



THE ARNAVON COMMUNITY MARINE CONSERVATION AREA

A REVIEW OF SUCCESSES, CHALLENGES
AND LESSONS LEARNED



Marine and Coastal Biodiversity Management
in Pacific Island Countries



EFFECTIVE MANAGEMENT



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Supported by the Marine and Coastal Biodiversity Management in Pacific Island Countries (MACBIO) project

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COVER PHOTO: Kerehikapa, Arnavons

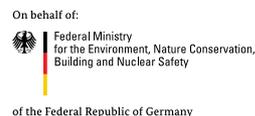
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On behalf of:
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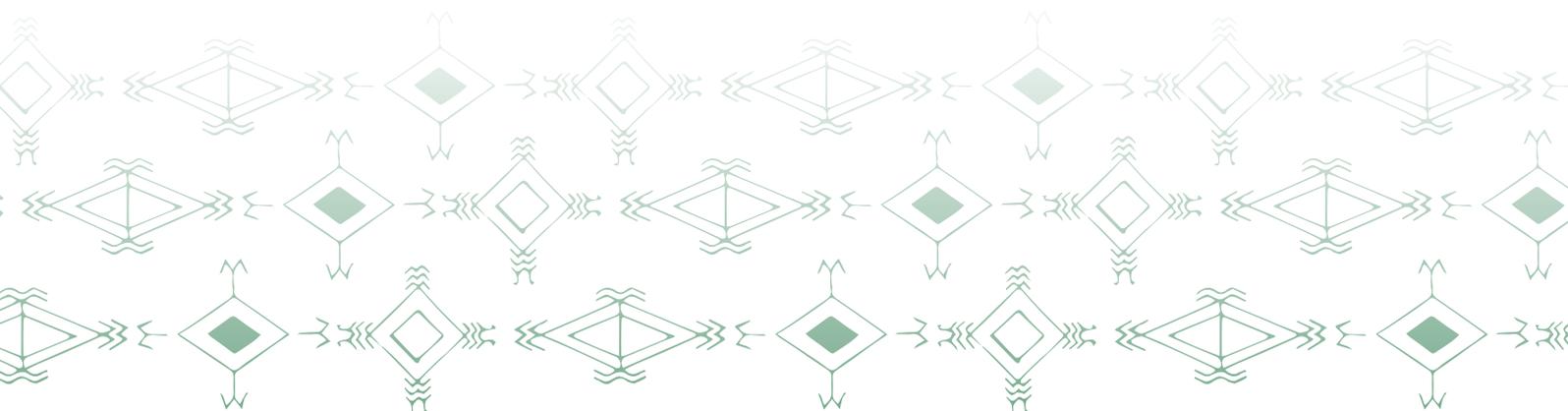


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ACRONYMS AND ABBREVIATIONS

ACMCA	Arnavon (Islands) Community Marine Conservation Area
ACMP	Arnavon Community Marine Park
IUCN	International Union for the Conservation of Nature
KAWAKI	Katupika, Wagina, Kia (Women's Association)
LMMA	Locally Managed Marine Area
MACBIO	Marine and Coastal Biodiversity Management in Pacific Island Countries
MECDM	Ministry of Environment, Climate Change, Disaster Management and Meteorology
MFMR	Ministry of Fisheries and Marine Resources
MPA	Marine Protected Area
PAAC	Protected Areas Advisory Committee
SDA	Seventh Day Adventist
SICCP	Solomon Islands Community Conservation Partnership
SPREP	Secretariat of the Pacific Regional Environment Programme
TNC	The Nature Conservancy
WWF	World Wildlife Fund (US) / World Wide Fund for Nature (Europe)



EXECUTIVE SUMMARY

Here we examine the successes, challenges and lessons learned from the Arnavon Islands Community Marine Conservation Area (ACMCA) which was first established in 1995. We review relevant literature and use material from interviews conducted with 28 key informants, all of whom have had a significant involvement in the ACMCA at some stage.

The ACMCA aims to conserve all species inhabiting the Arnavon Islands, but the primary inspiration for funding the work has been the presence of a large hawksbill turtle rookery on the islands. The turtles, were recognised as seriously threatened by hunting by the 1960s, and became the focus of systematic research and protection efforts by the mid-1970s. After initial conservation failures, the government scientists and conservationists recognised that they needed to involve the adjacent communities of Kia, Wagina and Katupika in the conservation project in order for it to succeed. A coordinated process of consultation and negotiation therefore commenced in the early 1990s and culminated in the establishment of the ACMCA in 1995. A national ban on the export of hawksbill shells ('bekko' or 'tortoiseshell') was also enacted into law in 1993.

Recent analysis of long term data on the hawksbill nesting population at Arnavons by Hamilton and collaborators (2015) has demonstrated unequivocally that there has been significant recovery. This review has been commissioned to examine the primary reasons for this, along with remaining challenges and lessons learned thus far from the experience.

Along with most of our interviewees, we are unable to separate the importance of the spatial protection that the ACMCA has afforded nesting female hawksbills, from the broader protective effects of the ban on bekko exports that was implemented two years prior to the commencement of the spatial protection. Both are likely to have been important. However recent data shows that most of the 20 nesting hawksbill females, fitted with satellite trackers in the last two years at Arnavons swam almost directly to the relative safety of the Great Barrier Reef in Queensland, Australia. This means that, whilst in the Solomon Islands, the protection afforded by the ACMCA may be more significant than the bekko export ban because the turtles do not move around the rest of the Solomon Islands.

The great majority of our interviewees stressed that there has been a steady increase in local acceptance of the desirability of preventing overharvesting of turtles and other marine resources at Arnavons. But poverty, the failure of a seaweed farming project at Wagina, and the existence of a lucrative black market for bekko will continue to drive a small number of people, particularly at Wagina, to continue poaching turtle, which means that the maintenance of the ranger station on Kerehikapa Island in the Arnavons is important for continued conservation.

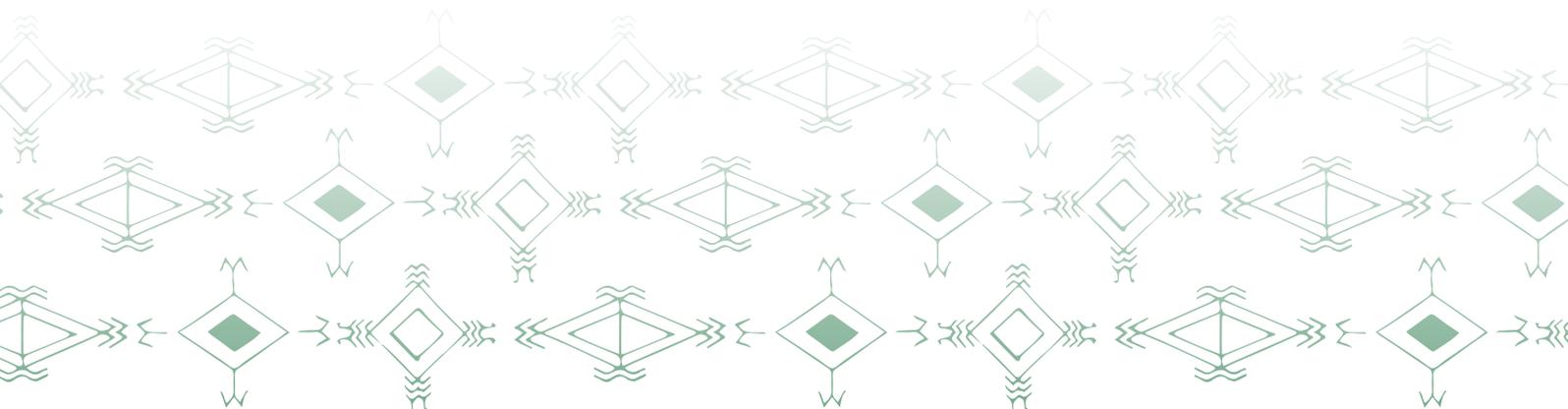
There has also been a significant increase in appreciation of the intrinsic or existence value of turtles among many members of the ACMCA communities. This appears to have been largely driven by increased knowledge about them, which can be credited to the efforts of a number of conservationists who have shared their scientific knowledge of turtles and other marine fauna to community stakeholders.

Community members expressed their appreciation of learning about the biology and ecology of the protected fauna, as well as their desire to learn more. They requested that all visiting scientists in future make greater efforts to engage with the communities to share their research findings and explain their interests to the community.

KEY LESSONS

Key lessons learned include:

1. Building trust through long term, transparent relationships with the community has been pivotal to the successes achieved thus far, but was initially difficult and required a lot of work.
2. Sustained efforts at communicating the relevant science about the species targeted for protection is not only highly effective for engendering a greater sense of ownership and desire to conserve, but is greatly appreciated by community members and continues to be requested by them.
3. Seeing is believing: the visits of community leaders to the Arnavons were important for catalysing the spread of enthusiasm for establishing new protected areas in other places.
4. Not raising expectations about financial benefits of the ACMCA has been crucial to its acceptance by the local communities.
5. Working from the bottom-up has been essential to the success of the ACMCA. A top-down approach, by itself, did not work.
6. Ensure full transparency of all financial processes within the ACMCA so that jealousies about use of project resources and benefit distribution never arise.
7. Although spillover of larvae, juveniles and adults from the ACMCA has not been scientifically demonstrated, many people told us they believe that it will happen, and even claim that they can see evidence of it for turtles and trochus already. Some long term, systematic catch and effort monitoring of key species in the three communities, involving local people, would be a good way to test this.
8. Involvement of women from Kia, Wagina and Katupika in management of the ACMCA has been seen to be beneficial, and should be increased.
9. Many people are worried about beach erosion at Arnavons, ostensibly caused by sea level rise, and strategies for establishing conservation areas on other potential nesting beaches should be discussed.
10. An exit strategy may be worth discussing at some point, but given the important role that the national TNC office continues to play, their good standing with the community, and their crucial role in raising much needed extra funds for running the ranger station at Kerehikapa each year, perhaps this should not be forced.



1. INTRODUCTION AND BACKGROUND

The Arnavon Islands are a group of small sand cays in the middle of Manning Strait, between western Isabel and eastern Choiseul in Solomon Islands (Figures 1 and 4). The Arnavon Islands Community Marine Conservation Area (ACMCA) was declared in 1995 and comprised an area of 152 km² (Hamilton et al., 2015) which, according to The Nature Conservancy, “protects the South Pacific’s largest rookery for the critically endangered Hawksbill sea turtle along [with] significant areas of unspoiled coral reefs, diversity of marine and bird species and cultural heritage sites.” On 11th May 2017, the ACMCA was upgraded to the Arnavon Community Marine Park (ACMP) (Figure 1b) which covers 169.09km² and includes a detailed management plan, the key components of which are outlined below, along with details the rules that applied under the ACMCA. The ACMCA was supported, and the ACMP continues to be supported, by Isabel Province legislation, and run by a committee, “made up of representatives from the communities of Kia, Wagina, Katupika, TNC, The Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM) and Isabel and Choiseul provincial governments” (Hamilton et al., 2015, p.3).

A Web of Science title search on ‘Arnavon*’ turns up four papers, none of which are actually about the Arnavon Islands. A topic search yields five, with Richard Hamilton and colleagues’ (2015) paper added to the above four. This is interesting given the apparent cachet the ACMCA currently has, along with Tetepare Island, with groups such as the Coral Triangle Initiative. Most of the literature directly relating to these islands and the large amount of conservation activity that has been associated with them since the mid 1970s is ‘grey’, and this includes some of the most interesting material.



Kia Village.

Hamilton et al.’s (2015) analysis of hawksbill turtle (*Eretmochelys imbricata*) nesting data from the early 1990s through to 2011 shows a significant recovery in the nesting population, which may have provided at least part of the impetus for commissioning this review. Either way, the story of conservation, of turtles and other species, at the Arnavon Islands is a most interesting one that spans the transition from the British colonial regime to the newly independent state in 1978, and from a somewhat top-down approach (which failed) to the much more challenging, but ultimately more rewarding, community-based approach that was embodied in the ACMCA and now the ACMP. The significant successes of the ACMCA were recognised in 2008 when it was awarded the Equator Prize at the World Conservation Congress in Barcelona.

When it was established, the ACMCA introduced prohibitions on hunting of all species of turtle within the conservation area boundaries (collecting eggs is prohibited everywhere under the Fisheries Act 1998), together with prohibitions on fishing for vulnerable species and commodity fisheries such as trochus, sea cucumbers, pearl shells and sharks. While collecting giant clams (*Tridacna* spp) is prohibited nationally under the Fisheries Act, giant clams enjoyed an extra level of protection due the presence of rangers on the islands. Line fishing for fin fish for subsistence only was permitted within the boundaries. Collecting of megapode eggs was allowed within specific seasons.

Under the new Arnavon Community Marine Park (ACMP), the following rules apply:

1. Mining and logging are prohibited (this will include deep sea mining within the boundaries of the Marine Park).
2. Species subject to total bans on harvesting: all species of turtles (and their eggs); all species of pearl shell; trochus (*Trochus niloticus*); all sea cucumbers; giant clams (*Tridacna* spp); green snail (*Turbo marmoratus*); all sharks; all corals (living and dead); pigeons; milk fish (*Chanos chanos*).
3. Cutting, damaging and removing of live vegetation within the Park is prohibited. Collection of firewood for subsistence use while on the islands is allowed.
4. Line fishing for reef fish within the Park is allowed for subsistence only.

5. Hunting of megapode birds is prohibited, but their eggs can be collected during a periodic open season, after consultation with Conservation Officers.
6. Commercial collection of all other marine or terrestrial animals (including aquarium fish, molluscs and crustaceans) is prohibited, but subsistence consumption of most of these is allowed while on the islands.

As can be seen a wide range of species are now protected at the Arnavon islands. However the ACMCA project was originally driven fundamentally by the desire to protect *one* species, the hawksbill turtle. For this reason, an inescapable theme of this review is the *value* of turtles, specifically hawksbill turtles, whose beautiful shells have been carved into sacred and prestigious artefacts in the Pacific since prehistoric times, and which have been traded extensively on global markets since the early 19th century (Bennett, 1987; McKinnon, 1975; Shineberg, 1966). That value has varied considerably for different groups of people and at different times. Since the mid- to late 20th century, the threat of extinction of hawksbills has concerned western scientists and conservationists. They have consequently had to deal with the moral challenge of requiring people who are much poorer than they are to stop harvesting the species for reasons that are based on a scientific worldview which is underpinned by a theory (Darwin's theory of evolution) that has largely not been shared by those people (Foale et al., 2016). This has resulted in an interesting conundrum, in which the moral discomfort produced by the economic inequality between the two partners in this relationship – the relatively wealthy western scientist on the one hand, and the relatively poor rural fisher on the other – intersects with a profound difference in worldview. The wealthy scientist/conservationist wants to prevent the extinction of the species because of its intrinsic value (Soule, 1985), and the rural fisher is motivated to harvest it for its food and/or exchange value (Foale, 2001; Foale et al., 2016; Foale & Macintyre, 2005).

Through the 1990s, international conservationists attempted to deal with the inequality between themselves and the mostly economically marginalised people, mostly in former colonies, who they were attempting to dissuade from harvesting a particular species or assemblage of species, by looking for 'alternative livelihoods' (Ellis, 1997; Foale, 2001; McCallum & Sekhran, 1997; Van Helden, 2001; West, 2006). This was the well-known 'integrated conservation and development' (ICAD) formula, which is still around today, though conservation discourse has diversified somewhat since and there is now a growing community of practitioners and thinkers advocating much better informed and more serious approaches addressing social and economic justice, indigenous sovereignty, political economy, knowledge systems, and cultural values (Brockington et al., 2008; Castree et al., 2014; Chapin, 2004; Dressler et al., 2010; Foale, 2013; Foale et al., 2016; Jeanrenaud, 2002).

