goals for each conservation target.

Corals

- Review, improve and enforce laws for pollution and dredging (EPA)
- Utilize community management strategies to help minimize bleaching / improve resilience through design (community)

Turtle

- Review and improve laws, consider ban on sales to main island (EPA, enforcement?)
- Bring back traditional regulations on turtle catch (community)
- Plastic bag ban (in place for 2 years)
- Stop egg consumption by protecting nests (communities, example on Ulithi)
- Regulation on long line use

Main challenge is how to enforce rules, especially since communities own their resources. It will take time to change behavior. Government needs to regulate sales, but communities need to help with turtle nests. We need more government leaders to attend meetings so as to align objectives and concerns with community representatives. For example, economic development aspirations are not incorporated here because government agency representatives are not present.

Banning turtle sale will be a challenge where it is the primary source of income for a family. What alternative income options are there? Maybe limit sales instead of ban?

Mangroves

- Establish no-take areas on recovering mangrove forest areas (community) – this will prevent mangrove cutting, but will be challenged by people who depend on mangrove wood for income, and will increase the price of lime
- Establish rotating "take" areas where cutting is allowed, and then re-vegetation activities. But could be hard if mangrove areas are insufficient, and people might poach.
- Identify and protect the old growth mangrove areas (community)
- Sustainable development (community)

NOTES – All mangroves are owned. Traditional practice was sustainable, with different people allowed to harvest particular species and no clear cutting.

Suggested: mangrove planting / re-vegetation activities in areas where mangrove extent has decreased (community)

Fruit bats

- Seasonal hunting period. But this would need to not conflict with customary needs e.g. Yap Day.
- Establish protected areas and regulations to prevent hunting at roost sites, but enforcement challenging
- Existing law only allows for traditional use but is abused. Chiefs need to reactivate and enforce traditional practice.

Bumphead parrotfish

- No take areas (community)
- Seasonal bans (community)
- Ban on using modern tools to take (community)
- Size limits to prevent take of juveniles
- Ban in night time spearfishing (community)

Challenges = lack of enforcement and limited possibility to create protected areas large enough to encompass species home range.

NOTE – Pohnpei traditional leaders currently refuse bumphead parrotfish as tribute, until stocks recover

Forests

- Protected areas, focused on areas important for food and bats (community)
- Laws (government can make but community led)

Challenges = managing invasive species and natural disasters. Wildfires caused by poor burning practices.

Suggested: have areas of the forest where harvest of fruits and bats allowed but no cutting (community); limit canoe building, doesn't need to be every year (community)

