

COVER SHEET FOR DARWIN INITIATIVE FINAL REPORT ON PROJECT 16002



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Darwin Initiative for the Sustainable Use of Kaledupan Fisheries, Indonesia

Final Report

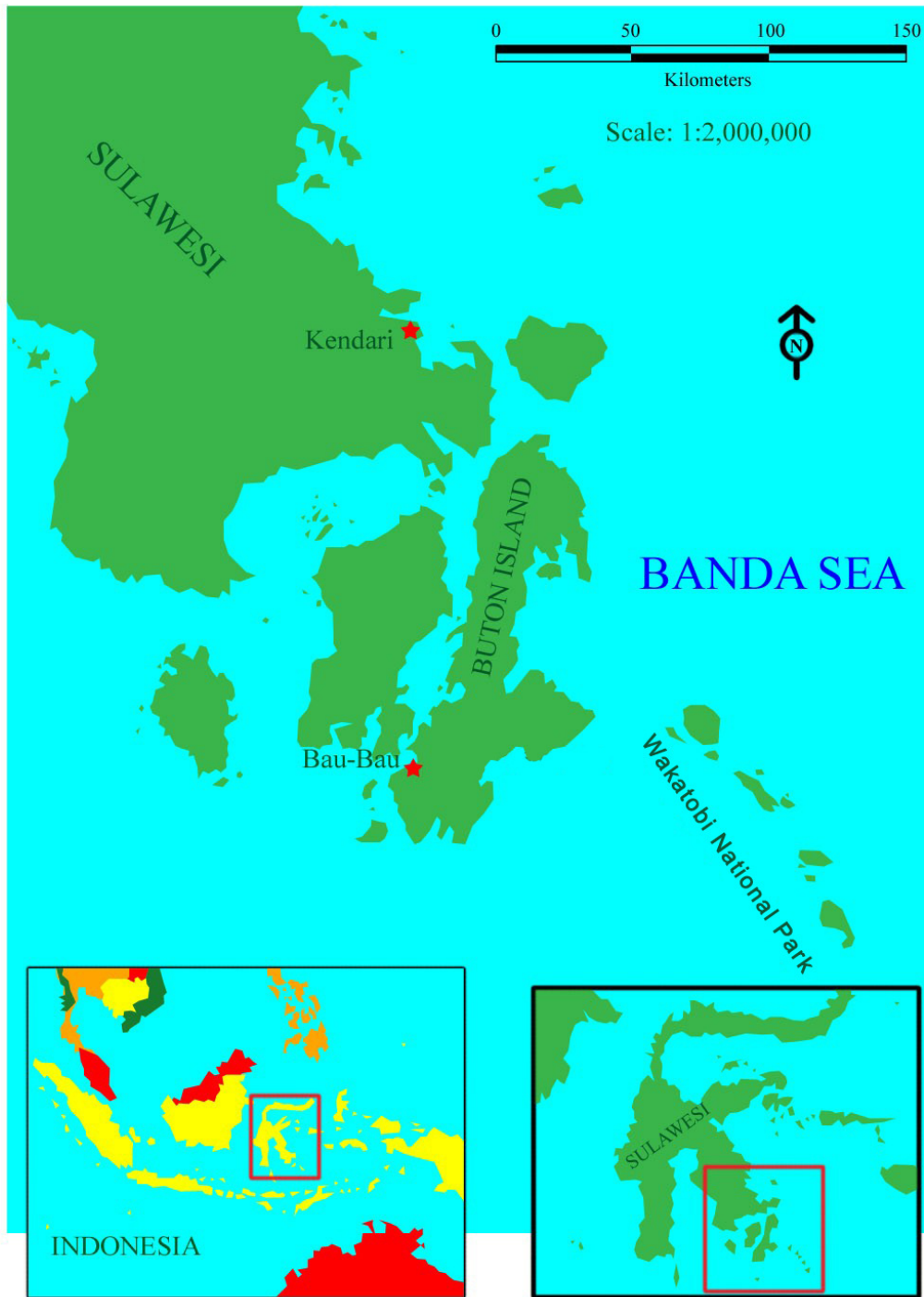
1 Darwin project information

Project Reference	16002
Project Title	Building capacity for sustainable fisheries management in the Wallacea region
Host country(ies)	Indonesia
UK Contract Holder Institution	Operation Wallacea Trust
UK Partner Institution(s)	-
Host Country Partner Institution(s)	FORKANI
Darwin Grant Value	£150,000
Start/End dates of Project	May 2007 to March 2011
Project Leader Name	Dr Tim Coles
Project Website	www.opwalltrust.org
Report Author(s) and date	Dr Tim Coles August 2011

2 Project Background

One of the main problems on Indonesian coral reefs is over-fishing by local people using small scale or artisanal techniques to a point where the fisheries are in a serious decline. This project explored management options for improving such fisheries using the example of reefs in the Wakatobi Marine National Park (Map 1). The project has demonstrated how an artisanal fishery registration scheme can be implemented to develop 'ownership' by the fishers, how a creel census scheme can be run cost effectively to inform decision making by local reef management schemes and demonstrated a business opportunity for providing sufficient income to buy out fishing effort.

Map 1 : South-east Sulawesi and the Tukangbesi Archipelago



3 Project support to the Convention on Biological Diversity (CBD)

The Kaledupa DI project has provided support for the CBD objectives in 3 main ways:

1. Made progress with how artisanal reef fisheries in Indonesia can be managed in a sustainable manner using financial incentives (Article 11 – 60%)
2. Provided capacity building for FORKANI (a local NGO) in how to organise and implement creel fishing surveys of artisanal fisheries and to implement boat and fisher registration schemes. The Wakatobi government has now requested that FORKANI complete similar schemes on Wanci and Tomea islands in the Wakatobi National Park and they have the skills and experience to do this without needing input from the Opwall Trust (Article 17 – 30%)
3. Data from the fish and coral monitoring programme run by the Opwall Trust as part of the DI scheme have been used to have the Wakatobi Marine National Park accepted as a UN Biosphere Reserve (June 2011 – Article 8 – 10%)

4 Project Partnerships

The main partnerships in this project have been between the Opwall Trust, a UK based charity, and within Indonesia a local NGO called FORKANI. The latter comprises representatives of each of the fishing communities on Kaledupa, the Wakatobi Island Government, COREMAP (a World Bank funded fisheries programme for eastern Indonesia) and the Opwall Trust (Indonesia). Internationally, the project has worked with Oaklea Ltd (a UK based process development consultancy) and the Coral Reef Research Unit (CRRU), which is based at the University of Essex but with input from academics based in other UK universities as well as in New Zealand, US and Spain.

FORKANI

Prior to commencement of the DI project, Operation Wallacea (a UK based tuition fee funded biodiversity research organisation) had completed fish catch surveys around Kaledupa Island and their staff had worked with FORKANI members in gathering these data. Once the Opwall Trust DI project started then FORKANI were contracted to implement the weekly monitoring under the guidance of a full time western fisheries scientist (Dr Duncan May). However, as the project proceeded, full time guidance from a western fisheries scientist was reduced to around 3 months a year (Joel Rice, Dr James Haynes, Paul Simonin, Richard Stanford, Aji Wahyu Anggoro) until by the end of the project FORKANI were capable of running the monitoring and completing data entry unassisted. In addition their knowledge of and acceptance by the local fishing communities on Kaledupa Island was so great that they were able to obtain universal support for the concept of registering boats and fishers on the island to restrict entry to the fishery to just Kaledupan fishers. FORKANI were then responsible for registering all the boats and compiling the database of 1000+ fishers and their equipment. In addition it was the FORKANI contacts that enabled the fishing communities of Kaledupa to come together to agree 22 fishery byelaws. FORKANI now have the skills to implement boat and fisher registration schemes as well as creel census data collection schemes in other islands without input from the Opwall Trust. Their only limitation is that additional analytical skills are needed to

convert the creel census data into information that can be used for management decisions.

Wakatobi Government

This partnership has been crucial to the implementation of the project and enormous help has been given both politically and in spending programmes. For example, without the chairmanship by the Bupati (Wakatobi Governor) of the Kaledupa Fisher Forum (KFF), the fishery byelaws would have not been implemented. The government provided land and funding for the construction of the building for the carrageenan factory and has implemented a substantial spending programme for attracting tourist visits to Hoga Island (e.g. provision of electricity to homestays, emergency evacuation boats for visitors to the island, a decompression chamber on the neighbouring island of Wanci so that dive based tourism can be developed, hospital facilities on Hoga island, jetty to allow boat access to the island even at low tide, footpaths around the island, wet and dry lab facilities on the island to encourage research based tourism etc.) where Kaledupa fishers own and operate homestays to provide alternative income to reef fishing. The Wakatobi Bupati has been recognised by the Indonesian government as one of the leading Bupatis in the country and he has won numerous awards for his work in developing economic activity in his region.

Opwall Trust (Indonesia)

This organisation is an Indonesian registered NGO, completely independent from the Opwall Trust and run by Dr Edi Purwanto. The Opwall Trust (Indonesia) has an MOU with the Opwall Trust (UK) to provide support for Opwall Trust projects in Indonesia. The accounting for all expenditure in Indonesia, the convening and facilitating of the byelaw conference and supervision of all Indonesian partner inputs has been carried out by the Opwall Trust (Indonesia). The Opwall Trust (Indonesia) is a very competent Indonesian run NGO that has bid and won a series of environment and development projects from funders such as the World Bank, DanAid and GEF.