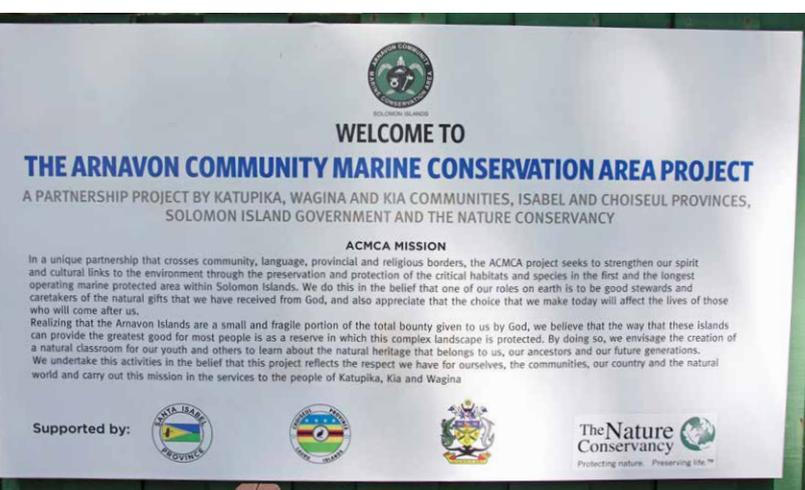
A range of different strategies have been tried at the Arnavons, including two serious attempts at providing alternative livelihoods that were intended to offset the short-term financial losses inherent to ceasing turtle harvesting. These were a deep-sea snapper fishing project that was established in the mid 1990s at Sire Harbour near Posarae in southeastern Choiseul, and a seaweed farming project that was established in the shallow lagoon just west of Wagina Island, in the early 2000s. Both eventually failed, for various reasons, which are detailed in the report.

More recently, a much more interesting approach has been adopted, and that has entailed engaging the local people with scientific knowledge about the biology, ecology and population dynamics of various species targeted for protection, with a focus on turtles (Willie Atu and John Pita, personal communication). This, together with the more coercive (yet also collaborative) approach of establishing a protected area on the Arnavon Islands themselves, seems to have yielded a result worth some scrutiny and discussion.

Thus, the objective of this research is to examine the various conservation efforts, methods and approaches applied in the Arnavons and assess what has worked, what has not worked and the main lessons learned.

We do this, not only regarding the efforts, at the Arnavons, in science communication but also for all of the approaches that have been tried in the intriguing, chequered, and yet inspiring twenty-one year history of the ACMCA, now moving into a new phase as the Solomon Islands' first legally gazetted marine park.

This report explains the methods used and the results section has two interlinked components: the findings of the literature review and the findings of the interviews. Main lessons learned from the experiences at the Arnavons are listed in the last section of the report.



Arnavons Community Marine Conservation Area notice board.

2. METHODS

This report is based on a review of the relevant literature and a number of key informant interviews, most of which were conducted in person during a 12-day visit to the Solomon Islands between 16th and 27th of January 2017. Most of the interviews were conducted in Honiara, Kia, Wagina and Katupika. A smaller number of interviews were conducted by phone, skype and/or email outside of that period. All key informants are listed in Table 1. Interviews typically ran for between 30 minutes and two hours. Most of the interviews conducted in the Solomon Islands were also filmed (always with the interviewees' prior informed consent) for potential inclusion of some of the interview in the short film about ACMCA that is one of the other outputs of the project beside this report. In the Solomon Islands, camera operation and interviewing roles were shared by Simon Foale and Lysa Wini.

TABLE 1. People interviewed for the review

NAME	POSITION / ROLE	LOCATION
Joseph Hurutarau	Chief Conservation Officer, Ministry of Environment, Climate Change, Disaster Management and Meteorology	Honiara
Geoffrey Mauriasi	Conservation Officer, Ministry of Environment, Climate Change, Disaster Management and Meteorology	Honiara
Kristina Fidali	Protected Areas Advisory Committee, Ministry of Environment, Climate Change, Disaster Management and Meteorology	Honiara
Rosalie Masu	Deputy Director, Inshore Fisheries, Ministry of Fisheries and Marine Resources	Honiara
David Lidimani	Chair, Protected Area Advisory Committee	Honiara
Willie Atu	Country Director, The Nature Conservancy, Solomon Islands	Honiara
Senoveva Mauli	Director, Solomon Islands Community Conservation Partnership	Honiara
Moira Dasipio	Vice President, Mothers Union, Isabel Diocese	Kia
James Mason	Anglican Bishop and Paramount Chief of Isabel Province (resident at Babahaero Village)	Kia
Leslie Miki	Chief, Kia	Kia
Merelin Gedi	Founder of KaWaKi, and member of Mothers Union	Kia
John Pita	TNC / Isabel Provincial Administration	Buala / Kia
John Kokoro	Chief, Posarae	Posarae
Harrison Benjamin	Lodge Proprietor, former Health Ministry official, and former ACMCA board member	Posarae
Rence Zama	Current ACMCA board member	Purinabangara Village
Dickson Motui	Head Ranger, Arnavon Islands (from Kia)	Kerehikapa Island HQ
Francis Rotanis	Ranger, Arnavon Islands (from Wagina)	Kerehikapa Is.
Teakai Akira	Former ACMCA board member	Nikumaroro
John Rabaua	Former ACMCA board member	Kukutin
Samao Biribo	KaWaKi representative for Wagina	Kukutin
Tewaia Sito	ACMCA board member representing Wagina women	Kukutin
Peter Tobire	Former ACMCA board member	Kukutin
Benedeti Abeta	Current ACMCA board chairman	Kukutin
Movete	Provincial Member and former ACMCA board member	Arariki
Richard Hamilton	Senior Scientist, TNC, with long involvement in ACMCA	Brisbane
Peter Thomas	Senior Scientist, TierraMar. Formerly with TNC and SPREP	New Zealand
Sango Mahanty	Associate Professor, ANU	Canberra
Peter Ramohia	Premier, Malaita Province. Long-term Arnavons researcher (late 1980s to present)	Auki

The locations in the Solomon Islands given in Table 1 are represented on the map in Figure 1, below.

Prior to the interviews in Solomon Islands, three sets of interview questions were discussed and agreed upon by the field team and the client's representative, Dr Leanne Fernandes (Appendix 2). Questions focused primarily on eliciting thoughts on successes, failures, and lessons learned from the Arnavons experience to date, along with any advice the interviewee would offer visiting scientists, government representatives or community members wanting to improve marine resource management. Three sets of questions addressing these objectives were tailored specifically for 1) scientists and conservationists; 2) villagers and community leaders in the Arnavons area; and 3) government officials. Where some of our informants straddled two or even three of these identities, and we combined questions from the relevant sets in those cases.

The interviews were semi-structured in that where an interviewee touched on a new or particularly interesting point we sometimes took the opportunity to explore it in more detail. Some interviews diverged substantially from the questions on the list for this reason. Those with relevant knowledge and experience were also asked for their thoughts on the effectiveness of the Arnavons marine reserve in supplying adults and larvae of protected species (including, but not limited to, the Hawksbill turtle), otherwise known as the spillover function of marine reserves.

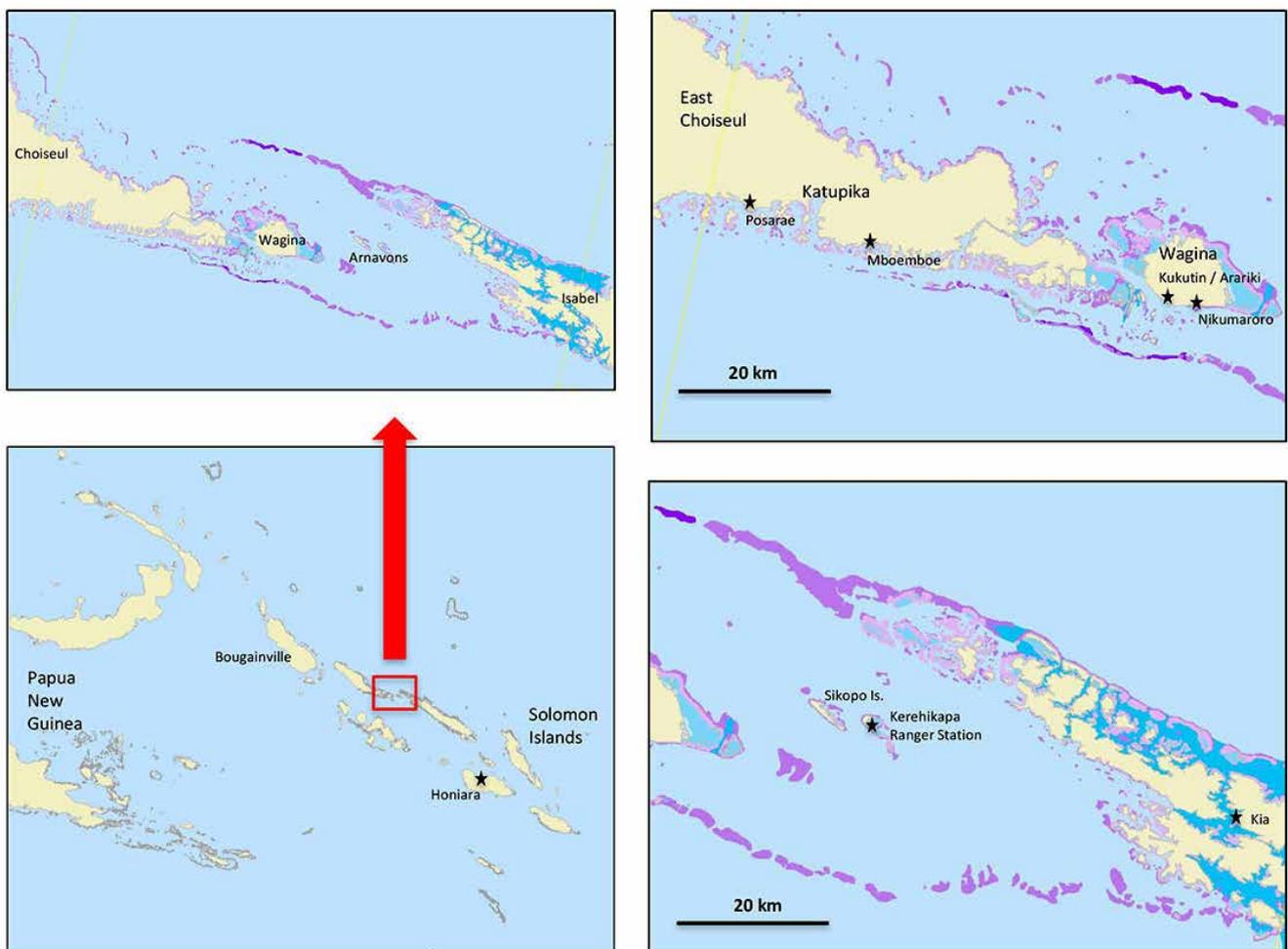


FIGURE 1A. Map of the study area.

Pale purple = reefs; dark purple = shoals; enclosed pale blue areas = shallow lagoon; enclosed dark blue = deep lagoon.

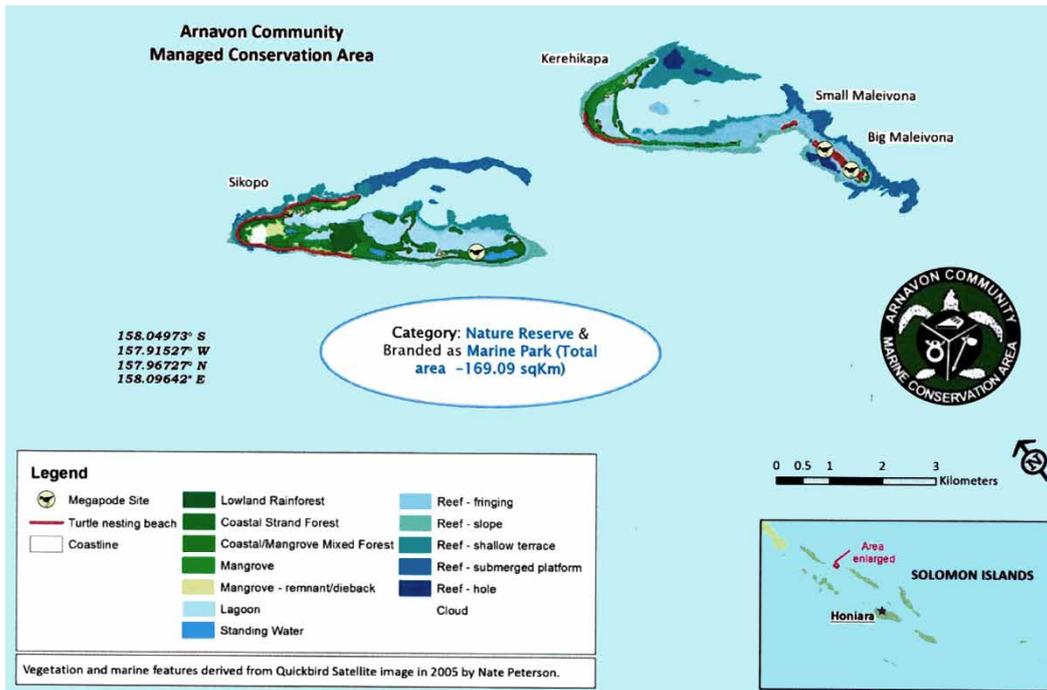


FIGURE 1B. Map of the ACMCA (c/- TNC).

For interviews that were recorded, either with video or audio equipment, the interviewees were asked if they wanted to volunteer any ‘off the record’ comments, after the recording equipment was turned off. The intention of this question was to allow people to offer thoughts on politically sensitive matters without fear of recrimination. They will be presented in a discrete sub-section of the Results and Discussion section below.

At the Arnavon Islands, we had the opportunity to accompany the rangers on some of their work, including adult turtle capture (‘rodeo’) for monitoring, and nocturnal beach patrols on the west side of Kerehikapa Island to check for turtle nesting visits and hatching events.



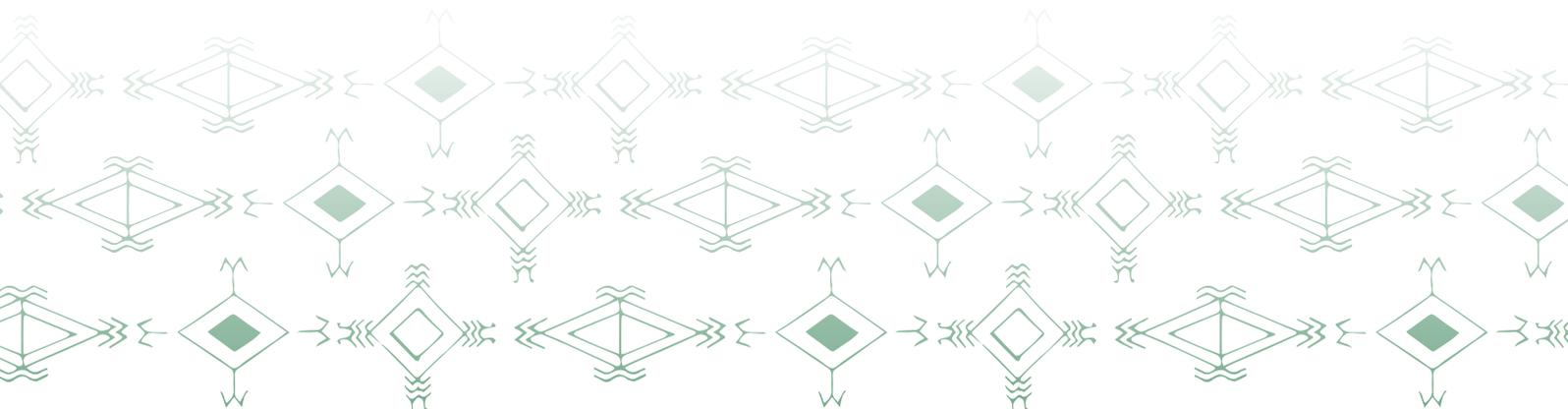
Hawksbill turtle.

The itinerary for interview work in Honiara, Kia, Arnavons, Katupika and Wagina is given in Table 2 below.