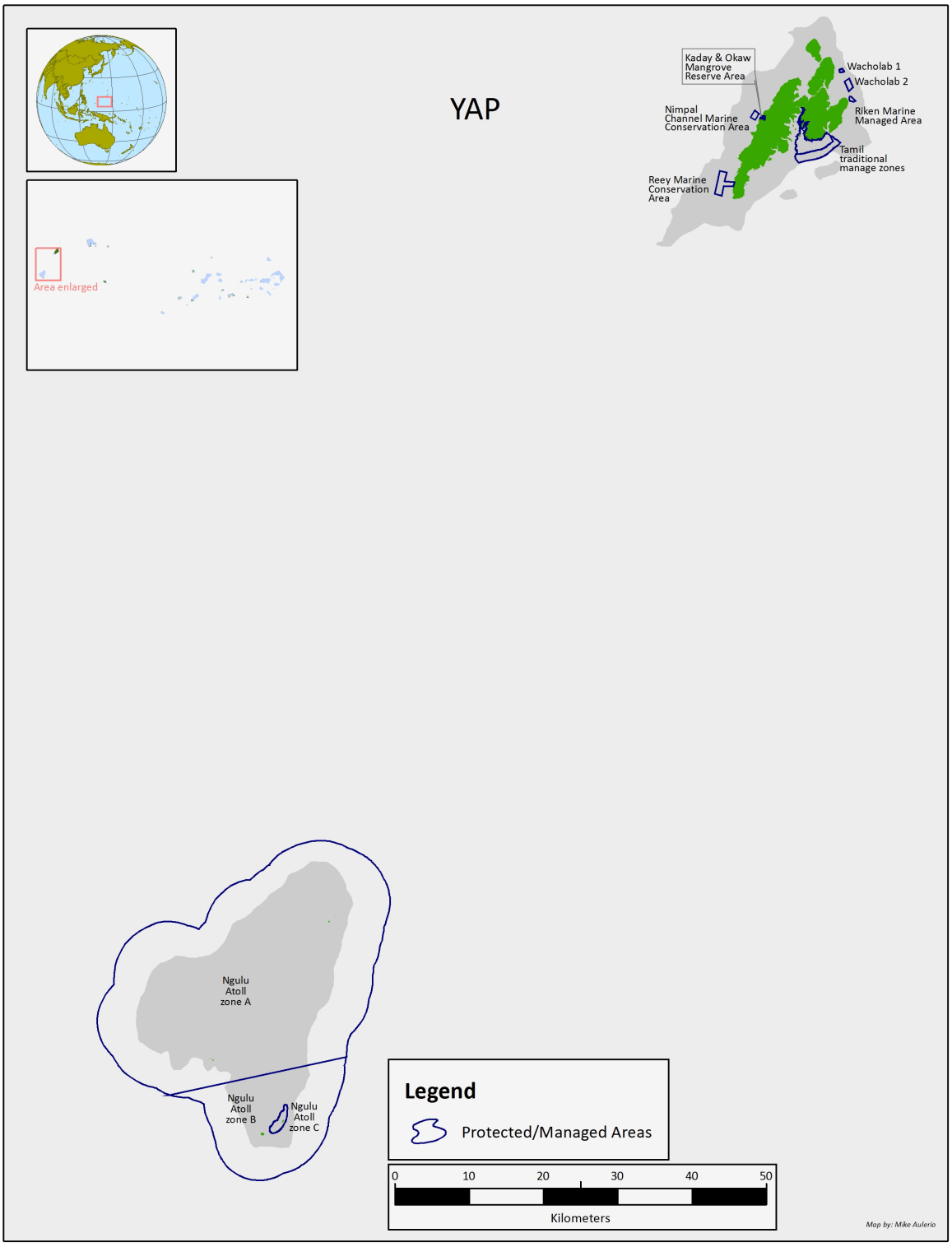
Reef fish and marine invertebrates

- Conservation areas (community)
- Gear restrictions (community)
- Limit or ban on selling fish (community)
- Size and species restrictions on catch (community)
- Land development to minimise erosion (community)
- Climate change considered in management and actions (communities made aware)
- Revisit existing laws (communities and government)
- Promote alternative fishing grounds and /or methods e.g. pelagic species, FADs, aquaculture
- Better enforce existing laws (communities and government)
- Propose to lessen pressure on main island reefs by facilitating access to outer island reefs

Challenges = communities can only enforce their own areas. Community commitment to unity – previous efforts to reward people for reporting violations haven't worked. We need a system to allow and reward anonymous whistleblowers. For between community violations, communities either need to work with the government to enforce or chiefs need to cooperate.

Mapping & review of existing Pas

Group reviewed current map of PAs to agree on confirmed sites versus proposed sites.



Anthony – Wacholab have had thoughts about changing their boundaries and would like recommendations.

No-one present can speak for Riken

Yap CAP have been approached by Rumung community – they are potentially interested in protecting the western side of their fishing ground, including the blue hole. The existing MPA marked is currently fished – Mike removed.

Reey – Current boundary is accurate, would like management recommendations.

Nimpal - Current boundary is accurate, would like management recommendations. Will also recognize traditional use area. NOTE – for traditional use areas, use soft boundaries to avoid causing boundary disputes)

Ngulu – Zone A = no take, B = commercial fishing allowed (including YFA), C = previously closed for 3 years, now open. Management was reviewed in 2014 so does not need to be revisited now.

Ulithi has ban on harvesting turtle eggs from two islands.

Adding Sites to the Yap PAN

The group discussed what the process should be for adding new sites to the PAN

- Draft PAN bill is with the legislature; we need to determine how new sites will be officially added
- Berna proposed that if a community is working with Yap CAP, their PA information can be shared. Group agree.
- Bertha suggested that new sites should be added when the community has endorsed the management plan and management is in place
- Before PAN membership, communities can apply for small grants to help develop their management plan
- **Agreed that membership of the Yap PAN requires a management plan.**

Next Steps

1. Dr. Rebecca Weeks & Liz Terk will produce technical report with recommendations based on the 3-day meeting by end of February 2017.
    a. Recommendation on existing & proposed areas
    b. Recommendation on other fisheries management strategies
    c. Provide presentation contents to government partners/traditional leaders (By 2nd week of December 2016)
    d. Scorecards on existing and proposed protected/managed areas
2. Yap CAP & YLMAN presentation to government partners/traditional leaders of meeting result. Bertha is doing an Oceans 5 presentation in December 2016 and will include results.
3. Yap CAP & YLMAN to follow up with proposed sites on main island only and report back ASAP on whether they are interested still in protected area and whether they are interested in recommendations.
4. Berna need to forward draft Yap PAN vision to Liz & Rebecca by Nov. 28th 2016
5. If communities are interested in comprehensive fisheries plan, that's something that TNC can facilitate. Yap State wide comprehensive fisheries planning (YLMAN & YFA).