Coral Reef Research Unit

All the coral and reef fish monitoring carried out as part of the DI project has been completed by the Coral Reef Research Unit based at the University of Essex. This international collaboration of academics has also been responsible for the numerous scientific papers coming out of the DI project and supporting co-funded projects. Hoga Island marine research station now has more scientific publications (>50) produced over the last 7 – 8 years than any other marine research station in Indonesia.

Oaklea Ltd

This is a small UK based consultancy specialising in process development. This consultancy completed the outstanding piece of work of the DI project – the development of an agar extraction process and detailed plant specification for business plan that could be completed on Kaledupa and which would provide the economic activity to buy out the excess fishing effort.

Operation Wallacea (Opwall) Ltd

This is a company with income from tuition fees paid by students to join research projects in the field. Opwall is entirely independent of the Opwall Trust with no shared Directors. Opwall provided additional support funding to the DI project in order to ensure the level of scientific expertise required.

5 Project Achievements

5.1 Impact: achievement of positive impact on biodiversity, sustainable use or equitable sharing of biodiversity benefits

The main goal of this project was to determine whether reef fisheries in eastern Indonesia (the most biologically diverse reefs on the planet) could be managed sustainably. The Kaledupa Island reefs within the Wakatobi Marine National Park were selected as an example of reefs that were being over exploited by artisanal fishers (a situation replicated on virtually all reefs in eastern Indonesia). The main achievements of the project were to demonstrate a way that Forums of local fishers could be formed to regulate their own fisheries, including voluntary registration of their boats so that the fishery could be limited to just registered boats and agreement on fishery byelaws introducing restrictions on gear use. So effective was the Kaledupa Fisher Forum (KFF) that the Wakatobi Government wishes to use the same approach on the remaining islands in the Wakatobi.

The other component of the project was to investigate whether local businesses could be created in these remote rural communities to generate enough income to buy out excess fishing effort. The work on the carrageenan extraction process and business plan clearly demonstrated that in the Kaledupa example sufficient income could be generated by development of a medium sized plant to extract much greater value from a product already being grown by fishers in most areas of eastern Indonesia. The Wakatobi government backed the proposals and constructed a building and donated land for investors to develop a full scale plant. Negotiations are ongoing with potential investors to now fully develop the plant utilising the process information developed as a result of the DI grant. The agreement will be based on free use of the building and land in exchange for offering sufficient shares to Kaledupan fishers to buy out 50% of island-wide fishing effort, thus allowing the fishery to recover and the remaining fishers to benefit from higher long term sustainable catches.

The final stage – getting the plant up and running and then seeing the effect of the buy outs on the fishery has not been achieved within the timeframe of the DI grant but all remaining parties (Opwall Trust, Wakatobi Government, Operation Wallacea, CRRU, FORKANI) are continuing with the work to ensure this final stage is achieved.

5.2 Outcomes: achievement of the project purpose and outcomes

The defined purpose of the DI funding was ‘to build capacity for sustainable fisheries co-management in the Wakatobi Marine National Park’. This has been achieved through the formation of the Kaledupa Fishers Forum and the training of the FORKANI staff to implement village based boat registration, formation of island based Forums and running detailed fishery monitoring programmes to inform the decision making process.

5.3 Outputs (and activities)

There were four main outputs identified in the logframe:

Fisheries co-management established and functioning under the KFF

This was established in full to the level that the Kaledupa approach is now being used as the basis for similar initiatives on other islands by the Wakatobi government. Note the voluntary registration of all boats used for reef fishing in each of the Kaledupa villages is a first for eastern Indonesia.

Effective enforcement of fisheries regulations

This includes the enforcement of only registered boats and the adopted fishery byelaws. The first of these was mainly enforced by the village fishing communities and was demonstrably successful. Implementation of the buy outs will provide an additional incentive for village fishing community enforcement of only licensed boats fishing the reefs, since those with the licences will have a significant financial benefit in ensuring full compliance. Implementation of the agreed fishery byelaws was much more patchy and there are still substantial non-compliances with the agreed fishery regulations. The National Park rangers were not effective at enforcement on either licensed boats or fishery byelaws and the best method appeared to be the village based enforcement.

Fisheries and biodiversity assessment programme established and functioning

The uninterrupted data set on weekly landings from across the island implemented entirely by local staff had not been achieved in Sulawesi before the DI funded project. The reef fish visual surveys (UVC) and video surveys of the coral communities were completed over the survey period and a PhD has been separately funded to analyse these data. In addition stereo video apparatus and accompanying software has now been purchased by Opwall to ensure that the reef fish surveys (which using the UVC approach is highly dependent on the availability of skilled observers) can be completed annually more cost effectively.

Alternative income sources developed to provide 'buy outs' of fishing licences and reduce fishing effort

The process and business plan for how to develop the buy outs of the fishing licences has been completed. The level of investment needed to get the business up and running was well beyond the resources available as part of the DI funded project and in hindsight this objective should not have been set as part of the stage 2 application. Not only is substantial investment needed to generate the income needed to buy out fishing licences, but also the time needed to complete the planning and raise this income could not be achieved in the lifetime of the DI project.

5.4 Project standard measures and publications

See Annex 4 for more details

A large number of project standard measures have been achieved during the course of this project. This has included achieving almost all targets set out during the application process (with several being significantly exceeded), as well as a number of additional standard measures not initially targeted for.

One of the most impressive achievements involves the match funding from additional sources. In total, over £1 million was raised to further develop the fishery sustainability programme, building on the foundations laid down by the DI project.

This equated to 260% of the initial target figure, and further demonstrates the high level of success achieved by the DI project in gaining such significant support from other organisations based on the achievements of the project itself. This will allow the framework established during the DI project to be further developed, and the conservation success boosted even further in the future.

Another key standard measure achieved was the high level of training provided, particularly to local stakeholders. This will promote the sustainability of the project once Darwin funding has ceased, as the fisheries programme can continue almost self-sufficiently without the need for input from external experts. The benefits of the project were also felt by students from the United Kingdom, for whom the DI project research formed either part or all of their theses. During the project there were one master's thesis and two PhD theses involving Darwin research related to the overall project.

A small number of standard measure targets were not achieved. The main example of this was in the dissemination of material, where some target quantities of material were not achieved (for example UK TV and radio programmes). However, others were exceeded, such as Indonesian radio programmes, which the project considers to be more important for the long term impact of the project due to the promotion of similar conservation efforts throughout Indonesia. Additional peer-reviewed publications currently in preparation will add to the dissemination of the project achievements outside of Indonesia, particularly amongst the scientific and conservation communities.

Publications

Funding from DI supported a number of projects which are vital to the research activities taking place in the Wakatobi Marine National Park. In particular, fisheries monitoring of catch landings on Kaledupa and coral reef monitoring (through underwater visual census of fish communities and benthic assessments of habitat quality) have provided the foundations for a number of more specific studies.

Many of these have led to journal publications which have undergone the peer review process (see Annex 5 for a detailed list). In total at present, 15 scientific papers have been accepted and published in twelve different international journals, with a further one accepted and *in press*, one *in review*, and three *in preparation*.

Those already published feature in leading journals in the field of marine and environmental science, meaning their impact on the scientific community is likely to be high. Of the 12 papers already published, six are in journals with an impact factor of between 1 – 2, two of between 2 – 3, two between 4 – 6, and one of above 6. This level of success via the peer review process demonstrates the high regard which the research outputs from this project are held by the academic community.

In addition to international scientific journals, a major publication output from this project has been a peer reviewed edited book. Published by *NOVA Science (New York)*, the book entitled "Marine Research and Conservation in the Coral Triangle: The Wakatobi National Park" was independently reviewed by anonymous experts in the relevant field for each chapter. The book included chapters on a range of topics surrounding research and conservation in the Wakatobi, including a summary of DI fisheries monitoring data, providing a detailed background with the Wakatobi as a case study.

Furthermore, an invited book chapter was also written for inclusion in an edited book entitled "Fishery Management", published by *NOVA Science (New York)*. This

chapter focused on the role of communities in coral reef fishery management, and was based on the experiences and efforts of the DI funded Kaledupan Fisheries Project. Although this chapter was not peer-reviewed, it represents another significant publication output from the project.

5.5 Technical and Scientific achievements and co-operation

Reef monitoring programme

An annual survey of coral reef community structure has been carried out at sites around Kaledupa since 2002, and has been supported by DI since 2007. Marine ecologists survey a total of 108 fixed transects during the summer research period, with key data collected including hard coral cover and fish abundance. This data provides a detailed assessment of the state of reefs in the area, particularly highlighting temporal changes, and also forms the foundation of more detailed research carried out by Operation Wallacea academics in their respective areas of interest.

Methodology is separated into two components. Continuous line intercept transects (50m length) are used to assess the benthic state of the reef, whilst time restricted belt transects (50m length, 5m width and depth) are used to assess the fish community. These transects are both repeated in triplicate at each site, and also at each of three depths representing the major reef zones: reef flat (<5m), reef crest (5m) and reef slope (12m). In 2011, fish monitoring was performed using a stereo-video technique for the first time. This cutting edge technology uses a dual camera setup, which allows post-dive data processing and enables individual fish lengths and biomass to be calculated. This is an important advantage over the conventional visual census method, and will allow a more detailed and accurate data set to be collected in the future with particular relevance to the fisheries management project through biomass information.

Scleractinian corals (hard corals) are the ecosystem architects of complex reef systems, and as such their abundance (measured as % cover) is an important indicator of habitat quality. Reefs around Kaledupa underwent large scale declines in their hard coral cover in the early 2000's, with some sites experiencing as much as a 75% decline in just a few years (Figure 4.1). This is an alarming rate of decline, which would often be expected to ultimately lead to a collapse of the ecosystem. However, Darwin funded monitoring has since shown a significant increase in hard coral cover, which suggests the reefs around Kaledupa are in some state of recovery. Levels remain significantly below their original 2002 values, but the early signs of recovery are encouraging, and the most recent data sets, which are currently being analysed, will give a better indication of the extent of recovery.

