

Darwin Initiative Annual Report

Darwin Project Information

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| Project Ref Number | 16002 |
| Project Title | Building capacity for sustainable fisheries management in the Wallacea region |
| 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 |
| Reporting period (1 Apr 2007 to 31 Mar 2008) and annual report number (1,2,3..) | Annual Report 3 April 2009 – March 2010 |
| Project Leader Name | Dr Tim Coles |
| Project website | www.wallaceatrust.org |
| Author(s), date | Dr Tim Coles, April 2010 |

1. Project Background

One of the main problems on Indonesian coral reefs is over-fishing by local people using small scale or artisanal techniques. Until recently artisanal fishing has been regarded by the Indonesian government as too small scale to have any significant impact on reef fisheries. As a result there has been no legislation to restrict fisheries on coastal reefs and in many parts of the archipelago the reef fishery has been seriously impacted. An example of this is on the reefs around Kaledupa Island in the Wakatobi Marine National Park, SE Sulawesi in Indonesia. Scientists and university students as part of annual biodiversity and fisheries surveys funded through Operation Wallacea have studied these reefs and the fishery since 1996. The results from these surveys demonstrated a fishery that was in serious decline with average catch per unit effort at 10% of levels in other parts of the Pacific and evidence of some species being commercially extinct.

The Darwin Initiative funding was obtained to demonstrate how a reef fishery could be managed sustainably by using financial incentives. The advantage of using Kaledupa Island was the long-term presence of Operation Wallacea at the site to provide the monitoring data to assess the effectiveness of the scheme, the support (with powers devolved from central government) of the Wakatobi government in implementing the political changes needed, the existence of a strong fishers based NGO and a strong desire from the local fishers to manage their own fishery and stop the decline in their incomes.

The proposed scheme works by registering all the fishers and their boats on Kaledupa. This registration has proved popular with Kaledupan fishers since it prevents fishers from other islands utilising their reefs. Once the scheme is fully implemented though the objective is to reduce overall fishing effort to ensure the fishery begins to recover by offering businesses for

up to 30% of the fishers in exchange for surrendering their licences. The fishers coming out of the fishery would therefore only do so if the businesses created more income than continuing to fish the reefs, whilst those that remain in the fishery then have a licence with a value equal to that of the income created from the businesses for those 'selling' their licences. These remaining stakeholders would be allowed to trade the licences amongst those on Kaledupa or use them as collateral for raising funds. This scheme needs local byelaws introducing by the Wakatobi government and a Kaledupa Fishers Forum created to actively manage the reef fishery. A weekly fishery monitoring programme has been implemented to provide data by which the Forum can take the necessary decisions to maximise the sustainable yield from the reefs.

By the end of year 2, 16 of the 18 project outputs that were scheduled to be implemented in the first two years of the project were on target or had already been completed and substantially exceeded the original target. The most impressive was the way the project had motivated the partners to invest in associated activities designed to achieve the same objectives as originally planned by the Darwin project. The matching funding target of £400,000 had already been doubled with funding provided by Operation Wallacea on the surveys and ecotourism development, the Wakatobi government on donation of land and buildings, and the construction contract for the carrageenan extraction plant and from COREMAP on information dissemination and awareness. Boat and net registration had been completed on all the Kaledupa villages and 100% compliance achieved and by the end of year 2 the weekly catch monitoring over a 24 hour period once a week in each of the 9 main villages had been running without interruption for 18 months enabling very detailed analysis of catches. The production of scientific papers to underpin the project was also well ahead of schedule. The two outputs that were behind schedule were both related to the postponement of the Kaledupa Fisheries Forum, which was done on the advice of the Wakatobi Government in order to ensure the consultation was completed and the data on the impacts of various proposed fisheries byelaws could be presented.

Project Partnerships

FORKANI

Forkani are the main partners implementing the fisheries monitoring, development of the Kaledupa Fisheries Forum, development of proposed byelaws and boat and fisher registration. Forkani have turned out to be very reliable and are doing an excellent job on the ground. The training their staff have received as part of the Darwin project has given them a much greater understanding of how to manage reefs sustainably.

Coral Reef Research Unit

The CRRU at Essex University is the main partner for the biological monitoring of the reefs around Kaledupa. Their production of research papers from the programme has been outstanding with the scientific paper publication target of 15 papers having been achieved after year 2. The list currently stands at 17 papers published in peer reviewed journals over the 3 years of the project, a further 10 submitted to peer reviewed journals. In addition a book summarising the research carried out in the Wakatobi has been completed and is due to be published in July 2010. A further chapter has been drafted in another book. Mainly those publications where the lead scientist for the coral and fish monitoring surveys (Dr David Smith, Essex University) or his deputy (Dr Richard Barnes, Cambridge University) have been included in the listing of publications. Without the Darwin Initiative reef monitoring programme neither of these scientists would have been on site and the publications would not have been completed. Note the full publication list from this site is much longer than that listed in table 2.

Wakatobi Government

Contacts with the Wakatobi Government either through the head of the government (Bupati) or through the Fisheries department have been regular since implementation of the project and the Wakatobi government has already budgeted expenditure on the project significantly more than received from the Darwin grant. The Bupati in particular is supportive of the project and is keen to work with the project on developing the Wakatobi as an ecotourism destination with accommodation supplied by local homestays (the most efficient of all the options available at

ensuring a high percentage of any spend remains within the communities). In 2009 the Wakatobi Government built ecotourism support facilities (jetty, field hospital) on Hoga where the project is based to encourage additional tourism. In addition in 2009 the Wakatobi government agreed a zonation plan for the reefs which will further help implementation of the project. In 2010 the Wakatobi Government are spending £300,000 on constructing an international marine research centre on Hoga, which will help with the long term monitoring of the fishery and the reefs. The runway built by the Wakatobi government in 2008 on Wanci to help facilitate home-stay based tourism has been followed up in 2010 by the government grant aiding twice daily flights by a 30 seater plane between Kendari and Wanci to significantly improve access to the islands. The 2010 Wakatobi budget is also extending the runway on Wanci to 1.8km to allow larger planes to land. In addition in 2010 the Wakatobi Government has donated 1 ha of land and constructed a large building specifically for use as the carrageenan processing factory. The building is being offered for free use by an investing company in developing the carrageenan plant in exchange for 30% of the shares in the plant being available for buying out fishers licences.