TABLE 2. Fieldwork Itinerary

DATE	LOCATION
16-1-17	SF travels to Honiara from Townsville. Interviews at MECDM.
17-1-17	Discussion and field trip planning at TNC HQ. Interviews with NGO reps.
18-1-17	Interviews in Honiara. SF and LW fly to Suavanao, then travel by boat to Kia.
18/19-1-17	Interviews in and around Kia.
20-1-17	Travel to Posarae, via a brief stop at Kerehikapa Island, Arnavons.
20/21-1-17	Interviews in and around Posarae.
22-1-17	Travel to Arnavons. Interviews with rangers.
23-1-17	Travel to Kukutin, Wagina. Interviews in and around Kukutin.
24-1-17	Travel to Kagau (Choiseul). SF and LW fly back to Honiara.
25/26-1-17	Interviews in Honiara.
27-1-17	Interviews in Honiara. SF travels back to Townsville.

Although this report will be published after the 11 May 2017 declaration of the Arnavon Community Marine Park (ACMP), much of results and discussion will refer to the ACMCA, since this was the subject of most of the interview material gathered for the report in January 2017. This does not impact the veracity of the results, however, in terms of lessons learned.



3. RESULTS AND DISCUSSION

The first part of this section, focussing primarily on the historical background to the development of the ACMCA, draws somewhat more heavily on a review of the literature than on interviews, though some interview material was also critical to the story. John Pita, Sango Mahanty, Chief Leslie Miki and Peter Thomas, in particular, were important sources of information about the extensive research and community consultation that had to be done in order to establish the export ban on *bekko* in 1993 and the ACMCA in 1995. The results section then moves to focus more on the findings from the interviews, albeit still within the framework of the literature and reports accessed for this work.

3.1 A BRIEF HISTORY OF MARINE CONSERVATION AT THE ARNAVON ISLANDS

3.1.1 PRE-CONTACT AND EARLY POST-CONTACT HARVESTING AND TRADE

Pre-historic use by Pacific islanders of turtles, along with coastal molluscs including those that later became commodity fisheries (pearl shells, trochus, green snail and giant clams) is well documented in various archaeological studies (Allen, 2007; Dalzell, 1998; Kirch & Yen, 1982). Allen (Allen, 2007) provides archaeological evidence for significant declines in turtle populations following colonisation of high islands by Austronesian peoples after 2800 BP. However pressure on all of these species at the Arnavon Islands prior to sustained contact with whalers and traders in the late 18th and early 19th Centuries is likely to have been strongly limited by very low population densities (Bayliss-Smith et al., 2003; Foale et al., 2011; Kirch & Rallu, 2007) and the absence of global markets.

Jeremy Jackson and colleagues (Jackson, 2001; Jackson et al., 2001) famously review the catastrophic population declines of turtles and other ecologically vulnerable species and ecosystems, with particular emphasis on the Western Atlantic post-Columbus, and similar (though perhaps not quite so devastating) patterns can be shown for the Western

Pacific. Judith Bennett (1987) documents the trade in 'bekko' or 'tortoiseshell' (all of which comprised carapaces of hawksbill turtles) from the Solomon Islands in the 19th Century (Figure 2), along with a host of other commodities. We will use the terms 'bekko' and 'tortoiseshell' interchangeably here.

Bennett also provides some figures for volumes of *bêche-de-mer* and 'pearlshell' exported from Solomon Islands from 1860, though these commodities, along with tortoiseshell, were being sought by whalers and traders for up to four decades before then (McKinnon, 1975). In a fascinating and compelling historical analysis of the political economy of 19th Century trade relations between traders (including whalers until about 1860) and 'big men' of the Western Solomon Islands, McKinnon (1975) provides evidence of an escalation of large-scale expeditions by Roviana men to the Manning Straits and adjacent parts of Santa Isabel and Choiseul

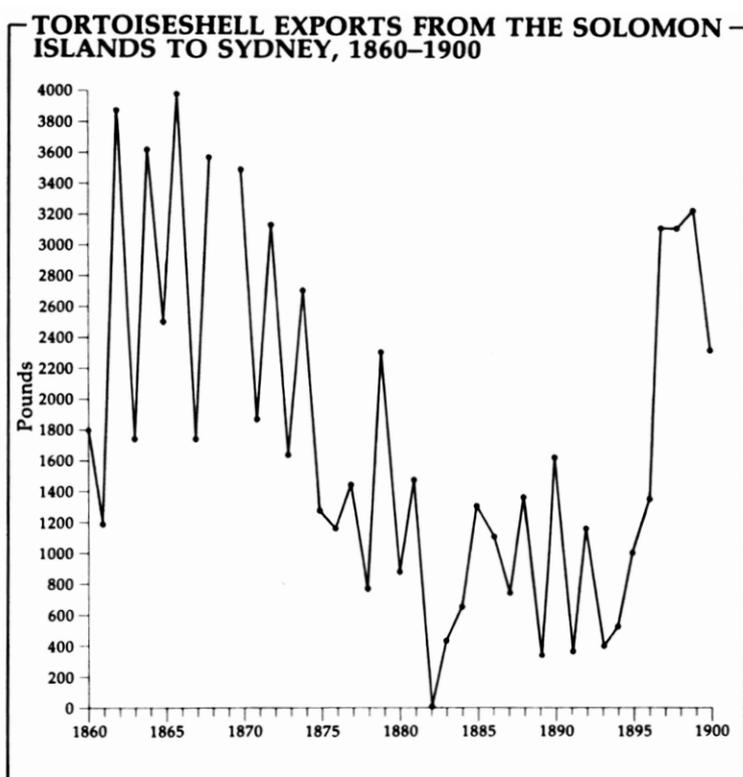


Figure 6 (Note: Real exports were greater because some ships' cargoes were unquantified. Data from Appendix 4.)

FIGURE 2. Late 19th Century Hawksbill shell export figures from Solomon Islands to Sydney (Bennett, 1987, p.50).

which routinely combined hawksbill turtle harvesting with predatory head-hunting and slaving raids. These trips appear to have been common in the latter part of the 19th Century and are likely to have been mainly driven by the depletion of hawksbill turtle populations around New Georgia in the preceding decades of very busy trade. The high market price of tortoiseshell in the 19th Century, combined with the intense demand for tomahawks and hoop iron (which could be fashioned into knives or saws) from Solomon Islanders at the time (for which they exchanged the tortoiseshell), would have ensured that fishing pressure on hawksbills remained heavy from the commencement of the trade in the 1820s.

Australia and the USA were not the only destinations for Solomon Islands tortoiseshell in the 19th century. Historian Dorothy Shineberg documents an unquantified level of intra-Pacific trade in the commodity as well:

From the mid-50s export cargoes and requests for trade showed more variation. This reflected the mixed nature of the trade from the new sandalwood stations in the islands. They traded with well-visited places like Eromanga and new places like Espiritu Santo for sandalwood, they traded to other 'old' areas like Tana and Lifu for pigs and provisions, and new ones like the Solomons for the tortoiseshell which was in request. Shineberg, 1966, p.136

The turn of the century saw a reduction in that pressure on the Arnavons hawksbill population owing to lower prices for tortoiseshell, the suppression of headhunting by the new British colonial regime, economic (and consequent social) changes caused by the expansion of coastal copra production, and the (by then) heavy depopulation of neighbouring Isabel and Choiseul (McKinnon, 1975).

3.1.2 20TH CENTURY MARINE RESOURCE USE PATTERNS AND TRENDS

Turtles

Through the first half of the 20th Century pressure on turtles and other marine resources around the Arnavons area fluctuated. Japanese demand for tortoiseshell increased after World War II (Humber et al., 2014; McKeown, 1977; Vaughan, 1981). Andrew McKeown (1977) reports the price for hawksbill turtle shells in Wagina to have increased from around \$1 per pound in 1972 to \$6.50 per pound (for all grades) in 1977. Vaughan (1981) reports a further increase to \$7 per pound by 1980. McKeown assertively argues that this increase in price was the primary factor for widely reported declines in hawksbill turtle populations at the time, not just in and around the Arnavons, but across the Solomon Islands.

Peter Thomas reported to us that biologist Tanya Leary (who we were unfortunately unable to contact for interview for this project) worked on building the case for banning the export of turtle shells from the Solomons during the late 1980s and this ban was eventually enacted into law in 1993. Several of our more senior interviewees remarked that the most significant factor in the reduction of pressure on hawksbills that would explain the increased nesting rates recently reported by Hamilton et al. (2015) is the ban on shell exports. Hamilton et al. (2015) and Humber et al. (2014) also emphasise the importance of this factor as a major driver of positive change in the populations of hawksbill turtles over the past three decades.

Observations made by Damian Broderick (1998) from his fieldwork with Seventh Day Adventist hunters in the Katupika area between 1994 and 1996 suggest that these people, who do not eat turtle meat, but who formerly regularly hunted hawksbills for cash, ceased hunting turtles altogether after 1993 as a consequence of the bekko export ban. However Kia and Wagina people continued to hunt hawksbills in large numbers for their meat during the same period.

A number of people we spoke to in January 2017 for this research said that a black market currently exists for hawksbill shells, that there was an active buyer on Wagina, and that the current price is SBD300/kg (SBD300 = AUD49.14 = USD37.22). Hamilton et al. (2015) corroborate this observation, noting that the open sale of hawksbill turtle shell jewellery in the departure lounge at Honiara International Airport demonstrates the lack of enforcement of the law. It is difficult to gauge the significance of that black market as a contemporary driver of fishing pressure on hawksbill turtles.

The first protection measures were only for nesting populations of hawksbill turtles at the Arnavon Islands and are mentioned by Andrew McKeown:

In recent years however, it has been noted that the number of turtles had become reduced to a fraction of its former size. Consequently, in November 1975 the Arnavon group was designated as a sanctuary by the Fisheries Division and a base was established on Kerehikapa to facilitate study of the turtle population and to protect the sanctuary against intrusion. McKeown, 1977, p.12

McKeown and his team also appear to have conducted the first extensive and systematic monitoring of the nesting population of hawksbill turtles at the Arnavon Islands, including monitoring of hatchling production.

But the sanctuary established by the colonial and early post-colonial administrations apparently lacked sufficient community involvement and the base at Kerehikapa was famously burned down by Rence Zama, a customary claimant of the islands, in 1982. This event was dramatized in the film *Home for Hawksbill* (<https://www.youtube.com/watch?v=WR3ExxSBLSM>), directed by Jordan Plotsky and produced by Plotsky and The Nature Conservancy. Zama was jailed for two years for this act and later became an advocate for conservation at the Arnavons (he currently serves on the board of the ACMCA).

McKeown (1977) and Vaughan (1981) estimated total annual hawksbill nest numbers for the Arnavons group as a whole, at 600 and 560 per year, respectively. Hamilton et al. (2015) estimate daily nest rates *during peak season* (May to August) between 1991 and 1995 at 1.44 (S.E. 0.29). This would give an annual total of 525 (S.E. 106) *if* the peak season nesting rate occurred all year (which, by definition, it can't). This suggests that the nesting population continued to decline through the 1980s.

Concerns about ongoing declines of turtle populations, along with the dramas around Rence Zama's intervention, led to the above-mentioned move to ban turtle shell exports as well as a much stronger impetus to involve the invested communities (Kia, Katupika and Wagina) in conservation. Peter Thomas, together with Chief Leslie Miki, played pivotal roles in this transition to a higher level of community engagement and ownership. This included organising the socio-economic baseline study conducted by Tanya Leary and Sango Mahanty in the early 1990s (Leary & Mahanty, 1993). Leary was also involved in extensive turtle monitoring surveys (Leary & Laumani, 1989) as well as training in survey methods. From 1991, a substantial monitoring program was coordinated by the then Ministry of Agriculture and Fisheries with initial support from SPREP and later TNC. Peter Ramohia and John Pita, both of whom have contributed their knowledge to the present review, were involved in these surveys and have maintained their involvement in this work since then.

The ACMCA was officially declared in 1995. The protection measures implemented as a result of this declaration have been listed in the Introduction section above.

A trust fund (or endowment fund) was established around 2006, which continues to support about a third (ca US\$23,000/year) of the costs of the ACMCA (totalling around US\$60-80,000/year), the rest being sourced from regular fund raising, principally by TNC. Willie Atu reported that the trust fund now has around US\$800,000 in it. Peter Thomas, who is widely credited with raising the original donations for the trust fund, noted that achieving endorsement and collaboration among the three communities was initially quite difficult. He attributes much of the credit for this achievement to the negotiating skills of Chief Leslie Miki and John Pita (both of whom reiterated his observation of the difficulty of this task), along with the efforts of two former Peace Corps volunteers, Ed Mayer and Sue Brown.

Given the close coincidence of the government ban on turtle shell exports (1993) and the establishment of community-endorsed spatial management via the ACMCA (1995), it is difficult to separate their impacts on the impressive increase in hawksbill peak season daily nesting rates at the Arnavons, between 1991 and 2011, from 1.44 (Standard Error 0.29) to 3.85 (Standard Error 0.42), reported by Hamilton et al. (2015). This will be discussed further in the section on governance



Hawksbill turtle.

below. For the moment it is important to note that western Pacific hawksbill turtles are believed to take 30 years or more to mature (Limpus, 2009) (But a shorter estimate is given for Hawaiian populations by Snover et al., 2013). So it seems unlikely that a population effect resulting from protection of turtles nesting at the Arnavons, starting in the early 1990s, would be responsible for the increased nesting rates only 15–20 years later. John Pita and other turtle experts we spoke to suggested that the reduction in disturbance to nesting turtles after the establishment of the ACMCA

may have made the female turtles more willing to come ashore to nest there. It is also very likely that the bekko export ban implemented in 1993 may have increased the survival rates of 20–30 year old turtles around the Solomons, some of which subsequently returned to nest at the Arnavons on reaching maturity.

The significant decrease in the remigration interval measured by Hamilton et al. (2015) is, in Rick Hamilton's view, probably due to the greater survival of female turtles that stay around the Solomon Islands and therefore attributable in part to the closure of the bekko trade (Hamilton, pers. comm.). A clear understanding of the relative importance of area-based versus trade-based protection is further complicated by recent results of satellite tagging in early 2016 of ten nesting female hawksbills at the Arnavon Islands, which show that of the eight that survived (two were poached) seven swam to the Great Barrier Reef or Torres Strait and stayed there. This behaviour suggests that hawksbills may spend most of their life in Australia, where they are relatively safe from hunting. This means that, whilst in the Solomon Islands, the protection afforded by the ACMCA may be more significant than the bekko export ban because the turtles do not move around the rest of the Solomon Islands. Information on the 2017 iteration of TNC's satellite tagging work can be found here: <https://www.nature.org/magazine/archives/the-turtle-trackers.xml>.

Crocodiles

Peter Vaughan (1981) notes, in the section of his report dedicated to the Arnavons, that saltwater crocodiles (*Crocodilus porosus*) were entirely absent from the island group due to excessive hunting for their skins in the 1960s and early 1970s. But populations have increased dramatically since the export of crocodile skins from Solomon Islands was first banned by the Ministry of Fisheries in the early 1980s. Heavy restrictions on firearms ownership since the commencement of the Regional Assistance Mission to Solomon Islands (RAMSI) in 2003 have given additional protection to this species.

During our stay on Kerehikapa for this research we observed a large crocodile swim under the boat near Maleivona Island, and we also observed a fresh crocodile track crossing the path from the ranger station to the nesting beach at Kerehikapa Island. Crocodiles are widely reported to be an increasing nuisance to coastal communities across the Solomon Islands, due to their recovery since harvesting and the export of skins was banned. Peter Tobire, one of our senior interviewees at Wagina, advocated a resumption of crocodile harvesting and the sale of skins as a potential alternative livelihood for people in the Arnavons region.

Coastal Invertebrate Commodity Fisheries

The combination of heavy depopulation during the 19th Century from both headhunting and introduced western diseases meant that population densities in most parts of Solomon Islands were extremely low (Caldwell et al., 2001). However, the most important determinants of pressure on commodity fisheries during this time would have been the combination of export market price, accessibility, perishability and ecological vulnerability (Foale, 2008). The market price of trochus increased dramatically after World War II (Allan, 1957) and has not fluctuated much since then. Prices of sea cucumbers, on the other hand, started to increase significantly in the 1980s and have continued to increase since then, as stocks of the highest priced species have plummeted, across the region, under sustained heavy pressure (Hair et al., 2016; Kinch, 2004; Ramofafia et al., 2005; Ramohia, 2006) – pressure which has only been alleviated by national moratoria.