Reef fish are of particular importance to the Darwin Project, as they provide the resource base to support the local fisheries around Kaledupa. As with hard corals, monitoring initially highlighted a severe decline in fish abundance of up to 90% at some sites over a period of several years (Figure 4.2). However, in more recent years, levels have stabilised, which is a positive sign. This suggests that fishing pressure has moved towards sustainability, although to meet recovery targets, a significant increase in fish populations is still required. During the course of the Darwin Project, some sites have even seen an increase in fish abundance, which is a promising sign in light of the fisheries management efforts which have taken place.

Recent data sets are currently being analysed, including new biomass data obtained via stereo-video monitoring in 2011.

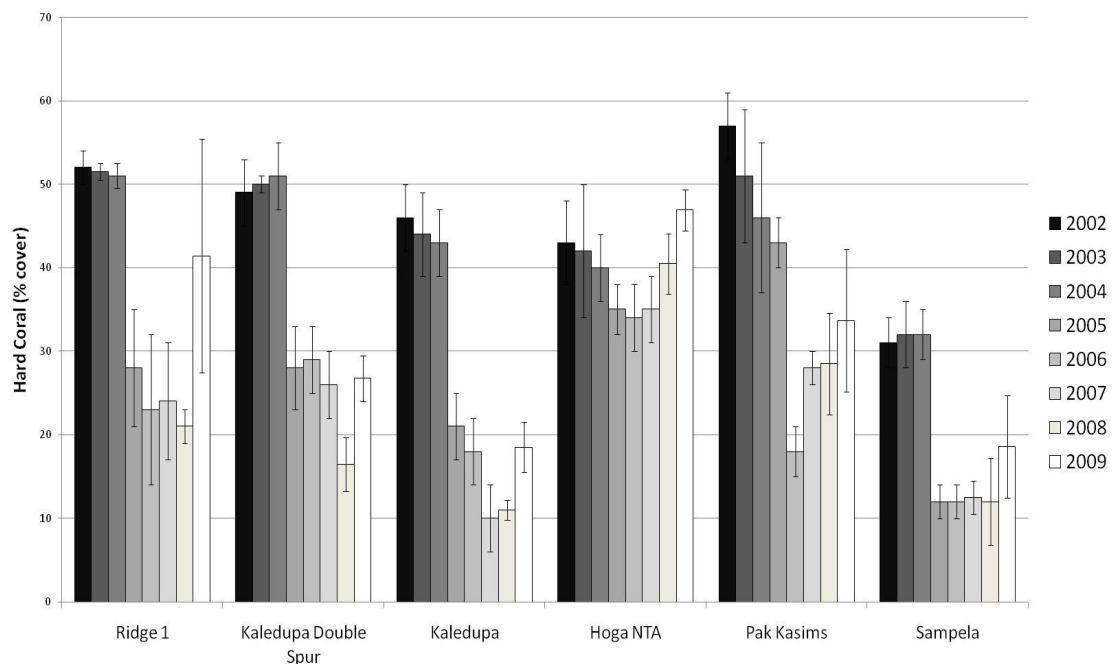


Figure 4.1. The percentage cover of live Scleractinian coral at 6 key monitoring sites around Kaledupa Island, Wakatobi Marine National Park, Indonesia. Data show mean values \pm SE for all reef zones (n=9).

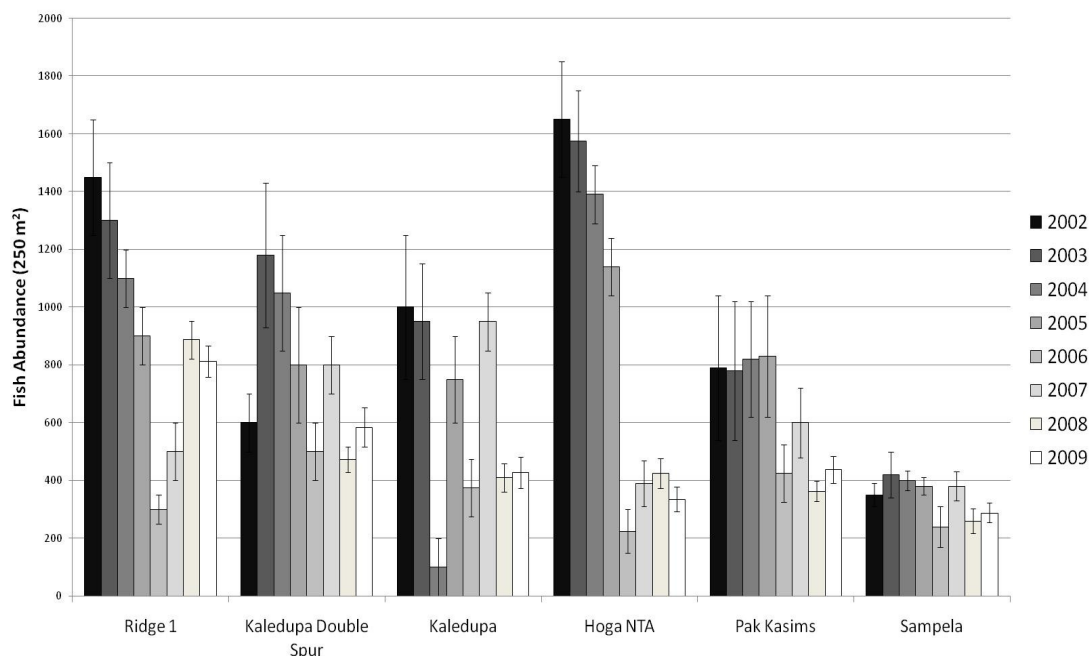


Figure 4.2. Total fish abundance (250m-2) at 6 key monitoring sites around Kaledupa Island, Wakatobi Marine National Park, Indonesia. Data show mean values \pm SE for all reef zones (n=9).

Fishery catch monitoring programme

In addition to ecosystem monitoring, fisheries monitoring has been ongoing throughout the Darwin Project. This has involved uninterrupted weekly catch monitoring at the nine major landing sites around Kaledupa over a 24 hour period. This has been carried out by specially trained local monitors under the guidance of FORKANI and international fisheries scientists contracted to the project.

This programme provides baseline data on the state of the Kaledupan fishery, including parameters such as catch per unit effort (CPUE), catch composition and juvenile selectivity, and includes catch monitoring for all extraction techniques in use locally (including fish fences, fish traps, seine netting etc.). Data are entered into a database, allowing more detailed questions to be addressed, and to provide material for community awareness programmes.

As the Darwin Project on Kaledupa was focused on adaptive community-led management as a tool to protect the fisheries and encourage sustainability, a long term data set such as this is vital. For example, it has allowed the most heavily impacting gear types to be identified, and conservation efforts to be tailored in a way that prioritises their management. This was fundamental in the formation of the bylaws by the Kaledupa Fisheries Forum in 2009. The continuation of this data collection will also allow fisheries management to be continually assessed, and any management failings and emerging threats to be identified quickly.

Fishery community management

The ultimate aim of the Darwin Project on Kaledupa was the design and implementation of a successful and sustainable community management programme to develop the future sustainability of local fisheries. This is something which has proved especially difficult throughout the tropics, due in part to the high reliance of local communities and economies on these natural resources, combined with a lack of awareness of environmental issues surrounding overfishing. This project therefore took a careful approach, ensuring that all stakeholders were included in the process throughout.

One of the first steps in the management process was to effectively semi-close the fishery, and move away from the open access 'Olympic' system which previously existed. This was an important step, as not only would it reduce the overall fishing effort taking place by limiting effort to local fishers, it would also provide a sense of ownership to local resource users, and form a basis for more detailed management in the future. Restricted access was achieved through a boat registration scheme, whereby all boats operating from villages on Kaledupa were given a registration number, painted clearly on the vessel. This had the added benefit of being essentially self-policing, as local fishers would discourage 'foreign' fishing effort from taking place in their waters.

Once restricted access had been achieved, the issue of overfishing could be addressed. Detailed village level consultations were carried out, allowing stakeholders to discuss fishery problems and potential remedies with representatives of local conservation organisations in conjunction with the Darwin Project. Representatives were then democratically elected from each Village Forum to join the Kaledupa Fisheries Forum (KFF); a task which was completed in November 2008.

The inaugural meeting of the KFF took place in August 2009, and was attended by the 27 elected village representatives, as well as 38 additional persons including government officials, fisheries and conservation scientists, and representatives from

local NGOs. A number of presentations were given over the two day event, followed by extensive discussions. This resulted in an agreement on 24 island-wide bylaw restrictions on fishing gears – an achievement of one of the Darwin Initiative objectives. Since September 2009, FORKANI has been working in all villages on Kaledupa to ensure the introduction and enforcement of these bylaws.

Subsequent meetings with regional government representatives have indicated the high regard in which this achievement is held. In light of the success of the KFF, the Wakatobi government has requested funding from Indonesian central government to implement similar schemes on the three other main islands which make up the Wakatobi Marine National Park.

Sustainable business development

Although the introduction of bylaws was an important step in the right direction, they were unlikely to enable adequate fishery recovery unless the original objective of a 30% reduction in fishing effort was also achieved. For this reduction to be possible, it was necessary to provide an alternative income stream, which would act as compensation for those relinquishing their license to fish around Kaledupa.