COREMAP

From the very start of the Darwin project the head of the COREMAP project in eastern Indonesia instructed all his staff in the Wakatobi and those on Kaledupa in particular to ensure that the objectives and activities of COREMAP on Kaledupa were fully aligned with the activities of the Darwin project. COREMAP regard the Darwin Kaledupa project as an excellent prospect for establishing a flagship example of how fisheries can be managed throughout eastern Indonesia. Their remit covers the whole of eastern Indonesia and they do not have the facility to concentrate all their efforts on one island as is being undertaken by the Darwin project on Kaledupa. The COREMAP meeting in October 2010 is being hosted in the Wakatobi so the various staff can see the Kaledupa fisheries project first hand.

2. Project progress

2.1 Progress in carrying out project activities

Activities postponed from previous years

Kaledupa Fisheries Forum

The original target for holding the first meeting of the Kaledupa Fishers Forum was for September 2008 but this was delayed because during consultation a much more effective way of achieving the same objective was discovered. As noted in the previous annual report the approach recommended by the Bupati (Head of the Wakatobi Government) and the village heads was to complete detailed village level consultation on the fishery problems and potential byelaw solutions first. That would give the team time to introduce the concept of a democratic process by which each village would have its own Forum consisting of a representative from local government (BPD) and all the fishers from that village to meet regularly to discuss ways in which the fishery on the local reefs could be managed. A representative from each of the village Forums would then be elected to a Kaledupa Fisheries Forum to work alongside the sub-district heads (Camats), and police, army and Park ranger representatives. This process was followed with all 25 villages and 2 sub villages and was completed by November 2008. In each village a Village Fishers Forum was formed and a representative elected to the Kaledupa Fishers Forum.

The inaugural meeting of the Kaledupa Fishers Forum was held on Saturday and Sunday, 1 and 2 of August 2009 at Ambeua, the capital of Kaledupa Sub-district and the agenda of the workshop is enclosed in *Appendix 1*. The workshop was attended by 65 persons, comprising: (a) Representatives of Kaledupa Island Reef Fishery Forum of 25 Villages and 2 hamlets (27 persons); (b) Main Official Leaders (Muspika) at Kaledupa and Kaledupa Selatan Sub-Districts (5 persons); (c) FORKANI members (12 persons); Wakatobi National Park (2 persons); (d) Wakatobi District Government (2 persons); (e) TNC/WWF (3 persons); (f) COREMAP (2 persons); (g) Operation Wallacea Trust (2 persons); (h) Opwall Ltd (5 persons); (i) CRRU (2 persons); (j) Lembaga Alam (2 persons) (*Appendix 2*). The workshop was officially opened by

Head of Kaledupa Sub-District, and then continued with several presentations, i.e. Operation Wallacea Trust (*Dr. Edi Purwanto* and *Dr. Tim Coles*), District Fishery Service (*Baharuddin*), TNC/WWF (*Purwanto* and *Weda Santiaji*), CRRU (*Dr. Dave Smith*) and *Joel Rice*¹. The last speaker presented the results of data processing and modeling of the fish catches data collected by FORKANI since October 2007 (*Appendix 3*). The presentation together with others was aimed to inspire KFF members on the byelaw formulation during the next session of the workshop.

After the main presentations, the KFF members (27 persons) were divided into three working group and each group was assigned to discuss a specific topic. Working group 1 (WG 1) discussed bylaws related to fish-fences, whilst WG 2 concentrated on net fishing and WG 3 concentrated on 'bubu' trapping. Each working group was assisted by a facilitator, i.e. *Beloro* (FORKANI) for WG 1, *Edi Jaimu* (FORKANI) for WG 2, and *Kamaluddin* (FORKANI) for WG 3.

To ensure that the working group discussion addressed the expected outputs, list of questions were given to the facilitators to guide discussion.

Questions on WG 1 on Fish Fences: (a) how many fish-fences are allowed to be installed in every village? (b) What is the optimal distance between fish-fences which provide optimum catches, avoid conflicts on the use of near shore spatial among fishers and do not degrade reef fish stocks? (c) What should be the minimum mesh size at the cod end ('Futu'²)? (d) What should be the minimum mesh size of the 'Kasandu'³? (e) Do we need to use different mesh-size of Kasandu to catch different fish species at the cod end? (f) Do we need to construct an opening door at the cod-end to release juvenile fishes?

Questions on WG 2 on Net Fishing: (a) Do we need to restrict the length and width of gillnets used in reef fisheries? (b) What should be the minimum mesh-size of the gillnets to protect juvenile reef fishes? (c) Do we need to agree gillnet operational procedures? (d) Do we need a licensing scheme for gillnet operation?

Questions on WG 3 on Bubu Trap: (a) Do we need to restrict the mesh size of Bubu trap used in reef fisheries? (b) Do we need to restrict the numbers of Bubu trap installed in reef fisheries? (c) Do we need to agree Bubu trap to operational procedures?

To ensure cross fertilization of ideas amongst the working groups, during the second day of the workshop, the representatives of each working group presented their proposed byelaw versions in front of the other working groups. After long and heated discussions over several sensitive points, the KFF was finally able to formulate the draft (*Appendix 4*). The draft then was declared in front of Bupati Wakatobi during the closing ceremony (*Appendix 5*). The workshop was officially closed by Bupati Wakatobi (*Ir. Hugua*). In his speech, the Bupati considered the workshop was very productive and it provided strong support to other government initiatives such as the zonation plan and gave full support to the agreed outputs from the Workshop.