Peter Thomas recounted a trip he made to the Arnavon Islands in the early 1990s in the company of Chief Leslie Miki, where they saw dozens of fishing camps all over the island group, widespread deforestation (due to demand for fuel to cook sea cucumbers), many divers sick with the bends (many were using hookah compressors) and a general sense of environmental devastation. Chief Miki also talks about the devastation he observed during this period in *Home for hawksbill*. Leary and Mahanty (1993) and Colgan (1993) also document a high rate of ownership of hookah compressor kits at Wagina at the time.

Peter Ramohia (2006) observed substantially higher densities of many of the more vulnerable commodity fishery species at the Arnavons compared to most other sites surveyed in the Solomon Islands in a large survey conducted by The Nature Conservancy in mid-2004 (Green et al., 2006), nine years after the ACMCA had been declared. These included the giant clams *Tridacna gigas* and *T. derasa*, as well as a number of the higher value sea cucumber species. However one of the most vulnerable (though least remarked on by western conservationists) commercial invertebrates, the green snail (*Turbo marmoratus*), was not observed at the Arnavons during that survey, nor at any other site surveyed. The species was also not sighted on another extensive survey conducted at sites on Guadalcanal, Nggela, and Western Province two years later by a team from the Secretariat of the Pacific Community (SPC) (Pinca et al., 2009). This species can still be found at Tetepare Island, Tikopia and the Duff Islands (Temotu Province), and is probably protected at those sites mostly by their remoteness. Household survey data presented by Leary and Mahanty (1993) indicate that some Katupika households had harvested this species at Arnavons in the past.

The goldlip pearl oyster (*Pinctada maxima*) was also conspicuous by its complete absence from any of the transects surveyed by Ramohia and colleagues in 2004, including at the Arnavon Islands. Evidence for the former abundance of these two species can be found in data on volumes of ‘pearlshell’ (most likely *P. maxima*) exported to Sydney in the second half of the 19th Century by Bennett (1987, p.48) and in a story recounted by Peter Ramohia in the first module of *Fish and People* (Foale & Kelley, 2012), in which he describes his own father having collected many large copra bags full of green snail from on top of the reef at Are’Are Lagoon in southern Malaita. Figure 3, below is a photograph by Frank Hurley (1955, p.93) that indicates the former abundance of *P. maxima* in the Torres Strait in Australia, where it has also since been drastically overharvested (Dennis et al., 1999).

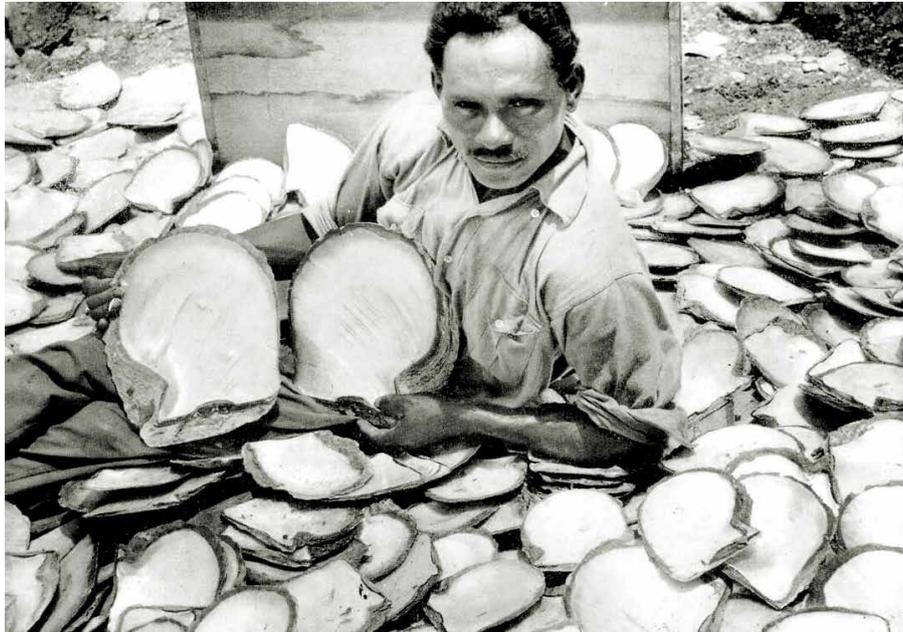


FIGURE 3. A pile of *Pinctada maxima* (goldlip pearl oyster) on Thursday Island. Photograph taken some time between 1945 and 1955 (Hurley, 1955, p.93).

Pinctada maxima is likely to be present in larger numbers than *Turbo marmoratus*, primarily because of its much greater depth range (80m vs around 30 for *T. marmoratus*). Colgan (1993) reviews information on this species in the Solomons and reports that it has been fished sporadically through the 20th Century in various parts of the Solomon Islands, and that it was under sustained heavy pressure around Wagina through the 1980s due to extensive use of hookah gear by Wagina-based divers. Colgan’s team conducted 36 dives in late 1990 specifically to survey for *P. maxima* around Wagina, ranging down to 51m, and found a total of 12 individuals.

A similar depth refuge is afforded to *Holothuria fuscogilva* (‘white teatfish’) which ranges down to 40m, putting it out of reach of most breath-hold divers. Much of the sea bed between Wagina and Isabel would provide suitable habitat for high-value species such as *H. fuscogilva* and *P. maxima* (see Figure 4). Colgan’s survey (1993) (though not Ramohia et al.’s (2006)) suggests that there may have been some fishing effort on this habitat, though the strong currents in the area would restrict diving in open areas somewhat.

What this information suggests is that with ongoing protection at the Arnavons, recovery of *H. fuscogilva* and *P. maxima* may be possible. But recovery of *T. marmoratus* is far less likely without restocking (E.g. Andréfouët et al., 2014). Another high value species that was not seen by Ramohia et al. (2006) on their 2004 surveys – sandfish (*Holothuria scabra*) – has an even shallower natural depth range (0-10m), and is also unlikely to recover without restocking (Hair et al., 2016).

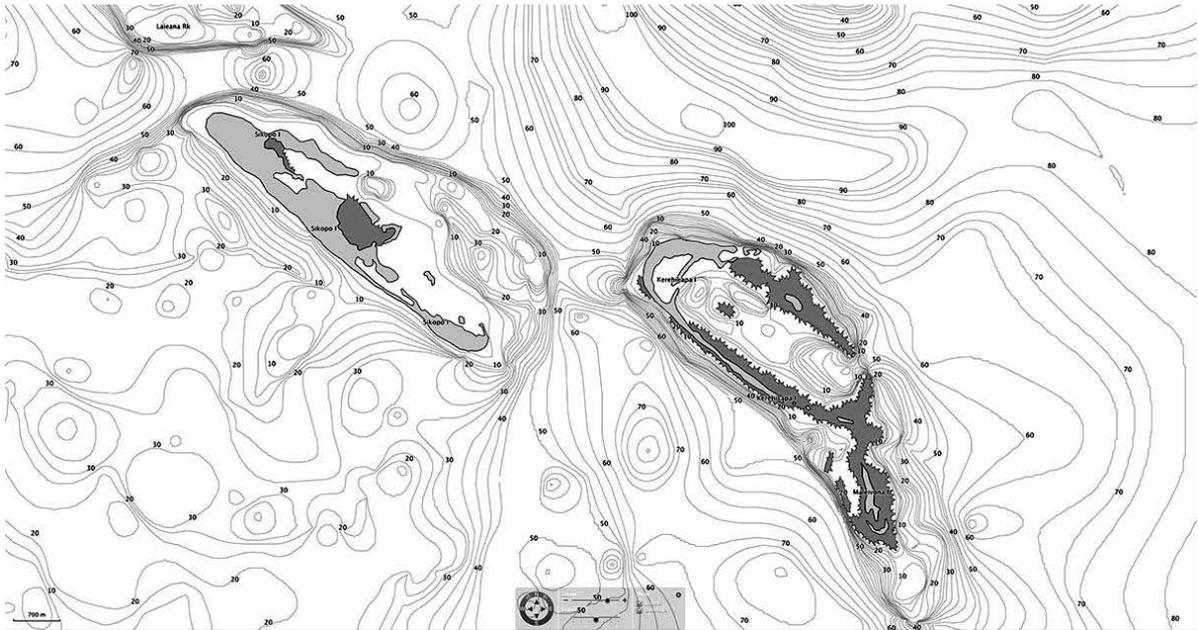


FIGURE 4. Marine chart of the area around the Arnavon Islands, showing extensive areas of potentially suitable habitat, at least in terms of depth, for both *Holothuria fuscogilva* and *Pinctada maxima*.

There is understandably a lot of interest in the potential for spillover of both adults and larvae of high value species that enjoy the protection of the ACMCA. Marcus Lincoln-Smith and colleagues (Lincoln-Smith et al., 1996; Lincoln-Smith et al., 2006) conducted a before-after, control-impact (BACI) survey design based on data generated shortly prior to the commencement of the ACMCA in 1995 ('before') and then again in 1999 ('after'). Surveys were conducted at sites within the ACMCA ('impact') and at unprotected sites near Wagina and Isabel. The study found that the only significant increase was for trochus (*Trochus niloticus*) at the ACMCA. Given the very short interval between the before and after surveys it is unsurprising that their surveys found no significant increase in populations of any high-value invertebrates at the unprotected sites.

We are not aware of any subsequent attempts to empirically test the assumption that protection of marine resources at the ACMCA will result in spill-over of adults and/or larvae that can be measured at adjacent sites outside of the ACMCA. We comment further on this in the section below on this specific topic.

Fin fish

Because there are no export markets for fin fish and the population density of the Solomon Islands is quite a lot smaller than most Southeast Asian countries, coastal fish stocks, even at sites where fish are caught for local markets, are (with a small number of exceptions) generally in quite good condition (Pinca et al., 2009). Green et al. (2006) surveyed reef fish in 2004, including at the Arnavons, and observed relatively healthy densities of highly vulnerable species such as the bumphead parrotfish (*Bolbometopon muricatum*) at the Arnavons compared to most (though not all) of the other sites (Choiseul, Isabel and Makira sites also featured good densities of this species). Densities and sizes of less vulnerable fished species (e.g. Serranidae, Lutjanidae, Lethrinidae) at the Arnavons were reported as being very good, though several sites on Isabel, Choiseul and other parts of the Solomon Islands had similar or greater densities and biomass of fin fish than the Arnavons in 2004 according to Green et al's (2006) underwater visual census data.

Rick Hamilton has devoted many years to studying the bumphead parrotfish (Hamilton, 2003a, 2003b; Hamilton et al., 2008; Hamilton et al., 2016) and remains concerned for its future, given its slow growth, late maturation and the 'hyper-stable' behaviour of the artisanal fishery, which means that rapid depletion of populations is not revealed by catch-per-unit-effort data. Hamilton and colleagues have also noted the rapidity with which slow-recovering species such as *B. muricatum* can be depleted by a relatively small level of poaching effort at the Arnavon Islands (Hamilton et al., 2008).

Several of the people we interviewed remarked on the importance of milkfish (*Chanos chanos*) which is present in the lagoons of Sikopo and Kerehikapa at Arnavons (Green et al., 2006; Leary & Mahanty, 1993). People from both Kia and Katupika formerly harvested this species, and one Kia-based informant referred to it as a 'kastom fish', suggesting it may have had some ritual significance in the past. It is worth mentioning here because this species is farmed in huge quantities in many parts of Southeast Asia (E.g. Department of Agriculture: Bureau of Fisheries and Aquatic Resources, 2014).

Sharks

Sharks have been taken in the past, mainly by Wagina residents (Colgan, 1993; Mahanty & Stacey, 2004). Sharks were recorded by Green et al (2004) as present at the Arnavons though not in remarkable numbers.

Spillover

One of the key objectives of many marine protected areas, although not specifically for the Arnavons, is for the protected populations to increase to the point where they start to export both adults and larvae to neighbouring areas that are open to fishing (Harrison et al., 2012). This can take a very long time for reef-associated fauna (Russ & Alcala, 2010), and the rate and range of export depend on a number of factors including stock densities, migratory behaviour of adults, larval biology, fecundity, growth and maturation rates, and current patterns (Cowen, 2002; Dennis, 2001; Foale & Manele, 2004). We are not aware of any systematic studies attempting to empirically test the possibility of spillover from the Arnavons to surrounding areas since the work of Lincoln-Smith et al. (2006). However we did ask some of our interviewees whether they thought there were more or bigger fish (i.e. any adult or larval “spillover”) since the establishment of the ACMCA. Responses varied quite a bit but we give some examples below.

If the conservation works well, we will benefit. But at times I hear the rangers say that some people go and steal turtles and the shells and trochus – they dive at night, but they can't catch them. If they don't touch it like this, we could benefit from this conservation area because the ocean current flows up and down or in and out, and can bring in the shells or seafood that grow there. It will supply them for us. Merelin Gedi

If Arnavons had not existed as a conservation [project]..., it would affect other communities, especially Kia and Wagina. Because... on the reefs adjacent to the Arnavons, before it was very rare to find juvenile turtles swimming around those lagoons. But after more than ten years of Arnavons operating as a conservation area, they started to see lots of young turtles, juvenile turtles, swimming around, and especially baby trochus shells. And this has given some elders and chiefs of the two communities an appreciation of the work of Arnavons. They've seen the result. So if Arnavons had not become a conservation place, I think some resources would be scarce in the reef areas here at Kia, and especially at Wagina where both are close to Arnavons. John Pita

The evidence I can talk about is that you can see turtles floating around Wagina now. Before when the government was exporting hawksbill turtle shell, it was very rare to see any there. But now you can see some there. Another thing, harvesting is really big, yeah, overharvesting, but you can still see shells and fish. I think this is the outcome of spillover from Arnavons. I think if no [conservation] it would be already finished there. Francis Rotanis

Yes, trochus, because that's commercialised... and also I buy trochus... there's always plenty of trochus, it cannot [be] finished. And even the divers they say that... there's plenty of the small ones around. And that one we believe... well, because that's what the Arnavons told the people that that's where those things come from and therefore we believe in that. Also the fish, the milkfish, that one that also travels out... those giant milkfish are never finished. They just continue... Maybe not as before when we had them on Wagina itself, but the continuation of those things we believe that's a spillover from Arnavons. John Rabaua

[In response to the question: Would things be different if the Arnavons conservation project had never been established]:

Things would be the same, but turtles would be gone. That's turtles. But other species, like trochus, I don't see any impact that benefits us... Especially Trochus. It's breeding but it's very far. [On our reefs] trochus continues to decline... Before [30 years ago] I could take 20-70 in one day. Now they say they take 12 or 5 in one day, if they are lucky. Peter Tobire

Peter Tobire also made clear his belief in the importance of empirical assessments of stock status and dynamics for the various species of interest we were discussing. After he provided a detailed and accurate elaboration of the scientific model of spillover from MPAs, he lamented the lack of any recent scientific surveys to test it around Wagina. However, he also indicated his approval of the monitoring work being done by Conservation Officers at the ACMCA base on Kerehikapa.

One thing which has been an outcome of the Arnavons is broader efforts towards enhanced conservation. Many of our interviewees remarked on this. The following comment by John Pita illustrates:

Every conservation area in Choiseul has started because of Arnavons. During one meeting of the Luru Land Conference that they held at Wagina, very close to the Arnavons, so Willie Atu, director of the Nature Conservancy Solomon Islands, organised a day trip. So the big men of the Luru Land Conference of Choiseul travelled to Arnavons, just for the day trip and then returned. That same week, the first two conservation or LMMA sites on Choiseul were established because of the two elders who travelled with the team... that time. The moment they reached Arnavons they were convinced. So the very day they returned to their communities they called their tribe, discussed it, and started [their LMMA projects].



Sasaku Island MPA on Choiseul was inspired by the work at the Arnavons.

So Choiseul now has more than 20 LMMA sites because of those first two, after they visited the Arnavons and now it has spread throughout the whole of Choiseul Province. And similarly on Isabel we have three other new marine turtle conservation areas on Isabel, because of the visit they did to Arnavons and the training they received from the rangers, and the coordinator and the Nature Conservancy with the Ministry of Environment... two years ago. John Pita

Moveete also said that there were plans at Wagina to set aside Pereteta or Kabiri Island for conservation.