Various consultations were carried out into the viability of a number of options available on Kaledupa over the initial two years of the Darwin Project. These identified the carrageenan industry as the most suitable source of alternative income. Seaweed farming is widespread in the Wakatobi, but the raw material currently exported from the area means only small financial rewards are gained. By processing the harvested seaweed, however, Carrageenan can be extracted, which is a much more valuable product. To achieve this, a processing plant is required, along with the technical expertise to run and maintain the facility. Initial reports estimated that a \$2 million investment would create a business which is lucrative to investors, whilst also allowing \$1.75 million to be paid annually as compensation to those fishers surrendering their licenses. Currently, a site on Kaledupa has been provided, and a plant building constructed by the Wakatobi government, meaning the project is well on its way. Once operational, the plant is expected to enable sufficient buy outs to ensure the full quota of 30% of fishers are removed from the fishery.

In addition to the Carrageenan extraction plant, ecotourism was identified as a potential source of alternative incomes. Despite the focus on the carrageenan industry as the primary option, the Darwin Project team has been advising on the development of ecotourism on Kaledupa. Improved ecotourism in the Wakatobi as a whole is a target of the Wakatobi government, and significant investment has already been made by them. The remote nature of the Wakatobi is a major obstacle to attracting ecotourists, and this has been tackled by the construction of a 1.4 km runway on Wanci Island, with daily flights subsidised by the government. There is currently a project underway to extend the runway to allow larger capacity aircraft to fly into Wanci directly from Bali. Furthermore, the success of Operation Wallacea led research in the Wakatobi is viewed by the government as an important aspect of future ecotourism. As such, a Marine Research Centre was constructed on Hoga Island through a £300,000 government grant, which opened in March 2010.

Project Staff

Tim Coles, Project Director of Operation Wallacea, Operation Wallacea Trust
Founder, Kaledupan Darwin Initiative Project Leader 2007-2011
Edi Purwanto, Kaledupan Darwin Initiative Project Manager 2007-2011

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Piotr Kalinowski, Kaledupan Darwin Initiative Project Business Development Advisor 2007-2010
Dan Exton, Operation Wallacea Marine Research and Operations Manager, Kaledupan Darwin Initiative Project Fisheries Scientist 2007-2011
FORKANI staff involved in specific on site aspects of the project, including community education, fisheries monitoring, government liaising, and logistical support; particularly Beloro for overseeing the FORKANI aspects of the project.

5.6 Capacity building

FORKANI staff are now competent in registering boats, forming fishers Forums and running fishery surveys as evidenced by the proposed extension of the Kaledupa project to other Wakatobi Islands.

The Wakatobi government has been given a very valuable process description for building a medium scale carrageenan extraction plant that should generate significant tax revenue as well as raise income of carrageenan farmers and buy out surplus fishing effort on the Kaledupa reefs. Once the first carrageenan plant is up and running, the concept can be applied to other reef fisheries with shares used to reduce fishing effort to sustainable levels.

5.7 Sustainability and Legacy

The Forum funded by the Wakatobi government, the biological monitoring funded by Opwall, the implementation of the carrageenan extraction plant funded by the Wakatobi government and private investment and the buy outs of some of the fishing licences to reduce fishing effort once the carrageenan plant is established are likely to be the achievements of the project that will endure.

The FORKANI staff will likely be funded by the Wakatobi government to introduce similar schemes on other Wakatobi Islands. The CRRU staff are funded by the University of Essex. The Opwall Trust staff have funding from other World Bank and international aid projects. Opwall staff are funded from the tuition fees paid by students to join the research programme.

6 Lessons learned, dissemination and communication

Lessons to be drawn from this project

The Kaledupan Darwin project has provided an example of best practice for implementing reef fisheries management which achieves both community and government support. This is something conservation organisations throughout the tropics have struggled to achieve. It has, however, underlined the importance of supportive government in the overall process, as the backing of the Bupati (regional governor) has been instrumental in achieving many aspects of the project.

Community management is based on the 'trialogue' of partners: local resource users, NGOs and government (with the latter often the most difficult to gain the backing of). In the Wakatobi, the early formation of strong ties with senior government officials, including the Bupati, by DI and Operation Wallacea scientists provided a stable foundation on which the fisheries management strategy was built, and helped overcome this potential difficulty.

The project also reiterated the widely publicised importance of a multi-disciplinary approach to conservation problems. The diverse group of international experts brought in to consult on the management process, combined with educational and training programmes for local stakeholders, provided a pool of individuals which possess both the practical and academic qualities needed to complete the project. It also ensured that the process could be maintained after Darwin funding had ceased due to the heavy involvement of local communities throughout the process, with social scientists key in facilitating this aspect of the work.

Project dissemination

Locally, information relating to project achievements was prioritised to the resource users themselves, as this was felt to be the best strategy to encourage continued compliance through increased awareness.

On a broader scale, this project was designed to develop a method of best practice which could ultimately be applied to other reef fisheries in Indonesia once a successful strategy had been identified and tested. Therefore, project achievements were also heavily communicated to regional government and high profile conservation organisations. This was designed to help inform stakeholders in other areas of the Wakatobi and Indonesia on the possibilities for successful reef management, in a format which will also develop the local economy through the provision of alternative income streams based on the principle of enhanced prices for existing products. This has already been successful, with the Wakatobi government currently in the process of implementing similar programmes on the other main islands of the region.

Project dissemination will continue after the completion of the project. Due to the continued work of Operation Wallacea in a marine research capacity in the area, and the efforts of FORKANI on Kaledupa, the framework is in place for the state of Kaledupan fisheries to be monitored in the future and island-wide consultations, including the fisheries forum process, to be upheld. This will provide regular updates on the state of the fishery, and thus the success of the management process, which will be communicated to all parties. Additional peer-reviewed journal papers are also planned to ensure that the continued long term success of the project is widely disseminated amongst the international scientific and conservation community.

6.1 Darwin identity

In all instances where the Darwin project has been publicised, the Darwin Initiative has been specifically recognised. This is particularly true of media outputs, including Indonesian radio and TV programmes. Written articles in the popular press, including locally published newsletters, have included the DI logo where applicable.

The on site identity of DI has two components. The fisheries management programme itself was identified to all parties as a distinct and independent programme clearly identifiable as a DI project. This included work relating to the main focus of the project, such as fisheries monitoring, community education and awareness, establishment of a representative-led fisheries forum and development of alternative income streams. However, additional work carried out during summer research seasons on the Hoga Marine Research Base was incorporated into the Operation Wallacea research programme. This included projects part-funded by DI with clear benefits to the fisheries management project, but where the majority of the funding was via Operation Wallacea's tuition fee programme.

There is now a high degree of understanding of DI within the project region of the host country. All stakeholders involved in the project have been made aware of the role of Darwin as an entity associated with the fisheries management programme. This is particularly true of local government and NGOs, who were more heavily involved behind the scenes than many local resource users, and thus naturally more aware and familiar with the work of DI.

7 Monitoring and evaluation

The logframe provided an excellent sense of direction for the Kaledupa project, and allowed achievements and setbacks to be monitored much more closely than would otherwise have been possible. The monitoring and evaluation (M&E) aspect of the logframe was particularly beneficial to this project in particular, as the large number of stakeholders involved in the process meant that project leaders were often required to react to unforeseen circumstances and evaluate the project structure accordingly. This proved successful, as can be seen with the high level of success seen in the project logframe (see Annex 1 and 2), and helped communicate project progress to partners and collaborators. Those outcomes and specific activities which were subject to change after M&E are discussed in more detail below:

Activity 1.1 was achieved but after some delay. The KFF was due to be established in Year 1, but was delayed until Year 3. This was due to government being keen to ensure full consultation with local communities, which proved a major benefit to the overall success of the project, and should thus be viewed as a necessary and important amendment to the original logframe. Conservation efforts on this scale require continual refinement and alteration to cope with issues as they arise. This is an excellent example of how communication between multiple parties within the Kaledupa management framework acted to boost success by modifying the process.

Activity 1.3 stated that business income should at least partially fund the KFF during the project. However, this did not take place as it proved unnecessary. During the course of the project, the KFF was included in the World Bank COREMAP project funding for the Wakatobi, whilst the Wakatobi government has agreed to fund the KFF now the Darwin project has ended. This ensures the continuation of the KFF as an active body on Kaledupa into the future, which is hugely positive in terms of the

legacy of the Kaledupan DI project, and also achieves Activity 1.4 (that the KFF would be self-sufficient from business income after the project ends).

Activity 1.5 (quarterly KFF info bulletin) began, but was not continued. This was simply a reaction to local developments, where COREMAP funded the formation of a Kaledupan radio station, and thus the info planned for bulletins was communicated to local stakeholders via this medium, making the bulletins unnecessary.

Activity 3.3 was completed, but with a minor amendment. The original proposal was to train a local project team to undertake all aspects of the fisheries monitoring programme. However in practice, it proved much more effective to employ an experienced fisheries scientist for a short period each year to perform data analysis. This was simply due to the large and complex nature of the data set, and our desire to maximise the scientific outputs from the project, which require a higher degree of training and expertise than was available locally.

Output 4 is well underway, but proved an optimistic target within the timeframe of the project. Delays were due to the longer than anticipated time required to develop sufficient economic backing to establish the carrageenan plant (which was identified through business development consultancies to be the most suitable and sustainable option to remove fishing pressure around Kaledupa). However, this should not be viewed as a failure, as a number of key steps have already been achieved, such as obtaining the land and building for the carrageenan plant, on a free of charge basis to ensure investors are willing to provide sufficient shares to reduce fishing pressure by 50%. The investment process is underway, and will continue despite the ending of the Darwin project – which is testament to the longevity of the programme developed on Kaledupa.