Note the Workshop comprising representatives from each of the Kaledupa fishing communities had agreed on 24 byelaw restrictions on fishing gears – an outstanding result and achievement of one of the Darwin Initiative objectives of achieving island wide fishery regulations. Indeed the Wakatobi government were so pleased with the outcome that they have requested funds from central government to implement the same scheme of consultation and byelaw agreement on the other three main islands in the Wakatobi. However, the proposed byelaws were still short of what is required to allow the fishery to fully recover and allow higher catches (*Appendix 6*). So whilst a step in the right direction had been taken particularly when coupled with the agreed zonation plan, these steps were unlikely to enable the fishery to recover and the original plan of reducing fishing effort by 'buy outs' of up to 30% of fishing licences would still be required.

¹ Scientist hired by Operation Wallacea Trust to process and model the fish catches data collected by FORKANI in Kaledupa.

² 'Futu' is Kaledupan term for cod end (trap)

³ 'Kasandu' is Kaledupan term for a fish net use to catch fishes in the cod-end.

Implementation and enforcement of the byelaws

From September 2009 FORKANI has been working with each of the villages on Kaledupa to ensure the byelaws are introduced. The first task was to gain agreement between each of the communities on which sections of the reefs their perdes would apply (*Appendix 7*). This was completed by January 2010 and FORKANI since then have been completing the following procedure in each of the villages to ensure the perdes are drafted and adopted by each community using the following methodology:

ORKANI members, living in the targeted village, conduct door-to-door meetings with key leaders/elders of the village, which is followed by organising a small group meeting involving the village head, head of village representative body (BPD) and key elders from the community. In this meeting, FORKANI members supported by the KFF, speak to the meeting participants of the importance of village commitment on managing the marine area.

From this meeting they then move to the facilitation phase where there is a village meeting to socialise the concept of introducing the 24 perdes. This is followed by focus group discussions to understand the different perceptions between genders and socio-economic groups in the village. FORKANI then develop a draft of the Perdes which is then put to a full meeting of the village as a draft. These drafts go through various stages until finally there is a village meeting where the perdes are accepted as village law. To date 5 villages (Sombano, Peropa, Kasuwari, Waduri and Lewuto) have completed this process and introduced all the KFF proposed perdes.

Enforcement of the zonation plan adopted by the Wakatobi Government has been underway since the start of 2010 by the National park rangers. The communities themselves have been policing their agreed areas of reefs to ensure that only village registered fishers are using their areas. Enforcement of the byelaws though has not really begun yet since the remaining villages need to complete the perdes process. The workshop to develop collaborative enforcement strategies (Police, park rangers and communities) that was scheduled for year 2 of the project has been postponed until July 2010 to allow completion of the perdes process. The enforcement strategy will now combine fishing zone, boat registration and byelaw enforcement.

Year 3 Objectives and Target Outputs

Co-management

The main objective for year 3 under the co-management heading was to ensure that the KFF has partial funding from business income to become self sustaining. The Wakatobi government however, has adopted the KFF as a model for how to manage fisheries in the Wakatobi and the costs of the KFF have been included in government budgets beyond the Darwin Initiative funding. The Kaledupa Fishers Forum is actively involved with FORKANI in introducing the 24 agreed byelaws in each of the villages on Kaledupa and is a functioning organisation.

Alternative business development

By the end of year 2 the project had reached the stage where carrageenan extraction had been identified as the main source of alternative income with a building at Buranga set aside by the Bupati for use as the extraction plant. The final carrageenan extraction report though had not been received by the time of the last Annual Report due to ill health of the author. The report (*Appendix 8*) indicated that with investment of around \$2 million a business could be created that would give the investors substantial returns and still allow \$1.75 million to be paid annually as compensation for those fishers surrendering their licences. This report was forwarded to the Wakatobi government for consideration of how it could be implemented within the Wakatobi and tied to buy outs of the fishing licences on Kaledupa to provide replacement income for those surrendering their fishing licences. The Wakatobi government agreed to move forward on the basis of donating land and buildings to potential commercial investors in exchange for 30% of the shares of the new business being made available to Kaledupa fishers surrendering their fishing licences. Unfortunately by the time the report had been received the land and buildings at Buranga that had originally been identified by the Bupati as the best location for the plant had been lost. The Wakatobi government therefore set aside a £150,000 budget to purchase additional land and construct a new set of buildings for use as the plant. This building has recently been completed (*Appendix 9*) and the Wakatobi government is now in the process of tendering for potential investors to utilise the facilities and the extraction methodology developed as part of the Darwin Initiative funding. So whilst the target of beginning the buy outs of fishing licences by May 2009 has not been achieved, the construction of the plant and the offer of shares will enable the entire 30% of the fishers that need to be removed from the fishery to be achieved in one round of buy outs once the plant is operational.

Ecotourism was also identified as an alternative income source for fishers surrendering their licence and during the last year the Darwin team has continued in advising on the development of ecotourism in the Kaledupa area. The Wakatobi Government has also continued with investment to develop the islands as a destination in the centre of the Coral Triangle. The main problem with getting ecotourists to visit the Wakatobi is their inaccessibility and this has been tackled by the Wakatobi government by constructing a 1.4km long runway on Wanci Island. The opening of the runway was in May 2009 and from June 2009, Susi Air operated twice daily Wakatobi Government subsidised flights using a Cessna 12 seater plane operating from Kendari airport and connecting to national and international flights. From January 2010 the Susi Air flights were replaced by Express Air daily flights from Makassar and Kendari using a 30 seater Dornier 328 Turboprop plane. The runway is currently being extended to 1.8km so that larger planes can be used and flights directly from Bali can land.

The Wakatobi government is marketing ecotourism to the area based on its location in the centre of the Coral Triangle (the triangle of reefs in eastern Indonesia and southern Philippines that have the greatest diversity of hard coral genera). A key part of this strategy is having a strong research base built around the research programme being completed by Operation Wallacea and the Darwin Initiative. In 2009 the Wakatobi government constructed a Marine Research Centre on Hoga Island to build on this existing research at a total investment of £300,000. The Centre was opened in March 2010 and Dr Dave Smith from the Coral Reef Research Unit (one of the Darwin partners on this project) has been appointed as the Senior Scientist advising the Wakatobi government on marine science issues.