3.2 UNDERSTANDING MOTIVES AND VALUES ACROSS CULTURAL AND ECONOMIC DIVIDES

There is absolutely no question that the initial impetus to create a conservation area encompassing the Arnavon Islands was the large, and threatened, nesting population of hawksbill turtles there (Hamilton et al., 2015; McKeown, 1977; Vaughan, 1981). It is unlikely that any donor funding could have been obtained to conserve the commodity fishery species, birds and other fauna that have since also gained protection from the ACMCA, had there not been a large hawksbill rookery at the site as well. Turtles, like cetaceans (Einarsson, 1993), dugongs (Marsh et al., 2015) and other marine 'megafauna' have a particularly high intrinsic value in the minds of western scientists and conservationists (Foale, 2001; Foale et al., 2016; Foale & Macintyre, 2005; Mrosovsky, 1997; Mrosovsky, 2000; Mrosovsky, 2002), and it is for this reason that we deliberately asked many of our Solomon Islander interviewees to try to explain what they thought was the reason for this specific concern from the foreign funders and instigators of the conservation program. Their responses were surprisingly uniform. Most offered a fairly straightforward explanation of the notion that the threat of extinction of turtles was what most concerned the foreigners, and that this seemed like a reasonable concern.

If we finish it we won't have it any more. The people who come to try to protect it, before we were not happy with them, because it's a main food for us. But now we realise we were wrong. What they came to do is good, to protect and keep it. Moira Dasipio

The turtle is becoming extinct I think. The foreign scientists believe that there is very little number remaining of that species. So I think that is why they are sort of encouraging local people, especially sanctuaries like Arnavons to be able to be established. Bishop James Mason

You can replant trees but you can't replace turtles once they are gone. Peter Tobire

At the same time we recorded a number of statements that made it clear that people wanted the turtle population to be conserved so they and their children could continue to eat them in the future.

There are changes in attitude but quite small. At community levels they see the importance of conserving an area, leaving an area to rest and later harvest. So there is that general concept from the community that you need to rest a particular site. But not really understanding the ecology aspect of it... Senoveva Mauli

If there were no more turtles, lots of people would be affected because a lot of people here really like to eat turtle. Moira Dasipio

We also asked whether the disappearance of turtles would cause significant hardship in terms of food security.

No way, there are plenty of other sources of food. Even dogs. Peter Tobire

I think no, we cannot be affected, because we are very rich with all kinds of resources. So no matter we can't eat turtle but we can still eat fish, clams... crabs, any kind. We are not short of these kinds of food. Chief Leslie Miki

It should be noted that many of the Katupika people are Seventh Day Adventists, so they are forbidden from eating turtle by their church. When asked if he had perceived any changes in the way people in Katupika value turtles, Harrison Benjamin responded:

It's hard for me to comment on this. But I don't eat turtle so I really practice conservation! Harrison Benjamin

So if we look at all of the above statements together, it seems that most of the people living in the rural communities we visited around the Arnavons express a mixed position in which they agree that turtles have some sort of intrinsic or 'heritage' value, that they are not crucial for food security, and that they would like to be able to continue harvesting them in the future, mainly for festive occasions.

Turtles are not crucial for food security today (despite several older informants saying that when they were young they ate turtle quite frequently) and it appears to be a greater sense, now, (for many) that turtles have an intrinsic value and that it would be a shame if they disappeared. This will inevitably compete with economic pressures to harvest turtles for money or simply an opportunistic meal (and associated cultural kudos, given the large amount of meat that can be shared). So despite the apparent shift in 'worldview' among many people, we suspect that this alone will not ensure conservation in the future. Economic improvement for people in the area, especially Wagina, and the continued presence of rangers on the Arnavon Islands, are going to be necessary to ensure continued success.

3.3 ALTERNATIVE LIVELIHOODS – HOLY GRAIL OR MIRAGE?

The establishment of the seaweed farm adjacent to Wagina has for some years been a significant factor in reducing hunting pressure on nesting turtles at the Arnavons by Wagina residents (see also Leisher et al., 2007). However the recent collapse of the market price for seaweed, from around SBD6/kg (dried) to SBD2 at the time of this study, has meant that most Wagina people have walked away from the seaweed farms. While at the same time, fishing pressure on turtles at the Arnavons has also increased somewhat, according to several of our Wagina-based informants.



Figure 5. Abandoned seaweed drying racks near Wagina. January 2017.

Peter Thomas recounted TNC's earlier investment in the snapper fisheries centre at Sire Harbour near Posarae on Choiseul during the 1990s – a project that absorbed a great deal of effort from George Myers and others, but eventually also collapsed, due to a combination of high overheads, remoteness and the intrinsically low productivity of the deep-sea snapper resource.

A new commodity that has attracted a lot of interest from communities on Malaita and Guadalcanal, as well as several other Pacific and Asian countries, is virgin coconut oil (VCO). This product may be a viable alternative for some Kia and Katupika communities, but requires a sizeable coconut plantation as well as a stable and reliable workforce and a reasonably high level of business management skills. The product may also be subject in the future to the same problems as seaweed production, which are largely a consequence of overproduction and price depression due to high levels of buy-in to the sector in Asia.

Merelin Gedi expressed the desire to learn more about agriculture generally, as she believed that was a logical direction for improving livelihoods at Kia. In responding to the question, what advice does she have for government officials, she told us:

Give us more ideas or knowledge or modern technology of how to use the bush, so we turn to the bush, not always to the sea. We feel we are left out here. We want to work in the bush... Help us to use the land! Merelin Gedi

This approach is unlikely to be of much use for the iKiribati people living on Wagina, given a) their strong cultural predisposition to fishing, and b) the lack of good soil on Wagina (Hansell & Wall, 1974).

Tourism elicited optimism among some of our interviewees, but is beset with a variety of problems at present, the most immediate of which is some protest, mainly from Katupika community members, that landing fees from tour boats are entirely captured by the Kia community at present, because Isabel Province claims the Arnavons within its territorial boundary. The ACMCA has a tourism-oriented web page (<http://www.arnavons.com/>), which provides contact details for cruise ship tours and village-based accommodation and has a small amount of additional information about turtle conservation. Willie Atu reported that two or three tourist ships visit the islands each year and visitors are able to go ashore at the Arnavons for a day trip. Each of these trips generates around SBD6000 (AUD982; US744) for the Kia community. This money usually goes to the church, school or clinic. Some homestay operators at the western end of Isabel are able to take their guests across to the Arnavons by dinghy.

Moiras Dasipio told us that, in addition to not seeing what she regarded as a substantial benefit flowing from the ACMCA generally, that the tourism benefit, even for Kia, was not large. Since the estimation for annual visitor expenditure in the Solomons as a whole is SBD233 million (=AUD38.13m = USD28.92m) (eTN Managing Editor, 2017), some transparency about the current tourism income and distribution would be useful.

Rosalie Masu, who comes from a village not far along the coast from the Suavanao airstrip, also expressed another reservation about tourism development in Arnavons that we think is worth heeding:

Ownership of land... it's a really big thing for Solomon Islanders... the alienated lands from before, many people are trying to get them back actually.

The Papatara Resort [which is opposite the Suavanao airstrip], it has been alienated as well. And now I've heard, when I went back to the village, that they are trying to claim it back.

When people see something good happening, they want to take it back or they want to own it... maybe for their own economic benefits. So that would be [a] negative impact, depending on what they want it back for.

[About the push for more tourism at Arnavons]: Yes I think that will drive the people to really take that island back because they [will] want to run that tourism there themselves, and get the benefits themselves. Rosalie Masu

Similar responses have already been documented in Solomon Islands and PNG (Foale & Macintyre, 2000; Gneccchi-Ruscione, 1991; Macintyre & Foale, 2007; West, 2006).

Some of our Wagina interviewees informed us about mining prospecting activity on Wagina, for bauxite. Given the small scale of the island in general, the lack of control the Wagina residents have over land tenure there, and the corrosive social impact of mining projects in Melanesia generally (Allen, 2013; Filer & Macintyre, 2006), it is hard to imagine how the benefits from such a project would outweigh the negative social and environmental impacts.

A major part of the reason Solomon Islanders are so dependent on primary resources for income is that their education system has been so chronically underfunded for such a long time, preventing the development of a strong service sector and a knowledge-based economy. One important part of the solution to this problem ultimately lies with preventing practices of transfer pricing and other forms of profit shifting by multinational resource extractors that result in massive capital flight (Mousseau & Lau, 2015; <http://www.taxjustice.net/topics/corporate-tax/transfer-pricing/>; Shaxson, 2011), and diverting more of the value of exported primary resources such as timber, minerals and fish to education (Foale et al., 2016).

3.4 GOVERNANCE: SOCIAL AND LEGAL ASPECTS

3.4.1 COMMUNITY-SCALE GOVERNANCE

But what I did not see as a big change was general management... These communities need to show visible governance structures. If you have a governance structure within a particular site, then that is like the baseline or the platform to build from. You can talk about the fish, you can talk about the crab, you can talk about how many resources there are at a particular site, but if you aren't dealing with the people, which I can emphasise is ninety percent of your effort, then I would see attitude as a long shot to get there. Senoveva Maui

The above quote from Senoveva Maui clearly highlights the need for ongoing external support for the project despite some impressive changes in mindset among many community members. The community component of the management of the ACMCA is a necessary but not yet sufficient ingredient for successful conservation. There remains some fractiousness among community representatives, and none of the communities, nor, at this stage, the provincial or national governments, appear to be in a position to raise the money required to keep the ranger station functioning.

While it would be difficult to calculate, the amount of money that conservation work at the Arnavons has absorbed over the four decades since the first sanctuary was declared there (McKeown, 1977), would likely run to several million US dollars. This generosity, mostly from foreign donors, both multilateral and private, has been inspired primarily by the threat of extinction and the high intrinsic value of hawksbill turtles, in the minds of mostly western scientists and conservationists, together with the small number of dedicated Solomon Islanders who have worked with them over the years (several of whom we interviewed for this study).

Now, after many years of persistent hard work by this group, we see an impressive level of engagement and buy-in to the idea of conservation from many members of the three surrounding communities, as documented in the above sections, and this statement from Willie Atu:

When you explain the life cycle and biology... you say, it takes 60 years for this animal to mature, and... it comes back after 30 years, then it won't go to any other place, it will only come back to the place it was born. When you do this, all of a sudden you give people a sense of the intrinsic value, and a sense of ownership of the place, and sense of ownership of the animal. They say "Oh, it's ours!" So they change!

People ring me and ask "where is the turtle now?". So when they are interested they want to follow the story. And the children go and read more about it.

When you relate the custom stories together with the biological life cycle, people accept it. But it takes time. But when you stay with people a long time, and they trust you, they'll accept what you tell them. They want to know who is the messenger – are you telling the truth? Willie Atu



Arnavons Ranger Base

But the big question remains, is this altered mindset and elevated local concern enough to ensure continued protection of both turtles and, incidentally but importantly, vulnerable commodity fishery stocks at the Arnavons? Most of our interviewees from all three communities argued that there is now a high level of acceptance of the desirability of conservation at the Arnavons, even given the common acknowledgement that substantial financial benefits are unlikely to flow from the enterprise for quite some time, if ever. However most of them, along with the two rangers we spoke to, also pointed out that there is still a low level of poaching at the islands, mainly of turtles, and that there will always be a small number of dissenters. During our brief stay at Kukutin we observed three dead turtles, though these may have been caught locally.

I've talked about all the successes. But a small number of people still oppose the conservation because they have a very narrow understanding of benefit as immediate cash only but not other areas that other people may see like education and job opportunities. John Pita

This dissent, which in our view is driven at least as much by poverty as by any lack of acceptance of the idea of conservation, poses an ongoing problem for any form of management. Thus the continued external funding of the ranger base at Kerehikapa would seem mandatory, and may be necessary for the foreseeable future. The Solomon Islands government must decide whether to contribute to the costs of running the station that are not met by the annual dividend from the trust fund established by Peter Thomas (around US\$40-50,000/pa)— this will be discussed further in the conclusion and recommendations section below. In the mean-time the importance of the high level of community acceptance of the presence of the ranger station, including the scientific work the rangers perform, should not be undersold as an achievement of the project to date.

3.4.2 GENDER AND GOVERNANCE

In reviewing the successes of conservation work to date at the Arnavons, Solomon Islands Community Conservation Partnership (SICCP) director, Senoveva Mauli, highlighted the fact that women have become much more involved. This is most clearly evident in the existence of the KaWaKi (Katupika-Wagina-Kia) women's group, the chairperson (Merelin Gedi) and Wagina representative (Samao Biribo) of which we were able to interview. KaWaKi was formed only 3-5 years ago at the time of writing and encountered some difficulties initially with what was then a male dominated board of management (Willie Atu, pers. comm.). We also spoke to Tewaia Sito, who is a current board member of ACMCA, representing women. Senoveva also highlighted specifically the importance of the Mothers Union, of which Moira Dasipio is vice president for Isabel Diocese and Merelin Gedi is secretary. The fact that Senoveva Mauli is head of an influential NGO, and Rosalie Masu is deputy director of inshore fisheries at MFMR, are also positive signs. Given the clearly evident fractiousness among the three ACMCA communities, which is likely to be ongoing, and could even be exacerbated by developments such as tourism, the more women that are involved in management of the ACMCA, the better.

However Solomon Islands women still operate within a profoundly patriarchal culture, particularly in the rural communities. The handicaps this imposes were evident in a number of ways during our fieldwork. Firstly there were no female rangers at the Kerehikapa ranger station. In the Solomons, as in many other countries, it is much easier for married men to leave the work of parenting to their wife than vice versa. Secondly, as a more general observation, female control over fertility remains very limited in the Solomon Islands. Tewaia Sito and Peter Tobire told us they had 10 and 17 children, respectively. If we assume that all natural resources have limits (Rockstrom et al., 2009), then despite the present, comparatively low coastal population densities of the Solomon Islands (Foale et al., 2011) and the low environmental footprint of Solomon Islanders compared with the average Western conservationist (Foale et al., 2016; <http://data.footprintnetwork.org/compareCountries.html>), population is nevertheless something that will ultimately need management. There now a long-established body of research that indicates that this is easiest where women have real economic independence (Jejeebhoy, 1995; Sen, 1994). This can sometimes be facilitated, but by no means guaranteed, by improved access to education for women (Cornwall & Rivas, 2015; Hickel, 2014; Jejeebhoy, 1995).

As ever, there are no silver bullets for the challenge of women's economic empowerment in the Solomon Islands, but the considerable progress that has been made to date should be acknowledged. Any further opportunities to involve more women in the ACMCA should be encouraged. Engagement with other groups, such as Live and Learn, that are achieving some success with women's micro-finance schemes and savings clubs around the country, may also be worth pursuing (see also Dyer, 2016, 2017).

3.4.3 UNITY AND DISSENT

The extent to which the ACMCA has brought the three communities together, politically, was remarked on by an impressive number of interviewees. The ability of the communities to work together successfully is evidenced by the fact that in 2011 The Nature Conservancy formally stepped aside to allow the ACMCA Trust Board to take the lead in conservation at the Arnavons. Leisher et al. (2007) also noted this.

The most important function of Arnavons to me is to bring unity to the three communities. (John Rabaua).

Despite this, we recorded quite a lot of critical comments about the structure of, and management role of the ACMCA board, many of which were in the 'off the record' section of the interview, and thus focussed on conflicts and disagreements within the current ACMCA management system. The major points are:

1. Several interviewees were bothered about the way board members are appointed, and were unhappy about the fact that some board members, particularly from Kia and Katupika, had been there for too long, and should move out to make way for new people and new ideas.
2. There have been financial irregularities and there is insufficient transparency about the finances of the ACMCA. Some wanted to know where the money from the tourist ship visits was going.
3. Some board members were apparently taking liberties with ACMCA resources, particularly fuel.
4. Insufficient information, including research outputs, is being communicated back to communities by board members after meetings. People wanted to know what is going on.
5. Despite the increased acceptance of the idea of conservation, many people are disgruntled by the apparent disconnect between local struggles for improved livelihoods and the conspicuous expenditure on Arnavons, especially when wealthy foreign scientists visit, do research, and take photos, and leave, without visiting any of the communities.
6. Some investment in training the rangers would help them with their work and relieve some of the boredom of staying on the island for long periods.
7. Many Wagina people remain concerned about ongoing desires of Katupika and Kia members to claim back the Arnavons under customary ownership. They felt that they were doing much of the 'heavy lifting' of making the ACMCA a truly 'community' project while the others blamed them as a whole for continued poaching, and focused on their clan/tribal rights.