Project Evaluation

Due to the large team involved in the project, and the diverse backgrounds and areas of expertise they represent, internal evaluations have been taking place constantly, albeit informally. Now the project has officially finished, continued progress will be monitored by Operation Wallacea in their capacity as a key conservation and research component of the Wakatobi. This will be in partnership with the Wakatobi government and other conservation organisations in the area, with continued progress planned until the buy-outs can be achieved, at which point fisheries and ecosystem monitoring will continue to assess changes in the state of the Kaledupan fishery, hopefully illustrating a recovery in stocks and associated increased catches.

7.1 Actions taken in response to annual report reviews

Reviewer comments have been taken on board and addressed throughout the course of the project. Most related to terminology, and simply requested clarification of the roles of various project partners and additional funding sources. This is understandable as the Kaledupan fishery management project involved an enormous number of stakeholders in an area of the world which is traditionally difficult to work in. It was therefore important that we included all relevant organisations as project partners to ensure full cooperation with all stakeholders, and to maximise the chance of success and ensure the legacy of the project after Darwin funding has ended.

One comment which we feel should be addressed in particular is in relation to publications, where the reviewer requests clarification of the links between DI and the publications listed in our annual reports. The majority of Darwin funding was used to

establish the fisheries management programme on Kaledupa, including components such as boat registration, KFF formation, fisheries catch monitoring and alternative income business development. However, an important aspect of the project was the monitoring of ecosystem health via underwater visual census, which Darwin part-funded alongside Operation Wallacea (who possessed the expertise to perform the survey work). This data then facilitated more specific research projects on the Hoga Marine Research Base, as it provided baseline data on habitat quality and community composition for visiting Academics to build their research on. There are therefore a large number of publications which were possible only thanks to the availability of this baseline data. Those listed in this report are a small portion of these publications, included based on their relevance to the DI fisheries management project. Those projects making use of the monitoring data but concerning fields not relevant to fisheries management have therefore been excluded from this report, but are available on request.

Unless purely for clarification of terms, reviewer comments were discussed with project partners, and our responses represent the opinions of all senior project managers. All comments were, however, made available to everyone involved in the project.

8 Finance and administration

8.1 Project expenditure

See Table 7.1 for a breakdown of project expenditure.

Table 7.1. Annual and total project expenditure and budget (2007-2011)

	BUDGET	EXPENDITURE (£)				Total	Variation (%)
		2007-08	2008-09	2009-10	2010-11		
Overheads	14,500	3,000	2,500	4,778.66	4,691.86	14,970.52	+3.24
Office costs	12,853	2,400	2,000	4,017.13	4,070.62	12,487.75	-2.84
Travel and subsistence	13,632	3,360	6,414	2,216.88	1,448.19	13,439.07	-1.42
Printing	1,600	500	1,100	0.00	0.00	1,600	0
Conferences	5,026	2,365	2,661	0.00	0.00	5,026	0
Capital items	13,714	4,250	0	6,129.54	3,789.27	14,168.81	+3.32
Others (Audit costs)	2,000	500	500	479.63	477.33	1,956.96	-2.15
Salaries	86,675	28,625	34,825	18,266.84	5,983.00	87,699.84	+1.18
TOTAL	150,000	45,000	50,000	35,888.68	20,460.27	151,349	+0.90

Salary Breakdown

2007-2008

Tim Coles	Project Supervisor	£4,000
Duncan May	Fisheries Scientist	£9,300
Piotr Kalinowski	Business Development Advisor	£3,808
Julian Clifton	Social Research Advisor	£625
FORKANI	Local staff wages	£11,000

2008-2009

Tim Coles	Project Supervisor	£3,000
Edi Purwanto	Project Manager	£6,500
Richard Stanford	Fisheries Scientist	£1,300
Piotr Kalinowski	Business Development Advisor	£6,025
FORKANI	Local staff wages	£18,000

2009-2010

Edi Purwanto	Project Manager	£3,062.54
Joel Rice	Fisheries Scientist	£1,500
M Siddq	Book Keeper	£2,625.04
Piotr Kalinowski	Business Development Advisor	£920
FORKANI	Local staff wages	£10,159.26

2010-2011

Edi Purwanto	Project Manager	£1,177
Joel Rice	Fisheries Scientist	£1,275
Aji Wahyu Anggoro	Fisheries Scientist	£2,746
M Siddq	Book Keeper	£785

Details of Capital Items

2007-08

Computer equipment to facilitate database construction	£2,250
Business development (implementation of the Kaledupan boat licensing scheme)	£2,000

2008-09

None

2009-10

Business development (development of the Kaledupan carrageenan processing plant)	£6,129.54
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2010-2011

Business development (payments for <i>Perdi</i> – required for the ratification process of bylaws agreed by the Kaledupan Fisheries Forum)	£3,789.27
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8.2 Additional funds or in-kind contributions secured

This has been one of the major achievements of the project and substantial additional funding has been attracted to help achieve the original project proposed to DI. This funding includes the following:

COREMAP, a World Bank funded project for fisheries in eastern Indonesia made all their staff on Kaledupa available for implementing the described project and disseminating information

about the project. Salaries for their staff amounted to £30,000 over the lifetime of the project. Note COREMAP pledged 100% support for the DI project but the original figure claimed in the Stage 2 application related to all the COREMAP staff in the Wakatobi, most of which worked on related projects but not directly on the Kaledupa project. The figure claimed relates only to Kaledupa based staff. In total, COREMAP funding for related projects during the course of the Darwin project totalled in excess of £500,000.

Operation Wallacea provided substantial additional funding for academic input to the monitoring programme and purchase of equipment and boats to support the monitoring (estimated conservatively at £120,000 over the 2007 – 2011 period)

The Wakatobi Government provided substantial funding for the construction of the carrageenan building and land (cost £150,000) and significant investment in increasing tourism to Kaledupa Island so that homestay income would increase for fishers and their families. This investment included constructing a marine research centre on Hoga Island (£300,000) to build on the research reputation that the work on Hoga has engendered (the overall concept is to market the Wakatobi around the research as done for the Galapagos Islands). In addition a jetty has been constructed on Hoga so that visitors can land without damaging the coral, electricity has been supplied to the homestays, a decompression chamber constructed so that dive based tourism can operate in the Wakatobi and the runway on Wanci extended so that flights can come directly from Makassar or Bali. In addition significant sums have been spent by the Wakatobi government in promoting the islands as a destination built around the marine research programme which has been part funded by DI. It is difficult to put a total value on all this expenditure but the benefits to Kaledupa and the DI project conservatively are £500,000, and total funding relating to the Darwin project (although not necessarily directly involving the project) amounted to over £1 million. In addition, the Wakatobi government has now funded the establishment of a new marine based university in the islands and the newly appointed Dean is meeting with the Coral Reef Research Unit at Essex University with a view to establishing a long term collaboration.

8.3 Value of DI funding

Whilst research tourism had already been started by Operation Wallacea on Kaledupa before the DI funding, achievement of the grant enabled the initial research findings to be directed towards a conservation management project for the reef fishery. Without this initial DI funding the boat registration, the Fishers Forum and the process development and business plan for the carrageenan extraction plant would not have happened. All these developments then led to significant additional investment by other partners and commitment to carry on the Kaledupa fishery management project (and extend it to other islands) after the DI funding has finished.

Annex 1 Report of progress and achievements against final project logframe for the life of the project

Project summary	Measurable Indicators	Progress and Achievements April 2007 - March 2011
<p>Goal: To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but constrained in resources to achieve</p> <ul style="list-style-type: none"> • The conservation of biological diversity, • The sustainable use of its components, and • The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources 		<p>The main achievements have been to demonstrate that artisanal fisheries in coastal communities will with initial support introduce registration schemes to limit the use of boat access to overfished reefs, develop fishery byelaws and that carrageenan extraction can provide the income needed to complete buy outs of reef fishing licences and provide factory gate prices rather than middle men prices for all carrageenan farmers</p>
<p>Purpose To build capacity for sustainable fisheries co-management in the Wakatobi Marine National Park</p>	<p>KFF functioning effectively by yr1 Fisheries monitoring and assessment functioning by yr1 Effective enforcement system by yr3</p> <p>Initiation of 'buy outs' by year 2 Evidence of recovery of fisheries by yr4</p>	<p>The Kaledupa Fishers Forum was formed later than year 1 because the Bupati (Governor of the region) wanted to make sure there was full consultation with all the villages on Kaledupa so there was widespread support and elected representatives from each village. He then wanted to use the formation of the Forum to complete consultation over island wide fishery regulations. This was achieved with 22 byelaws being agreed and the Wakatobi government are now using this model to create Fishers Forums on the other islands in the Wakatobi.</p> <p>The buy outs were not achieved because it took much longer than anticipated to develop the business opportunities. A number of business opportunities to support the buy outs were investigated including homestay ecotourism, aquaculture and carrageenan extraction. The best option was carrageenan extraction and detailed process and business plan development was completed and demonstrated that a plant constructed on Kaledupa could provide sufficient income to complete the buy outs of 50% of the fishing effort (buy outs are proposed as offering shares with annual dividend payments in exchange for fishers licences), pay factory gate prices for the carrageenan (40% higher than the middlemen prices currently paid) and produce an attractive return on initial investment. The Wakatobi government proceeded to construct a building on a 3 ha plot with landing facilities for the carrageenan plant. The concept is that the Government will offer the use of the land and buildings free of charge to a commercial investor in exchange for that investor offering sufficient shares in the business to buy out 50% of the reef fishing effort. Negotiations are currently ongoing with investors to construct a pilot plant to produce a scale model of the lab concept and from there to a full</p>