Field Research program

The annual survey of coral and fish communities of the 108 fixed transects around Kaledupa was completed in July/August 2009 and *Appendix 10* gives an analysis of the change over the last year. In contrast to 2008, in most cases there was either no change in habitat quality, as indicated by hard coral cover, but in many cases there was actually an increase particularly in *Acropora* colonies at Kaledupa Double Spur and the Hoga site. This is the first time in the last several years whether there hasn't been an overall decrease and suggests that the area is in some state of recovery. There was no change in fish abundance and again this is seen as a positive sign, as for many years abundance has been decreasing. A similar trend was observed for the fish species richness.

The weekly monitoring of reef catches over a 24 hour period once a week has been continued by FORKANI in each of the 9 main villages and Joel Rice independent fisheries consultant is ensuring the data are checked and available for analysis. The fishery monitoring has now been running uninterrupted for 29 months.

Dissemination and Publicity

In October 2009, a newsletter named '*Warta Kaledupa*' (news from Kaledupa) was designed to describe progress of the Darwin Project, research findings, profile local fisher champions and describe village regulations (byelaws). The first edition entitled '*Building Agreement on Sustainable Coral Reef Fisheries Management*' (*Appendix 11*), which reported the outputs and follow-up actions of KFF workshop in August 2009 had 2500 copies printed and distributed to key villagers in two kecamatans. Further editions of the Newsletter are proposed once the perdes have been agreed by each of the villages. An article was published in BAKTI in October 2009 describing the Kaledupa Fishers Forum and the development of the byelaws (*Appendix 12*)

In year 3 a film to increase public awareness of the importance of sustainable resource use was due to have been produced. This was delayed slightly since funding from the Wakatobi government and WWF is being used to produce a major feature film about the Wakatobi including the Darwin Initiative funded fishery management project. Filming is due to start in May 2010.

A presentation about the Darwin Wakatobi project was given at the international symposium (*Coral Reef Management Symposium in Coral Triangle Areas*) organized by COREMAP on 12 October 2009 in Jakarta. Many workshop participants were interested on the concept and implementation of Darwin Project and during the discussion session, more questions were addressed to this project than to other remaining four presenters.

A book summarising the reef, fishery and social science research completed to date in the Wakatobi has been compiled and is due for publication in July 2009. The Wakatobi Government is supporting the publication costs to help promote the islands.

Progress towards Project Outputs

24 of the 26 project output measures described in 2.3 that were scheduled to be implemented in the first three years of the project are on target or have already been completed and substantially exceeded the original target. The most impressive is undoubtedly the way the project has motivated the partners to invest in associated activities designed to achieve the same objectives as originally planned by the Darwin project. The matching funding target of £400,000 has already been more than doubled with funding provided by Operation Wallacea on the surveys and ecotourism development, the Wakatobi government on donation of land and buildings, and the construction of the carrageenan extraction plant and the construction of a marine research centre and from COREMAP on information dissemination and awareness. The production of scientific papers to underpin the project is also well ahead of schedule and is likely to substantially exceed the original target.

The only major area of concern is the delay in starting the buy outs and this is due to the decision to concentrate on offering shares in the carrageenan extraction plant so that all 30% of fishers can be offered the buy out option at the same time rather than spread over a 3 year period. Considerable progress has been made on the carrageenan plant with persuading the government to build the plant and to then offer the premises to investors in exchange for 30% of the shares being offered to Kaledupa fishers. The ecotourism developments are also proceeding ahead of initial estimates. Of minor concern is that the dissemination of information about the project to national and internal media has been mainly pushed back to the 2010/11 season. This was done to ensure all the elements of the project were in position before the media were invited. Visits by various media are being arranged for summer 2010. There are two measures identified in the original proposal that are not likely to be achieved. The quarterly fishery reports were not worth doing because of the seasonal changes in the fishery and these have been replaced by annual fisheries reports. The other measure was the numbers of newsletters produced. COREMAP have been producing regular newsletters throughout the period of the Darwin project many of which have included descriptions of the Darwin work. COREMAP have also funded a local radio station on Kaledupa and FORKANI staff have been doing bi-monthly broadcasts. The same (or probably enhanced) level of awareness about the Darwin project on Kaledupa have been achieved without the need for these newsletters.

2.2 Standard Measures

Table 1 Project Standard Output Measures

| Code No. | Description | Year 3 Total | Performance to date | Total planned from application |
|----------|---|--|---|--|
| 6a | Number of people to receive other forms of education/training (which does not fall into categories 1-5 above) * | | Output measure completed after year 1 | 20 Fishery Monitors and 3 Fisheries Scientists 20 KFF members |
| 6b | Number of training weeks to be provided | | Output measure completed after year 1 | 2 X 1 week training courses and mentoring for 3 months |
| 8 | Number of weeks to be spent by UK project staff on project work in the host country | 40 man weeks | 75% of 4 year output measure achieved after year 2 On target | 160 man weeks |
| 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 | 2 – analysis of fishery to June 2009 and analysis of effects of byelaws on fisheries | Behind target and this target may need revising because the same effect can be achieved whilst still producing smaller numbers of reports | 12 quarterly fishery management reports |

| Code No. | Description | Year 3 Total | Performance to date | Total planned from application |
|----------|---|--|---|--|
| 10 | Number of individual field guides/manuals to be produced to assist work related to species identification, classification and recording | | Output measure completed after year 1 | 1 Fisheries Monitoring Manual. |
| 11a | Number of papers to be published in peer reviewed journals | 2 – Appendices 13 and 14 | Output measure achieved after year 2 with 17 papers so far published | 15 papers to be published |
| 11b | Number of papers to be submitted to peer reviewed journals | 10 | A further 10 papers are in Press or have been submitted, meaning that by the end of year 3 there have been 27 papers published or in review already | 15 papers to be submitted |
| 12a | Number of computer based databases to be established and handed over to the host country | | Output measure completed after year 1 | 1 fishery database |
| 14a | Number of conferences/seminars/ workshops to be organised to present/disseminate findings | 1 | 50% of this target achieved – remaining two scheduled for 2010/11 | 2 workshops to be organised (fishery survey, KFF management training). |
| 14b | Number of conferences/seminars/ workshops attended at which findings from Darwin project work will be presented/ disseminated | 1 | 33% of this target achieved - remaining two scheduled for 2010/11 | 3 presentations at seminars |
| 15a | Number of national press releases in host country(ies) | 1 – article in Bakti News October 2009 – | 66% of this output achieved after year 3. Measure on target. | 3 national Indonesia newspaper articles |