3.4.4 YOUTH AND GOVERNANCE

The topic of generational shifts in attitudes came up a few times in the interviews but the extent to which a groundswell of increased conservation concern is disproportionately represented by contemporary youth remains unclear. The fact that the program is conducting regular awareness programs for schools, and that school students regularly visit the island, must be making a substantial impression on youth from around the three partner communities and beyond. Such a strategy can only be commended.

3.4.5 LEGAL ASPECTS OF GOVERNANCE

The national export bans on crocodile skins and bekkos, as with national moratoria on bêche-de-mer (Foale, 2007; Hair et al., 2016), and other restrictions such as size limits (Foale, 1998; Foale & Day, 1997) are also highly effective management measures, often more so than community-based measures, and should not be left out of the equation.

At the time of our fieldwork, the gazettal of a bill for the declaration of Protected Area (Marine Park) status of the Arnavon Islands was still pending. Lawyer David Lidimani spoke to us about this, as it is even more complicated than the tenure system over the islands. He pointed out that even though the islands themselves are still legally classified as alienated land, the adjoining foreshores and seabed still come under customary ownership. This is why he has been working together with conservationists to establish a Protected Area around the islands that protects as much of the seabed as possible. This would also protect the area from deep sea mining interests:

Once an area is declared protected under the PA Act, no form of extractive industry development will be allowed within the boundaries. That is why the whole aim now at the moment is to expand the boundaries of the Arnavons program as wide as possible just to capture that issue to make sure that when it is protected no form of mining, no form of extractive industry will be allowed within the boundary. David Lidimani

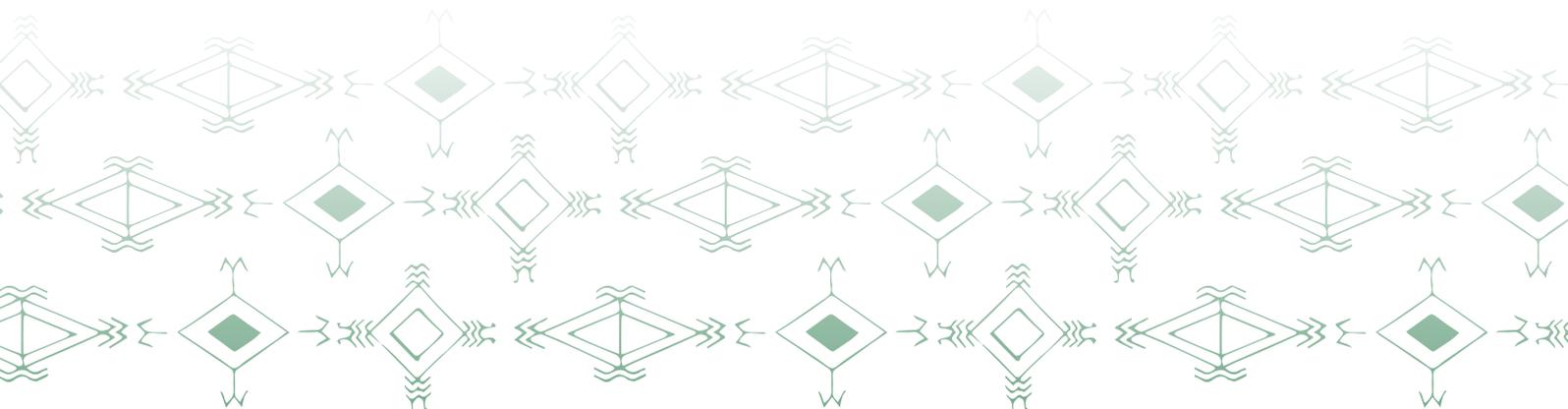
He went on to describe how this Protected Area agenda included the objective of expanding the boundary to include some of the western-most islands of Isabel and some of the eastern-most islands of Choiseul, which would be subject to a system of zoning with the PA scheme, yet to be finalised with the respective provincial governments. The Arnavons is now the first site in the country to test the Protected Areas Act.

3.5 CLIMATE CHANGE

Concerns about climate change were raised by a good number of our interviewees, generally in response to the question 'Is there anything else you want to tell us about the ACMCA?'. Shoreline erosion is already conspicuous at the Arnavons, especially on much of the key nesting habitat on Kerehikapa and Sikopo. Many people are worried that, even if community conservation succeeds, that rising sea levels will destroy the nesting habitat before too long and the turtles will be forced to nest somewhere else. Representative quotes follow.

One thing I see, that I realise is a big change, is shoreline erosion at Arnavons. It's a sad thing, because it's happening at an alarming rate. So logically we are throwing away the place for turtles to come and lay their eggs. In another 50 years, the place they call Arnavons, Home of the Hawksbill, itself will be extinct too. Benedeti Abeta

Sooner or later, places like Arnavons or nesting beaches at Tetepare or Hele Bar - those known nesting sites in Solomon Islands - will be gone, because of the impact of climate change. Maybe the turtles might look for a new nesting site and if other communities can look after their nesting beaches maybe those turtles from the Arnavons or other places like Hele Bar might end up using other islands for nesting. So that's one... part of climate change adaptation work we are doing, to try to encourage other places to protect their small islands that aren't spoiled by high water rise... that we are currently experiencing... John Pita



4. CONCLUSIONS

The great majority of our interviewees stressed that there has been a steady increase in local acceptance of the desirability of preventing overharvesting of turtles and other marine resources at Arnavons. But poverty, the failure of the seaweed farming project, and the existence of a lucrative black market for bekkos will continue to drive some people, particularly on Wagina, to continue poaching for turtle, which means that the maintenance of the ranger station is vital for continued conservation to be effective.

The Trust Fund only pays for about 30% of the annual costs, which means the rest has to be fund-raised each year. TNC has been assisting with this, apparently quite consistently, but several people argued for increased support from the Solomon Islands government and some also wanted to see TNC actively reducing its involvement in the program, ostensibly to facilitate the expansion of ownership and leadership of the ACMCA by both government and community leaders. However, the flow of financial resources to support the ranger station at Kerehikapa is clearly pivotal to the perpetuation of both reliable protection and continued monitoring of turtles and other marine resources at the Arnavon Islands, and TNC has been able to ensure that support to date. In the absence of a sudden change of heart of the Solomon Islands government, it seems unwise to expect TNC to take a back seat just yet.

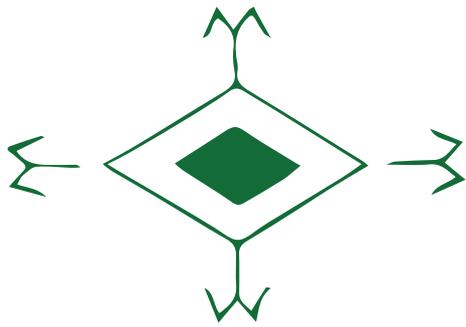
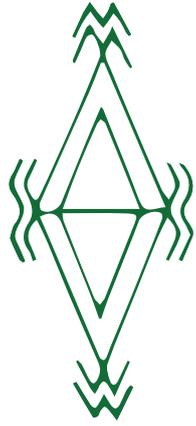
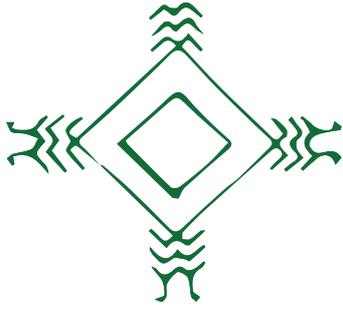
While much of the interview material we have presented here indicates that many people in the Kia, Wagina and Katupika areas are indeed acquiring a greater sense of the intrinsic value of turtles and other marine resources, they nevertheless remain highly marginalised economically, a condition which will always make it difficult to resist the temptation to harvest any marine resource with a high unit value.

In relation to the above points, it is worth interrogating the moral philosophy of withdrawing external support for conservation of turtles in the Solomon Islands. The Solomons is a tiny, economically marginalised state on the global economic periphery that struggles with myriad economic and political handicaps and currently is ranked by the UNDP, with Papua New Guinea, equal 157th out of 187 on the Human Development Index. It loses significant wealth to multinational resource extraction corporations (e.g. mining, offshore fishing, logging) every year through profit shifting and illegal activities facilitated by jurisdictions supporting financial secrecy such as Singapore, Hong Kong and Australia (Mousseau & Lau, 2015; <http://www.taxjustice.net/topics/corporate-tax/transfer-pricing/>; Sharman, 2017; Shaxson, 2011).

These financial manipulations ultimately mean that much resource wealth that should be captured by the state and directed to education, health and resource ministries such as MFMR, instead flow out and end up in the offshore bank accounts of both foreign CEOs and local elites (Foale et al., 2016; Sharman, 2017). Until these financial structures that drive inequity and de-democratisation (Sassen, 2014) are addressed at a global scale, the moral mandate to devolve greater financial responsibility to the Solomon Islands government should be approached with some care, and for the time being the ongoing external support of TNC appears to be a pragmatic strategy.

The Arnavon Islands are very remote from both markets and service centres, which means that the most likely sources of income must be, like bekkos, trochus and bêche-de-mer, non-perishable, cost-effective to transport, and cost-effective in terms of labour.

The collapse in market price for seaweed appears to have caused that product to fall below a labour cost-benefit threshold for the Wagina people, meaning another alternative must be found. Tourism appears to hold hope for many, though it disproportionately benefits Kia over the other two communities, and, even then, at least one Kia-based informant claimed that the tour boats were not delivering significant benefits. Virgin Coconut Oil may be worth trying but might also be vulnerable to price fluctuation just like seaweed.



5. RECOMMENDATIONS AND LESSONS LEARNED

The emphatic desire for greater community contact by visiting scientists and conservationists seemed almost universal among our informants. This has to be one of the least ambiguous ‘lessons learned’ coming out of our research. There is a very strong desire for more knowledge about all aspects of research being conducted at the Arnavon Islands. This seems to us to be a great opportunity for transnational conservationists and scientists to gain some skills at communicating the outputs and benefits of their work to the three communities invested in the ACMCA. It would seem that any increase in effort to comply with this request will be rewarded with not only a new set of relationships but will also inspire an even greater level of engagement with and interest in the idea of conservation from the communities.

Running parallel to the above unanimity regarding the obligation of scientists to engage more with communities, was a common assertion that one of the most important perceived benefits of the ACMCA was education. Most of our interviewees spoke enthusiastically about how much everyone valued the knowledge they gained about turtles and the other life forms at the Arnavons from the extensive research work that has been conducted there as part of the conservation program.

The above findings highlight an excellent opportunity for a substantial in-depth study by social scientists (ideally someone from one of the three communities) of the relationship between knowledge about the biology and ecology of the species targeted for protection at the Arnavons and the exact nature of the attitudinal shift towards a greater embrace of a conservationist worldview by members of the three communities. We have seen relatively little detailed *social* research focussed on the Arnavons in the literature we have reviewed, since the work of Leary and Mahanty (1993).

The original process of engagement of the three communities, driven by people like Peter Thomas, John Pita, Chief Leslie Miki, and Ed Mayer and Sue Brown, was fundamental to the early success of the ACMCA.

Building trust through long term, transparent relationships with the community has been pivotal to the successes achieved thus far, but was initially difficult and required a lot of work.

Sustained efforts at communicating the relevant science about the species targeted for protection is not only highly effective for engendering a greater sense of ownership and desire to conserve, but is greatly appreciated by community members and continues to be requested by them. But, as for the above point, the messenger is as important as the message – people are more likely to accept scientific facts from people they have gotten to know through regular visits and are prepared to trust.

Participation in scientific work is a great way to create conservationists.

Seeing is believing: the visits of community leaders to the Arnavons were important for catalysing the spread of enthusiasm for establishing new protected areas in other places.

Do not raise expectations, especially with respect to financial benefits. Many of the people we spoke to observed that a lot of community members have accepted that conservation of turtles and other species at Arnavons is unlikely to deliver financial benefits to them, but are happy for the program to continue in any case. This is a considerable achievement.

Never talk about land tenure. Despite the legal alienation of the Arnavons, and their status as a protected area, there are clearly ongoing sensitivities about tenure.

Ensure full transparency of all financial processes within the ACMCA so that jealousies about use of project resources and benefit distribution never arise.

Exercise caution and transparency around financial transactions relating to tourism, as several people pointed to potential conflicts arising in relation to it.

All visiting scientists should be required to give some kind of feedback to the ACMCA board and one or more community groups before going home, and should be required to remit a report about their work back to ACMCA community leaders for distribution to community groups upon completion of the research.

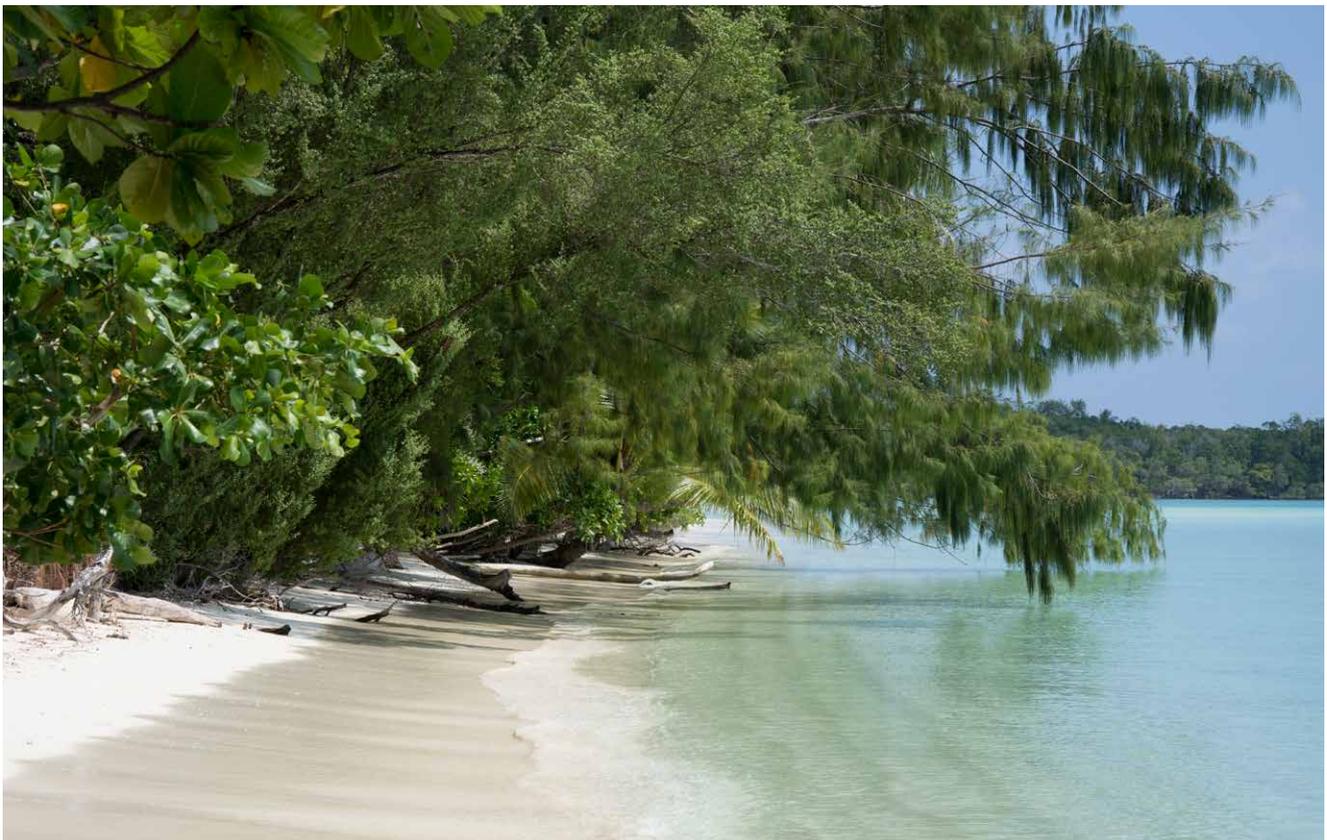
Although spillover from the ACMCA has not been scientifically demonstrated, many people appear willing to believe that it will happen, and some claim that they can see evidence of it for turtles and trochus already.