		<p>plant.</p> <p>The delay in developing sufficient economic firepower to buy out the fishing licences has meant that the only changes to the fishery since the DI scheme started has been the restriction of fishing effort to licensed (i.e. Kaledupa based) boats (this reduced fishing effort because boats from other islands were previously fishing the Kaledupa reefs) and the introduction of gear based byelaws. This reduction does appear to have stabilised the catches albeit at a low level and without the buy outs the fishery is unlikely to start recovering.</p>
Output 1. Fisheries co-management established and functioning under the KFF	KFF members trained in fisheries management by yr2 Island wide fisheries regulations by yr2	<p>FORKANI, a Kaledupa based NGO formed from local fishers were the organisation that completed the consultation with the fishing communities. Training was completed in how to conduct these consultations and how to conduct weekly creel censuses. After this initial training the consultation process, formation of the Kaledupa Fishers Forum and weekly fishery monitoring was entirely completed by FORKANI. The fisheries regulations were introduced by year 3 because of the delay in formation of the Forum (see above) but island wide regulations were agreed and introduced.</p>
Activity 1.1 KFF functioning effectively by yr1		The Forum was formed in year 3 but the delay enabled a much stronger organisation to be created with elected representatives from each village
Activity 1.2 Yr 2 Ensure KFF functions as a decision making body and registration process completed		The agreement to introduce 22 island wide byelaws is evidence that the Forum is functioning effectively. The registration of all the fishing boats on Kaledupa (>1000) was completed by the end of year 2.
Activity 1.3 Yr 3 Ensure KFF has partial funding from business income		This proved unnecessary because funding of the Forum was include din the World Bank COREMAP project and the Wakatobi government have agreed to fund the Forum after COREMAP finishes.
Activity 1.4 Yr 4 Ensure KFF is self-sufficient from business income		See above
Activity 1.5 Quarterly KFF info bulletin & annual report		Quarterly KFF newsletters were not produced – one newsletter was produced before the formation of the Forum to describe its purpose and a second was produced after agreement of the byelaws. The reason the newsletters became less important is that COREMAP funded the formation of a local radio station on Kaledupa and FORKANI staff had regular slots on this station so could update on fishery developments.
Activity 1.6 Yr 2 Sustainable fisheries management workshop for KFF members;		This workshop was the one that developed the island wide fishery regulations under the chairmanship of the Bupati.

<p>Output 2. Effective enforcement of fisheries regulations</p>	<p>KFF develop and maintain effective surveillance and collaborative policing strategy by yr2</p> <p>Reduced levels of non-compliance by yr3</p>	<p>The building of the Forum from elected representatives from each village created a strong basis on which the Forum could have the authority to develop a policing strategy. The Marine National Park rangers and the police are members of the Kaledupa Forum. The policing of the registered only boats and the byelaws is mainly done at village level with National Park rangers providing some additional support. The National Park rangers though were far less widely supported amongst the coastal communities than were the Forum representatives in each village.</p>
<p>Activity 2.1. Yr 2 Workshop to develop collaborative enforcement strategies (police, park rangers and communities)</p>		<p>This was done at the time of the formation of the Forum and creation of the byelaws</p>
<p>Output 3. Fisheries & biodiversity assessment program established & functioning</p>	<p>Senior Fisheries Manager, 3 Fisheries Scientists and 20 Fishery Monitors trained in fisheries monitoring programme.</p> <p>Weekly fish landings surveys completed and interview data from fishers registration recorded</p> <p>CRRU completes fish and biodiversity monitoring on 108 transects</p> <p>Data condensed into reports and proposed management actions for KFF to use for decision making</p>	<p>This was completed on target and the fishery monitoring programme ran uninterrupted on a weekly basis from April 2007 to August 2010 and the data entered into a database.</p> <p>Data on each fishers gear and boats was collected at the registration of all the boats in year 1.</p> <p>The CRRU completed fish and coral monitoring on 108 transects annually throughout the DI project and this annual monitoring continued in 2011 and is being funded on an annual basis by Operation Wallacea.</p> <p>Fisheries reports on the catch data have been produced and these data provided to the Kaledupa Fishers Forum</p>
<p>Activity 3.1 Yr 2 Manual produced on fisheries assessment and management</p>		<p>This Manual was produced at the beginning of the project in order to train the fisheries monitors</p>
<p>Activity 3.2. Yr 1 Establish fisheries monitoring programme</p>		<p>This was established very successfully and was run by an Indonesian NGO throughout the scheme</p>
<p>Activity 3.3. Yr 1 Training for project team on monitoring and assessment techniques, database analysis and reporting to KFF;</p>		<p>Training was completed for the FORKANI team on the monitoring and database input. It proved much more effective though to employ an experienced fisheries scientist to complete the annual analysis of the</p>

		fisheries data.
Activity 3.4 Yr 2 Establish scientific basis for a sustainable fishery using field data;		The database output data on catch per unit effort for different techniques (from which changes in catch rates over years can be compared) and length frequency for each species landed (from which percentage mature fish can be calculated).
Activity 3.5 Yr 3 Analysis of biological and socio-economic time series data		The fisheries landing data and the reef survey data have been written up as a series of reports and papers. In addition the reef survey data are being analysed as part of a PhD at Essex University
Output 4 Alternative income sources developed to provide 'buy out's of fishing licences and reduce fishing effort	<p>Development of business plans to provide income for 30% (in fishing effort terms) of fishers to sell their licences</p> <p>Exchange of licences for businesses</p> <p>Generation of sufficient business income to cover KFF costs</p>	<p>A business plan with sufficient generated income to buy out at least 30% of the fishing effort has been completed (see above). The Wakatobi Government has constructed the building and made the land available for the plant to investors in exchange for offering sufficient shares to Kaledupa fishers to buy out 50% of the reef fishing effort</p> <p>The buy outs have not begun and with hindsight this was far too optimistic a timetable since development of businesses to generate sufficient income to buy out fishing effort is generally going to take longer than the timeframe of a DI project.</p> <p>The funding for the Forum became unnecessary because of funding from COREMAP and the Wakatobi government.</p>
Activity 4.1 Yr 1 Economic study for alternative incomes		This was completed and identified carrageenan extraction as the business to develop.

Annex 2 Project's final logframe, including criteria and indicators

Project summary	Measurable Indicators	Means of verification	Important Assumptions
<p>Goal:</p> <p>To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve</p> <ul style="list-style-type: none"> • the conservation of biological diversity, • the sustainable use of its components, and • the fair and equitable sharing of benefits arising out of the utilisation of genetic resources 			
<p>Purpose:</p> <p>To build capacity for sustainable fisheries co-management in the Wakatobi Marine National Park</p>	<p>KFF functioning effectively by yr1 Fisheries monitoring and assessment functioning by yr1 Effective enforcement system by yr3</p> <p>Initiation of 'buy outs' by year 2 Evidence of recovery of fisheries by yr4</p>	<p>KFF quarterly meeting reports Field survey reports and database</p> <p>Ranger and local community enforcement records Budgets</p> <p>Project technical reports</p>	<p>National & regional government act on policies that support community based co-management</p> <p>Political climate remains stable</p> <p>Fishers remain receptive to programme</p>
<p>Outputs:</p> <p>1. Fisheries co-management established and functioning under the KFF</p>	<p>KFF members trained in fisheries management by yr2 Island wide fisheries regulations by yr2</p>	<p>KFF training workshop attendance</p> <p>Village and KFF meeting records</p>	<p>KFF members remain committed to program</p> <p>KFF legislation and zonation accepted by National Park and regional government</p>
<p>2. Effective enforcement of fisheries regulations</p>	<p>KFF develop and maintain effective surveillance and collaborative policing strategy by yr2</p> <p>Reduced levels of non-</p>	<p>Community and Ranger training (funded by COREMAP) workshop attendance levels Park Ranger & community records</p>	<p>Local Rangers co-operate with KFF policing strategy Communities are proactive in self-policing High legitimacy of regulations</p>

	compliance by yr3		
3. Fisheries & biodiversity assessment program established & functioning	<p>Senior Fisheries Manager, 3 Fisheries Scientists and 20 Fishery Monitors trained in fisheries monitoring programme.</p> <p>Weekly fish landings surveys completed and interview data from fishers registration recorded</p> <p>CRRU completes fish and biodiversity monitoring on 108 transects</p> <p>Data condensed into reports and proposed management actions for KFF to use for decision making</p>	<p>Training workshop attendance</p> <p>Database</p> <p>CRRU reports</p> <p>Quarterly reports to KFF</p>	<p>Trained project staff continue to operate under KFF and use skills provided</p>
4. Alternative income sources developed to provide 'buy out's of fishing licences and reduce fishing effort	<p>Development of business plans to provide income for 30% (in fishing effort terms) of fishers to sell their licences</p> <p>Exchange of licences for businesses</p> <p>Generation of sufficient business income to</p>	<p>Business plans</p> <p>Data on numbers of fishing licences bought out</p> <p>Budgets from year 3</p>	<p>Businesses develop sufficient income</p>