| Code No. | Description | Year 3 Total | Performance to date | Total planned from application |
|----------|---|--------------|--|---|
| 15b | Number of local press releases in host country(ies) | | 50% of output measure target completed to end of year 3 | 6 local paper articles |
| 15c | Number of national press releases in UK | | This output is targeted for 2010/11 when various media have been invited to visit the Darwin project | 3 UK national Press releases |
| 16a | Number of newsletters to be produced | 1 | 32% of this output measure achieved by year 3. Behind target but replaced by COREMAP funded newsletters and local radio broadcasts | 24 X newsletters |
| 16b | Estimated circulation of each newsletter in the host country(ies) | 1000 | This output measure is on target | 1000 readership in Indonesia since the newsletters are circulated to all villages in Kaledupa |
| 16c | Estimated circulation of each newsletter in the UK | 25 | This output measure is on target | 25 readership in UK |
| 17a | Number of dissemination networks to be established | | Output measure exceeded after year 1 | 1 information network established by COREMAP |
| 18a | Number of national TV progs/features in host country(ies) | 0 | Dissemination is the main focus of 2010/11 season | 3 Indonesian national TV programmes |
| 18b | Number of national TV programmes/features in UK | 0 | Dissemination is the main focus of the 2010/11 season | 1 national UK TV programme |
| 18c | Number of local TV programmes/features in host country(ies) | | 50% of output measure achieved after year 3 | 4 local Indonesian TV progs |

| Code No. | Description | Year 3 Total | Performance to date | Total planned from application |
|----------|--|--|---|---|
| 19a | Number of national radio interviews/features in host country(ies) | 0 | Dissemination is the main focus of the 2010/11 season | 3 Indonesian national radio programmes |
| 19b | Number of national radio interviews/features in UK | 0 | Dissemination is the main focus of the 2010/11 season | 1 national UK radio programme |
| 19c | Number of local radio interviews/features in host country(ies) | Weekly or bi-monthly broadcasts on Kaledupa radio by FORKANI staff throughout the period | Output measure already massively exceeded | 4 local Indonesian radio programmes |
| 20 | Estimated value (£'s) of physical assets to be handed over to host country(ies) | . | Output measure already achieved | £1000 |
| 21 | Number of permanent educational/training/research facilities or organisations to be established and then continued after Darwin funding has ceased | | Output measure already achieved | 1 fishery and biodiversity research centre will continue after Darwin |
| 22 | Number of permanent field plots to be established during the project and continued after Darwin funding has ceased | 108 X 50m transects established . | Output measure already achieved | 108 X 50m transects |
| 23 | Value of resources raised from other sources (ie. in addition to Darwin funding) for project work | £120,000 from Operation Wallacea towards survey costs in 2008 and 2009 £150,000 from Wakatobi Govt on carrageenan extraction plant £300,000 for marine research centre. £500,000 from COREMAP in 2008 | £1,070,000 in matching funding achieved by the end of year 2 which is 260% of the target for the whole 4 year period. | £402,750 |

| Code No. | Description | Year 3 Total | Performance to date | Total planned from application |
|----------|-------------|---|---------------------|--------------------------------|
| | | and 2009 on expenditure in Kaledupa (estimated at 25% of total expenditure from COREMAP in Wakatobi | | |

Table 2 Publications

| Type * (eg journals, manual, CDs) | Detail (title, author, year) | Publisher (name, city) | Available from (eg contact address, website) |
|--------------------------------------|--|---------------------------|---|
| Journal | Eme, J & Bennett, WA (2009). Acute temperature quotient responses of fishes reflect their divergent thermal habitats in the Banda Sea, Sulawesi, Indonesia. <i>Australian Journal of Zoology</i> , 2009, 57, 357–362 | | Appendix 13 |
| Journal | Smith DJ, Pretty JN, Etienne M, Spring N and Suggett DJ. (2009). Using Coral Reefs to Examine the Threats of Climate Change to Marine Biodiversity. Indonesian Biodiversity. | | Appendix 14 |
| Journal | Suggett DJ and Smith DJ (In press). Interpreting the signs of coral bleaching as friend of foe. <i>Global Change Biology</i> | | Not available until published |
| Journal | Hennige S.J., Smith D.J., Walsh S.J., McGinley M.P., Warner M.E., Suggett D.J. (Submitted) Acclimation and adaptation of scleractinian coral communities along environmental gradients within an Indonesian reef system. <i>Limnology and Oceanography</i> . | | Not available until published |
| Journal | Barnes RSK (In press). A remarkable case of fiddler crab, <i>Uca</i> Spp., alpha diversity in Wallacea. <i>Hydrobiologica</i> | | Not available until published |
| Journal | Barnes RSK (In press). 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> | | Not available until published |
| Journal | Salinas de León P, Costales Carrera A, Zeljkovic S, Smith DJ, Bell JJ. (In Press). | | Not available |