Establishing a long term program of systematic catch and effort monitoring for commodity and subsistence fishery species, in the three communities, involving local people, would be a good move at this stage.

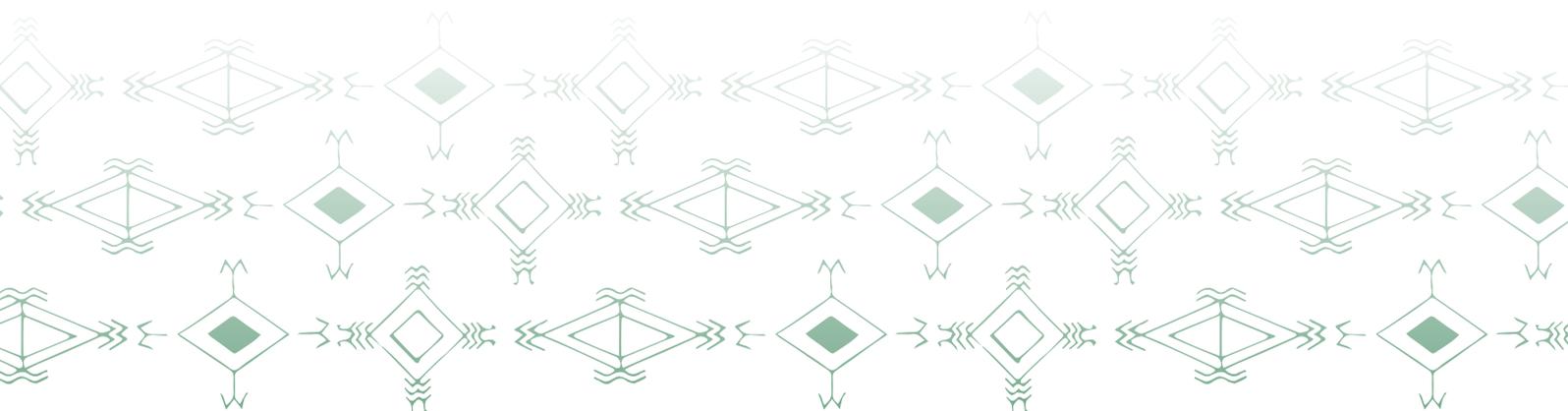
Involvement of women from Kia, Wagina and Katupika in management of the ACMCA has apparently been beneficial. Management may be further improved by an increased proportion of female ACMCA/ACMP board members.

Given the many remarks made about beach erosion at Arnavons, ostensibly caused by sea level rise, strategies for establishing conservation areas on other potential nesting beaches should be discussed.

An exit strategy may be worth discussing at some point, but, given the important role TNC continues to play, their good standing with the community, and their crucial role in raising much needed extra funds for running the ranger station at Kerehikapa each year, perhaps this should not be forced.



Kerehikapa Island, Arnavons.



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ACKNOWLEDGEMENTS

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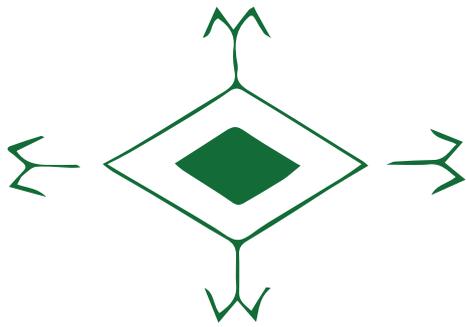
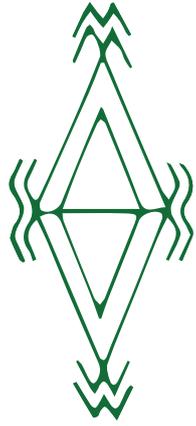
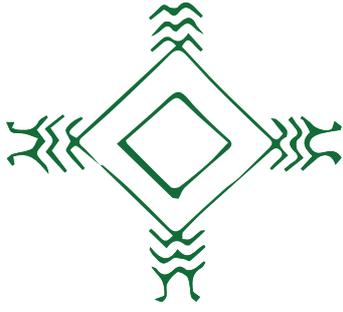
Ethics clearance was obtained from James Cook University under permit H6800, together with a memorandum of understanding between the Solomon Islands Government and The Nature Conservancy.

We sincerely thank all of the interviewees listed in Table 1 for generously giving their time to provide their knowledge, thoughts, historical recollections and considered opinions on the issues and events we are exploring for this work.

Special thanks to Fred Rotu and Lionel Madada for their valuable assistance as skipper and 'fixer' for our dinghy tour of the Kia, Katupika and Wagina communities, and our stay at the Arnavon Islands. Thanks also to John Pita for making his dinghy available to us at short notice. Thanks also to Willie Atu and Simon Vuto for speedy and highly efficient assistance with organising a very compressed field trip with almost no room for error.

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APPENDIX 1

TERMS OF REFERENCE FOR THE STUDY

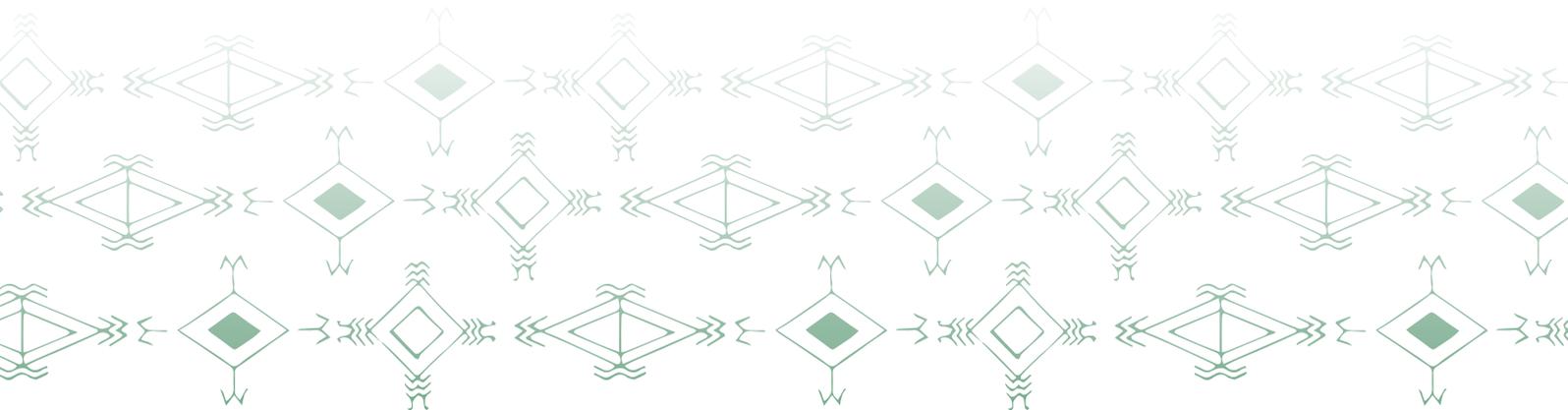
TERMS OF REFERENCE (“the Services”) (clause 4.2)

Tasks:

1. Review reports, papers and other documentation regarding the Arnavons to collate, from these, existing records of lessons learned.
2. Review other reports, papers and documentation that might inform the assessment of lessons learnt in the Arnavons from experiences elsewhere.
3. Identify relevant parties (key informants) with knowledge to share about additional lessons learned from the Arnavons experience. These should include, but not be limited to, individuals from the Arnavons Management Committee and from relevant: government agencies (e.g. MFMR, Environment), local and international non-government agencies (e.g. TNC), commercial operators (e.g. tourism operators), scientific organisations, local communities (both in and adjacent to the Arnavons) and provincial government.
4. Develop a plan for gathering information from key informants
5. Develop different sets of interviews to be used with the different groups of people (as per 3, above). The interviews should explore lessons learned (both positive and negative) during marine resource management efforts in the Arnavons. The questionnaire should address, but not be limited to, issues to do with:
 - a Culture
 - b Livelihoods
 - c Food
 - d Alternative livelihoods
 - e Status of marine resources
 - f Biodiversity protection
 - g Partnerships
 - h Marine organisms’ life history
 - i Community expectations
 - j Management and planning approach(es) including exit strategies
 - k Costs and benefits of the Arnavon Community Marine Conservation Area
 - l Costs and benefits of having no Arnavon Community Marine Conservation Area
 - m Sustaining management efforts
6. Provide an outline of the technical report to be delivered including description of the communication products to be prepared. These should include videos, posters and fliers.
7. Prepare draft technical report (in English) for review.
8. Prepare draft storyboards for proposed videos and schematics of proposed posters and flyers – these must be in English and Pijin-English.
9. Where interviewees are willing, following initial interviews and discussions, selected individuals, if they are prepared to do so, should be interviewed to camera, to be used in the video.
10. Prepare draft communication products (video(s), poster(s) and flyers for review (flyers, at least, should also be uploadable onto websites).
11. Finalise technical report and finalise communication products (the latter in English and pijin English) based upon feedback from MACBIO and TNC.

Deliverables:

1. Technical report explaining the methods and results of the literature review and interviews conducted re: marine resource management at the Arnavons by March 2017.
2. Explanatory video (at least one) of lessons learned re: marine resource management at the Arnavons – tailored for local use (in Pijin with English sub-titles) by June 2017 (prior to the UN Ocean Summit).
3. PDF versions of posters (up to 3) and flyers (up to 4) summarising the main findings (as per (1) and (2)) above for local use (in English and Pijin). Flyers, at least, must be able to be uploaded onto webpages by June 2017 (prior to the UN Ocean Summit).



APPENDIX 2

EXAMPLE INTERVIEW QUESTIONS

To begin with, we provided some background to the participants about this project – specifically that our understanding is that many lessons have been learned through the experience in the Arnavons, both regarding what works and doesn't for marine resource management in the Solomons. The aim of the work is to provide back, to the people of the Arnavons, a comprehensive set of information about lessons learned that they can then use as they continue to share their experiences with others in the Solomons.

FOR MARINE SCIENTISTS AND CONSERVATIONISTS:

1. Please tell us your name, position and any involvement you have had with the ACMCA.
2. What real changes have you seen in fish and other marine resources due to the work in the ACMCA? Apart from turtles, what changes have been measured?
3. Do you think local attitudes towards conservation specifically and fishery management more generally have changed in your experience working with the ACMCA and if so, how would you explain any changes?
4. Do you think there has been an increase in the extent to which local people in the Arnavons area embrace the notion that marine animals (including turtle and fish) and plants have an intrinsic or existence value that is separate from their economic value?
5. What do you think is necessary to maintain the recovery in turtle populations that has recently been reported?
6. What do you think are the main successes in the ACMCA and how do you explain them?
7. What do you think are the remaining unsolved problems and why do they remain unsolved?
8. What do you think the future holds for the ACMCA?
9. Can you comment on how different things would be (marine resources, food security and income levels) if there had never been any conservation project at Arnavons?
10. Given what you have learned from the Arnavons, if you could make 3 recommendations to communities wanting to do more to manage their marine resources, what would you say?
11. Given what you have learned from the Arnavons, if you could make 3 recommendations to scientists or other foreigners wanting to do more, to assist with local marine resource management, what would you say?
12. Given what you have learned from the Arnavons, if you could make 3 recommendations to government departments wanting to do more, in terms of assisting with local marine resource management, what would you say?
13. What do you think has been the main factor or factors responsible for the recently reported increase in Hawksbill turtles at the Arnavons?
14. How would you compare the importance of the ban on export markets of turtle shell and shell products compared to the closure to fishing of the Arnavons area itself?
15. How much do you think local understandings of the life histories of fished species have changed as a result of conservation work in the Arnavons area?
16. Is there anything else you want to tell us about the Arnavon Islands, turtles, fisheries, conservation or livelihoods in the Arnavons area?
17. Is there any comment you want to make about the ACMCA off the record? (asked after recording equipment is switched off).

FOR VILLAGERS AND COMMUNITY LEADERS IN THE ARNAVON ISLANDS AREA:

1. Please tell us your name, your age, your position / main occupation, and where you grew up?
2. How long has the conservation area been operating to your knowledge?
3. What do you see as the main aims of the conservation area?
4. Have there been any benefits for you or others here from the conservation area?

5. (If yes to above) What sort of benefits do you think the conservation area has provided, and for whom and why?
6. Have there been any costs/negative things that happened to you or others here from the conservation area?
7. (If yes to the above) What costs has the conservation area brought, to who and why?
8. How often did people eat turtles when you were young?
9. When was the last time you ate turtle? What kind of turtle was it?
10. Do you think people in your community would be seriously affected if turtles all disappeared? If yes, how?
11. How seriously impacted would your community be if the fish all disappeared? How much more serious would this be than if turtles disappeared?
12. Do (or did) turtles have any spiritual importance in *kastom* (local culture). If yes, discuss.
13. Given what you have learned from the Arnavons, if you could make 3 recommendations to communities wanting to improve their marine resource management, what would you say? What would you recommend to government departments? Scientists or other foreigners?
14. Can you comment on how different things would be (marine resources, food security and income levels) if there had never been any conservation project at Arnavons?
15. Is there anything else you want to tell us about turtles, fish, conservation, or the Arnavon Islands?
16. Is there any comment you want to make about the ACMCA off the record? (asked after recording equipment is switched off).

FOR SOLOMON ISLANDS GOVERNMENT OFFICIALS:

1. Please tell us your name and position.
2. How long have you been involved in the ACMCA and what is the nature of your involvement?
3. How well has it been performing in your opinion?
4. Have you seen any benefits of the ACMCA for the local community? If so, what?
5. Have you seen any costs/negatives of the ACMCA for the local community? If so, what?
6. Would there be any conservation in Arnavons without external funding?
7. What have been the costs and benefits of this external funding?
8. What do you think has been the main factor or factors responsible for the recently reported increase in Hawksbill turtles at the Arnavons?
9. How would you compare the importance of the ban on export markets of turtle shell and shell products compared to the closure to fishing of the Arnavons area itself?
10. Have you seen any change in the way local communities value the marine environment since the ACMCA has been operating? If yes, discuss?
11. Are there any issues regarding ownership of the Arnavon Islands?
12. Are there any issues regarding the boundaries of the marine park?
13. Given what you have learned from the Arnavons, if you could make 3 recommendations to communities wanting to do more, in terms of their marine resource management, what would you say?
14. Given what you have learned from the Arnavons, if you could make 3 recommendations to scientists or other foreigners wanting to do more, in terms of their marine resource management, what would you say?
15. Given what you have learned from the Arnavons, if you could make 3 recommendations to government departments wanting to do more, in terms of assisting with local marine resource management, what would you say?
16. Is there anything else you want to tell us about the ACMCA?
17. Is there any comment you want to make about the ACMCA off the record? (asked after recording equipment is switched off).

MACBIO = Marine and Coastal Biodiversity Management in Pacific Island Countries. Funded by German Department of Environment through GIZ, and IUCN and SPREP are partners. This project is under MACBIO's Output 3: Marine Protected Areas – Documenting Lessons Learned and Best Practices. Two sites have been looked at in Fiji, and Arnavons is the site of choice for Solomons. IUCN is managing the site work in the Solomons.

APPENDIX 3

RESPONSES TO TWO KEY QUESTIONS (VIA EMAIL) BY THE HONORABLE PETER RAMOHIA, PREMIER OF MALAITA PROVINCE

1) What are the most important lessons that have been learned from the Arnavons conservation experience (including for commodity fisheries, turtles and any social impacts)?