Activities	Activity milestones (summary of project implementation timetable)	Assumptions
Co-management Framework	Yr 1 Establish fisheries monitoring programme; Yr 2 Ensure KFF functions as a decision making body and registration process completed Yr 3 Ensure KFF has partial funding from business income Yr 4 Ensure KFF is self-sufficient from business income	District government and National Park support legislation and zonation to establish KFF Business income from ecotourism and marine aquarist supplies is sufficient
Training & Capacity Building	Yr 1 Training for project team on monitoring and assessment techniques, database analysis and reporting to KFF; Yr 2 Sustainable fisheries management workshop for KFF members; Yr 2 Workshop to develop collaborative enforcement strategies (police, park rangers and communities)	Local partners remain committed to project and are effective in transferring knowledge and skills
Field Research Program	Yr 1 Development of biological and socio-economic program; Economic study for alternative incomes Yr 2 Establish scientific basis for a sustainable fishery using field data;; Yr 3 Analysis of biological and socio-economic time series data	Local communities remain willing to comply with fisheries and socio-economic monitoring
Dissemination & Publicity	Quarterly KFF info bulletin & annual report Yr 2 Manual produced on fisheries assessment and management Yr 2 - 4: radio and TV broadcasts, and national and local newspaper articles Yr 3 Film produced to increase public awareness of the importance of sustainable resource use; Scientific publications.	Local and national press remain interested in project progress

Annex 3 Project contribution to Articles under the CBD

Project Contribution to Articles under the Convention on Biological Diversity

Article No./Title	Project %	Article Description
6. General Measures for Conservation & Sustainable Use		Develop national strategies that integrate conservation and sustainable use.
7. Identification and Monitoring		Identify and monitor components of biological diversity, particularly those requiring urgent conservation; identify processes and activities that have adverse effects; maintain and organise relevant data.
8. In-situ Conservation	10	Establish systems of protected areas with guidelines for selection and management; regulate biological resources, promote protection of habitats; manage areas adjacent to protected areas; restore degraded ecosystems and recovery of threatened species; control risks associated with organisms modified by biotechnology; control spread of alien species; ensure compatibility between sustainable use of resources and their conservation; protect traditional lifestyles and knowledge on biological resources.
9. Ex-situ Conservation		Adopt ex-situ measures to conserve and research components of biological diversity, preferably in country of origin; facilitate recovery of threatened species; regulate and manage collection of biological resources.
10. Sustainable Use of Components of Biological Diversity		Integrate conservation and sustainable use in national decisions; protect sustainable customary uses; support local populations to implement remedial actions; encourage co-operation between governments and the private sector.
11. Incentive Measures	60	Establish economically and socially sound incentives to conserve and promote sustainable use of biological diversity.
12. Research and Training		Establish programmes for scientific and technical education in identification, conservation and sustainable use of biodiversity components; promote research contributing to the conservation and sustainable use of biological diversity, particularly in developing countries (in accordance with SBSTTA recommendations).
13. Public Education and Awareness		Promote understanding of the importance of measures to conserve biological diversity and propagate these measures through the media; cooperate with other states and organisations in developing awareness programmes.
14. Impact Assessment and Minimizing Adverse Impacts		Introduce EIAs of appropriate projects and allow public participation; take into account environmental consequences of policies; exchange information on impacts beyond State boundaries and work to reduce hazards; promote emergency responses to hazards; examine mechanisms for re-dress of international damage.
15. Access to Genetic Resources		Whilst governments control access to their genetic resources they should also facilitate access of environmentally sound uses on mutually agreed terms; scientific research based on a country's genetic resources should ensure sharing in a fair

Article No./Title	Project %	Article Description
		and equitable way of results and benefits.
16. Access to and Transfer of Technology		Countries shall ensure access to technologies relevant to conservation and sustainable use of biodiversity under fair and most favourable terms to the source countries (subject to patents and intellectual property rights) and ensure the private sector facilitates such assess and joint development of technologies.
17. Exchange of Information	30	Countries shall facilitate information exchange and repatriation including technical scientific and socio-economic research, information on training and surveying programmes and local knowledge
19. Bio-safety Protocol		Countries shall take legislative, administrative or policy measures to provide for the effective participation in biotechnological research activities and to ensure all practicable measures to promote and advance priority access on a fair and equitable basis, especially where they provide the genetic resources for such research.
Other Contribution		Smaller contributions (e.g. of 5%) or less should be summed and included here.
Total %	100%	Check % = total 100

Annex 4 Standard Measures

Code	Description	Application target	Status	Details
1A	Number of people to submit PhD thesis	None	Two PhD theses to include Darwin project data	<p>One PhD (University of Essex, UK) near completion using monitoring data achieved through the DI project to assess resource utilisation by reef fish communities.</p> <p>One PhD (University of Essex, UK) underway involving field work to explore fish recruitment patterns in the area, directly relevant to, and making use of monitoring data achieved through, the DI project..</p>
2	Number of Masters qualifications obtained	None	One achieved	Masters in Environmental Governance (University of Essex, UK) completed with Distinction, based on thesis involving DI Project
6A	Number of people to receive other forms of education/training (which does not fall into categories 1-5)	<p>20 Fishery Monitors and 3 Fisheries Scientists</p> <p>20 KFF members</p>	Exceeded after Year 1	<p>26 fishery monitors, 1 Wakatobi fishery officer, 3 COREMAP staff, 2 Park Rangers and 2 WWF/TNC staff trained in fishery monitoring</p> <p>27 Potential forum members (one from each sub-district) and 4 FORKANI staff trained in fishery management options and how to develop local bylaws</p>

6B	Number of training weeks to be provided	2 x 1 week training courses and mentoring for 3 months	Achieved after Year 1	
8	Number of weeks to be spent by UK project staff on project work in the host country	160 man weeks	Achieved	40 man weeks annually
9	Number of species/habitat management plans (or action plans) to be produced for Governments, public authorities, or other implementing agencies in the host country	12 quarterly fishery management reports	Not fully achieved	Although on schedule after Year 1, fell behind after Year 2. However, a revision to the original target was suggested based on the ability to more efficiently achieve the desired outcome via a smaller number of reports
10	Number of individual field guides/manuals to be produced to assist work related to species identification, classification and recording	1 Fisheries Monitoring Manual	Achieved after Year 1	
11A	Number of papers to be published in peer reviewed journals	15 peer reviewed papers to be published	Achieved	A total of 15 peer review articles have been published in international journals See Annex 5 for details
11B	Number of papers to be submitted to peer reviewed journals	15 papers to be submitted	Achieved	In addition, there is a further one paper in press, one in review, and three in preparation There is also a peer reviewed edited book and contributed book chapter

				See Annex 5 for details
12A	Number of computer databases to be established and handed over to the host country	1 fishery database	Achieved after Year 1	
14A	Number of conferences/seminars/worksh ops to be organised to present/disseminate findings	2 workshops to be organised (fishery survey, KFF management training)	Achieved	2 workshops: (1) fishery surveying and (2) KFF management training
14B	Number of conferences/seminars/worksh ops attended at which findings from Darwin project work will be presented/disseminated	3 presentations at seminars	Achieved	Coral Reef Management Symposium in Coral Triangle Areas (organized by COREMAP, October 2009, Jakarta) CTI Conference, Wanci (January 2010) Wakatobi Government presentation by Dr David Smith (August 2011)
15A	Number of national press releases in host country(ies)	3 national Indonesian newspaper articles	Achieved	Articles in Bakti News (November 2008 and October 2009) COREMAP press release (January 2010)
15B	Number of local press releases in host country(ies)	6 local newspaper articles	Achieved	Kendari Post x 3 (2 pages) Media Sutra (1 page) Kendari Express (0.5 page) "Sustainable fisheries rescue in Kaledupa

				Island”, Opwall Trust Online (2010)
15C	Number of national press releases in UK	3 national UK press releases	2 Achieved	Article published in Biodiversity Science titled “Conservation efforts to restrict over-fishing in Wakatobi” (July 2011) Article published in New Scientist Online titled “Free-diving Indian Ocean nomads under threat” (July 2011)
16A	Number of newsletters to be produced	12 x quarterly KFF newsletters	Not fully achieved	Behind schedule after Year 3, but replaced by COREMAP funded newsletters and local radio, thus achieving the ultimate aim of the original newsletters.
16B	Estimated circulation of each newsletter in the host country(ies)	1000 readership in Indonesia	Achieved throughout project period	
16C	Estimated circulation of each newsletter in the UK	25 readership in the UK	Achieved throughout project period	
17A	Number of dissemination networks to be established	1 information network to be established by COREMAP	Achieved after Year 1	Information network established by COREMAP on Kaledupa to disseminate results
18A	Number of national TV programmes/features in host country(ies)	3 Indonesian national TV programmes	2 Achieved	Documentary on Metro TV (27 th November 2010) titled “ <i>Laboratorium bawah laut di jantung segitiga karang dunia</i> ” (Laboratory under the sea in the heart of the coral triangle region) Wakatobi fisheries documentary on Metro TV (2008)
18B	Number of national TV programmes/features in the	1 UK national TV programme	None achieved	

	UK			
18C	Number of local TV programmes/features in host country(ies)	4 local Indonesian TV programmes	Achieved	Kendari TV, Bale Bale KTV, Berita Lingkinan, Kendari TV (Documentary follow-up)
19A	Number of national radio interviews/features in host country(ies)	3 Indonesian national radio programmes	Achieved	Interview on Lawero Radio, Bau Bau. Sulawesi (July 2009) Several national radio interviews given by the Bupati (Wakatobi Governor), on the work of the Darwin Initiative to develop sustainable fisheries in the region
19B	Number of national radio interviews/features in the UK	1 national UK radio programme	None achieved	
19C	Number of local radio interviews/features in host country(ies)	4 local Indonesian radio programmes	Output exceeded after Year 1	50 completed, with 2 interviews circulated to 23 separate local radio stations Also monthly broadcasts on Radio Vatalolo in Kaledupa since January 2008
20	Estimated value (£'s) of physical assets to be handed over to host country(ies)	£1000	Achieved after Year 1	
21	Number of permanent educational/training/research facilities or organisations to be established and then continued after Darwin funding has ceased	1 Fishery and Biodiversity Research Centre	Achieved after Year 1	Centre will continue after Darwin funding has ceased. Rent is sufficiently low for FORKANI (with assistance from Operation Wallacea) to raise the required funds.
22	Number of permanent field plots to be established during the project and continued after	108 x 50m transects	Achieved after Year 1	