| Type * | Detail | Publisher | Available from |
|----------------------------|---|--------------|--|
| (eg journals, manual, CDs) | (title, author, year) | (name, city) | (eg contact address, website) |
| | Scleractinian recruitment patterns in the Wakatobi National Marine Park, Indonesia. <i>Marine Biology</i> . | | until published |
| Journal | Hennige SJ, Smith DJ, Walsh SJ, McGinley MP, Warner ME, Suggett DJ. (In review) Acclimation and adaptation of scleractinian coral communities along environmental gradients within an Indonesian reef system. <i>Limnology and Oceanography</i> | | Not available until published |
| Journal | Unsworth RKF, Cullen LC, Bell JJ, Smith DJ, Pretty J (In review) Economic and subsistence values of the standing stocks of seagrass fisheries: benefits of no-fishing marine protected area management. <i>Animal Conservation</i> . | | Not available until published |
| Journal | Salinas de León P, Smith DJ, Bell JJ. (in review) Seasonal and inter-annual variability in scleractinian recruitment patterns: influence of environmental heterogeneity. <i>Coral Reefs</i> | | Not available until published |
| Journal | Hepburn L, Smith DJ, Bell JJ. (in review). Bioerosion rates and reef sustainability in the Indo-Pacific. <i>Marine Biology</i> | | Not available until published |
| Journal | Cullen LL, Pretty J and Smith DJ. (In review). Developing Community-Derived Indicators of the Economic Impact of Conservation Management in the Coral Triangle. <i>Environmental Conservation</i> | | Not available until published |
| Book | Clifton J, Unsworth RKF, and Smith DJ (In Press). Research and Conservation in the Marine Biodiversity Triangle. NOVA Science Publishers. ISBN: 978-1-61668-473-0. | | Not available until published in July 2010 |
| Book | Haapkylä J, Unsworth RKF, Seymour AS, Melbourne-Thomas J, Flavell M, Willis BL, Smith DJ (In press) Spatio-temporal coral disease dynamics in the Wakatobi Marine National Park, South-East Sulawesi, Indonesia. <i>Diseases of Aquatic Organisms</i> . ISSN 0177-5103. | | Not available until published |

2.3 Progress towards the project purpose and outcomes

The purpose of the project is to build capacity for sustainable fisheries co-management in the Wakatobi Marine National Park. The assumptions that national & regional government act on policies that support community based co-management, that the political climate remains stable and that fishers remain receptive to programme have all held true. The continuing fisheries monitoring programme run entirely by Kaledupan staff, the completion of the registration of 100% of the motorised fishing boats used for fishing, the formation of a strong Kaledupa Fishers Forum that has agreed 24 fishery byelaws and is currently implementing these through local perdes, the development of the carrageenan extraction process and construction of the plant by the Wakatobi government together with their support for ecotourism development indicates that the project has a strong chance of success.

2.4 Progress towards impact on biodiversity, sustainable use or equitable sharing of biodiversity benefits

The coral and fish monitoring surveys indicate that the decline in fish stocks may have been halted. However, there is still a long way to go in allowing the fish stocks to recover to a level where maximum sustainable yields at levels much higher than current catches can be achieved. The agreement of the zonation plan and 24 fishery byelaws puts the use of the fishery on a much more equitable basis.

3. Monitoring, evaluation and lessons

Four outputs were proposed in the original proposal

1. Fisheries co-management established and functioning under the KFF

This output had two suggested measurable indicators; that KFF members are trained in fisheries management by year 2 and that island wide fisheries regulations are introduced by year 2. Note both of these indicators were delayed on the advice of the Wakatobi Government to complete consultation on potential byelaws and then model their impact on the fishery. The Kaledupa Forum has now been formed and a Workshop held on fisheries management. 24 byelaws have been agreed at island level and are now being implemented through a series of village perdes.

2. Effective enforcement of fisheries regulations

This output had two suggested measurable indicators that the KFF develop and maintain effective surveillance and collaborative policing strategy by year 2 and that there are reduced levels of non-compliance by year 3. Enforcement of the zonation system has already been started by the National Park rangers, the villages are enforcing usage of their reefs only by Kaledupa registered boats. Enforcement of the byelaws has been delayed whilst the perdes were introduced in all the villages. Once this is completed then a workshop for enforcement with KFF members, National Park and Wakatobi government officials will be held (scheduled for July 2010).

3. Fisheries & biodiversity assessment program established & functioning

This output had four suggested measurable indicators; that the Senior Fisheries Manager, 3 Fisheries Scientists and 20 Fishery Monitors are trained in fisheries monitoring programme, that weekly fish landings surveys are completed and interview data from fishers registration recorded, that the CRRU completes fish and biodiversity monitoring on 108 transects and that data condensed into reports and proposed management actions for KFF to use for decision making. The means of verification for these indicators were training workshop attendance, provision of database, CRRU reports and Quarterly reports to KFF. All of these outputs have been achieved except for the quarterly KFF reports. These quarterly reports have been replaced by an annual fisheries report.

4. Alternative income sources developed to provide 'buy out's of fishing licences and reduce fishing effort

This output had three suggested measurable indicators; development of business plans to provide income for 30% (in fishing effort terms) of fishers to sell their licences, exchange of licences for businesses and generation of sufficient business income to complete the buy outs. The means of verification for these indicators were: business plans, data on numbers of fishing licences bought out and budgets from year 3. The first indicator was achieved with the selection of the carrageenan extraction plant and the development of home-stay based ecotourism. The other two indicators have not been achieved due to the decision to concentrate on offering shares in the carrageenan extraction plant so that all 30% of fishers can be offered the buy out option at the same time rather than spread over a 3 year period. Considerable progress has been made on the carrageenan plant with persuading the government to build the plant and to then offer the premises to investors in exchange for 30% of the shares being offered to Kaledupa fishers.

4. Actions taken in response to previous reviews

The reviewer supports the changes made to the process by which KFF is formed and legislation developed, essentially at the end of a process of community engagement. It is recommended that the project adjusts its purpose level indicator and appropriate elements in the logframe to reflect this change, and therefore reports against the agreed changes.