PETER: I have been very blessed to be part of the Arnavon Community Marine Conservation Area (ACMCA) since the very beginning, even before this Community based Conservation Area was official declared in August 1995. At that time it was the first of its kind in the country and to me that is why ACMCA is special and it was a blessing (to me) to be part of this Community based development. To me the most important lessons learnt from the ACMCA are:

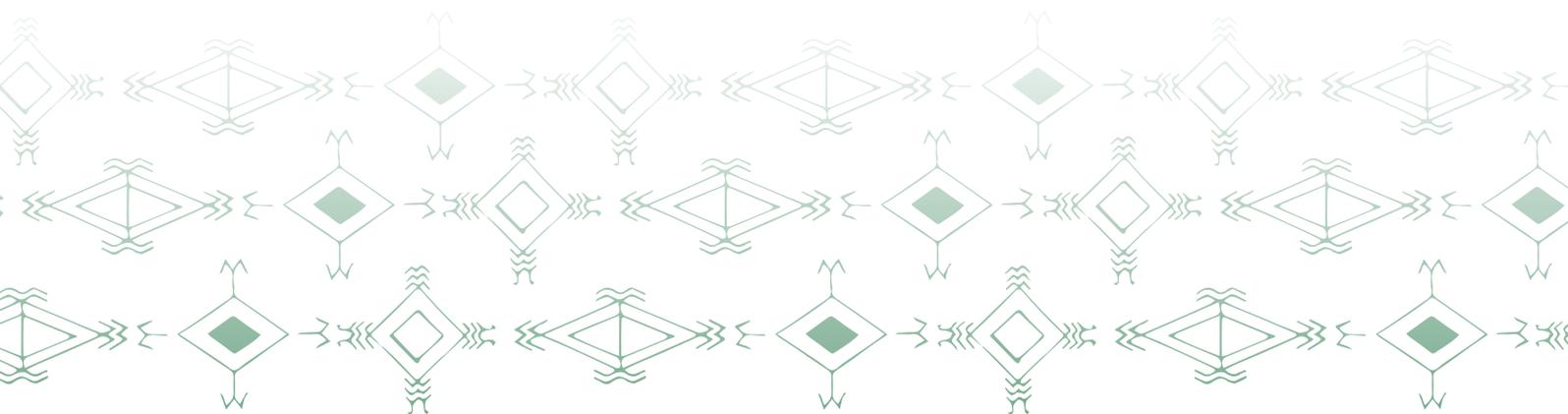
1. ACMCA helps enhance/rebuild or maintain in health state stocks of commercial species such as reef fish, trochus, sea cucumbers and giant clams.
2. ACMCA is not only protecting the nesting hawksbill and green turtle population nesting in the islands but the ACMCA is also helping to increase the nesting population (no of females returning to nest per nesting season every year) and the number of hatchlings produced from the nesting beaches as well.
3. Management of the ACMCA comprised not only Landowning communities but users as well (inclusive).
4. Strong support from government (Provincial and National)
5. Strong support from The Nature Conservancy
6. ACMCA represents not only a Community based initiative but this is a strong Partnership as well (Landowning communities and Users, Provincial Government, National Government, NGO, Donors)
7. Land disputes/disagreements affect well intended projects such as Conservation and other Development. Therefore, all Land issues MUST be sorted out first. (Land issues affected the Conservation work in the Arnavons in the beginning.....burnt down in 1982).
8. TNC assisted ACMCA to have a "TRUST FUND". This is a good lesson as well.....address long term sustainability of the AMCA.
9. Ecotourism based on Yacht and Cruise Ship visits.
10. ACMCA established under appropriate legislation.....Isabel Provincial Ordinance and Protected Area Act 2010.
11. The greatest lesson learnt from the ACMCA is the demonstration of the "Before, After, Control, Impact" study works in the marine environment.....justifying why it is very important to continue "Conserving the marine (and terrestrial) habitats and species of the Arnavons".

2) What is most needed in the future to ensure successful community conservation of marine resources both at the Arnavons and around the surrounding communities?

PETER: To ensure successful community conservation of marine resources both at ACMCA and around the surrounding communities, I suggest the following:

1. Strong Management and Partnership based on visionary leadership and commitment – a platform allowing for stronger participation of community leaders (chiefs, churches, teachers, youth, women) and people in the ACMCA. ACMCA is a leader of Conservation in the Solomon Islands and it is on this that the ACMCA must stand and build. Who do we look to as example of Community based Conservation? Who do we learn from in terms of Community based Conservation? Does ACMCA has a role to play in terms of Conservation work at Community, Province and National levels?

2. Innovation: This will answer the question of “alternative” for Landowning communities. Use the ACMCA not only as a Conservation Area but as a marketable “commodity” for tourism, research and learning, or others. In this way, the long term sustainability of the ACMCA is addressed.
3. The participation of Provincial Governments and the National Government in ACMCA is important for long term sustainability of the project. Not only that, this participation is also important for leveraging and replicating the ACMCA in other Provinces and Communities of the country. This how the success story of the ACMCA is spread and shared nationwide.



APPENDIX 4

SCRIPT FOR NARRATOR FOR LESSONS-LEARNED VIDEO

This narration will be interspersed with videos of interviewees who have given their permission for their interviews to be used in this way. The narration and interviews will also be supported, in the video, with relevant still and moving imagery.

SCRIPT FOR THE MAIN MOVIE ABOUT LESSONS LEARNED FROM THE ARNAVONS EXPERIENCE
FOUR KEY THEMES: 1) THREATS, 2) VALUES, 3) MANAGEMENT STRATEGIES, 4) LESSONS LEARNED

NOTE: English and pijin paragraphs are alternated for clarity

Before 1800, the population of Solomon Islands was very small and not increasing very much. Malaria was one main reason for this. But after World War 2, the population has been increasing very quickly. The population is now more than four times bigger than it was in 1960! This means four times as much fish is needed for food and four times as many people who need money.

Bifoa 1800, population blong Solomon Islands hem small nomoa and nating increase bik. Malaria na main reson why population hem smol lo dat time. But afta world war 2, population stat kam up bik. Population distime hem increase 4 times moa then long year 1960. Hem meanim distime people needim staka moa fish and staka moa seleni.

So, we have a problem. People are increasing and people's need for money is also increasing. But the natural resources we depend on to feed our growing population and to sell for money, are decreasing. Some resources have almost disappeared completely. To make sure that our natural resources will always be available to use, we need to find ways to manage them. Management is vital but not easy to achieve. In this movie we will look at what has been learned about marine resource management by the people of Kia, Wagina and Katupika communities in Isabel and Choiseul Solomon Islands.

So lumi garem wanfala problem. Population blong pipol hem increase and pipol nidim selen tu. Bata olketa risos iumi iusim fo kaikai and selen, hem go go down and sumfala risos hem lose finis. Fo mekem risos blo iumi stap gud and kam bak moa, iumi mas lukautim gud. Bata diswan hemi no isi. Insaet distfala movie iumi bae lukim waka an save lo risos management blo oketa pipol lo Kia, Wagina an Katupika long Isabel and Choisel Province insaed Solomon Islands.

Some species have almost disappeared, some remain but are decreasing, and some are still abundant. The species that are disappearing most quickly are those that can be sold for a high price, can be easily harvested, stored and transported, and those that live for a long time, grow slowly and don't have many babies. Examples are green snail, gold lip pearl shell, giant clam, Topa, sharks and turtles. Fish that grow fast like Buma, Roma and Katukatu, are generally still OK.

Samfala species olketa kolsap lus. Samfala stap yet bata go daun tumas. Onli samfala stap gud yet. Olketa species wea hemi go daun fast tumas, hemi olketa wea iumi save salem fo staka selen, save faenem isi, kipim long taem lelebet, and transpotim long sip hem isi. Hemi includim tu alketa species wea hemi garem longfala laef, grow slow tumas, and hemi no save bonim stacka pikinini. Samfala example na green snail, gold lip, giant clam, Topa, sak an total. Kaen fis hem save grow fast tumas, olsem Buma, Roma and Katukatu, oketa stap gud lelebet.

Some species are in danger of going extinct. This includes turtles and sharks. Some turtles, like the hawksbill turtle, need to be looked after carefully because they only live in a few places around the world. One of those places is the Arnavon Islands.

Samfala species olketa kolsap lus foeva. If eni species hemi disapia, had fo hem kam baek nao. Population blo olketa total na samfala sak hemi barava go daun tumas nao, an staka pipol wari bae oli lus. Hawksbill total hem nao onefala total wea nating staka lo ples hem save stap. Kaen ples olsem Arnavon Islands.

Here is something to think about. If turtles disappear we can still eat. There might still be fish in the sea and land to make gardens on. But we would lose something very special. Sea turtles have been around for more than 200,000 years. It would be very sad to see this species disappear forever because of our carelessness.

One fala sumting for ting aboutim hem 'sapos olketa total disapia, bae iumi save kaikai yet'. Bata bae iumi lusim samting special tumas. Oltketa total bin stap raon winim 200,000 yia. Bae hem wanfala sori samting tumas sapos olketa disapia becos umi no care aboutim olketa.

There are many ways to make sure we will always have turtles and also the other things we use from the sea. But this means taking less of all of them now. Management methods that can be used include export bans, fishery closures, size limits, closed seasons and marine parks. What management method is best depends on the species, and the place.

Garem staka ways for mek sure umi keepim oketa total and oketa nara risos lo sea. Oketa managemen teknik olsem stoppim expot, suttim fisaries, saes limit, Mekem tabu times an Mekem marin pak. Wat type mamagement umi usim hem depend lo species and ples.

At the Arnavons, taking turtles has been banned completely since 1995. The Arnavon islands is the most important nesting site for hawksbill turtles in the Western Pacific. Before 1995, the population of hawksbills was very low because of overharvesting. But in recent years there has been an increase in numbers of nesting females. Scientists think that this increase is for two reasons: 1) the protection from harvesting at the Arnavon Islands, and 2) the national ban on turtle shell exports since 1993.

Long Arnavon Islands, havestim total hemi tambu since 1995, Arnavons hemi namba wan ples blo total fo layim egg long Western Pacific. Bifo long 1995, over-harvesting hem barava daunim hawksbill population tumas. Bata since olketa tambuim ples, namba blong olketa mere total wea kam soa fo layim egg hem incris. Hemi no disfala tambu long Arnavon Islands seleva hemi mekem namba blong total incris. Long 1993, gavman hemi tambuim expot blo sela (baksaet) blo total. Disfala tambu hem helpim population tu.

At the Arnavon Islands, taking fish and trochus and other resources is also restricted. This has resulted in big increases of these species in Arnavons and also in some places nearby, like Wagina and Isabel. When populations of fish and trochus increase, some of their eggs float in the current and settle in other places where there is no protection. Also, bigger fish and bigger trochus have more eggs than smaller animals. All this helps sustain the population of fish and trochus in places with no protection so that the benefits people get from harvesting them can also be maintained. This is called the spillover effect.

Long Arnavon Islands, hemi tambu tu fo tekem fis an trochus an olketa nara marine risos. Disfela rule hemi mekem olketa risos incris bigfala long Arnavons na long samfala ples kolsap tu, olsem Wagina an Isabel. Taem population blong olketa fis an trochus hem incris, samfala egg blo oloketa save float long current an incrisim population long samfala difren ples wea olketa no usim tambu or rules. Oltketa scientist callim dis wan 'spillover effect'.

The people of Kia, Wagina and Katupika say they can see the benefits of protection of all marine resources at Arnavon Islands. Many are starting to make their own tambu sites in other places.

Oltketa pipol long Kia, Wagina an Katupika tok olsem olketa lukim nao benefit blong disfela tambu system long Arnavon Islands. Staka long olketa go het fo mekem tambu long ples blong olketa finis.

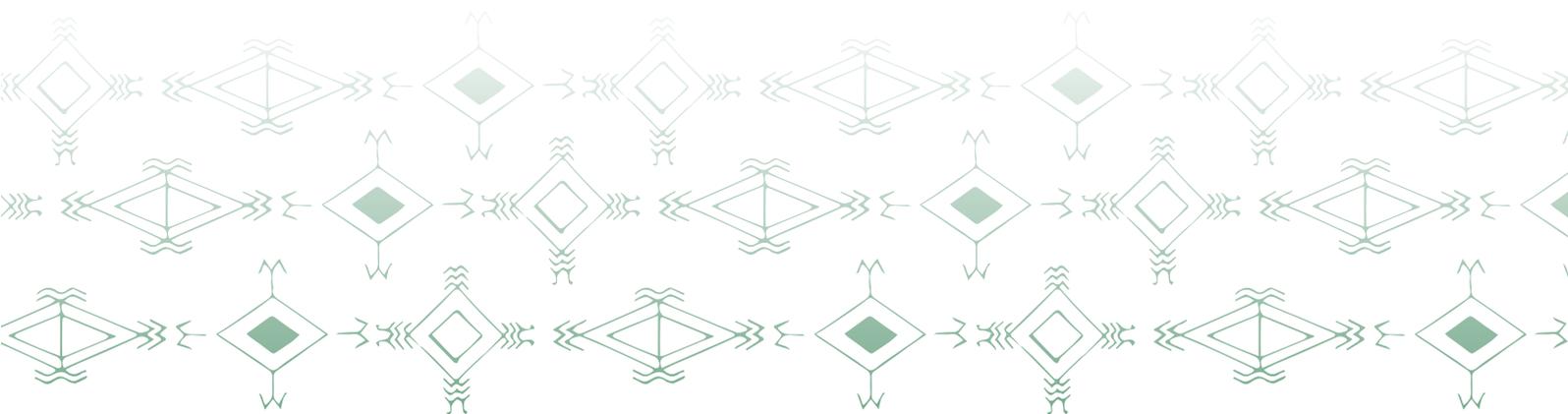
If others want to benefit from the management system used at the Arnavon Islands, there are a few things we can learn from their experience.

1. Resource management needs open, clear communication with the whole community involved. Trust must be built and this can take time.
2. It is important not to raise expectations that cannot be met. Resource management takes time, and population increases of fish, for example, may not be as large as people would like. There may not be immediate cash benefits. But the alternative is no resources.
3. If any money is associated with a managed area, then the financial systems must be transparent so that jealousies do not arise.
4. Community members need to understand the science of marine resource management – they need to understand how different species respond to management – how long it takes and how it works.
5. Including community members in any data collection that happens is a great way to share knowledge.
6. Having rangers or other ways to ensure compliance is important. Without compliance, management cannot work.
7. If people can see for themselves the increased populations of fish and other marine resources in places where there is good management, like Arnavon Islands, they will be inspired to use the same methods.

8. It is important for women to be involved in management programs from the start.
9. Having other community leaders coming to visit and see for themselves what's working or not is a good way to share lessons learned.
10. If possible, conduct monitoring of the species, habitats, benefits and other aspects of your marine managed area which you want to be able to keep track of.

Sapos iu laek benefit long wat olketa komuniti long Arnavon Islands area lanem finis long risos menegment, samfala gudfala tingting olketa talem finis.

1. *Evriwan long komuniti mas involve long stat blo program. Evriwan mas klia lo wat nao insaed lo tambu program or management program. Mesej insaet long komuniti mas klia an open everi time. Olketa memba long komuniti mas garem trust lo each other. Disfala kaen samting hem save tek taem.*
2. *Evriwan long komuniti mas save gud long science blo disfela management system. Olketa mas klia long hao nao olketa species bonim pikinini an biology long olketa.*
3. *Sapos management hem usim seleni, hem must clear lo komuniti mekem pipol no jealous or mistrustim each other.*
4. *Sapos pipol save lukim seleva gudfala result blong management, olsem long Arnavons, bae olketa save bilivim. An bae olketa laek iusim sem kaen system long ples blong olketa tu.*
5. *Mus includim komuniti members lo oketa program olsem monitoring an data collection mekem pipol understandim oketa result blo ples ya.*
6. *Mek sure garem rangers fo look afterim ples, suppose no any ranger bae pipol no save respectim management area ya.*
7. *Pipol mas no tingim dat benefit blo management hem easy. Benefit hem samting em no save kam quicktaem tumas. Hem tekem taem. Maet olketa incris hem no bik olsem samfala laekem. Maet iumi no save garem staka selen quicktaem tumas. Bata sapos no eni management, bae no eni marine risos tu.*
8. *Hemi impotan tumas fo olketa mere stap insaet long management komiti.*
9. *Encouragim oketa leaders blo other komunities for kam visitim ples, mekem oketa save lukim and lanem oketa lesson wea bae useful fo area blo olketa.*
10. *Hemi important for must garem monitoring blo every risos you laek for luk afterim mekem u save if hem kam up gud.*





Marine and Coastal Biodiversity Management
in Pacific Island Countries



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