	Darwin funding has ceased			
23	Value of resources raised from other sources (i.e. in addition to Darwin funding) for project work	£402,750	£1,070,000 in matched funding achieved (260% of target figure)	<p>£120,000 from Operation Wallacea towards survey costs in 2008 and 2009</p> <p>£150,000 from Wakatobi Government for carrageenan extraction plant</p> <p>£300,000 from Wakatobi Government for marine research centre</p> <p>£500,000 from COREMAP for expenditure in Kaledupa in 2008 and 2009 (estimated 25% of total expenditure from COREMAP in Wakatobi)</p>

Annex 5 Publications and material

Type	Detail	Publisher	Available from	Cost (£)
Edited Book (Peer Reviewed)	Clifton J., Unsworth R.K.F., Smith D.J. (2010). Marine Research and Conservation in the Coral Triangle: The Wakatobi National Park. ISBN: 978-1-61668-386-3	Nova Science, New York, USA	www.novapublisher.com	60 (hardback)
Book Chapter	Exton D.A., Smith D.J. (In Press). Coral Reef Fisheries and the Role of Communities in their Management. <i>In: Intilli J.S. (eds.) Fishery Management.</i> ISBN: 978-1-61209-682-7	Nova Science, New York, USA	www.novapublisher.com	75 (hardback)
Peer Reviewed Journal	Exton D.A., Rice J., Simonin P., Smith D.J. (In Prep). Development of community based management to address the impacts of artisanal fishing on coral reefs.	N/A	N/A	N/A
	Exton D.A., Simonin P., Rice J., May D., Smith D.J. (In Prep). Impacts of artisanal fish fences on coral reefs in the Wakatobi Marine National Park, Indonesia.	N/A	N/A	N/A
	Exton D.A., Simonin P., Rice J., Smith D.J. (In Prep). Underwater visual census vs. fishery catch monitoring as methods to assess community change on coral reefs.	N/A	N/A	N/A
	Salinas-de-León P., Dryden C., Smith D.J., Bell J.J. (In Review). Temporal and spatial variability in coral recruitment patterns on an Indonesia coral reef. <i>Coral Reefs</i>	Springer, Berlin, Germany	Not yet available	N/A
	Powell A., Smith D.J., Hepburn L., Bell J.J. (In Press). Patterns of sponge abundance across a gradient of habitat degradation in the Wakatobi Marine National Park, Indonesia. <i>The Open Marine Biology Journal</i>	Bentham Science, Sharjah, UAE	Not yet available	N/A
	Suggett D.J., Smith, D.J. (2011). Interpreting the signs	Wiley, New York, USA	http://onlinelibrary.wiley.com/doi/10.11	Open Access

	of coral bleaching as friend vs. foe. <i>Global Change Biology</i> 17(1) : 45-55		11/j.1365-2486.2009.02155.x/abstract	
	Cullen-Unsworth L.C., Pretty J., Smith D.J. (2011). Developing community-derived indicators of economic status in the coral triangle: A management support tool. <i>Ocean and Coastal Management</i> 54(6) : 446-454	Elsevier, Amsterdam, Netherlands	http://www.sciencedirect.com/science/article/pii/S0964569111000329	20
	Barnes R.S.K. (2010). Regional and latitudinal variation in the diversity, dominance and abundance of microphagous microgastropods and other benthos in intertidal beds of dwarf eelgrass, <i>Nanozostera</i> spp. <i>Marine Biodiversity</i> 40(2) : 95-106	Springer, Berlin, Germany	http://www.springerlink.com/content/hn5482801u62q160/	30
	Unsworth R.K.F., Cullen L.C., Bell J.J., Smith D.J., Pretty J. (2010). Economic and subsistence values of the standing stocks of seagrass fisheries: benefits of no-fishing marine protected area management. <i>Ocean and Coastal Management</i> 53 : 218-224	Elsevier, Amsterdam, Netherlands	http://www.sciencedirect.com/science/article/pii/S0964569110000396	20
	Hennige S.J., Smith D.J., Walsh S.J., McGinley M.P., Warner M.E., Suggett D.J. (2010). Acclimation and adaptation of scleractinian coral communities along environmental gradients within an Indonesian reef system. <i>Journal of Experimental Marine Biology and Ecology</i> 391 : 143-152	Elsevier, Amsterdam, Netherlands	http://www.sciencedirect.com/science/article/pii/S0022098110002248	25
	Barnes R.S.K. (2010). A remarkable case of fiddler crab, <i>Uca</i> Spp., alpha diversity in Wallacea. <i>Hydrobiologica</i> 637(1) : 249-253	Springer, Berlin, Germany	http://www.springerlink.com/content/gw697146kv311742/	30
	Haapkylä J., Unsworth R.K.F., Seymour A.S., Melbourne-Thomas J., Flavell M., Willis B.L., Smith D.J. (2009). Spatio-temporal coral disease dynamics in the Wakatobi Marine National Park, South-East Sulawesi, Indonesia. <i>Diseases of Aquatic</i>	Inter-Research, Oldendorf, Germany	http://www.int-res.com/abstracts/dao/v87/n1-2/p105-115/	Open Access

	<i>Organisms</i> 87(1-2) : 105-115			
	Unsworth R.K.F., Garrard S., Salinas De León P., Sloman K.A., Cullen L.C., Smith D.J., Bell J.J. (2009). Structuring of Indo-Pacific fish assemblages along the mangrove-seagrass continuum. <i>Aquatic Biology</i> 5 : 85-95	Inter-Research, Oldendorf, Germany	http://www.int-res.com/articles/ab2009/5/b005p085.pdf	Open Access
	Smith D.J., Pretty J.N., Etienne M., Spring N. Suggett D.J. (2009). Using Coral Reefs to Examine the Threats of Climate Change to Marine Biodiversity. Indonesian Biodiversity.			
	Eme J., Bennett W.A. (2009). Acute temperature quotient responses of fishes reflect their divergent thermal habitats in the Banda Sea, Sulawesi, Indonesia. <i>Australian Journal of Zoology</i> 57 : 357–362	CSIRO, Collingwood, Australia	http://www.publish.csiro.au/paper/ZO09081	Subscription Required
	Unsworth R.K.F., Salinas De León P., Garrard S.L., Smith D.J., Bell J.J. (2009). Habitat usage of <i>Lethrinus harak</i> (Forsskål, 1775) in an Indo-Pacific coastal seascape. <i>The Open Journal of Marine Biology</i> 3 : 16-20	Bentham Science, Sharjah, UAE	http://www.benthamscience.com/open/tombj/openaccess2.htm	Open Access
	Hennige S.J., Smith D.J., Perkins R., Consalvey M., Patterson D.M., Suggett D.J.. (2008). Photoacclimation, growth and distribution of massive corals in clear and turbid waters. <i>Marine Ecology Progress Series</i> 369 : 77-88	Inter-Research, Oldendorf, Germany	http://www.int-res.com/abstracts/meps/v369/p77-88/	Subscription Required
	Unsworth R.K.F., Salinas De Leon P., Garrard S., Jompa J., Smith D.J., Bell J.J. (2008). High connectivity of Indo-Pacific seagrass fish assemblages with mangrove and coral reef habitats. <i>Marine Ecology Progress Series</i> 353 : 213–224	Inter-Research, Oldendorf, Germany	http://www.int-res.com/abstracts/meps/v353/p213-224/	Subscription Required
	Pilgrim S.E., Cullen L.C., Smith D.J., Pretty J. (2008). Ecological knowledge is lost in wealthier communities and countries. <i>Environmental Science and Technology</i> 42(4) : 1004-1009	ACS Publications, Washington DC, USA	http://pubs.acs.org/doi/abs/10.1021/es070837v	Open Access
	Perry C.T., Hepburn L.J.	Elsevier,	http://www.science	25

	(2008). Syn-depositional alteration of coral reef framework through bioerosion, encrustation and cementation: Taphonomic signatures of reef accretion and reef depositional events. <i>Earth-Science Reviews</i> 86(1-4) : 106-144	Amsterdam, Netherlands	direct.com/science/article/pii/S0012825207001183	
UK Press Releases	Exton D.A. (2011). Conservation efforts to restrict over-fishing in Wakatobi. <i>Biodiversity Science Online</i>		http://www.biodiversityscience.com/2011/07/25/restrict-over-fishing-wakatobi/	Free
	Highfield R. (2011). Free-diving Indian Ocean nomads under threat. <i>New Scientist Online</i>		http://www.newscientist.com/blogs/shortsharpscience/2011/07/free-diving-indian-ocean-nomad.html	Free
Indonesian Press Releases	Sustainable fisheries rescue in Kaledupa Island (2010)		http://owt.or.id/projects/darwin-inisiatives	Free
TV Documentary	Laboratorium bawah laut di jantung segitiga karang dunia (<i>Laboratory under the sea in the heart of the coral triangle region</i>) 27 th November 2010	Metro TV, Indonesia	http://www.metrotvnews.com/read/newsprograms/2010/11/27/7555/88/-Laboratorium-Bawah-Laut-di-Jantung-Segitiga-karang-Dunia-	Free

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