The positive village process to include recommendations and to form village fora for fisheries managements has thrown up (not unexpectedly) some (seemingly not major) levels of conflict between village fishers themselves and with other stakeholders, especially 'outsiders' and Bajo fishers. Three questions arise a) is a process being developed to mediate in the conflicts b) are the Bajo included in the engagement process and how will they be represented on the KFF, c) how are the 'outsiders' being handled?

a. The agreement over the map showing the areas of reef for which each community is responsible is a major step in resolving disputes between villages.

b. The Bajo communities have areas of reef for which they are responsible. The problem is more of a social one with the Bajo since they tend to defer to Kaledupans in the meetings. However, the representatives from the Bajo communities on the KFF are fairly strong characters.

c. Outsiders (ie non licence holders) are not being allowed to fish on the reefs around Kaledupa. There have been no reports of this causing conflict but if it did then this is where the National Park rangers would be deployed.

It is very positive that the project has access to the high level of scientific research generated via the CRRU. The low level of DI contribution does however, beg the question whether DI should be recording all the papers in the standard measures as attributable to DI, especially since some of the paper topics do not seem directly relevant to the project itself. It is suggested that fewer papers are reported as project measures focusing on those that receive most DI support and are most relevant to the project.

Understood but the full list of papers is actually much longer than that provided. Without the funding provided by the Darwin Initiative for the coral and fish monitoring then neither Dr Smith nor Dr Barnes could spend the time on site that would allow many of these papers to be completed.

The development of the Carrageen Plant is a key component of the livelihoods that will take fishers out of the fisheries. Has the project taken steps to reduce any possible risks that may arise from the understandably delayed Carrageen report?

The speedy construction of the carrageenan plant by the Wakatobi government has shown that they are committed to making this happen and this has heightened expectation that the scheme will be introduced.

5. Other comments on progress not covered elsewhere

None

6. Sustainability

The main approach for ensuring the project continues long after the Darwin funding finishes is to ensure that the alternative income streams (carrageenan extraction, ecotourism) being developed produce enough income for the necessary buy outs to continue. The Operation Wallacea Trust and Operation Wallacea are committed to continue working in the area after the Darwin project finishes and Operation Wallacea has a sustainable business model independent of grant aid.

7. Dissemination

Much of the dissemination activity is scheduled to be started in July 2010. Dr Edi Purwanto who was outstanding in disseminating information about the Lambusango World Bank/GEF project is organising all the within Indonesia dissemination and Dr Tim Coles has arranged for a journalist who writes for various high circulation international magazines in the UK and North America will be visiting in July 2010 to draft articles.

8. Project expenditure during the reporting period (Defra Financial Year 01 April to 31 March)

| Item | Budget | Expenditure | Balance |
|-------------------------|--------|-------------|---------|
| Overhead costs | | | |
| Travel and subsistence | | | |
| Operating costs | | | |
| Capital items/equipment | | | |
| Others | | | |
| Salaries (specify) | | | |
| TOTAL | | | |

9. OPTIONAL: Outstanding achievements of your project during the reporting period (300-400 words maximum). This section may be used for publicity purposes

There are 5 main achievements of the project to date;

1. Developing and continuously running a weekly fisheries monitoring programme for 29 months on the 9 main villages across Kaledupa. Note COREMAP a \$200 million World Bank funded project has not achieved this level of monitoring. The achievement is all the more considerable since the monitoring programme is entirely run by local Kaledupan staff. The data are now there for the effects of various potential byelaws to be modelled so that the decisions on which are the most effective regulations can be made.
2. Compiling database records of 1000+ fishers across the island and their fishing gear. In addition all motorised boats used for fishing have been registered and individual identification codes painted on each of the boats (more than 550 boats). There is no other area of Indonesia where such a detailed census of fishers has been completed and 100% of reef fishing boats registered.
3. Development of potential income streams that have the financial power to buy out sufficient fishers' licences to reduce fishing effort to a point where the fishery can start recovering. The development of a carrageenan extraction process which does not infringe any existing patents is an outstanding achievement. In addition the financial commitment of the Wakatobi government in completing the building for the plant means that the investment needed to get this income stream developed is in position. Moreover the commitment by the Wakatobi government in building a airport on Wanci and marine research centre and the year round operation of the Hoga centre by local organisation Lembaga Alam means home-stay ecotourism income is likely to rise.
4. The number of publications in peer reviewed journals has already achieved the target with 17 papers published to date and a further 10 in review. Note one of those in for review in a previous year was refused and has to be re-submitted to another journal because a copy of the draft paper was on the Operation Wallacea/ Darwin web site as an Appendix and was therefore regarded as published. Only copies of those papers already published have therefore been included in this Annual Report.
5. Formation of the Kaledupa Fishers Forum that agreed 24 byelaws to restrict different aspects of the fishery and then their introduction by introduction of local perdes in each of the villages is a major achievement. There are few fisheries where the participants have voluntarily agreed to 24 byelaws!

Annex 1 Report of progress and achievements against Logical Framework for Financial Year: 2009/10

| Project summary | Measurable Indicators | Progress and Achievements April 2000 - March 2010 | Actions required/planned for next period |
|--|--|--|--|
| <p><i>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</i></p> <p><i>The conservation of biological diversity,</i></p> <p><i>The sustainable use of its components, and</i></p> <p><i>The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources</i></p> | | <p><i>(report on any contribution towards positive impact on biodiversity or positive changes in the conditions of human communities associated with biodiversity eg steps towards sustainable use or equitable sharing of costs or benefits)</i></p> | <p><i>(do not fill not applicable)</i></p> |
| <p><i>Purpose</i> To build capacity for sustainable fisheries co-management in the Wakatobi Marine National Park</p> | <p>KFF functioning effectively by yr1</p> <p>Fisheries monitoring and assessment functioning by yr1</p> <p>Effective enforcement system by yr3</p> <p>Initiation of 'buy outs' by year 2</p> <p>Evidence of recovery of fisheries by yr4</p> | <p>Formed and functioning effectively</p> <p>Monitoring has now been running for 27 months uninterrupted</p> <p>Enforcement of zonation system and boat registration now underway</p> <p>Delayed due to decision to complete all buy outs in one round by developing the carrageena n extraction plant concept</p> <p>Fish populations appear to have stabilised</p> | <p>Meetings to complete enforcement training in July 2010</p> <p>Continued monitoring and production of fisheries report in August 2010</p> <p>Continued enforcement and addition of byelaw enforcement</p> <p>Tenders to be offered to investors to use the newly constructed buildings in exchange for 30% of the shares being offered to fishers</p> <p>Repeat monitoring</p> |
| <p>1. Fisheries co-management established and functioning under the KFF</p> | <p>KFF members trained in fisheries management by yr2</p> <p>Island wide fisheries regulations by yr2</p> | <p>Completed</p> <p>Island wide byelaws agreed and now being implemented via village perdes</p> | |