Appendix 1. Agenda

Yap Protected Areas Network Design Workshop

November 18th, 21st & 22nd

YapCAP Conference Room

Friday: Where are we now, where are we going?			
9:00 – 9:30 am	Workshop purpose and participants introductions	Berna	
9:30 – 10:15	History of PAN and previous GAP analysis	Berna	Previous plans that have been developed for FSM and Yap State, and the strengths and weaknesses of those processes/products. Setting the scene
10:15-10:30	Break		
10:30 – 11:30	Systematic conservation planning and benefits of scaling up local efforts	Rebecca	Position current process as part of adaptive management cycle, outline systematic conservation planning process, and explain how spatial prioritization works. use Pohnpei as example
11:30 – 12:30	Where are we now?		Discussion about successes and challenges w. existing PAs
12:30 – 1:30	Lunch		
1:30 – 2:00	Where are we now? Gap analysis results.	Rebecca	Current PA achievement of MC targets and comparison with Pohnpei.
2:00 – 3:00	Planning Scope & PAN vision	Berna	Identify the scope of planning, so that it is clear what the plan covers and what it does not, and who is expected to use the plan to implement conservation strategies. Decide on a clear and common vision – a description of the desired state or ultimate condition that we are working to achieve.
3:00 -3:15	Break		
Notes: Ali, Rebecca and Berna. Try to see if Lance from YapCAP can help.			

Monday:			
9:00 – 9:30 am	Introduce new participants and workshop plan	Berna	
9:30 – 10:00	recap Friday	Liz	Present scope & vision for agreement
10:00-10:45	Latest scientific advice for designing MPAs	Liz	Presentation and open discussion: Refine biophysical design principles to achieve goals/objectives biophysical design principles for MPAs
10:45 – 11.00	Break		
11:00-12:00	Where are we now? Gap analysis results.		Current PA achievement of MC targets and comparison with Pohnpei.
12:00 – 1:00	Lunch		
1:00 – 3:00	Designing MPA networks for important fish species in Yap	Groups, facilitated by Liz & Rebecca	MPA size activity, followed by plenary discussion
3:00 -3:15	Break		
3.15 – 4.30	Situation Analysis – conservation targets & threats	Rebecca intro, Marine & terrestrial groups	List specific features that need to be considered (species, habitats, sites); identify threats to them & social & economic outcomes [note: includes important fish spp]

Tuesday: Operationalizing			
9:00 -9:15	Recap of Day 2	Liz / Berna	Summary of key challenges
9:15 – 10:30	Goals	Liz	Define what constitutes success, for both conservation and connected outcomes for human well-being Representation targets for primary features and habitat surrogates Look at conservation features and say what we want to see
10:30 – 10:45	Break		
10:45-12:00	Strategy mapping	Rebecca/Berna	Identify possible management strategies and construct results chains
12:00 – 1:00	Lunch		
1:00 – 2:00	Social, economic and cultural goals & objectives, targets	Rebecca/Berna/Liz	What are the important trade-offs and how can we consider them in planning? Presentation on options for fisheries data (Rebecca) & discussion
2.00 – 2.15	Break		
2.15 – 3:45	Data needs & Mapping exercise (Mike to bring blank maps of Yap)	Mike & Rebecca	Review maps of conservation features and primary interests (noting where surrogates are required for primary interests) • Map opportunities and constraints on PA placement Map key threats and spatial uses
3:45-4:00	Wrap up & Next steps	Liz / Berna	Revisit conservation planning framework with what we have achieved and what we will do next

Appendix 2. Participants

Participant	Entity	Day 1	Day 2	Day 3
1. Brian Ramngen	Balebat MPA community	X	X	X
2. Daniel Forang	Reey MCA community	X		
3. Patrick Sogaw	Reey MCA community	X	X	X
4. Johnathan Fichibman	Gachpar community	X	X	X
5. Christina Fillmed	Yap State EPA	X		
6. Sabino Sauchomal	Yap CAP	X		
7. Rachael Nash	MC Regional Office	X	X	X
8. James G. Lukan	Dept. of R&D	X		
9. Ray Tamow	Dept. of R&D	X		
10. Juliana Adgil	Yap Fishing Authority	X	X	X
11. Anthony Yalon	Yap CAP	X	X	X
12. Magmay Magmay	Weloy community/Nimpal MCA	X	X	X
13. Jesse G. Lukan	Weloy community	X	X	X
14. Michael Gaag	Weloy community/Nimpal MCA	X		
15. Janice Tamangided	Tamil Resources Conservation Trust (TRCT)		X	X
16. Michael Ruw	Yap CAP/Ngulu	X	X	X
17. Francis Ruegorong	Division of Agric. & Forestry, Dept. of R&D	X		
18. Thomas Gorong	Nimpal MCA community	X	X	X
19. Xavier Jibemai	Marine Resources, Dept. of R&D	X		

20. Jordan Paam	Balebat MPA community	X		
21. Clement Mohoral	Historic Preservation Office	X	X	X
22. Owen Foneg	Gachpar community	X		
23. Akira Sueba	TRCT/JICA		X	X
24. Vitt Foneg	TRCT		X	
25. Jacob Falan	Yap State EPA		X	X
26. Debra Laan	Yap GEF5 R2R		X	
27. Bertha Reyuw	Yap CAP		X	X