| Project summary | Measurable Indicators | Progress and Achievements April 2000 - March 2010 | Actions required/planned for next period |
|---|--|--|--|
| Training & Capacity Building | | | |
| 2. Effective enforcement of fisheries regulations | <p>KFF develop and maintain effective surveillance and collaborative policing strategy by yr2</p> <p>Reduced levels of non-compliance by yr3</p> | Policing of zonation and registration of boats now underway | |
| 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>Completed</p> <p>Continuing</p> <p>Continuing</p> <p>Annual reports completed to June 2009</p> | |
| Training & Capacity Building | | Fisheries Monitors trained in fishery monitoring programme | |
| Field Research Program | | <p>Fisheries monitoring programme up and running, database developed and annual reports produced.</p> <p>Coral and fish surveys on 108 transects completed</p> | |
| 4. Alternative income sources developed to provide 'buy out's of fishing licences and reduce fishing effort | Development of business plans to provide income for 30% (in fishing effort terms) of fishers to sell their licences | Completed | |

| Project summary | Measurable Indicators | Progress and Achievements April 2000 - March 2010 | Actions required/planned for next period |
|--------------------------------|--|--|---|
| | <p>Exchange of licences for businesses</p> <p>Generation of sufficient business income to complete buy outs of 30% of licences</p> | <p>Delayed due to the decision to concentrate on offering shares in the carrageenan extraction plant so that all 30% of fishers can be offered the buy out option at the same time rather than spread over a 3 year period</p> | |
| Training and capacity building | | <p>Business plans developed for carrageenan extraction, aquaculture for the aquarist trade, ecotourism and Wildlife Conservation Products.</p> | |

Annex 2 Project's full current logframe

| 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> <p>the conservation of biological diversity,</p> <p>the sustainable use of its components, and</p> <p>the fair and equitable sharing of benefits arising out of the utilisation of genetic resources</p> | | | |
| <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</p> <p>Fisheries monitoring and assessment functioning by yr1</p> <p>Effective enforcement system by yr3</p> <p>Initiation of 'buy outs' by year 2</p> <p>Evidence of recovery of fisheries by yr4</p> | <p>KFF quarterly meeting reports</p> <p>Field survey reports and database</p> <p>Ranger and local community enforcement records</p> <p>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</p> <p>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> |

| Project summary | Measurable Indicators | Means of verification | Important Assumptions |
|---|---|---|---|
| 2. Effective enforcement of fisheries regulations | KFF develop and maintain effective surveillance and collaborative policing strategy by yr2 Reduced levels of non-compliance by yr3 | Community and Ranger training (funded by COREMAP) workshop attendance levels Park Ranger & community records | Local Rangers co-operate with KFF policing strategy Communities are proactive in self-policing High legitimacy of regulations |
| 3. Fisheries & biodiversity assessment program established & functioning | Senior Fisheries Manager, 3 Fisheries Scientists and 20 Fishery Monitors trained in fisheries monitoring programme. Weekly fish landings surveys completed and interview data from fishers registration recorded CRRU completes fish and biodiversity monitoring on 108 transects Data condensed into reports and proposed management actions for KFF to use for decision making | Training workshop attendance Database CRRU reports Quarterly reports to KFF | Trained project staff continue to operate under KFF and use skills provided |
| 4. Alternative income sources developed to provide 'buy out's of fishing licences and reduce fishing effort | Development of business plans to provide income for 30% (in fishing effort terms) of fishers to sell their licences Exchange of licences for businesses Generation of sufficient business income to | Business plans Data on numbers of fishing licences bought out Budgets from year 3 | Businesses develop sufficient income |

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

Annex 3

Appendix 1 - Kaledupa Fishers Forum agenda

Appendix 2 – Kaledupa Fishers Forum attendance list

Appendix 3 – Management implications of the potential byelaws in the Kaledupa fishery

Appendix 4 – Proposed byelaws formulated by Kaledupa workshop

Appendix 5 – Photos of the Kaledupa Fishers Forum close out ceremony

Appendix 6 – Effects of accepted byelaws

Appendix 7 – Map of village boundaries and reef areas where village perdes will be introduced

Appendix 8 – Development of a carrageenan extraction plant

Appendix 9 – New carrageenan extraction plant photos

Appendix 10 – 2009 Wakatobi fish and coral monitoring surveys

Appendix 11 – Post KFF edition of newsletter

Appendix 12 – BAKTI news October 2009 (translation)

Appendix 13 - Eme, J & Bennett, WA (2009). Acute temperature quotient responses of fishes reflect their divergent thermal habitats in the Banda Sea, Sulawesi, Indonesia. *Australian Journal of Zoology*, 2009, 57, 357–362

Appendix 14 - Smith DJ, Pretty JN, Etienne M, Spring N and Suggett DJ. (2009). Using Coral Reefs to Examine the Threats of Climate Change to Marine Biodiversity. *Indonesian Biodiversity*.

Checklist for submission

| | Check |
|---|-------|
| Is the report less than 5MB? If so, please email to Darwin-Projects@ectf-ed.org.uk putting the project number in the Subject line. | X |
| Is your report more than 5MB? If so, please advise Darwin-Projects@ectf-ed.org.uk that the report will be send by post on CD, putting the project number in the Subject line. | |
| Do you have hard copies of material you want to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number. | |
| Have you completed the Project Expenditure table? | X |
| Do not include claim forms or communications for Defra with this report. | |